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UK Renal Registry

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19th Annual Report

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UK Renal Registry
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The UK Renal Registry

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Foreword

I hope you enjoy reading the 2016 UK Renal Registry report compiled by the outstanding team at the registry. As a trainee starting out in nephrology in 1994 I have witnessed the incredible evolution of the registry from its inception under the auspices of the Renal Association. Conceived initially as a large scale audit of performance throughout the United Kingdom it continues to grow both in scope and influence. On the horizon are projects to report on episodes of acute kidney injury, low clearance care and conservative management. It is not only a very high quality database about kidney disease derived from 84 UK renal units but has evolved into a more proactive engine for change. Examples of this transformation include:

- High quality research facilitated by the ability to collect huge volumes of data over many years manifested by a number of NIHR grants
- Setting up the Think Kidneys programme and pioneering quality improvement in nephrology by setting up KQUIP in partnership with NHS England
- Leading the UK Renal Data Collaboration
- Driving patient activation through PatientView and measurement of patient reported outcome measures
- Award-winning work on a AKI

When I had the chance to visit the registry I was impressed by the palpable commitment and enthusiasm of all the members of staff. They share a passion for the project which is infectious. There is a large team of data handlers, analysts, programmers, statisticians, business managers all sharing the same commitment to improve the lot of the four million people in the UK who have kidney disease.

Congratulations to Ron, Fergus, Retha, Karen and Hilary and the rest of the team on the continuing success of the endeavour.

Through the work of the Clinical Reference Group I have spent a lot of time over the past twelve months considering metrics of quality and it is clear that accurate contemporary data is the cornerstone of measuring performance. When I attend meetings with clinicians from other specialities I realise that the renal community is in a uniquely privileged position. For this we should all thank the vision of a handful of individuals who conceived the project more than twenty years ago and the continuing efforts of Ron's team. If you want a definition of good value, then consider that the capitation cost of this service per patient is approximately a quarter of one haemodialysis session!

Finally I was reminded during my visit that the registry data set is a dynamic process and that the team are amenable to proposals. So, if you have an idea for new data that should be collected, or if you would like to use the registry database to facilitate data collection on a research project then get in touch and start a partnership.

Richard Baker
Chair Renal Services Clinical Reference Group

Chapters and appendices

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UK Renal Registry 19th Annual Report: Introduction

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Background

Fair processing is a key principle of the Data Protection Act and requires organisations to be clear and open with individuals about how their information will be used. This is particularly important where data are collected without individual patient consent with support under section 251 of the Health and Social Care Act, as is the case for the UK Renal Registry (UKRR).

As part of ongoing efforts to communicate its work to patients and clinicians, in 2017 the UKRR worked with its Patient Council to update its information leaflets and posters. It also produced a video animation explaining the varied work of the UKRR (see www.renalreg.org/about-us/) and published a more technical "Strategy on a Page" series (see www.renalreg.org/about-us/strategy-mission/). The framework used by the Strategy on a Page series arranges activity into three broad areas: audit, research, improvement and innovation and clinical informatics. The same framework has been adopted here.

Audit

The UKRR collects data primarily for national audit. For this purpose it is essential that high risk populations are not excluded and on this basis it continues to receive support under section 251 of the Health and Social Care Act to collect data without individual patient consent. With the recent expansion of the scope of the UKRR to include acute kidney injury (AKI) and pre-dialysis chronic kidney disease (CKD) in England, Wales and Northern Ireland, the Confidentiality Advisory Group of the Health Research Authority requested two new applications from the UKRR in 2016:

1. An updated non-research application, i.e. to allow audit and quality assurance
2. A new research application.

These applications both sought a legal basis for linking the UKRR data to the Hospital Episode Statistics and Office for National Statistics databases at NHS Digital (figure 1). Separate arrangements are required for Scotland and Northern Ireland.

Since the UKRR secured the necessary legal bases in December 2016 and March 2017 respectively, the next step has been to apply to NHS Digital to link the main UKRR database to the Hospital Episode Statistics and

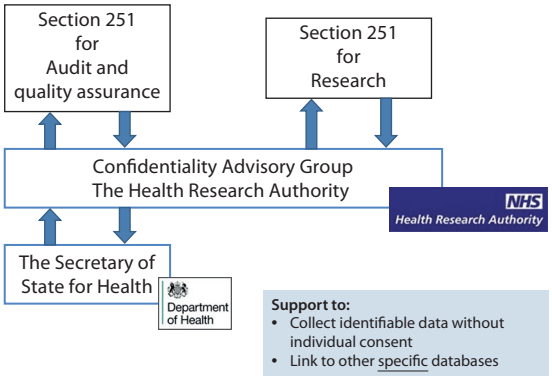

Fig. 1. Section 251 approval process

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Office for National Statistics databases. This has the potential to enhance the UKRR data in a number of ways, by:

- enabling adjustment for case-mix in centre survival comparisons
- providing information about differences in rates of hospital admission between renal centres
- making it possible to study equity of access to other non-renal services, such as cardiology, stroke and orthopaedic
- transforming the AKI database from a 'master patient index' of all cases of AKI in primary and secondary care into one with information about admissions to hospital, reasons for admission to hospital, admissions to intensive care units and mortality
- providing hospital admissions and mortality data to support efficient clinical trials in nephrology.

This linkage is likely to take six to twelve months to agree, but has the potential to transform the way the UKRR works.

In the meantime, during the Summer of 2016, one new chapter (Home Therapies) and one revamped chapter (Dialysis Access) were prepared for this year's Annual Report. Dr Matt Tabinor and Dr Barny Hole, Academic Clinical Fellows affiliated with the UKRR from Stoke and Bristol, led the work in a series of task and finish groups with UKRR statisticians and expert co-authors. The aim of these, to explore and present the data in new ways. For example, the dialysis access chapter explores the counter-intuitive finding in last year's report of higher permanent vascular access rates in older people and those with a very high body mass index and concludes that these are likely explained by lower rates of transplantation and peritoneal dialysis in these groups. At the same time, however, these new analyses lead to as many new questions and ideas for how we should study the structure and process differences behind the variation in outcomes. The feedback on this approach has been positive and therefore there are plans to do something similar for future reports.

Research

As part of the re-application for section 251 support, it was necessary to cease all research activity for a number of months in 2016. The UKRR is very grateful to all researchers whose work was affected for their patience during this time. At last, in April 2017, advertisements for applications from researchers interested in analysing the UKRR data to answer specific research hypotheses were placed. Going forwards, there will be four such calls a year, timed to allow peer-review of the applications by clinician researchers and members of the UKRR's Research Methods Study Group before a recommendation is made regarding release of the data. Establishing such formal assessments of scientific quality and risk of re-identification and being transparent to patients about the use of their data were key requirements for the UKRR's ongoing section 251 support. For further information see www.renalreg.org/about-us/working-with-us/.

Despite the restrictions placed on UKRR research activity in 2016/2017, several papers have been published from work that pre-dated the temporary halt in research activity and these are listed in appendix 1 of this chapter.

The need to reapply for section 251 support has not held up applications for primary research, and there have been a number of recent successes (table 1). Most notable amongst these are two NIHR HTA-funded

Table 1. Grant and fellowship income in 2016/2017

Reference	Title	Applicant/Chief investigator	Value (Period)
NIHR HTA 15/80/52	The High-volume Haemodiafiltration vs. High-flux Haemodialysis Registry Trial (H4RT).	F J Caskey	£1,500,276 (2017–2021)
NIHR HTA 15/57/39	Prepare for Kidney Care Trial – a randomised controlled trial of preparing for responsive management versus preparing for renal dialysis	F J Caskey	£2,538, 968 (2017–2021)
NIHR HTA 14/216/01	Bioimpedance guided fluid management in dialysis patients – the BISTRO trial.	S Davies	£1,403,368 (2016–2019)
NIHR DRF	Why do children with severe chronic kidney disease present late to specialist services? A mixed-methods observational study.	L Plumb	£331,496.00 (2017–2022)

NIHR National Institute for Health Research; HTA Health Technology Assessment; DRF Doctoral Research Fellowship

individual patient level randomised controlled trials:

1. The Prepare for Kidney Care Study – a randomised controlled trial of preparing for responsive management versus preparing for dialysis (£2.5m)
2. The High-volume Haemodiafiltration versus High-flux Haemodialysis Registry Trial (£1.5m)

Both are currently in set-up phase, with sites opening to recruitment in July 2017 and November 2017, respectively. This as a significant development at the UKRR and alongside the quality improvement work provides a new set of tools and opportunities to generate evidence that will improve patient care and outcomes for people with kidney disease.

UKRR data have impact in other ways too, and throughout 2016/2017 a number of requests for data sharing for audit, commissioning and research have been approved. Several previously approved projects also remain open. For details see table 2.

Table 2. UKRR work requests received 2016–2017

Originator: person & organisation	Aims & objectives	Date			Funding?
		Original application	Data shared	End	
David Milford, Birmingham Children's Hospital[a]	A list of hospitals that report AKI data to the UKRR by month.	Feb 2017	Feb 2017	Feb 2017	None
Aric Bendorf, Centre for Value, Ethics and the Law in Medicine (VELiM), the University of Sydney[a]	Data requested for the time period of 2003–2015 by age group and year included: • Number of patients in each dialysis group • Number of patients in each diagnosis group • Number of deaths while on dialysis	Aug 2016	Mar 2017	Mar 2017	None
Hanna Meredith, BBC[a]	Incident and prevalent numbers by year (2011–2015), for Leicestershire, Derbyshire and Nottinghamshire	May 2017	May 2017	May 2017	None
Su Sheti, NHS England[a]	Incident and prevalent numbers in 2015, by CCG in the North-West of England	Dec 2016	Mar 2017	Mar 2017	None
Matthew Katz, Department of Health[a]	Incident numbers in 2013 and 2014, by age-group, gender and referral for each treatment modality	Aug 2016	Aug 2016	Aug 2016	Health Foundation (ASSIST-CKD grant)
World Health Organisation (via Andrew Hughes, Public Health England)[a]	Global Burden of Disease update	Nov 2016	Dec 2016	Dec 2016	None
Neil Ashman, NHS England (London Region)[a]	Information on a variety of measures for London – suggested by their 'Quality Review Service'	Jul 2016	Oct 2016	Oct 2016	None
Deborah Duval, Kidney Life[a]	Information for the spring issue 2017 publication of Kidney Life	Jan 2017	Jan 2017	Jan 2017	None
Zandra Richards[a]	Information for a patient forum	Nov 2016	Dec 2016	Dec 2016	None
Hannah Burton, Kings College London[b]	Information for research on cause of graft failure.	Sep 2016	Nov 2016	In progress	None
John Wilson, Liverpool CG[a]	Number of AKI-alerts in April'15-March'16, by month and AKI-stage, from Liverpool laboratories	July 2016	July 2016	July 2016	None

[a]No input from the UKRR after supplying the data
[b]UKRR will perform most of the analysis and the write up

Improvement and innovation

A main component of UKRR work is quality improvement and innovation, which falls under the banner of our Think Kidneys brand. There are three main programmes of activity under Think Kidneys and significant progress has been made over the last year with respect to this work.

AKI national programme

This is a national NHS campaign to improve the care of people at risk of, or with, AKI. The programme was a partnership between the UKRR and NHS England, and then latterly, NHS Improvement, with the main programme of work concluding in March 2017. The AKI programme was established to address the need identified by the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) and NICE. The national programme responded by raising awareness of AKI, improving access to education, developing effective resources and sharing best practice across the NHS and beyond.

More than 70% of laboratories in England are now submitting AKI data from primary and secondary care to the UKRR. Going forward, the focus of the work at the UKRR will be improving the quality of the data coming in and identifying other data sets to link with to provide more meaningful data. Running in parallel with these efforts, a working group has been set up to begin the process of agreeing a publication plan which will detail analyses and their interpretation together with a reporting structure appropriate for different audiences.

Transforming Participation in CKD programme

This programme is a further collaboration between the UKRR and NHS England. The programme supports a person centred approach to care where people with kidney problems are supported to build their skills, knowledge and confidence to better manage and make decisions about their own health to improve their quality of life. This programme has successfully piloted the collection of patient reported outcome measures and a patient's level of activation in 14 renal centres. Renal centres have been encouraged to test various ways to collect the data and work continues to test interventions that might have a positive impact on an individual's outcome.

A development of this programme has been the introduction of an annual Patient Reported Experience Measure Survey (PREM). This is a joint collaboration between the UKRR and Kidney Care UK. This collaboration has allowed the expansion of this survey outside of the original programme. A pilot survey was run last year which resulted in over 8,000 completed surveys. The survey has now been validated and rolled out to English and Welsh centres. For further information see www.renalreg.org/projects/prem.

Kidney Quality Improvement Partnership

The Kidney Quality Improvement Partnership (KQuIP) is a dynamic network of kidney health professionals, patients and carers who are committed to developing, supporting and sharing quality improvement in kidney services in order to enhance outcomes and quality of life for patients with kidney disease. It will improve the lives of adults and children affected by kidney disease by supporting healthcare professionals, kidney units, renal networks and commissioners across the UK to achieve the highest quality of care for patients. KQuIP builds on rather than replaces existing quality improvement structures.

It will do this by:

- focussing on embedding systematic quality improvement (QI) into everyday multidisciplinary paediatric and adult practice by clinicians and managerial staff within all renal services including kidney transplantation
- providing expert clinical strategic advice regarding QI within renal services to NHS England and the other UK countries
- facilitating education, project management and capture of outcome data for QI projects in collaboration with renal clinical networks/regional QI architecture and local renal units.

It is anticipated that this supportive framework will provide the freedom for clinicians to identify, foster and encourage local innovation (bottom up ideas and priorities) and to address education of clinical staff to improve the quality of practice with an expectation that this learning will be passed on and shared.

For more details and latest activities on any of these programmes please visit https://www.thinkkidneys.nhs.uk/.

Clinical informatics

The UK Renal Data Collaboration (UKRDC) is a new process for collecting data for kidney patients, whereby data will flow into a central data repository and flow

out to various organisations with approved access to the data. The main advantages of implementing the UKRDC are:

- reducing unnecessary data flows and increasing efficiency
- storing all renal data in a central warehouse
- obtaining more granular data and meta data
- timely data for the renal community and NHS England
- renal units will have the ability to access and interrogate their data in almost real time
- improving the use made of available data

The implementation of the UKRDC requires IT developments, such as:

- adopting standard terms using SNOMED CT and LOINC
- adopting standard methods for labelling and formatting data via the creation of a data model and standard messaging system
- developing two way communications between all participants including patients via Patient View (PV).

There has been major progress in the implementation of the UKRDC over the last 12 months:

- PatientView: laboratory results are now flowing through the UKRDC to PV on an almost real time basis
- the National Registry of Rare Kidney Disease (RaDaR): data is now being transferred in both directions between the UKRDC and RaDaR. This has allowed the UKRR to provide researchers from several renal disease groups with data extractions that include both manually entered data and PV data which has been received electronically
- the Transforming Participation in Chronic Kidney Disease (TP-CKD) project: TP-CKD is supported by the UKRDC and scanned PAM and PROM survey results are uploaded into the UKRDC and stored in the central repository. Reports are generated and sent to PV where they can be viewed by patients registered on PV and to renal centres
- SNOMED CT: SNOMED codes have been added into the updated UKRDC schema and the implementation of SNOMED successfully tested in an anonymised dataset of primary renal diseases
- clinical trials: the UKRDC is supporting the NIHR HTA-funded SIMPLIFIED clinical trial of cholecalciferol versus placebo to reduce all-cause mortality in dialysis patients (led by Dr Thomas Hiemstra in Cambridge). Particularly novel from a UKRR perspective is the ability to provide laboratory data such as blood calcium level in real-time to the clinical trials unit
- UKRDC pilot sites: these have been identified and agreed to work with the UKRR to develop an extract to the UKRDC. UKRDC test files have been received from the first pilot site and from one of the renal system suppliers and work is underway to finalise the extraction. As a result of working on the UKRDC extract with pilot sites and renal system suppliers, the UKRDC schema documentation has been updated, refined and published on the website (*www.ukrdc.org*). Some pilot sites are expected to submit some of their 2016 data via the UKRDC.

The concept of the UKRDC has been proven and data are flowing through the UKRDC in two directions. Work with pilot sites is progressing but the success of the UKRDC depends on support and commitment from renal centres and the renal community.

Completeness of data returns from UK renal centres

Data completeness remains fairly static for returns on ethnic origin, primary renal diagnosis and date first seen by a nephrologist (table 3). Comorbidity at the start of RRT remained poor, with almost half (30/62) of the adult renal centres in England, Wales and Northern Ireland having less than 75% completeness for comorbidity data. Twelve renal centres submitted comorbidity data on less than 10% of their incident patients. This makes it impossible for the UKRR to adjust survival analyses for case mix, something that is particularly relevant to outlying centres [1]. The UKRR and NHS Digital have agreed that there could be considerable benefits for patients from routine linkage with Hospital Episode Statistics data [2].

For the first time since the UKRR gained full coverage of the UK in 2008, one renal centre, Cambridge, was unable for technical reasons to provide patient level data in time for inclusion in the Annual Report. As a temporary measure, aggregate data were provided to allow estimation of treatment rates and work is ongoing within

Table 3. Percentage completeness of data returns for 2015 and 2014

	Ethnicity Year		Primary diagnosis Year		Date first seen Year		Comorbidity Year		Cause of death Year		Average completeness Year		
Centre	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	Country
Newry	100.0	100.0	100.0	100.0	100.0	94.7	100.0	94.7	100.0	93.3	100.0	96.6	N Ireland
L Kings	100.0	100.0	100.0	100.0	99.4	100.0	100.0	100.0	96.7	98.7	99.2	99.7	England
Oxford	99.0	76.2	100.0	97.4	98.5	97.9	99.5	95.2	96.9	98.3	98.8	93.0	England
Swanse	100.0	100.0	99.2	100.0	100.0	100.0	99.2	100.0	94.9	82.6	98.7	96.5	Wales
Hull	99.2	100.0	99.2	99.0	97.6	95.3[b]	99.2	100.0	97.3	91.7	98.5	97.2	England
Leeds	98.6	100.0	99.3	100.0	98.0	99.4	99.3	100.0	96.4	99.2	98.3	99.7	England
Bangor	100.0	100.0	100.0	81.8	100.0	90.9	100.0	59.1	90.0	95.0	98.0	85.4	Wales
Ulster	100.0	100.0	96.9	100.0	96.9	94.7	100.0	100.0	96.0	90.0	98.0	96.9	N Ireland
Middlbr	100.0	100.0	99.3	99.0	98.5	98.1	98.5	97.1	93.4	95.1	97.9	97.9	England
Wrexm	97.8	100.0	100.0	97.6	93.3	97.6	100.0	100.0	97.4	87.0	97.7	96.4	Wales
B Heart	100.0	100.0	99.2	83.7	95.9	92.8	98.4	99.0	93.8	65.6	97.4	88.2	England
Bradfd	96.6	98.8	98.9	100.0	100.0	100.0	98.9	100.0	90.2	98.0	96.9	99.4	England
Dudley	100.0	95.1	100.0	87.8	95.9	95.1	93.9	87.8	94.3	95.5	96.8	92.3	England
West NI	100.0	97.1	100.0	100.0	96.5[b]	97.0	86.5	97.1	100.0	93.9	96.6	97.0	N Ireland
York	90.2	93.8	100.0	98.4	98.4	90.5[b]	98.4	95.3	94.7	97.4	96.3	95.1	England
Dorset	100.0	100.0	98.7	100.0	94.6	98.7	97.3	100.0	90.2	90.6	96.1	97.8	England
Sund	96.8	100.0	95.2	96.8	96.8	100.0	93.7	95.2	98.0	97.4	96.1	97.9	England
L Guys	95.0	93.7	93.9	64.8	93.3	81.5	100.0	1.9	92.4	0.0	94.9	48.4	England
Exeter	93.4	97.8	99.2	97.1	99.2	91.9	93.4	93.5	85.3	96.5	94.1	95.4	England
Cardff	93.7	100.0	100.0	99.4	98.1	95.8	94.9	89.9	80.9	96.7	93.5	96.4	Wales
Newc	100.0	100.0	99.2	100.0	99.2	98.1	94.3	97.2	74.1	51.8	93.4	89.4	England
Redng	93.0	93.5	100.0	99.1	100.0	97.2	94.2	92.5	76.7	79.7	92.8	92.4	England
Antrim	100.0	100.0	100.0	100.0	94.3	97.1	71.4	100.0	93.9	100.0	91.9	99.4	N Ireland
Derby	96.8	98.7	98.4	98.7	98.4	97.3	79.0	94.7	86.4	73.7	91.8	92.6	England
Kent	100.0	94.7	61.2	96.7	100.0	100.0	100.0	100.0	95.3	86.6	91.3	95.6	England
Wolve	100.0	100.0	98.8	87.3	97.6	92.4	94.0	16.5	62.5	85.2	90.6	76.3	England
Donc	100.0	100.0	100.0	100.0	94.4	98.2	63.9	70.4	91.7	96.8	90.0	93.1	England
B QEH	99.2	100.0	99.6	99.6	98.8	97.9	98.8	96.7	53.4	90.4	90.0	96.9	England
Chelms	78.3	71.2	89.1	100.0	95.7	98.1	82.6	92.3	96.2	85.7	88.4	89.4	England
Clwyd	100.0	89.7	96.6	79.3	72.4	78.3[b]	72.4	55.2	100.0	90.0	88.3	78.5	Wales
Wirral	93.7	98.2	93.7	73.2	92.2[b]	96.4	84.1	30.4	69.0	68.5	86.5	73.4	England
Stoke	99.1	97.3	83.2	57.1	92.5	90.1	75.7	81.3	75.0	53.5	85.1	75.9	England
Plymth	100.0	100.0	96.2	32.1	94.3	26.9	52.8	41.5	74.0	24.5	83.5	45.0	England
Colchr	78.6	78.9	78.6	64.2[a]	67.9	44.7	100.0	100.0	90.0	77.3	83.0	73.0	England
Glouc	100.0	100.0	100.0	96.1	92.2	66.7	28.1	15.7	94.2	88.1	82.9	73.3	England
Norwch	99.1	77.2	94.5	93.7	94.2[b]	49.9[b]	76.2	43.0	48.6	74.0	82.5	67.6	England
Basldn	93.5	95.7	73.9	100.0	97.8	95.7	54.4	89.1	86.4	90.0	81.2	94.1	England
Truro	100.0	100.0	98.8	94.9	96.3	97.4	3.8	0.0	98.0	97.1	79.3	77.9	England
L West	100.0	99.7	99.7	100.0	97.7	98.6	0.0	0.3	96.7	93.8	78.8	78.5	England
Bristol	89.6	100.0	96.5	85.1	77.8	95.2	64.6	84.5	61.2	90.0	77.9	91.0	England
Nottm	100.0	100.0	97.6	100.0	94.4	97.3	0.8	95.5	95.7	98.9	77.7	98.3	England
Shrew	100.0	98.5	100.0	90.8	83.7[b]	98.4	67.7	18.5	34.9	0.0	77.3	61.2	England
Carlis	100.0	100.0	57.3	100.0	97.7	92.1	45.5	55.3	82.4	92.0	76.6	87.9	England
Prestn	99.4	99.3	100.0	99.4	96.9	97.4	4.4	4.6	80.3	95.2	76.2	79.2	England
Sthend	94.3	63.3	100.0	100.0	88.6	100.0	0.0	76.7	97.0	95.7	76.0	87.1	England
Liv Ain	97.0	98.5	100.0	100.0	95.5	98.5	72.7	56.7	12.5	0.0	75.5	70.7	England
Sheff	95.8	96.7	100.0	99.3	92.7	98.7	79.2	78.8	0.8	0.9	73.7	74.9	England
Leic	90.5	93.7	76.6	78.0	98.2	98.0	29.3	42.9	57.7	55.2	70.4	73.6	England
Belfast	69.7	100.0	77.5	95.2	89.9	91.9	45.5	77.8	47.8	51.1	66.1	83.2	N Ireland
L Rfree	97.0	94.8	96.2	96.1	96.2	96.1	8.5	22.3	16.1	15.9	62.8	65.0	England
M RI	93.6	93.2	95.5	59.5	92.3	43.4	25.9	34.2	2.0	1.4	61.8	46.3	England
Stevng	87.8	90.1	68.4	80.3	87.8	94.1	1.4	0.7	62.1	9.3	61.5	54.9	England

Table 3. Continued

	Ethnicity Year		Primary diagnosis Year		Date first seen Year		Comorbidity Year		Cause of death Year		Average completeness Year		
Centre	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	Country
Brightn	88.7	93.2	90.1	100.0	97.9	98.6	4.2	11.6	7.0	0.9	57.6	60.9	England
L Barts	99.7	99.4	89.8	82.6	1.1[b]	28.7	40.8	55.2	49.2	82.7	56.1	69.7	England
L St.G	94.1	86.8	51.3	75.8	67.2	24.2	31.1	42.9	32.8	57.1	55.3	57.4	England
Covnt	100.0	98.4	64.2	88.0	88.1	84.8	15.6	15.2	4.7	6.7	54.5	58.6	England
Ports	84.8	84.9	69.5	86.7	67.0	59.5	17.3	26.7	33.8	38.8	54.5	59.3	England
Liv Roy	93.2	94.2	46.6	85.4	91.1	97.8	28.1	48.2	11.0	19.0	54.0	68.9	England
Salford	98.6	99.3	95.7	98.6	5.8	0.7	0.0	0.0	0.0	0.0	40.0	39.7	England
Carsh	93.1	87.9	17.3	23.8	42.3	41.4	4.0	11.4	24.9	16.3	36.3	36.2	England
Ipswi	80.3	0.0	34.9	61.2[a]	16.7	90.9	7.6	0.0	25.0	83.3	32.9	47.1	England
Camb		86.6		57.3[a]		68.5		4.7		42.3		51.9	England
Abrdn			100.0	100.0					46.7	67.7			Scotland
Airdrie			100.0	100.0					97.5	97.6			Scotland
D&Gall			100.0	100.0					69.2	100.0			Scotland
Dundee			100.0	100.0					66.7	52.8			Scotland
Edinb			100.0	100.0					92.6	96.2			Scotland
Glasgw			100.0	100.0					91.4	100.0			Scotland
Inverns			100.0	100.0					100.0	100.0			Scotland
Klmarnk			100.0	100.0					97.4	100.0			Scotland
Krkcldy			100.0	100.0					54.8	92.3			Scotland

[a]Data from these centres included a high proportion of patients whose primary renal diagnosis was 'uncertain'. In some cases, this appears to have been because software in these centres was defaulting missing values to 'uncertain'. The value given for the completeness has been reduced in proportion to the amount by which the percentage of non-missing diagnoses being 'uncertain' exceeded 40%
[b]More than 10% of patients reported as starting RRT on the same date as first presentation, the percentage completeness shown excludes the amount by which this exceeded 10%

the Trust and with commissioners to ensure submission recommences as quickly as possible. This has however meant that it was impossible to audit the quality of care and outcomes for people with kidney disease in the Cambridge area and this has been made clear in each of the relevant tables and figures in this report.

Interpretation of centre-specific clinical measures and survival comparisons

The UKRR continues to advise caution in the interpretation of the comparisons of centre-specific attainment of clinical performance measures provided in this report. In general terms, the UKRR has not tested for a 'significant difference' between the highest achiever of a standard and the lowest achiever, as centres were not identified in advance of looking at the data and statistically this approach can be invalid. As in previous reports, the arbitrary 95% confidence interval is shown for compliance with a guideline. The calculation of this confidence interval (based on the binomial distribution) and the width of the confidence interval depends on the number of values falling within the standard and the number of patients with reported data. However for many of these analyses no adjustment can be made for the range of factors known to influence the measured variable as outlined above.

For a number of years de-anonymised centre specific reports on survival of RRT patients have been published. The Francis and Keogh enquiries and the ongoing CQC inspections of patient care and outcomes at a number of hospital trusts highlight the ongoing need for such transparency. This year (2015 data) two centres had to be contacted because of lower than expected survival in patients starting dialysis. Although that centre's results may reflect the comorbidity of their patients, the UKRR was unable to adjust the main survival analysis due to missing key data from many other centres (as discussed above).

Centres are asked to report their outlying status internally at trust level and follow up with robust mortality and morbidity meetings. The UKRR has no statutory powers. However, the fact that the UKRR provides centre-specific de-anonymised analyses of important clinical outcomes, including survival, makes it important to define how the UKRR responds to apparent under-performance. The senior management team of the UKRR communicate survival outlier status with the renal centres in advance of publication of this finding. The centres are asked to provide evidence that the Clinical Governance department and Chief Executive of the Trust housing the service have been informed. In the event that no such evidence is provided, the Chief Executive Officer or Medical Director of the UKRR would inform the President of the Renal Association, who would then take action to ensure that the findings were properly investigated.

Information governance

At present the UKRR operates within a comprehensive governance framework covering data handling, reporting and research, including data linkages and data sharing agreements. The Chair of the Renal Association Renal Information Governance Board is the person responsible for ensuring good governance, with the UKRR Chief Executive Officer as data controller and accountable officer responsible for day to day management of governance compliance. The Chief Executive Officer is supported by the Senior Information Risk Officer and the Caldicott Guardian. The framework is based on good practice, as described in the Information Governance Framework [3] and the Research Governance Framework for Health and Social Care (2005).

Each year the UKRR completes the NHS Digital Information Governance Toolkit and for the 2016/2017 assessment period achieved a score of 94% (subject to audit) against the 'satisfactory' standard of 80%.

Summary

The big challenge for the UKRR in 2017 is the need to use its new permissions to link to other databases for efficient national audit, perhaps most excitingly in research through the AKI Master Patient Index and the delivery of efficient registry trials. The core purpose of the UKRR remains however, national audit with the ability to report patient survival on dialysis and kidney transplantation. To this end it must be a priority to use the new linkage permissions to derive information about patient comorbidity from hospital admissions data and report case-mix adjusted survival for each renal centre. Until this happens, the UKRR report could be inappropriately alarming patients and clinicians in some centres whilst falsely reassuring patients and clinicians in others.

Conflicts of interest: the authors declare no conflicts of interest

References

1 Fotheringham J, Jacques RM, Fogarty D, Tomson CR, El Nahas M, Campbell MJ. Variation in centre-specific survival in patients starting renal replacement therapy in England is explained by enhanced comorbidity information from hospitalization data. *Nephrol Dial Transplant* 2014; **29**(2): 422–30.

2 Health and Social Care Information Centre. Release of health data to the UK Renal Registry (UKRR) Improvements in the analysis of renal care services for patients undergoing renal replacement therapy (RRT). 2014. http://www.hscic.gov.uk/casestudy/renalcareanalysis.

3 Health and Social Care Information Centre. 2014.

Appendix 1

Original research involving UKRR data

1 The clinical epidemiology of young adults starting renal replacement therapy in the UK: presentation, management and survival using 15 years of UK Renal Registry data. Hamilton AJ, Casula A, Ben-Shlomo Y, Caskey FJ, Inward CD. Nephrol Dial Transplant. 2017 May 1;32(5):904–905. doi: 10.1093/ndt/gfx046.

2 Lifetime risk of renal replacement therapy in Europe: a population-based study using data from the ERA-EDTA Registry. van den Brand JAJG, Pippias M, Stel VS, Caskey FJ, Collart F, Finne P, Heaf J, Jais JP, Kramar R, Massy ZA, De Meester J, Traynor JP, Reisæter AV, Wetzels JFM, Jager KJ. Nephrol Dial Transplant. 2017 Feb 1;32(2):348–355. doi: 10.1093/ndt/gfw392.

3 Validity of estimated prevalence of decreased kidney function and renal replacement therapy from primary care electronic health records compared with national survey and registry data in the United Kingdom. Iwagami M, Tomlinson LA, Mansfield KE, Casula A, Caskey FJ, Aitken G, Fraser SDS, Roderick PJ, Nitsch D. Nephrol Dial Transplant. 2017 Apr 1;32(suppl_2):ii142–ii150. doi: 10.1093/ndt/gfw318.

4 Renal replacement therapy in Europe: a summary of the 2013 ERA-EDTA Registry Annual Report with a focus on diabetes mellitus. Kramer A, Pippias M, Stel VS, Bonthuis M, Abad Diez JM, Afentakis N, Alonso de la Torre R, Ambuhl P, Bikbov B, Bouzas Caamaño E, Bubic I, Buturovic-Ponikvar J, Caskey FJ, Castro de la Nuez P, Cernevskis H, Collart F, Comas Farnés J, Garcia Bazaga Mde L, De Meester J, Ferrer Alamar M, Finne P, Garneata L, Golan E, G Heaf J, Hemmelder M, Ioannou K, Kantaria N, Kolesnyk M, Kramar R, Lassalle M, Lezaic V, Lopot F, Macário F, Magaz A, Martín-Escobar E, Metcalfe W, Ots-Rosenberg M, Palsson R, Piñera Celestino C, Resiæ H, Rutkowski B, Santiuste de Pablos C, Spustová V, Stendahl M, Strakosha A, Süleymanlar G, Torres Guinea M, Varberg Reisæter A, Vazelov E, Ziginskiene E, Massy ZA, Wanner C, Jager KJ, Noordzij M. Clin Kidney J. 2016 Jun;9(3):457–69. doi: 10.1093/ckj/sfv151. Epub 2016 Jan 31.

5 Erythropoiesis-stimulating agent dosing, haemoglobin and ferritin levels in UK haemodialysis patients 2005–13. Birnie K, Caskey F, Ben-Shlomo Y, Sterne JA, Gilg J, Nitsch D, Tomson C. Nephrol Dial Transplant. 2017 Apr 1;32(4):692–698. doi: 10.1093/ndt/gfw043.

6 Long-term Kidney Transplant Outcomes in Primary Glomerulonephritis: Analysis From the ERA-EDTA Registry. Pippias M, Stel VS, Aresté-Fosalba N, Couchoud C, Fernandez-Fresnedo G, Finne P, Heaf JG, Hoitsma A, De Meester J, Pálsson R, Ravani P, Segelmark M, Traynor JP, Reisæter AV, Caskey FJ, Jager KJ. Transplantation. 2016 Sep;100(9):1955–62. doi: 10.1097/TP.0000000000000962.

7 The changing trends and outcomes in renal replacement therapy: data from the ERA-EDTA Registry. Pippias M, Jager KJ, Kramer A, Leivestad T, Sánchez MB, Caskey FJ, Collart F, Couchoud C, Dekker FW, Finne P, Fouque D, Heaf JG, Hemmelder MH, Kramar R, De Meester J, Noordzij M, Palsson R, Pascual J, Zurriaga O, Wanner C, Stel VS. Nephrol Dial Transplant. 2016 May;31(5):831–41. doi: 10.1093/ndt/gfv327. Epub 2015 Sep 11.

8 Trends in dialysis modality choice and related patient survival in the ERA-EDTA Registry over a 20-year period van de Luijtgaarden MW, Jager KJ, Segelmark M, Pascual J, Collart F, Hemke AC, Remón C, Metcalfe W, Miguel A, Kramar R, Aasarød K, Abu Hanna A, Krediet RT, Schön S, Ravani P, Caskey FJ, Couchoud C, Palsson R, Wanner C, Finne P, Noordzij M. Nephrol Dial Transplant. 2016 Jan;31(1):120–8. doi: 10.1093/ndt/gfv295. Epub 2015 Aug 26.

9 Kidney Transplantation Significantly Improves Patient and Graft Survival Irrespective of BMI: A Cohort Study. Krishnan N, Higgins R, Short A, Zehnder D, Pitcher D, Hudson A, Raymond NT. Am J Transplant. 2015 Sep;15(9):2378–86. doi: 10.1111/ajt.13363. Epub 2015 Jul 3.

10 Can we routinely measure patient involvement in treatment decision-making in chronic kidney care? A service evaluation in 27 renal units in the UK. Durand MA, Bekker HL, Casula A, Elias R, Ferraro A, Lloyd A, van der Veer SN, Metcalfe W, Mooney A, Thomson RG, Tomson CR. Clin Kidney J. 2016 Apr;9(2):252–9. doi: 10.1093/ckj/sfw003. Epub 2016 Mar 5.

11 Long-term graft outcomes and patient survival are lower posttransplant in patients with a primary renal diagnosis of glomerulonephritis. Pruthi R, McClure M, Casula A, Roderick PJ, Fogarty D, Harber M, Ravanan R. Kidney Int. 2016 Apr;89(4):918–26. doi: 10.1016/j.kint.2015.11.022. Epub 2016 Jan 21.

12 Predicting 6-month mortality risk of patients commencing dialysis treatment for end-stage kidney disease. Ivory SE, Polkinghorne KR, Khandakar Y, Kasza J, Zoungas S, Steenkamp R, Roderick P, Wolfe R. Nephrol Dial Transplant. 2017 Jan 10. pii: gfw383. doi: 10.1093/ndt/gfw383. [Epub ahead of print]

13 Measuring senescence rates of patients with end-stage renal disease while accounting for population heterogeneity: an analysis of data from the ERA-EDTA Registry. Koopman JJ, Kramer A, van Heemst D, Åsberg A, Beuscart JB, Buturoviæ-Ponikvar J, Collart F, Couchoud CG, Finne P, Heaf JG, Massy ZA, De Meester JM, Palsson R, Steenkamp R, Traynor JP, Jager KJ, Putter H. Ann Epidemiol. 2016 Nov;26(11):773–779. doi: 10.1016/j.annepidem.2016.08.010. Epub 2016 Aug 31.

14 Early Requirement for RRT in Children at Presentation in the United Kingdom: Association with Transplantation and Survival. Pruthi R, Casula A, Inward C, Roderick P, Sinha MD; British Association for Paediatric Nephrology. Clin J Am Soc Nephrol. 2016 May 6;11(5):795–802. doi: 10.2215/CJN.08190815. Epub 2016 Feb 15.

15 Access to Transplantation and Transplant Outcome Measures (ATTOM): study protocol of a UK wide, in-depth, prospective cohort analysis. Oniscu GC, Ravanan R, Wu D, Gibbons A, Li B, Tomson C, Forsythe JL, Bradley C, Cairns J, Dudley C, Watson CJ, Bolton EM, Draper H, Robb M, Bradbury L, Pruthi R, Metcalfe W, Fogarty D, Roderick P, Bradley JA; ATTOM Investigators. BMJ Open. 2016 Feb 25;6(2):e010377. doi: 10.1136/bmjopen-2015-010377.

16 Patient attitudes towards kidney transplant listing: qualitative findings from the ATTOM study. Calestani M, Tonkin-Crine S, Pruthi R, Leydon G, Ravanan R, Bradley JA, Tomson CR, Forsythe JL, Oniscu GC, Bradley C, Cairns J, Dudley C, Watson C, Draper H, Johnson RJ, Metcalfe W, Fogarty DG, Roderick P; ATTOM Investigators. Nephrol Dial Transplant. 2014 Nov;29(11):2144–50. doi: 10.1093/ndt/gfu188. Epub 2014 Jul 4.

Original research involving other data

1 Routinely measured iohexol glomerular filtration rate versus creatinine-based estimated glomerular filtration rate as predictors of mortality in patients with advanced chronic kidney disease: a Swedish Chronic Kidney Disease Registry cohort study. Methven S, Gasparini A, Carrero JJ, Caskey FJ, Evans M. Nephrol Dial Transplant. 2017 Apr 1; 32(suppl_2):ii170–ii179. doi: 10.1093/ndt/gfw457.

2 Quality of Reporting and Study Design of CKD Cohort Studies Assessing Mortality in the Elderly Before and After STROBE: A Systematic Review. Rao A, Brück K, Methven S, Evans R, Stel VS, Jager KJ, Hooft L, Ben-Shlomo Y, Caskey F. PLoS One. 2016 May 11;11(5):e0155078. doi: 10.1371/journal.pone.0155078. eCollection 2016.

3 Patient and disease factors predictive of adverse perioperative outcomes after nephrectomy. Henderson JM, Pitcher D, Steenkamp R, Fowler S, Keeley FX. Ann R Coll Surg Engl. 2016 May;98(5):314–9. doi: 10.1308/rcsann.2016.0126.

4 Early invasive treatment for acute coronary syndrome in patients with chronic kidney disease: do we know what we're doing? Shaw C, Sharpe CC. Future Cardiol. 2015;11(1):5–8. doi: 10.2217/fca.14.71.

Editorials, reviews, commentaries and methods papers

1 Strengthening Renal Registries and ESRD Research in Africa. Davids MR, Caskey FJ, Young T, Balbir Singh GK. Semin Nephrol. 2017 May;37(3):211–223. doi: 10.1016/j.semnephrol.2017.02.002.

2 Rationale and design of BISTRO: a randomized controlled trial to determine whether bioimpedance spectroscopy-guided fluid management

maintains residual kidney function in incident haemodialysis patients. Davies SJ, Caskey FJ, Coyle D, Lindley E, Macdonald J, Mitra S, Wilkie M, Davenport A, Farrington K, Dasgupta I, Ormandy P, Andronis L, Solis-Trapala I, Sim J. BMC Nephrol. 2017 Apr 26;18(1):138. doi: 10.1186/s12882-017-0554-1.

3 Optimising care for children with kidney disease. Caskey FJ, Morton RL. Lancet. 2017 Mar 20. pii: S0140-6736(17)30267-2. doi: 10.1016/S0140-6736(17)30267-2.

4 Prevalence and incidence of renal disease in disadvantaged communities in Europe. Caskey FJ. Clin Nephrol. 2016 Supplement 1;86 (2016)(13):34–36.

5 A programme to spread eGFR graph surveillance for the early identification, support and treatment of people with progressive chronic kidney disease (ASSIST-CKD): protocol for the stepped wedge implementation and evaluation of an intervention to reduce late presentation for renal replacement therapy. Gallagher H, Methven S, Casula A, Thomas N, Tomson CR, Caskey FJ, Rose T, Walters SJ, Kennedy D, Dawnay A, Cassidy M, Fluck R, Rayner HC, Nation M. BMC Nephrol. 2017 Apr 11;18(1):131. doi: 10.1186/s12882-017-0522-9.

6 Design and Rationale of 'Tackling Acute Kidney Injury', a Multicentre Quality Improvement Study. Selby NM, Casula A, Lamming L, Mohammed M, Caskey F; Tackling AKI Investigators.Nephron. 2016;134(3):200–204. Epub 2016 Jul 5.

7 How long have I got doctor?' The development and validation of a new prognostic model. Steenkamp R, Caskey FJ. Kidney Int. 2015 May;87(5):879–82. doi: 10.1038/ki.2015.36.

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UK Renal Registry 19th Annual Report: Chapter 1 UK RRT Adult Incidence in 2015: National and Centre-specific Analyses

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Keywords

Acceptance rates · Clinical Commissioning Group · Comorbidity · Diabetes · Dialysis · End stage renal disease · End stage renal failure · Established renal failure · Glomerulonephritis · Haemodialysis · Incidence · Peritoneal dialysis · Registries · Renal replacement therapy · Transplantation · Treatment modality · Acute haemodialysis

Summary

- The incidence rate in the UK increased from 115 per million population (pmp) in 2014 to 120 pmp in 2015 reflecting renal replacement therapy (RRT) initiation for 7,814 new patients.
- There was an increase in incidence rate from 2014 to 2015 in each of the four countries of the UK.
- The median age of all incident patients was 64.4 years but this was highly dependent on ethnicity (66.3 for White incident patients; 59.8 for non-White patients).
- Diabetic renal disease remained the single most common cause of renal failure (27.5%).
- By 90 days, 67.3% of patients were on haemodialysis (HD), 18.4% on peritoneal dialysis (PD), 8.6% had a functioning transplant (Tx) and 5.7% had died or stopped treatment.
- The percentage of RRT patients at 90 days who had a functioning transplant varied between centres from 0% to 35% (between 7% and 35% for transplanting centres and between 0% and 13% for non-transplanting centres).
- The mean eGFR at the start of RRT was 8.5ml/min/1.73 m^2 similar to the previous five years.
- Late presentation (<90 days) fell from 23.9% in 2006 to 16.4% in 2015.

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Introduction

This chapter contains analyses of adult patients starting renal replacement therapy (RRT) in the UK in 2015. The methodology and results for these analyses are in four separate sections: geographical variations in incidence rates; the demographic and clinical characteristics of patients starting RRT; analyses of late presentation and delayed referral; and new for this report, acute haemodialysis sessions.

The data were analysed using SAS 9.3.

Definitions

The definition of incident patients is given in detail in appendix B: Definitions and Analysis Criteria (www.renalreg.org). In brief, it is all patients over 18 who commenced RRT in the UK in 2015 and who did not recover renal function within 90 days. Note that this does not include those with a failed renal transplant who returned to dialysis.

Differences may be seen in the 2010 to 2014 numbers now quoted when compared with previous publications because of retrospective updating of data in collaboration with renal centres. Also, for patients who were initially thought to have acute renal failure, subsequent chronic RRT codes may have been received in the following year's data, allowing the UK Renal Registrty (UKRR) to backdate the start date of RRT.

Where applicable and possible, pre-emptive transplant patients were allocated to their work up centre rather than their transplant centre. However, this was not possible for all such patients and consequently some patients probably remain incorrectly allocated to the transplanting centre. The term established renal failure (ERF) as used within this chapter is synonymous with the terms end stage renal failure/disease (ESRF or ESRD).

UK Renal Registry coverage

The UKRR received individual patient level data from 70 adult renal centres in the UK (five centres in Wales, five in Northern Ireland, nine in Scotland, 51 in England). Cambridge renal centre (Addenbrooke's) was unable to submit 2015 data at patient level prior to the UKRR closing the database and only provided summary numbers of patients starting RRT by treatment modality. This centre is therefore excluded from most analyses in this chapter. Data from centres in Scotland were obtained from the Scottish Renal Registry. Data on children and young adults can be found in chapter 4: Demography of the UK Paediatric Renal Replacement Therapy population in 2015.

Renal Association Guidelines

Table 1.1 lists the relevant items from the Renal Association Guidelines on the Planning, Initiating and Withdrawal of Renal Replacement Therapy [1]. Many of the audit measures are not currently reported by the UKRR; mainly due to a high proportion of incomplete data or because the relevant data item(s) is not currently within the specified UKRR dataset. Over time it is hoped to work with the renal community to improve reporting across the range of these measures.

1. Geographical variation in incidence rates

Introduction

Over the years there have been wide variations in incidence rates between renal centres. Equity of access to RRT is an important aim but hard to assess as the need for RRT depends on many variables including medical, social and demographic factors such as underlying conditions, age, gender, social deprivation and ethnicity. Thus, comparison of crude incidence rates by geographical area can be misleading. This year's report again uses age and gender standardisation of Clinical Commissioning Group/Health Board (CCG/HB) rates as well as showing crude rates. It also gives the ethnic minority percentage for each area as this influences incidence rates.

Methods

CCG/HB level

Crude incidence rates per million population (pmp) and age/gender standardised incidence ratios were calculated as detailed in appendix D: Methodology used for Analyses (www.renalreg.org).

For the calculation of rates and standardised ratios by CCG/HB, for which patient-level information is needed for age/gender standardisation, the Cambridge data from 2014 were used in place of the missing 2015 data. This is obviously a gross approximation but was felt to be a better approach than excluding a number of CCGs from the analyses. As the main analysis is based on six years of data the effect of this approximation will be not as great as it would be for a one year analysis. Those CCGs that were at least in part (>10%) covered by Cambridge were identified using 2010–14 data and flagged in table 1.3. For three CCGs with between 10% and 65% of the RRT starters being incident patients of Cambridge, rates/ratios for 2015 are shown but the values are flagged. For CCGs where most patients (>65%) are thought to be incident patients of Cambridge, the

Table 1.1. Summary of Renal Association (RA) audit measures relevant to RRT incidence

RA audit measure	Reported	Reason for non-inclusion/comment
Percentage of patients commencing RRT referred <3 months and <12 months before date of starting RRT	Yes	UKRR dataset allows reporting on time elapsed between date first seen and start of RRT
Percentage of incident RRT patients followed up for >3 months in dedicated pre-dialysis or low clearance clinic	No	Not in UKRR dataset
Proportion of incident patients on UK transplant waiting list at RRT initiation	No	Not in UKRR dataset
Proportion of incident RRT patients transplanted pre-emptively from living donors and cadaveric donors	Yes	
Mean eGFR at time of pre-emptive transplantation	No	Numbers with data were small, the UKRR will consider doing a combined years analysis in future reports
Proportion of incident patients commencing peritoneal or home haemodialysis	Partly	See appendix F for proportion starting on PD and table 1.12 for proportion on PD at 90 days. Not reported for home HD due to small numbers.
Proportion of patients who have undergone a formal education programme prior to initiation of RRT	No	Not in UKRR dataset
Proportion of haemodialysis patients who report that they have been offered a choice of RRT modality	No	Not in UKRR dataset
Proportion of patients who have initiated dialysis in an unplanned fashion who have undergone formal education by 3 months	No	Not in UKRR dataset
Evidence of formal continuing education programme for patients on dialysis	No	Not in UKRR dataset
Proportion of incident patients known to nephrology services for 3 months or more prior to initiation (planned initiation)	Yes	
Proportion of planned initiations with established access or pre-emptive transplantation	Yes	See appendix F for proportion of incident patients having pre–emptive transplantation, and see chapter 12 for dialysis access
Inpatient/outpatient status of planned initiations	No	Not in UKRR dataset
Mean eGFR at start of renal replacement therapy	Partly	Reported but not at centre level due to poor data completeness

2015 rates/ratios have been blanked as they are based in large part on 2014 data.

For Sheffield, 55 of their 151 incident patients for 2015 were not submitted. Here the data were used as received but the relevant CCGs are again flagged/blanked as above as their rates/ratios will be underestimates.

Centre level

As mentioned previously, Cambridge was unable to submit 2015 data at patient level but provided the UKRR with information allowing their incident number for 2015 to be estimated and this estimate has been used in tables 1.2 and 1.4 but not elsewhere in this chapter. A number of other centres have informed the UKRR of corrections to the data they submitted and these have been applied to tables 1.2 and 1.4 but not elsewhere in this chapter. These are detailed in the footnotes to table 1.4. The largest of these was Sheffield with approximately a third of the 2015 incident patients not submitted. Therefore the results for Sheffield are likely not representative. In particular, all those submitted were early presenters (see the third section of this chapter).

For the methodology used to estimate catchment populations see appendix E: Methodology for Estimating Catchment Populations (www.renalreg.org).

Results

Overall

In 2015, the number of adult patients starting RRT in the UK was 7,814 equating to an incidence rate of 120 pmp (table 1.2), compared with 115 pmp in 2014.

Table 1.2. Number of new adult patients starting RRT in the UK in 2015

	England	N Ireland	Scotland	Wales	UK
Number starting RRT	6,580	221	623[b]	390	**7,814**
Total estimated population mid-2015 (millions)[a]	54.8	1.9	5.4	3.1	**65.1**
Incidence rate (pmp)	120	119	116[b]	126	**120**
(95% CI)	(117–123)	(104–135)	(107–125)	(113–138)	**(117–123)**

[a]Data from the Office for National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census

[b]The number starting RRT, and hence the RRT incidence rate, published in the Scottish Renal Registry report for the same period is slightly lower at 619 (115 pmp). This is explained by differences in the definition of incident RRT patients between the two registries

Wales remained the country with the highest incidence rate (126 pmp – figure 1.1). There continued to be very marked gender differences in incidence rates which were 152 pmp (95% CI 148–156) in males and 89 pmp (95% CI 86–92) in females.

The denominators used for these rates were the entire population i.e. they include under 18 year olds. When incident patients aged under 18 were included in the numerator the UK rate was 122 pmp.

CCG/HB level

Table 1.3 shows incidence rates and standardised incidence ratios for CCG/HBs. There were wide variations between areas. From the analysis using all six years, out of a total of 235 areas, 48 areas had notably high ratios and 71 notably low. The standardised incidence ratios ranged from 0.63 to 2.64 (IQR 0.82, 1.10). The crude rates ranged from 71 pmp to 205 pmp (IQR 93 pmp, 117 pmp). As previously reported, urban areas with high percentages of non-White residents tended to have high incidence rates. Figure 1.2 shows the strong positive correlation between the standardised incidence ratio and the percentage of the CCG/HB population that was non-White.

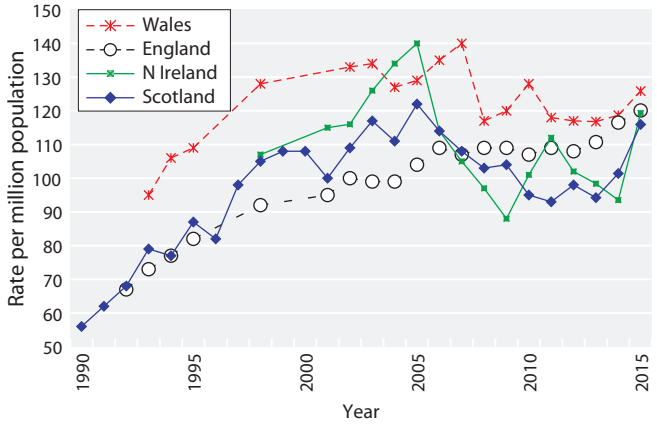

Fig. 1.1. RRT incidence rates in the countries of the UK 1990–2015

Centre level

The number of new patients starting RRT at each renal centre from 2010 to 2015 is shown in table 1.4. The table also shows centre level incidence rates (per million population) for 2015. For most centres there was a lot of variability in the numbers of incident patients from one year to the next making it hard to see any underlying trend. Some centres have had an increase in new patients over time and others have fallen. The variation may reflect chance fluctuation, the introduction of new centres, changes in catchment populations or in completeness of reporting. Variation over time may also be due to changing incidence of established renal failure (increases in underlying disease prevalence, survival from comorbid conditions and recognition of ERF), changes to treatment thresholds such as a greater emphasis on pre-emptive transplantation or the introduction of conservative care programmes. Analysis of CKD stage 5 patients not yet on RRT is required to explore some of these underlying mechanisms for centre level incidence rate changes.

There was an increase of 18.8% in new patients for England between 2010 and 2015. Across all four countries the change between 2010 and 2015 was an increase of 18.2%.

2. Demographics and clinical characteristics of patients starting RRT

Methods

Age, gender, primary renal disease, ethnic origin and treatment modality were examined for patients starting RRT. A mixture of old and new (2012) ERA-EDTA codes for primary diagnoses [2] were received from centres. The split was about 30:70 for 2015 incident patients. For those people without an old code, new

Table 1.3. Crude adult incidence rates (pmp) and age/gender standardised incidence ratios 2010–2015

CCG/HB – CCG in England, Health and Social Care Areas in Northern Ireland, Local Health Boards in Wales and Health Boards in Scotland
O/E – standardised incidence ratio
LCL – lower 95% confidence limit
UCL – upper 95% confidence limit
pmp – per million population
[a] – per year
Areas with notably low incidence ratios over six years are italicised in greyed areas, those with notably high incidence ratios over six years are bold in greyed areas – for the full methodology see appendix D
Confidence intervals are not given for the crude rates per million population but figures D1 and D2 in appendix D can be used to determine if a CCG/HB falls within the 95% confidence interval around the national average rate
Mid-2015 population data from the Office for National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census
% non-White – percentage of the CCG/HB population that is non-White, from 2011 census
[b]CCGs where at least 10% of the incident RRT population were incident patients of Cambridge/Sheffield renal centres. In these CCGs the rates/ratios are approximated/underestimated. In the CCGs which were >65% covered by Cambridge/Sheffield, the rates for 2015 have been blanked (see methods for details)

									2015	2010–2015				
UK area	CCG/HB	Total population (2015)	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	O/E	Crude rate pmp	O/E	LCL	UCL	Crude rate pmp[a]	% non-White
Cheshire, Warrington and Wirral	*NHS Eastern Cheshire*	*196,500*	*0.86*	*0.75*	*0.70*	*0.64*	*0.72*	*0.84*	*117*	*0.75*	*0.63*	*0.91*	*96*	*3.7*
	NHS South Cheshire	178,900	0.71	0.74	0.58	1.14	1.08	0.82	106	0.85	0.70	1.03	101	2.9
	NHS Vale Royal	*102,900*	*0.81*	*0.88*	*0.78*	*1.26*	*0.16*	*0.38*	*49*	*0.70*	*0.53*	*0.92*	*81*	*2.1*
	NHS Warrington	*207,700*	*0.61*	*0.45*	*0.85*	*0.70*	*0.99*	*0.76*	*91*	*0.73*	*0.60*	*0.89*	*81*	*4.1*
	NHS West Cheshire	231,000	1.16	1.05	0.85	0.98	0.82	0.79	104	0.94	0.80	1.10	113	2.8
	NHS Wirral	*320,900*	*0.91*	*0.91*	*0.63*	*0.98*	*0.68*	*1.09*	*140*	*0.87*	*0.75*	*1.00*	*102*	*3.0*
Durham, Darlington and Tees	NHS Darlington	105,400	0.98	0.86	1.28	0.83	0.55	1.14	142	0.94	0.74	1.19	108	3.8
	NHS Durham Dales, Easington and Sedgefield	274,000	1.05	1.11	0.85	1.01	0.93	1.01	131	0.99	0.86	1.14	119	1.2
	NHS Hartlepool and Stockton-on-Tees	287,300	0.82	0.93	1.05	0.89	0.97	0.70	84	0.89	0.76	1.03	97	4.4
	NHS North Durham	*245,700*	*0.50*	*0.55*	*1.25*	*0.64*	*0.51*	*0.72*	*90*	*0.69*	*0.58*	*0.83*	*79*	*2.5*
	NHS South Tees	274,800	1.09	0.95	0.98	1.22	0.81	1.63	197	1.12	0.98	1.29	124	6.7
Greater Manchester	NHS Bolton	281,600	1.42	0.95	0.91	0.92	0.68	1.09	124	0.99	0.85	1.15	104	18.1
	NHS Bury	187,900	0.69	0.72	1.37	0.79	1.17	0.99	117	0.96	0.80	1.15	104	10.8
	NHS Central Manchester	**188,900**	**2.08**	**1.11**	**1.69**	**2.27**	**2.24**	**2.24**	**164**	**1.95**	**1.66**	**2.29**	**132**	**48.0**
	NHS Heywood, Middleton & Rochdale	214,200	0.78	1.23	1.27	1.24	1.34	0.96	107	1.14	0.97	1.34	117	18.3
	NHS North Manchester	**178,700**	**0.92**	**1.48**	**1.48**	**1.44**	**1.44**	**1.99**	**168**	**1.47**	**1.23**	**1.76**	**115**	**30.8**
	NHS Oldham	230,800	0.84	1.04	0.72	0.96	1.28	1.12	121	1.00	0.84	1.18	100	22.5
	NHS Salford	245,600	1.36	0.74	0.87	1.10	0.89	0.78	81	0.95	0.80	1.13	92	9.9
	NHS South Manchester	162,700	1.02	1.20	1.20	1.25	0.91	1.41	129	1.17	0.96	1.42	98	19.6
	NHS Stockport	*288,700*	*0.94*	*0.88*	*0.65*	*0.54*	*0.89*	*0.77*	*97*	*0.78*	*0.66*	*0.91*	*89*	*7.9*
	NHS Tameside and Glossop	254,900	0.93	0.98	0.60	1.09	0.82	0.99	118	0.90	0.77	1.06	98	8.2
	NHS Trafford	233,300	1.30	0.50	1.16	1.13	0.84	0.85	99	0.96	0.81	1.13	102	14.5
	NHS Wigan Borough	*322,000*	*0.74*	*1.01*	*0.77*	*0.72*	*0.92*	*0.81*	*99*	*0.83*	*0.72*	*0.96*	*93*	*2.7*
Lancashire	NHS Blackburn with Darwen	146,800	0.92	1.41	1.24	0.93	0.81	1.63	170	1.16	0.95	1.42	111	30.8
	NHS Blackpool	139,600	0.66	0.89	1.51	1.17	1.16	0.90	115	1.05	0.87	1.27	123	3.3
	NHS Chorley and South Ribble	172,500	0.55	0.96	0.74	1.28	0.87	1.12	139	0.93	0.77	1.12	105	2.9
	NHS East Lancashire	*374,200*	*0.75*	*0.93*	*0.55*	*0.87*	*1.08*	*0.66*	*80*	*0.81*	*0.70*	*0.93*	*90*	*11.9*
	NHS Fylde & Wyre	*167,900*	*0.70*	*0.55*	*0.77*	*0.79*	*0.96*	*0.85*	*125*	*0.77*	*0.64*	*0.94*	*105*	*2.1*
	NHS Greater Preston	*202,800*	*0.55*	*0.53*	*1.01*	*0.85*	*0.93*	*1.03*	*118*	*0.83*	*0.68*	*1.00*	*87*	*14.7*
	NHS Lancashire North	*161,500*	*0.58*	*1.00*	*0.67*	*0.60*	*0.61*	*0.64*	*81*	*0.68*	*0.54*	*0.85*	*78*	*4.0*
	NHS West Lancashire	112,700	0.56	0.85	0.77	0.67	0.64	1.30	169	0.81	0.63	1.03	96	1.9

Table 1.3. Continued

UK area	CCG/HB	Total population (2015)	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 Crude rate pmp	2010–2015 O/E	2010–2015 LCL	2010–2015 UCL	2010–2015 Crude rate pmp[a]	% non-White
Merseyside	NHS Halton	126,500	0.87	1.53	0.98	0.96	1.04	1.41	166	1.14	0.93	1.39	123	2.2
	NHS Knowsley	147,200	0.89	1.12	1.31	0.70	1.69	0.87	102	1.10	0.91	1.33	118	2.8
	NHS Liverpool	**478,600**	**0.87**	**1.11**	**1.21**	**1.01**	**1.20**	**1.30**	**138**	**1.12**	**1.01**	**1.25**	**110**	**11.1**
	NHS South Sefton	**158,600**	**1.33**	**1.40**	**1.05**	**1.29**	**1.28**	**1.04**	**132**	**1.23**	**1.04**	**1.45**	**144**	**2.2**
	NHS Southport and Formby	115,100	0.63	0.95	0.74	1.38	0.81	0.66	96	0.86	0.69	1.07	114	3.1
	NHS St Helens	177,600	0.93	0.75	0.89	0.63	0.96	0.97	124	0.86	0.71	1.04	100	2.0
Cumbria, Northumberland, Tyne and Wear	*NHS Cumbria*	*504,100*	*0.75*	*0.58*	*0.62*	*0.92*	*0.79*	*0.82*	*115*	*0.75*	*0.67*	*0.84*	*96*	*1.5*
	NHS Newcastle Gateshead	*493,900*	*0.79*	*0.82*	*0.84*	*0.62*	*0.85*	*1.06*	*117*	*0.83*	*0.74*	*0.94*	*85*	*10.1*
	NHS North Tyneside	*202,500*	*0.92*	*0.67*	*0.88*	*0.95*	*0.65*	*0.75*	*94*	*0.80*	*0.67*	*0.96*	*92*	*3.4*
	NHS Northumberland	*315,300*	*0.61*	*0.82*	*0.76*	*0.62*	*0.94*	*0.63*	*89*	*0.73*	*0.63*	*0.85*	*94*	*1.6*
	NHS South Tyneside	*148,700*	*0.75*	*1.09*	*0.54*	*0.76*	*0.61*	*0.96*	*121*	*0.78*	*0.63*	*0.97*	*91*	*4.1*
	NHS Sunderland	277,200	1.06	0.76	0.89	0.61	0.91	1.00	123	0.87	0.75	1.02	99	4.1
North Yorkshire and Humber	*NHS East Riding of Yorkshire*	*315,100*	*0.70*	*0.73*	*0.69*	*0.46*	*0.73*	*0.84*	*121*	*0.69*	*0.60*	*0.80*	*92*	*1.9*
	NHS Hambleton, Richmondshire and Whitby	151,800	0.77	0.69	1.21	0.87	0.82	0.61	86	0.82	0.68	1.01	106	2.7
	NHS Harrogate and Rural District	157,000	0.66	0.96	0.95	0.52	1.07	1.08	146	0.88	0.73	1.07	109	3.7
	NHS Hull	259,000	0.97	0.77	0.77	0.95	1.01	1.37	147	0.98	0.84	1.15	97	5.9
	NHS North East Lincolnshire	159,600	0.71	1.32	0.68	0.83	0.99	1.01	125	0.93	0.76	1.12	105	2.6
	NHS North Lincolnshire	169,800	0.70	1.51	1.13	1.00	0.47	1.01	130	0.97	0.81	1.16	114	4.0
	NHS Scarborough and Ryedale	*110,700*	*0.59*	*0.57*	*0.92*	*0.69*	*0.78*	*0.69*	*99*	*0.71*	*0.55*	*0.91*	*93*	*2.5*
	NHS Vale of York	*355,400*	*0.71*	*1.08*	*0.92*	*0.77*	*0.82*	*0.64*	*79*	*0.82*	*0.71*	*0.94*	*93*	*4.0*
South Yorkshire and Bassetlaw	NHS Barnsley[b]	239,300	1.18	0.80	1.02	1.03	1.29			0.99	0.85	1.16	113	2.1
	NHS Bassetlaw[b]	114,500	0.93	0.82	1.04	1.23	0.89	0.53	70	0.90	0.72	1.13	109	2.6
	NHS Doncaster	304,800	0.95	1.07	0.82	1.15	1.34	0.76	92	1.01	0.88	1.16	113	4.7
	NHS Rotherham[b]	*260,800*	*1.12*	*0.70*	*0.84*	*0.75*	*0.83*			*0.81*	*0.69*	*0.95*	*92*	*6.4*
	NHS Sheffield[b]	569,700	1.05	1.00	1.23	0.95	0.95			0.96	0.86	1.06	96	16.3
West Yorkshire	*NHS Airedale, Wharfedale and Craven*	*159,300*	*0.56*	*0.49*	*0.65*	*0.84*	*1.15*	*0.87*	*113*	*0.77*	*0.62*	*0.95*	*92*	*11.1*
	NHS Bradford City	**83,900**	**3.31**	**1.87**	**2.63**	**2.56**	**3.15**	**2.36**	**167**	**2.64**	**2.14**	**3.26**	**173**	**72.2**
	NHS Bradford Districts	**337,700**	**1.23**	**1.09**	**1.40**	**1.05**	**1.15**	**1.50**	**157**	**1.24**	**1.09**	**1.41**	**119**	**28.7**
	NHS Calderdale	*208,400*	*0.52*	*0.59*	*0.76*	*1.05*	*0.62*	*0.68*	*82*	*0.71*	*0.58*	*0.86*	*78*	*10.3*
	NHS Greater Huddersfield	243,800	0.82	0.91	1.10	0.92	1.01	0.77	90	0.92	0.78	1.08	99	17.4
	NHS Leeds North	*200,800*	*0.67*	*0.84*	*0.78*	*0.85*	*0.89*	*0.66*	*80*	*0.78*	*0.65*	*0.95*	*87*	*17.4*
	NHS Leeds South and East	249,700	0.73	0.93	0.75	0.95	0.98	0.67	68	0.83	0.70	1.00	78	18.3
	NHS Leeds West	*323,600*	*0.61*	*0.58*	*0.72*	*1.14*	*0.70*	*0.89*	*90*	*0.78*	*0.66*	*0.92*	*72*	*10.8*
	NHS North Kirklees	190,500	1.06	1.24	0.48	1.46	0.84	0.81	89	0.98	0.81	1.18	99	25.3
	NHS Wakefield	333,800	0.88	0.91	1.07	0.85	1.01	0.61	75	0.89	0.77	1.02	100	4.6
Arden, Herefordshire and Worcestershire	**NHS Coventry and Rugby**	**448,800**	**1.33**	**1.44**	**1.75**	**1.29**	**1.11**	**1.06**	**111**	**1.32**	**1.19**	**1.47**	**128**	**22.2**
	NHS Herefordshire	188,100	0.72	0.82	0.90	0.80	0.91	1.30	181	0.92	0.77	1.09	117	1.8
	NHS Redditch and Bromsgrove	180,500	0.98	0.80	1.23	0.72	0.82	0.75	94	0.88	0.73	1.06	102	6.0
	NHS South Warwickshire	*261,500*	*0.75*	*0.99*	*0.66*	*0.58*	*0.85*	*0.79*	*103*	*0.77*	*0.65*	*0.91*	*92*	*7.0*
	NHS South Worcestershire	*298,600*	*0.67*	*0.71*	*0.81*	*0.77*	*0.96*	*0.75*	*100*	*0.78*	*0.67*	*0.91*	*96*	*3.7*
	NHS Warwickshire North	189,100	1.62	1.10	0.80	0.74	1.57	1.09	137	1.15	0.98	1.35	133	6.5
	NHS Wyre Forest	99,500	0.93	1.06	0.81	0.63	1.35	0.43	60	0.87	0.68	1.10	111	2.8

Table 1.3. Continued

UK area	CCG/HB	Total population (2015)	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 Crude rate pmp	2010–2015 O/E	2010–2015 LCL	2010–2015 UCL	2010–2015 Crude rate pmp[a]	% non-White
Birmingham and the Black Country	**NHS Birmingham CrossCity**	**740,800**	**1.38**	**1.62**	**1.49**	**1.46**	**1.52**	**1.63**	**162**	**1.52**	**1.40**	**1.65**	**139**	**35.2**
	NHS Birmingham South and Central	**202,300**	**1.51**	**1.86**	**1.52**	**1.65**	**1.78**	**1.41**	**133**	**1.62**	**1.39**	**1.88**	**142**	**40.4**
	NHS Dudley	316,500	0.82	0.85	1.22	1.21	0.94	0.83	104	0.98	0.85	1.12	113	10.0
	NHS Sandwell and West Birmingham	**487,700**	**1.84**	**1.69**	**1.47**	**1.55**	**1.71**	**1.84**	**180**	**1.69**	**1.54**	**1.85**	**152**	**45.3**
	NHS Solihull	210,400	1.00	0.68	1.01	0.90	0.89	1.08	138	0.93	0.78	1.10	109	10.9
	NHS Walsall	**276,100**	**1.96**	**1.23**	**1.37**	**1.61**	**1.00**	**1.31**	**152**	**1.40**	**1.24**	**1.59**	**150**	**21.1**
	NHS Wolverhampton	**254,400**	**1.50**	**1.18**	**1.53**	**1.07**	**1.52**	**1.26**	**142**	**1.34**	**1.17**	**1.53**	**139**	**32.0**
Derbyshire and Notting-hamshire	NHS Erewash	96,300	0.89	1.15	1.33	1.30	0.70	0.93	114	1.04	0.82	1.32	118	3.2
	NHS Hardwick[b]	*110,500*	*0.40*	*0.71*	*0.85*	*0.76*	*0.79*			*0.70*	*0.54*	*0.91*	*84*	*1.8*
	NHS Mansfield & Ashfield	196,400	0.91	0.75	0.83	0.81	1.02	0.78	97	0.85	0.71	1.02	97	2.5
	NHS Newark & Sherwood	118,700	0.96	1.30	0.93	0.49	0.72	0.63	84	0.83	0.66	1.04	101	2.4
	NHS North Derbyshire[b]	*272,900*	*0.69*	*0.94*	*0.78*	*0.76*	*0.61*			*0.69*	*0.59*	*0.81*	*87*	*2.5*
	NHS Nottingham City	**318,900**	**1.60**	**1.12**	**1.24**	**1.28**	**1.32**	**1.77**	**160**	**1.39**	**1.22**	**1.59**	**117**	**28.5**
	NHS Nottingham North & East	*149,500*	*0.87*	*0.78*	*0.72*	*0.70*	*0.55*	*0.85*	*107*	*0.74*	*0.59*	*0.93*	*86*	*6.2*
	NHS Nottingham West	112,300	0.98	0.55	1.10	1.22	0.87	0.91	116	0.94	0.75	1.18	110	7.3
	NHS Rushcliffe	*114,500*	*0.95*	*1.16*	*0.38*	*1.04*	*0.42*	*0.20*	*26*	*0.68*	*0.52*	*0.89*	*80*	*6.9*
	NHS Southern Derbyshire	523,800	0.97	1.03	1.13	0.87	0.96	0.81	97	0.96	0.86	1.07	105	11.0
East Anglia	*NHS Cambridgeshire and Peterborough*[b]	*876,400*	*0.77*	*0.90*	*0.66*	*1.05*	*0.78*			*0.83*	*0.76*	*0.91*	*89*	*9.5*
	NHS Great Yarmouth & Waveney	214,800	1.09	1.16	0.97	0.95	0.79	1.16	163	1.02	0.88	1.18	131	2.7
	NHS Ipswich and East Suffolk	*399,500*	*0.66*	*0.62*	*0.89*	*0.91*	*0.72*	*1.13*	*150*	*0.83*	*0.73*	*0.94*	*101*	*5.6*
	NHS North Norfolk	*170,600*	*0.79*	*0.51*	*0.76*	*0.82*	*0.85*	*1.05*	*164*	*0.80*	*0.67*	*0.96*	*115*	*1.5*
	NHS Norwich[b]	198,200	1.17	1.13	0.89	0.82	0.82	0.97	111	0.96	0.81	1.15	102	7.3
	NHS South Norfolk[b]	*243,400*	*0.67*	*0.95*	*0.81*	*0.99*	*0.65*	*0.99*	*136*	*0.84*	*0.72*	*0.99*	*106*	*2.6*
	NHS West Norfolk[b]	*174,100*	*0.83*	*0.63*	*0.67*	*0.61*	*0.86*			*0.76*	*0.63*	*0.93*	*101*	*2.6*
	NHS West Suffolk[b]	*226,300*	*0.84*	*0.70*	*0.89*	*0.83*	*0.60*			*0.74*	*0.61*	*0.88*	*87*	*4.6*
Essex	NHS Basildon and Brentwood	257,800	0.88	1.04	1.25	0.93	0.98	1.08	128	1.03	0.89	1.19	112	7.1
	NHS Castle Point, Rayleigh and Rochford	174,300	0.87	0.75	0.70	1.18	0.73	0.87	120	0.85	0.71	1.02	108	3.0
	NHS Mid Essex[b]	*385,700*	*0.84*	*0.98*	*0.81*	*0.72*	*0.87*	*0.76*	*96*	*0.83*	*0.73*	*0.95*	*96*	*4.4*
	NHS North East Essex	325,100	0.98	1.24	0.95	0.85	1.11	0.87	114	1.00	0.88	1.14	120	5.5
	NHS Southend	178,700	0.65	0.84	0.94	1.06	0.72	1.02	123	0.87	0.72	1.06	97	8.4
	NHS Thurrock	165,200	1.16	1.19	0.79	0.96	1.09	1.05	109	1.04	0.85	1.27	99	14.1
	NHS West Essex[b]	300,200	0.65	0.73	1.19	1.04	1.10	0.97	117	0.95	0.82	1.10	104	8.2
Hertfordshire and the South Midlands	NHS Bedfordshire	440,300	0.86	0.72	0.95	0.99	0.94	0.92	109	0.90	0.79	1.01	97	11.2
	NHS Corby	66,900	1.31	1.11	0.79	0.61	1.02	1.68	179	1.09	0.81	1.48	107	4.5
	NHS East and North Hertfordshire	559,100	0.87	1.04	0.70	1.09	1.03	1.11	127	0.98	0.88	1.09	103	10.4
	NHS Herts Valleys	*588,200*	*0.84*	*0.78*	*0.88*	*0.90*	*1.11*	*0.84*	*95*	*0.89*	*0.80*	*1.00*	*93*	*14.6*
	NHS Luton	**214,700**	**1.09**	**1.38**	**1.21**	**1.98**	**1.53**	**1.33**	**126**	**1.42**	**1.22**	**1.66**	**124**	**45.3**
	NHS Milton Keynes	267,800	1.03	0.91	1.10	0.88	1.18	1.28	131	1.07	0.92	1.25	100	19.6
	NHS Nene	*640,000*	*0.74*	*0.89*	*1.07*	*0.97*	*0.90*	*0.85*	*100*	*0.90*	*0.82*	*1.00*	*98*	*9.1*
Leicestershire and Lincolnshire	*NHS East Leicestershire and Rutland*	*325,900*	*0.71*	*0.72*	*0.97*	*0.90*	*0.78*	*0.92*	*120*	*0.83*	*0.73*	*0.96*	*100*	*9.8*
	NHS Leicester City	**342,600**	**1.72**	**1.80**	**1.62**	**1.69**	**1.21**	**1.51**	**140**	**1.59**	**1.41**	**1.78**	**135**	**49.5**
	NHS Lincolnshire East	*232,000*	*0.78*	*0.89*	*0.75*	*1.08*	*0.57*	*0.76*	*112*	*0.80*	*0.68*	*0.94*	*109*	*2.0*
	NHS Lincolnshire West	*234,300*	*0.64*	*0.74*	*0.42*	*0.79*	*0.60*	*0.65*	*81*	*0.64*	*0.53*	*0.78*	*73*	*3.0*
	NHS South Lincolnshire	146,000	1.17	0.97	0.90	0.66	0.68	0.95	130	0.88	0.72	1.08	111	2.3
	NHS South West Lincolnshire	*124,300*	*0.91*	*0.95*	*0.67*	*0.85*	*0.50*	*0.54*	*72*	*0.73*	*0.57*	*0.93*	*90*	*2.3*
	NHS West Leicestershire	*387,500*	*1.10*	*0.90*	*0.52*	*0.80*	*0.99*	*0.63*	*77*	*0.82*	*0.72*	*0.94*	*93*	*6.9*

Table 1.3. Continued

UK area	CCG/HB	Total population (2015)	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 Crude rate pmp	2010–2015 O/E	2010–2015 LCL	2010–2015 UCL	2010–2015 Crude rate pmp[a]	% non-White
Shropshire and Staffordshire	NHS Cannock Chase	134,900	1.11	1.15	0.80	1.17	0.80	0.77	96	0.96	0.78	1.18	110	2.4
	NHS East Staffordshire	125,700	1.51	0.88	0.72	1.13	0.87	0.71	87	0.96	0.77	1.19	109	9.0
	NHS North Staffordshire	216,700	0.69	1.11	0.59	0.96	0.97	1.05	138	0.90	0.76	1.06	109	3.5
	NHS Shropshire	311,400	0.92	0.97	0.75	1.01	0.88	0.92	128	0.91	0.80	1.04	116	2.0
	NHS South East Staffs and Seisdon and Peninsular	*224,800*	*0.71*	*0.99*	*0.72*	*0.63*	*0.77*	*0.71*	*93*	*0.75*	*0.63*	*0.90*	*91*	*3.6*
	NHS Stafford and Surrounds	152,200	1.13	0.82	0.92	0.90	0.85	1.21	164	0.97	0.81	1.17	122	4.7
	NHS Stoke on Trent	259,900	1.40	1.06	0.86	1.10	1.45	1.04	119	1.15	1.00	1.33	122	11.0
	NHS Telford & Wrekin	**171,200**	**1.38**	**1.10**	**1.21**	**1.23**	**1.27**	**1.43**	**164**	**1.27**	**1.08**	**1.50**	**133**	**7.3**
London	**NHS Barking & Dagenham**	**202,000**	**1.38**	**1.66**	**2.05**	**1.61**	**2.03**	**1.95**	**163**	**1.79**	**1.54**	**2.08**	**138**	**41.7**
	NHS Barnet	**379,700**	**1.74**	**1.42**	**1.50**	**1.24**	**1.31**	**1.42**	**145**	**1.43**	**1.28**	**1.60**	**135**	**35.9**
	NHS Camden	**241,100**	**1.63**	**1.13**	**1.13**	**1.34**	**1.19**	**1.32**	**124**	**1.29**	**1.10**	**1.50**	**112**	**33.7**
	NHS City and Hackney	**277,800**	**1.57**	**1.71**	**2.05**	**1.86**	**2.16**	**1.17**	**94**	**1.75**	**1.53**	**2.00**	**129**	**44.6**
	NHS Enfield	**328,400**	**1.37**	**1.98**	**1.62**	**1.58**	**1.54**	**1.54**	**152**	**1.60**	**1.43**	**1.80**	**146**	**39.0**
	NHS Haringey	**272,900**	**1.44**	**1.72**	**2.30**	**2.24**	**1.67**	**1.57**	**139**	**1.82**	**1.61**	**2.07**	**149**	**39.5**
	NHS Havering	249,100	0.36	1.20	1.04	0.82	0.92	1.09	128	0.91	0.78	1.07	98	12.3
	NHS Islington	**227,700**	**1.50**	**1.55**	**2.07**	**1.51**	**1.13**	**1.60**	**136**	**1.56**	**1.34**	**1.81**	**122**	**31.8**
	NHS Newham	**332,800**	**2.26**	**2.17**	**1.95**	**2.19**	**2.31**	**2.42**	**186**	**2.22**	**1.99**	**2.48**	**158**	**71.0**
	NHS Redbridge	**296,800**	**1.55**	**1.38**	**2.15**	**1.99**	**1.46**	**1.47**	**142**	**1.66**	**1.47**	**1.88**	**147**	**57.5**
	NHS Tower Hamlets	**295,200**	**1.41**	**1.66**	**1.88**	**2.08**	**2.34**	**2.49**	**180**	**1.99**	**1.75**	**2.26**	**133**	**54.8**
	NHS Waltham Forest	**271,200**	**1.23**	**1.82**	**1.27**	**1.68**	**2.10**	**1.78**	**162**	**1.66**	**1.46**	**1.89**	**139**	**47.8**
	NHS Brent	**324,000**	**2.66**	**2.10**	**2.45**	**1.96**	**2.54**	**2.32**	**222**	**2.34**	**2.12**	**2.58**	**206**	**63.7**
	NHS Central London (Westminster)	**174,100**	**1.30**	**1.31**	**1.18**	**1.40**	**1.10**	**1.00**	**103**	**1.21**	**1.01**	**1.45**	**115**	**36.2**
	NHS Ealing	**343,100**	**2.01**	**1.91**	**2.26**	**1.69**	**1.79**	**2.32**	**227**	**2.00**	**1.81**	**2.22**	**180**	**51.0**
	NHS Hammersmith and Fulham	**179,400**	**1.56**	**1.43**	**1.49**	**0.99**	**1.45**	**1.22**	**111**	**1.35**	**1.13**	**1.61**	**114**	**31.9**
	NHS Harrow	**247,100**	**2.13**	**2.23**	**1.59**	**1.06**	**1.55**	**1.46**	**158**	**1.66**	**1.46**	**1.88**	**165**	**57.8**
	NHS Hillingdon	**297,700**	**1.48**	**1.47**	**1.50**	**1.43**	**1.01**	**1.11**	**111**	**1.33**	**1.16**	**1.51**	**122**	**39.4**
	NHS Hounslow	**268,800**	**1.81**	**1.84**	**1.74**	**2.03**	**1.29**	**1.32**	**127**	**1.66**	**1.46**	**1.89**	**146**	**48.6**
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	225,900	1.25	1.21	0.91	0.98	1.52	0.69	71	1.09	0.92	1.29	103	33.4
	NHS Bexley	242,100	1.38	1.21	0.87	1.01	1.11	1.22	136	1.13	0.97	1.32	116	18.1
	NHS Bromley	324,900	1.15	0.69	0.71	0.84	0.99	1.51	175	0.99	0.87	1.14	106	15.7
	NHS Croydon	**379,000**	**1.43**	**1.26**	**2.00**	**1.95**	**1.80**	**1.89**	**193**	**1.73**	**1.56**	**1.92**	**162**	**44.9**
	NHS Greenwich	**274,800**	**2.06**	**1.04**	**1.17**	**2.41**	**1.25**	**1.73**	**156**	**1.61**	**1.41**	**1.83**	**134**	**37.5**
	NHS Kingston	173,500	0.87	0.96	1.09	1.12	1.13	0.80	81	0.99	0.81	1.21	92	25.5
	NHS Lambeth	**324,400**	**1.38**	**1.78**	**1.69**	**1.40**	**1.89**	**2.00**	**166**	**1.70**	**1.50**	**1.92**	**130**	**42.9**
	NHS Lewisham	**297,300**	**1.46**	**1.80**	**1.87**	**1.49**	**1.54**	**1.52**	**135**	**1.61**	**1.42**	**1.83**	**131**	**46.5**
	NHS Merton	**204,600**	**1.21**	**1.57**	**1.77**	**1.25**	**1.39**	**1.74**	**171**	**1.49**	**1.28**	**1.74**	**135**	**35.1**
	NHS Richmond	*194,700*	*0.88*	*0.69*	*0.79*	*0.98*	*0.78*	*0.61*	*67*	*0.79*	*0.64*	*0.97*	*79*	*14.0*
	NHS Southwark	**308,900**	**1.84**	**1.99**	**1.77**	**2.27**	**1.89**	**1.89**	**159**	**1.94**	**1.73**	**2.18**	**150**	**45.8**
	NHS Sutton	**200,100**	**1.45**	**1.30**	**1.54**	**0.80**	**1.67**	**1.47**	**160**	**1.37**	**1.18**	**1.60**	**137**	**21.4**
	NHS Wandsworth	**314,500**	**1.49**	**1.23**	**1.39**	**0.96**	**1.57**	**1.76**	**153**	**1.41**	**1.23**	**1.61**	**112**	**28.6**
Bath, Gloucestershire, Swindon and Wiltshire	*NHS Bath and North East Somerset*	*184,900*	*0.64*	*0.56*	*0.92*	*0.95*	*0.66*	*0.59*	*70*	*0.72*	*0.58*	*0.89*	*78*	*5.4*
	NHS Gloucestershire	*617,200*	*0.90*	*0.88*	*1.17*	*0.70*	*0.78*	*0.79*	*102*	*0.87*	*0.79*	*0.96*	*103*	*4.6*
	NHS Swindon	222,800	1.03	1.14	1.22	0.92	1.17	1.28	144	1.13	0.97	1.32	116	10.0
	NHS Wiltshire	*486,100*	*0.81*	*0.64*	*0.47*	*0.77*	*0.81*	*0.67*	*86*	*0.70*	*0.61*	*0.79*	*82*	*3.4*

Table 1.3. Continued

UK area	CCG/HB	Total population (2015)	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 Crude rate pmp	2010–2015 O/E	2010–2015 LCL	2010–2015 UCL	2010–2015 Crude rate pmp[a]	% non-White
Bristol, North Somerset, Somerset and South Gloucestershire	**NHS Bristol**	**449,300**	**1.51**	**1.43**	**1.25**	**1.37**	**1.16**	**1.19**	**116**	**1.31**	**1.18**	**1.47**	**118**	**16.0**
	NHS North Somerset	209,900	0.98	0.87	1.02	1.04	1.05	0.81	110	0.96	0.82	1.13	120	2.7
	NHS Somerset	*545,400*	*1.07*	*0.85*	*0.67*	*0.55*	*0.88*	*0.67*	*92*	*0.78*	*0.70*	*0.87*	*98*	*2.0*
	NHS South Gloucestershire	*274,700*	*1.09*	*0.61*	*0.81*	*1.15*	*0.68*	*0.75*	*91*	*0.85*	*0.72*	*0.99*	*94*	*5.0*
Devon, Cornwall and Isles of Scilly	NHS Kernow	551,700	0.90	0.81	0.95	0.85	0.79	1.16	161	0.91	0.83	1.01	117	1.8
	NHS North, East, West Devon	*890,600*	*1.01*	*0.93*	*1.00*	*0.83*	*0.93*	*0.84*	*110*	*0.92*	*0.85*	*0.99*	*111*	*3.0*
	NHS South Devon and Torbay	278,600	1.27	0.89	1.08	1.00	0.87	0.84	122	0.99	0.86	1.12	132	2.1
Kent and Medway	NHS Ashford	124,300	0.93	0.83	1.27	1.09	0.96	0.87	105	0.99	0.80	1.23	110	6.3
	NHS Canterbury and Coastal	207,700	0.95	0.83	0.57	0.94	1.17	0.90	111	0.90	0.75	1.07	102	5.9
	NHS Dartford, Gravesham and Swanley	258,200	0.98	0.87	0.98	1.46	0.94	0.94	108	1.03	0.88	1.19	109	13.0
	NHS Medway	276,500	0.73	0.90	0.81	1.08	0.92	1.15	127	0.94	0.80	1.10	95	10.4
	NHS South Kent Coast	205,500	0.92	1.02	0.57	0.75	1.00	0.93	127	0.87	0.73	1.03	108	4.5
	NHS Swale	112,500	1.05	0.59	1.34	0.82	1.16	0.90	107	0.98	0.78	1.23	107	3.8
	NHS Thanet	139,800	1.46	0.86	1.04	1.55	1.01	0.65	86	1.09	0.90	1.31	131	4.5
	NHS West Kent	*476,800*	*0.72*	*0.82*	*0.62*	*0.70*	*0.93*	*0.81*	*99*	*0.77*	*0.68*	*0.87*	*86*	*4.9*
Surrey and Sussex	NHS Brighton & Hove	285,300	0.84	0.93	1.16	0.79	1.07	1.07	109	0.98	0.84	1.14	92	10.9
	NHS Coastal West Sussex	*495,000*	*0.49*	*0.64*	*0.80*	*0.78*	*1.02*	*0.89*	*127*	*0.78*	*0.70*	*0.87*	*102*	*3.8*
	NHS Crawley	110,900	1.98	0.50	0.80	1.07	1.29	0.71	72	1.05	0.82	1.34	98	20.1
	NHS East Surrey	182,000	1.30	0.74	1.25	0.91	0.82	1.39	165	1.07	0.90	1.27	116	8.3
	NHS Eastbourne, Hailsham and Seaford	188,100	0.60	0.84	1.04	1.18	0.73	1.08	154	0.92	0.77	1.08	121	4.4
	NHS Guildford and Waverley	*206,100*	*0.72*	*0.74*	*1.16*	*0.54*	*0.77*	*0.87*	*102*	*0.80*	*0.66*	*0.97*	*87*	*7.2*
	NHS Hastings & Rother	184,400	0.76	0.96	0.73	1.22	0.64	0.96	136	0.88	0.74	1.05	114	4.6
	NHS High Weald Lewes Havens	*171,600*	*0.65*	*0.68*	*0.91*	*0.61*	*0.97*	*0.86*	*117*	*0.78*	*0.65*	*0.95*	*98*	*3.1*
	NHS Horsham and Mid Sussex	*230,300*	*0.73*	*0.79*	*0.51*	*0.76*	*0.83*	*0.56*	*69*	*0.70*	*0.58*	*0.84*	*80*	*4.9*
	NHS North West Surrey	343,000	1.15	1.31	0.91	0.94	1.22	0.88	105	1.06	0.94	1.21	116	12.5
	NHS Surrey Downs	287,000	0.96	0.97	0.89	1.02	0.94	0.80	101	0.93	0.80	1.07	108	9.1
	NHS Surrey Heath	*95,900*	*0.79*	*0.77*	*0.76*	*0.46*	*0.44*	*0.93*	*115*	*0.69*	*0.51*	*0.92*	*78*	*9.3*
Thames Valley	*NHS Aylesbury Vale*	*207,000*	*0.96*	*1.03*	*0.74*	*0.67*	*0.81*	*0.74*	*87*	*0.82*	*0.68*	*0.99*	*89*	*9.7*
	NHS Bracknell and Ascot	137,000	1.02	0.76	0.37	1.24	0.97	0.73	80	0.85	0.67	1.07	85	9.5
	NHS Chiltern	*324,000*	*0.68*	*0.69*	*0.74*	*0.99*	*0.78*	*0.81*	*99*	*0.78*	*0.67*	*0.91*	*88*	*15.8*
	NHS Newbury and District	*106,400*	*0.65*	*0.63*	*0.62*	*1.03*	*0.90*	*0.71*	*85*	*0.76*	*0.58*	*0.99*	*83*	*4.4*
	NHS North & West Reading	100,300	0.29	0.94	0.93	0.64	0.95	0.91	110	0.79	0.60	1.03	86	10.4
	NHS Oxfordshire	*663,600*	*0.89*	*1.01*	*0.98*	*0.88*	*0.83*	*0.81*	*93*	*0.90*	*0.81*	*0.99*	*96*	*9.3*
	NHS Slough	**145,700**	**2.01**	**2.21**	**1.75**	**1.79**	**1.71**	**1.96**	**172**	**1.90**	**1.60**	**2.25**	**153**	**54.3**
	NHS South Reading	**111,000**	**1.33**	**1.16**	**1.17**	**2.39**	**1.52**	**0.73**	**63**	**1.38**	**1.09**	**1.73**	**110**	**30.5**
	NHS Windsor, Ascot and Maidenhead	141,400	0.92	1.24	0.61	1.33	1.20	0.61	71	0.98	0.80	1.21	105	14.7
	NHS Wokingham	*160,400*	*0.80*	*1.31*	*0.47*	*0.80*	*0.76*	*0.63*	*75*	*0.79*	*0.64*	*0.98*	*86*	*11.6*
Wessex	*NHS Dorset*	*765,700*	*0.62*	*0.73*	*0.71*	*0.72*	*0.71*	*0.60*	*82*	*0.68*	*0.62*	*0.75*	*86*	*4.0*
	NHS Fareham and Gosport	199,500	1.12	0.78	0.78	1.01	1.08	0.89	115	0.94	0.80	1.12	113	3.4
	NHS Isle of Wight	139,400	0.62	0.77	0.87	1.22	0.85	0.68	100	0.84	0.69	1.02	114	2.7
	NHS North East Hampshire and Farnham	209,200	0.87	0.84	1.16	1.17	0.85	0.95	110	0.97	0.82	1.15	104	9.7
	NHS North Hampshire	*220,800*	*0.71*	*0.69*	*0.47*	*0.71*	*1.03*	*0.76*	*91*	*0.73*	*0.61*	*0.89*	*80*	*6.4*
	NHS Portsmouth	211,800	0.54	1.31	1.10	1.12	0.97	1.03	104	1.01	0.85	1.21	94	11.6

Table 1.3. Continued

UK area	CCG/HB	Total population (2015)	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 Crude rate pmp	2010–2015 O/E	2010–2015 LCL	2010–2015 UCL	2010–2015 Crude rate pmp[a]	% non-White
Wessex cont.	NHS South Eastern Hampshire	211,900	1.07	0.76	0.63	0.96	1.09	0.70	94	0.87	0.73	1.02	107	3.1
	NHS Southampton	249,500	1.25	1.15	0.88	0.63	0.98	0.95	92	0.97	0.82	1.15	87	14.1
	NHS West Hampshire	*554,900*	*0.47*	*0.67*	*0.62*	*0.66*	*0.76*	*0.59*	*79*	*0.63*	*0.56*	*0.71*	*78*	*3.9*
Wales	Betsi Cadwaladr University	694,500	0.99	0.83	1.01	0.90	1.07	1.08	144	0.98	0.90	1.07	120	2.5
	Powys Teaching	132,600	0.72	1.27	1.26	0.73	0.58	0.97	143	0.92	0.75	1.12	124	1.6
	Hywel Dda	383,200	1.13	1.24	0.92	1.08	1.18	1.02	141	1.09	0.98	1.22	138	2.2
	Abertawe Bro Morgannwg University	**525,500**	**1.52**	**1.18**	**1.44**	**1.04**	**0.95**	**1.12**	**139**	**1.20**	**1.09**	**1.32**	**137**	**3.9**
	Cwm Taf	296,700	1.01	1.45	0.91	1.13	1.13	0.95	115	1.09	0.96	1.25	121	2.6
	Aneurin Bevan	**581,800**	**1.29**	**1.21**	**1.18**	**1.04**	**1.16**	**0.98**	**122**	**1.14**	**1.04**	**1.25**	**130**	**3.9**
	Cardiff and Vale University	484,800	1.32	1.01	1.01	1.11	0.93	0.92	99	1.05	0.93	1.17	103	12.2
Scotland	Ayrshire and Arran	370,600	1.14	0.83	0.95	1.00	0.80	0.91	121	0.93	0.83	1.06	114	1.2
	Borders	*114,000*	*1.08*	*0.56*	*0.55*	*0.47*	*0.57*	*0.74*	*105*	*0.66*	*0.51*	*0.85*	*86*	*1.3*
	Dumfries and Galloway	*149,700*	*0.59*	*0.58*	*1.04*	*0.40*	*1.19*	*0.60*	*87*	*0.74*	*0.60*	*0.91*	*98*	*1.2*
	Fife	368,100	1.26	1.17	0.87	1.01	0.91	1.05	133	1.04	0.92	1.17	121	2.4
	Forth Valley	302,700	1.04	0.82	0.87	1.00	0.92	1.02	126	0.95	0.82	1.09	107	2.2
	Grampian	*587,800*	*0.86*	*0.83*	*0.85*	*0.91*	*0.76*	*0.89*	*105*	*0.85*	*0.76*	*0.95*	*92*	*4.0*
	Greater Glasgow and Clyde	1,149,900	0.91	1.11	1.13	0.93	0.90	1.16	133	1.02	0.95	1.10	108	7.3
	Highland	*321,000*	*0.67*	*0.52*	*0.61*	*0.67*	*0.50*	*0.93*	*128*	*0.65*	*0.56*	*0.76*	*82*	*1.3*
	Lanarkshire	654,500	0.95	0.83	1.08	0.93	0.89	0.95	115	0.94	0.85	1.03	104	2.0
	Lothian	*867,800*	*0.62*	*0.72*	*0.74*	*0.60*	*0.75*	*0.70*	*80*	*0.69*	*0.62*	*0.76*	*72*	*5.6*
	Orkney	21,700	0.39	0.00	1.86	0.72	0.00	1.65	231	0.78	0.45	1.34	100	0.7
	Shetland	23,200	0.40	0.78	0.00	0.75	1.06	1.03	129	0.68	0.38	1.23	79	1.5
	Tayside	415,000	1.03	1.19	0.68	0.86	0.95	0.94	120	0.94	0.84	1.06	111	3.2
	Western Isles	27,100	1.50	0.00	0.00	0.84	1.59	1.54	222	0.93	0.60	1.45	123	0.9
Northern Ireland	**Belfast**	**353,800**	**1.33**	**1.07**	**1.69**	**1.16**	**0.85**	**1.19**	**127**	**1.21**	**1.07**	**1.37**	**119**	**3.2**
	Northern	471,200	1.08	1.24	1.12	1.03	1.02	0.89	102	1.06	0.95	1.18	111	1.2
	Southern	373,000	1.02	1.28	0.86	0.84	0.77	0.90	94	0.94	0.82	1.08	90	1.2
	South Eastern	354,700	0.73	0.92	0.78	0.92	0.77	1.27	149	0.90	0.79	1.04	98	1.3
	Western	299,000	0.90	0.98	0.59	0.98	1.06	1.11	120	0.94	0.81	1.09	94	1.0

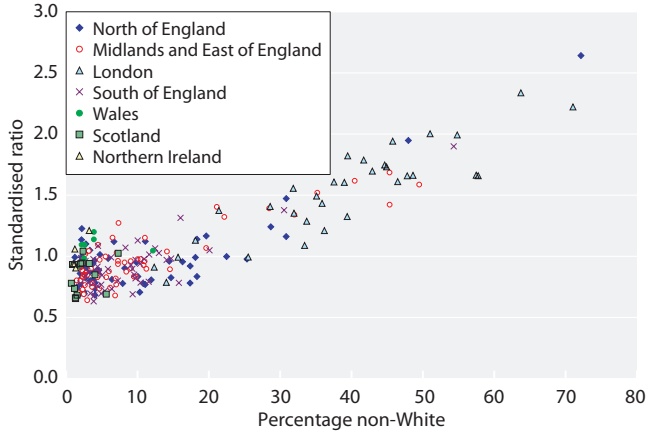

Fig. 1.2. Age/gender standardised incidence ratio (2010–2015) by percentage non-White

codes (where available) were mapped back to old codes using the mapping available on the ERA-EDTA website. As recommended in the notes for users in the ERA-EDTA's PRD code list document, this mapping is provided for guidance only and has not been validated; therefore care must be taken not to over interpret data from this mapping. These codes were grouped into the same eight categories as in previous reports, the details are given in appendix H: Ethnicity and ERA-EDTA Coding (www.renalreg.org).

Most centres electronically upload ethnicity coding to their renal information technology (IT) system from the hospital Patient Administration System (PAS). Ethnicity coding in these PAS systems is based on self-reported ethnicity. For the remaining centres, ethnicity coding is performed by clinical staff and recorded directly into the renal IT system (using a variety of coding systems). Data on ethnic origin were grouped into White, South Asian, Black, Chinese or Other. The details of regrouping of the PAS codes into the above ethnic categories are provided in appendix H: Ethnicity and ERA-EDTA Coding (www.renalreg.org). Chi-squared, Fisher's exact, ANOVA and Kruskal Wallis tests were used as appropriate.

Table 1.4. Number of patients starting RRT by renal centre 2010–2015

Centre	Year						Estimated catchment population (millions)	2015 crude rate pmp[a]	(95% CI)
	2010	2011	2012	2013	2014	2015			
England									
B Heart	94	113	101	100	100	122	0.74	165	(136–195)
B QEH	196	213	210	200	250	247	1.70	145	(127–163)
Basldn	35	44	53	34	45	46	0.42	111	(79–143)
Bradfd	67	60	71	63	83	88	0.65	135	(107–163)
Brightn	105	119	132	139	148	142	1.30	109	(91–128)
Bristol	168	141	149	174	151	144	1.44	100	(84–116)
Camb	105	122	123	136	126	175[b]	1.16	151	(129–174)
Carlis	22	27	19	42	37	44	0.32	137	(97–178)
Carsh	216	207	244	229	265	248	1.91	130	(114–146)
Chelms	46	47	46	47	55	46	0.51	90	(64–116)
Colchr	32	44	29	29	38	28	0.30	94	(59–128)
Covnt	113	110	114	91	125	109	0.89	122	(99–145)
Derby	79	74	80	74	76	60[c]	0.70	85	(64–107)
Donc	45	43	40	60	54	36	0.41	88	(59–116)
Dorset	72	79	73	73	78	74	0.86	86	(66–105)
Dudley	43	43	56	51	42	49	0.44	111	(80–142)
Exeter	139	112	134	100	143	126[cd]	1.09	116	(95–136)
Glouc	61	58	76	53	62	64	0.59	109	(82–136)
Hull	87	108	94	90	98	121[c]	1.02	119	(97–140)
Ipswi	32	29	44	40	34	66	0.40	165	(126–205)
Kent	131	120	114	143	149	142	1.22	116	(97–135)
L Barts	201	250	266	284	302	314	1.83	172	(153–191)
L Guys	142	121	130	134	160	180	1.08	166	(142–191)
L Kings	144	138	123	166	148	179	1.17	153	(130–175)
L Rfree	203	220	235	225	230	237[c]	1.52	156	(136–176)
L St.G	85	72	95	84	91	117[cd]	0.80	147	(120–173)
L West	364	364	354	303	355	340	2.40	142	(127–157)
Leeds	124	153	151	183	170	146	1.67	87	(73–102)
Leic	243	266	235	288	252	273	2.44	112	(99–125)
Liv Ain	48	58	63	65	65	66	0.48	136	(103–169)
Liv Roy	97	111	104	95	136	146	1.00	146	(122–170)
M RI	159	154	161	198	164	199[c]	1.53	130	(112–148)
Middlbr	100	100	119	111	102	133[c]	1.00	132	(110–155)
Newc	91	98	102	92	109	124	1.12	111	(91–130)
Norwch	85	86	75	79	76	109	0.79	139	(113–165)
Nottm	116	114	100	113	111	129[c]	1.09	119	(98–139)
Oxford	164	176	170	164	188	200[c]	1.69	118	(102–135)
Plymth	56	60	54	64	55	53	0.47	113	(82–143)
Ports	147	187	159	194	230	197	2.02	97	(84–111)
Prestn	121	138	146	154	164	161[c]	1.49	108	(91–124)
Redng	89	103	72	117	104	86	0.91	94	(75–114)
Salford	145	131	134	116	161	176[c]	1.49	118	(101–136)
Sheff	141	135	156	136	151	151[c]	1.37	110	(93–128)
Shrew	57	61	58	59	65	65	0.50	130	(98–161)
Stevng	104	110	109	156	150	139	1.20	115	(96–135)
Sthend	27	29	26	42	30	35	0.32	110	(74–147)
Stoke	95	91	74	104	115	107	0.89	120	(97–143)
Sund	54	57	71	51	62	63	0.62	102	(77–127)
Truro	46	39	49	45	39	71[c]	0.41	172	(132–212)
Wirral	59	58	46	65	55	63	0.57	110	(83–137)
Wolve	106	77	87	91	79	83	0.67	124	(97–151)
York	39	53	55	37	64	61	0.49	124	(93–155)

Table 1.4. Continued

Centre	Year						Estimated catchment population (millions)	2015 crude rate pmp[a]	(95% CI)
	2010	2011	2012	2013	2014	2015			
N Ireland									
Antrim	38	29	25	29	35	35	0.29	119	(79–158)
Belfast	71	68	96	72	64	89	0.64	140	(111–169)
Newry	21	36	17	23	20	28	0.26	107	(67–147)
Ulster	20	36	28	30	23	32	0.27	120	(79–162)
West NI	28	35	22	30	35	37	0.35	105	(71–139)
Scotland									
Abrdn	51	50	53	58	53	66	0.60	110	(83–137)
Airdrie	56	48	60	51	50	64	0.55	116	(88–144)
D & Gall	10	10	18	8	22	12	0.15	81	(35–127)
Dundee	50	59	38	42	50	45	0.46	97	(69–126)
Edinb	69	76	82	72	90	97	0.96	101	(81–121)
Glasgw	153	177	184	174	174	222	1.62	137	(119–155)
Inverns	28	12	16	21	21	34	0.27	126	(84–168)
Klmarnk	43	33	40	40	34	39	0.36	108	(74–142)
Krkcldy	45	43	30	38	36	44	0.32	139	(98–180)
Wales									
Bangor	26	20	21	24	22	29	0.22	133	(85–181)
Cardff	181	186	170	171	168	158	1.42	111	(94–129)
Clwyd	21	17	22	17	32	29	0.19	153	(97–209)
Swanse	134	118	118	109	121	129[c]	0.89	146	(121–171)
Wrexm	25	26	34	37	41	45	0.24	187	(133–242)
							% change since 2010		
England	**5,540**	**5,723**	**5,781**	**5,983**	**6,342**	**6,580**	**18.8**		
N Ireland	**178**	**204**	**188**	**184**	**177**	**221**	**24.2**		
Scotland	**505**	**508**	**521**	**504**	**530**	**623**	**23.4**		
Wales	**387**	**367**	**365**	**358**	**384**	**390**	**0.8**		
UK	**6,610**	**6,802**	**6,855**	**7,029**	**7,433**	**7,814**	**18.2**		

[a]pmp – per million population
[b]Cambridge were unable to submit patient level data for 2015 but provided the UKRR with information allowing their incident number for 2015 to be estimated. This number has been used here and in table 1.1 but not elsewhere in this chapter
[c]Subsequent to closing the 2015 database the UKRR received corrections to the numbers of incident patients in 2015 for these centres. This table and table 1.2 (but not the remainder of this chapter) include these revisions. For most centres the change was small (<5 patients), but the changes made here were notable for a number of centres: MRI-21 (pre-emptive transplants now allocated to other centres), Salford +38, Sheffield +55, Truro −9
[d]Exeter believe that their number for 2015 should be 11 higher than reported here, these are all patients that have been allocated to other centres (mainly pre-emptive transplants) and these are reported here under those centres (as those were the numbers those centres were told would be published). L St.G believe that their number for 2015 should be 3 lower than reported here, these are all patients that they believe should have been allocated to other centres

Estimated glomerular filtration rate (eGFR) at the start of RRT was studied amongst patients with eGFR data within 14 days before the start of RRT. The eGFR was calculated using the abbreviated 4 variable MDRD study equation [3]. For the purpose of the eGFR calculation, patients who had missing ethnicity but a valid serum creatinine measurement were classed as White. The eGFR values were log transformed due to their skewed distribution.

Results

Incidence rates had plateaued in the nine years before the previous report but they increased in 2014 and again in 2015 (figure 1.3). Figure 1.4 shows RRT incidence rates for 2015 by age group and gender. For both men and women, the peak rate was in the 75–79 age group. Showing numbers starting RRT (rather than rates); figure 1.5 shows that the 65–74 age group contained the most incident patients for HD and the 55–64 age group included the most people for PD.

Age

In 2015, the median age of patients starting renal replacement therapy was 64.4 years (table 1.5) and this has changed little over recent years. Per modality, the median age at start was 66.9 years for patients starting on HD, 60.3 for patients starting on PD and 50.8 for

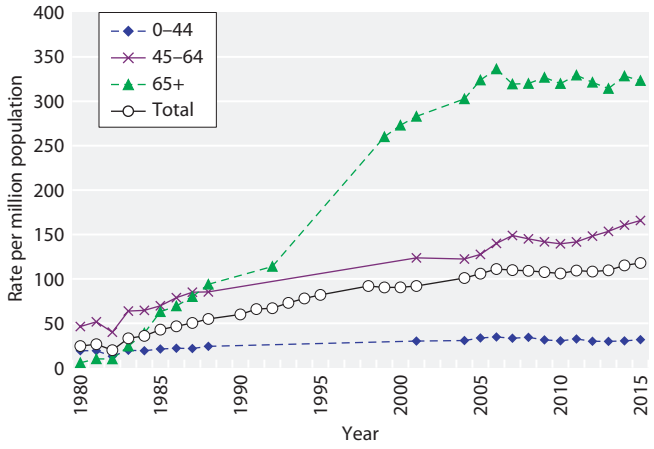

Fig. 1.3. RRT incidence rates between 1980 and 2015

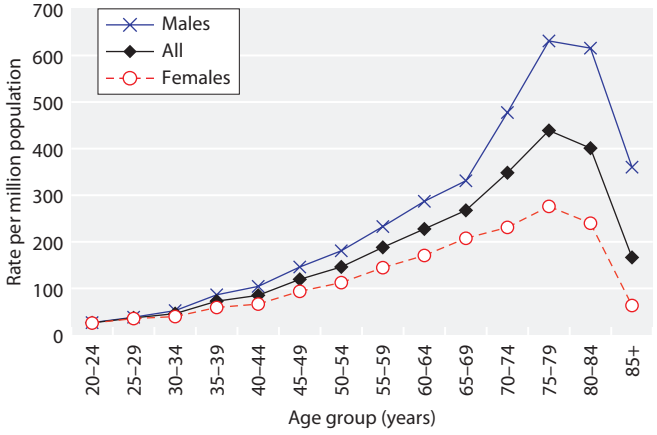

Fig. 1.4. RRT incidence rates in 2015 by age and gender

those having a pre-emptive transplant (table 1.6). The median age at start of non-White patients increased from 57.0 years for 2013 starters to 58.7 in 2014 and 59.8 in 2015 but was still considerably lower than that

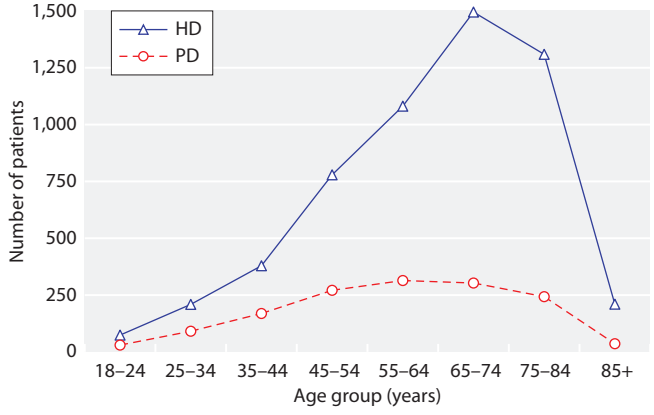

Fig. 1.5. Number of incident dialysis patients in 2015, by age group and initial dialysis modality

Table 1.5. Median, inter-quartile range and 90% range of the age of patients starting renal replacement therapy in 2015 by country

Country	Median	IQR	90% range
England	64.6	(51.6–74.8)	(32.0–83.9)
N Ireland	67.5	(52.9–76.5)	(29.4–83.6)
Scotland	61.5	(50.9–70.7)	(33.8–80.7)
Wales	65.1	(51.7–75.4)	(32.3–83.1)
UK	**64.4**	**(51.6–74.6)**	**(32.1–83.7)**

for White patients (66.3 years) reflecting CKD differences and the younger age distribution of ethnic minority populations in general compared with the White population (in the 2011 census data for England and Wales 5.3% of ethnic minorities were over 65 years old compared to 18.3% of Whites) [4]. The median age of new patients with diabetes was similar to the overall median and has not varied greatly over recent years.

There were large differences between centres in the median age of incident patients (figure 1.6) reflecting differences in the age and ethnic structure of the catchment populations and also, particularly in smaller centres, chance fluctuations. The median age of patients starting treatment at transplant centres was 62.2 years (IQR 50.0, 73.1) and at non-transplanting centres 66.2 years (IQR 53.2, 75.8).

There has been recent interest in the access of older patients to RRT and this is explored again this year. Averaged over 2010–2015, crude CCG/HB incidence rates in the over 75 years age group varied from 57 per million age related population (pmarp) in Borders to 1,059 pmarp in NHS Brent (IQR 252 pmarp, 399 pmarp). The wide range of treatment rates suggests that there was geographical variation in the prevalence of comorbid and predisposing renal conditions as well as uncertainty within the renal community about the suitability of older patients for dialysis. The variation between CCG/HBs seen in the over 75s was much greater than the variation seen in the overall analysis although some of this difference is likely to be due to the smaller numbers included in the over 75 analysis.

Table 1.6. Median, inter-quartile range and 90% range of the age of patients starting renal replacement therapy in 2015 by initial treatment modality

Treatment	Median	IQR	90% range
HD	66.9	(54.3–75.8)	(34.7–84.1)
PD	60.3	(47.8–72.4)	(30.1–83.0)
Transplant	50.8	(41.0–60.5)	(24.1–71.9)

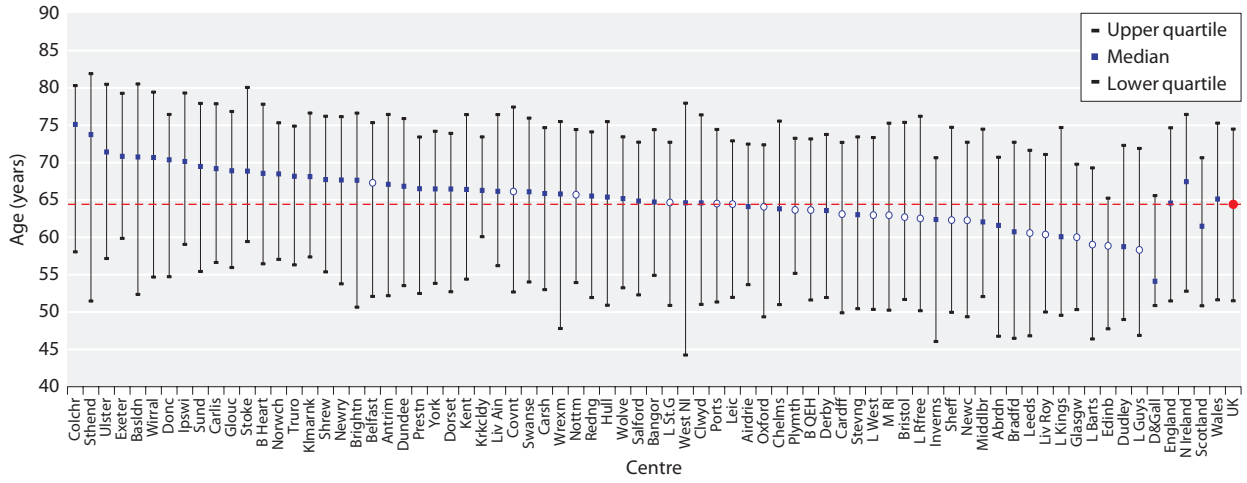

Fig. 1.6. Median age of incident RRT patients by centre in 2015
White points indicate transplant centres

Gender

More men than women started RRT in every age group except the youngest (figure 1.7). The overall breakdown was 62.2% male, 37.8% female equating to a M : F ratio of 1.65.

Ethnicity

As in previous reports, Scotland is not included in this section as completeness of ethnicity data was low. Across centres in England, Wales and Northern Ireland the average completeness was 95.8% for 2015 incident patients – similar to the 94.8% seen last year. A five year cohort was used for the centre level analysis presented here (table 1.7a). For completeness data by centre for 2015 incident patients see the Introduction chapter of this report. Table 1.7b shows the overall detailed ethnicity breakdown for England for 2015.

Primary renal diagnosis

The breakdown of primary renal diagnosis (PRD) by centre is shown for a 2011–2015 incident cohort in table 1.8a. The breakdown by country is shown for 2015 incident patients in table 1.8b. For completeness data for 2015 by centre see the Introduction chapter of this report. Fifty-seven centres provided data on over 90% of incident patients and 28 of these centres had 100% completeness. There was only a small amount of missing data for Wales and Scotland, whilst Northern Ireland had 9.5% missing and England had 11.3% missing. The overall percentage missing was 9.7% and this was slightly lower in the under compared to the over 65 year olds (8.8% and 10.8% respectively). Seven

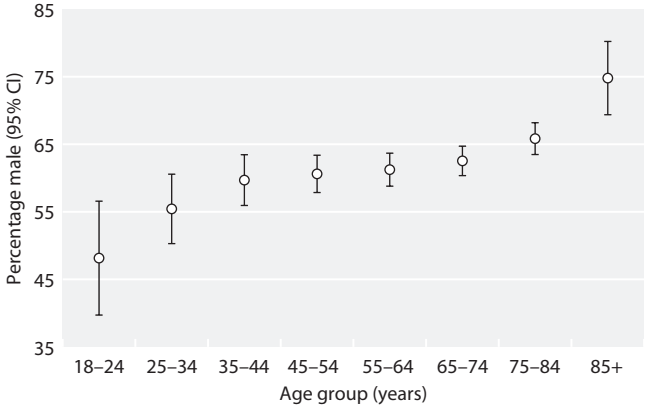

Fig. 1.7. Percentage of patients starting RRT in 2015 who were male, by age group

centres had missing PRD for more than 25% of incident patients.

The UKRR continues to be concerned about centres with apparently very high data completeness for PRD but also very high rates of 'uncertain' diagnoses (EDTA code 00: Chronic renal failure; aetiology uncertain). It is accepted that there will inevitably be a number of patients with uncertain aetiology and that the proportion of these patients will vary between clinicians and centres as the definitions of e.g. renal vascular disease and hypertensive renal disease remain relatively subjective. Many of the new ERA-EDTA PRD codes allow clinicians to indicate the basis for the diagnosis of the renal disease (e.g. based on histology or not). Adoption of these new codes should therefore reduce the coding of PRD as uncertain. This year there was again a lot of variability between centres

Table 1.7a. Percentage of incident patients (2011–2015) in minority ethnic groups (South Asian, Black, Chinese or Other) by centre

Centre	% data not available	*N* with data	Percentage in minority ethnic group
England			
B Heart	0.0	536	37
B QEH	0.2	1,118	35
Basldn	1.8	218	15
Bradfd	1.1	361	42
Brightn	3.5	656	8
Bristol	2.2	742	10
Camb	4.1	486	5
Carlis	0.0	169	2
Carsh	6.8	1,112	29
Chelms	17.4	199	9
Colchr	6.0	158	3
Covnt	0.0	549	19
Derby	2.5	358	16
Donc	0.0	233	5
Dorset	0.0	377	4
Dudley	0.4	240	13
Exeter	2.1	598	1
Glouc	0.0	313	5
Hull	0.8	510	3
Ipswi	10.8	190	13
Kent	0.7	663	5
L Barts	0.4	1,411	66
L Guys	3.4	700	42
L Kings	0.3	752	47
L Rfree	3.5	1,106	51
L St.G	6.1	433	52
L West	0.0	1,716	60
Leeds	0.2	801	19
Leic	5.5	1,242	23
Liv Ain	1.9	311	4
Liv Roy	4.6	565	8
M RI	2.9	871	27
Middlbr	0.4	564	5
Newc	0.0	525	8
Norwch	1.6	418	3
Nottm	0.0	563	15
Oxford	4.9	857	17
Plymth	0.4	285	4
Ports	8.8	882	6
Prestn	0.4	758	13
Redng	10.2	433	26
Salford	0.6	676	19
Sheff	1.2	666	12
Shrew	0.3	307	7
Stevng	4.7	633	24
Sthend	3.7	156	9
Stoke	0.8	487	7
Sund	0.7	302	4
Truro	0.4	251	*
Wirral	2.8	279	3
Wolve	0.2	416	30
York	3.0	262	3
N Ireland			
Antrim	0.0	153	*
Belfast	6.9	362	2
Newry	0.0	124	*
Ulster	0.0	149	5
West NI	0.0	159	*
Wales			
Bangor	0.0	116	*
Cardff	1.3	842	7
Clwyd	1.7	115	4
Swanse	0.3	592	2
Wrexm	1.1	181	3
England	**2.5**	**29,414**	**24**
N Ireland	**2.8**	**947**	**2**
Wales	**0.9**	**1,846**	**4**
E, W & NI	**2.4**	**32,207**	**22**

*Values suppressed due to small numbers in minority ethnic group

Table 1.7b. Percentage of incident RRT patients (2015) in different ethnic groups (England)

Country	% data not available	*N* with data	Percentage in each ethnic group				
			White	South Asian	Black	Chinese	Other
England	**4.0**	**6,091**	**74.6**	**13.5**	**8.2**	**0.7**	**3.1**

but no centre had a far higher percentage with 'uncertain' diagnosis than the others. Last year there were three centres with diagnosis 'uncertain' for over 45% of their incident patients – Cambridge (65%), Colchester (61%) and Ipswich (79%). The situation has improved this year for Colchester but Ipswich now has 65% missing data and Cambridge were unable to supply the data.

There was a lot of variability between centres in the percentages with the specific diagnoses (partly due to the reasons mentioned above). For example, for the 2011–2015 cohort, the percentage with diabetes as PRD varied from 15% to 40%.

The overall UK distribution of PRDs is shown in table 1.9. When using a simple under versus over 65

Table 1.8a. Distribution of primary renal diagnosis by country in the 2011–2015 incident RRT cohort

Centre	% data not available	*N* with data	Percentage							
			Uncertain aetiology	Diabetes	Glomerulo-nephritis	Hyper-tension	Other	Polycystic kidney	Pyelo-nephritis	Renal vascular disease
England										
B Heart	3	520	17	39	10	8	13	4	6	2
B QEH	0	1,119	16	22	13	6	22	7	5	9
Basldn	6	208	7	30	20	7	10	5	9	12
Bradfd	0	364	20	26	15	10	13	6	5	5
Brightn	8	628	22	20	15	4	20	8	7	5
Bristol	2	741	13	24	15	4	19	10	8	6
Camb										
Carlis	1	168	2	20	14	18	14	12	8	13
Carsh	47	631								
Chelms	5	230	18	26	15	7	20	4	7	4
Colchr	11	51	29	33	*	*	*	*	*	*
Covnt	2	540	15	20	14	13	14	6	7	11
Derby	2	361	13	32	16	2	17	5	9	5
Donc	0	232	22	19	12	10	20	7	4	5
Dorset	0	376	10	25	12	10	17	10	9	7
Dudley	0	240	23	21	10	8	26	5	3	4
Exeter	1	607	10	23	15	10	16	6	7	13
Glouc	0	313	30	21	15	3	13	7	5	6
Hull	0	513	20	20	15	6	17	11	8	4
Ipswi	45	52								
Kent	0	666	23	23	15	5	17	5	8	3
L Barts	6	1,335	14	33	11	11	15	5	9	2
L Guys	24	554	32	22	12	7	13	6	5	3
L Kings	0	754	11	38	10	17	11	4	6	3
L Rfree	3	1,113	10	31	12	9	25	4	3	6
L St.G	23	354	20	27	15	9	17	7	3	2
L West	0	1,715	11	39	13	4	18	6	5	5
Leeds	0	801	13	21	15	11	18	9	9	5
Leic	17	1,087	21	21	14	6	15	9	9	5
Liv Ain	2	311	24	20	13	9	14	4	7	10
Liv Roy	22	374	7	21	17	17	20	8	8	2
M RI	9	819	10	28	13	14	19	7	6	3
Middlbr	1	561	19	26	12	5	18	8	6	6
Newc	1	521	14	21	15	4	23	9	7	8
Norwch	4	409	26	20	15	3	15	8	6	6
Nottm	1	560	20	23	12	5	20	8	8	6
Oxford	0	897	15	28	16	6	15	9	6	5
Plymth	10	258	10	19	21	7	12	8	8	15
Ports	11	865	10	25	14	9	19	9	8	7
Prestn	0	759	14	24	14	11	15	7	9	6
Redng	1	477	17	29	13	3	18	5	7	7
Salford	42	394								
Sheff	1	667	18	25	18	5	10	8	8	8
Shrew	4	297	23	24	8	5	25	5	4	6
Stevng	8	609	17	24	11	2	32	7	3	4
Sthend	0	162	19	19	15	4	20	10	7	7
Stoke	11	438	10	27	11	8	22	8	5	8
Sund	2	299	4	24	13	19	18	8	7	8
Truro	2	248	11	24	20	8	17	5	8	8
Wirral	22	223	8	28	8	15	26	7	3	5
Wolve	1	411	25	20	13	2	26	4	5	4
York	1	268	7	19	18	9	22	10	9	7

Table 1.8a. Continued

Centre	% data not available	*N* with data	Percentage							
			Uncertain aetiology	Diabetes	Glomerulo-nephritis	Hyper-tension	Other	Polycystic kidney	Pyelo-nephritis	Renal vascular disease
N Ireland										
Antrim	0	153	30	28	10	*	14	4	9	*
Belfast	5	368	15	19	14	4	20	11	13	4
Newry	0	124	14	28	10	2	17	10	5	13
Ulster	1	148	11	26	11	13	19	4	5	11
West NI	0	159	8	23	14	11	18	5	13	8
Scotland										
Abrdn	0	280	9	31	14	8	17	9	7	5
Airdrie	0	273	18	26	17	5	12	8	8	6
D & Gall	0	70	7	40	14	14	13	*	*	*
Dundee	0	234	15	22	15	7	21	9	5	5
Edinb	0	417	12	26	17	4	18	12	6	5
Glasgw	0	931	13	28	16	2	15	9	6	10
Inverns	1	103	21	15	16	*	24	10	7	*
Klmarnk	0	186	4	27	12	8	17	6	10	16
Krkcldy	0	191	16	25	18	*	16	5	6	*
Wales										
Bangor	1	115	19	27	12	9	11	6	3	13
Cardff	0	851	23	26	17	2	12	8	4	6
Clwyd	7	93	17	26	13	12	18	4	5	4
Swanse	1	588	7	30	18	3	15	3	7	17
Wrexm	0	183	14	26	15	3	16	8	10	8
England	**8**	**27,100**	**16**	**26**	**13**	**8**	**18**	**7**	**7**	**6**
N Ireland	**2**	**952**	**16**	**23**	**13**	**6**	**18**	**8**	**10**	**7**
Scotland	**0**	**2,685**	**13**	**27**	**16**	**4**	**17**	**9**	**7**	**8**
Wales	**1**	**1,830**	**16**	**27**	**17**	**3**	**14**	**6**	**6**	**10**
UK	**7**	**32,567**	**16**	**26**	**14**	**7**	**18**	**7**	**7**	**6**

*Values suppressed due to small numbers (primary or secondary suppression)
The percentage in each category has been calculated after excluding those patients with data not available
For those centres with >25% missing primary diagnoses, the percentages in the other diagnostic categories have not been calculated
For those centres judged to have high % uncertain aetiology for a year, their data has not been used for that year

Table 1.8b. Distribution of primary renal diagnosis by country in the 2015 incident RRT cohort

Country	% data not available	*N* with data	Percentage							
			Uncertain aetiology	Diabetes	Glomerulo-nephritis	Hyper-tension	Other	Polycystic kidney	Pyelo-nephritis	Renal vascular disease
England	**11.3**	**5,628**	**14.9**	**27.5**	**13.5**	**7.4**	**17.4**	**7.3**	**6.6**	**5.5**
N Ireland	**9.5**	**200**	**15.5**	**26.0**	**16.5**	**5.5**	**16.0**	**7.5**	**9.0**	**4.0**
Scotland	**0.0**	**623**	**11.6**	**28.6**	**14.9**	**4.2**	**18.1**	**9.3**	**4.7**	**8.7**
Wales	**0.5**	**387**	**11.9**	**26.9**	**19.9**	**2.8**	**16.3**	**6.5**	**7.0**	**8.8**
UK	**9.7**	**6,838**	**14.4**	**27.5**	**14.1**	**6.8**	**17.3**	**7.4**	**6.5**	**5.9**

The percentage in each category has been calculated after excluding those patients with data not available

Table 1.9. Percentage distribution of primary renal diagnosis by age in the 2015 incident RRT cohort

	Percentage with diagnosis							
	Age group							
Diagnosis	18–<35	35–<45	45–<55	55–<65	65–<75	75–<85	85+	All
Diabetes	14.3	26.5	30.3	33.9	29.8	23.3	9.9	27.5
Glomerulonephritis	29.6	20.6	16.6	13.5	11.6	8.9	8.4	14.1
Pyelonephritis	9.1	5.2	5.8	4.8	6.8	7.8	8.9	6.5
Hypertension	4.0	6.7	5.8	5.5	6.4	8.9	14.8	6.8
Polycystic kidney	5.8	11.6	14.3	9.0	4.9	3.0	2.0	7.4
Renal vascular disease	0.7	1.2	1.5	3.5	7.7	11.8	17.2	5.9
Other	22.5	17.6	15.6	18.4	18.2	15.5	12.8	17.3
Uncertain aetiology	14.0	10.7	10.0	11.2	14.6	20.8	26.1	14.4

Percentages calculated after excluding those patients with data not available

split (data not shown) diabetic nephropathy was the most common renal diagnosis in both the under and over 65 year age groups, accounting for 28% of all (non-missing) incident diagnoses. Glomerulonephritis and autosomal dominant polycystic kidney disease (ADPKD) made up much higher proportions of the younger than the older incident cohorts (18% vs 10% and 11% vs 4% respectively), whilst patients with renal vascular disease comprised a much higher percentage of the older rather than the younger patients (10% vs 2%). Uncertainty about the underlying diagnosis was also much more likely in the older rather than the younger cohort (18% vs 11%).

For all primary renal diagnoses except ADPKD, the male to female ratio was 1.4 or greater. This gender difference may relate to factors such as smoking, hypertension, atheroma and renal vascular disease, which are more common in males and may influence the rate of progression of renal failure.

Table 1.10 shows the incidence rates for each PRD per million population for the 2015 cohort. As there were some missing data, the rates for at least some of the diagnoses will be underestimates.

First established treatment modality

In 2015, the first treatment recorded, irrespective of any later change, was haemodialysis in 73.1% of patients, peritoneal dialysis in 19.2% and pre-emptive transplant in 7.7% (table 1.11). The percentage having a pre-emptive transplant fell in 2015, however, about half of this drop is due to Cambridge (a transplant centre) not being included in the data for 2015. Table F.1.3 in appendix F: Additional Data Tables for 2015 New and Existing Patients gives the treatment breakdown at start of RRT by centre.

Many patients undergo a brief period of HD before switches to other modalities are, or can be, considered. Therefore, the established modality at 90 days is more representative of the elective first modality and this

Table 1.10. Primary renal diagnosis RRT incidence rates (2015) per million population (unadjusted)

Diagnosis	England	N Ireland	Scotland	Wales	UK
Diabetes	28.8	28.1	33.1	33.6	29.4
Glomerulonephritis	14.2	17.8	17.3	24.8	15.1
Pyelonephritis	6.9	9.7	5.4	8.7	7.0
Hypertension	7.7	5.9	4.8	3.5	7.2
Polycystic kidney	7.6	8.1	10.8	8.1	7.9
Renal vascular disease	5.8	4.3	10.1	11.0	6.3
Other	18.2	17.3	21.0	20.3	18.5
Uncertain aetiology	15.6	16.7	13.4	14.8	15.4
Data not available	13.3	11.3	0.0	0.6	11.5
All	**118**	**119**	**116**	**126**	**118**

The overall rates per country may be slightly different to those in table 1.2 as Cambridge have been excluded from both the numerator and the denominator here

Table 1.11. Treatment at start and at 90 days by year of start

Start	HD (%)	PD (%)	Transplant (%)
Day 0 treatment			
2010	74.5	18.6	6.9
2011	72.7	20.4	6.9
2012	72.8	19.5	7.7
2013	71.9	19.4	8.8
2014	71.9	19.8	8.3
2015	73.1	19.2	7.7
Day 90 treatment			
Oct 2009 to end Sept 2010	72.5	19.4	8.1
Oct 2010 to end Sept 2011	70.7	20.6	8.7
Oct 2011 to end Sept 2012	70.8	20.2	9.1
Oct 2012 to end Sept 2013	69.8	20.0	10.2
Oct 2013 to end Sept 2014	69.6	20.1	10.3
Oct 2014 to end Sept 2015	71.3	19.6	9.1

modality was used for the remainder of this section. For these analyses, the incident cohort from 1st October 2014 to 30th September 2015 was used so that follow up to 90 days was possible for all patients. By 90 days, 5.2% of incident patients had died and a further 0.5% had stopped treatment, leaving 94.3% of the original cohort still on RRT. Table 1.12a shows the percentages on each treatment modality at 90 days both as percentages of all of those starting RRT and then of those still on treatment at 90 days. Expressed as percentages of the whole incident cohort, 67.3% were on HD at 90 days, 18.4% were on PD and 8.6% had received a transplant. Expressed as percentages of those still receiving RRT at 90 days, 71.3% were on HD, 19.6% on PD and 9.1% had received a transplant.

Figure 1.8 shows the modality breakdown with the HD patients further subdivided. Of those still on RRT at 90 days, 41% were treated with hospital HD, 30% with satellite HD, and only 0.4% were receiving home HD at this early stage. This 0.4% on home HD was 27 patients (across 11 centres). This was a decrease from the 0.6% (43 patients across 16 centres) seen for 2014. Chapter 2: UK Renal Replacement Therapy Prevalence in 2015 shows that 4.2% of all dialysis patients were receiving home HD.

Table 1.12b shows the treatment breakdown at 90 days by centre. Here a five year cohort was used (1st October 2010 to 30th September 2015). The percentage of incident patients who had died by 90 days varied considerably between centres. The ongoing observation that in some centres few patients die by 90 days is difficult to explain clinically. Differences in the definition of whether patients have acute or chronic renal failure and when they then report patients to the UKRR (with a period of time between start of RRT and reporting to the UKRR in which they have by definition survived – immortal time bias) may be a factor in this apparent variation along with possible differences in clinical practice.

Using just 2015 incident patients, the percentage of patients still on RRT at 90 days who had a functioning transplant at 90 days varied between centres from 0% to 35% (between 7% and 35% for transplanting centres and between 0% and 13% for non-transplanting centres). The mean percentage of the incident cohort with a functioning transplant at 90 days was greater in transplanting compared to non-transplanting centres (11.9% vs 5.8%). One possible reason could be that some patients transplanted pre-emptively were attributed to the incident cohort of the transplanting centre rather than that of the referring centre.

Table 1.13 gives the HD/PD breakdown by age group for those incident patients on dialysis at 90 days (incident cohort 1/10/2012 to 30/09/2015). The percentage on PD at 90 days was about 50% higher in patients aged under 65 years than in older patients (27% vs 17%). In both

Table 1.12a. RRT modality at 90 days by country (incident cohort 1/10/2014 to 30/09/2015)

		Status at 90 days of all patients who started RRT (%)					Status at 90 days of only those patients still on RRT (%)		
Centre	*N*	HD	PD	Tx	Recovered/ discontinued	Died	HD	PD	Tx
England	**6,431**	**66.7**	**18.9**	**8.6**	**0.4**	**5.4**	**70.9**	**20.0**	**9.1**
N Ireland	**214**	**62.6**	**15.9**	**16.4**	**2.8**	**2.3**	**66.0**	**16.8**	**17.2**
Scotland	**553**	**73.4**	**14.7**	**8.0**	**0.5**	**3.4**	**76.5**	**15.3**	**8.3**
Wales	**389**	**70.2**	**18.3**	**5.7**	*	*	**74.6**	**19.4**	**6.0**
UK	**7,587**	**67.3**	**18.4**	**8.6**	**0.5**	**5.2**	**71.3**	**19.6**	**9.1**

*Values suppressed due to small numbers (primary or secondary suppression)

Table 1.12b. RRT modality at 90 days by centre (incident cohort 1/10/2010 to 30/09/2015)

Centre	*N*	Percentage who had died by 90 days	Percentage of patients still on RRT at 90 days		
			HD	PD	Tx
England					
B Heart	528	5	79	17	3
B QEH	1,092	2	72	19	9
Basldn	218	4	74	25	1
Bradfd	363	5	78	12	10
Brightn	671	7	69	25	6
Bristol	760	5	71	17	12
Camb	542	4	63	10	26
Carlis	171	2	54	39	7
Carsh	1,189	7	74	19	7
Chelms	244	4	*	21	*
Colchr	172	8	*	*	*
Covnt	560	8	61	29	10
Derby	370	6	54	44	2
Donc	227	6	*	21	*
Dorset	375	3	68	27	5
Dudley	244	4	*	34	*
Exeter	621	4	75	21	4
Glouc	314	4	72	24	4
Hull	500	5	60	33	6
Ipswi	200	2	67	27	6
Kent	660	5	73	17	9
L Barts	1,374	4	64	29	7
L Guys	721	2	73	9	18
L Kings	752	2	71	25	4
L Rfree	1,139	4	64	25	11
L St.G	453	4	74	15	11
L West	1,734	3	82	6	12
Leeds	809	6	66	17	17
Leic	1,310	6	68	19	13
Liv Ain	309	13	72	25	3
Liv Roy	577	9	55	25	19
M RI	883	6	60	21	18
Middlbr	556	7	79	7	13
Newc	510	8	69	19	12
Norwch	419	7	79	19	2
Nottm	558	7	55	32	14
Oxford	884	5	60	23	17
Plymth	281	6	65	21	15
Ports	956	4	72	18	11
Prestn	757	5	73	16	11
Redng	484	7	59	35	7
Salford	704	5	66	27	7
Sheff	689	5	76	15	9
Shrew	313	8	71	27	2
Stevng	662	5	78	13	9
Sthend	162	6	69	25	6
Stoke	476	7	72	26	2
Sund	302	3	80	13	7
Truro	247	11	72	19	9
Wirral	296	14	73	23	4
Wolve	436	7	62	36	2
York	261	4	60	25	15

Table 1.12b. Continued

Centre	*N*	Percentage who had died by 90 days	Percentage of patients still on RRT at 90 days		
			HD	PD	Tx
N Ireland					
Antrim	149	4	79	15	6
Belfast	387	4	63	13	24
Newry	125	5	*	31	*
Ulster	144	10	*	11	*
West NI	155	4	74	19	6
Scotland					
Abrdn	276	4	79	19	2
Airdrie	262	1	*	12	*
D & Gall	69	4	56	44	0
Dundee	233	4	83	16	2
Edinb	399	5	72	11	17
Glasgw	900	3	77	12	12
Inverns	98	*	69	27	4
Klmarnk	180	8	*	22	*
Krkcldy	182	8	83	17	0
Wales					
Bangor	114	6	*	21	*
Cardff	867	5	71	17	12
Clwyd	109	6	74	22	4
Swanse	604	6	74	22	4
Wrexm	183	7	66	27	7
England	**30,035**	**5**	**70**	**21**	**10**
N Ireland	**960**	**5**	**72**	**16**	**12**
Scotland	**2,599**	**4**	**77**	**15**	**7**
Wales	**1,877**	**6**	**72**	**20**	**8**
UK	**35,471**	**5**	**70**	**20**	**10**

*Values suppressed due to small numbers (primary or secondary suppression)

age groups there was a lot of variability between centres in the percentage on PD.

In 2015, the median age at start for those on HD at 90 days was 66.7 years compared with 59.9 years for PD. There were eleven centres where the percentage of patients treated with PD was the same as or higher in the over 65s than the under 65s (seven centres for the three year cohort shown in table 1.13). This reflects the use of assisted PD programmes – a feature of note and one that is valued by the patients and their families.

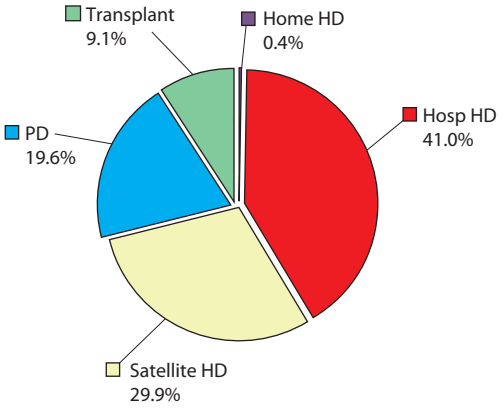

Fig. 1.8. RRT modality at 90 days (incident cohort 1/10/2014 to 30/09/2015)

Modality change over time

Table 1.14 gives the breakdown of status/treatment modality at four subsequent time points by initial treatment type for patients starting RRT in 2010. Fifty-four percent of patients who started on HD had died within five years of starting. This compared to 34% and 4% for those starting on PD or transplant respectively. Of the patients starting on PD, 90% were on PD at 90 days but this percentage dropped sharply at the later time points. In contrast, 92% of patients starting with a transplant were also transplant patients at the five year time point.

Table 1.13. Modality split of patients on dialysis at 90 days (incident cohort 1/10/2012 to 30/09/2015)

	Age <65 (%)		Age ⩾65 (%)	
Centre	HD	PD	HD	PD
England				
B Heart	74	26	88	12
B QEH	73	27	89	11
Basldn	70	30	79	21
Bradfd	82	18	95	5
Brightn	70	30	78	22
Bristol	74	26	84	16
Camb	87	13	88	13
Carlis	57	43	58	42
Carsh	72	28	84	16
Chelms	76	24	83	17
Colchr	100	0	100	0
Covnt	63	37	73	27
Derby	44	56	70	30
Donc	70	30	85	15
Dorset	71	29	72	28
Dudley	56	44	74	26
Exeter	71	29	81	19
Glouc	58	42	81	19
Hull	59	41	75	26
Ipswi	73	27	72	28
Kent	74	27	87	13
L Barts	67	34	70	30
L Guys	88	12	92	8
L Kings	71	29	78	22
L Rfree	62	38	74	26
L St.G	83	17	81	19
L West	93	7	92	8
Leeds	77	24	88	12
Leic	76	24	85	15
Liv Ain	59	41	83	17
Liv Roy	68	33	72	28
M RI	72	28	80	20
Middlbr	86	14	95	6
Newc	79	21	79	21
Norwch	79	21	92	8
Nottm	53	47	78	22
Oxford	65	35	77	23
Plymth	69	31	81	19
Ports	78	22	84	16
Prestn	80	20	83	17
Redng	53	47	74	27
Salford	69	31	76	24
Sheff	79	21	88	12
Shrew	61	39	82	18
Stevng	84	16	90	10
Sthend	66	34	78	22
Stoke	60	40	81	20
Sund	76	24	97	3
Truro	71	29	88	12
Wirral	66	34	88	12
Wolve	57	43	73	27
York	68	32	78	22
N Ireland				
Antrim	83	17	89	11
Belfast	78	22	84	16
Newry	74	27	55	45
Ulster	76	24	93	7
West NI	67	33	81	19
Scotland				
Abrdn	71	30	89	11
Airdrie	87	13	88	12
D & Gall	61	39	59	41
Dundee	83	18	84	16
Edinb	89	11	86	14
Glasgw	86	14	88	12
Inverns	61	40	83	17
Klmarnk	78	22	79	21
Krkcldy	71	29	90	10
Wales				
Bangor	83	17	81	19
Cardff	74	27	87	13
Clwyd	67	33	87	14
Swanse	65	35	88	12
Wrexm	51	49	86	15
England	**72**	**28**	**82**	**18**
N Ireland	**76**	**24**	**83**	**17**
Scotland	**81**	**19**	**86**	**14**
Wales	**69**	**31**	**87**	**13**
UK	**73**	**27**	**83**	**17**

Renal function at the time of starting RRT

The mean eGFR at initiation of RRT in 2015 was 8.5ml/min/1.73 m^2. This is shown by age group in figure 1.9.

Figure 1.10 shows serial data from centres reporting to the UKRR every year since 2006. For the six years before 2011 there was higher average eGFR at start of RRT for PD than HD patients but on average, the values were more similar between treatments for 2011 to 2015.

Some caution should be applied to the analyses of eGFR at the start of RRT as data were only available for less than half of the incident patients (approximately 3,100 for 2015) and almost half of these came from only 10 centres. Three-quarters of the values came from 21 centres. Further caution should be applied as a review of pre-RRT biochemistry in nine renal centres revealed that up to 18% of patients may have had an incorrect date of starting RRT allocated and thus, the eGFR used

Table 1.14. Initial and subsequent modalities for patients starting RRT in 2010*

First treatment	*N*	Later modality	Percentage			
			90 days	1 year	3 years	5 years
HD	4,856	HD	90	73	47	28
		PD	2	3	2	1
		Transplant	1	4	11	16
		Recovered/discontinued	0	1	1	1
		Died	7	18	39	54
PD	1,219	HD	6	16	21	16
		PD	90	64	27	11
		Transplant	2	11	30	38
		Recovered/discontinued	0	1	1	1
		Died	2	9	21	34
Transplant	430	HD	0	1	2	3
		PD	0	0	1	1
		Transplant	99	98	95	92
		Died	1	1	2	4

*Cambridge excluded as five year follow up not available

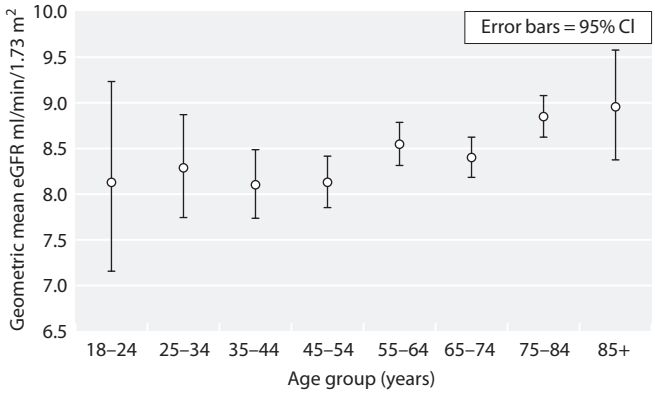

Fig. 1.9. Geometric mean eGFR at start of RRT (2015) by age group

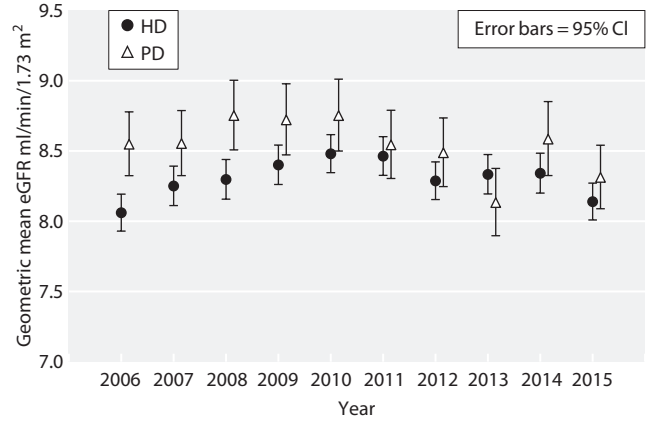

Fig. 1.10. eGFR on starting RRT 2006 to 2015, PD and HD (restricted to centres reporting since 2006)

for analysis may have been taken whilst they were already receiving RRT. For details see the 12th Annual Report chapter 13: The UK Renal Registry Advanced CKD Study 2009 [5]. The UKRR hopes to address this and other related timeline anomalies by prospectively capturing data on patients attending renal units from eGFR 30 ml/min/1.73 m^2 and by more frequent data downloads.

3. Late presentation and delayed referral of incident patients

Introduction

Late presentation to a nephrologist is regarded as a negative aspect in renal care. It can be defined in a number of ways as it has a range of possible causes. There are many patients with chronic kidney disease who are regularly monitored in primary or secondary care and whose referral to nephrology services is delayed (delayed or late referral). In contrast, other patients present late to medical services due to no particular deficiency in the service; those with either such slowly progressive disease as to have remained asymptomatic for many years or the opposite – those with rapidly progressive CKD. The main analyses presented here do not differentiate between these groups and include any patient first seen by renal services within 90 days of starting RRT as 'late presentation'. One analysis attempts to capture 'late referrals': it shows the percentage presenting

within 90 days of starting RRT after excluding an acute renal disease group.

Methods

Date first seen by a nephrologist has not been collected from the Scottish Renal Registry and so Scottish centres were excluded from these analyses. Data were included for incident patients in English, Welsh or Northern Irish centres in the years 2014 to 2015. This two year cohort was used for most of the analyses in order to make the late presentation percentages more reliably estimated and to allow these to be shown for subgroups of patients. The date first seen in a renal centre and the date of starting RRT were used to define the late presenting cohort. A small amount of data was excluded because of actual or potential inconsistencies. Only data from those centres with 75% or more completeness for the relevant year were used. Data were excluded if 10% or more of the patients were reported to have started RRT on the same date as the first presentation. This was because investigation has shown that this is likely due to misunderstanding on the part of the renal centres resulting in incorrect recording of data. Sheffield was excluded from the late presentation analyses because 55 of their incident patients for 2015 were not submitted to the UKRR and those 96 that were submitted were all early presenters. After these exclusions, data on 10,038 patients were available for analysis. Presentation times of 90 days or more before start were defined

Table 1.15. Percentage completeness of time of presentation data (2014 and 2015 incident RRT patients) by centre

	N		Percentage completeness	
Centre	2014	2015	2014	2015
England				
B Heart	100	122	95.0	95.9
B QEH	250	247	98.0	98.8
Basldn	45	46	95.6	97.8
Bradfd	83	88	98.8	100.0
Brightn	148	142	96.6	97.9
Bristol	151	144	98.7	77.8
Camb	126	[a]	68.3	[a]
Carlis	37	44	94.6	97.7
Carsh	265	248	42.6	42.3
Chelms	55	46	100.0	95.7
Colchr	38	28	44.7	67.9
Covnt	125	109	92.0	88.1
Derby	76	63	100.0	98.4
Donc	54	36	98.2	94.4
Dorset	78	74	98.7	94.6
Dudley	42	49	95.2	95.9
Exeter	143	122	97.2	99.2
Glouc	62	64	72.6	92.2
Hull	98	124	[b]	97.6
Ipswi	34	66	85.3	16.7
Kent	149	142	100.0	100.0
L Barts	302	314	28.8	[b]
L Guys	160	180	80.0	93.3
L Kings	148	179	100.0	99.4
L Rfree	230	236	96.5	96.2
L St.G	91	119	24.2	67.2
L West	355	340	98.3	97.7
Leeds	170	146	98.8	98.0
Leic	252	273	98.0	98.2
Liv Ain	65	66	98.5	95.5
Liv Roy	136	146	97.1	91.1
M RI	164	220	50.0	92.3
Middlbr	102	134	98.0	98.5
Newc	109	124	98.2	99.2
Norwch	76	109	[b]	[b]
Nottm	111	125	97.3	94.4
Oxford	188	203	97.9	98.5
Plymth	55	53	49.1	94.3
Ports	230	197	60.4	67.0
Prestn	164	159	91.5	96.9
Redng	104	86	97.1	100.0
Salford	161	138	4.4	5.8
Sheff[c]	151	96[c]	98.0	92.7[c]
Shrew	65	65	98.5	[b]
Stevng	150	139	96.7	87.8
Sthend	30	35	100.0	88.6
Stoke	115	107	92.2	92.5
Sund	62	63	100.0	96.8
Truro	39	80	97.4	96.3
Wirral	55	63	96.4	[b]
Wolve	79	83	96.2	97.6
York	64	61	[b]	98.4
N Ireland				
Antrim	35	35	97.1	94.3
Belfast	64	89	95.3	89.9
Newry	20	28	95.0	100.0
Ulster	23	32	95.7	96.9
West NI	35	37	97.1	[b]
Wales				
Bangor	22	29	90.9	100.0
Cardff	168	158	95.8	98.1
Clwyd	32	29	[b]	72.4
Swanse	121	128	100.0	100.0
Wrexm	41	45	97.6	93.3
England	**6,342**	**6,343**	**80.1**	**81.0**
N Ireland	**177**	**221**	**96.0**	**77.8**
Wales	**384**	**389**	**89.1**	**91.0**
E, W & NI	**6,903**	**6,953**	**81.0**	**81.4**

[a]Cambridge was unable to submit 2015 data

[b]Data not shown as >10% of patients reported as starting RRT on the same date as first presentation

[c]Only 96 of Sheffield's 151 incident patients were submitted to the UKRR and, although completeness was good for these 96, they included no late presenters. Therefore Sheffield have been excluded from the late presentation analyses

as early presentation and times of less than 90 days were defined as late presentation.

Estimated glomerular filtration rate (eGFR) at the start of RRT was studied amongst patients with eGFR data within 14 days before the start of RRT. The eGFR was calculated using the abbreviated 4 variable MDRD study equation [3]. For the purpose of the eGFR calculation, patients who had missing ethnicity but a valid serum creatinine measurement were classed as White. The eGFR values were log transformed due to their skewed distribution.

A mixture of old and new (2012) EDTA codes for primary diagnoses were received from centres. New codes were received for about 64% of 2014 incident patients and for about 70% of 2015 incident patients. For those people without an old code, new codes (where available) were mapped back to old codes. These codes were grouped into the same eight categories as in previous reports, the details are given in appendix H: Ethnicity and ERA-EDTA Coding (www.renalreg.org).

The 'acute' group was made up of those people with conditions likely to present with rapidly deteriorating renal function: crescentic (extracapillary) glomerulonephritis (type I, II, III), nephropathy (interstitial) due to cis-platinum, renal vascular disease due to malignant hypertension, renal vascular disease due to polyarteritis, Wegener's granulomatosis, cryoglobulinemic glomerulonephritis, myelomatosis/light chain deposit disease, Goodpasture's syndrome, systemic sclerosis (scleroderma), haemolytic ureaemic syndrome, multi-system disease – other, tubular necrosis (irreversible) or cortical necrosis, Balkan nephropathy, kidney tumour(s), and traumatic or surgical loss of kidney(s).

Results

Data completeness

Table 1.15 shows the percentage completeness of data for 2014 and 2015.

Late presentation by centre

Figure 1.11 shows that late presentation varied between centres from 5% to 35% in patients starting RRT in 2014 to 2015. The overall rate of late presentation was 17.0% and was 12.2% once those people with diseases likely to present acutely were excluded. Table 1.16 shows the overall percentage presenting late for the combined 2014/2015 incident cohort, the percentages presenting late amongst those patients defined as not having an 'acute diagnosis' and the percentages amongst non-diabetics (as PRD).

Considerable differences exist between centres in late presentation rates. One centre (Birmingham Heartlands) attained a late presentation rate of just over 5%. Four centres (Ipswich, Southend, Stoke and Wirral) reported that over 40% of their incident patients were only seen within a year of commencement of RRT. These differences have implications for their regions and referral pathways.

Late presentation in 2015 and the trend over time

There has been a steady decline nationally in the proportion of patients presenting late to renal services, with some centres achieving <10% late presentation rates. This may be a consequence of the National CKD guidelines published by the Medical and GP Royal Colleges [6], the Quality and Outcomes Framework (QOF) initiative (www.dh.gov.uk) raising awareness of CKD amongst non-nephrologists and the introduction of estimated GFR reporting. The Health Foundation is currently funding a quality improvement initiative rolling out a computer program that flags people with declining kidney function to laboratory staff who in turn flag these people to the GP to ensure they are aware of the decline and have considered referral to a nephrologist. About twenty renal centres are participating in this initiative (ASSIST-CKD [7]) which is being managed through Kidney Research

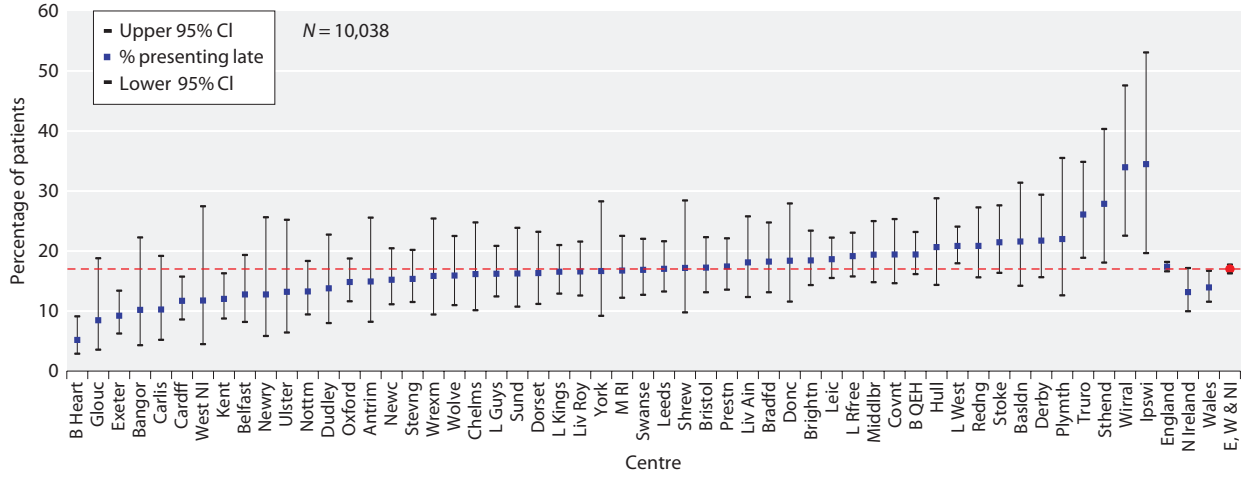

Fig. 1.11. Percentage presenting late (2014/2015)

Table 1.16. Percentage of patients presenting to a nephrologist less than 90 days before RRT initiation and percentage presenting less than a year before initiation (2014/2015 incident patients) by centre

		Percentage presenting <90 days before start				Percentage presenting <1 year before start[b]	
Centre	*N* with data	Overall	(95% CI)	Non-acute[a]	Non-diab PRD		(95% CI)
England							
B Heart	212	5.2	(2.9–9.1)	3.3	7.1	10.4	(6.9–15.3)
B QEH	489	19.4	(16.2–23.2)	16.0	21.1	31.9	(27.9–36.2)
Basldn	88	21.6	(14.2–31.4)	20.9	28.6	30.7	(22.0–41.1)
Bradfd	170	18.2	(13.1–24.8)	10.6	24.6	28.8	(22.5–36.1)
Brightn	282	18.4	(14.3–23.4)	13.2	21.0	33.7	(28.4–39.4)
Bristol	261	17.2	(13.1–22.3)	9.9	20.5	24.9	(20.0–30.5)
Carlis	78	10.3	(5.2–19.2)	10.0	8.5	15.4	(9.0–25.2)
Chelms	99	16.2	(10.1–24.8)	14.0	21.1	30.3	(22.1–40.0)
Covnt	211	19.4	(14.6–25.3)	14.8	22.4	34.6	(28.5–41.3)
Derby	138	21.7	(15.6–29.4)	14.1	29.0	32.6	(25.3–40.9)
Donc	87	18.4	(11.6–27.9)	11.0	22.7	28.7	(20.2–39.1)
Dorset	147	16.3	(11.2–23.2)	10.8	19.1	26.5	(20.0–34.2)
Dudley	87	13.8	(8.0–22.7)	8.6	16.7	24.1	(16.3–34.2)
Exeter	260	9.2	(6.3–13.4)	6.1	11.2	25.8	(20.8–31.4)
Glouc	59	8.5	(3.6–18.8)	5.5	12.2	17.0	(9.4–28.7)
Hull	121	20.7	(14.4–28.8)	18.4	23.5	38.0	(29.8–47.0)
Ipswi	29	34.5	(19.7–53.1)			58.6	(40.4–74.8)
Kent	291	12.0	(8.8–16.3)	8.7	13.8	23.0	(18.5–28.2)
L Guys	296	16.2	(12.4–20.9)	12.4	15.5	29.7	(24.8–35.2)
L Kings	326	16.6	(12.9–21.0)	14.5	21.8	29.8	(25.0–34.9)
L Rfree	449	19.2	(15.8–23.1)	15.7	22.6	34.1	(29.8–38.6)
L West	681	20.9	(18.0–24.1)	16.8	25.3	34.8	(31.3–38.5)
Leeds	311	17.0	(13.3–21.6)	13.0	18.5	28.6	(23.9–33.9)
Leic	515	18.6	(15.5–22.2)	11.2	21.7	33.0	(29.1–37.2)
Liv Ain	127	18.1	(12.3–25.8)	9.4	23.5	28.4	(21.2–36.8)
Liv Roy	265	16.6	(12.6–21.6)	10.3	14.0	27.6	(22.5–33.2)
M RI	203	16.8	(12.2–22.5)	9.0	22.8	36.5	(30.1–43.3)
Middlbr	232	19.4	(14.8–25.0)	15.2	22.4	31.5	(25.8–37.7)
Newc	230	15.2	(11.1–20.5)	9.7	18.5	24.8	(19.6–30.8)
Nottm	226	13.3	(9.4–18.4)	11.3	17.7	23.5	(18.4–29.4)
Oxford	384	14.8	(11.6–18.8)	8.7	19.7	27.9	(23.6–32.6)
Plymth	50	22.0	(12.6–35.5)	20.5	26.3	32.0	(20.6–46.0)
Prestn	304	17.4	(13.6–22.1)	11.9	22.8	29.3	(24.4–34.6)
Redng	187	20.9	(15.6–27.3)	14.0	27.3	27.8	(21.9–34.7)
Shrew	64	17.2	(9.8–28.4)	15.8	17.7	37.5	(26.6–49.9)
Stevng	267	15.4	(11.5–20.2)	11.4	15.2	20.6	(16.2–25.9)
Sthend	61	27.9	(18.1–40.3)	21.8	34.8	42.6	(30.9–55.2)
Stoke	205	21.5	(16.4–27.6)	13.9	25.2	45.4	(38.7–52.2)
Sund	123	16.3	(10.7–23.9)	9.5	19.2	29.3	(21.9–37.9)
Truro	115	26.1	(18.9–34.9)	19.8	34.2	39.1	(30.7–48.3)
Wirral	53	34.0	(22.6–47.6)	13.2	37.2	56.6	(43.1–69.2)
Wolve	157	15.9	(11.0–22.5)	11.6	18.4	28.7	(22.1–36.2)
York	60	16.7	(9.2–28.3)	13.8	20.0	36.7	(25.5–49.5)
N Ireland							
Antrim	67	14.9	(8.2–25.6)	8.5	21.3	20.9	(12.8–32.3)
Belfast	141	12.8	(8.2–19.4)	6.3	14.7	21.3	(15.3–28.8)
Newry	47	12.8	(5.9–25.6)	9.5	17.1	17.0	(8.8–30.5)
Ulster	53	13.2	(6.4 – 25.2)	10.9	18.0	28.3	(17.8 – 41.8)
West NI	34	11.8	(4.5–27.5)	[c]	15.4	26.5	(14.4–43.5)

Table 1.16. Continued

Centre	*N* with data	Percentage presenting <90 days before start				Percentage presenting <1 year before start[b]	
		Overall	(95% CI)	Non-acute[a]	Non-diab PRD		(95% CI)
Wales							
Bangor	49	10.2	(4.3–22.3)	10.4	10.8	18.4	(9.8–31.7)
Cardff	316	11.7	(8.6–15.7)	7.1	13.2	22.2	(17.9–27.1)
Swanse	249	16.9	(12.7–22.0)	12.4	20.7	28.9	(23.6–34.9)
Wrexm	82	15.9	(9.4–25.4)	11.0	16.7	24.4	(16.3–34.8)
England	**9,000**	**17.4**	**(16.6–18.2)**	**12.6**	**20.7**	**30.1**	**(29.1–31.0)**
N Ireland	**342**	**13.2**	**(10.0–17.2)**	**7.7**	**16.7**	**22.2**	**(18.1–26.9)**
Wales	**696**	**13.9**	**(11.6–16.7)**	**9.7**	**16.0**	**24.6**	**(21.5–27.9)**
E, W & NI	**10,038**	**17.0**	**(16.3–17.8)**	**12.2**	**20.2**	**29.4**	**(28.5–30.3)**
Min		**5.2**		**3.3**	**7.1**	**10.4**	
Quartile 1		**14.6**		**9.6**	**16.7**	**24.7**	
Quartile 3		**19.4**		**14.0**	**22.8**	**33.2**	
Max		**34.5**		**21.8**	**37.2**	**58.6**	

Blank cells – data for PRD not used due to high % with missing data or high % with uncertain aetiology
[a]Non-acute group excludes those diagnoses defined as acute (see methods)
[b]The remaining patients starting RRT therefore presented over 1 year beforehand
[c]Value suppressed due to small numbers

UK, the UKRR is leading the stepped-wedge evaluation to establish effectiveness.

In 2015, 71.3% of incident patients presented to nephrology services over a year before they started RRT, an increase from the 69.4% reported last year. The remaining patients presented within a year of start, with 8.1% of patients presenting within the 6–12 month window before RRT, 4.2% within 3–6 months and 16.4% within three months of RRT start. Figure 1.12 shows this breakdown by year for those 33 centres supplying data over 75% complete for each of the last six years. The figure shows an increase over time in the percentage of patients presenting a year or more before starting RRT. As shown in previous reports this increase was even more marked in the years before those shown in the figure. In 2005, only 52.6% of incident patients presented over a year before they started RRT.

Characteristics of patients presenting late versus those presenting early

In the combined 2014/2015 incident cohort, the median age was a little lower in those presenting late than those presenting early (table 1.17). The male : female ratio was higher in the group presenting late than those presenting early. There were large differences in the

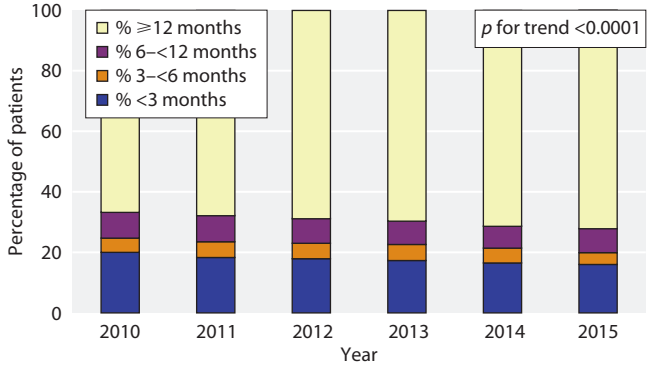

Fig. 1.12. Late presentation rate by year (2010–2015)
Restricted to centres reporting continuous data for 2010–2015

Table 1.17. Patient characteristics amongst patients presenting late (<90 days) compared with those presenting early (⩾90 days) (2014/2015 incident patients)

	<90 days	⩾90 days	*p*-value
Median age	64.5	65.1	0.02
Male : female ratio (% male)	1.94 (66%)	1.66 (62%)	0.004
Percentage starting on PD	10.2	22.2	<0.0001
Percentage on PD at 90 days	12.7	21.7	<0.0001
Mean haemoglobin at RRT start (g/L)	90	99	<0.0001
Geometric mean eGFR at RRT start (ml/min/1.73 m^2)	7.7	8.6	<0.0001

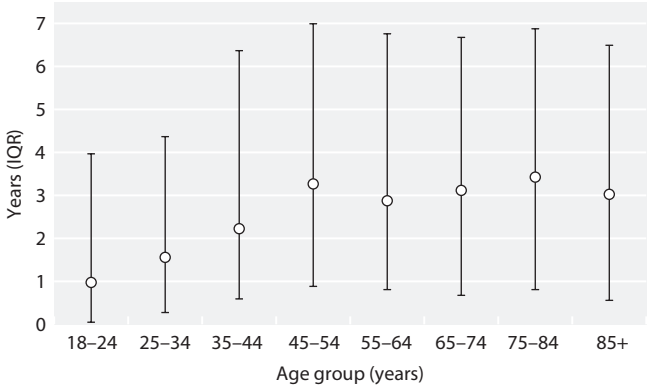

Fig. 1.13. Median duration of pre-RRT care by age group (incident patients 2014/2015)

percentages starting on PD and in haemoglobin and eGRF at start with all three of these being lower in late presenters than in early presenters. The difference for haemoglobin may reflect inadequate pre-dialysis care with limited anaemia management, but alternatively those presenting late may be more likely to have anaemia because of multisystem disease or inter-current illness. More detailed analyses of haemoglobin at start of RRT and late presentation can be found in chapter 7: Haemoglobin, Ferritin and Erythropoietin amongst UK Adult Dialysis Patients in 2015. The finding of lower average eGFR in those presenting late is in contrast to some of the studies in the literature but many of those studies pre-date the era of routine use of eGFR [8, 9]. A recent Cochrane review [10] has shown that eGFR was indeed lower in RRT patients referred late (mean difference of 0.42 ml/min/1.73 m^2) compared to those presenting early (definition: more than six months before starting RRT) consistent with UKRR data.

In the 2014/2015 cohort, the percentage of South Asian and Black patients presenting late (<90 days) was lower than in Whites (14.0% vs 17.3%: $p < 0.001$). Above age 45, the median duration of pre-RRT care did not vary greatly with age group (figure 1.13).

Primary renal disease and late presentation

In the 2014/2015 cohort, there were large differences in late presentation rates between primary renal diagnoses (Chi-squared test $p < 0.0001$) (table 1.18). Patients in the acute group or with data not available had high rates of late presentation as anticipated. Those with diabetes and adult polycystic kidney disease or pyelonephritis had low rates in keeping with their longer natural histories of CKD progression. There was a notable decline in the proportion of diabetics presenting late up until 2007. Since then the proportion has been stable. The decline seen earlier likely reflects national initiatives to screen patients with diabetes for proteinuria and falling GFR.

Table 1.18. Late presentation by primary renal diagnosis (2014/2015 incident patients)

		Late presentation	
Diagnosis	*N*	*N*	%
Uncertain aetiology	1,245	266	21.4
Diabetes	2,570	198	7.7
Glomerulonephritis	1,274	181	14.2
Other identified category	921	166	18.0
Polycystic kidney or pyelonephritis	1,224	75	6.1
Renal vascular disease	1,153	131	11.4
Acute group	932	516	55.4
Data not available	262	81	30.9

Unlike elsewhere in the report: (i) the RVD group includes hypertension, and (ii) polycystic kidney and pyelonephritis are grouped together
For definition of acute group see methods

Comorbidity and late presentation

In the 2014/2015 cohort, the percentage of patients who were recorded as having no comorbidity was similar in those who presented late as in those presenting earlier (49.1% vs 51.1%: $p = 0.2$). That said however, there were differences in those with comorbidities: cardiovascular disease was less common and liver disease and malignancy more common in those presenting late compared to those presenting early (table 1.19) perhaps reflecting underlying causes of CKD and its progression. This is in keeping with findings from other studies [8–9, 11].

Table 1.19. Percentage prevalence of specific comorbidities amongst patients presenting late (<90 days) compared with those presenting early (⩾90 days) (2014/2015 incident patients)

Comorbidity	<90 days	⩾90 days	*p*-value
Ischaemic heart disease	13.1	20.1	<0.0001
Cerebrovascular disease	7.9	10.8	0.01
Peripheral vascular disease	7.5	11.8	<0.0001
Diabetes (not a cause of ERF)	12.0	10.7	0.2
Liver disease	5.2	3.1	0.001
Malignancy	20.8	12.0	<0.0001
COPD	8.4	7.7	0.5
Smoking	11.4	11.6	0.8

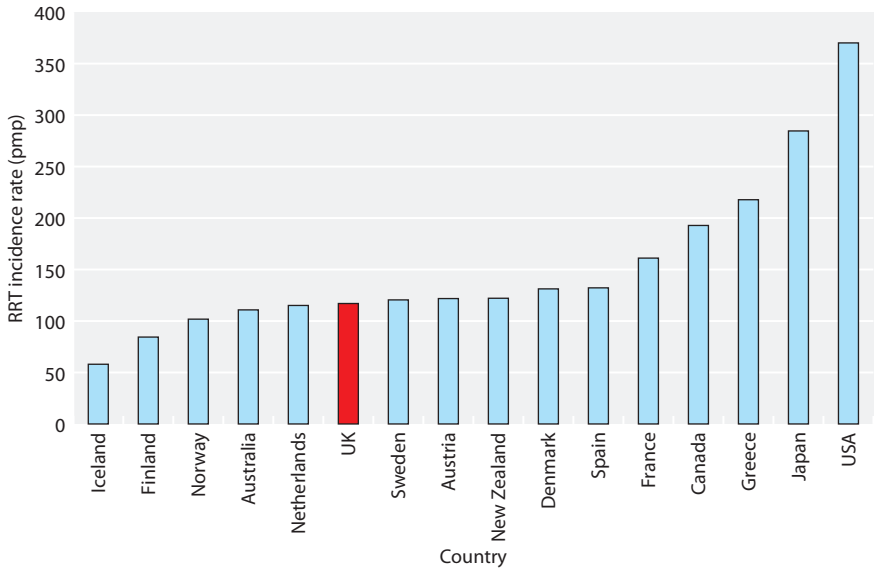

Fig. 1.14. International comparison of RRT incidence rates in 2014
Non-UK data from USRDS [12]

International comparisons

Figure 1.14 shows the crude RRT incidence rates (including children) for 2014 for various countries. The non-UK data are from the USRDS [12]; 2014 was the latest year available at time of writing. The UK incidence rate was similar to those in many other Northern European countries, Australia and New Zealand but remained markedly lower than in some other countries, most notably Greece, Japan and the USA. There are numerous reasons for these differences which have been documented and explored in other ecological studies and summarised by this review [13].

Survival of incident patients

See chapter 5: Survival and Causes of Death of UK Adult Patients on Renal Replacement Therapy in 2015.

Discussion

Across the UK, as a whole, the renal replacement therapy (RRT) incidence rate for 2015 was higher than for 2014, 2013 and 2012. Partly because of the smaller numbers involved, rates have been more variable over the last few years for Northern Ireland, Scotland and Wales compared with England. Wales continued to have the highest incidence rate and there remained large between centre variation in incidence rates for RRT some of which is likely explained by population differences in ethnicity and age structure. There was a lot of variation between CCG/HBs in the rates of older people (>75) starting RRT and also substantial between centre variation in use of different types of RRT modality some of which suggests inefficient use of cheaper and more effective forms of treatment. Although large numbers of patients continued to present late to renal centres this proportion has dropped substantially in the last decade. Some centres' lower rates (<10%) suggest that local factors may be worth exploring with the aim of improving this aspect of renal care and one example of this is the ASSIST-CKD Study being funded by the Health Foundation. More frequent and more detailed data downloads and prospectively capturing data on patients attending renal centres from eGFR 30 ml/min/1.73 m^2 will hopefully allow the UKRR to explore these areas of variation in advanced CKD care.

4. Acute haemodialysis sessions

Introduction

The analyses presented here relate to data submitted to the UKRR about individual haemodialysis sessions, performed for acute kidney injury (AKI). These haemodialysis session data were submitted by centres for the first time on treatment undertaken during 2015.

Methods

Correct use of acute and chronic timeline codes

Patients who have acute HD sessions and do not recover renal function, becoming established on dialysis, should have two separate entries in their treatment timeline; the first, a modality code on the date of the first dialysis session; acute haemodialysis or acute peritoneal dialysis (timeline entries 81–83), the second, a chronic dialysis code, on the date it was decided that the person had ERF; for HD or PD (timeline codes 1–19 can be used to describe the appropriate form of HD or PD being provided). When the decision is made that the person has ERF, the timeline should NOT be backdated to the original date of first treatment (as was advised prior to 2009). The resultant date is the same for some purposes (such as incidence) as backdating is undertaken at the UKRR when defining the start date of incident patients (see appendix B: Definitions and Analysis Criteria (www.renalreg.org)). The advantage of the backdating procedure being undertaken by the UKRR rather than by the centres themselves is that the most granular information is provided by the acute timeline codes and can be used for other analyses such as those on acute HD sessions presented here.

Definition of an acute HD session

Session data were submitted on HD sessions for AKI, ERF and plasma exchange (PEX). A 'session type' variable was used to identify and exclude PEX sessions but the individual HD sessions were not labelled in the dataset as being acute or chronic, so the timeline was used to identify if an HD session was undertaken for AKI or ERF, using the following logic (applied in this order);

i) If a timeline entry for AKI was submitted and the HD session dates were within the period defined as AKI by the timeline dates, then the session was defined as acute.
ii) If there was a timeline entry of ERF before the date a HD session occurred then the session was defined as chronic.
iii) If there was a timeline entry for ERF, and no prior timeline entry of acute dialysis, but the dates of the HD sessions preceded the stated date for chronic HD, then the HD sessions were defined as acute. There is potential for misclassification error here due to the assumption being made (that there is a missing acute timeline code, rather than that the date of starting chronic RRT was wrong).

Completeness and other data issues

If multiple HD sessions were recorded as occurring within a six hour period, only the first session was included in the analysis on the assumption that these additional HD sessions were duplicates or a result of technical problems, for example problems with an HD machine, and that they only represented one treatment.

HD session data were submitted to the UKRR for the first time for treatments undertaken in 2015, and there were some early issues with missing data. In the first quarter of 2015, a significant proportion of the 'session type' variable was missing, so HD sessions could not be reliably differentiated from PEX sessions (after this it was 100% complete). In addition, data submission began at staggered time-points over the first half of 2015. Therefore only session data from July–December 2015 have been included in this analysis.

The submission of data regarding HD sessions has been mandated by NHS England. Submission of these data from renal centres in Northern Ireland and Wales is optional. The Scottish Renal Registry does not collect these data.

Results

Forty of the 52 adult renal centres in England submitted individual HD session data. Of these, London Guys and Manchester Royal Infirmary submitted only HD session data pertaining to chronic HD sessions (according to the logic described in the methods section to identify acute sessions). All five Northern Ireland renal centres submitted data regarding acute and chronic sessions. In Wales, four centres (all except Clwyd) submitted HD sessions data, but only Swansea submitted data on acute HD sessions.

From the HD sessions data supplied by these 49 renal centres, our algorithm defined sessions as acute HD sessions for 998 patients. Of these, 929 were defined using step i) of the algorithm, i.e. using timeline entries of acute dialysis. The remaining 69 patients had sessions defined as acute HD sessions despite having no acute timeline entries (these are the cases where the third step of the algorithm defined in the methods section was used). See table 1.20.

From these same 49 centres, there were 1,038 people who, according to the timeline, had a spell of acute dialysis that included a period during July to December 2015. Of these, 929 people had HD sessions data supplied which were defined as acute sessions by our algorithm. The remaining 109 people had no HD session data supplied for the time period that they were on acute dialysis according to the timeline. (Some of these people had no HD sessions data supplied at all and others had some sessions supplied but only for after the time period when the timeline defined them as acute patients).

Table 1.21 shows the number of individual HD sessions reported to the UKRR, and what proportion were defined as acute sessions by our algorithm.

Data completeness of variables associated with haemodialysis sessions

Centres were asked to report details related to each HD session, such as vascular access used for the session and dialysate sodium concentration. Completeness varied by centre from 0–100% and these are shown for those sessions defined as acute, in table F.4.1 in appendix F: Additional Data Tables.

Table 1.20. Cross-tabulation demonstrating use of the algorithm to differentiate between acute and chronic dialysis sessions, July to December 2015

	Time on acute dialysis within July–Dec 2015 according to the timeline		
	Yes	No	**Total**
People defined as having acute HD sessions	929	69	**998**
People not defined as having any acute HD sessions	109		
Total	**1,038**		

Table 1.21. Individual haemodialysis session data for July–December 2015, by centre, for England, Wales and Northern Ireland.

Centre	Number of prevalent HD patients* (31/12/15)	Total number of HD sessions	Number of sessions defined as chronic	Number of sessions defined as acute	% of sessions defined as acute
Antrim	122	1,159	1,146	13	1
B Heart	420	4,661	4,581	80	2
B QEH	1,007	10,700	10,483	217	2
Bangor	84	874	874	0	0
Basldn	163	1,743	1,678	65	4
Belfast	183	2,335	2,193	142	6
Bradfd	233	190	66	124	65
Bristol	525	5,538	5,380	158	3
Cardff	497	2,501	2,501	0	0
Carlis	81	1,542	1,540	2	0
Carsh	817	11,641	10,621	1,020	9
Chelms	144	2,301	2,135	166	7
Colchr	120	1,462	1,430	32	2
Covnt	354	3,713	3,415	298	8
Derby	244	2,215	2,117	98	4
Donc	181	1,455	1,432	23	2
Dorset	289	3,040	2,651	389	13
Dudley	172	1,479	1,239	240	16
Exeter	436	5,078	4,720	358	7
Glouc	228	3,234	3,181	53	2
Hull	357	224	9	215	96
Ipswi	143	2,248	2,225	23	1
Kent	424	5,793	5,789	4	0
L Guys	676	7,276	7,276	0	0
L Kings	566	6,325	6,205	120	2
L Rfree	713	7,197	7,039	158	2
L West	1,445	12,696	12,677	19	0
Leeds	512	198	58	140	71
Leic	917	10,689	10,387	302	3
M RI	526	956	956	0	0
Middlbr	353	5,322	5,131	191	4
Newc	315	3,949	3,778	171	4
Newry	88	801	793	8	1
Nottm	388	4,679	4,536	143	3
Oxford	438	2,567	2,563	4	0
Plymth	137	1,749	1,724	25	1
Ports	667	9,667	9,410	257	3
Redng	302	3,008	2,885	123	4
Salford	400	5,431	5,116	315	6

Table 1.21. Continued

Centre	Number of prevalent HD patients* (31/12/15)	Total number of HD sessions	Number of sessions defined as chronic	Number of sessions defined as acute	% of sessions defined as acute
Shrew	203	3,018	2,764	254	8
Stevng	509	6,093	5,870	223	4
Sthend	126	1,666	1,650	16	1
Swanse	365	4,643	4,121	522	11
Truro	160	2,508	2,495	13	1
Ulster	107	1,886	1,843	43	2
West NI	123	1,568	1,530	38	2
Wolve	318	3,038	2,790	248	8
Wrexm	112	1,230	1,230	0	0
York	160	56	0	56	100
Total	**17,850**	**183,342**	**176,233**	**7,109**	**4**

*Number of prevalent HD patients at year end given as a measure of centre size

Renal recovery and survival of patients receiving acute haemodialysis sessions

As data collection for this report is only up to 31st December 2015 follow-up is truncated for those who were receiving acute dialysis in July–December 2015. Therefore renal recovery and survival cannot yet be reported for this cohort.

Discussion

The collection of data regarding acute dialysis performed in renal centres was undertaken for the first time using data from January 2015 onwards. A significant proportion of renal centres in England, Wales and Northern Ireland returned data regarding acute dialysis sessions to the UKRR, with data completeness for associated variables varying from 0–100%. There were large between centre differences in the number of acute HD sessions reported to the UKRR, which may be a result of differing use of the timeline and subsequent misclassification, incomplete data returns, or may represent true clinical differences (such as the proportion of people with dialysis dependent AKI treated in renal centres versus intensive care units).

This is a major addition to the previous scope of the UKRR and requires significant input from all contributing renal centres to ensure data of adequate quality are returned in order to draw accurate and meaningful conclusions. These data are being collected and reported for several purposes. Firstly, they have been mandated by NHS England to monitor acute dialysis activity in renal centres in England. Secondly the UKRR will analyse these data to assess whether they can account for some of the observed difference between centres in 90 day survival of incident patients. One hypothesis for the differences between centres relates to how nephrologists describe and define the kidney disease of patients who then subsequently suffer an early death after commencing RRT. For example, a person has made an unplanned start on RRT for diabetic kidney disease with a possible intercurrent infection. They were not known to a nephrologist, but had underlying progressive and advanced kidney disease. In renal centre 1, the patient may be described as having AKI, whilst the nephrologists of renal centre 2 would quickly describe the same patient as having ERF. Such differences led to differences in the reporting of incident patients to the UKRR. Therefore, in 2009, in order to address this and allow like-for-like comparison of incident rates and early survival between renal centres, the UKRR introduced a new rule; ***'The UKRR now asks all nephrologists to complete the timeline as accurately as possible, recording the date of first dialysis or haemofiltration and, separately, the date on which the patient was deemed to be chronic. This will allow us to distinguish between patients who have an acute start and those whose start on RRT was planned. If the patient recovers renal function an entry in the Timeline – TXT – 'Recovered function' should be made'***.

Despite the introduction of this rule, the UKRR continued to observe a pattern in the submitted data that suggested that not all patients who suffered early mortality were being included in the UKRR returns (i.e. there was evidence of immortal time bias). Collection of these additional data regarding acute sessions seeks to address

this issue; by collecting data on all acute and chronic dialysis sessions these discrepancies can be identified and accounted for, and true clinical differences and/or practice pattern variation highlighted (rather than those resulting purely from misclassification). However, in order to allow the accurate collection of these data and to progress the renal community's understanding of acute dialysis provision in the UK, it is essential that all renal centres are consistent in how they report data to the UKRR. From the data for 2015, some centres returned no HD sessions defined as acute sessions by our algorithm (while simultaneously returning HD session data for patients on long-term HD). One possible explanation is incorrect use of the timeline, i.e. backdating of the start date of chronic RRT to the original (acute) date of first treatment (as was advised prior to 2009).

Acknowledgement

The (non-UK) data reported in the section on International comparisons have been supplied by the United States Renal Data System (USRDS). The interpretation and reporting of these data are the responsibility of the author(s) and in no way should be seen as an official policy or interpretation of the U.S. government.

Conflicts of interest: the authors declare no conflicts of interest

References

1 Warwick G, Mooney A, Russon L, Hardy R. Planning,initiating and withdrawal of renal replacement therapy. UK Renal Association 2014; http://www.renal.org/docs/default-source/guidelines-resources/future-guidelines/planning-initiation-finalf506a031181561659443ff000014d4d8.pdf?sfvrsn=4 (accessed 02/09/17)

2 Venkat-Raman G, Tomson CR, Gao Yet al. New primary renal diagnosis codes for the ERA-EDTA. Nephrol Dial Transpl 2012; 27:4414–4419.

3 Levey AS, Coresh J, Greene T, Stevens LA, Zhang YL, Hendriksen S, Kusek JW, Van Lente F; & Chronic Kidney Disease Epidemiology Collaboration. Using standardized serum creatinine values in the modification of diet in renal disease study equation for estimating glomerular filtration rate. Ann Intern Med. 2006;145(4):247–54.

4 http://www.nomisweb.co.uk/census/2011/LC2101EW/view/2092957703?rows=c_ethpuk11&cols=c_age

5 Ford DJ, Fogarty DG, Steenkamp R, Tomson CRV, Ben-Shlomo Y, Ansell D. Chapter 13: The UK Renal Registry Advanced CKD Study: frequency of incorrect reporting of date of start of RRT. Nephron Clinical Practice;115(suppl 1):c271-c78

6 Working Party of the Royal College of Physicians, Royal College of General Practitioners, Royal College of Paediatrics and Child Health (2008). Teams without walls: the value of medical innovation and leadership (RCP, RCGP & RCPCH, London).

7 Gallagher et al., A programme to spread eGFR graph surveillance for the early identification, support and treatment of people with progressive chronic kidney disease (ASSIST-CKD): protocol for the stepped wedge implementation and evaluation of an intervention to reduce late presentation for renal replacement therapy. BMC Nephrology (2017) 18:131 DOI 10.1186/s12882-017-0522-9

8 Kazmi, W.H., et al., Late nephrology referral and mortality among patients with end-stage renal disease: a propensity score analysis. Nephrology Dialysis Transplantation, 2004. 19(7): p. 1808–1814.

9 Roubicek, C., et al., Timing of nephrology referral: Influence on mortality and morbidity. American journal of kidney diseases: the official journal of the National Kidney Foundation, 2000. 36(1): p. 35–41.

10 Cochrane Database Syst Rev. Early referral to specialist nephrology services for preventing the progression to end-stage kidney disease. 2014 Jun 18;6:CD007333. doi: 10.1002/14651858.CD007333.pub2.

11 Winkelmayer, W.C., et al., A Propensity Analysis of Late Versus Early Nephrologist Referral and Mortality on Dialysis. Journal of the American Society of Nephrology, 2003. 14(2): p. 486–492.

12 Saran R, Robinson B, Shahinian V, et al. US Renal Data System 2016 Annual Data Report: epidemiology of kidney disease in the United States. Am J Kidney Dis (in press).

13 Caskey FJ, Jager KJ. A population approach to renal replacement therapy epidemiology: lessons from the EVEREST study. Nephrol Dial Transplant. 2014 Aug;29(8):1494–9. doi: 10.1093/ndt/gft390. Epub 2013 Oct 28.

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UK Renal Registry 19th Annual Report: Chapter 2 UK Renal Replacement Therapy Prevalence in 2015: National and Centre-specific Analyses

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Keywords

Chronic kidney disease · Clinical Commissioning Group · Comorbidity · Diabetes · Dialysis · End stage renal disease · Established renal failure · Ethnicity · Haemodialysis · Peritoneal dialysis · Prevalence · Renal replacement therapy · Transplantation · Treatment modality

Summary

- There were 61,256 adult patients receiving renal replacement therapy (RRT) in the UK on 31st December 2015, an absolute increase of 3.9% from 2014.
- The actual number of patients increased by 3.6% for haemodialysis (HD), 4.7% for those with a functioning transplant but decreased by 0.8% for peritoneal dialysis (PD).
- The UK adult prevalence of RRT was 941 per million population (pmp). The reported prevalence in 2000 was 523 pmp.
- The number of patients receiving home HD decreased slightly from 1,195 patients in 2014 to 1,175 patients in 2015.
- The median age of prevalent patients was 59 years (HD 67 years, PD 64 years, transplant 54 years). In 2000 the median age was 55 years (HD 63 years, PD 58 years, transplant 48 years). The percentage of RRT patients aged greater than 75 years in 2015 was 16.1%.
- For all ages, RRT prevalence in men exceeded that in women, peaking in age group 75–79 years at 3,074 pmp in men and at 1,589 pmp in women.
- The most common identifiable renal diagnosis was glomerulonephritis (19%), followed by diabetes (16%), other (16%) and aetiology uncertain (16%).
- Transplantation continued as the most common treatment modality (53%), HD was used in 41% and PD in 6% of RRT patients.
- RRT prevalence in patients aged ⩾85 years continued to increase between 2014 and 2015 (1,060 to 1,084 per million age related population).

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Introduction

This chapter presents data on all adult patients on RRT in the UK at the end of 2015. The UK Renal Registry (UKRR) received data returns for 2015 from all five renal centres in Wales, all five in Northern Ireland and 51 in England. Cambridge (Addenbrooke's) renal centre were unable to submit their 2015 data at patient level by the close of the data collection period. The centre was able to submit summary numbers of patients on RRT at the end of 2015 by treatment modality. Data from all nine centres in Scotland were obtained from the Scottish Renal Registry. Demographic data on children and young adults can be found in chapter 4.

These analyses of prevalent RRT patients are performed annually to aid clinicians and policy makers in planning future RRT requirements in the UK. It is important to understand national, regional and centre level variation in numbers of prevalent patients as part of the capacity planning process. In addition, knowledge about variation in case mix is also reported to improve understanding of where resources should be focussed to improve equity of provision of RRT in the UK.

The term established renal failure (ERF) used within this chapter is synonymous with the terms end stage renal failure and end stage renal disease, which are in more widespread international usage. Patients have disliked the term 'end stage' which reflects the inevitable outcome of this disease.

Methods

Crude prevalence ratios were calculated per million population (pmp) and age/gender standardised prevalence ratios were calculated as detailed in appendix D: Methodology used for Analyses of Clinical Commissioning Group (CCG)/Health Board (HB) Incidence and Prevalence Rates and of Standardised Ratios. (www.renalreg.org).

Throughout this chapter, haemodialysis refers to all modes of HD treatment, including haemodiafiltration (HDF). Several centres reported significant numbers of patients on HDF, but other centres did not differentiate this treatment type in their UKRR returns. Where joint care of renal transplant recipients between the referring centre and the transplant centre occurred, the patient was usually allocated to the referring centre (see appendix B2 for the allocation procedure). Thus the number of patients allocated to a transplant centre is often lower than that recorded by the centre itself and as a converse pre-emptively transplanted patients are sometimes allocated to the transplanting centre rather than the referring centre if no transfer out code had been received. Queries and updated information are welcomed by the UKRR at any point during the year if this has occurred.

Prevalent patients on RRT in 2015 were examined by time on RRT, age group, gender, ethnic origin, primary renal disease, presence of diabetes and treatment modality (see appendix H: Coding) (www.renalreg.org). In the analysis of prevalence, only adult patients on RRT contributed to the numerator and denominator.

Time on RRT was defined as median time on treatment and was calculated from the most recent start date. Patients without an accurate start date were excluded from this calculation.

Analyses were done for the UK as a whole, by UK country, at centre level and split by treatment modality when appropriate. Cambridge is excluded from centre level prevalent analyses.

Chi-squared test, Fisher's exact test, linear regression and Kruskal Wallis tests were used as appropriate to test for significant differences between groups. The data were analysed using SAS 9.3.

Results

Prevalent patient numbers and changes in prevalence

The number of patients for each country (table 2.1) was calculated by adding the number of patients in each renal centre located in the country. These differ marginally from those quoted elsewhere in this report, however, when patients are allocated to geographical areas by their individual postcodes, as some centres treat patients across national boundaries.

Table 2.1. Prevalence of adult RRT in the UK on 31/12/2015

	England	N Ireland	Scotland	Wales	UK
Number of prevalent patients	51,672	1,701	4,853	3,030	61,256
Total estimated population, mid-2015 (millions)*	54.8	1.9	5.4	3.1	65.1
Prevalence ratios HD (pmp)	389	336	358	368	384
Prevalence ratios PD (pmp)	56	45	41	69	55
Prevalence ratios dialysis (pmp)	446	382	399	437	440
Prevalence ratios transplant (pmp)	497	537	504	540	501
Prevalence ratios total (pmp)	943	919	903	978	941
95% confidence intervals total (pmp)	935–951	875–962	878–929	943–1013	933–948

*Data from the Office for National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census

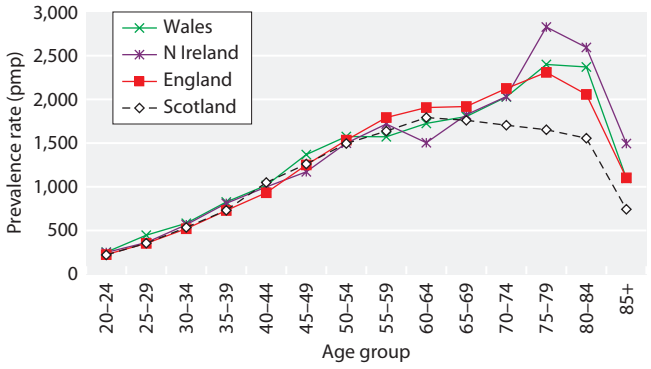

Fig. 2.1. RRT prevalence per million population by age group and UK country on 31/12/2015

There were 61,256 adult patients receiving RRT in the UK at the end of 2015, giving an adult UK population prevalence of 941 pmp (table 2.1) compared with 913 pmp in 2014. RRT prevalence increased in all UK countries in 2015. The prevalence of dialysis increased slightly in the UK from 430 pmp in 2014 to 440 pmp in 2015 and there continued to be a slow decline in PD prevalence (55 pmp in 2015 compared with 56 pmp in 2014 and 57 pmp in 2013). This decline in PD prevalence in the UK has been noted since 1997. Conversely, the prevalence of transplanted patients continued to increase in the UK from 482 pmp in 2014 to 501 pmp in 2015. In analyses stratified by country and age group, Northern Ireland exhibited a higher RRT prevalence for patients aged 75 years and older compared with the other UK countries (figure 2.1). In the UK, RRT prevalence in patients aged 80–84 continued to rise from 2,006 per million age related population (pmarp) in 2014 to 2,044 pmarp in 2015 and in patients aged ⩾85 years from 1,060 pmarp in 2014 to 1,084 pmarp in 2015. This trend has been remarked upon over a number of years and the observed aging of the prevalent population is likely due in part to improving patient survival.

Prevalent patients by RRT modality and centre

There was a marked variation in the number of prevalent patients across renal centres and the distribution of their treatment modalities varied widely (table 2.2).

Changes in prevalence

The prevalent UK RRT population grew by 4.3% between 2014 and 2015 (table 2.3), an annual growth rate which has been fairly consistent over the last 10–15 years (figure 2.2).

The increase in prevalence was smallest in England (4.0%) and greatest in Wales (6.4%). In the case of the latter, this increase was due in part to the way in which Bangor reported transplant patients – previously these were reported by Liverpool Royal with whom Bangor shares the care of its transplant patients. The changes reported here between 2013 and 2014 will differ from those presented in the 18th Annual Report as the current report includes data updates made subsequent to publication of the 18th Annual Report.

The number of prevalent HD patients increased by 2.7% in 2015 compared with 2014 (table 2.4) which was a greater increase than that seen between 2013 and 2014 (1.3% growth in prevalence pmp). There continued to be an increase in prevalent transplant patients (3.9% pmp) and a decrease in prevalent PD patients (1.6% pmp decrease).

The average annual change in prevalent patients between 2011 and 2015 was a 1.3% pmp increase in HD, 2.1% pmp fall in PD, and 4.8% pmp growth in prevalent transplant patients (table 2.4). In the same period there was an average annual 14.9% pmp growth in the use of home haemodialysis (data not shown).

The long-term (1998–2015) UK prevalence pattern by treatment modality is shown in figure 2.2. The steady growth in transplant numbers was maintained in 2015. The increase in home haemodialysis patient numbers over this period has been associated with more than a doubling in prevalence, from 2.0% of the dialysis population in 2005 ($N = 450$) to 4.2% in 2015 ($N = 1,175$). In contrast PD has fallen by 6.2% between 2005 and 2015.

Prevalence of RRT in Clinical Commissioning Groups in England (CCGs), Health and Social Care Areas in Northern Ireland (HBs), Local Health Boards in Wales (HBs) and Health Boards in Scotland (HBs)

The need for RRT depends upon many factors such as primary renal diagnosis but also on social and demographic factors such as age, gender, social deprivation and ethnicity. Hence, comparison of crude prevalence ratios by geographical area can be misleading. This section, as in previous reports, uses age and gender standardisation to compare RRT prevalence. The ethnic minority profile is also provided to help understand the differences in standardised prevalence ratios (SPRs).

There were substantial variations in the crude CCG/HB prevalence ratios pmp, from 631 pmp (NHS Guildford and Waverley, population 206,100) to 1,741 pmp (NHS Brent, population 324,000). There were similar variations in the standardised prevalence ratios (ratio of observed: expected prevalence given the age/gender breakdown of the CCG/HB) from 0.64 (NHS South

Table 2.2. Number of prevalent RRT patients by treatment modality and centre on 31/12/2015

Centre	*N*					Catchment population (millions)	2015 crude rate pmp	(95% CI)
	HD	PD	Dialysis	Transplant	RRT			
England								
B Heart	420	51	471	186	657	0.74	890	(822–958)
B QEH[a]	1,007	142	1,149	1,105	2,254	1.70	1,327	(1,272–1,381)
Basldn	163	35	198	77	275	0.42	663	(584–741)
Bradfd	233	18	251	330	581	0.65	891	(819–964)
Brightn	434	67	501	451	952	1.30	734	(687–781)
Bristol[a]	525	57	582	895	1,477	1.44	1,026	(974–1,079)
Camb[a,b]	583	44	627	912	1,539	1.16	1,329	(1,263–1,395)
Carlis	81	38	119	162	281	0.32	876	(774–978)
Carsh	817	113	930	652	1,582	1.91	827	(786–868)
Chelms	144	27	171	114	285	0.51	558	(494–623)
Colchr	120	0	120	0	120	0.30	401	(329–473)
Covnt[a]	354	86	440	518	958	0.89	1,074	(1,006–1,142)
Derby	244	80	324	213	537	0.70	764	(700–829)
Donc	181	23	204	97	301	0.41	734	(651–817)
Dorset	289	43	332	347	679	0.86	788	(729–847)
Dudley	172	57	229	83	312	0.44	706	(628–785)
Exeter	436	83	519	446	965	1.09	886	(830–942)
Glouc	228	37	265	178	443	0.59	754	(684–825)
Hull[b]	357	76	433	424	857	1.02	840	(784–896)
Ipswi	143	38	181	226	407	0.40	1,020	(921–1,119)
Kent	424	60	484	558	1,042	1.22	851	(799–903)
L Barts[a]	1,007	207	1,214	1,072	2,286	1.83	1,249	(1,198–1,300)
L Guys[a]	676	33	709	1,302	2,011	1.08	1,858	(1,777–1,939)
L Kings	566	90	656	429	1,085	1.17	926	(871–981)
L Rfree[a]	713	154	867	1,221	2,088	1.52	1,375	(1,316–1,434)
L St.G[a,b]	339	49	388	457	845	0.80	1,059	(988–1,131)
L West[a]	1,445	71	1,516	1,804	3,320	2.40	1,384	(1,337–1,431)
Leeds[a]	512	58	570	954	1,524	1.67	912	(867–958)
Leic[a]	917	108	1,025	1,161	2,186	2.44	897	(860–935)
Liv Ain	175	38	213	15	228	0.48	471	(410–532)
Liv Roy[a]	384	67	451	841	1,292	1.00	1,292	(1,222–1,363)
M RI[a]	526	65	591	1,305	1,896	1.53	1,238	(1,182–1,294)
Middlbr[b]	353	22	375	527	902	1.00	898	(840–957)
Newc[a]	315	46	361	649	1,010	1.12	901	(845–956)
Norwch	338	38	376	365	741	0.79	942	(874–1,010)
Nottm[a]	388	82	470	644	1,114	1.09	1,024	(964–1,084)
Oxford[a,b]	438	94	532	1,165	1,697	1.69	1,004	(956–1,052)
Plymth[a]	137	35	172	333	505	0.47	1,075	(981–1,169)
Ports[a]	667	72	739	932	1,671	2.02	826	(786–865)
Prestn[b]	573	53	626	591	1,217	1.49	815	(769–861)
Redng	302	66	368	410	778	0.91	855	(795–915)
Salford[b]	400	94	494	483	977	1.49	656	(615–697)
Sheff[a,b]	593	65	658	732	1,390	1.37	1,013	(960–1,067)
Shrew	203	32	235	135	370	0.50	739	(664–814)
Stevng	509	16	525	302	827	1.20	687	(640–734)
Sthend	126	17	143	103	246	0.32	777	(680–874)
Stoke	334	75	409	380	789	0.89	887	(825–949)
Sund	221	18	239	220	459	0.62	742	(674–810)
Truro[b]	160	22	182	234	416	0.41	1,007	(910–1,104)
Wirral	187	19	206	22	228	0.57	399	(347–450)
Wolve	318	79	397	184	581	0.67	869	(798–939)
York	160	29	189	300	489	0.49	993	(905–1,082)

Table 2.2. Continued

Centre	*N*					Catchment population (millions)	2015 crude rate pmp	(95% CI)
	HD	PD	Dialysis	Transplant	RRT			
Northern Ireland								
Antrim	122	20	142	97	239	0.29	811	(708–914)
Belfast[a]	183	24	207	566	773	0.64	1,214	(1,128–1,299)
Newry	88	22	110	116	226	0.26	865	(752–978)
Ulster	107	6	113	57	170	0.27	639	(543–735)
West NI	123	12	135	158	293	0.35	833	(737–928)
Scotland								
Abrdn	218	26	244	288	532	0.60	887	(811–962)
Airdrie	195	16	211	214	425	0.55	770	(697–843)
D & Gall	54	11	65	65	130	0.15	876	(725–1,026)
Dundee	187	17	204	217	421	0.46	909	(822–996)
Edinb[a]	284	27	311	462	773	0.96	802	(745–858)
Glasgw[a]	605	55	660	1,055	1,715	1.62	1,056	(1,006–1,106)
Inverns	93	13	106	147	253	0.27	937	(821–1,052)
Klmarnk	136	37	173	136	309	0.36	855	(760–950)
Krkcldy	150	20	170	125	295	0.32	931	(825–1,038)
Wales								
Bangor	84	15	99	83	182	0.22	834	(713–955)
Cardff[a]	497	79	576	1,037	1,613	1.42	1,136	(1,080–1,191)
Clwyd	84	20	104	81	185	0.19	975	(835–1,116)
Swanse[b]	365	62	427	330	757	0.89	855	(794–916)
Wrexm	112	37	149	144	293	0.24	1,220	(1,080–1,359)
England	**21,337**	**3,089**	**24,426**	**27,246**	**51,672**			
N Ireland	**623**	**84**	**707**	**994**	**1,701**			
Scotland	**1,922**	**222**	**2,144**	**2,709**	**4,853**			
Wales	**1,142**	**213**	**1,355**	**1,675**	**3,030**			
UK	**25,024**	**3,608**	**28,632**	**32,624**	**61,256**			

Centres prefixed 'L' are London centres

The numbers of patients calculated for each country quoted above differ marginally from those quoted elsewhere in this report when patients are allocated to areas by their individual post codes, as some centres treat patients from across national boundaries

[a]Transplant centres

[b]Subsequent to closing the 2015 database a number of centres reported a variation to the numbers returned. Additionally, this year Cambridge was unable to submit their 2015 data at patient level prior to closing the database and , as such, provided summary numbers of patients still on RRT at the end of 2015 by treatment modality. This centre is therefore excluded from all centre level prevalent analyses. Tables 2.1, 2.3 and 2.4 (but not the remainder of this chapter) reflect these revisions: Hull (−1), Truro (–1), Prestn (–1), Middlbr (+9), Sheff (+65), L St.G (–1), Oxford (–1), Salford (+13), Camb (+1,539) and Swanse (+1)

West Lincolnshire) to 2.17 (Brent) (table 2.5). Confidence intervals are not presented for the crude ratios per million population for 2015 but figures D3 and D4 in appendix D (www.renalreg.org) can be used to determine if a CCG/HB falls within the range representing the 95% confidence limit of the national average prevalence.

Factors associated with variation in standardised prevalence ratios in Clinical Commissioning Groups in England, Health and Social Care Trust Areas in Northern Ireland, Local Health Boards in Wales and Health Boards in Scotland

In 2015, there were 77 CCGs/HBs with a significantly low standardised prevalence ratio (SPR), 110 with a 'normal' SPR and 48 with a significantly high SPR (table 2.5). As has been seen in previous years, they tend to reflect the demographics of the regions in question such that urban, ethnically diverse populations in areas of high social deprivation have the highest prevalence of renal replacement therapy. For example, the association with the level of ethnic diversity is illustrated by the fact that mean SPRs were significantly higher in the 89 CCGs/HBs with an ethnic minority population $\geqslant 10\%$ than in those with lower ethnic minority populations ($p < 0.001$). There was a strong, positive correlation between the SPR and percentage of the population that are non-White ($r = 0.9$ $p < 0.001$). In 2015, for each 10% increase in ethnic minority population,

Table 2.3. Number of prevalent patients on RRT by centre at year end 2011–2015

Centre	Date					% change 2014–2015	% annual change 2011–2015
	31/12/2011	31/12/2012	31/12/2013	31/12/2014	31/12/2015		
England							
B Heart	665	668	654	635	657	3.5	−0.3
B QEH	1,908	1,969	2,045	2,135	2,254	5.6	4.3
Basldn	231	258	270	278	275	−1.1	4.5
Bradfd	466	504	520	548	581	6.0	5.7
Brightn	777	829	871	915	952	4.0	5.2
Bristol	1,317	1,338	1,424	1,458	1,477	1.3	2.9
Camb	1,075	1,111	1,191	1,242	1,539	23.9	9.4
Carlis	215	216	227	250	281	12.4	6.9
Carsh	1,368	1,454	1,480	1,553	1,582	1.9	3.7
Chelms	216	225	240	261	285	9.2	7.2
Colchr	119	117	115	119	120	0.8	0.2
Covnt	875	899	929	960	958	−0.2	2.3
Derby	465	475	465	515	537	4.3	3.7
Donc	248	261	259	284	301	6.0	5.0
Dorset	587	609	627	664	679	2.3	3.7
Dudley	287	315	311	305	312	2.3	2.1
Exeter	809	842	888	945	965	2.1	4.5
Glouc	381	415	410	428	443	3.5	3.8
Hull	755	782	814	803	857	6.7	3.2
Ipswi	340	339	355	368	407	10.6	4.6
Kent	861	918	958	1,014	1,042	2.8	4.9
L Barts	1,871	1,948	2,090	2,210	2,286	3.4	5.1
L Guys	1,683	1,738	1,828	1,913	2,011	5.1	4.6
L Kings	873	917	964	1,023	1,085	6.1	5.6
L Rfree	1,727	1,842	1,921	2,006	2,088	4.1	4.9
L St.G	705	706	754	793	845	6.6	4.6
L West	3,008	3,084	3,123	3,231	3,320	2.8	2.5
Leeds	1,421	1,413	1,464	1,500	1,524	1.6	1.8
Leic	1,922	1,974	2,067	2,147	2,186	1.8	3.3
Liv Ain	190	194	190	217	228	5.1	4.7
Liv Roy	1,235	1,229	1,265	1,302	1,292	−0.8	1.1
M RI	1,650	1,711	1,854	1,797	1,896	5.5	3.5
Middlbr	753	788	830	854	902	5.6	4.6
Newc	919	946	962	977	1,010	3.4	2.4
Norwch	610	622	690	690	741	7.4	5.0
Nottm	1,022	1,012	1,073	1,062	1,114	4.9	2.2
Oxford	1,451	1,532	1,563	1,655	1,697	2.5	4.0
Plymth	464	458	502	503	505	0.4	2.1
Ports	1,390	1,440	1,545	1,592	1,671	5.0	4.7
Prestn	1,018	1,079	1,089	1,171	1,217	3.9	4.6
Redng	688	672	731	760	778	2.4	3.1
Salford	832	880	881	971	977	0.6	4.1
Sheff	1,256	1,299	1,329	1,360	1,390	2.2	2.6
Shrew	345	354	338	350	370	5.7	1.8
Stevng	639	664	755	778	827	6.3	6.7
Sthend	208	213	220	238	246	3.4	4.3
Stoke	695	699	724	775	789	1.8	3.2
Sund	389	422	421	450	459	2.0	4.2
Truro	355	375	371	379	416	9.8	4.0
Wirral	233	225	247	245	228	−6.9	−0.5
Wolve	512	524	568	574	581	1.2	3.2
York	340	396	409	461	489	6.1	9.5

Table 2.3. Continued

Centre	Date					% change 2014–2015	% annual change 2011–2015
	31/12/2011	31/12/2012	31/12/2013	31/12/2014	31/12/2015		
N Ireland							
Antrim	225	223	224	229	239	4.4	1.5
Belfast	683	702	726	747	773	3.5	3.1
Newry	189	188	199	208	226	8.7	4.6
Ulster	136	145	155	149	170	14.1	5.7
West NI	271	254	238	274	293	6.9	2.0
Scotland							
Abrdn	480	507	517	502	532	6.0	2.6
Airdrie	346	389	389	395	425	7.6	5.3
D & Gall	124	128	119	130	130	0.0	1.2
Dundee	397	395	398	401	421	5.0	1.5
Edinb	700	720	737	747	773	3.5	2.5
Glasgw	1,470	1,536	1,586	1,607	1,715	6.7	3.9
Inverns	227	220	216	225	253	12.4	2.7
Klmarnk	298	301	296	299	309	3.3	0.9
Krkcldy	278	278	283	277	295	6.5	1.5
Wales							
Bangor	109	105	99	102	182	78.4	13.7
Cardff	1,531	1,544	1,582	1,591	1,613	1.4	1.3
Clwyd	137	173	152	166	185	11.4	7.8
Swanse	659	663	693	707	756	6.9	3.5
Wrexm	236	248	251	283	293	3.5	5.6
England	**44,369**	**45,900**	**47,821**	**49,664**	**51,672**	4.0	3.9
N Ireland	**1,504**	**1,512**	**1,542**	**1,607**	**1,701**	5.8	3.1
Scotland	**4,320**	**4,474**	**4,541**	**4,583**	**4,853**	5.9	3.0
Wales	**2,672**	**2,733**	**2,777**	**2,849**	**3,030**	6.4	3.2
UK	**52,865**	**54,619**	**56,681**	**58,703**	**61,256**	4.3	3.8

the standardised prevalence ratio increased by 0.17 (equates to ~17%). These trends are identical to those identified previously. The relationship between the ethnic composition of a CCG/HB and its SPR is demonstrated in figure 2.3.

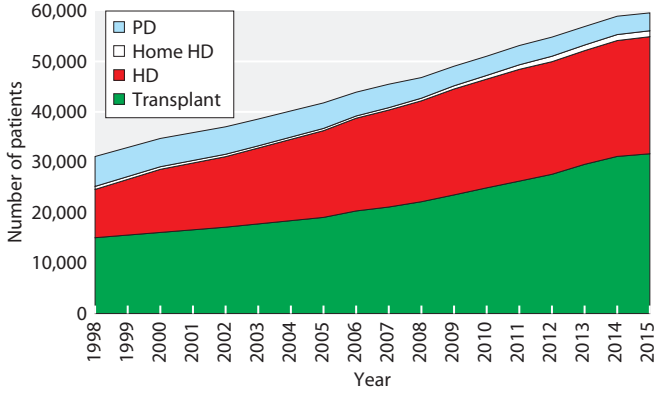

Fig. 2.2. Growth in prevalent patients by treatment modality at the end of each year 1998–2015

Only four of the 146 CCGs/HBs with ethnic minority populations of less than 10% had high SPRs: Abertawe Bro Morgannwg University and Cwm Taf in Wales, Greater Glasgow and Clyde in Scotland, and Belfast in Northern Ireland. Forty-four (49.4%) of the 89 CCGs/HBs with ethnic minority populations greater than 10% had high SPRs, whereas eight (9.0%) (NHS Chiltern, NHS Brighton and Hove, NHS Richmond, NHS Havering, NHS Solihull, NHS Calderdale, NHS Newcastle and Gateshead, NHS Trafford) had low SPRs. Some of the CCGs/HBs with a high (>15%) ethnic minority population had a normal expected RRT prevalence (e.g. NHS Crawley, NHS Kingston, NHS Milton Keynes, NHS Sheffield, NHS South Manchester).

The age and gender standardised prevalence ratios (which do not take into account variation in ethnicity) in each region of England and in Wales, Northern Ireland and Scotland are presented in table 2.6. Wales and Northern Ireland previously had higher than expected RRT prevalence but in more recent years were similar

Table 2.4. Change in RRT prevalence ratio pmp 2011–2015 by modality*

	Prevalence					% growth in prevalence pmp				
Year	HD pmp	PD pmp	Dialysis pmp	Transplant pmp	RRT pmp	HD	PD	Dialysis	Tx	RRT
2011	365	60	426	416	841					
2012	370	60	430	436	866	1.3	−0.9	1.0	5.0	3.0
2013	369	57	427	462	888	−0.1	−4.6	−0.8	5.8	2.5
2014	374	56	430	482	913	1.3	−1.5	0.9	4.5	2.8
2015	384	55	440	501	941	2.7	−1.6	2.2	3.9	3.1
Average annual growth 2011–2015						1.3	−2.1	0.8	4.8	2.8

*Differences in the figures for dialysis and RRT prevalence and the sum of the separate modalities are due to rounding
pmp – per million population
Tx – Transplant

to expected. Scotland had lower than expected RRT prevalence as did the North and South of England. RRT prevalence in London remained higher than expected.

Case mix in prevalent RRT patients

Time on RRT (vintage)

Table 2.7 shows the median time, in years, since starting RRT of prevalent RRT patients on 31st December 2015. Median time on RRT for all prevalent patients remained fairly static at 6.2 years (6.1 years in 2014). Patients with functioning transplants had survived a median of 10.2 years on RRT whilst the median time on RRT of HD and PD patients was significantly less (3.3 and 1.6 years respectively).

The median time on HD was more than double that on PD and this could reflect early transplantation in the latter as well as higher technique failure rates for PD. Time on transplant is the same as observed in 2013 and 2014, but decreased slightly since 2008 (median 10.4 years) which may reflect a trend towards both the use of more marginal donor kidneys (including Donor after Cardiac Death (DCD) kidneys) and transplantation of older recipients in recent years.

Age

The median age of prevalent UK patients on RRT at 31st December 2015 (59.0 years, table 2.8) has remained stable over recent years although it is significantly higher than in 2005 when it was 55.0 years. As observed previously, there were marked differences between modalities; the median age of HD patients (67.2 years) was greater than that of those on PD (64.2 years) and substantially higher than that of transplanted patients (53.8 years). Of the UK prevalent RRT population, 50% were in the 40–64 years age group (table 2.9). The proportion of patients aged 75 years and older varied greatly between countries and was highest in Wales (18.1%) and Northern Ireland (18.3%) and lowest in Scotland (12.5%) (table 2.9). Within countries there were large differences in the proportion of patients aged over 75 (within England these ranged between 9.1% in Liverpool Royal Infirmary and 46.7% in Colchester). In most centres the prevalent PD population was younger than the HD population (table 2.8).

Between-centre differences in the median age of prevalent patients by treatment modality can reflect differing demographics of the catchment populations as well as differing approaches to treatment modalities. For example, Colchester had the highest median age (73.1 years), whilst Belfast and London Guy's the lowest (55.0 years each) (table 2.8). This could reflect either variation in the catchment populations or follow-up of younger transplant patients (as noted above in the case of Belfast). The median age of the non-White dialysis population was lower than the overall dialysis population (62.0 vs 67.2 years, data not shown). The differing age distributions of the transplant and dialysis populations are illustrated in figure 2.4, demonstrating that the age peak for prevalent dialysis patients was 24 years later than for prevalent transplant patients.

In the UK on 31st December 2015, 65.8% of patients aged less than 65 years on RRT had a functioning transplant (table 2.15), compared with only 31.3% aged 65 years and over. There was a similar pattern in all four UK countries although the proportion of patients aged less than 65 with a functioning transplant in Northern Ireland (75.3%) was much higher than elsewhere.

Gender

The age distributions of males and females were very similar (data not shown). Standardising the age of the

Table 2.5. Prevalence of RRT and standardised prevalence ratios in CCG/HB areas

CCG/HB – Clinical Commissioning Groups (England); Health and Social Care Trust Areas (Northern Ireland); Health Boards (Scotland) and Local Health Boards (Wales). Note that 3 CCGs merged in April 2015: Gateshead CCG, Newcastle North & East CCG and Newcastle West CCG became a single statutory body on 1 April 2015 and are reported here
O/E – standardised prevalence ratio. Ratio of observed:expected rate of RRT given the age and gender breakdown of the area
LCL – lower 95% confidence limit
UCL – upper 95% confidence limit
pmp – per million population
Areas with significantly low prevalence ratios in 2015 are italicised in greyed areas, those with significantly high prevalence ratios in 2015 are bold in greyed areas
Population numbers are the 2015 mid-year estimates by age group and gender (data obtained from the Office of National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 Census)
% non-White – percentage of the CCG/HB population that is non-White, from 2011 Census
ONS specifies that the populations should be rounded to the nearest 100 when being presented
*CCGs where at least 10% of the RRT population were seen in Cambridge. In these CCGs the rate is underestimated. In the CCGs with >70% RRT population covered by Cambridge, the rate for 2015 has been blanked

UK area	Name	Total population	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 95% LCL	2015 95% UCL	2015 Crude rate pmp	% non-White
Cheshire, Warrington and Wirral	*NHS Eastern Cheshire*	*196,500*	*0.76*	*0.76*	*0.81*	*0.79*	*0.78*	*0.77*	*0.66*	*0.90*	*824*	*3.7*
	NHS South Cheshire	178,900	0.92	0.89	0.86	0.88	0.92	0.93	0.80	1.09	939	2.9
	NHS Vale Royal	*102,900*	*0.75*	*0.77*	*0.72*	*0.78*	*0.73*	*0.73*	*0.58*	*0.92*	*729*	*2.1*
	NHS Warrington	207,700	0.83	0.80	0.82	0.84	0.90	0.87	0.75	1.01	838	4.1
	NHS West Cheshire	*231,000*	*0.98*	*0.99*	*0.96*	*0.96*	*0.95*	*0.83*	*0.72*	*0.96*	*840*	*2.8*
	NHS Wirral	*320,900*	*0.84*	*0.83*	*0.81*	*0.83*	*0.75*	*0.74*	*0.65*	*0.84*	*735*	*3.0*
Durham, Darlington and Tees	NHS Darlington	105,400	0.83	0.77	0.83	0.83	0.82	0.85	0.69	1.05	835	3.8
	NHS Durham Dales, Easington and Sedgefield	274,000	0.94	0.98	0.94	0.98	0.97	0.98	0.87	1.11	1,000	1.2
	NHS Hartlepool and Stockton-on-Tees	*287,300*	*0.86*	*0.89*	*0.93*	*0.90*	*0.93*	*0.88*	*0.78*	*1.00*	*832*	*4.4*
	NHS North Durham	*245,700*	*0.77*	*0.76*	*0.83*	*0.79*	*0.78*	*0.77*	*0.67*	*0.89*	*753*	*2.5*
	NHS South Tees	274,800	1.06	1.09	1.08	1.09	1.05	1.10	0.98	1.24	1,041	6.7
Greater Manchester	NHS Bolton	281,600	1.06	1.10	1.10	1.07	1.02	1.05	0.93	1.18	952	18.1
	NHS Bury	187,900	0.91	0.92	0.91	0.90	0.93	0.95	0.82	1.10	889	10.8
	NHS Central Manchester	188,900	1.51	1.44	1.48	1.57	1.63	1.65	1.44	1.90	1,043	48.0
	NHS Heywood, Middleton & Rochdale	214,200	0.95	0.99	1.00	1.03	1.03	1.03	0.89	1.18	920	18.3
	NHS North Manchester	**178,700**	**1.05**	**1.05**	**1.11**	**1.08**	**1.10**	**1.15**	**0.97**	**1.35**	**817**	**30.8**
	NHS Oldham	230,800	0.93	0.94	0.93	0.96	0.96	1.00	0.87	1.15	871	22.5
	NHS Salford	*245,600*	*0.85*	*0.84*	*0.87*	*0.89*	*0.87*	*0.83*	*0.71*	*0.96*	*704*	*9.9*
	NHS South Manchester	162,700	0.92	0.91	0.94	0.96	0.98	1.02	0.85	1.21	774	19.6
	NHS Stockport	*288,700*	*0.86*	*0.89*	*0.88*	*0.81*	*0.82*	*0.83*	*0.73*	*0.94*	*814*	*7.9*
	NHS Tameside and Glossop	254,900	0.94	0.93	0.93	0.92	0.90	0.90	0.78	1.02	847	8.2
	NHS Trafford	*233,300*	*0.88*	*0.85*	*0.85*	*0.87*	*0.88*	*0.84*	*0.73*	*0.97*	*780*	*14.5*
	NHS Wigan Borough	322,000	0.82	0.89	0.93	0.95	0.96	0.90	0.80	1.01	873	2.7
Lancashire	**NHS Blackburn with Darwen**	**146,800**	**1.23**	**1.28**	**1.26**	**1.25**	**1.23**	**1.25**	**1.07**	**1.47**	**1,062**	**30.8**
	NHS Blackpool	139,600	0.81	0.80	0.91	0.99	1.08	1.07	0.91	1.25	1,060	3.3
	NHS Chorley and South Ribble	172,500	0.77	0.83	0.89	0.95	0.93	0.91	0.78	1.07	893	2.9
	NHS East Lancashire	374,200	1.01	1.02	0.97	0.98	0.99	0.96	0.86	1.06	914	11.9
	NHS Fylde & Wyre	167,900	0.84	0.84	0.85	0.85	0.84	0.86	0.74	1.01	959	2.1
	NHS Greater Preston	202,800	0.87	0.83	0.89	0.87	0.88	0.89	0.76	1.03	809	14.7
	NHS Lancashire North	*161,500*	*0.72*	*0.75*	*0.75*	*0.69*	*0.70*	*0.73*	*0.60*	*0.87*	*700*	*4.0*
	NHS West Lancashire	*112,700*	*0.89*	*0.85*	*0.81*	*0.77*	*0.74*	*0.79*	*0.64*	*0.97*	*789*	*1.9*
Merseyside	NHS Halton	126,500	0.96	1.06	1.02	1.00	1.00	1.02	0.85	1.21	956	2.2
	NHS Knowsley	147,200	0.99	0.97	1.01	0.96	0.99	0.99	0.84	1.18	924	2.8
	NHS Liverpool	478,600	1.06	1.06	1.04	1.02	1.03	1.02	0.92	1.12	871	11.1
	NHS South Sefton	158,600	0.88	0.95	0.95	0.94	0.98	0.97	0.83	1.14	971	2.2
	NHS Southport and Formby	*115,100*	*0.78*	*0.82*	*0.75*	*0.79*	*0.80*	*0.79*	*0.64*	*0.96*	*852*	*3.1*
	NHS St Helens	*177,600*	*0.92*	*0.90*	*0.91*	*0.87*	*0.86*	*0.85*	*0.72*	*1.00*	*845*	*2.0*

Table 2.5. Continued

UK area	Name	Total population	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 95% LCL	2015 95% UCL	2015 Crude rate pmp	% non-White
Cumbria, Northumberland, Tyne and Wear	*NHS Cumbria*	*504,100*	*0.74*	*0.73*	*0.73*	*0.75*	*0.75*	*0.79*	*0.72*	*0.87*	*849*	*1.5*
	NHS Newcastle Gateshead	*493,900*	*0.90*	*0.88*	*0.88*	*0.83*	*0.83*	*0.84*	*0.76*	*0.93*	*741*	*10.1*
	NHS North Tyneside	202,500	1.01	0.94	0.96	0.98	0.92	0.90	0.78	1.04	889	3.4
	NHS Northumberland	*315,300*	*0.75*	*0.75*	*0.75*	*0.73*	*0.77*	*0.77*	*0.68*	*0.86*	*825*	*1.6*
	NHS South Tyneside	148,700	1.01	1.04	0.98	0.93	0.86	0.85	0.72	1.02	848	4.1
	NHS Sunderland	277,200	1.03	0.98	1.00	0.95	0.96	0.94	0.83	1.07	916	4.1
North Yorkshire and Humber	*NHS East Riding of Yorkshire*	*315,100*	*0.84*	*0.84*	*0.82*	*0.80*	*0.79*	*0.79*	*0.70*	*0.89*	*866*	*1.9*
	NHS Hambleton, Richmondshire and Whitby	*151,800*	*0.62*	*0.63*	*0.67*	*0.72*	*0.74*	*0.72*	*0.60*	*0.86*	*771*	*2.7*
	NHS Harrogate and Rural District	157,000	0.85	0.83	0.89	0.87	0.91	0.96	0.82	1.13	1,006	3.7
	NHS Hull	259,000	1.03	0.99	0.95	0.97	1.01	1.08	0.95	1.23	934	5.9
	NHS North East Lincolnshire	159,600	0.99	1.08	1.04	1.02	0.97	0.99	0.84	1.16	959	2.6
	NHS North Lincolnshire	169,800	0.75	0.84	0.89	0.95	0.90	0.90	0.77	1.05	901	4.0
	NHS Scarborough and Ryedale	*110,700*	*0.88*	*0.83*	*0.86*	*0.84*	*0.81*	*0.80*	*0.66*	*0.98*	*867*	*2.5*
	NHS Vale of York	*355,400*	*0.87*	*0.88*	*0.93*	*0.92*	*0.90*	*0.89*	*0.79*	*0.99*	*861*	*4.0*
South Yorkshire and Bassetlaw	NHS Barnsley	239,300	1.12	1.10	1.05	1.03	1.03	0.98	0.86	1.11	953	2.1
	NHS Bassetlaw	114,500	0.82	0.81	0.88	0.82	0.82	0.83	0.68	1.01	856	2.6
	NHS Doncaster	304,800	0.94	0.98	0.97	0.93	0.96	0.95	0.85	1.07	915	4.7
	NHS Rotherham	260,800	1.13	1.08	1.07	1.05	1.04	0.99	0.87	1.12	959	6.4
	NHS Sheffield	569,700	1.14	1.11	1.12	1.11	1.09	1.04	0.95	1.13	895	16.3
West Yorkshire	NHS Airedale, Wharfedale and Craven	159,300	0.82	0.78	0.79	0.79	0.83	0.86	0.73	1.02	873	11.1
	NHS Bradford City	**83,900**	**1.91**	**1.81**	**1.90**	**1.96**	**2.13**	**2.12**	**1.76**	**2.56**	**1,299**	**72.2**
	NHS Bradford Districts	**337,700**	**1.13**	**1.16**	**1.23**	**1.21**	**1.18**	**1.21**	**1.09**	**1.35**	**1,024**	**28.7**
	NHS Calderdale	*208,400*	*1.10*	*1.02*	*0.96*	*0.90*	*0.86*	*0.86*	*0.74*	*1.00*	*821*	*10.3*
	NHS Greater Huddersfield	243,800	0.95	0.93	0.98	0.95	0.98	0.98	0.86	1.11	911	17.4
	NHS Leeds North	200,800	1.01	0.99	0.96	0.91	0.88	0.88	0.76	1.03	842	17.4
	NHS Leeds South and East	249,700	0.95	0.97	0.95	0.96	0.98	0.97	0.84	1.11	793	18.3
	NHS Leeds West	323,600	0.85	0.82	0.80	0.86	0.90	0.91	0.80	1.03	742	10.8
	NHS North Kirklees	**190,500**	**1.15**	**1.18**	**1.14**	**1.24**	**1.23**	**1.17**	**1.01**	**1.34**	**1,029**	**25.3**
	NHS Wakefield	*333,800*	*0.83*	*0.85*	*0.86*	*0.86*	*0.85*	*0.81*	*0.72*	*0.91*	*785*	*4.6*
Arden, Herefordshire and Worcestershire	**NHS Coventry and Rugby**	**448,800**	**1.23**	**1.25**	**1.30**	**1.27**	**1.22**	**1.16**	**1.06**	**1.27**	**978**	**22.2**
	NHS Herefordshire	*188,100*	*0.77*	*0.78*	*0.79*	*0.77*	*0.77*	*0.85*	*0.73*	*0.99*	*904*	*1.8*
	NHS Redditch and Bromsgrove	180,500	0.90	0.89	0.92	0.87	0.86	0.87	0.74	1.01	859	6.0
	NHS South Warwickshire	*261,500*	*0.91*	*0.92*	*0.89*	*0.88*	*0.89*	*0.90*	*0.80*	*1.03*	*914*	*7.0*
	NHS South Worcestershire	298,600	0.82	0.83	0.85	0.81	0.81	0.80	0.71	0.91	827	3.7
	NHS Warwickshire North	189,100	1.15	1.12	1.03	1.04	1.07	1.04	0.91	1.20	1,031	6.5
	NHS Wyre Forest	99,500	0.89	0.91	0.88	0.88	0.98	0.89	0.73	1.09	945	2.8
Birmingham and the Black Country	**NHS Birmingham Cross City**	**740,800**	**1.44**	**1.45**	**1.45**	**1.44**	**1.43**	**1.45**	**1.36**	**1.55**	**1,161**	**35.2**
	NHS Birmingham South and Central	**202,300**	**1.64**	**1.67**	**1.72**	**1.71**	**1.69**	**1.64**	**1.45**	**1.86**	**1,261**	**40.4**
	NHS Dudley	316,500	0.96	0.89	0.95	0.96	0.93	0.92	0.82	1.04	901	10.0
	NHS Sandwell and West Birmingham	**487,700**	**1.79**	**1.75**	**1.72**	**1.71**	**1.68**	**1.70**	**1.57**	**1.83**	**1,355**	**45.3**
	NHS Solihull	*210,400*	*0.95*	*0.92*	*0.89*	*0.87*	*0.83*	*0.86*	*0.74*	*0.99*	*846*	*10.9*
	NHS Walsall	**276,100**	**1.37**	**1.35**	**1.33**	**1.35**	**1.35**	**1.33**	**1.19**	**1.48**	**1,210**	**21.1**
	NHS Wolverhampton	**254,400**	**1.22**	**1.13**	**1.14**	**1.15**	**1.16**	**1.13**	**1.00**	**1.28**	**1,010**	**32.0**

Table 2.5. Continued

UK area	Name	Total population	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 95% LCL	2015 95% UCL	2015 Crude rate pmp	% non-White
Derbyshire and Nottingham-shire	NHS Erewash	96,300	0.99	1.00	0.98	0.90	0.88	0.95	0.78	1.17	924	3.2
	NHS Hardwick	*110,500*	*0.85*	*0.79*	*0.79*	*0.76*	*0.77*	*0.75*	*0.60*	*0.92*	*760*	*1.8*
	NHS Mansfield & Ashfield	196,400	0.97	0.95	0.91	0.94	0.95	0.95	0.82	1.10	927	2.5
	NHS Newark & Sherwood	118,700	1.07	1.14	1.09	1.04	0.99	0.92	0.76	1.10	943	2.4
	NHS North Derbyshire	*272,900*	*0.79*	*0.80*	*0.79*	*0.78*	*0.76*	*0.73*	*0.64*	*0.84*	*773*	*2.5*
	NHS Nottingham City	**318,900**	**1.24**	**1.17**	**1.15**	**1.15**	**1.13**	**1.20**	**1.07**	**1.35**	**897**	**28.5**
	NHS Nottingham North & East	*149,500*	*0.88*	*0.90*	*0.90*	*0.87*	*0.83*	*0.80*	*0.67*	*0.96*	*789*	*6.2*
	NHS Nottingham West	112,300	1.06	1.00	1.04	1.07	1.07	1.07	0.90	1.28	1,069	7.3
	NHS Rushcliffe	*114,500*	*0.85*	*0.87*	*0.77*	*0.82*	*0.76*	*0.72*	*0.58*	*0.90*	*725*	*6.9*
	NHS Southern Derbyshire	523,800	1.03	1.02	0.98	0.98	1.00	1.00	0.92	1.09	945	11.0
East Anglia	*NHS Cambridgeshire and Peterborough**	*876,400*	*0.90*	*0.94*	*0.90*	*0.93*	*0.91*	*0.87*	*0.81*	*0.94*	*806*	*9.5*
	NHS Great Yarmouth & Waveney	214,800	1.01	0.99	0.96	0.97	0.95	0.99	0.87	1.13	1,047	2.7
	NHS Ipswich and East Suffolk*	399,500	0.83	0.83	0.82	0.85	0.84	0.90	0.82	1.00	924	5.6
	NHS North Norfolk	170,600	0.98	0.92	0.88	0.97	0.95	0.94	0.81	1.08	1,085	1.5
	NHS Norwich	198,200	0.88	0.83	0.82	0.90	0.89	0.92	0.79	1.08	832	7.3
	*NHS South Norfolk**	*243,400*	*0.81*	*0.82*	*0.83*	*0.88*	*0.84*	*0.87*	*0.77*	*1.00*	*912*	*2.6*
	*NHS West Norfolk**	*174,100*	*0.85*	*0.80*	*0.77*	*0.75*	*0.74*					*2.6*
	*NHS West Suffolk**	*226,300*	*0.83*	*0.82*	*0.81*	*0.81*	*0.77*					*4.6*
Essex	NHS Basildon and Brentwood	257,800	0.96	1.00	0.97	1.05	1.02	0.99	0.87	1.12	927	7.1
	NHS Castle Point, Rayleigh and Rochford	*174,300*	*0.85*	*0.80*	*0.78*	*0.83*	*0.89*	*0.85*	*0.72*	*0.99*	*895*	*3.0*
	*NHS Mid Essex**	*385,700*	*0.85*	*0.84*	*0.80*	*0.84*	*0.85*	*0.86*	*0.77*	*0.96*	*850*	*4.4*
	*NHS North East Essex**	*325,100*	*0.90*	*0.93*	*0.90*	*0.87*	*0.91*	*0.88*	*0.79*	*0.99*	*886*	*5.5*
	NHS Southend	178,700	0.92	0.93	0.95	1.00	0.96	0.96	0.82	1.12	912	8.4
	NHS Thurrock	165,200	0.96	0.98	0.98	0.99	0.98	0.97	0.82	1.14	823	14.1
	NHS West Essex*	300,200	0.74	0.73	0.83	0.87	0.92	0.91	0.80	1.02	859	8.2
Hertford-shire and the South Midlands	NHS Bedfordshire*	440,300	0.90	0.87	0.90	0.91	0.92	0.91	0.83	1.01	861	11.2
	NHS Corby	66,900	0.81	0.87	0.91	0.85	0.87	0.92	0.71	1.21	808	4.5
	NHS East and North Hertfordshire*	559,100	0.86	0.89	0.88	0.90	0.93	0.94	0.86	1.02	859	10.4
	NHS Herts Valleys	588,200	0.97	0.95	0.94	0.93	0.95	0.95	0.87	1.04	865	14.6
	NHS Luton*	**214,700**	**1.24**	**1.31**	**1.34**	**1.41**	**1.42**	**1.45**	**1.28**	**1.65**	**1,132**	**45.3**
	NHS Milton Keynes	267,800	0.89	0.91	0.91	0.93	1.01	1.02	0.89	1.15	863	19.6
	NHS Nene	*640,000*	*0.90*	*0.91*	*0.90*	*0.90*	*0.91*	*0.88*	*0.81*	*0.96*	*834*	*9.1*
Leicester-shire and Lincolnshire	*NHS East Leicestershire and Rutland*	*325,900*	*0.80*	*0.80*	*0.79*	*0.78*	*0.78*	*0.79*	*0.70*	*0.89*	*801*	*9.8*
	NHS Leicester City	**342,600**	**1.68**	**1.71**	**1.73**	**1.75**	**1.75**	**1.73**	**1.58**	**1.90**	**1,325**	**49.5**
	NHS Lincolnshire East	*232,000*	*0.83*	*0.85*	*0.88*	*0.89*	*0.85*	*0.84*	*0.74*	*0.96*	*935*	*2.0*
	NHS Lincolnshire West	*234,300*	*0.83*	*0.87*	*0.82*	*0.85*	*0.86*	*0.84*	*0.73*	*0.97*	*811*	*3.0*
	*NHS South Lincolnshire**	*146,000*	*0.72*	*0.74*	*0.76*	*0.72*	*0.73*	*0.72*	*0.60*	*0.87*	*754*	*2.3*
	NHS South West Lincolnshire	*124,300*	*0.73*	*0.75*	*0.71*	*0.68*	*0.66*	*0.64*	*0.52*	*0.80*	*668*	*2.3*
	NHS West Leicestershire	*387,500*	*0.90*	*0.91*	*0.89*	*0.90*	*0.90*	*0.89*	*0.80*	*0.99*	*867*	*6.9*
Shropshire and Stafford-shire	NHS Cannock Chase	134,900	0.92	0.94	0.84	0.93	0.92	0.91	0.76	1.09	897	2.4
	NHS East Staffordshire	*125,700*	*0.77*	*0.74*	*0.76*	*0.76*	*0.76*	*0.74*	*0.61*	*0.91*	*724*	*9.0*
	NHS North Staffordshire	216,700	0.91	0.96	0.92	0.95	0.91	0.90	0.78	1.03	918	3.5
	NHS Shropshire	*311,400*	*0.86*	*0.85*	*0.84*	*0.78*	*0.79*	*0.81*	*0.71*	*0.91*	*857*	*2.0*
	NHS South East Staffs and Seisdon and Peninsular	*224,800*	*0.96*	*0.97*	*0.90*	*0.88*	*0.86*	*0.85*	*0.74*	*0.98*	*876*	*3.6*
	NHS Stafford and Surrounds	152,200	0.88	0.91	0.91	0.88	0.93	0.96	0.82	1.12	1,005	4.7
	NHS Stoke on Trent	259,900	1.13	1.13	1.09	1.07	1.13	1.04	0.92	1.18	951	11.0
	NHS Telford & Wrekin	171,200	1.04	1.02	0.99	1.01	1.00	1.07	0.92	1.24	976	7.3

Table 2.5. Continued

UK area	Name	Total population	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 95% LCL	2015 95% UCL	2015 Crude rate pmp	% non-White
London	**NHS Barking & Dagenham**	**202,000**	**1.27**	**1.39**	**1.43**	**1.47**	**1.52**	**1.53**	**1.34**	**1.75**	**1,089**	**41.7**
	NHS Barnet	**379,700**	**1.41**	**1.40**	**1.45**	**1.44**	**1.44**	**1.46**	**1.33**	**1.60**	**1,219**	**35.9**
	NHS Camden	**241,100**	**1.13**	**1.15**	**1.15**	**1.15**	**1.16**	**1.18**	**1.03**	**1.34**	**929**	**33.7**
	NHS City and Hackney	**277,800**	**1.32**	**1.34**	**1.40**	**1.40**	**1.42**	**1.39**	**1.23**	**1.56**	**976**	**44.6**
	NHS Enfield	**328,400**	**1.37**	**1.46**	**1.49**	**1.49**	**1.51**	**1.51**	**1.37**	**1.66**	**1,227**	**39.0**
	NHS Haringey	**272,900**	**1.31**	**1.45**	**1.54**	**1.59**	**1.62**	**1.64**	**1.47**	**1.82**	**1,257**	**39.5**
	NHS Havering	*249,100*	*0.83*	*0.87*	*0.89*	*0.85*	*0.84*	*0.87*	*0.76*	*1.00*	*807*	*12.3*
	NHS Islington	**227,700**	**1.18**	**1.24**	**1.35**	**1.38**	**1.38**	**1.40**	**1.24**	**1.59**	**1,032**	**31.8**
	NHS Newham	**332,800**	**1.52**	**1.64**	**1.68**	**1.76**	**1.85**	**1.92**	**1.75**	**2.11**	**1,304**	**71.0**
	NHS Redbridge	**296,800**	**1.34**	**1.32**	**1.37**	**1.43**	**1.44**	**1.45**	**1.30**	**1.61**	**1,156**	**57.5**
	NHS Tower Hamlets	**295,200**	**1.21**	**1.23**	**1.33**	**1.40**	**1.48**	**1.55**	**1.39**	**1.74**	**999**	**54.8**
	NHS Waltham Forest	**271,200**	**1.37**	**1.46**	**1.41**	**1.47**	**1.59**	**1.61**	**1.45**	**1.79**	**1,246**	**47.8**
	NHS Brent	**324,000**	**2.07**	**2.06**	**2.10**	**2.07**	**2.12**	**2.17**	**2.00**	**2.35**	**1,741**	**63.7**
	NHS Central London (Westminster)	174,100	1.01	1.08	1.07	1.12	1.14	1.13	0.97	1.31	970	36.2
	NHS Ealing	**343,100**	**1.86**	**1.85**	**1.91**	**1.89**	**1.90**	**1.97**	**1.81**	**2.14**	**1,609**	**51.0**
	NHS Hammersmith and Fulham	**179,400**	**1.29**	**1.32**	**1.33**	**1.27**	**1.31**	**1.30**	**1.13**	**1.50**	**1,020**	**31.9**
	NHS Harrow	**247,100**	**1.79**	**1.84**	**1.82**	**1.73**	**1.72**	**1.72**	**1.55**	**1.90**	**1,501**	**57.8**
	NHS Hillingdon	**297,700**	**1.35**	**1.43**	**1.47**	**1.48**	**1.48**	**1.44**	**1.30**	**1.60**	**1,182**	**39.4**
	NHS Hounslow	**268,800**	**1.38**	**1.43**	**1.46**	**1.53**	**1.54**	**1.56**	**1.41**	**1.74**	**1,258**	**48.6**
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	**225,900**	**1.17**	**1.20**	**1.18**	**1.17**	**1.22**	**1.18**	**1.04**	**1.35**	**1,018**	**33.4**
	NHS Bexley	**242,100**	**1.27**	**1.26**	**1.25**	**1.24**	**1.27**	**1.29**	**1.15**	**1.45**	**1,156**	**18.1**
	NHS Bromley	324,900	1.02	1.01	0.98	0.97	0.97	1.05	0.94	1.17	973	15.7
	NHS Croydon	**379,000**	**1.30**	**1.34**	**1.39**	**1.44**	**1.47**	**1.47**	**1.34**	**1.61**	**1,237**	**44.9**
	NHS Greenwich	**274,800**	**1.21**	**1.23**	**1.22**	**1.39**	**1.42**	**1.44**	**1.29**	**1.61**	**1,110**	**37.5**
	NHS Kingston	173,500	1.11	1.14	1.13	1.06	1.07	1.03	0.88	1.21	859	25.5
	NHS Lambeth	**324,400**	**1.52**	**1.58**	**1.65**	**1.68**	**1.75**	**1.81**	**1.65**	**1.99**	**1,328**	**42.9**
	NHS Lewisham	**297,300**	**1.45**	**1.50**	**1.52**	**1.55**	**1.53**	**1.54**	**1.39**	**1.71**	**1,177**	**46.5**
	NHS Merton	**204,600**	**1.26**	**1.25**	**1.29**	**1.28**	**1.36**	**1.43**	**1.26**	**1.62**	**1,178**	**35.1**
	NHS Richmond	*194,700*	*0.74*	*0.73*	*0.73*	*0.76*	*0.76*	*0.75*	*0.63*	*0.89*	*673*	*14.0*
	NHS Southwark	**308,900**	**1.62**	**1.70**	**1.76**	**1.79**	**1.83**	**1.88**	**1.71**	**2.06**	**1,382**	**45.8**
	NHS Sutton	**200,100**	**1.17**	**1.19**	**1.21**	**1.16**	**1.15**	**1.18**	**1.03**	**1.35**	**1,049**	**21.4**
	NHS Wandsworth	**314,500**	**1.29**	**1.26**	**1.21**	**1.18**	**1.28**	**1.31**	**1.18**	**1.47**	**982**	**28.6**
Bath, Gloucestershire, Swindon and Wiltshire	*NHS Bath and North East Somerset*	*184,900*	*0.82*	*0.79*	*0.80*	*0.81*	*0.80*	*0.82*	*0.70*	*0.97*	*763*	*5.4*
	NHS Gloucestershire	*617,200*	*0.88*	*0.88*	*0.90*	*0.89*	*0.88*	*0.87*	*0.80*	*0.94*	*868*	*4.6*
	NHS Swindon	222,800	0.88	0.91	0.93	0.95	0.96	0.99	0.86	1.13	898	10.0
	NHS Wiltshire	*486,100*	*0.73*	*0.75*	*0.72*	*0.73*	*0.73*	*0.74*	*0.67*	*0.82*	*739*	*3.4*
Bristol, North Somerset, Somerset and South Gloucestershire	**NHS Bristol**	**449,300**	**1.21**	**1.22**	**1.26**	**1.29**	**1.29**	**1.25**	**1.14**	**1.37**	**993**	**16.0**
	NHS North Somerset	209,900	0.90	0.91	0.94	0.93	0.94	0.92	0.80	1.05	953	2.7
	NHS Somerset	*545,400*	*0.86*	*0.87*	*0.84*	*0.81*	*0.82*	*0.79*	*0.72*	*0.87*	*831*	*2.0*
	NHS South Gloucestershire	274,700	0.97	0.94	0.93	0.98	0.98	0.93	0.82	1.05	888	5.0
Devon, Cornwall and Isles of Scilly	NHS Kernow	551,700	1.01	0.98	0.97	0.96	0.95	0.95	0.87	1.03	1,004	1.8
	NHS North, East, West Devon	*890,600*	*0.94*	*0.93*	*0.93*	*0.92*	*0.92*	*0.91*	*0.85*	*0.97*	*915*	*3.0*
	NHS South Devon and Torbay	278,600	1.07	1.05	1.03	1.08	1.06	1.04	0.93	1.16	1,138	2.1
Kent and Medway	NHS Ashford	124,300	1.04	1.02	1.04	1.00	1.01	0.98	0.82	1.18	934	6.3
	NHS Canterbury and Coastal	207,700	0.99	0.97	0.96	0.99	1.06	1.05	0.92	1.21	1,002	5.9
	NHS Dartford, Gravesham and Swanley	258,200	1.08	1.07	1.07	1.11	1.13	1.11	0.98	1.25	1,022	13.0

Table 2.5. Continued

UK area	Name	Total population	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 95% LCL	2015 95% UCL	2015 Crude rate pmp	% non-White
Kent and Medway cont.	NHS Medway	276,500	0.86	0.85	0.88	0.92	0.91	0.92	0.81	1.05	814	10.4
	NHS South Kent Coast	*205,500*	*0.81*	*0.84*	*0.83*	*0.78*	*0.83*	*0.83*	*0.71*	*0.96*	*861*	*4.5*
	NHS Swale	112,500	1.04	1.07	1.16	1.17	1.11	1.09	0.90	1.30	1,022	3.8
	NHS Thanet	139,800	0.99	1.00	1.05	1.11	1.06	1.00	0.85	1.18	1,009	4.5
	NHS West Kent	*476,800*	*0.79*	*0.80*	*0.82*	*0.80*	*0.83*	*0.80*	*0.72*	*0.89*	*770*	*4.9*
Surrey and Sussex	*NHS Brighton & Hove*	*285,300*	*0.84*	*0.83*	*0.87*	*0.83*	*0.88*	*0.87*	*0.76*	*0.99*	*729*	*10.9*
	NHS Coastal West Sussex	*495,000*	*0.84*	*0.80*	*0.82*	*0.82*	*0.82*	*0.84*	*0.77*	*0.93*	*905*	*3.8*
	NHS Crawley	110,900	1.17	1.08	1.01	0.94	0.94	0.90	0.73	1.12	758	20.1
	NHS East Surrey	*182,000*	*0.85*	*0.78*	*0.85*	*0.90*	*0.84*	*0.84*	*0.71*	*0.99*	*791*	*8.3*
	NHS Eastbourne, Hailsham and Seaford	*188,100*	*0.80*	*0.76*	*0.82*	*0.83*	*0.82*	*0.81*	*0.69*	*0.94*	*861*	*4.4*
	NHS Guildford and Waverley	*206,100*	*0.69*	*0.65*	*0.71*	*0.67*	*0.68*	*0.68*	*0.57*	*0.81*	*631*	*7.2*
	NHS Hastings & Rother	*184,400*	*0.79*	*0.76*	*0.75*	*0.81*	*0.80*	*0.81*	*0.69*	*0.94*	*862*	*4.6*
	NHS High Weald Lewes Havens	*171,600*	*0.66*	*0.65*	*0.72*	*0.69*	*0.71*	*0.74*	*0.63*	*0.88*	*781*	*3.1*
	NHS Horsham and Mid Sussex	*230,300*	*0.70*	*0.74*	*0.69*	*0.70*	*0.70*	*0.68*	*0.58*	*0.80*	*673*	*4.9*
	NHS North West Surrey	343,000	0.96	0.96	0.96	0.95	0.98	0.98	0.88	1.09	924	12.5
	NHS Surrey Downs	*287,000*	*0.92*	*0.92*	*0.90*	*0.89*	*0.86*	*0.83*	*0.73*	*0.95*	*829*	*9.1*
	NHS Surrey Heath	95,900	0.97	0.95	0.95	0.86	0.82	0.82	0.66	1.03	803	9.3
Thames Valley	NHS Aylesbury Vale	207,000	0.96	0.93	0.92	0.91	0.90	0.88	0.75	1.02	826	9.7
	NHS Bracknell and Ascot	137,000	0.85	0.82	0.81	0.92	0.95	0.93	0.77	1.11	832	9.5
	NHS Chiltern	*324,000*	*0.87*	*0.83*	*0.83*	*0.87*	*0.86*	*0.83*	*0.74*	*0.94*	*799*	*15.8*
	NHS Newbury and District	106,400	0.93	0.97	0.93	0.97	1.00	0.98	0.81	1.20	940	4.4
	NHS North & West Reading	100,300	0.87	0.87	0.86	0.86	0.83	0.86	0.69	1.06	817	10.4
	NHS Oxfordshire	*663,600*	*0.88*	*0.90*	*0.91*	*0.91*	*0.91*	*0.87*	*0.80*	*0.94*	*797*	*9.3*
	NHS Slough	**145,700**	**1.76**	**1.88**	**1.87**	**1.87**	**1.88**	**1.93**	**1.69**	**2.21**	**1,448**	**54.3**
	NHS South Reading	**111,000**	**1.51**	**1.39**	**1.30**	**1.43**	**1.50**	**1.47**	**1.23**	**1.75**	**1,072**	**30.5**
	NHS Windsor,Ascot and Maidenhead	141,400	0.95	0.98	0.99	1.00	1.07	1.06	0.90	1.26	983	14.7
	NHS Wokingham	160,400	0.86	0.94	0.91	0.93	0.88	0.87	0.74	1.03	829	11.6
Wessex	*NHS Dorset*	*765,700*	*0.84*	*0.80*	*0.80*	*0.79*	*0.80*	*0.78*	*0.73*	*0.85*	*823*	*4.0*
	NHS Fareham and Gosport	199,500	0.87	0.86	0.85	0.91	0.92	0.95	0.83	1.10	963	3.4
	NHS Isle of Wight	*139,400*	*0.56*	*0.60*	*0.64*	*0.75*	*0.75*	*0.72*	*0.60*	*0.87*	*803*	*2.7*
	NHS North East Hampshire and Farnham	209,200	0.83	0.83	0.84	0.89	0.89	0.92	0.79	1.06	851	9.7
	NHS North Hampshire	*220,800*	*0.72*	*0.69*	*0.69*	*0.71*	*0.75*	*0.76*	*0.65*	*0.89*	*725*	*6.4*
	NHS Portsmouth	211,800	0.89	0.93	0.96	0.99	0.93	0.96	0.83	1.12	789	11.6
	NHS South Eastern Hampshire	211,900	0.91	0.90	0.85	0.88	0.90	0.89	0.77	1.02	916	3.1
	NHS Southampton	249,500	0.95	0.99	1.02	0.99	0.98	1.03	0.90	1.18	814	14.1
	NHS West Hampshire	*554,900*	*0.78*	*0.78*	*0.77*	*0.77*	*0.77*	*0.74*	*0.68*	*0.82*	*768*	*3.9*
Wales	*Betsi Cadwaladr University*	*694,500*	*0.93*	*0.88*	*0.90*	*0.82*	*0.85*	*0.91*	*0.84*	*0.98*	*929*	*2.5*
	Powys Teaching	*132,600*	*0.93*	*0.90*	*0.89*	*0.86*	*0.81*	*0.83*	*0.69*	*0.99*	*920*	*1.6*
	Hywel Dda	383,200	0.97	0.98	0.92	0.95	0.95	0.96	0.87	1.06	1,005	2.2
	Abertawe Bro Morgannwg University	**525,500**	**1.28**	**1.27**	**1.24**	**1.19**	**1.13**	**1.13**	**1.04**	**1.23**	**1,098**	**3.9**
	Cwm Taf	**296,700**	**1.31**	**1.36**	**1.28**	**1.27**	**1.23**	**1.18**	**1.06**	**1.31**	**1,119**	**2.6**
	Aneurin Bevan	581,800	1.13	1.11	1.11	1.09	1.10	1.07	0.99	1.16	1,047	3.9
	Cardiff and Vale University	484,800	1.07	1.06	1.04	1.04	1.00	1.00	0.91	1.10	862	12.2
Scotland	Ayrshire and Arran	370,600	1.12	1.06	1.04	1.01	0.98	0.97	0.88	1.07	1,007	1.2
	Borders	114,000	1.09	0.98	0.93	0.90	0.85	0.84	0.69	1.02	921	1.3
	Dumfries and Galloway	*149,700*	*0.92*	*0.90*	*0.89*	*0.83*	*0.82*	*0.82*	*0.70*	*0.98*	*909*	*1.2*
	Fife	368,100	0.96	1.01	0.98	0.98	0.92	0.93	0.84	1.04	926	2.4

Table 2.5. Continued

UK area	Name	Total population	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2015 95% LCL	2015 95% UCL	2015 Crude rate pmp	% non-White
Scotland cont.	*Forth Valley*	*302,700*	*0.96*	*0.90*	*0.87*	*0.87*	*0.86*	*0.87*	*0.77*	*0.98*	*852*	*2.2*
	Grampian	*587,800*	*0.93*	*0.93*	*0.96*	*0.95*	*0.88*	*0.91*	*0.83*	*0.99*	*861*	*4.0*
	Greater Glasgow and Clyde	**1,149,900**	**1.07**	**1.06**	**1.08**	**1.07**	**1.04**	**1.06**	**1.00**	**1.13**	**983**	**7.3**
	Highland	*321,000*	*0.98*	*0.90*	*0.86*	*0.82*	*0.80*	*0.86*	*0.76*	*0.96*	*907*	*1.3*
	Lanarkshire	654,500	0.96	0.94	0.99	0.97	0.95	0.97	0.89	1.05	934	2.0
	Lothian	*867,800*	*0.85*	*0.81*	*0.82*	*0.80*	*0.79*	*0.80*	*0.74*	*0.86*	*725*	*5.6*
	Orkney	21,700	0.93	0.79	0.77	0.83	0.62	0.68	0.42	1.12	738	0.7
	Shetland	23,200	0.57	0.50	0.48	0.51	0.49	0.65	0.39	1.08	647	1.5
	Tayside	415,000	1.04	1.02	0.98	0.94	0.92	0.95	0.86	1.04	942	3.2
	Western Isles	27,100	0.85	0.70	0.60	0.58	0.73	0.90	0.62	1.32	997	0.9
Northern Ireland	**Belfast**	**353,800**	**1.18**	**1.15**	**1.17**	**1.15**	**1.15**	**1.14**	**1.02**	**1.26**	**975**	**3.2**
	Northern	471,200	1.01	1.04	1.03	1.02	1.02	1.00	0.91	1.10	913	1.2
	Southern	373,000	0.97	1.00	0.96	0.96	0.97	1.01	0.90	1.12	855	1.2
	South Eastern	354,700	0.89	0.90	0.88	0.86	0.83	0.90	0.80	1.00	837	1.3
	Western	299,000	1.13	1.09	1.00	0.98	1.05	1.10	0.98	1.23	963	1.0

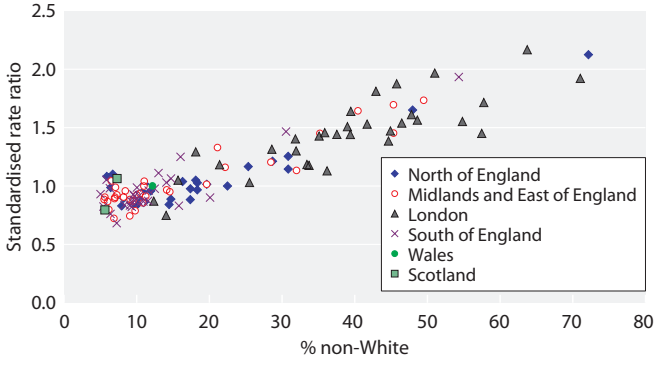

Fig. 2.3. Standardised prevalence ratios for CCG/HB areas by percentage non-White on 31/12/2015 (excluding areas with <5% ethnic minorities)

Table 2.7. Median time on RRT of prevalent patients on 31/12/2015

Modality	*N*	Median time treated (years)
Haemodialysis	24,027	3.3
Peritoneal dialysis	3,513	1.6
Transplant	30,392	10.2
All RRT	**57,932**	**6.2**

For patients who recovered for >90 days and then subsequently restarted RRT the median time from the start of RRT was calculated from the most recent start date

Patients with an initial treatment modality of transferred in or transferred out were excluded from the calculation of median time on RRT since their treatment start date was not accurately known

Table 2.6. Standardised prevalence rate ratio of RRT for each region in England and for Wales, Scotland and Northern Ireland in 2015

UK area	Total population	O/E	95% LCL	95% UCL	Crude rate pmp
North England	15,198,200	0.92	0.91	0.94	859.1
Midlands and East of England	16,342,200	0.98	0.97	1.00	916.2
London	**8,416,500**	**1.49**	**1.46**	**1.52**	**1,164.8**
South England	13,908,900	0.90	0.88	0.92	861.8
Wales	3,082,400	0.99	0.96	1.03	955.7
Scotland	5,327,700	0.90	0.88	0.93	858.5
Northern Ireland	1,829,700	0.97	0.92	1.02	844.9

O/E – observed/expected prevalence ratio given the age/gender breakdown of each region
Bold – higher than expected prevalence ratio

Table 2.8. Median age of prevalent RRT patients by treatment modality in renal centres on 31/12/2015

Centre	Median age			
	HD	PD	Transplant	RRT
England				
B Heart	68.0	67.3	52.7	64.0
B QEH	65.4	59.8	52.9	58.2
Basldn	67.7	57.9	53.5	63.0
Bradfd	63.2	53.3	52.5	55.5
Brightn	67.8	66.3	54.5	60.8
Bristol	69.5	68.0	54.5	58.8
Carlis	70.3	69.6	53.9	60.9
Carsh	68.9	65.6	54.8	61.9
Chelms	69.3	70.2	58.9	64.5
Colchr	73.1			73.1
Covnt	68.3	64.6	52.6	58.3
Derby	67.2	63.5	53.8	60.5
Donc	68.2	69.4	56.7	64.1
Dorset	72.2	73.3	57.6	65.0
Dudley	66.6	60.6	56.7	64.7
Exeter	72.4	67.7	54.9	63.5
Glouc	71.5	66.7	54.5	65.1
Hull	68.8	65.0	53.3	59.4
Ipswi	69.5	69.4	55.5	62.2
Kent	69.2	64.3	55.2	61.0
L Barts	61.3	60.9	51.5	56.0
L Guys	61.0	61.8	51.8	55.0
L Kings	63.8	58.6	55.0	59.5
L Rfree	69.1	63.8	53.2	58.0
L St.G	65.9	71.2	54.5	60.5
L West	66.5	65.4	55.5	59.7
Leeds	63.2	52.9	53.8	56.0
Leic	67.7	66.4	53.9	59.5
Liv Ain	68.7	59.5	42.5	67.5
Liv Roy	61.2	61.0	53.7	55.7
M RI	64.0	66.0	52.3	55.6
Middlbr	67.4	53.5	54.0	58.4
Newc	62.6	69.3	54.8	57.3
Norwch	70.7	63.7	55.0	61.5
Nottm	71.3	65.0	53.2	58.5
Oxford	67.8	65.6	53.4	56.5
Plymth	71.0	64.3	56.8	60.2
Ports	67.5	65.1	54.6	59.5
Prestn	66.1	67.6	54.3	60.1
Redng	69.5	67.7	57.4	62.3
Salford	63.3	61.7	52.5	58.1
Sheff	67.0	65.5	53.3	58.9
Shrew	69.0	57.7	55.8	63.7
Stevng	67.9	68.4	52.9	61.9
Sthend	67.9	70.4	54.7	63.5
Stoke	68.0	69.0	52.4	60.1
Sund	65.8	64.7	55.3	59.6
Truro	69.6	64.2	56.9	62.0
Wirral	68.0	65.9	55.8	65.4
Wolve	65.9	63.4	51.8	60.6
York	67.7	65.4	54.0	58.8
N Ireland				
Antrim	73.8	61.3	52.5	63.5
Belfast	69.5	67.0	51.9	55.0
Newry	65.8	75.3	53.7	60.6
Ulster	73.8	69.5	52.7	66.5
West NI	71.6	61.9	50.4	57.7
Scotland				
Abrdn	66.3	53.2	50.8	57.1
Airdrie	65.0	60.4	52.7	57.0
D & Gall	67.0	68.6	54.1	58.9
Dundee	67.8	63.9	53.5	60.7
Edinb	60.1	62.8	53.5	56.0
Glasgw	65.5	62.2	53.3	57.3
Inverns	66.5	59.2	51.0	56.4
Klmarnk	64.5	61.0	54.2	58.5
Krkcldy	69.2	62.5	54.4	62.0
Wales				
Bangor	68.9	69.0	55.8	64.2
Cardff	68.0	65.8	53.8	58.0
Clwyd	67.2	64.9	55.6	63.7
Swanse	71.7	62.5	56.8	63.8
Wrexm	72.0	57.6	53.2	58.7
England	**67.2**	**64.4**	**53.9**	**59.0**
N Ireland	**71.0**	**68.7**	**52.1**	**57.8**
Scotland	**65.4**	**61.1**	**53.2**	**57.5**
Wales	**69.1**	**64.1**	**54.3**	**59.9**
UK	**67.2**	**64.2**	**53.8**	**59.0**

Blank cells indicate no patients on that treatment modality attending that centre when data were collected

UK RRT prevalent patients by using the age and gender distribution of the UK population by CCG/HB (from mid-2015 population estimates), allowed estimation of crude prevalence by age and gender (figure 2.5). This shows a progressive increase in prevalence with age, peaking at 2,270 pmp (similar to the 2,274 pmp estimate in 2014) in the age group 75–79 years then a rapid decline thereafter. Crude RRT prevalence in males exceeded that of females for all age groups. The difference was smallest in younger patients and was greatest from the age of 70 years onwards. RRT prevalence in males was highest in the 75–79 years group (3,074 pmp) and for females also in the same age group at 1,589 pmp. Survival on RRT by gender is described in chapter 5.

Ethnicity

Key to understanding differences in RRT prevalence between regions is understanding the ethnic diversity of

Table 2.9. Percentage of prevalent RRT patients in each age group by centre on 31/12/2015

Centre	*N*	Percentage of patients			
		18–39 years	40–64 years	65–74 years	75+ years
England					
B Heart	657	10.0	42.2	22.5	25.3
B QEH	2,254	14.3	51.2	19.3	15.3
Basldn	275	10.5	45.1	21.5	22.9
Bradfd	581	22.0	48.9	16.4	12.7
Brightn	952	11.9	46.6	22.4	19.1
Bristol	1,477	14.7	48.1	20.7	16.5
Carlis	281	12.8	47.3	19.6	20.3
Carsh	1,582	9.4	46.3	23.3	21.0
Chelms	285	9.1	43.5	24.6	22.8
Colchr	120	4.2	21.7	27.5	46.7
Covnt	958	13.2	50.6	19.0	17.2
Derby	537	11.5	48.6	23.6	16.2
Donc	301	10.6	41.5	23.6	24.3
Dorset	679	9.3	40.4	26.4	24.0
Dudley	312	9.0	42.9	24.0	24.0
Exeter	962	10.1	42.6	24.1	23.2
Glouc	443	8.6	41.3	24.6	25.5
Hull	858	13.3	48.8	21.3	16.6
Ipswi	407	9.1	47.7	23.8	19.4
Kent	1,042	11.5	47.3	23.5	17.7
L Barts	2,286	15.6	56.9	17.1	10.4
L Guys	2,011	19.1	54.5	16.3	10.1
L Kings	1,085	9.5	53.4	18.6	18.5
L Rfree	2,088	15.8	49.5	18.0	16.8
L St.G	846	13.4	48.2	22.9	15.5
L West	3,320	11.7	52.1	21.7	14.5
Leeds	1,524	16.7	52.6	18.9	11.8
Leic	2,186	12.6	48.7	23.1	15.6
Liv Ain	228	7.0	36.0	24.6	32.5
Liv Roy	1,292	15.4	58.0	17.4	9.1
M RI	1,894	17.2	54.1	18.4	10.3
Middlbr	893	14.1	49.5	21.2	15.2
Newc	1,010	14.9	52.7	20.1	12.4
Norwch	741	10.9	46.4	22.7	20.0
Nottm	1,114	14.4	48.7	19.8	17.1
Oxford	1,698	14.0	53.9	19.3	12.8
Plymth	505	11.7	49.5	23.0	15.8
Ports	1,671	12.6	49.7	21.5	16.3
Prestn	1,218	12.0	48.7	25.0	14.3
Redng	778	8.7	48.5	23.8	19.0
Salford	964	13.7	52.7	20.7	12.9
Sheff	1,325	14.0	51.2	19.0	15.8
Shrew	370	8.9	43.8	25.1	22.2
Stevng	827	10.4	46.8	19.6	23.2
Sthend	246	12.6	41.9	19.5	26.0
Stoke	789	12.8	47.4	20.3	19.5
Sund	459	11.1	51.0	22.2	15.7
Truro	417	10.8	45.1	23.5	20.6
Wirral	228	6.6	42.5	20.6	30.3
Wolve	581	10.7	49.7	20.1	19.4
York	489	15.7	47.6	20.7	16.0

Table 2.9. Continued

Centre	*N*	Percentage of patients			
		18–39 years	40–64 years	65–74 years	75+ years
N Ireland					
Antrim	239	9.6	44.4	21.8	24.3
Belfast	773	18.5	52.4	16.6	12.5
Newry	226	12.8	49.6	17.3	20.4
Ulster	170	10.0	35.9	22.9	31.2
West NI	293	14.0	44.7	21.5	19.8
Scotland					
Abrdn	532	17.7	51.3	19.5	11.5
Airdrie	425	14.8	52.0	18.6	14.6
D & Gall	130	11.5	45.4	24.6	18.5
Dundee	421	7.8	51.8	21.1	19.2
Edinb	773	14.7	58.6	17.7	8.9
Glasgw	1,715	14.3	55.8	18.7	11.2
Inverns	253	10.7	57.3	20.2	11.9
Klmarnk	309	8.1	57.9	22.7	11.3
Krkcldy	295	10.2	47.8	23.7	18.3
Wales					
Bangor	182	10.4	42.9	25.3	21.4
Cardff	1,613	14.1	51.2	21.0	13.6
Clwyd	185	13.5	42.2	23.8	20.5
Swanse	756	10.1	43.0	22.6	24.3
Wrexm	293	16.0	45.1	15.7	23.2
England	**50,046**	**13.2**	**49.8**	**20.7**	**16.3**
N Ireland	**1,701**	**14.9**	**47.9**	**18.9**	**18.3**
Scotland	**4,853**	**13.3**	**54.5**	**19.6**	**12.5**
Wales	**3,029**	**13.0**	**47.5**	**21.3**	**18.1**
UK	**59,629**	**13.3**	**50.0**	**20.6**	**16.1**
Range (Min:Max)		**(4.2, 22.0)**	**(21.7, 58.6)**	**(15.7, 27.5)**	**(8.9, 46.7)**

the patient groups. As such, the completeness of ethnicity data provided by renal centres is important. Sixty-one of the 70 centres (87.1%) providing patient-level data provided ethnicity data that were at least 90% complete (table 2.10), an improvement on only 36 centres in 2006. Overall ethnicity completeness for prevalent RRT patients has reached a stable 93.3% for the UK in 2015 compared to 93.6% in 2014. Data completeness is very high in England, Wales and Northern Ireland (98.8%, 99.6% and 98.6% respectively), but much lower in Scotland (30.1%). Completeness in Scotland is improving,

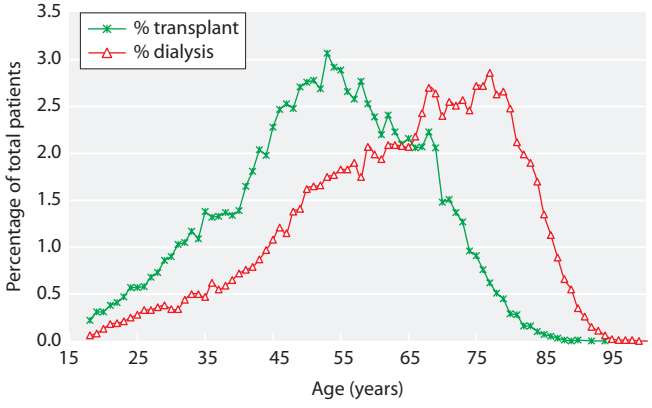

Fig. 2.4. Age profile of prevalent RRT patients by modality on 31/12/2015

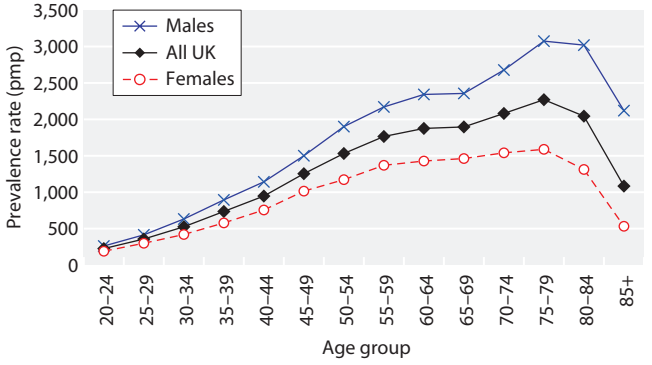

Fig. 2.5. Prevalence of RRT patients per million population by age and gender on 31/12/2015

Table 2.10. Ethnicity of prevalent RRT patients by centre on 31/12/2015

Centre	Percentage data not available	*N* with data	Percentage in each ethnic group*				
			White	Black	S Asian	Chinese	Other
England							
B Heart	0.0	657	60.3	8.4	30.1	0.5	0.8
B QEH	0.0	2,253	61.2	9.9	25.6	0.7	2.7
Basldn	0.4	274	85.8	6.6	5.5	1.1	1.1
Bradfd	0.7	577	54.8	2.1	42.3	0.5	0.3
Brightn	2.0	933	91.7	2.1	4.0	0.2	1.9
Bristol	1.1	1,461	89.9	4.8	3.5	0.3	1.5
Carlis	0.0	281	98.2	0.4	1.4	0.0	0.0
Carsh	2.0	1,551	70.1	9.4	14.5	1.5	4.5
Chelms	7.4	264	90.2	4.9	1.9	1.5	1.5
Colchr	5.8	113	97.3	0.0	1.8	0.0	0.9
Covnt	0.0	958	79.2	4.7	15.3	0.7	0.0
Derby	0.4	535	81.5	3.2	12.9	0.4	2.1
Donc	0.0	301	94.4	1.3	2.3	0.3	1.7
Dorset	0.1	678	96.8	0.7	0.7	0.4	1.3
Dudley	0.0	312	84.3	3.5	9.9	0.6	1.6
Exeter	0.4	958	98.4	0.5	0.4	0.2	0.4
Glouc	0.2	442	94.6	2.3	2.5	0.0	0.7
Hull	1.5	845	96.6	0.4	2.0	0.4	0.7
Ipswi	3.2	394	81.7	2.3	1.5	0.3	14.2
Kent	0.2	1,040	94.5	0.7	2.8	0.4	1.6
L Barts	0.0	2,286	36.6	22.7	31.7	1.2	7.9
L Guys	1.3	1,984	62.1	24.7	7.7	1.1	4.4
L Kings	0.0	1,085	47.9	36.2	11.1	1.8	2.9
L Rfree	1.5	2,056	48.6	22.2	21.7	1.4	6.1
L St.G	3.9	813	45.9	23.0	22.6	2.3	6.2
L West	0.0	3,320	40.2	17.8	30.0	0.9	11.1
Leeds	0.3	1,520	80.0	4.9	13.5	0.7	0.9
Leic	3.2	2,115	74.4	4.0	19.2	0.7	1.7
Liv Ain	0.9	226	96.9	1.3	0.9	0.0	0.9
Liv Roy	1.8	1,269	92.7	2.0	1.7	1.3	2.2
M RI	1.6	1,863	75.9	8.8	12.7	0.8	1.9
Middlbr	0.0	893	94.0	0.3	5.2	0.4	0.1
Newc	0.0	1,010	92.5	1.2	4.7	0.9	0.8
Norwch	0.0	741	97.3	0.7	0.8	1.1	0.1
Nottm	0.2	1,112	85.6	5.5	6.7	0.4	1.8
Oxford	4.3	1,625	82.3	4.1	9.7	0.7	3.2
Plymth	0.0	505	97.2	0.4	0.4	0.4	1.6
Ports	3.9	1,605	93.5	1.2	3.6	0.0	1.7
Prestn	0.1	1,217	85.5	0.8	13.4	0.0	0.3
Redng	3.6	750	71.9	6.0	20.0	0.4	1.7
Salford	0.0	964	81.2	1.8	15.4	0.6	1.0
Sheff	0.5	1,318	89.7	2.4	4.9	0.8	2.1
Shrew	0.0	370	93.0	1.4	4.3	0.3	1.1
Stevng	3.0	802	72.6	9.1	16.6	0.5	1.2
Sthend	0.0	246	85.4	2.8	4.9	2.0	4.9
Stoke	0.5	785	93.4	1.1	3.7	0.1	1.7
Sund	0.4	457	96.3	0.4	2.8	0.4	0.0
Truro	0.0	417	98.6	0.2	0.2	0.2	0.7
Wirral	0.0	228	96.1	0.0	3.1	0.9	0.0
Wolve	0.2	580	69.1	9.5	20.3	0.9	0.2
York	1.8	480	97.3	0.6	1.5	0.2	0.4

Table 2.10. Continued

Centre	Percentage data not available	*N* with data	Percentage in each ethnic group*				
			White	Black	S Asian	Chinese	Other
N Ireland							
Antrim	0.0	239	99.2	0.4	0.4	0.0	0.0
Belfast	3.1	749	97.9	0.4	1.3	0.3	0.1
Newry	0.0	226	99.6	0.0	0.0	0.4	0.0
Ulster	0.0	170	95.9	1.8	1.2	1.2	0.0
West NI	0.0	293	99.0	0.3	0.3	0.3	0.0
Scotland							
Abrdn	63.2	196					
Airdrie	43.1	242	98.3	0.8	0.8	0.0	0.0
D & Gall	78.5	28					
Dundee	60.6	166					
Edinb	79.8	156					
Glasgw	81.3	320					
Inverns	37.5	158	98.1	0.0	1.3	0.0	0.6
Klmarnk	59.2	126					
Krkcldy	77.3	67					
Wales							
Bangor	0.0	182	97.8	0.0	0.5	0.0	1.6
Cardff	0.7	1,601	92.8	1.1	4.7	0.7	0.7
Clwyd	0.0	185	97.3	0.5	2.2	0.0	0.0
Swanse	0.0	756	97.2	0.4	2.0	0.0	0.4
Wrexm	0.0	293	98.0	0.7	0.3	0.7	0.3
England	**1.2**	**49,469**	**75.0**	**8.3**	**13.0**	**0.7**	**3.0**
N Ireland	**1.4**	**1,677**	**98.3**	**0.5**	**0.8**	**0.4**	**0.1**
Scotland	**69.9**	**1,459**	**95.8**	**1.0**	**1.9**	**0.4**	**0.8**
Wales	**0.4**	**3,017**	**95.0**	**0.8**	**3.2**	**0.4**	**0.6**
UK	**6.7**	**55,622**	**77.3**	**7.4**	**11.8**	**0.7**	**2.7**

Percentage breakdown is not shown for centres with less than 50% data completeness, but these centres are included in national averages
*See appendix H for ethnicity coding

however, and only two years ago was 23.0%. Here, completeness of ethnicity data was highest in prevalent transplant patients (39.0%) which likely reflects improved data recording during the intensive work-up for transplantation.

In 2015, 22.7% of the prevalent UK RRT population (with ethnicity assigned) were from ethnic minorities (25.0% in England). The proportion of the prevalent UK RRT population (with ethnicity assigned) from ethnic minorities in Wales, Scotland and Northern Ireland was very small, although it should be noted that there was a high level of missing ethnicity data in Scotland as described above. The ONS estimates that approximately 14% of the UK general population is designated as belonging to an ethnic minority [1]. The relative proportion of patients reported to the UKRR as receiving RRT and belonging to an ethnic minority has increased from 14.9% in 2007 to 22.7% in 2015 which may reflect improvements in coding and reporting of ethnicity data as well as an increasing incidence of ERF and increased referral rates in these populations.

Amongst the centres with more than 50% returns there was wide variation in the proportion of patients from ethnic minorities, ranging from 0.4% in Newry to 63.4% in London St Bartholomew's.

Primary renal diagnosis

Primary renal diagnosis (PRD) is associated with patient outcomes and as it could be used for case-mix adjustment, high levels of data completeness is important. Data for PRD were not complete for 2.6% of patients (table 2.11), but there exists a marked inter-centre difference in completeness of data returns. One centre had $\geqslant$40% primary renal diagnosis data coded as uncertain and has been excluded from the between centre analysis and other analyses where PRD is included in the case-mix adjustment (Colchester, 47% uncertain PRD); the UK and national totals have been appropriately adjusted.

Table 2.11. Primary renal diagnosis in prevalent RRT patients by age and gender on 31/12/2015

Primary diagnosis*	N	% all patients	Intercentre range %	Age <65		Age ⩾65		M : F ratio
				N	%	N	%	
Aetiology uncertain	9,168	15.5	4.4–31.2	5,226	13.9	3,942	18.1	1.5
Glomerulonephritis	11,391	19.1	8.3–26.9	8,140	21.6	3,251	14.9	2.1
Pyelonephritis	6,289	10.6	5.2–18.6	4,593	12.2	1,696	7.8	1.1
Diabetes	9,913	16.7	8.9–27.7	5,830	15.5	4,083	18.7	1.6
Polycystic kidney	5,980	10.0	4.0–16.4	3,856	10.2	2,124	9.7	1.1
Hypertension	3,707	6.2	1.7–17.2	2,001	5.3	1,706	7.8	2.4
Renal vascular disease	1,760	3.0	0.5–9.7	376	1.0	1,384	6.3	2.0
Other	9,758	16.4	11.2–30.5	6,818	18.1	2,940	13.5	1.3
Not sent	1,542	2.6	0.0–24.3	864	2.3	678	3.1	1.6

*See appendix H: ERA-EDTA coding
Excluded centre: ⩾40% primary renal diagnosis aetiology uncertain (Colchr)

The percentage of patients with uncertain aetiology for the remaining 69 centres providing individual-level data ranged between 4.4% and 31.2%, which is comparable to recent years. No centre had >30% missing data in 2015 and overall rates of incomplete data are improving.

As observed in previous years, glomerulonephritis (GN) was the most common primary renal diagnosis in the 2015 prevalent cohort at 19.1% (table 2.11). Diabetic nephropathy accounted for 16.7% of renal disease in prevalent patients on RRT, although it was more common in the 65 and over year age group compared to the younger group (18.7% vs 15.5%). This contrasted with incident patients where diabetic nephropathy was the predominant diagnostic code in 27.5% of new RRT patients. The frequency of individual primary renal diagnoses varied with age; patients aged under 65 years and younger were more likely to have GN (21.5%) or diabetes (15.5%) and less likely to have renal vascular disease (1.0%) as the cause of their renal failure. This contrasts with older patients (⩾65 years) among whom 6.3% have renal vascular disease as the cause of their renal failure. Uncertain aetiology was a more common cause in this age group than amongst younger patients (18.1% compared with 13.9% amongst patients <65 years).

As described in previous years, the male : female ratio was greater than 1 : 1 for all primary renal diagnoses (table 2.11). The biggest differences between males and females were for GN (male : female ratio of 2.1), hypertension (2.4) and renal vascular disease (2.0).

Trends in the transplant : dialysis ratio by primary diagnosis differed markedly between older and younger patients. In individuals aged less than 65 years, the renal transplantation to dialysis ratio was greater than 1 in all PRD groups except diabetic nephropathy and renal vascular disease. In those aged ⩾65 years, dialysis was more prevalent than renal transplantation in all PRD groups except polycystic kidney disease (PKD) (table 2.12).

Diabetes

Throughout this section the term 'diabetic nephropathy' is used to denote patients in whom diabetes mellitus is considered to be the primary cause of the kidney disease rather than merely an associated comorbidity. It includes all prevalent patients with type 1 or type 2 diabetes as the primary renal diagnosis (ERA-EDTA coding). This analysis did not differentiate between type 1 and type 2 diabetes as this distinction was not made in the data submitted by most centres.

The number of prevalent patients with diabetic nephropathy has increased steadily over the last number

Table 2.12. Transplant : dialysis ratios by age and primary renal disease in the prevalent RRT population on 31/12/2015

Primary diagnosis*	Transplant : dialysis ratio	
	<65	⩾65
Aetiology uncertain	2.1	0.4
Glomerulonephritis	2.4	0.9
Pyelonephritis	2.9	0.6
Diabetes	0.9	0.2
Polycystic kidney	3.1	1.8
Hypertension	1.4	0.4
Renal vascular disease	0.9	0.1
Other	2.1	0.4
Not sent	0.8	0.1

*appendix H ERA-EDTA coding
Excluded centre: ⩾40% primary renal diagnosis aetiology uncertain (Colchr)

Table 2.13. Age relationships in patients with diabetes and patients without diabetes and modality in prevalent RRT patients on 31/12/2015

	Patients with diabetes[a]	Patients without diabetes[b]
N	9,913	48,054
M : F ratio	1.63	1.54
Median age on 31/12/15	62	58
Median age at start of RRT[c,d]	56	48
Median years on RRT[d]	3.6	7.3
% HD	58	37
% PD	8	5
% transplant	34	58

Excluded centre: ⩾40% primary renal diagnosis aetiology uncertain (Colchr)
[a]Patients with diabetes: patients with a primary renal disease code of diabetes
[b]Patients without diabetes: all patients excluding patients with diabetes as a PRD and patients with a missing primary renal disease code
[c]Median age at start of RRT was calculated from the most recent RRT start date
[d]Patients with an initial treatment modality of transferred in or transferred out were excluded from the calculation of median age at start of RRT and median years on RRT, since their treatment start date was not accurately known

Table 2.14. Treatment modalities by age and diabetes status on 31/12/2015

	<65		⩾65	
	Diabetes[a]	All other causes[b]	Diabetes[a]	All other causes[b]
N	5,830	31,011	4,083	17,043
% HD	44.7	25.8	77.7	56.0
% PD	7.3	4.3	8.3	7.6
% transplant	48.1	69.9	14.0	36.4

Excluded centre: ⩾40% PRD aetiology uncertain (Colchr)
[a]Patients with diabetes: patients with a primary renal disease code of diabetes
[b]Patients without diabetes: calculated as all patients excluding patients with diabetes as a PRD and patients with a missing primary renal disease code

of years and grew by 4.8% to 9,913 in 2015, from 9,456 in 2014, representing 17.1% of all prevalent patients (compared with 13.5% in 2006) (table 2.13). The male : female ratio for diabetic nephropathy was 1.6. The median age at start of RRT for patients with diabetic nephropathy (56 years) was eight years higher than those with other PRDs (48 years), although the median age at the end of 2015 for prevalent patients with diabetic nephropathy was only four years higher than for individuals without diabetic nephropathy. This reflects reduced survival for patients with diabetes compared with patients without diabetes on RRT. This is also supported by the lower median time on RRT for patients with diabetic nephropathy (3.6 years vs 7.3 years for those without diabetic nephropathy) and this difference in survival has not changed over the last five years (3.4 years vs 6.5 years in 2010). The age at starting RRT in those with diabetic nephropathy was four years younger in Scotland compared with the UK average (data not shown).

There were large differences in the distribution of treatment modalities in those with diabetic nephropathy compared with those without. Fifty eight percent of patients with diabetic nephropathy were undergoing HD compared with just 37% of patients with any other primary renal diagnosis (table 2.13). The percentage of patients with a functioning transplant was much lower in prevalent patients with diabetic nephropathy than in prevalent patients without (34% vs 58%). However, the proportion of patients with diabetic nephropathy with a functioning transplant has increased since 2005 when only 26.9% of patients with diabetic nephropathy had a functioning transplant. For older patients with diabetic nephropathy (age ⩾65 years), only 14.0% had a functioning transplant compared with 48.1% of their peers with other primary diagnoses (table 2.14). In the UK, 34.0% of prevalent patients with diabetic nephropathy had a functioning transplant compared with the UK average of 58.0% amongst those with other primary diagnoses. Amongst those patients receiving dialysis, a higher proportion of prevalent patients without diabetic nephropathy (18.0%) were on home dialysis therapies (home HD and PD) compared with prevalent patients with diabetic nephropathy (13.8%).

Modalities of treatment

Transplantation was the most common treatment modality (53.1%) for prevalent RRT patients in 2015, followed closely by centre-based HD (39.0%) in either hospital centre (17.8%) or satellite unit (21.2%) (figure 2.6). Satellite HD was again more prevalent than in-centre HD, a trend first noted in 2012. Home therapies made up the remaining 7.9% of treatment therapies, largely PD in its different formats (5.9%) which followed a similar pattern since 2012. The proportion on continuous ambulatory peritoneal dialysis (CAPD) and automated PD (APD) was 2.5% and 3.4% respectively, although the proportion on APD may be an underestimate due to centre level coding issues which meant the UKRR could not always distinguish between these therapies.

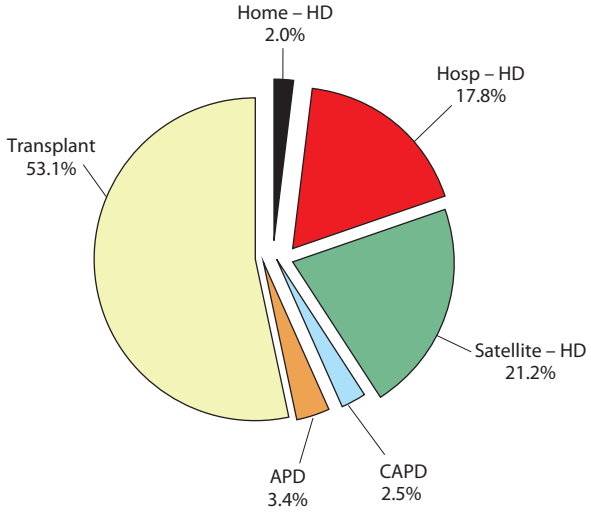

Fig. 2.6. Treatment modality in prevalent RRT patients on 31/12/2015

As described earlier, treatment modality was related to patient age. Younger patients (age <65 years), were more likely to have a functioning transplant (65.8%) when compared with patients aged 65 and over (31.3%) (table 2.15). HD was the principal modality in the older patient group (60.9%).

Figure 2.7 shows the distribution of RRT modalities by age group. From the age of 45 years onwards, transplant prevalence declined as HD prevalence increased. The proportion of each age group treated by PD remained relatively stable.

As the HD prevalence varied by age group, the proportion of prevalent dialysis patients receiving HD varied between centres ranging from 68.1% in Carlisle to 100% in Colchester (table 2.16).

Of the dialysis population, 45.2% received their treatment at a satellite haemodialysis unit in 2015. This figure remains comparable to recent years, but represents an increase from 39.9% in 2010. In 2015, the number of centres that had more than 50% of their haemodialysis activity taking place in satellite units was 27 (figure 2.8). Although there are satellite units in Scotland, the data provided for 2015 did not distinguish between main centre and satellite unit haemodialysis. As such, it is difficult to accurately assess access to satellite haemodialysis across the UK as a whole, so the statistics pool only England, Wales and Northern Ireland data.

There was also wide variation between centres in the proportion of dialysis patients being managed with APD, ranging from 0.0% to 24.2% (table 2.16). While

Table 2.15. Percentage of prevalent RRT patients by dialysis and transplant modality by UK country on 31/12/2015

	<65 years				≥65 years			
UK country	*N*	% HD	% PD	% transplant	*N*	% HD	% PD	% transplant
England	31,541	29.8	4.9	65.2	18,505	61.0	8.0	31.0
N Ireland	1,068	21.2	3.6	75.3	633	62.7	7.3	30.0
Scotland	3,293	28.6	4.1	67.3	1,560	62.8	5.6	31.6
Wales	1,834	25.5	6.2	68.3	1,195	56.4	8.4	35.2
UK	**37,736**	**29.3**	**4.9**	**65.8**	**21,893**	**60.9**	**7.8**	**31.3**

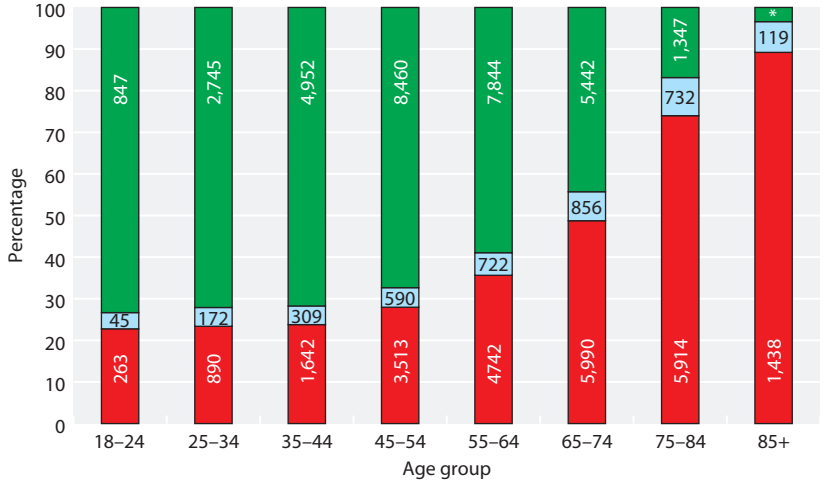

Fig. 2.7. Treatment modality distribution by age in prevalent RRT patients on 31/12/2015
*$N = 55$

Table 2.16. Percentage of prevalent dialysis patients by dialysis modality and centre on 31/12/2015

		% haemodialysis					% peritoneal dialysis	
Centre	**N**	Total	Home	Geo-HDD[c]	Hospital	Satellite	CAPD	APD
England								
B Heart	471	89.2	2.8	2.7	80.5	5.9	4.7	6.2
B QEH	1,149	87.6	4.4	3.7	12.1	71.2	4.1	8.3
Basldn	198	82.3	0.5	1.0	64.7	17.2	7.6	10.1
Bradfd	251	92.8	2.8	3.5	74.5	15.5	2.8	4.4
Brightn	501	86.6	9.0	9.5	35.5	42.1	9.6	3.8
Bristol	582	90.2	3.8	2.9	17.9	68.6	5.0	4.8
Carlis	119	68.1	0.0	0.0	47.9	20.2	12.6	17.7
Carsh	930	87.9	3.1	3.5	19.1	65.6	2.6	9.6
Chelms	171	84.2	0.0	0.6	84.2	0.0	8.8	7.0
Colchr	120	100.0	0.0	0.0	100.0	0.0	0.0	0.0
Covnt	440	80.5	3.6	3.4	76.8	0.0	19.1	0.2
Derby	324	75.9	11.7	10.7	64.2	0.0	16.4	7.7
Donc	204	88.7	4.9	7.1	44.6	39.2	1.0	10.3
Dorset	332	87.1	2.1	3.3	19.3	65.7	3.6	8.7
Dudley	229	75.1	5.7	8.0	43.7	25.8	15.7	8.7
Exeter	516	84.3	1.0	1.0	10.3	73.1	5.8	9.9
Glouc	265	86.0	1.9	3.0	64.5	19.6	3.4	10.6
Hull	434	82.5	1.8	2.5	41.5	39.2	10.6	6.9
Ipswi	181	79.0	0.0	0.0	68.5	10.5	8.8	12.2
Kent	484	87.6	3.3	3.9	25.4	58.9	10.3	2.1
L Barts	1,214	83.0	1.9	1.7	35.3	45.8	1.8	15.2
L Guys	709	95.4	6.9	3.4	11.9	76.6	2.0	2.7
L Kings	656	86.3	1.8	3.0	16.9	67.5	5.8	7.9
L Rfree	867	82.2	2.4	2.8	2.2	77.6	6.5	11.3
L St.G	388	87.4	1.0	1.8	36.6	49.7	4.1	7.0
L West	1,516	95.3	1.2	1.2	20.6	73.6	2.6	2.1
Leeds	570	89.8	4.0	3.6	15.6	70.2	1.6	8.6
Leic	1,025	89.5	5.9	5.6	17.7	66.0	3.1	7.4
Liv Ain	213	82.2	4.7	7.4	10.3	67.1	1.9	16.0
Liv Roy	451	85.1	8.2	6.7	34.6	42.4	6.9	8.0
M RI	591	89.0	8.5	7.6	27.6	53.0	4.4	6.6
Middlbr	375	94.1	4.0	4.2	25.9	64.3	5.9	0.0
Newc	361	87.3	6.7	6.1	74.8	5.8	1.9	10.8
Norwch	376	89.9	6.7	6.6	51.1	32.2	9.8	0.3
Nottm	470	82.6	6.2	7.0	38.1	38.3	7.0	10.4
Oxford	533	82.4	3.6	2.9	30.2	48.6	3.9	13.7
Plymth	172	79.7	4.1	4.2	66.3	9.3	8.1	12.2
Ports	739	90.3	7.6	7.2	18.9	63.7	9.7	0.0
Prestn	626	91.5	6.4	6.5	20.5	64.7	1.6	6.9
Redng	368	82.1	1.4	2.6	38.9	41.9	13.0	4.6
Salford	483	82.4	3.1	4.1	24.2	55.1	6.2	11.4
Sheff	601	90.2	7.2	6.6	36.6	46.4	9.8	0.0
Shrew	235	86.4	9.8	11.5	42.1	34.5	5.5	8.1
Stevng	525	97.0	4.4	4.4	26.3	66.3	2.9	0.0
Sthend	143	88.1	1.4	2.1	86.7	0.0	11.9	0.0
Stoke	409	81.7	8.1	7.2	48.9	24.7	2.4	10.0
Sund	239	92.5	0.8	1.3	68.2	23.4	4.2	3.4
Truro	183	88.0	5.5	5.5	39.9	42.6	5.5	6.6
Wirral	206	90.8	5.8	6.3	37.9	47.1	1.5	7.8
Wolve	397	80.1	5.8	6.9	43.8	30.5	7.3	11.1
York	189	84.7	5.8	5.4	32.8	46.0	4.8	10.6

Table 2.16. Continued

Centre	N	% haemodialysis					% peritoneal dialysis	
		Total	Home	Geo-HDD[c]	Hospital	Satellite	CAPD	APD
N Ireland								
Antrim	142	85.9	1.4	2.8	84.5	0.0	0.7	13.4
Belfast	207	88.4	4.4	2.9	84.1	0.0	1.0	10.6
Newry	110	80.0	2.7	2.9	77.3	0.0	0.9	19.1
Ulster	113	94.7	1.8	2.6	92.9	0.0	0.0	5.3
West NI	135	91.1	3.0	2.9	88.2	0.0	0.0	8.2
Scotland								
Abrdn	244	89.4	2.1	2.0	87.3	0.0	6.6	4.1
Airdrie	211	92.4	0.0	1.4	92.4	0.0	2.4	5.2
D & Gall	65	83.1	4.6	4.7	78.5	0.0	13.9	3.1
Dundee	204	91.7	1.0	1.0	90.7	0.0	5.9	2.5
Edinb	311	91.3	1.9	2.2	89.4	0.0	2.6	6.1
Glasgw	660	91.7	3.9	3.4	87.7	0.0	1.8	6.5
Inverns	106	87.7	2.8	3.7	84.9	0.0	6.6	5.7
Klmarnk	173	78.6	5.8	5.2	72.8	0.0	1.2	20.2
Krkcldy	170	88.2	0.0	0.0	88.2	0.0	1.2	10.6
Wales								
Bangor	99	84.9	15.2	17.1	51.5	18.2	7.1	8.1
Cardff	576	86.3	4.9	4.7	12.7	68.8	9.7	4.0
Clwyd	104	80.8	6.7	4.0	74.0	0.0	4.8	14.4
Swanse	427	85.5	8.4	8.5	44.3	32.8	7.7	6.8
Wrexm	149	75.2	3.4	2.8	58.4	13.4	0.7	24.2
England	**23,731**	**87.3**	**4.3**		**32.2**	**50.8**	**5.6**	**7.0**
N Ireland[a]	**707**	**88.1**	**2.8**		**85.3**	**0.0**	**0.6**	**11.2**
Scotland[b]	**2,144**	**89.7**	**2.6**		**87.1**	**0.0**	**3.4**	**7.0**
Wales	**1,355**	**84.3**	**6.7**		**35.2**	**42.4**	**7.5**	**8.2**
UK	**27,937**	**87.3**	**4.2**		**37.9**	**45.2**	**5.4**	**7.2**

[a]There are no satellite units in Northern Ireland
[b]All haemodialysis patients in Scotland are shown as receiving treatment at home or in centre as no data was available regarding satellite dialysis
[c]Geo-HHD: home haemodialysis presented by the centre closest to the patient's home postcode rather than the centre returning the data to the UKRR

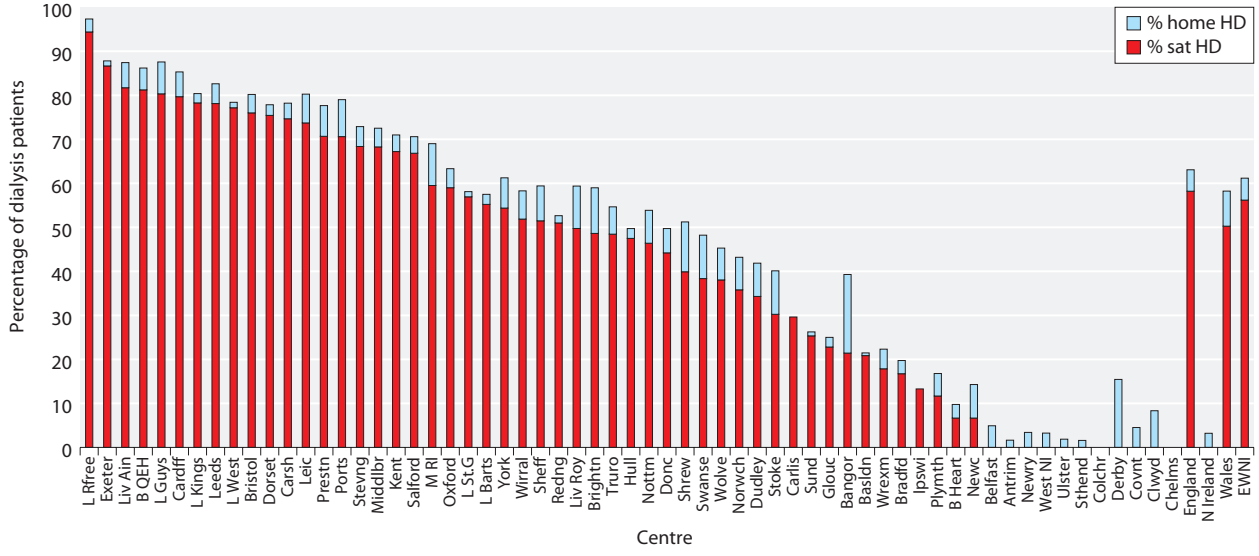

Fig. 2.8. Percentage of prevalent haemodialysis patients treated with satellite or home haemodialysis by centre on 31/12/2015
*Scottish centres excluded as information on satellite HD was not available. No centres in Northern Ireland have satellite dialysis units

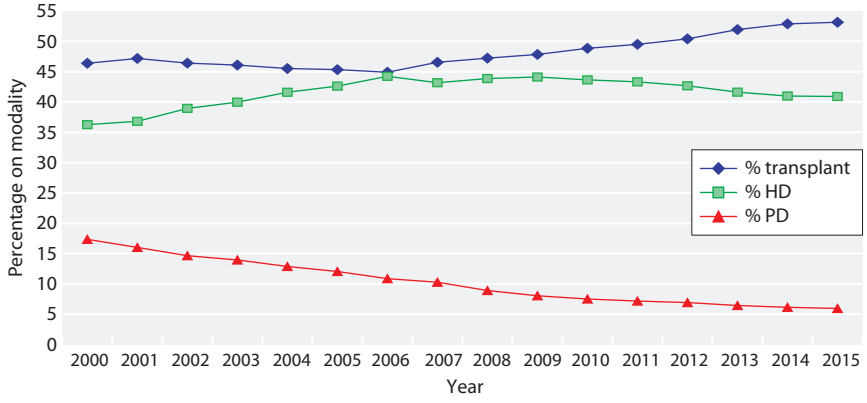

Fig. 2.9. Modality changes in prevalent RRT patients from 2000–2015

in Northern Ireland nearly all PD patients were on APD, across the UK six of the 69 centres with a PD programme did not report having any patients on APD.

Home haemodialysis

In 2015, the percentage of dialysis patients receiving home HD varied from 0% in six centres, to greater than 5% in 23 centres (table 2.16). In the UK, the overall percentage of dialysis patients receiving home haemodialysis has increased from 2.9% in 2010 to 4.2% in 2015.

The proportion of dialysis patients receiving home haemodialysis was greatest in Wales at 6.7%, compared with 2.8% in Northern Ireland, 4.3% in England and 2.6% in Scotland (figure 2.8, table 2.16). By comparison, in 2007, the proportion of patients receiving home haemodialysis was 2% in each of the four UK countries. More recently, thirty-five renal centres across the UK had an increase in the proportion of individuals on home haemodialysis compared with 2014.

Some patients are sent by their parent renal centre to centres known to have a strong programme for home HD. In order to avoid the possibility of the parent renal centre being wrongly penalised, the proportion of patients on home HD was measured by centre, by assigning the patients to a given centre based on the patient postcode, rather than to the centre that returned the data to the UKRR (table 2.16 – Geo-HHD). This showed an increase in the prevalence of >1% of the home HD for some centres (Doncaster, Dorset, Dudley, Gloucester, London Kings, Liverpool Aintree, Reading, Shrewsbury, Wolverhampton, Antrim, Airdrie and Bangor).

Change in modality

The relative proportion of RRT modalities in prevalent patients has changed dramatically over the past 16 years. The main features are depicted in figure 2.9, which describes a year on year decline in the proportion of patients treated by PD since 2000 and a drop of 6.1% over the last 10 years. The absolute number of patients on PD decreased from 4,471 patients in 2005 to 3,545 patients in 2015. Time on PD has decreased over the last six years, from a median of 2.0 years in 2007 to 1.6 years in 2015 probably reflecting increased transplantation rates in this largely younger patient group and reducing technique survival rates. The percentage of patients undergoing PD for more than seven years was only 8.6%.

The proportion of all RRT patients being treated with HD has fallen slightly since 2009 from 44.1% to 40.9% though this still represents an increase in absolute numbers on HD (from 21,671 to 25,024) as well as an increase in HD prevalence (from 354 to 384 pmp).

The proportion of patients with a functioning transplant has been increasing since 2007 (46.5%) to 53.1% in 2015. This probably reflects both an increasing number of incident transplants (2,218 adults and children in 2007 [2] to 3,174 in 2015) as well as increasing survival of prevalent transplant patients.

Figure 2.10 depicts in more detail the modality changes in the prevalent dialysis population during this time. The data show a clear reduction in patients treated by CAPD over time and an increase in satellite HD coupled with a reduction in hospital HD.

International comparisons

There are marked differences in RRT prevalence between countries (figure 2.11). RRT prevalence in Northern European countries (including the UK), Australia and New Zealand was lower than in Southern Europe which was lower than the USA and Canada.

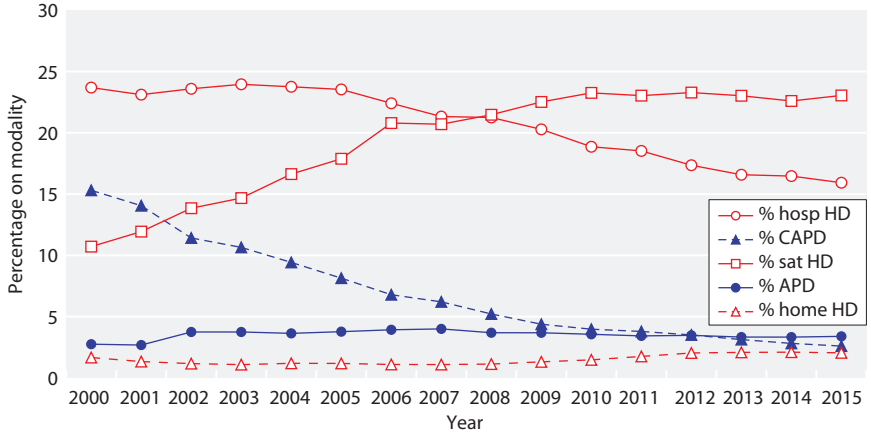

Fig. 2.10. Detailed dialysis modality changes in prevalent RRT patients from 2000–2015
*Scottish centres excluded as information on satellite HD was not available

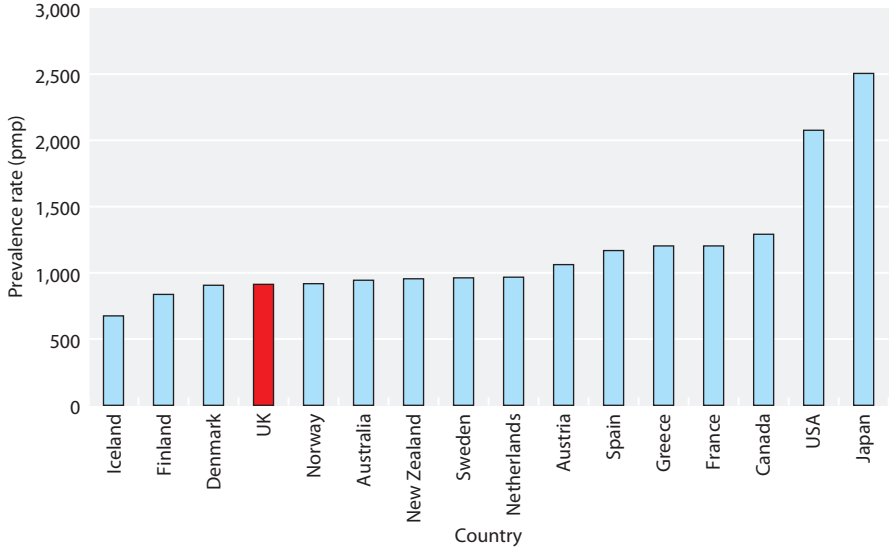

Fig. 2.11. RRT Prevalence (pmp) by country in 2014
Non-UK data from USRDS available at https://www.usrds.org/2016/view/v2_13.aspx
The UK data include paediatric patients to correspond with the data from the other countries.
All rates unadjusted. Japan is dialysis only. Data for France include 22 regions. Data for Spain include 18 of 19 regions. Data for Canada excludes Quebec.

Identifying the source of these differences is complicated by differences in healthcare systems, patient registry coverage and definitions (for example, data from Japan only includes dialysis), approaches to conservative care and incidence rates in these countries.

Discussion

The proportion of adults undergoing RRT continued to grow across all countries in the UK and there was an increase of 4% on 2014 in the UK as a whole.

Whilst half of all patients on RRT continued to be aged 40–64 years, the prevalent population is becoming more elderly with 16% of patients being over 75 years compared to 15.1% in 2010. This is most noticeable in transplant patients where 31% of over 65 year old patients had a working transplant in 2015 compared to 23.7% in 2010.

The proportion of patients using peritoneal dialysis has been falling since the early 1990s and was just 6% in 2015.

There were large variations in RRT prevalence between CCG/HB across the UK. This variation will largely be determined by the number of patients needing RRT but also by the clinical care delivered by renal centres. Many factors unrelated to clinical care will also have contributed to these differences such as geography, local population density, age distribution, ethnic composition, prevalence of diseases predisposing to kidney disease and the social deprivation index of that population. Comparisons with previous years was hindered somewhat by changes in the lower super output areas (LSOAs) 'covered' by each CCG as well as the combining of CCGs (in 2015 Gateshead CCG, Newcastle North and East CCG and Newcastle West CCG merged).

The percentage of CCG/HB areas with prevalence ratios as expected for the age and gender distribution of each area has increased over the last five years with fewer areas having higher than expected ratios. The reorganisations seen in healthcare areas over this same time period make interpretation of this finding more difficult. There remained large variations in the numbers of patients receiving RRT in each health area in the UK and the effects of centralising specialist commissioning arrangements in England on this variation will be seen in subsequent years.

Acknowledgement

The (non-UK) data reported in the section on International comparisons have been supplied by the United States Renal Data System (USRDS). The interpretation and reporting of these data are the responsibility of the author(s) and in no way should be seen as an official policy or interpretation of the U.S. government.

Conflicts of interest: the authors declare no conflicts of interest

References

1 Office for National Statistics. www.statistics.gov.uk
2 Webb, L., et al., UK Renal Registry 13th Annual Report: Chapter 3 Demographic and biochemistry profile of kidney transplant recipients in the UK in 2009: national and centre-specific analyses. Nephron Clin Pract. 2011; 119 (suppl 2): c53–84. doi: 10.1159/000331745

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UK Renal Registry 19th Annual Report: Chapter 3 Demographic and Biochemistry Profile of Kidney Transplant Recipients in the UK in 2015: National and Centre-specific Analyses

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Keywords

Blood pressure · Bone metabolism · Chronic kidney disease · Clinical Commissioning Group · Deceased donor · eGFR · Epidemiology · Ethnicity · Graft function · Haemoglobin · Live donor · Outcomes · Renal transplantation · Survival

Summary

- There was a 1% fall in overall renal transplant numbers in 2015, with a fall in kidney donation from donors after brainstem death (6%) and from living donors (5%).
- In 2015, death-censored renal transplant failure rates in prevalent patients were similar to previous years at 2.7% per annum. Transplant patient death rates were similar at 2.5 per 100 patient years.
- The median age of incident and prevalent renal transplant patients in the UK was 50.9 and 53.8 years respectively.
- The median eGFR of prevalent renal transplant recipients was 51.8 ml/min/1.73 m^2.
- The median eGFR of patients one year after transplantation was 57.5 ml/min/1.73 m^2 post live transplant, 53.7 ml/min/1.73 m^2 post brainstem death transplant and 50.4 ml/min/1.73 m^2 post circulatory death transplant.
- In 2015, 13.3% of prevalent transplant patients had eGFR <30 ml/min/1.73 m^2.
- The median decline in eGFR slope beyond the first year after transplantation was -0.56 ml/min/1.73 m^2/year.
- In 2015, infection (24%) and malignancy (22%) remained the commonest causes of death in patients with a functioning renal transplant.

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Introduction

This chapter includes independent analyses regarding renal transplant activity and survival data from the UK Transplant Registry, held by the Organ Donation and Transplantation Directorate (ODT) of NHS Blood and Transplant (NHSBT). The UK Renal Registry (UKRR) has performed additional analyses of renal transplant recipient follow-up data examining demographics, clinical and biochemical variables. NHSBT records all information regarding the episode of transplantation (donor and recipient details) and the UKRR holds additional information on key clinical and biochemical variables in renal transplant recipients. The co-operation between these two organisations results in a comprehensive database describing the clinical care delivered to renal transplant patients within the UK. This allows for the comparison of key quality measures between centres and provides insight into the processes involved in the care of such patients in the UK.

This chapter is divided into six sections: (1) transplant activity, waiting list and survival data; (2) transplant demographics; (3) clinical and laboratory outcomes; (4) analysis of prevalent patients by chronic kidney disease (CKD) stage; (5) eGFR slope analysis; and (6) cause of death in transplant recipients. Methodology, results and a discussion of these analyses are provided in detail for all six sections separately.

The UK Renal Registry methodology has previously been described [1]. The UKRR collects quarterly clinical data via an electronic data extraction process from hospital based renal IT systems on all patients receiving renal replacement therapy. Throughout the chapter, the number preceding the centre name in each figure indicates the percentage of missing data for that centre for that variable.

Unless otherwise specified, prevalent transplant patients were defined as patients with a functioning renal transplant on the 31st December 2015.

A list of the Renal Association recommended audit measures which are relevant to the transplant population are given in appendix 1 of this chapter. Several of the audit measures are not currently reported by the UKRR in the annual report; the reasons behind this are varied, but predominantly relate to a high proportion of incomplete data or that the relevant variable is not currently within the specified UKRR dataset. Over time it is hoped to work with the renal community to improve reporting across the range of recommended standards.

Transplant activity, waiting list activity and survival data

Introduction

NHSBT prospectively collects donor and recipient data at the time of transplantation. They also request that transplant centres provide an annual paper based data return on the status of the recipient including graft function. This enables ODT to generate comprehensive analyses of renal transplant activity and graft survival statistics.

NHSBT attributes a patient to the centre that performed the transplant operation irrespective of where the patient was cared for before or after the procedure and hence only reports on transplant centre performance.

Methods

In 2015, there were 23 UK adult renal transplant centres, 19 in England, two in Scotland and one each in Northern Ireland and Wales.

Annual organ-specific updates and five-year reports with comprehensive data concerning the number of patients on the transplant waiting list, percentage of pre-emptive listing, the number of transplants performed, the number of deceased kidney donors (donor after brainstem death and donor after circulatory death), living kidney donors, patient survival and graft survival are available on the NHSBT website (https://www.organdonation.nhs.uk/statistics/)

Results

During 2015, 3,174 kidney or kidney plus transplants were performed (table 3.1). The absolute number of living kidney donors showed a small decline in 2015, but still represented 32.9% of all transplants performed. Compared to the relative fall observed in 2014, there was recovery in the number of donor after circulatory death (DCD) transplants (+12%), whereas the number of deceased brainstem death donors did not increase. The number of kidney plus other organ transplants has not changed.

There were small differences in one- and five-year risk adjusted patient and graft survival rates amongst UK kidney transplant centres (table 3.2). These graft survival rates include grafts with primary non-function, which are excluded from analysis by some registries.

Using data from the UKRR on prevalent renal transplant patients on 1st January 2015, the death rate during 2015 was 2.5 per 100 patient years (CI 2.3–2.7) when censored for return to dialysis, and 2.7 per 100 patient years (CI 2.5–2.9) without censoring for dialysis. These death rates were similar to those observed over the last five years and have not shown any impact from the increasing age or comorbidity of the transplanted cohort.

Table 3.1. UK kidney and kidney plus other organ transplant numbers in the UK (including paediatric), 1/1/2013–31/12/2015

Organ	2013	2014	2015	% change 2014–2015
Donor after brainstem death[a]	1,160	1,205	1,130	−6
Donor after circulatory death[b]	794	713	802	12
Living donor kidney	1,104	1,097	1,044	−5
Kidney and liver[c]	11	12	21	
Kidney and heart	1	1	0	
Kidney and pancreas[d]	190	171	175	2
Kidney and lung	0	1	0	
Small bowel (inc kidney)	1	1	2	
Total kidney transplants	**3,261**	**3,201**	**3,174**	**−1**

[a]Includes en bloc kidney transplants (4 in 2013, 3 in 2014, 4 in 2015) and double kidney transplants (18 in 2013, 22 in 2014, 15 in 2015)
[b]Includes en bloc kidney transplants (6 in 2013, 4 in 2014, 8 in 2015) and double kidney transplants (53 in 2013, 51 in 2014, 31 in 2015)
[c]Includes DCD transplants (2 in 2013)
[d]Includes DCD transplants (36 in 2013, 47 in 2014, 50 in 2015)

Table 3.2. Risk-adjusted first adult kidney transplant only, graft and patient survival percentage rates for UK centres*

	Deceased donor 1 year survival		Deceased donor 5 year survival		Living kidney donor 1 year survival		Living kidney donor 5 year survival	
Centre	Graft	Patient	Graft	Patient	Graft	Patient	Graft	Patient
B QEH	92	97	83	90	96	99	93	95
Belfast	98	92	91	87	96	100	93	100
Bristol	94	94	83	87	97	100	96	95
Camb	94	96	85	90	99	99	97	96
Cardff	96	96	88	89	96	99	86	97
Covnt	89	92	87	86	99	100	90	96
Edin	95	97	82	85	95	99	89	93
Glasgw	93	96	90	90	95	99	94	95
L Barts	89	90	86	85	95	99	92	94
L Guys	93	98	85	90	98	99	93	96
L Rfree	93	96	90	93	98	100	98	98
L St.G	94	97	89	95	98	99	93	95
L West	96	98	85	92	96	99	87	96
Leeds	94	97	86	88	95	99	90	96
Leic	93	99	83	81	97	97	91	96
Liv Roy	91	93	87	88	97	98	85	95
M RI	96	96	89	90	99	98	96	95
Newc	95	96	82	86	99	100	93	95
Nottm	96	97	82	81	100	100	92	94
Oxford	93	96	89	90	96	99	96	93
Plymth	87	94	85	90	97	100	89	96
Ports	95	94	84	86	100	99	88	93
Sheff	95	94	85	94	99	100	96	98
All centres	**94**	**96**	**86**	**89**	**97**	**99**	**92**	**95**

Cohorts for survival rate estimation: 1 year survival: 1/4/2010 – 31/03/2014; 5 year survival: 1/4/2006 – 31/03/2010; first grafts only – re-grafts excluded for patient survival estimation. Since the cohorts to estimate 1- and 5-year survival are different, some centres may appear to have 5 year survival better than 1 year survival
*Information courtesy of NHSBT: number of transplants, patients and 95% CI for each estimate; statistical methodology for computing risk-adjusted estimates can be obtained from the NHSBT website (see http://odt.nhs.uk/pdf/organ_specific_report_kidney_2015.pdf)

During 2015, 2.7% of prevalent transplant patients experienced graft failure (excluding death as a cause of graft failure), which was a slight increase on the rate in 2014 (2.4%), and above the mean rate for 2009–2014 (2.5%).

Discussion

During 2015, there was a 1% reduction in overall kidney transplant numbers, with a fall in the number of living kidney donors. The number of deceased donor transplants remained stable, whilst there was an increase in deceased cardiac death kidney transplants compared to 2014. The graft failure rate of 2.7% per annum and the patient death rate of 2.5 per 100 patient years are similar to previous years, despite the changes in donor and recipient populations.

Transplant demographics

Introduction

Since 2008, all UK renal centres have established electronic linkage to the UKRR or Scottish Renal Registry, giving the UKRR complete coverage of individual patient level data across the UK.

The following sections should be interpreted in the context of centre-specific variations in repatriation policies; some transplant centres continue to follow up and report on all patients they transplant, whereas others refer patients back to non-transplanting centres at some point post-transplant. Some transplant centres only refer back patients when their graft is failing. The time post-transplantation that a patient is referred back to their local centre varies between transplant centres, but the UKRR can detect duplicate patients (being reported from both transplant and referring centres) and in such situations care is usually attributed to the referring centre (see appendix B for allocation procedure). This process may result in some discrepancies in transplant numbers particularly in Oxford/Reading and Clywd/Liverpool Royal.

Methods

Cambridge renal centre (Addenbrooke's) was unable to submit the 2015 data at patient level on time for the end of 2015 UKRR data collection. The centre was able to submit summary numbers of patients still on renal replacement therapy (RRT) at the end of 2015, by treatment modality, and incident numbers. Cambridge renal centre is therefore excluded from all centre level prevalent analysis. However their data have been included in the transplant rates calculation in England and UK, where only summary numbers are needed. For the calculation of transplant rates by Clinical Commissioning Groups (CCG) or Health Board/Social Care Areas (HB), where patient-level information are needed for age/gender standardisation, Cambridge data from 2014 were used instead, which will cause a slight underestimation of the rates. Those CCGs that are at least in part covered by Addenbrooke's were identified using 2014 data and they are flagged in table 3.4 (in CCGs where between 10–70% of the RRT population was seen in Addenbrooke's, rates are shown but the CCG is flagged, while for the two CCGs where most patients (>70%) are thought to be seen in Addenbrooke's, rates have been blanked as they would represent mainly 2014 data.

As Colchester did not have any transplant patients they were excluded from some of the analyses, though their dialysis patients were included in the relevant dialysis population denominators. Also, this year Bangor directly submitted its data on transplant patients (previously submitted mainly by Liverpool Royal) and it is therefore now included separately in centre analyses.

For the analysis of primary renal diagnosis (PRD) in transplant recipients, a few centres were excluded from some of the incidence years because of concerns relating to the reliability of PRD coding (with these centres submitting a high percentage of uncertain or missing aetiology codes).

Information on patient demographics (age, gender, ethnicity and PRD) for patients in a given renal centre was obtained from UKRR patient registration data fields. Individual patients were assigned to the centre that returned data for them during 2015. The prevalence of transplant patients in areas covered by individual CCG or HB was estimated based on the postcode of the registered address for patients on RRT. Data on ethnic origin, supplied as Patient Administration System (PAS) codes, were retrieved from fields within renal centre IT systems. For the purpose of this analysis, patients were grouped into White, South Asian, Black, Other and Unknown categories. The details of ethnicity regrouping into the above categories are provided in appendix H: Coding https://www.renalreg.org/publications-reports/.

Results and Discussion

Prevalent transplant numbers across the UK are described in table 3.3.

Table 3.3. The prevalence per million population (pmp) of renal transplants in adults in the UK on 31/12/2015, by country

	England	N Ireland	Scotland	Wales	UK
Number of prevalent transplant patients	27,246	994	2,709	1,675	32,624
Total population, mid-2015 estimates* (millions)	54.8	1.9	5.4	3.1	65.1
Prevalence transplant rate (pmp)	497	537	504	540	501

*Data from the Office of National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census

Table 3.4. The prevalence per million population (pmp) of patients with a renal transplant and standardised rate ratio in the UK, as on 31st December 2011–2015, by CCG/HB

CCG/HB – CCG in England, Health and Social Care Areas in Northern Ireland, Local Health Boards in Wales and Health Boards in Scotland
O/E – age and gender standardised transplant prevalence rate ratio
LCL – lower 95% confidence limit
UCL – upper 95% confidence limit
pmp – per million population
CCG/HBs with significantly high average rate ratios are bold in greyed areas
CCG/HBs with significantly low average rate ratios are italicised in greyed areas
Mid-2015 population data at CCG/HB level was obtained from the Office for National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census
% non-White – percentage of the CCG/HB population that is non-White, from 2011 Census
*CCGs where at least 10% of the RRT population was seen in Cambridge renal centre. In these CCGs the rate is underestimated. In the CCGs with >70% RRT population covered by Cambridge, the rates for 2015 have been blanked (see methods for details)

UK area	CCG/HB	Total population	O/E				2015				
			2011	2012	2013	2014	O/E	95% LCL	95% UCL	Crude rate pmp	% non-White
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	196,500	0.87	0.88	0.88	0.87	0.88	0.72	1.07	478	3.7
	NHS South Cheshire	178,900	0.89	0.87	0.91	0.97	0.99	0.80	1.21	520	2.9
	NHS Vale Royal	102,900	0.69	0.72	0.75	0.73	0.77	0.57	1.04	408	2.1
	NHS Warrington	207,700	0.87	0.89	0.97	0.94	0.89	0.73	1.09	462	4.1
	NHS West Cheshire	231,000	0.95	0.94	0.94	0.95	0.87	0.72	1.05	455	2.8
	NHS Wirral	*320,900*	*0.86*	*0.81*	*0.78*	*0.75*	*0.74*	*0.62*	*0.88*	*383*	*3.0*
Durham, Darlington and Tees	NHS Darlington	105,400	0.95	0.92	0.96	0.99	0.96	0.73	1.26	493	3.8
	NHS Durham Dales, Easington and Sedgefield	274,000	1.05	1.02	1.04	1.09	1.04	0.89	1.22	555	1.2
	NHS Hartlepool and Stockton-on-Tees	287,300	1.03	1.03	1.01	1.02	1.01	0.86	1.18	508	4.4
	NHS North Durham	*245,700*	*0.95*	*0.93*	*0.89*	*0.85*	*0.82*	*0.68*	*1.00*	*423*	*2.5*
	NHS South Tees	**274,800**	**1.38**	**1.35**	**1.27**	**1.25**	**1.22**	**1.05**	**1.42**	**608**	**6.7**
Greater Manchester	**NHS Bolton**	**281,600**	**1.26**	**1.28**	**1.23**	**1.21**	**1.27**	**1.09**	**1.47**	**621**	**18.1**
	NHS Bury	187,900	1.00	1.01	0.96	1.00	1.05	0.86	1.27	527	10.8
	NHS Central Manchester	**188,900**	**1.06**	**1.07**	**1.12**	**1.18**	**1.29**	**1.05**	**1.58**	**487**	**48.0**
	NHS Heywood, Middleton & Rochdale	214,200	1.09	1.10	1.09	0.95	1.01	0.83	1.22	490	18.3
	NHS North Manchester	178,700	0.85	0.91	0.95	0.95	0.99	0.79	1.25	414	30.8
	NHS Oldham	230,800	1.04	1.01	1.07	1.02	1.07	0.89	1.28	507	22.5
	NHS Salford	245,600	0.95	1.03	0.97	1.00	1.02	0.85	1.22	476	9.9
	NHS South Manchester	162,700	0.82	0.87	0.86	0.90	0.92	0.72	1.17	399	19.6
	NHS Stockport	288,700	0.97	0.95	0.94	0.92	0.94	0.80	1.11	485	7.9
	NHS Tameside and Glossop	254,900	1.10	1.06	1.03	1.06	1.04	0.88	1.23	534	8.2
	NHS Trafford	233,300	0.85	0.88	0.90	0.94	0.96	0.80	1.16	480	14.5
	NHS Wigan Borough	322,000	1.05	1.07	1.10	1.06	1.02	0.88	1.19	534	2.7
Lancashire	NHS Blackburn with Darwen	146,800	0.97	0.99	1.01	1.06	1.07	0.86	1.35	504	30.8
	NHS Blackpool	139,600	0.83	0.93	1.04	1.05	1.03	0.82	1.29	537	3.3
	NHS Chorley and South Ribble	172,500	0.95	0.90	0.94	0.95	0.97	0.79	1.20	510	2.9
	NHS East Lancashire	374,200	1.08	1.04	1.05	1.03	1.04	0.91	1.20	532	11.9
	NHS Fylde & Wyre	167,900	0.82	0.85	0.84	0.80	0.87	0.70	1.08	476	2.1
	NHS Greater Preston	202,800	0.81	0.88	0.85	0.86	0.87	0.70	1.07	424	14.7
	NHS Lancashire North	*161,500*	*0.84*	*0.80*	*0.77*	*0.77*	*0.77*	*0.60*	*0.99*	*384*	*4.0*
	NHS West Lancashire	112,700	0.86	0.88	0.84	0.81	0.84	0.63	1.11	435	1.9
Merseyside	NHS Halton	126,500	1.00	1.04	0.99	1.02	1.01	0.79	1.28	514	2.2
	NHS Knowsley	147,200	0.97	0.97	0.97	0.91	0.89	0.69	1.13	441	2.8
	NHS Liverpool	478,600	0.95	0.95	0.98	0.98	0.94	0.82	1.08	443	11.1
	NHS South Sefton	158,600	0.91	0.95	0.91	0.89	0.87	0.69	1.09	454	2.2
	NHS Southport and Formby	*115,100*	*0.72*	*0.63*	*0.73*	*0.69*	*0.70*	*0.52*	*0.94*	*374*	*3.1*
	NHS St Helens	177,600	0.85	0.82	0.85	0.92	0.89	0.72	1.11	467	2.0

Table 3.4. Continued

UK area	CCG/HB	Total population	O/E				2015				
			2011	2012	2013	2014	O/E	95% LCL	95% UCL	Crude rate pmp	% non-White
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	504,100	0.94	0.92	0.93	0.91	0.92	0.82	1.04	508	1.5
	NHS Newcastle Gateshead	493,900	1.04	1.00	0.96	0.94	0.91	0.80	1.04	431	10.1
	NHS North Tyneside	202,500	1.41	1.35	1.26	1.13	1.12	0.93	1.34	588	3.4
	NHS Northumberland	315,300	0.97	0.93	0.93	0.92	0.86	0.73	1.01	476	1.6
	NHS South Tyneside	148,700	1.19	1.15	1.17	1.02	0.95	0.76	1.19	498	4.1
	NHS Sunderland	277,200	1.14	1.14	1.12	1.07	1.01	0.85	1.18	520	4.1
North Yorkshire and Humber	NHS East Riding of Yorkshire	315,100	0.93	0.93	1.00	0.96	0.93	0.80	1.09	517	1.9
	NHS Hambleton, Richmondshire and Whitby	151,800	0.75	0.73	0.78	0.91	0.88	0.70	1.10	481	2.7
	NHS Harrogate and Rural District	157,000	1.12	1.20	1.13	1.12	1.13	0.92	1.38	605	3.7
	NHS Hull	259,000	1.02	1.04	1.05	1.03	1.09	0.92	1.29	517	5.9
	NHS North East Lincolnshire	159,600	0.99	1.00	0.99	0.92	0.94	0.75	1.18	476	2.6
	NHS North Lincolnshire	*169,800*	*0.67*	*0.65*	*0.64*	*0.69*	*0.69*	*0.54*	*0.89*	*365*	*4.0*
	NHS Scarborough and Ryedale	110,700	1.10	1.04	0.93	0.93	0.94	0.73	1.22	515	2.5
	NHS Vale of York	355,400	1.00	1.07	1.07	1.07	1.06	0.92	1.23	543	4.0
South Yorkshire and Bassetlaw	NHS Barnsley	239,300	0.95	0.93	0.91	0.96	0.96	0.80	1.15	501	2.1
	NHS Bassetlaw	114,500	0.73	0.69	0.66	0.71	0.79	0.60	1.05	428	2.6
	NHS Doncaster	304,800	0.91	0.91	0.87	0.90	0.93	0.79	1.09	472	4.7
	NHS Rotherham	260,800	1.04	1.04	1.04	1.08	1.04	0.88	1.23	537	6.4
	NHS Sheffield	569,700	1.00	0.98	0.98	0.96	0.94	0.83	1.06	435	16.3
West Yorkshire	NHS Airedale, Wharfedale and Craven	159,300	1.03	1.02	1.00	0.97	1.02	0.83	1.26	534	11.1
	NHS Bradford City	**83,900**	**1.31**	**1.53**	**1.62**	**1.59**	**1.82**	**1.40**	**2.37**	**668**	**72.2**
	NHS Bradford Districts	**337,700**	**1.24**	**1.30**	**1.32**	**1.29**	**1.31**	**1.14**	**1.50**	**607**	**28.7**
	NHS Calderdale	208,400	1.19	1.21	1.12	1.03	1.01	0.84	1.22	523	10.3
	NHS Greater Huddersfield	243,800	1.06	1.07	1.04	1.06	1.08	0.91	1.28	541	17.4
	NHS Leeds North	200,800	1.07	1.04	0.98	1.01	1.03	0.85	1.25	518	17.4
	NHS Leeds South and East	249,700	1.01	1.01	1.05	0.98	0.99	0.83	1.20	449	18.3
	NHS Leeds West	323,600	0.92	1.01	1.05	1.10	1.07	0.92	1.26	482	10.8
	NHS North Kirklees	**190,500**	**1.23**	**1.18**	**1.29**	**1.37**	**1.38**	**1.16**	**1.64**	**661**	**25.3**
	NHS Wakefield	*333,800*	*0.85*	*0.85*	*0.84*	*0.83*	*0.82*	*0.69*	*0.96*	*425*	*4.6*
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	448,800	1.04	1.05	1.01	1.07	1.08	0.95	1.23	495	22.2
	NHS Herefordshire	*188,100*	*0.70*	*0.71*	*0.68*	*0.68*	*0.73*	*0.58*	*0.92*	*393*	*1.8*
	NHS Redditch and Bromsgrove	*180,500*	*0.79*	*0.83*	*0.79*	*0.81*	*0.78*	*0.62*	*0.98*	*410*	*6.0*
	NHS South Warwickshire	261,500	0.95	1.02	1.00	0.98	0.99	0.83	1.17	516	7.0
	NHS South Worcestershire	*298,600*	*0.81*	*0.79*	*0.79*	*0.78*	*0.74*	*0.62*	*0.88*	*392*	*3.7*
	NHS Warwickshire North	189,100	1.07	1.01	0.98	0.92	0.91	0.74	1.12	476	6.5
	NHS Wyre Forest	*99,500*	*0.80*	*0.80*	*0.83*	*0.74*	*0.69*	*0.50*	*0.95*	*372*	*2.8*
Birmingham and the Black Country	NHS Birmingham CrossCity	740,800	1.03	1.04	1.04	1.07	1.08	0.97	1.20	472	35.2
	NHS Birmingham South and Central	202,300	1.06	0.98	1.07	1.13	1.11	0.91	1.36	470	40.4
	NHS Dudley	*316,500*	*0.74*	*0.66*	*0.69*	*0.69*	*0.72*	*0.60*	*0.87*	*367*	*10.0*
	NHS Sandwell and West Birmingham	487,700	0.98	0.99	1.08	1.03	1.03	0.91	1.18	457	45.3
	NHS Solihull	*210,400*	*0.76*	*0.77*	*0.74*	*0.76*	*0.75*	*0.60*	*0.93*	*385*	*10.9*
	NHS Walsall	276,100	1.07	1.06	1.10	1.12	1.07	0.91	1.26	514	21.1
	NHS Wolverhampton	254,400	0.76	0.78	0.88	0.88	0.84	0.69	1.02	401	32.0

Table 3.4. Continued

UK area	CCG/HB	Total population	O/E 2011	O/E 2012	O/E 2013	O/E 2014	2015 O/E	2015 95% LCL	2015 95% UCL	2015 Crude rate pmp	% non-White
Derbyshire and Nottingham-shire	NHS Erewash	96,300	0.65	0.64	0.80	0.85	0.81	0.59	1.10	415	3.2
	NHS Hardwick	*110,500*	*0.66*	*0.62*	*0.54*	*0.60*	*0.64*	*0.47*	*0.88*	*344*	*1.8*
	NHS Mansfield & Ashfield	196,400	0.98	1.05	1.04	1.04	0.98	0.81	1.19	509	2.5
	NHS Newark & Sherwood	118,700	1.09	1.15	1.16	1.16	1.10	0.87	1.39	590	2.4
	NHS North Derbyshire	*272,900*	*0.78*	*0.84*	*0.78*	*0.74*	*0.75*	*0.62*	*0.90*	*410*	*2.5*
	NHS Nottingham City	318,900	0.93	0.96	0.98	0.96	0.99	0.84	1.18	417	28.5
	NHS Nottingham North & East	149,500	0.90	0.91	0.91	0.80	0.81	0.63	1.03	421	6.2
	NHS Nottingham West	112,300	1.04	1.01	1.04	1.05	1.09	0.85	1.39	570	7.3
	NHS Rushcliffe	114,500	0.88	0.87	0.94	0.86	0.78	0.59	1.04	411	6.9
	NHS Southern Derbyshire	523,800	0.93	0.94	0.96	0.95	0.97	0.85	1.09	487	11.0
East Anglia	*NHS Cambridgeshire and Peterborough**	*876,400*	*0.97*	*0.95*	*0.94*	*0.94*	*0.90*	*0.82*	*1.00*	*447*	*9.5*
	NHS Great Yarmouth & Waveney	214,800	0.78	0.80	0.93	0.98	1.01	0.84	1.21	531	2.7
	NHS Ipswich and East Suffolk*	399,500	0.88	0.84	0.90	0.88	0.91	0.79	1.05	478	5.6
	NHS North Norfolk	170,600	0.93	0.82	1.01	0.91	0.93	0.75	1.14	522	1.5
	NHS Norwich	198,200	0.77	0.72	0.89	0.90	0.93	0.76	1.15	444	7.3
	NHS South Norfolk*	243,400	0.85	0.84	0.98	0.95	0.98	0.82	1.16	518	2.6
	*NHS West Norfolk**	*174,100*	*0.82*	*0.86*	*0.83*	*0.85*					*2.6*
	*NHS West Suffolk**	*226,300*	*0.92*	*0.95*	*0.91*	*0.87*					*4.6*
Essex	NHS Basildon and Brentwood	257,800	0.95	0.92	1.03	0.91	0.89	0.74	1.06	442	7.1
	NHS Castle Point, Rayleigh and Rochford	174,300	0.85	0.82	0.88	0.98	0.90	0.72	1.11	482	3.0
	NHS Mid Essex*	385,700	1.00	0.92	0.98	0.94	0.93	0.80	1.07	485	4.4
	NHS North East Essex*	325,100	0.94	0.92	0.94	0.99	0.95	0.81	1.11	483	5.5
	NHS Southend	178,700	0.83	0.89	0.96	0.97	0.92	0.74	1.14	464	8.4
	NHS Thurrock	165,200	0.86	0.83	0.81	0.81	0.80	0.62	1.02	381	14.1
	NHS West Essex*	300,200	0.86	0.89	0.85	0.88	0.87	0.73	1.03	440	8.2
Hertfordshire and the South Midlands	NHS Bedfordshire*	440,300	1.00	1.08	1.04	1.06	1.01	0.88	1.15	513	11.2
	NHS Corby	66,900	0.87	0.80	0.74	0.68	0.89	0.62	1.28	434	4.5
	NHS East and North Hertfordshire*	559,100	0.94	0.97	0.97	0.99	0.97	0.86	1.09	478	10.4
	NHS Herts Valleys	588,200	1.00	0.98	0.99	1.01	1.03	0.92	1.16	508	14.6
	NHS Luton*	**214,700**	**1.14**	**1.22**	**1.24**	**1.33**	**1.42**	**1.20**	**1.68**	**619**	**45.3**
	NHS Milton Keynes	267,800	1.02	1.04	0.98	1.06	1.11	0.94	1.30	534	19.6
	NHS Nene	640,000	0.97	0.91	0.90	0.95	0.95	0.85	1.06	483	9.1
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	325,900	0.91	0.89	0.88	0.92	0.90	0.77	1.05	476	9.8
	NHS Leicester City	**342,600**	**1.49**	**1.49**	**1.54**	**1.62**	**1.64**	**1.44**	**1.86**	**706**	**49.5**
	NHS Lincolnshire East	232,000	0.85	0.84	0.85	0.85	0.84	0.70	1.02	465	2.0
	NHS Lincolnshire West	*234,300*	*0.84*	*0.81*	*0.83*	*0.83*	*0.76*	*0.62*	*0.93*	*384*	*3.0*
	*NHS South Lincolnshire**	*146,000*	*0.65*	*0.67*	*0.63*	*0.70*	*0.69*	*0.53*	*0.90*	*370*	*2.3*
	NHS South West Lincolnshire	*124,300*	*0.74*	*0.73*	*0.71*	*0.71*	*0.69*	*0.51*	*0.92*	*370*	*2.3*
	NHS West Leicestershire	387,500	1.05	1.03	1.02	1.00	1.00	0.88	1.15	519	6.9
Shropshire and Staffordshire	*NHS Cannock Chase*	*134,900*	*0.76*	*0.72*	*0.74*	*0.70*	*0.65*	*0.49*	*0.87*	*341*	*2.4*
	NHS East Staffordshire	*125,700*	*0.59*	*0.56*	*0.66*	*0.61*	*0.66*	*0.49*	*0.89*	*342*	*9.0*
	NHS North Staffordshire	216,700	0.90	0.92	0.94	0.88	0.90	0.74	1.09	480	3.5
	NHS Shropshire	*311,400*	*0.83*	*0.76*	*0.72*	*0.71*	*0.75*	*0.63*	*0.89*	*408*	*2.0*
	NHS South East Staffs and Seisdon and Peninsular	224,800	0.89	0.82	0.85	0.87	0.86	0.71	1.05	463	3.6
	NHS Stafford and Surrounds	152,200	0.87	0.88	0.90	0.92	0.93	0.75	1.17	506	4.7
	NHS Stoke on Trent	259,900	1.00	1.02	0.96	0.96	0.93	0.78	1.12	458	11.0
	NHS Telford & Wrekin	*171,200*	*0.71*	*0.66*	*0.72*	*0.70*	*0.77*	*0.61*	*0.98*	*386*	*7.3*

Table 3.4. Continued

UK area	CCG/HB	Total population	O/E				2015				
			2011	2012	2013	2014	O/E	95% LCL	95% UCL	Crude rate pmp	% non-White
London	NHS Barking & Dagenham	202,000	1.07	1.04	1.12	1.15	1.18	0.96	1.43	485	41.7
	NHS Barnet	**379,700**	**1.29**	**1.41**	**1.39**	**1.36**	**1.37**	**1.21**	**1.56**	**637**	**35.9**
	NHS Camden	241,100	1.10	1.11	1.07	1.02	1.02	0.85	1.23	465	33.7
	NHS City and Hackney	277,800	0.80	0.83	0.87	0.95	1.01	0.85	1.21	432	44.6
	NHS Enfield	**328,400**	**1.37**	**1.45**	**1.40**	**1.45**	**1.50**	**1.32**	**1.71**	**685**	**39.0**
	NHS Haringey	**272,900**	**1.16**	**1.20**	**1.22**	**1.27**	**1.36**	**1.17**	**1.58**	**619**	**39.5**
	NHS Havering	249,100	0.80	0.78	0.84	0.78	0.83	0.68	1.01	405	12.3
	NHS Islington	**227,700**	**1.19**	**1.23**	**1.21**	**1.25**	**1.27**	**1.07**	**1.51**	**558**	**31.8**
	NHS Newham	**332,800**	**0.85**	**0.95**	**1.05**	**1.16**	**1.18**	**1.01**	**1.38**	**487**	**71.0**
	NHS Redbridge	**296,800**	**1.13**	**1.20**	**1.18**	**1.27**	**1.27**	**1.09**	**1.47**	**569**	**57.5**
	NHS Tower Hamlets	295,200	0.77	0.83	0.82	0.91	0.91	0.75	1.10	362	54.8
	NHS Waltham Forest	**271,200**	**1.10**	**1.10**	**1.15**	**1.26**	**1.35**	**1.16**	**1.57**	**608**	**47.8**
	NHS Brent	**324,000**	**1.55**	**1.59**	**1.63**	**1.62**	**1.68**	**1.48**	**1.90**	**772**	**63.7**
	NHS Central London (Westminster)	174,100	1.05	1.06	1.03	1.10	1.15	0.94	1.40	563	36.2
	NHS Ealing	**343,100**	**1.55**	**1.55**	**1.52**	**1.59**	**1.60**	**1.41**	**1.81**	**746**	**51.0**
	NHS Hammersmith and Fulham	179,400	1.13	1.14	1.13	1.13	1.11	0.91	1.36	513	31.9
	NHS Harrow	**247,100**	**1.72**	**1.70**	**1.61**	**1.65**	**1.66**	**1.44**	**1.91**	**793**	**57.8**
	NHS Hillingdon	**297,700**	**1.48**	**1.49**	**1.42**	**1.48**	**1.42**	**1.23**	**1.63**	**648**	**39.4**
	NHS Hounslow	**268,800**	**1.23**	**1.20**	**1.29**	**1.34**	**1.39**	**1.20**	**1.61**	**644**	**48.6**
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	225,900	1.13	1.07	1.04	1.06	1.01	0.84	1.22	496	33.4
	NHS Bexley	**242,100**	**1.28**	**1.25**	**1.27**	**1.22**	**1.30**	**1.10**	**1.52**	**624**	**18.1**
	NHS Bromley	324,900	1.14	1.15	1.13	1.10	1.11	0.96	1.28	551	15.7
	NHS Croydon	379,000	0.90	0.89	0.93	0.93	0.97	0.83	1.12	456	44.9
	NHS Greenwich	**274,800**	**1.02**	**1.07**	**1.11**	**1.26**	**1.30**	**1.11**	**1.52**	**582**	**37.5**
	NHS Kingston	173,500	1.01	1.06	1.02	1.02	1.04	0.84	1.29	490	25.5
	NHS Lambeth	324,400	0.94	1.02	1.07	1.11	1.15	0.99	1.34	512	42.9
	NHS Lewisham	297,300	0.91	0.90	1.03	1.06	1.14	0.98	1.34	518	46.5
	NHS Merton	204,600	1.08	1.15	1.17	1.19	1.19	0.99	1.43	562	35.1
	NHS Richmond	194,700	0.79	0.84	0.85	0.85	0.82	0.66	1.02	411	14.0
	NHS Southwark	**308,900**	**1.27**	**1.36**	**1.39**	**1.44**	**1.42**	**1.24**	**1.64**	**635**	**45.8**
	NHS Sutton	200,100	1.09	1.12	1.09	1.02	1.02	0.84	1.24	500	21.4
	NHS Wandsworth	314,500	0.95	0.98	1.00	1.06	1.07	0.91	1.26	477	28.6
Bath, Gloucestershire, Swindon and Wiltshire	*NHS Bath and North East Somerset*	*184,900*	*0.68*	*0.66*	*0.75*	*0.80*	*0.77*	*0.61*	*0.98*	*373*	*5.4*
	NHS Gloucestershire	*617,200*	*0.92*	*0.86*	*0.90*	*0.85*	*0.85*	*0.76*	*0.96*	*446*	*4.6*
	NHS Swindon	222,800	1.01	0.99	1.00	1.03	1.10	0.92	1.31	552	10.0
	NHS Wiltshire	*486,100*	*0.89*	*0.89*	*0.84*	*0.86*	*0.86*	*0.75*	*0.98*	*451*	*3.4*
Bristol, North Somerset, Somerset and South Gloucestershire	**NHS Bristol**	**449,300**	**1.26**	**1.27**	**1.25**	**1.24**	**1.23**	**1.08**	**1.39**	**543**	**16.0**
	NHS North Somerset	209,900	1.07	1.08	1.07	1.01	1.00	0.83	1.20	529	2.7
	NHS Somerset	*545,400*	*0.95*	*0.91*	*0.89*	*0.86*	*0.84*	*0.74*	*0.95*	*446*	*2.0*
	NHS South Gloucestershire	274,700	1.13	1.09	1.08	1.05	1.04	0.88	1.22	528	5.0

Table 3.4. Continued

UK area	CCG/HB	Total population	O/E 2011	O/E 2012	O/E 2013	O/E 2014	2015 O/E	2015 95% LCL	2015 95% UCL	2015 Crude rate pmp	% non-White
Devon, Cornwall and Isles of Scilly	NHS Kernow	551,700	1.13	1.16	1.12	1.09	1.08	0.97	1.21	584	1.8
	NHS North, East, West Devon	890,600	1.04	1.04	1.04	1.01	1.00	0.91	1.09	513	3.0
	NHS South Devon and Torbay	278,600	1.16	1.11	1.14	1.13	1.08	0.92	1.25	589	2.1
Kent and Medway	NHS Ashford	124,300	1.15	1.21	1.13	1.15	1.12	0.88	1.41	563	6.3
	NHS Canterbury and Coastal	207,700	1.10	1.18	1.13	1.17	1.10	0.92	1.33	539	5.9
	NHS Dartford, Gravesham and Swanley	**258,200**	**1.18**	**1.16**	**1.15**	**1.18**	**1.21**	**1.03**	**1.41**	**596**	**13.0**
	NHS Medway	276,500	0.97	0.96	0.98	0.94	0.91	0.76	1.09	445	10.4
	NHS South Kent Coast	205,500	0.84	0.85	0.86	0.92	0.90	0.74	1.10	482	4.5
	NHS Swale	**112,500**	**1.32**	**1.34**	**1.38**	**1.33**	**1.30**	**1.04**	**1.64**	**658**	**3.8**
	NHS Thanet	139,800	1.06	1.19	1.20	1.18	1.21	0.98	1.49	615	4.5
	NHS West Kent	*476,800*	*0.88*	*0.89*	*0.88*	*0.87*	*0.86*	*0.75*	*0.98*	*438*	*4.9*
Surrey and Sussex	NHS Brighton & Hove	285,300	0.90	0.88	0.84	0.84	0.88	0.73	1.05	414	10.9
	NHS Coastal West Sussex	495,000	1.01	0.95	0.96	0.94	0.93	0.82	1.06	495	3.8
	NHS Crawley	*110,900*	*0.75*	*0.76*	*0.71*	*0.70*	*0.65*	*0.46*	*0.91*	*307*	*20.1*
	NHS East Surrey	*182,000*	*0.83*	*0.80*	*0.80*	*0.74*	*0.75*	*0.59*	*0.94*	*379*	*8.3*
	NHS Eastbourne, Hailsham and Seaford	*188,100*	*0.77*	*0.75*	*0.75*	*0.73*	*0.73*	*0.57*	*0.92*	*377*	*4.4*
	NHS Guildford and Waverley	*206,100*	*0.65*	*0.71*	*0.70*	*0.71*	*0.70*	*0.56*	*0.89*	*344*	*7.2*
	NHS Hastings & Rother	*184,400*	*0.84*	*0.78*	*0.77*	*0.79*	*0.76*	*0.61*	*0.95*	*407*	*4.6*
	NHS High Weald Lewes Havens	*171,600*	*0.76*	*0.85*	*0.79*	*0.79*	*0.73*	*0.58*	*0.93*	*396*	*3.1*
	NHS Horsham and Mid Sussex	*230,300*	*0.74*	*0.72*	*0.73*	*0.80*	*0.82*	*0.67*	*1.00*	*425*	*4.9*
	NHS North West Surrey	343,000	1.02	1.02	1.00	0.98	0.97	0.83	1.12	490	12.5
	NHS Surrey Downs	287,000	0.96	0.91	0.91	0.91	0.91	0.77	1.08	474	9.1
	NHS Surrey Heath	95,900	1.20	1.21	1.06	0.93	0.90	0.67	1.21	469	9.3
Thames Valley	NHS Aylesbury Vale	207,000	1.22	1.22	1.16	1.13	1.10	0.91	1.31	560	9.7
	NHS Bracknell and Ascot	137,000	1.08	1.06	1.05	0.99	0.95	0.74	1.21	474	9.5
	NHS Chiltern	324,000	1.00	1.06	1.04	0.99	0.99	0.85	1.16	503	15.8
	NHS Newbury and District	106,400	1.33	1.29	1.22	1.14	1.04	0.80	1.34	536	4.4
	NHS North & West Reading	100,300	0.99	1.01	1.05	1.00	0.95	0.72	1.26	488	10.4
	NHS Oxfordshire	663,600	1.06	1.08	1.05	1.08	1.08	0.97	1.20	530	9.3
	NHS Slough	**145,700**	**1.62**	**1.63**	**1.83**	**1.84**	**1.93**	**1.61**	**2.30**	**844**	**54.3**
	NHS South Reading	**111,000**	**1.39**	**1.29**	**1.31**	**1.36**	**1.46**	**1.15**	**1.85**	**621**	**30.5**
	NHS Windsor, Ascot and Maidenhead	**141,400**	**1.08**	**1.21**	**1.25**	**1.29**	**1.26**	**1.02**	**1.55**	**623**	**14.7**
	NHS Wokingham	160,400	1.00	1.00	0.97	0.98	0.97	0.78	1.21	499	11.6
Wessex	*NHS Dorset*	*765,700*	*0.96*	*0.90*	*0.86*	*0.86*	*0.85*	*0.76*	*0.94*	*445*	*4.0*
	NHS Fareham and Gosport	199,500	0.99	0.93	1.02	1.01	0.99	0.81	1.20	516	3.4
	NHS Isle of Wight	*139,400*	*0.77*	*0.74*	*0.64*	*0.63*	*0.69*	*0.53*	*0.90*	*380*	*2.7*
	NHS North East Hampshire and Farnham	209,200	0.84	0.85	0.86	0.88	0.89	0.73	1.09	449	9.7
	NHS North Hampshire	220,800	0.86	0.86	0.83	0.82	0.85	0.70	1.04	439	6.4
	NHS Portsmouth	211,800	1.01	0.98	0.98	0.92	0.87	0.71	1.08	397	11.6
	NHS South Eastern Hampshire	211,900	0.98	1.00	0.96	1.02	1.00	0.83	1.21	529	3.1
	NHS Southampton	249,500	1.02	1.06	1.08	1.10	1.10	0.92	1.32	485	14.1
	NHS West Hampshire	*554,900*	*0.99*	*0.95*	*0.92*	*0.90*	*0.87*	*0.77*	*0.99*	*460*	*3.9*
Wales	*Betsi Cadwaladr University*	*694,500*	*0.88*	*0.82*	*0.73*	*0.72*	*0.85*	*0.76*	*0.95*	*446*	*2.5*
	Powys Teaching	*132,600*	*0.95*	*0.80*	*0.78*	*0.76*	*0.73*	*0.56*	*0.96*	*407*	*1.6*
	Hywel Dda	383,200	1.08	1.00	1.06	1.00	0.95	0.83	1.10	504	2.2
	Abertawe Bro Morgannwg University	**525,500**	**1.32**	**1.32**	**1.29**	**1.25**	**1.20**	**1.08**	**1.34**	**613**	**3.9**
	Cwm Taf	**296,700**	**1.62**	**1.59**	**1.60**	**1.50**	**1.43**	**1.25**	**1.63**	**721**	**2.6**
	Aneurin Bevan	**581,800**	**1.27**	**1.34**	**1.28**	**1.23**	**1.18**	**1.07**	**1.31**	**608**	**3.9**
	Cardiff and Vale University	**484,800**	**1.22**	**1.24**	**1.19**	**1.13**	**1.14**	**1.01**	**1.28**	**532**	**12.2**

Table 3.4. Continued

UK area	CCG/HB	Total population	O/E 2011	O/E 2012	O/E 2013	O/E 2014	2015 O/E	2015 95% LCL	2015 95% UCL	2015 Crude rate pmp	% non-White
Scotland	Ayrshire and Arran	370,600	0.95	0.96	0.96	0.97	0.96	0.84	1.11	521	1.2
	Borders	114,000	1.03	1.10	1.04	1.00	0.95	0.74	1.22	535	1.3
	Dumfries and Galloway	149,700	0.93	0.88	0.82	0.84	0.86	0.68	1.09	481	1.2
	Fife	*368,100*	*0.87*	*0.87*	*0.87*	*0.85*	*0.84*	*0.72*	*0.98*	*443*	*2.4*
	Forth Valley	302,700	0.85	0.87	0.87	0.92	0.93	0.79	1.09	489	2.2
	Grampian	587,800	0.91	0.91	0.92	0.88	0.91	0.81	1.02	468	4.0
	Greater Glasgow and Clyde	**1,149,900**	**1.09**	**1.15**	**1.16**	**1.16**	**1.14**	**1.06**	**1.23**	**576**	**7.3**
	Highland	321,000	1.11	1.05	1.03	1.02	1.02	0.88	1.18	564	1.3
	Lanarkshire	654,500	1.04	1.06	1.03	1.07	1.04	0.94	1.16	547	2.0
	Lothian	*867,800*	*0.90*	*0.87*	*0.84*	*0.85*	*0.84*	*0.76*	*0.93*	*419*	*5.6*
	Orkney	21,700	0.84	0.79	0.74	0.52	0.50	0.22	1.10	277	0.7
	Shetland	23,200	0.51	0.58	0.54	0.51	0.48	0.22	1.08	259	1.5
	Tayside	415,000	1.00	0.96	0.94	0.90	0.90	0.78	1.03	465	3.2
	Western Isles	27,100	0.75	0.71	0.66	0.62	0.59	0.31	1.13	332	0.9
Northern Ireland	**Belfast**	**353,800**	**1.10**	**1.14**	**1.13**	**1.18**	**1.19**	**1.04**	**1.37**	**557**	**3.2**
	Northern	471,200	0.95	0.93	0.94	0.99	1.01	0.89	1.15	501	1.2
	Southern	373,000	0.89	0.96	0.96	1.02	1.12	0.97	1.29	528	1.2
	South Eastern	354,700	0.96	0.92	0.92	0.96	1.00	0.87	1.16	505	1.3
	Western	**299,000**	**0.92**	**0.89**	**1.02**	**1.15**	**1.20**	**1.03**	**1.39**	**582**	**1.0**

The prevalence of renal transplant recipients in each CCG in England, Northern Ireland (Health and Social Care Trust Areas), Scotland (Health Boards) and Wales (Local Health Boards) and the proportion of prevalent patients according to modality in the renal centres across the UK are described in tables 3.4 and 3.5 respectively.

After standardisation for age and gender, unexplained variability was evident in the prevalence of renal transplant recipients, with some areas having higher than the predicted number of prevalent transplant patients per million population and others lower. There are a number of potential explanations for these inconsistencies, including geographical differences in access to renal transplantation in the UK. This has previously been analysed in detail by the UKRR [2] and is currently the focus of a large national study (access to Transplant and Transplant Outcome Measures (ATTOM)) [3].

The proportion of prevalent RRT patients with a transplant relative to the number on dialysis has gradually risen over the last decade.

Age and gender

The gender ratio amongst incident and prevalent kidney transplant patients has remained stable for at least the last ten years (table 3.6, figure 3.1). The median age of incident transplant recipients has increased during the same time period, which reflects changes to the renal replacement therapy population. This is mirrored by an increase in the median age of the prevalent population, which reflects the increase in age at which patients are transplanted, the increase access to transplantation for older recipients, as well as improved survival after kidney transplantation over the last 10 years.

Primary renal diagnosis

The primary renal diagnosis of patients receiving a kidney transplant in the UK has remained relatively stable over the last five years (table 3.7).

Ethnicity

The ethnicity of those receiving a kidney transplant between 2010 and 2015 is shown in table 3.8. A comparison of the proportion of patients within each ethnic group receiving a transplant to those commencing dialysis from the same group is difficult because data on ethnicity were missing, or there was a high proportion with ethnicity classified as 'missing'. This is a particular issue in Scotland, where ethnicity reporting is not mandatory. Analysis isolated to the remainder of the

Table 3.5. Distribution of prevalent patients on RRT by centre and modality on 31/12/2015

Centre	*N*	% HD	% PD	% transplant
Transplant centres				
B QEH	2,254	45	6	49
Belfast	773	24	3	73
Bristol	1,477	36	4	61
Camb[a]	1,539	38	3	59
Cardff	1,613	31	5	64
Covnt	958	37	9	54
Edinb	773	37	3	60
Glasgw	1,715	35	3	62
L Barts	2,286	44	9	47
L Guys	2,011	34	2	65
L Rfree	2,088	34	7	58
L St.G[b]	845	40	6	54
L West	3,320	44	2	54
Leeds	1,524	34	4	63
Leic	2,186	42	5	53
Liv Roy	1,292	30	5	65
M RI[b]	1,896	28	3	69
Newc	1,010	31	5	64
Nottm	1,114	35	7	58
Oxford[b]	1,697	26	6	69
Plymth	505	27	7	66
Ports	1,671	40	4	56
Sheff[b]	1,390	43	5	53
Dialysis centres				
Abrdn	532	41	5	54
Airdrie	425	46	4	50
Antrim	239	51	8	41
B Heart	657	64	8	28
Bangor	182	46	8	46
Basldn	275	59	13	28
Bradfd	581	40	3	57
Brightn	952	46	7	47
Carlis	281	29	14	58
Carsh	1,582	52	7	41
Chelms	285	51	9	40
Clwyd	185	45	11	44
Colchr	120	100		
D & Gall	130	42	8	50
Derby[b]	537	45	15	40
Donc	301	60	8	32
Dorset	679	43	6	51
Dudley	312	55	18	27
Dundee	421	44	4	52
Exeter[b]	965	45	9	46
Glouc	443	51	8	40
Hull[b]	857	42	9	49
Inverns	253	37	5	58
Ipswi	407	35	9	56
Kent	1,042	41	6	54
Klmarnk	309	44	12	44
Krkcldy	295	51	7	42
L Kings	1,085	52	8	40

Table 3.5. Continued

Centre	*N*	% HD	% PD	% transplant
Liv Ain	228	77	17	7
Middlbr[b]	902	39	2	58
Newry	226	39	10	51
Norwch	741	46	5	49
Prestn[b]	1,217	47	4	49
Redng	778	39	8	53
Salford[b]	977	41	10	49
Shrew	370	55	9	36
Stevng	827	62	2	37
Sthend	246	51	7	42
Stoke	789	42	10	48
Sund	459	48	4	48
Swanse[b]	757	48	8	44
Truro[b]	416	39	5	56
Ulster	170	63	4	34
West NI	293	42	4	54
Wirral	228	82	8	10
Wolve	581	55	14	32
Wrexm	293	38	13	49
York	489	33	6	61
England	**51,672**	**41**	**6**	**53**
N Ireland	**1,701**	**37**	**5**	**58**
Scotland	**4,853**	**40**	**5**	**56**
Wales	**3,030**	**38**	**7**	**55**
UK	**61,256**	**41**	**6**	**53**

[a]Cambridge was unable to submit any patient level data for 2015 but provided the total number of adult patients on treatment at the end of the year by treatment modality. Those numbers have been added in tables 3.3 and 3.5 only, therefore Cambridge is not included in any of the centre level analyses

[b]Subsequent to closing the 2015 database some centres reported variation to the numbers returned for 2015. Tables 3.3 and 3.5 (but not the reminder of this chapter) reflect these revisions. For most centres the change reported was small (<5 patients), but a few centres reported notable numbers of patients not submitted (Sheffield 51 HD, 6 PD, 8 transplant; Salford 2 HD, 9 PD, 2 transplant and Middlesbrough 9 transplant patients)

Blank cells: no patients on that modality

Table 3.6. Median age and gender ratio of incident and prevalent transplant patients 2010–2015

	Incident transplants			Prevalent transplants*		
Year	*N*	Median age	M : F ratio	*N*	Median age	M : F ratio
2010	2,584	49.6	1.7	24,885	51.2	1.5
2011	2,628	49.1	1.7	26,172	51.7	1.6
2012	2,782	50.5	1.6	27,535	52.3	1.5
2013	3,128	50.4	1.6	29,442	52.8	1.6
2014	3,031	50.6	1.5	31,044	53.3	1.5
2015	2,864	50.9	1.5	31,692	53.8	1.5

*As on 31st December for given year

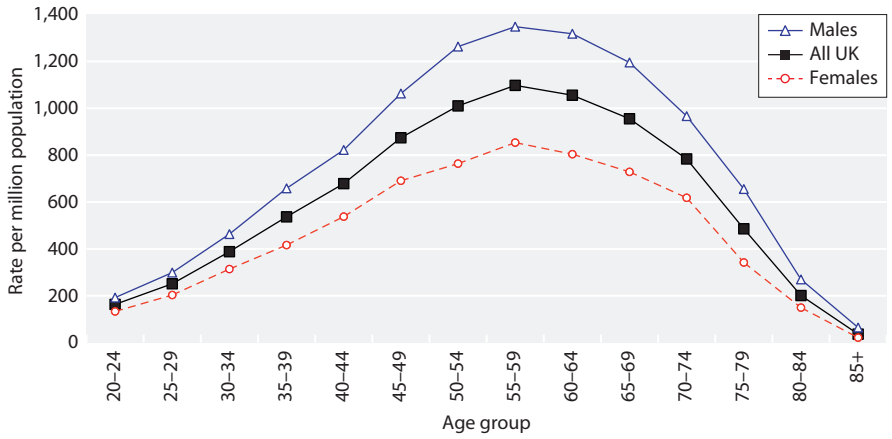

Fig. 3.1. Transplant prevalence rate per million population by age and gender on 31/12/2015

Table 3.7. Primary renal diagnosis in renal transplant recipients 2010–2015

	New transplants by year							Established transplants on 31/12/2015	
	2010	2011	2012	2013	2014	2015			
Primary renal diagnosis	%	%	%	%	%	%	*N*	%	*N*
Aetiology uncertain	15.1	15.1	12.3	13.3	12.3	12.3	349	14.7	4,671
Diabetes	13.1	13.6	15.1	13.9	15.3	15.1	430	10.6	3,375
Glomerulonephritis	20.7	23.4	23.0	22.8	21.7	21.5	612	23.0	7,299
Polycystic kidney disease	14.4	12.6	13.6	13.9	14.0	13.7	389	13.5	4,290
Pyelonephritis	10.7	10.2	10.5	10.2	9.0	9.2	261	12.8	4,054
Reno-vascular disease	7.7	7.2	7.2	8.2	7.7	8.1	230	6.3	2,002
Other	17.1	17.0	17.1	15.0	17.0	15.8	448	17.5	5,554
Not available	1.2	1.0	1.2	2.6	3.0	4.4	124	1.4	447

Table 3.8. Ethnicity of patients who received a transplant in the years 2010–2015

Year	% White	% S Asian	% Black	% Other	% Unknown
2010	76.9	10.5	5.7	2.6	4.3
2011	76.3	9.6	6.2	2.9	5.1
2012	73.1	10.2	7.1	3.2	6.4
2013	71.5	12.1	6.9	2.8	6.7
2014	69.2	12.3	6.5	4.2	7.8
2015	67.5	12.7	7.4	3.9	8.4

UK, where completeness of data was good, may allow assessment of variation in access to transplantation in future reports.

There has been a year on year increase in the percentage of incident kidney recipients from non-White ethnic groups, which reflects the changing population of the UK, the different incidence of CKD in different groups and improved access to transplantation across these ethnic backgrounds.

Clinical and laboratory outcomes

Introduction

There continued to be marked variation in the completeness of data (tables 3.9a, 3.9b) reported by each renal centre, particularly for blood pressure and parathyroid hormone, which limits the ability to perform more meaningful comparisons between centres, or determine the causes of inter-centre differences in outcomes.

Table 3.9a. Percentage completeness of ethnicity, eGFR and blood pressure by centre for prevalent transplant patients on 31/12/2015

Centre	*N*	Ethnicity[a]	eGFR	Blood pressure[b]
England				
B Heart	180	100	94	0
B QEH	1,057	100	95	0
Basldn	77	100	94	91
Bradfd	315	100	96	62
Brightn	436	99	98	49
Bristol	868	100	99	78
Camb[c]				
Carlis	158	100	92	0
Carsh	640	100	91	4
Chelms	112	98	96	96
Covnt	504	100	97	87
Derby	200	100	98	92
Donc	82	100	99	98
Dorset	341	100	89	87
Dudley	80	100	96	40
Exeter	430	100	99	90
Glouc	174	99	98	80
Hull	411	99	91	2
Ipswi	220	99	98	95
Kent	542	100	97	86
L Barts	1,028	100	68	0
L Guys	1,261	99	98	0
L Kings	415	100	99	100
L RFree	1,183	99	97	77
L St.G	440	96	96	49
L West	1,762	100	98	0
Leeds	918	100	99	98
Leic	1,132	98	97	28
Liv Ain	14	93	100	0
Liv Roy	812	99	95	1
M RI	1,220	99	98	7
Middlbr	504	100	95	34
Newc	630	100	98	96
Norwch	352	100	99	2
Nottm	617	100	100	92
Oxford	1,096	95	99	15
Plymth	316	100	98	92
Ports	909	99	95	11
Prestn	576	100	98	0
Redng	401	98	99	95
Salford	479	100	97	0
Sheff	705	100	99	96
Shrew	134	100	98	0
Stevng	286	100	98	45
Sthend	101	100	99	80
Stoke	368	100	99	0
Sund	218	100	99	0
Truro	222	100	99	3
Wirral	19	100	84	0
Wolve	184	100	96	73
York	294	99	95	69
N Ireland				
Antrim	97	100	99	96
Belfast	543	99	100	52
Newry	104	100	98	88
Ulster	55	100	98	98
West NI	149	100	100	95
Scotland				
Abrdn	278	56	99	n/a
Airdrie	212	61	73	n/a
D & Gall	65	28	88	n/a
Dundee	211	62	98	n/a
Edinb	451	25	94	n/a
Glasgw	1,018	24	74	n/a
Inverns	140	83	84	n/a
Klmarnk	132	67	79	n/a
Krkcldy	119	36	97	n/a
Wales				
Bangor	81	100	99	83
Cardff	1,006	100	99	97
Clwyd	79	100	100	94
Swanse	316	100	99	100
Wrexm	141	100	99	89
England	**25,423**	**99**	**96**	**39**
N Ireland	**948**	**100**	**99**	**70**
Scotland	**2,626**	**39**	**84**	**n/a**
Wales	**1,623**	**100**	**99**	**96**
UK	**30,620**	**94**	**95**	**43[d]**

n/a – not available
[a]Patients with missing ethnicity were classed as White for eGFR calculation
[b]Scottish centres excluded from blood pressure analysis as data not provided by the Scottish Renal Registry
[c]Cambridge was unable to submit data for 2015
[d]Excluding Scotland

The 71 renal centres in the UK comprise 52 centres in England, five in Wales, five in Northern Ireland and nine in Scotland. Colchester was reported as having no transplanted patients and was therefore excluded. Cambridge was unable to submit patient level data for 2015. After exclusion of these centres, prevalent patient data from 69 renal centres across the UK were analysed.

For the one-year post-transplant analyses, in which patients were assigned to the centre that performed their transplant, all 23 transplant centres across the UK were included in the analysis.

Table 3.9b. Percentage completeness of haemoglobin, serum cholesterol, serum calcium, serum phosphate and serum PTH by centre for prevalent transplant patients on 31/12/2015

Centre	*N*	Haemoglobin	Total serum cholesterol	Adjusted serum calcium[a]	Serum phosphate	Serum PTH
England						
B Heart	180	93	54	91	91	11
B QEH	1,057	94	95	95	94	6
Basldn	77	92	64	92	92	16
Bradfd	315	95	63	74	45	25
Brightn	436	97	69	95	95	42
Bristol	868	99	93	99	99	99
Camb[b]						
Carlis	158	93	66	89	82	15
Carsh	640	90	52	89	89	33
Chelms	112	93	81	96	78	18
Covnt	504	97	80	95	69	32
Derby	200	98	95	95	93	90
Donc	82	99	66	98	98	34
Dorset	341	86	71	86	67	33
Dudley	80	96	91	96	96	84
Exeter	430	99	96	98	97	40
Glouc	174	98	61	95	95	26
Hull	411	92	25	88	88	18
Ipswi	220	99	55	98	98	58
Kent	542	96	76	95	95	19
L Barts	1,028	98	98	98	98	97
L Guys	1,261	99	64	97	98	42
L Kings	415	99	77	99	99	67
L RFree	1,183	97	78	97	97	88
L St.G	440	96	91	96	96	88
L West	1,762	98	55	98	98	34
Leeds	918	98	99	98	98	30
Leic	1,132	96	96	95	95	57
Liv Ain	14	100	86	100	100	79
Liv Roy	812	94	64	89	91	68
M RI	1,220	98	72	98	98	62
Middlbr	504	95	37	94	94	16
Newc	630	98	86	98	98	70
Norwch	352	98	97	97	97	22
Nottm	617	99	79	96	94	88
Oxford	1,096	99	68	99	99	49
Plymth	316	98	78	97	96	62
Ports	909	95	62	95	90	31
Prestn	576	98	76	97	94	51
Redng	401	99	72	98	76	57
Salford	479	96	76	96	96	5
Sheff	705	99	59	99	99	11
Shrew	134	97	81	95	95	10
Stevng	286	77	54	94	90	44
Sthend	101	99	42	97	92	14
Stoke	368	99	100	99	99	70
Sund	218	99	78	98	99	95
Truro	222	98	96	99	99	89
Wirral	19	79	42	74	74	53
Wolve	184	94	82	95	85	71
York	294	94	65	92	92	14

Table 3.9b. Continued

Centre	*N*	Haemoglobin	Total serum cholesterol	Adjusted serum calcium[a]	Serum phosphate	Serum PTH
N Ireland						
Antrim	97	99	99	97	99	98
Belfast	543	99	99	99	99	32
Newry	104	97	99	96	97	97
Ulster	55	98	100	95	98	15
West NI	149	99	100	99	100	91
Scotland						
Abrdn	278	99	n/a	96	96	n/a
Airdrie	212	98	n/a	97	96	n/a
D & Gall	65	98	n/a	98	98	n/a
Dundee	211	98	n/a	97	97	n/a
Edinb	451	94	n/a	92	81	n/a
Glasgw	1,018	97	n/a	97	97	n/a
Inverns	140	79	n/a	72	68	n/a
Klmarnk	132	98	n/a	97	96	n/a
Krkcldy	119	97	n/a	97	97	n/a
Wales						
Bangor	81	98	100	99	99	27
Cardff	1,006	99	95	99	99	21
Clwyd	79	96	100	99	99	81
Swanse	316	99	91	99	99	72
Wrexm	141	99	100	99	99	100
England	**25,423**	**97**	**75**	**96**	**94**	**49**
N Ireland	**948**	**99**	**99**	**98**	**99**	**54**
Scotland[c]	**2,626**	**96**	**n/a**	**95**	**93**	**n/a**
Wales	**1,623**	**99**	**95**	**99**	**99**	**41**
UK	**30,620**	**97**	**77[d]**	**96**	**94**	**48[d]**

n/a – not available
[a]Serum calcium corrected for serum albumin
[b]Cambridge was unable to submit data for 2015
[c]Dataset provided by the Scottish Renal Registry for Scottish centres shown did not include data on serum cholesterol or serum PTH
[d]Excluding Scotland

Methods

Data for key laboratory variables are reported for all prevalent patients with valid data returns for a given renal centre (both transplanting and non-transplanting centres) and for one year post-transplant results for patients transplanted 2008–2014, with patients attributed to the transplant centre that performed the procedure.

Time since transplantation may have a significant effect on key biochemical and clinical variables and this is likely to be independent of a centre's clinical practices. Therefore, inter-centre comparison of data on prevalent transplant patients is open to bias. To minimise bias relating to fluctuations in biochemical and clinical parameters occurring in the initial post-transplant period, one year post-transplantation outcomes are also reported. It is presumed that patient selection policies and local clinical practices are more likely to be relevant in influencing outcomes 12 months post-transplant and therefore comparison of outcomes between centres is more robust. However, even the 12 months post-transplant comparisons could be biased by the fact that in some centres, repatriation of patients only occurs if the graft is failing whereas in others it only occurs if the graft function is stable.

Centres with <10 patients or <50% data completeness have been excluded from the figures. Scottish centres were also excluded from blood pressure analyses as data were not provided.

Prevalent patient data

Biochemical and clinical data for patients with a functioning transplant followed in either a transplanting or non-transplanting centre were included in the analyses. The cohort consisted of prevalent patients as on 31st December 2015. Patients were considered as having a functioning transplant if 'transplant' was listed as the last mode of RRT in the last quarter of 2015. Patients were assigned to the renal centre that sent the data to the UKRR but some patients will have received care in more than one centre. If data for the same transplant patient were received from both the transplant centre and non-transplant centre, care was usually allocated to the non-transplant centre (see appendix B). Patients with a functioning transplant of less than three months duration

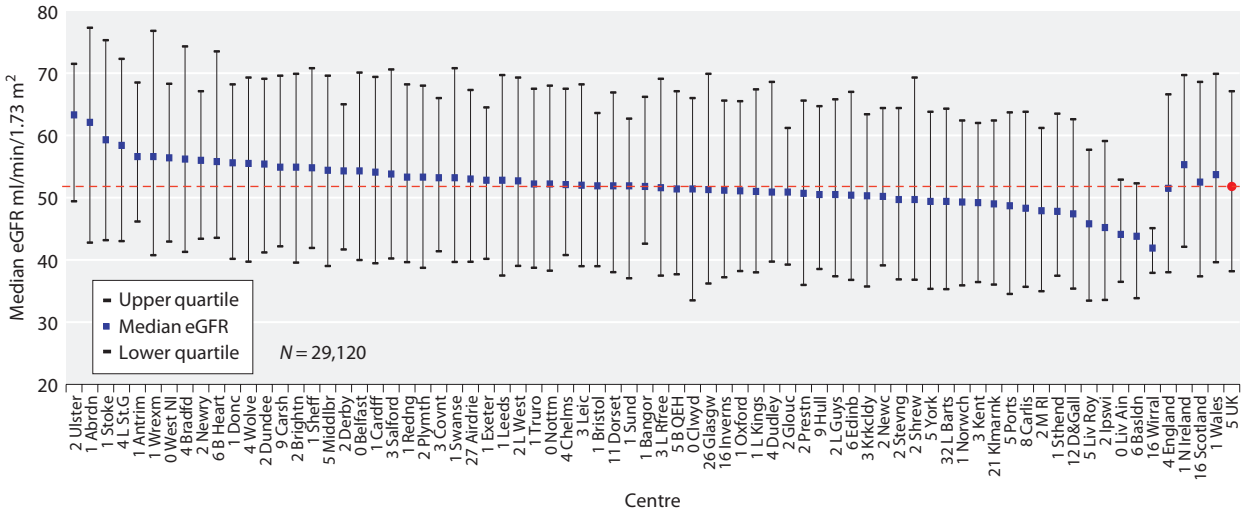

Fig. 3.2. Median eGFR in prevalent transplant patients by centre on 31/12/2015

were excluded from analyses. For haemoglobin, estimated glomerular filtration rate (eGFR), corrected calcium, phosphate and blood pressure (BP), the latest value in quarter 3 or quarter 4 of 2015 was used.

Estimated glomerular filtration rate (eGFR)

For the purpose of eGFR calculation, the original 4-variable MDRD formula was used (with a constant of 186) to calculate eGFR from the serum creatinine concentration as reported by the centre (unless otherwise stated). A wide variety of creatinine assays are in use in clinical biochemistry laboratories in the UK, and it is not possible to ensure that all measurements of creatinine concentration collected by the UKRR are harmonised. Patients with valid serum creatinine results but no ethnicity data were classed as White for the purpose of the eGFR calculation.

One year post-transplant data

Patients who received a renal transplant between 1st January 2008 and 31st December 2014 were assigned according to the renal centre in which they were transplanted. In a small number of instances, the first documented evidence of transplantation in a patient's record is from a timeline entry in data returned from a non-transplant centre, in these instances the patient was re-assigned to the nearest transplant centre.

As this analysis is stratified by transplant type, and for some of the renal centres reporting of donor type to the UKRR is poor, donor-type used in this analysis was obtained from NHSBT.

Patients who had died or experienced graft failure within 12 months of transplantation were excluded from the analyses. Patients with more than one transplant during 2008–2014 were included as separate episodes provided each of the transplants functioned for a year.

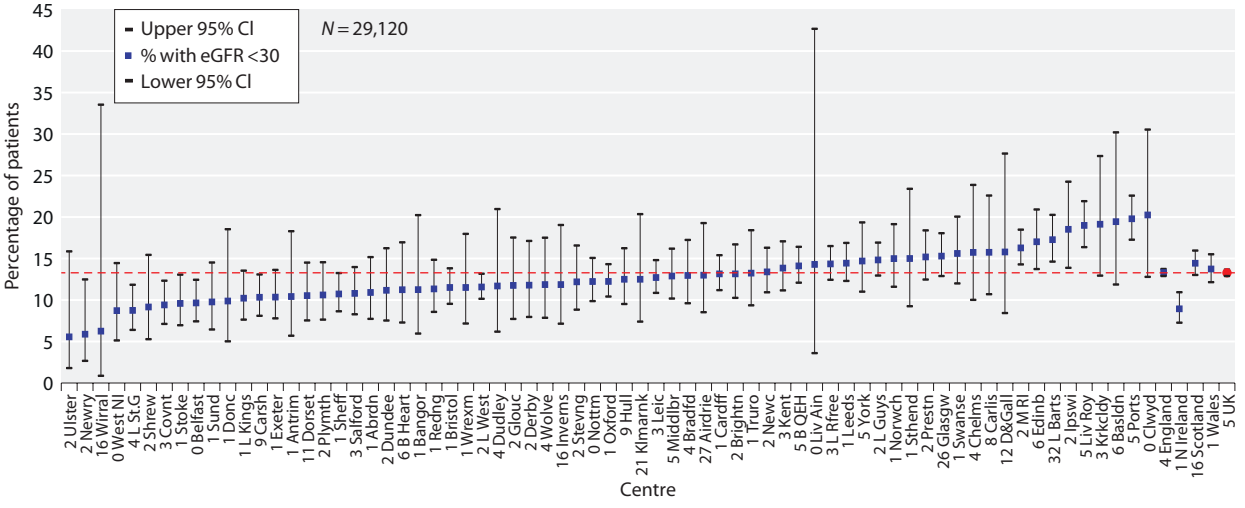

Fig. 3.3. Percentage of prevalent transplant patients by centre on 31/12/2015 with eGFR <30 ml/min/1.73 m^2

For each patient, the most recent laboratory or blood pressure result for the relevant 4th/5th quarter after renal transplantation was taken to be representative of the one year post-transplant outcome. Again, for the purpose of the eGFR calculation patients with valid serum creatinine results but missing ethnicity data were classed as White.

Results and Discussion

Post-transplant eGFR in prevalent transplant patients

When interpreting eGFR post-transplantation, it is important to remember that estimated GFR formulae only have a modest predictive performance in the transplant population [4]. Median eGFR in each centre and percentage of patients with eGFR <30 ml/min/1.73 m^2 are shown in figures 3.2 and 3.3.

The median eGFR was 51.8 ml/min/1.73 m^2, with 13.3% of prevalent transplant recipients having an eGFR <30 ml/min/1.73 m^2, summarised by centre in table 3.10. Whilst local repatriation policies on timing of transfer of care for patients with failing transplants from transplant centres to referring centres might explain some of the differences, it is notable that both transplanting and non-transplanting centres feature at both ends of the scale in figure 3.3. The accuracy of the 4-variable MDRD equation in estimating GFR ⩾60 ml/min/1.73 m^2 is questionable [5], therefore a figure describing this is not included in this chapter.

Figure 3.4 shows the percentage of prevalent patients by centre with eGFR <30 ml/min/1.73 m^2 as a funnel plot, enabling a more reliable comparison of outcomes between centres across the UK. The solid lines show the 2 standard deviation limits (95%) and the dotted lines the limits for 3 standard deviations (99.9%). With

Table 3.10. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 on 31/12/2015

Centre	Patients with eGFR data *N*	Percentage with eGFR <30	Centre	Patients with eGFR data *N*	Percentage with eGFR <30
Liv Ain	14	14.3	Swanse	314	15.6
Wirral	16	6.3	Norwch	347	15.0
Ulster	54	5.6	Stoke	365	9.6
D & Gall	57	15.8	Hull	376	12.5
Basldn	72	19.4	Redng	397	11.3
Dudley	77	11.7	L Kings	411	10.2
Clwyd	79	20.3	L St.G	423	8.7
Bangor	80	11.3	Edinb	423	17.0
Donc	81	9.9	Exeter	425	10.4
Antrim	96	10.4	Brightn	426	13.1
Sthend	100	15	Salford	463	10.8
Newry	102	5.9	Middlbr	481	12.9
Klmarnk	104	12.5	Covnt	489	9.4
Chelms	108	15.7	Kent	527	13.9
Krkcldy	115	19.1	Belfast	539	9.6
Inverns	118	11.9	Prestn	566	15.2
Shrew	131	9.2	Carsh	581	10.3
Wrexm	139	11.5	Nottm	613	12.2
Carlis	146	15.8	Newc	620	13.4
West NI	149	8.7	L Barts	695	17.3
Airdrie	154	13	Sheff	699	10.7
B Heart	169	11.2	Glasgw	752	15.3
Glouc	170	11.8	Liv Roy	769	19.0
Wolve	177	11.9	Bristol	860	11.5
Derby	195	11.8	Ports	864	19.8
Dundee	206	11.2	Leeds	907	14.4
Sund	215	9.8	Cardff	996	13.2
Ipswi	216	18.5	B QEH	999	14.1
Truro	219	13.2	Oxford	1,087	12.2
Abrdn	275	10.9	Leic	1,094	12.7
Stevng	279	12.2	L Rfree	1,150	14.3
York	279	14.7	M RI	1,192	16.3
Bradfd	301	13	L Guys	1,234	14.8
Dorset	304	10.5	L West	1,728	11.6
Plymth	311	10.6			

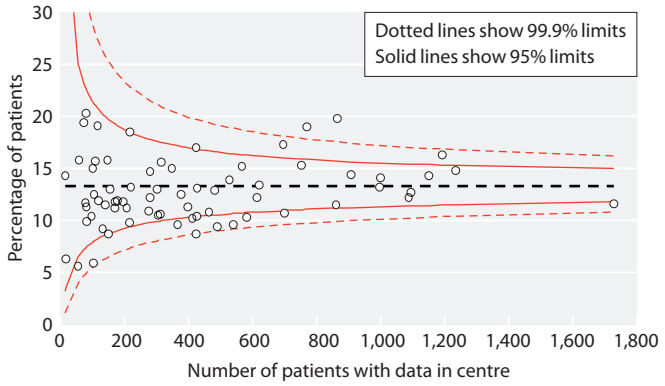

Fig. 3.4. Funnel plot of percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre size on 31/12/2015

69 centres included and a normal distribution, 3–4 centres would be expected to fall between the 95–99.9% CI (1 in 20) and no centres should fall outside the 99.9% limits.

There continued to be variation between centres; these data show over-dispersion with 15 centres falling outside the 95% CI. Liverpool Royal and Portsmouth both fell outside the upper 99.9% CI suggesting a higher than expected proportion of patients with eGFR <30 ml/min/1.73 m^2.

eGFR in patients one year after transplantation

Graft function at one year post-transplantation may predict subsequent long-term graft outcome [6]. Figures 3.5a, 3.5b, and 3.5c show the median one-year post-transplant eGFR for patients transplanted between 2008–2014, by transplant type. Living kidney donation had the highest median eGFR at one year (57.5 ml/min/1.73 m^2), followed by donation after brainstem death (53.7 ml/min/1.73 m^2) and donation after circulatory death (50.4 ml/min/1.73 m^2).

Figures 3.6a, 3.6b and 3.6c show one-year post-transplant eGFR by donor type and year of transplantation. There was no trend in eGFR over the time period for live kidney donation transplantation, donation after brainstem death or donation after circulatory death.

Haemoglobin in prevalent transplant patients

The Renal Association Anaemia guidelines recommend '***achieving a population distribution centred on a mean of 11 g/dl with a range of 10–12 g/dl***' [7] (equivalent to 110 g/L, range 100–120 g/L). However, many transplant patients with good transplant function will have haemoglobin concentrations >120 g/L without the use of erythropoiesis stimulating agents, and so it is inappropriate to audit performance using the higher limit.

A number of factors, including comorbidity, immunosuppressive medication, graft function, ACE inhibitor use, erythropoietin (EPO) use, intravenous or oral iron use, that affect centre-specific protocols for management of anaemia will affect haemoglobin concentrations in transplant patients. Most of these data are not collected by the UKRR and therefore caution must be used when interpreting analyses of haemoglobin attainment.

Figures 3.7a and 3.7b report centre results stratified according to graft function as estimated by eGFR. The percentage of prevalent transplant patients achieving Hb ⩾100 g/L in each centre, stratified by eGFR, is displayed in figures 3.8a and 3.8b.

Figure 3.9 describes the percentage of prevalent patients by centre with haemoglobin <100 g/L as a funnel plot enabling more reliable comparison of outcomes between centres across the UK. With 69 centres included and a normal distribution, 3–4 centres would be expected to fall between the 95%–99.9% CI (1 in 20) and no centres should fall outside the 99.9% CI purely as a chance event.

One centre (London St Bartholomew's) fell outside the upper 99.9% CI and two further centres (London Guys and London Kings) fell outside the upper 95% CI indicating a higher than predicted proportion of transplant patients not achieving the haemoglobin target. Seven centres fell outside the lower 99.9% CI, indicating they performed better than expected with fewer than predicted patients having a haemoglobin <100 g/L.

Blood pressure in prevalent transplant patients

The UK Renal Association (RA) guideline for the care of kidney transplant recipients recommends that '***Blood pressure should be <130/80 mmHg (or <125/75 mmHg if proteinuria)***' [8]. This blood pressure (BP) target is the same as that used in previous annual reports. Completeness for blood pressure data returns was variable with some centres unable to report. Data from 34 centres with >50% data returns were included in the analysis. Despite this restriction, caution needs to be exercised in interpretation of these results because of the volume of missing data and potential bias, (e.g. a centre may be more likely to record and report blood pressure data electronically in patients with poor BP control).

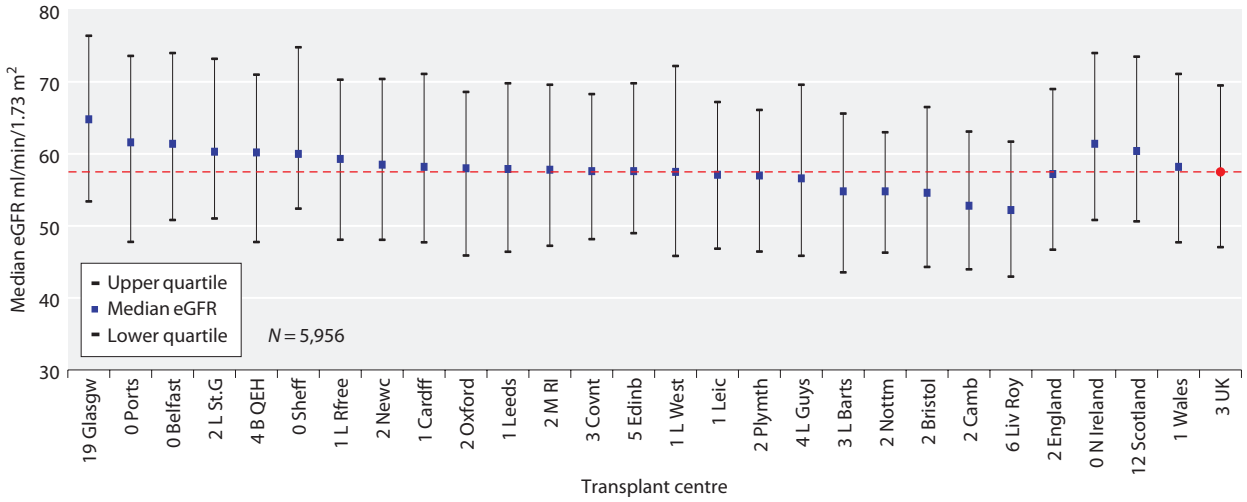

Fig. 3.5a. Median eGFR one year post-live donor transplant by transplant centre 2008–2014

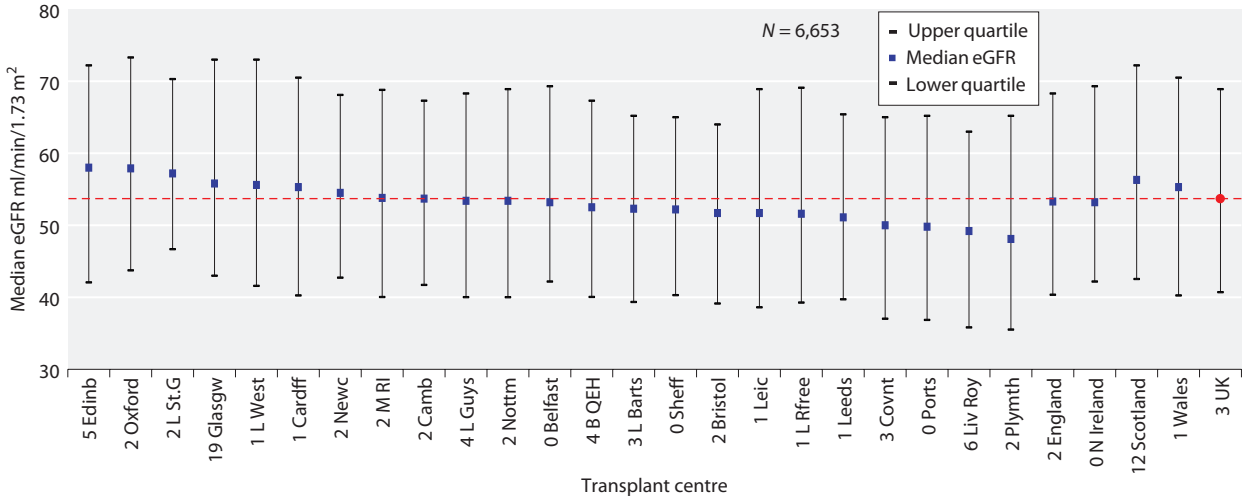

Fig. 3.5b. Median eGFR one year post-brainstem death donor transplant by transplant centre 2008–2014

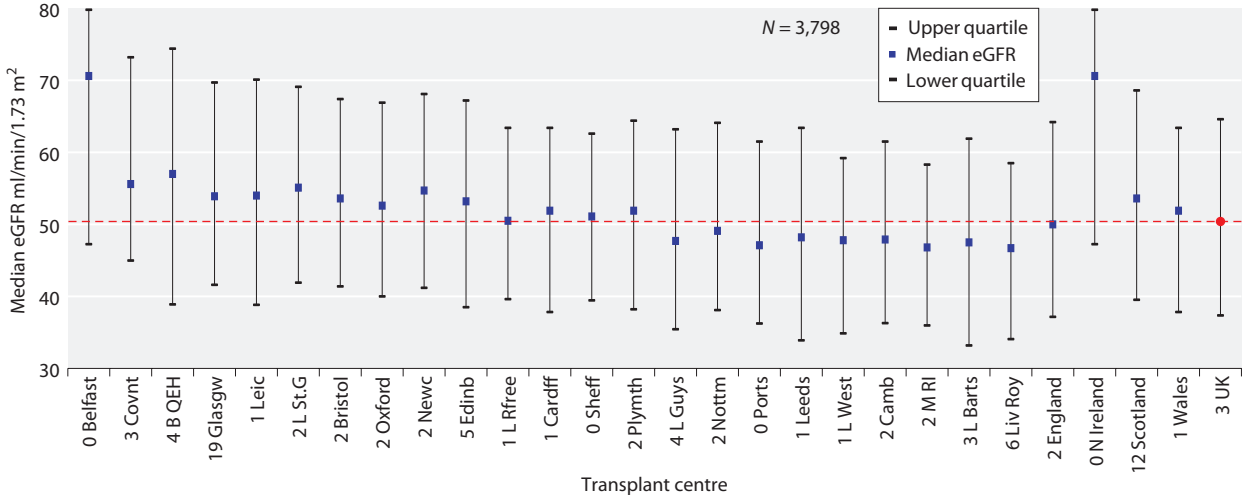

Fig. 3.5c. Median eGFR one year post-circulatory death donor transplant by transplant centre 2008–2014

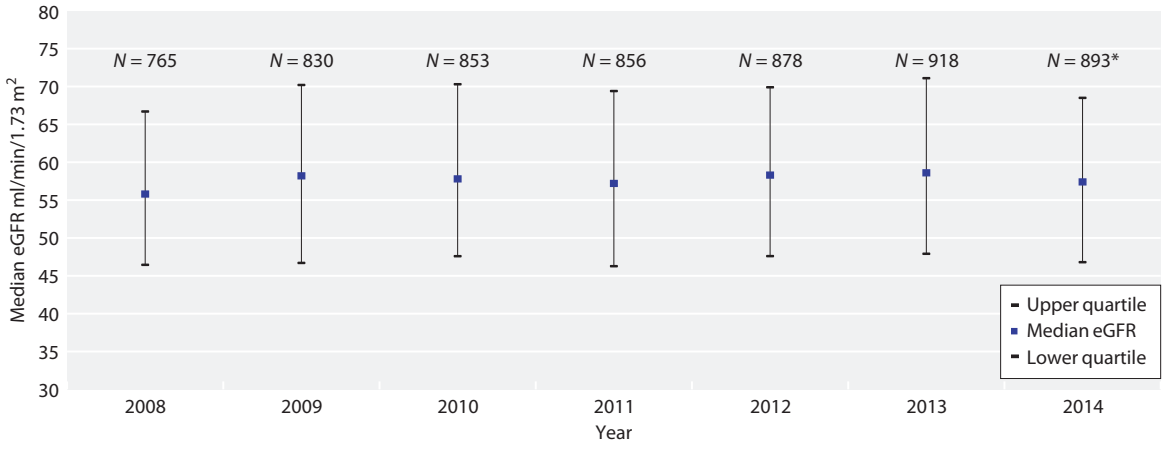

Fig. 3.6a. Median eGFR one year post-live donor transplant by year of transplantation 2008–2014
*This number does not include live-donor transplants performed in 2014 that were followed-up in Cambridge in 2015, as Cambridge was unable to submit data for 2015

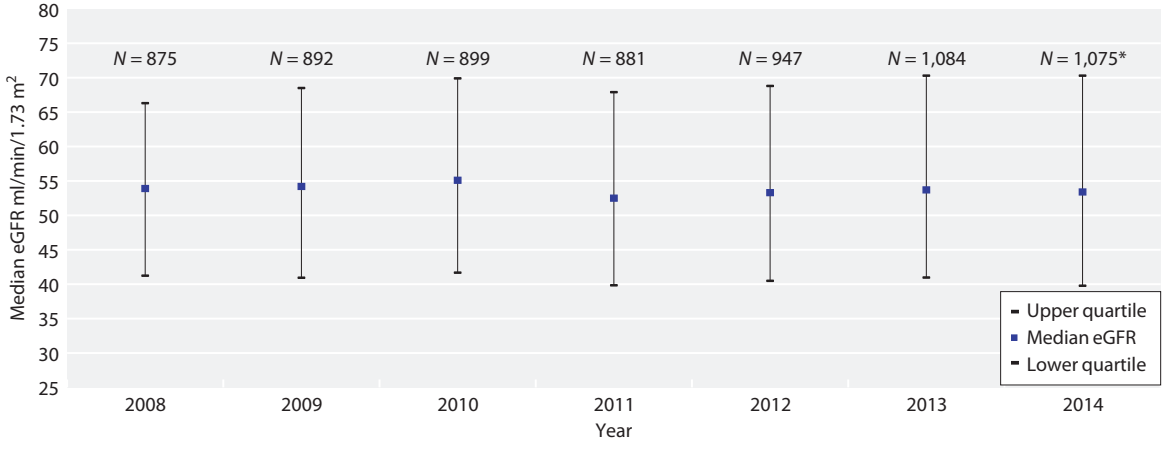

Fig. 3.6b. Median eGFR one year post-brainstem death donor transplant by year of transplantation 2008–2014
*This number does not include post-brainstem death donor transplants performed in 2014 that were followed-up in Cambridge in 2015, as Cambridge was unable to submit data for 2015

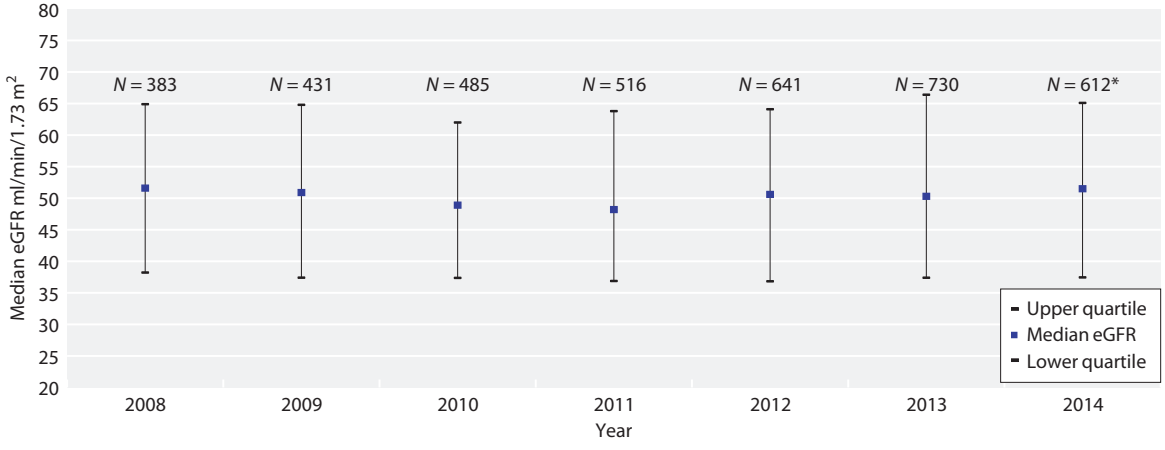

Fig. 3.6c. Median eGFR one year post-circulatory death donor transplant by year of transplantation 2008–2014
*This number does not include post-circulatory death donor transplants performed in 2014 that were followed-up in Cambridge in 2015, as Cambridge was unable to submit data for 2015

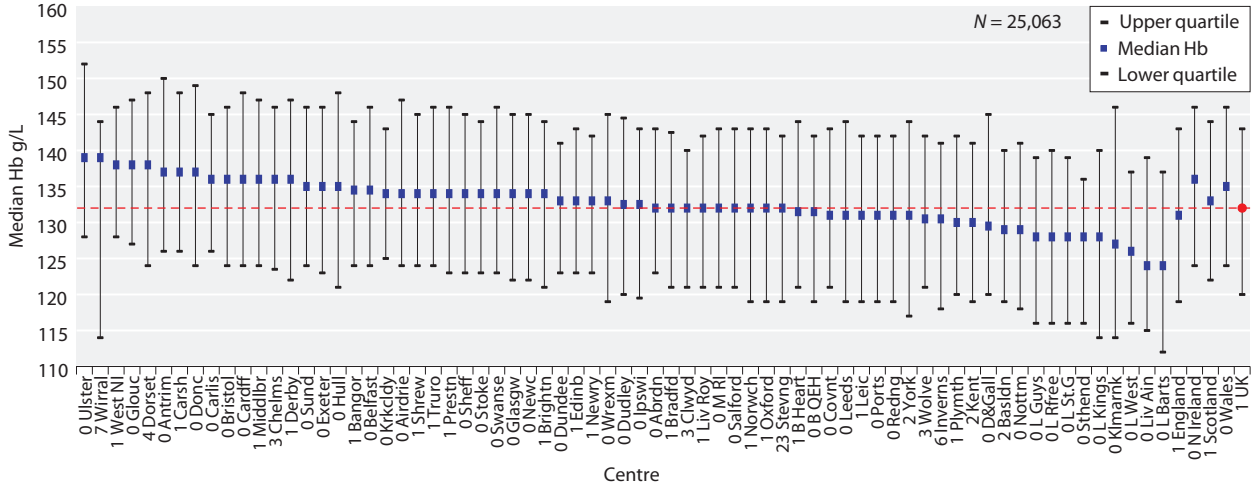

Fig. 3.7a. Median haemoglobin for prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 by centre on 31/12/2015

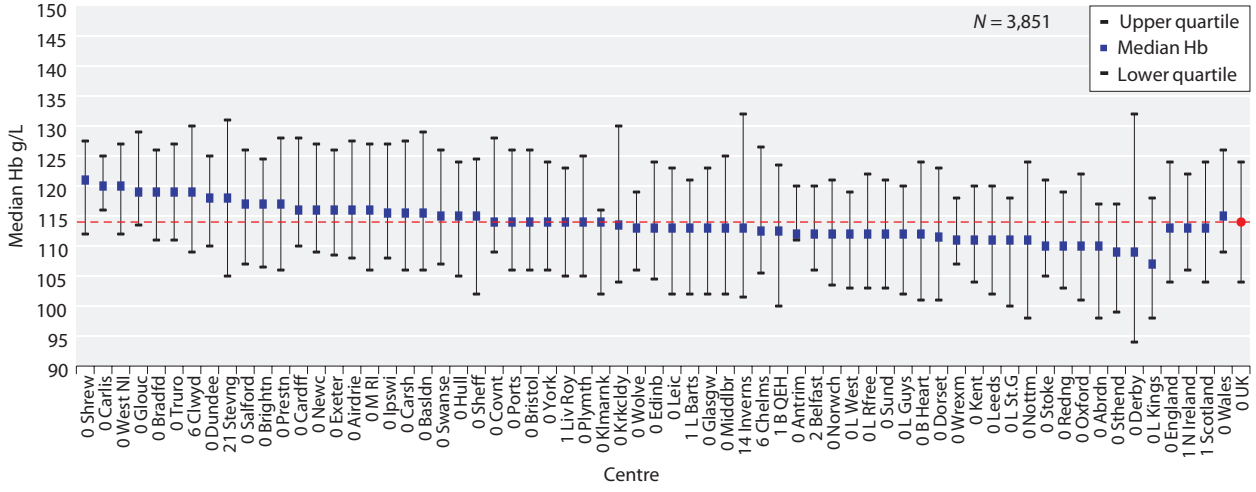

Fig. 3.7b. Median haemoglobin for prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre on 31/12/2015

Figures 3.10a and 3.10b show the percentage of patients with a blood pressure of <130/80 mmHg, by eGFR. The percentage of patients with BP <130/80 (systolic BP <130 and diastolic BP <80 mmHg) was higher (26.6% vs. 21.8%) in those with better renal function (eGFR ⩾30 ml/min/1.73 m^2).

Analysis of prevalent patients by CKD stage

Introduction

Approximately 2.7% of prevalent transplant patients returned to dialysis in 2015, a similar percentage to that seen over the last few years. Amongst patients with native chronic kidney disease, late presentation is associated with poor outcomes, largely attributable to lack of specialist management of anaemia, acidosis, hyperphosphataemia and to inadequate advance preparation for dialysis. Transplant recipients on the other hand, are almost always followed up regularly in specialist transplant or renal clinics and it would be reasonable to expect patients with failing grafts to receive appropriate care and therefore have many of their modifiable risk factors addressed before complete graft failure and return to dialysis.

Methods

The transplant cohort consisted of prevalent transplant recipients as on 31st December 2015 and patients were classified according to the KDIGO staging criteria with the suffix of 'T' to represent their transplant status. Patients with missing ethnicity information were classified as White for the purpose of calculating eGFR. Prevalent dialysis patients, except those who commenced dialysis

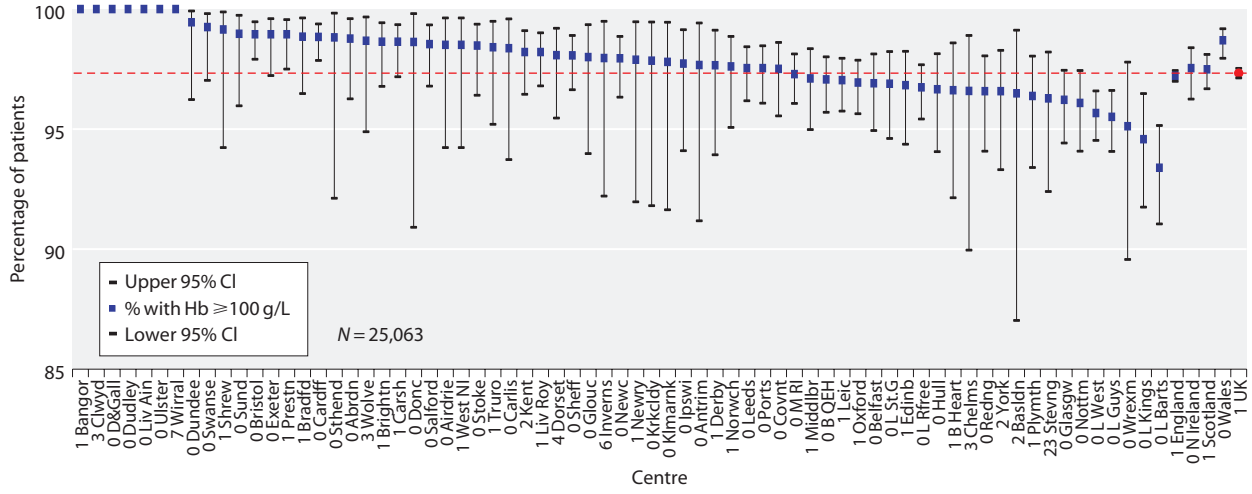

Fig. 3.8a. Percentage of prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 achieving haemoglobin ⩾100 g/L by centre on 31/12/2015

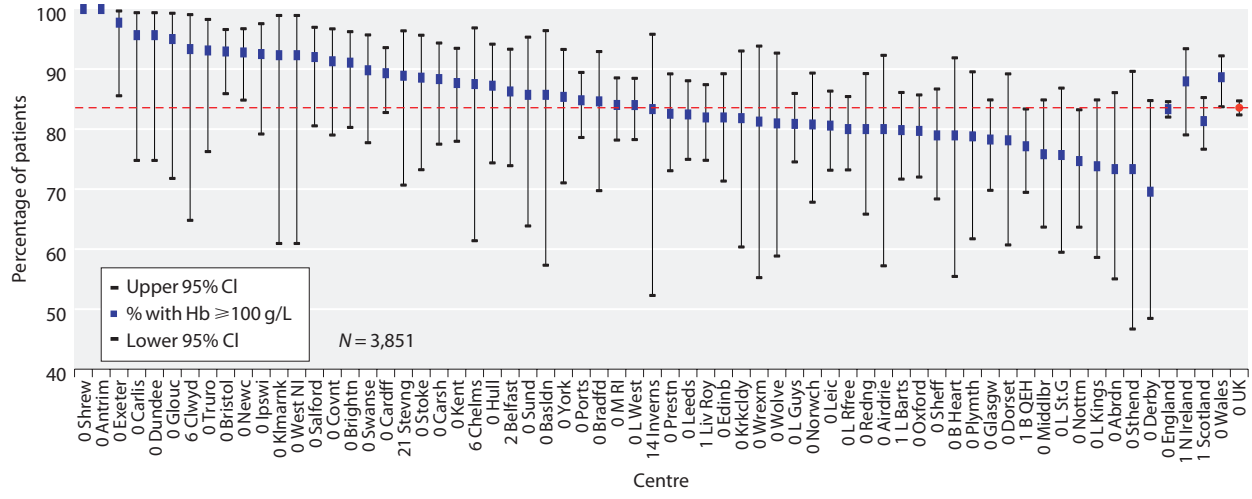

Fig. 3.8b. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 achieving haemoglobin ⩾100 g/L by centre on 31/12/2015

in 2015, comprised the comparison dialysis cohort ($N = 21,367$) including 2,163 peritoneal dialysis patients. Only patients on peritoneal dialysis were considered when examining differences in serum phosphate between transplant recipients and dialysis patients. For both the transplant and dialysis cohorts, the analysis used the most recent available value from the last two quarters of the 2015 laboratory data. Scottish centres were excluded from blood pressure, cholesterol and PTH analyses as corresponding data were not provided.

Results and Discussion

Table 3.11 shows that 13.3% of the prevalent transplant population (3,868 patients), had moderate to advanced renal impairment of eGFR <30 ml/min/1.73 m^2. The table also demonstrates that patients with failing grafts had poorer blood pressure control, and

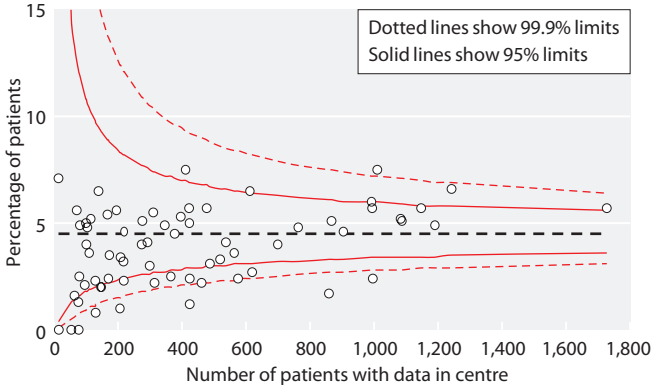

Fig. 3.9. Funnel plot of percentage of prevalent transplant patients with haemoglobin <100 g/L by centre size on 31/12/2015

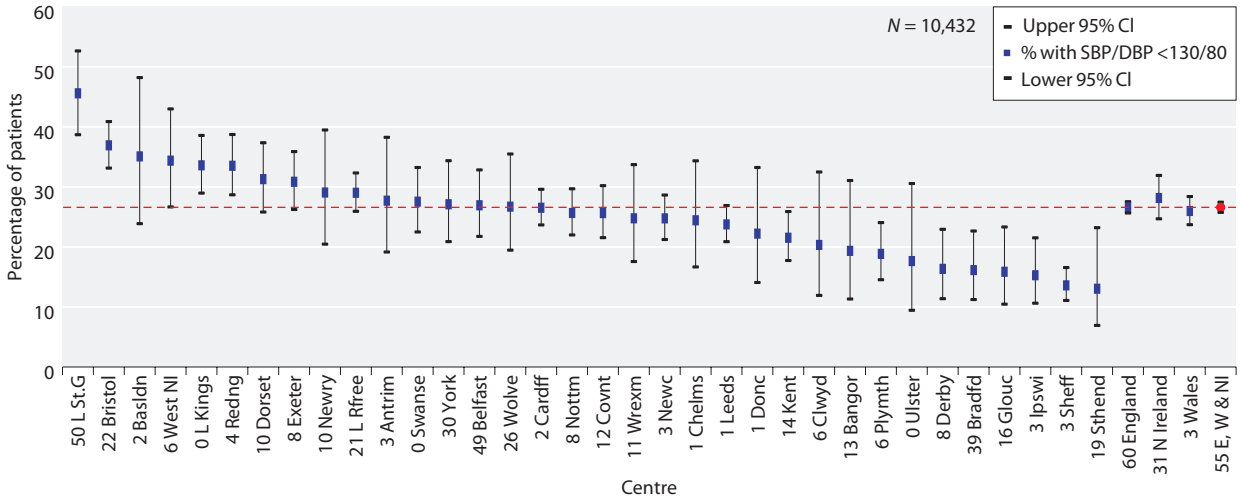

Fig. 3.10a. Percentage of prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 achieving blood pressure of <130/80 mmHg by centre on 31/12/2015

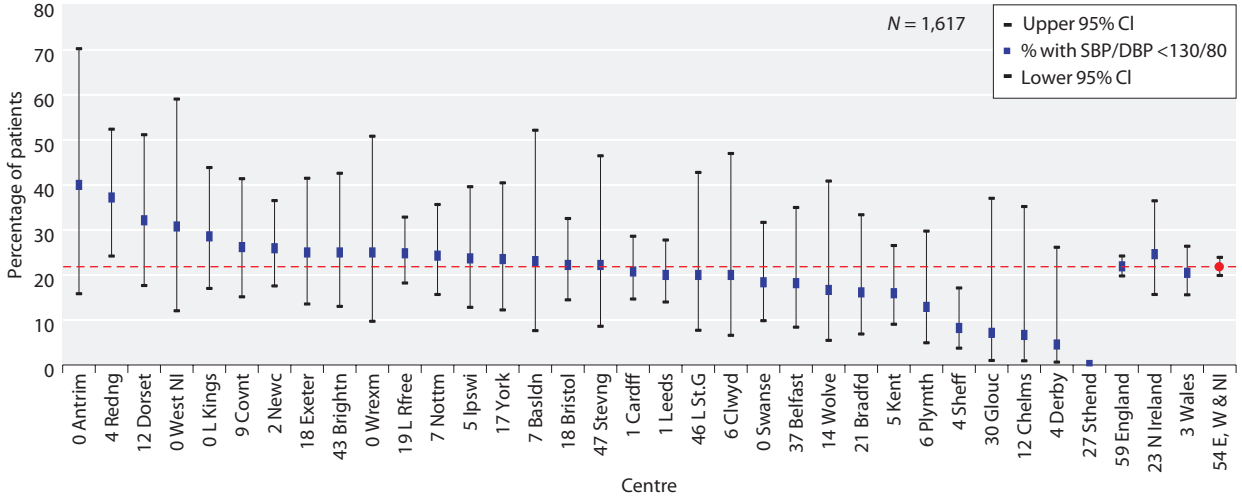

Fig. 3.10b. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 achieving blood pressure of <130/80 mmHg by centre on 31/12/2015

achieved UK Renal Association standards for some key biochemical and clinical outcome variables less often than dialysis patients. This substantial group of patients continues to represent a challenge, and improved pre-dialysis management should allow for timely re-listing for transplantation if appropriate, and a smooth transition to another renal replacement modality.

eGFR slope analysis

Introduction

The gradient of deterioration in eGFR (slope) may predict patients likely to have early graft failure. The eGFR slope and its relationship to specific patient characteristics are presented here.

Table 3.11. Analysis by CKD stage for prevalent transplant patients compared with prevalent dialysis patients on 31/12/2015

	Stage 1–2T (⩾60)	Stage 3T (30–59)	Stage 4T (15–29)	Stage 5T (<15)	Stage 5D
Number of patients	10,379	14,886	3,394	474	21,367
% of patients	35.6	51.1	11.7	1.6	
eGFR m,/min/1.73 m^2 [a]					
mean ± SD	77.1 ± 15.5	45.7 ± 8.3	23.8 ± 4.1	12.0 ± 2.1	
Median	73.2	46.1	24.3	12.4	
Systolic BP mmHg					
mean ± SD	133.8 ± 16.2	135.8 ± 17.0	139.6 ± 19.2	144.6 ± 21.0	132.7 ± 24.8
% ⩾130	60.1	64.3	70.1	76.8	52.3
Diastolic BP mmHg					
mean ± SD	79.1 ± 10.4	78.5 ± 10.7	79.1 ± 11.9	80.3 ± 12.7	68.7 ± 14.9
% ⩾80	49.6	48.0	49.7	55.8	22.0
Cholesterol mmol/L					
mean ± SD	4.5 ± 1.0	4.6 ± 1.1	4.7 ± 1.2	4.7 ± 1.3	3.9 ± 1.1
% ⩾4	68.0	71.7	71.1	68.8	42.4
Haemoglobin g/L					
mean ± SD	136.7 ± 15.9	128.0 ± 16.5	115.3 ± 15.4	105.2 ± 13.9	110.3 ± 13.6
% <100.0	1.4	3.6	14.3	32.1	19.5
Phosphate mmol/L [b]					
mean ± SD	0.9 ± 0.2	1.0 ± 0.2	1.1 ± 0.3	1.5 ± 0.4	1.6 ± 0.4
% >1.7	0.1	0.2	2.4	25.8	36.0
Corrected calcium mmol/L					
mean ± SD	2.4 ± 0.1	2.4 ± 0.1	2.4 ± 0.2	2.4 ± 0.2	2.4 ± 0.2
% >2.5	26.7	26.7	19.4	18.7	15.9
% <2.2	3.3	3.8	8.1	15.1	16.8
PTH pmol/L					
Median	8.7	10.1	16.8	32.6	33.5
% >72	0.3	0.7	3.8	20.6	19.6

[a]Prevalent transplant patients with no ethnicity data were classed as White
[b]Only PD patients included in stage 5D, $N = 2{,}163$

Methods

All UK patients aged ⩾18 years receiving their first renal transplant between 1st January 2004 and 31st December 2013, were considered for inclusion. A minimum duration of 18 months graft function was required and three or more creatinine measurements from the second year of graft function onwards were used to plot eGFR slope. If a transplant failed but there were at least three creatinine measurements between one year post-transplant and graft failure, the patient was included but no creatinine measurements after the quarter preceding the recorded date of transplant failure were analysed.

Slopes were calculated using linear regression, assuming linearity, and the effect of age, ethnicity, gender, diabetes, donor type, year of transplant and current transplant status were analysed. *P* values were calculated using the Kruskal-Wallis test. eGFR was calculated using the CKD-EPI equation and results expressed as ml/min/1.73 m^2/year. The CKD-EPI equation was used in preference to the MDRD formula as it is thought to have a greater degree of accuracy at higher levels of eGFR [9].

Results and Discussion

The study cohort consisted of 17,357 patients. The median GFR slope was −0.56 ml/min/1.73 m^2/year (table 3.12). The gradient was steeper for Black recipients (−1.01 ml/min/1.73 m^2/year), in keeping with previously published data suggesting poorer outcomes for this group [10].

There was no statistically significant difference in eGFR slope in recipients of deceased donor kidneys (−0.57 ml/min/1.73 m^2/year) compared to patients who received organs from live donors (−0.54 ml/min/1.73 m^2/year), although there was a significant difference in the eGFR slope in recipients of deceased cardiac death kidneys (−0.33 ml/min/1.73 m^2/year, $P < 0.001$). Female patients had a steeper slope (−0.98 ml/min/1.73 m^2/year) than males (−0.33 ml/min/1.73 m^2/year),

Table 3.12. Differences in median eGFR slope between subgroups of prevalent transplant patients

Patients characteristics		*N*	Median slope	Lower quartile	Upper quartile	p-value
Age at transplant	<40	4,936	−1.07	−4.14	0.95	<0.0001
	40–55	6,618	−0.38	−2.70	1.46	
	>55	5,803	−0.39	−2.68	1.59	
Ethnicity	Asian	1,729	−0.94	−4.29	1.30	<0.0001
	Black	1,083	−1.01	−4.16	1.41	
	Other	489	−0.81	−3.79	1.36	
	White	13,205	−0.47	−2.82	1.36	
Gender	Male	10,678	−0.33	−2.69	1.53	<0.0001
	Female	6,679	−0.98	−3.63	1.09	
Diabetes	No-diabetes	14,679	−0.46	−2.88	1.41	<0.0001
	Diabetes	2,541	−1.15	−4.12	0.98	
Donor	Deceased	11,211	−0.57	−3.14	1.37	0.6
	Live	6,146	−0.54	−2.95	1.36	
Year of transplant	2004	1,145	−0.42	−2.04	0.72	0.0002
	2005	1,136	−0.41	−2.16	0.90	
	2006	1,445	−0.63	−2.46	0.72	
	2007	1,581	−0.67	−2.43	0.81	
	2008	1,810	−0.51	−2.49	0.98	
	2009	1,898	−0.74	−2.85	0.95	
	2010	1,984	−0.52	−3.01	1.30	
	2011	1,949	−0.38	−3.30	2.12	
	2012	2,155	−0.47	−4.20	2.52	
	2013	2,254	−0.78	−6.46	3.96	
Status of transplant at end of follow-up	Died	1,261	−0.75	−3.95	1.83	<0.0001
	Failed	1,306	−6.32	−12.06	−3.03	
	Re-transplanted	70	−3.93	−7.31	−1.85	
	Functioning	14,720	−0.28	−2.36	1.53	
All		**17,357**	**−0.56**	**−3.09**	**1.36**	

as did patients with diabetes (−1.15 ml/min/1.73 m^2/year) compared to patients without (−0.46 ml/min/1.73 m^2/year). The slope was steeper in younger recipients, possibly reflecting differences in causes of graft failure. As might be expected, the steepest slope was in patients where the transplant subsequently failed. This analysis has assumed linearity of progression of fall in GFR and further work is ongoing to characterise the patterns of progression more precisely.

Cause of death in transplant recipients

Introduction

Differences in causes of death between dialysis and transplant patients may be expected due to selection for transplantation and use of immunosuppression. Chapter 5 includes a more detailed discussion on cause of death in dialysis patients.

Methods

The cause of death is sent by renal centres as an ERA-EDTA registry code. These have been grouped into the following categories: cardiac disease, cerebrovascular disease, infection, malignancy, treatment withdrawal, other and uncertain.

Some centres have high data returns to the UKRR regarding cause of death, whilst others return no information. Provision of this information is not mandatory. Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 1st January 2015.

Results and Discussion

Table 3.13 and figure 3.11 show the differences in the cause of death between prevalent dialysis and transplant patients. Table 3.14 shows the cause of death for prevalent transplant patients by age.

Death due to cardiovascular disease was less common in transplanted patients than in dialysis patients, perhaps reflecting the lower age of the transplanted patients, and cardiovascular screening undertaken during transplant work-up; transplant recipients are a pre-selected lower

Table 3.13. Cause of death by modality in prevalent RRT patients on 1/1/2015, who died in 2015

	All modalities		Dialysis		Transplant	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	714	22	613	23	101	18
Cerebrovascular disease	138	4	114	4	24	4
Infection	688	21	554	21	134	24
Malignancy	327	10	201	7	126	22
Treatment withdrawal	581	18	566	21	15	3
Other	666	20	534	20	132	24
Uncertain	144	4	115	4	29	5
Total	**3,258**		**2,697**		**561**	
No cause of death data	1,747	35	1,439	35	308	35

Table 3.14. Cause of death in prevalent transplant patients on 1/1/2015 by age, who died in 2015

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	101	18	54	21	47	15
Cerebrovascular disease	24	4	13	5	11	4
Infection	134	24	58	23	76	25
Malignancy	126	22	58	23	68	22
Treatment withdrawal	15	3	3	1	12	4
Other	132	24	61	24	71	23
Uncertain	29	5	10	4	19	6
Total	**561**		**257**		**304**	
No cause of death data	308	35	142	36	166	35

risk group of patients. The leading causes of death amongst transplant patients were malignancy (22%) and infection (24%). There has been a reduction over time in the proportion of deaths in transplant patients attributed to cardiovascular or cerebrovascular disease (43% in 2003 compared to 22% in 2015) with an increase in the proportion ascribed to infection or malignancy (30% in 2003 compared to 46% in 2015). The increased death rate secondary to malignancy and infection may include the increasing age of transplant recipients and

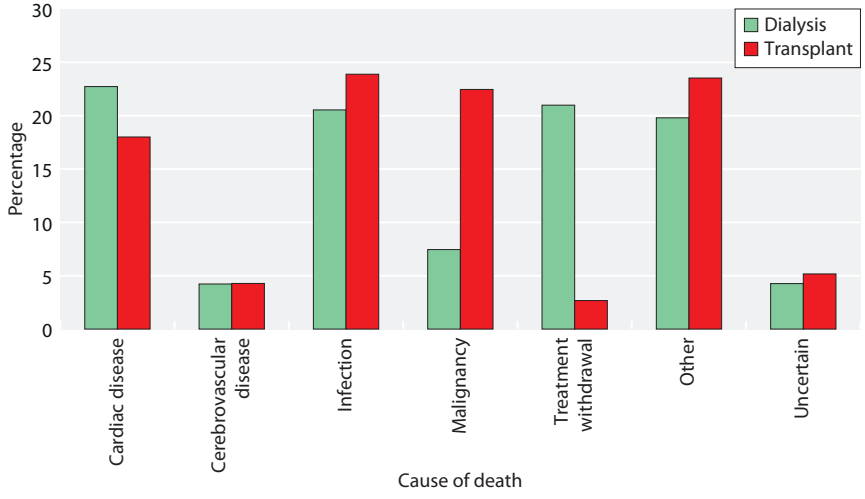

Fig. 3.11. Cause of death by modality for prevalent patients on 1/1/2015, who died in 2015

the increased intensity of immunosuppressive regimens, particularly the use of lymphocyte depleting induction regimes.

Conflicts of interest: Dr E Sharples has received travel honoraria from Alexion pharmaceuticals.

References

1 Ansell D, Tomson CRV: UK Renal Registry 11th Annual Report (December 2008) Chapter 15 The UK Renal Registry, UKRR database, validation and methodology. Nephron Clin Pract 2009;111(suppl 1): c277–c285

2 Pruthi R, Curnow E, Roderick P, Ravanan R. UK Renal Registry 17th Annual Report: Chapter 11 Centre Variation in Access to Renal Transplantation in the UK (2008–2010). Nephron. 2015;129(suppl 1):247–56. doi: 10.1159/000370281.

3 Oniscu GC, Ravanan R, et al. Access to Transplantation and Transplant Outcome Measures (ATTOM); study protocol of a UK wide, in-depth, prospective cohort analysis. BMJ Open 2016; 6: e010377.doi:10.1136/bmjopen-2015-010377

4 Bosma RJ, Doorenbos CRC, Stegeman CA, Homan van der Heide JJ, Navis G: Predictive Performance of Renal Function Equations in Renal Transplant Recipients: An analysis of Patient Factors in Bias. Am J Transplant 2005;5:2183–2203

5 Froissart M, Rossert J, Jacquot C, Paillard M, Houillier P: Predictive Performance of the Modification of Diet in Renal Disease and Cockcroft-Gault Equations for Estimating Renal Function. J Am Soc Nephrol. 2005;16:763–773

6 Hariharan, S, McBride MA, Cherikh WS, Tolleris CB, Bresnahan BA, Johnson CP: Post-transplant renal function in the first year predicts long-term kidney transplant survival. Kidney Int 2002;62:1:311–318

7 UK Renal Association Clinical Practice Guidelines Committee: Anaemia of CKD, 5th Edition. 2010. http://www.renal.org/clinical/GuidelinesSection/AnaemiaInCKD.aspx

8 UK Renal Association Clinical Practice Guidelines Committee: Guideline: Post-operative Care of the Kidney Transplant Recipient, 5th Edition. 2011. http://www.renal.org/Clinical/GuidelinesSection/Post-operative-Care-Kidney-Transplant-Recipient.aspx

9 White CA, Akbari A, Doucette S, Fergusson D, Knoll GA: Estimating Glomerular Filtration Rate in Kidney Transplantation: Is the New Chronic Kidney Disease Epidemiology Collaboration Equation Any Better? Clin Chem 2010;56:3:474–477

10 Ng FL, Holt DW, Chang RWS, MacPhee IAM: Black renal transplant recipients have poorer long-term graft survival than CYP3A5 expressers from other ethnic groups. Nephrol Dial Transplant 2010;25:628–634

Appendix 1: Reporting status of audit measures

Table 3.15. The reporting status of the recommended Renal Association Audit Measures for the Post-operative Care of Kidney Transplant Recipients in the 19th Annual Report

RA audit measure	Included in UKRR annual report?	Reason for non-inclusion
1. Proportion of blood results available for review, and reviewed, within 24 hours	No	UKRR does not currently collect these data
2. Proportion of renal centres with a written follow-up schedule available to all staff and patients	No	UKRR does not currently collect these data
3. Percentage of patients accessing their results through Renal Patient View	No	Requires linkage with RPV
4. Percentage of total patients assessed in an annual review clinic.	No	UKRR does not currently collect these data
5. Percentage of total patients receiving induction with ILRAs and TDAs	No	Poor data completeness
6. Percentage of de novo KTRs receiving tacrolimus	No	Poor data completeness
7. Percentage of de novo KTRs receiving MPA based immunosuppression	No	Poor data completeness
8. Percentage of de novo KTRs receiving corticosteroid maintenance therapy	No	Poor data completeness
9. Use of generic agents	No	UKRR does not currently collect these data
10. Severity of biopsy proven acute rejection (BPAR) recorded by BANFF criteria.	No	UKRR does not currently collect these data
11. Percentage of KTRs with BPAR in first 3 months and first 12 months.	No	UKRR does not currently collect these data
12. Percentage of KTRs requiring TDAs to treat rejection in first year	No	UKRR does not currently collect these data
13. Complication rates after renal transplant biopsy	No	UKRR does not currently collect these data
14. Proportion of patients receiving a target blood pressure of 130/80 mmHg or 125/75 mmHg in the presence of proteinuria (PCR >100 or ACR >70)	No	Poor data completeness on proteinuria
15. Proportion of patients receiving an ACE inhibitor or angiotensin receptor blocker	No	Poor data completeness
16. Proportion of patients with proteinuria assessed by dipstick and, if present, quantified at each clinic visit.	No	UKRR does not currently collect these data
17. Proportion of renal transplant recipients with an annual fasting lipid profile	No	UKRR does not currently collect these data
18. Proportion of KTR taking statins (including the type of statin) for primary and secondary prevention of premature cardiovascular disease	No	UKRR does not currently collect these data
19. Proportion of patients on other lipid lowering agents	No	Poor data completeness
20. Proportion of patients achieving dyslipidaemia targets	Partly	Reported but not a centre level, but by transplant status
21. Incidence of new onset diabetes after transplantation (NODAT) at three months and at annual intervals thereafter	No	UKRR does not currently collect these data
22. Proportion of patients who require insulin, and in whom remedial action is undertaken – minimisation of steroids and switching of CNIs	No	UKRR does not currently collect these data
23. Proportion of patients with ischaemic heart disease	No	Poor data completeness
24. Proportion of patients suffering myocardial infarction	No	Poor data completeness
25. Proportion of patients undergoing primary revascularisation	No	Poor data completeness

Table 3.15. Continued

RA audit measure	Included in UKRR annual report?	Reason for non-inclusion
26. Proportion of patients receiving secondary prevention with a statin, anti-platelet agents and RAS blockers	No	UKRR does not currently collect these data
27. Proportion of patients who are obese	No	Poor data completeness
28. Proportion of patients having screening procedures for neoplasia at the annual review clinic	No	UKRR does not currently collect these data
29. Incidence of CMV disease	No	Poor data completeness
30. Rate of EBV infection and PTLD	No	UKRR does not currently collect these data
31. Completeness of records for EBV donor and recipient serology	No	UKRR does not currently collect these data
32. Rates of primary VZV and shingles infection	No	UKRR does not currently collect these data
33. Completeness of records for VZV recipient serology	No	UKRR does not currently collect these data
34. Rates and outcomes of HSV infection.	No	UKRR does not currently collect these data
35. Rates of BK viral infection in screening tests.	No	UKRR does not currently collect these data
36. Rates and outcomes of BK nephropathy	No	UKRR does not currently collect these data
37. Frequency of bisphosponate use	No	UKRR does not currently collect these data
38. Incidence of fractures	No	UKRR does not currently collect these data
39. Incidence of hyperparathyroidism	Partly	Reported but not a centre level, due to poor data completeness
40. Incidence of parathyroidectomy	No	UKRR does not currently collect these data
41. Use of cinacalcet	No	Poor data completeness
42. Frequency of hyperuricaemia and gout	No	UKRR does not currently collect these data
43. Prevalence of anaemia	Yes	
44. Prevalence of polycythaemia	No	Poor data completeness
45. Pregnancy rates and outcomes	No	UKRR does not currently collect these data
46. Prevalence of sexual dysfunction	No	UKRR does not currently collect these data

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UK Renal Registry 19th Annual Report: Chapter 4 Demography of the UK Paediatric Renal Replacement Therapy Population in 2015

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Keywords
Adolescents · Aetiology · Children · Demography · Established renal failure · Incidence · Prevalence · Pre-emptive transplantation · Renal replacement therapy · Survival · Young adults

Summary

- A total of 941 children and young people aged <18 years with established renal failure (ERF) were receiving treatment at paediatric nephrology centres in 2015.
- At the census date (31st December 2015), 75.3% of prevalent paediatric patients aged <16 years had a functioning kidney transplant, 13.0% were receiving haemodialysis (HD) and 11.7% were receiving peritoneal dialysis (PD).
- In patients aged <16 years, prevalence of ERF was 62.7 per million age related population (pmarp) and incidence was 10.2 pmarp.
- The most common primary renal diagnosis was renal dysplasia ± reflux, present in 34.7% of prevalent paediatric patients aged <16 years.
- A quarter of patients aged <16 years had one or more reported comorbidities at onset of renal replacement therapy (RRT).
- Pre-emptive transplantation rates for children aged three months to 16 years who were referred early have been maintained and were 33.2% for the 2011–2015 period.
- At transfer to adult services, 89.4% of patients had a functioning kidney transplant.
- Survival during childhood among children commencing RRT was the lowest in those aged under two years compared to those aged 12 to <16 years, with a hazard ratio of 4.1 (confidence interval [CI] 1.7–9.9) and in those receiving dialysis compared to having a functioning transplant, with a hazard ratio of 6.5 (CI 3.4–12.6).

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Introduction

The UK Renal Registry (UKRR) publishes annually chapters detailing demographics, clinical, haematological and biochemical parameters for patients managed in UK paediatric nephrology centres. In the UK, care for children, adolescents and young adults with established renal failure (ERF) requiring renal replacement therapy (RRT) is a tertiary service provided in 13 paediatric nephrology centres. All centres are equipped to provide peritoneal dialysis (PD) and haemodialysis (HD), with 10 centres also undertaking kidney transplantation.

Young adults aged 16–18 years may be managed in either paediatric or adult services, depending on local practices, educational and social factors. In this report, data for all patients aged <18 years in UK paediatric nephrology centres reported to the UKRR (with a particular focus on the demographics of those aged <16 years) are described.

In the UK in 2014, the prevalence rate of treated ERF in children and adolescents aged <16 years was 60.4 per million age related population (pmarp) and the incidence rate was 9.4 pmarp [1].

The objectives of this chapter are:

1. To describe the UK incidence, prevalence, causes of ERF and modality of treatment of children, adolescents and young adults on RRT on 31st December 2015
2. To describe trends in (1) over the past 15 years
3. To describe pre-emptive transplantation rates and survival of children and adolescents on RRT aged <16 years in the UK.

All 13 paediatric nephrology centres in the UK contribute data to the UKRR, mandated in England by the NHS service specification which requires, ***'paediatric renal units to submit data comprising the national renal data set to the UK Renal Registry on all patients on renal replacement therapy'*** [2]. In most cases this is via an annual extract of a centre's clinical computer system which is checked, validated and loaded onto the UKRR paediatric database. Where this is not possible, data returns are completed using a data collection form and manually loaded. At each return, missing data items are sought. Centres pay a capitation fee in order to support the process. Currently, the UKRR paediatric and adult databases are maintained separately and a future merger is planned.

Methods

Centres arranged for their own data to be extracted and sent to the UKRR for processing by clinical informaticians. For this report, end of year numbers were required by 31st January 2016 and the full data by 31st March 2016. However, the last submission was received on 4th September 2016. Overall responsibility for the process is held by the chair of the British Association for Paediatric Nephrology (BAPN) Audit and Registry Committee.

The content and analyses contained in the paediatric chapters are discussed and agreed by the BAPN Audit and Registry Committee members.

In this report, patient groups are described as:

1. 'Incident' group: patients who started RRT between 1st January and 31st December 2015
2. 'Prevalent' group: patients who were receiving RRT on 31st December 2015
3. 'Five-year' groups: patients who started RRT in the periods of 2001–2005, 2006–2010 and 2011–2015.

RRT is defined as all patients with renal transplants and patients on HD and PD for 90 days or more, with dialysis for acute kidney injury (AKI) not reported upon at present. In this report those aged <16 years at start of RRT who had received at least 90 days of RRT are included. Data for those aged 16–18 years and those receiving RRT for <90 days are not currently uniformly submitted to the UKRR.

The populations used to calculate the incidence and prevalence were obtained from the Office for National Statistics (ONS) [3]. The mid-2015 population estimate produced by the ONS, based on the 2011 census, was used to calculate the 2015 incidence and prevalence; the 2003 census data were used for the 2001–2005 group, the 2008 data for the 2006–2010 group and the 2013 data for the 2011–2015 group. Incidence and prevalence for 16–18 year olds are not reported. This is because data would not be representative of the UK as a whole, because these young people may also be managed in adult services.

Ethnicity is defined as stated by the patient/family and is reported as White, South Asian, Black and Other. The 'South Asian' ethnicity includes those of Indian, Pakistani or Bangladeshi origin only. The 'Other' ethnicity includes those from Chinese, other South Asian groups, e.g. Vietnamese and Malaysian, Arabic, mixed race ethnic origin or any other group. 'Black' ethnicity includes those of 'Black-African', 'Black-Caribbean' origin and 'Black-other' groups.

Statistical analyses were performed using SAS 9.3, with group analyses using the chi-squared test and median analyses using the Kruskal-Wallis test. Infants under the age of three months and 'late presenters' (defined as those commencing dialysis within three months following first review by a paediatric nephrologist) were excluded from analyses when calculating pre-emptive transplantation rates. For survival analysis, only patients starting RRT between 1st January 2001 and 31st December 2014 and receiving RRT for at least 90 days were included to ensure a minimum of one year follow-up at the census date. These patients were followed up to a maximum age of 16 years. As the maximum age of follow-up was restricted to 16 years it was not possible to calculate 10-year survival probabilities for patients starting RRT aged over eight years, or five-year survival probability for children

starting RRT aged >12 years. A Cox regression model was used to calculate hazard ratios for patient survival, adjusting for gender, age at start of RRT and RRT modality as a time dependent variable. Survival probabilities were calculated using univariate Kaplan-Meier curves.

Results

Data returns

Centres used a variety of clinical data systems to facilitate returns. In 2015, the majority of paediatric renal centres were using Vitaldata (Birmingham, Cardiff, Glasgow, Leeds, London Great Ormond Street), with others using Clinicalvision (Manchester, Newcastle), Mediqal (Belfast, Nottingham), Proton (Bristol), CyberREN (Liverpool) or bespoke systems (London Evelina, Southampton).

Most centres submitted their 2015 data electronically ($N = 12$) to the UKRR via data extracts. The remaining centre used paper forms which were manually entered into the database.

Overall data completeness was excellent for the following: age and gender (100%), ethnicity (98.0%), start and 90-day treatment modality (99.7%) and start date (99.5%). Completeness of other data items ranged from 83.4% to 99.2% and is shown by centre in table 4.1. Centre size and type (if undertaking paediatric kidney transplantation) are also displayed.

The UK paediatric prevalent ERF population in 2015

A total of 941 children and young people aged <18 years with ERF were receiving treatment at paediatric nephrology centres in 2015 (table 4.1). Of these, 769 (81.7%) were <16 years of age. Table 4.2 shows the number of these patients receiving RRT and rate of RRT by age group and gender. There was more than ten times the number of teenagers than infants receiving RRT. The prevalence of RRT increased with age and was higher in males across all age groups with an overall male to female ratio of 1.7 : 1.0. The reported prevalence in <16 year olds was 62.7 pmarp.

Table 4.3 shows the prevalence of ERF in under 16 year olds by ethnicity. Children from ethnic minorities displayed higher RRT prevalence rates when compared with White children, with South Asian children exhibiting the highest rates.

Modality of treatment

The majority of prevalent paediatric patients under 16 years old in 2015 had a functioning transplant, as shown in figure 4.1. The ratio of living to deceased donor transplants was 1.0 : 0.8.

Forty-four percent of patients started RRT on PD, 33% on HD and 23% with a pre-emptive transplant, as displayed in figure 4.2.

Analysis by age shows the proportion of those receiving dialysis as current treatment was higher in younger children, with increasing use of transplantation in older

Table 4.1. Data completeness for the paediatric prevalent ERF population on 31/12/2015

		% completeness				
Centre	*N*	First seen date	Height at RRT start	Weight at RRT start	Creatinine at RRT start	Primary renal diagnosis
Blfst_P*	25	92.0	80.0	88.0	92.0	100.0
Bham_P*	110	93.6	92.7	94.6	94.6	99.1
Brstl_P*	56	96.4	87.5	94.6	98.2	100.0
Cardf_P	31	93.6	96.8	96.8	96.8	100.0
Glasg_P*	56	100.0	96.4	100.0	98.2	100.0
L Eve_P*	100	84.0	60.0	66.0	68.0	100.0
L GOSH_P*	179	96.7	88.3	93.9	96.1	100.0
Leeds_P*	82	100.0	90.2	100.0	100.0	100.0
Livpl_P	56	94.6	69.6	76.8	91.1	96.4
Manch_P*	91	94.5	92.3	95.6	95.6	100.0
Newc_P*	36	100.0	97.2	97.2	100.0	100.0
Nottm_P*	87	95.4	73.6	89.7	87.4	94.3
Soton_P	32	93.8	50.0	50.0	59.4	100.0
UK	**941**	**94.8**	**83.4**	**89.3**	**91.2**	**99.2**

RRT – renal replacement therapy
*Denotes centre undertaking kidney transplantation for children

Table 4.2. The UK paediatric prevalent ERF population <16 years old on 31/12/2015, by age group and gender

	All patients		Males		Females		M : F rate ratio
Age group (years)	*N*	pmarp	*N*	pmarp	*N*	pmarp	
0–<2	21	13.4	13	16.2	8	10.5	1.5
2–<4	55	33.5	40	47.6	15	18.7	2.5
4–<8	185	57.2	126	76.1	59	37.3	2.0
8–<12	231	77.2	143	93.3	88	60.2	1.5
12–<16	277	98.1	172	118.9	105	76.2	1.6
Under 16	**769**	**62.7**	**494**	**78.7**	**275**	**46.0**	**1.7**

pmarp – per million age related population

Table 4.3. The UK paediatric prevalent ERF population <16 years old on 31/12/2015, by age group and ethnic group[a]

	White		South Asian		Black		Other[b]
Age group (years)	*N*	pmarp	*N*	pmarp	*N*	pmarp	*N*
0–<4	52	20.1	11	52.2	2	23.7	9
4–<8	132	55.2	25	128.2	3	38.5	21
8–<12	163	63.7	46	220.7	8	95.9	12
12–<16	200	74.2	43	195.8	16	182.1	16
Under 16	**547**	**53.5**	**125**	**149.9**	**29**	**86.9**	**58**

pmarp – per million age related population
[a]Ten children with no ethnicity data recorded are excluded from this table
[b]pmarp data not included for group 'Other', because the group is too heterogeneous

patients, as shown in table 4.4. There were no transplants in those aged under two years and live transplants were more common than deceased transplants in those aged two to under 12 years. Treatment in the youngest age groups was subject to variation because there were few patients. There was no difference in modality by gender or ethnicity.

Cause of ERF

Renal dysplasia with or without reflux nephropathy was the commonest primary renal diagnosis (PRD) in prevalent patients under 16 years in 2015 as shown in table 4.5. The high male to female ratio in those with obstructive uropathy was a result of posterior urethral valves. Figure 4.3 displays the percentage of patients in

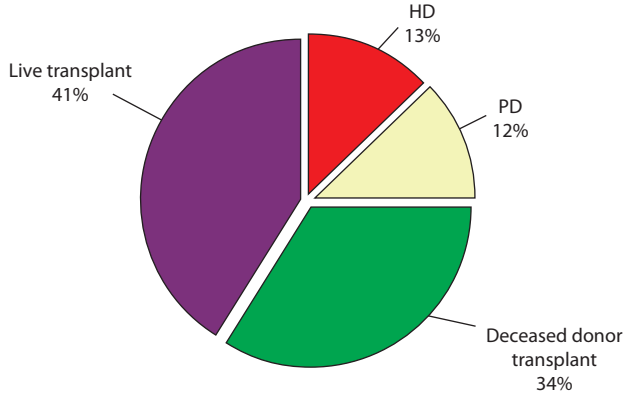

Fig. 4.1. RRT treatment used by prevalent paediatric patients <16 years old on 31/12/2015

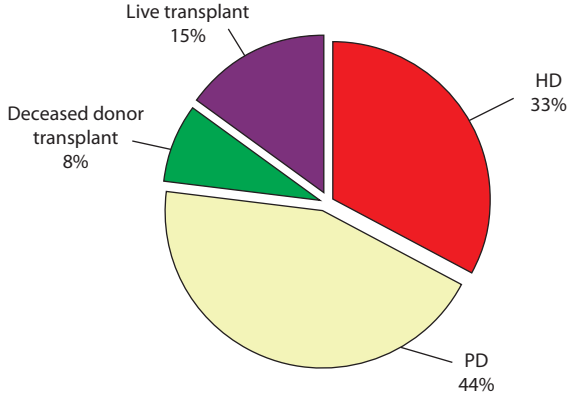

Fig. 4.2. Treatment modality at start of RRT in prevalent paediatric patients <16 years old on 31/12/2015

Table 4.4. Current treatment modality by age group in the UK paediatric prevalent ERF population <18 years old on 31/12/2015

Age group (years)	Total	Current treatment							
		HD		PD		Live transplant		Deceased donor transplant	
		N	%	*N*	%	*N*	%	*N*	%
0–<2	21	5	23.8	16	76.2	0	0.0	0	0.0
2–<4	55	16	29.1	24	43.6	13	23.6	2	3.6
4–<8	185	25	13.5	18	9.7	102	55.1	40	21.6
8–<12	231	30	13.0	14	6.1	97	42.0	90	39.0
12–<16	277	24	8.7	18	6.5	108	39.0	127	45.8
16–<18	172	9	5.2	10	5.8	68	39.5	85	49.4
Under 16	**769**	**100**	**13.0**	**90**	**11.7**	**320**	**41.6**	**259**	**33.7**
Under 18	**941**	**109**	**11.6**	**100**	**10.6**	**388**	**41.2**	**344**	**36.6**

HD – haemodialysis; PD – peritoneal dialysis

Table 4.5. Number, percentage and gender by primary renal disease in the UK paediatric prevalent ERF population <16 years old on 31/12/2015*

Diagnostic group	*N*	%	Males	Females	M : F ratio
Renal dysplasia ± reflux	267	34.7	172	95	1.8
Obstructive uropathy	145	18.9	142	3	47.3
Glomerular disease	88	11.4	37	51	0.7
Congenital nephrotic syndrome	77	10.0	40	37	1.1
Tubulo-interstitial diseases	51	6.6	21	30	0.7
Renovascular disease	37	4.8	25	12	2.1
Polycystic kidney disease	33	4.3	15	18	0.8
Metabolic	29	3.8	18	11	1.6
Uncertain aetiology	19	2.5	13	6	2.2
Malignancy & associated disease	17	2.2	5	12	0.4
Missing	6	0.8	6	0	
Total	**769**		**494**	**275**	**1.8**

*In 2015 there were no patients with ERF secondary to 'drug nephrotoxicity'

each diagnostic category for incident and prevalent cohorts. Missing PRD data have remained low: 0.4% in 2011 [4] to 0.8% in 2015.

The commonest comorbidities at the onset of RRT in 2015 were congenital abnormalities, developmental delay and syndromic diagnoses, reported in 7.0%, 6.9% and 6.5% of patients respectively, as shown in table 4.6. Although the majority of children were reported to have no comorbidities, there was considerable variation between centres (e.g. no comorbidity reported in 94% of patients from Cardiff and 50% of patients from Bristol). This may be due to small numbers in some centres or reporting practice and will be subject to a data quality exercise to evaluate whether there are genuine differences between centres in their willingness to accept patients with comorbidities onto the RRT programme.

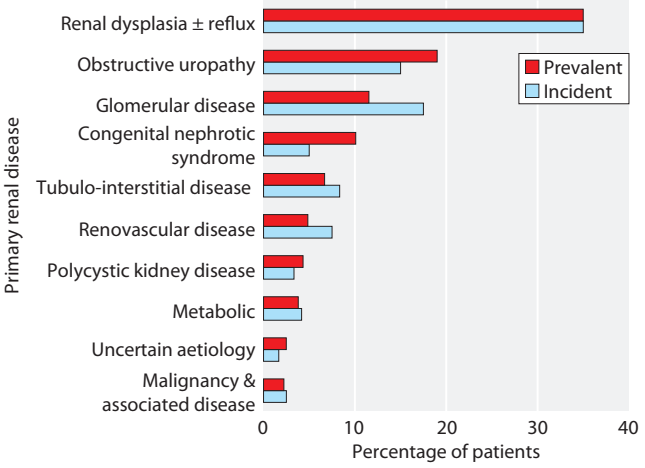

Fig. 4.3. Primary renal disease percentage in the UK paediatric incident and prevalent ERF population <16 years old in 2015 for patients with a reported causative diagnosis

Table 4.6. Frequency of registered comorbidities at onset of RRT in the UK paediatric prevalent ERF population <16 years old in 2015

Comorbidity	*N*	% all RRT patients
Congenital abnormality	54	7.0
Developmental delay	53	6.9
Syndromic diagnosis	50	6.5
Prematurity	46	6.0
Consanguinity	26	3.4
Liver disease	12	1.6
Chromosomal abnormality	11	1.4
Family member with ERF	11	1.4
Cerebral palsy	8	1.0
Congenital heart disease	7	0.9
Malignancy	6	0.8
Neural tube defect	4	0.5
Psychological disorder	4	0.5
Diabetes	1	0.1
No reported comorbidity	**571**	**74.3**
One reported comorbidity	**128**	**16.6**
Two or more comorbidities	**70**	**9.1**

The UK paediatric incident ERF population in 2015

There were 137 patients <18 years of age who commenced RRT at paediatric renal centres in 2015. As before, the following analyses were restricted to the 125 patients who were <16 years of age.

The incidence of RRT was 10.2 pmarp in 2015. Patients commencing RRT in 2015 are displayed by age and gender in table 4.7; apparent differences may be a result of small group sizes.

Trends in ERF demographics

Table 4.8 shows that the reported incidence of RRT has remained steady since 2001, with the highest incidence seen in both the youngest and oldest age groups. There were 1,715 children and adolescents <16 years of age who had received RRT in the UK over the 15-year period between 2001 and 2015. Table 4.9 shows an increase in the proportion of those aged two to <four years starting RRT and a decrease in the proportion of those aged 12 to <16 years starting RRT over the time period. Table 4.10 shows a decrease in the proportion of those with a White ethnicity starting RRT and an increase in the proportion of those in the 'Other' ethnic group starting RRT over the time period. Table 4.11 shows that the overall proportions between paediatric renal centres have fluctuated only slightly over the time period.

Table 4.8. Reported average incidence by age group in five-year time periods of the UK paediatric incident ERF population <16 years old commencing RRT

Age group (years)	pmarp		
	2001–2005	2006–2010	2011–2015
0–<2	12.4	13.1	12.1
2–<4	5.8	7.3	9.4
4–<8	5.7	6.9	6.9
8–<12	8.1	8.9	9.5
12–<16	13.1	14.4	11.7
Under 16	**9.1**	**10.2**	**9.7**

pmarp – per million age related population

Table 4.12 shows the number and percentage of children receiving RRT with each of the major reported comorbidities over the last 15 years. As before, any apparent differences may be a result of small numbers between groups. Overall, less comorbidity has been reported in children receiving RRT over the last 15 years and, as previously mentioned, it is not clear whether this was due to reporting or differences in case selection.

The proportion of those starting RRT with deceased donor transplants is falling (from 12.0% in 2001–2005 to 8.6% in 2011–2015), as shown in figure 4.4, whilst

Table 4.7. The UK paediatric incident ERF population <16 years old in 2015, by age group and gender

Age group (years)	All patients		Males		Females		M : F ratio
	N	pmarp	*N*	pmarp	*N*	pmarp	
0–<2	22	14.1	16	20.0	6	7.9	2.5
2–<4	14	8.5	10	11.9	4	5.0	2.4
4–<8	34	10.5	21	12.7	13	8.2	1.5
8–<12	26	8.7	14	9.1	12	8.2	1.1
12–<16	29	10.3	17	11.8	12	8.7	1.3
Under 16	**125**	**10.2**	**78**	**12.4**	**47**	**7.9**	**1.6**

pmarp – per million age related population

Table 4.9. Number and percentage of the UK paediatric incident ERF population <16 years old who commenced RRT, by age group and five-year period of starting RRT

	2001–2005		2006–2010		2011–2015	
Age group (years)	*N*	%	*N*	%	*N*	%
0–<2	83	15.6	101	16.9	98	16.8
2–<4	39	7.3	53	8.9	76	13.0
4–<8	83	15.6	95	15.9	107	18.3
8–<12	123	23.1	129	21.6	133	22.8
12–<16	205	38.5	220	36.8	170	29.1
Under 16	**533**		**598**		**584**	

Table 4.10. Number* and percentage of the UK paediatric incident ERF population <16 years old who commenced RRT, by ethnicity and five-year period of starting RRT

	2001–2005		2006–2010		2011–2015	
Ethnic group	*N*	%	*N*	%	*N*	%
White	418	78.7	445	75.3	399	69.6
South Asian	81	15.3	93	15.7	102	17.8
Black	14	2.6	24	4.1	20	3.5
Other	18	3.4	29	4.9	52	9.1
Under 16	**531**		**591**		**573**	

*Two children in 2001–2005, seven in 2006–2010 and 11 in 2011–2015 with no ethnicity recorded are excluded from this table

that of live transplants has remained stable in the two most recent five-year periods (17.8%). As seen previously, use of PD as a starting modality has fallen from 53.0% in 2001–2005 to 36.8% in 2011–2015, being replaced with increased use of HD and living kidney donation.

Glomerular disease as a cause of ERF has fallen compared to other PRDs in the prevalent paediatric population over the last 15 years, as shown in table 4.13.

Pre-emptive transplantation

Of the 1,715 patients aged <16 years who started RRT between 2001 and 2015, 463 were excluded from this

Table 4.11. Number and percentage of the UK paediatric incident ERF population <16 years old, by renal centre and five-year period of starting RRT

	2001–2005		2006–2010		2011–2015	
Centre	*N*	%	*N*	%	*N*	%
Blfst_P	17	3.2	24	4.0	13	2.2
Bham_P	54	10.1	66	11.0	70	12.0
Brstl_P	41	7.7	34	5.7	32	5.5
Cardf_P	16	3.0	19	3.2	24	4.1
Glasg_P	33	6.2	44	7.4	39	6.7
L Eve_P	44	8.3	65	10.9	63	10.8
L GOSH_P	97	18.2	121	20.2	99	17.0
Leeds_P	50	9.4	53	8.9	53	9.1
Livpl_P	31	5.8	21	3.5	35	6.0
Manch_P	52	9.8	47	7.9	68	11.6
Newc_P	30	5.6	25	4.2	20	3.4
Nottm_P	47	8.8	63	10.5	47	8.0
Soton_P	21	3.9	16	2.7	21	3.6
Under 16	**533**		**598**		**584**	

Table 4.12. Trends in reported comorbidity frequency at the onset of RRT in the UK paediatric incident population <16 years old, by five-year period

	2001–2005		2006–2010		2011–2015	
Comorbidity	*N*	%	*N*	%	*N*	%
Syndromic diagnosis	49	9.2	45	7.5	31	5.3
Developmental delay	38	7.1	44	7.4	30	5.1
Congenital abnormality	48	9.0	48	8.0	29	5.0
Prematurity	26	4.9	31	5.2	27	4.6
Consanguinity	21	3.9	16	2.7	19	3.3
Family member with ERF	22	4.1	11	1.8	13	2.2
Liver disease	10	1.9	11	1.8	8	1.4
Malignancy	8	1.5	3	0.5	5	0.9
Neural tube defect	3	0.6	4	0.7	5	0.9
Cerebral palsy	9	1.7	9	1.5	4	0.7
Congenital heart disease	12	2.3	19	3.2	4	0.7
Psychological disorder	10	1.9	8	1.3	4	0.7
Chromosomal abnormality	12	2.3	20	3.3	2	0.3
Diabetes	6	1.1	3	0.5	1	0.2
No reported comorbidity	**336**	**63.0**	**419**	**70.1**	**457**	**78.3**
One reported comorbidity	**140**	**26.3**	**119**	**19.9**	**84**	**14.4**
Two or more comorbidities	**57**	**10.7**	**60**	**10.0**	**43**	**7.4**

ERF – established renal failure

analysis (92 patients due to being aged under three months, 371 due to being late presenters). Table 4.14 shows that a third of the 1,252 patients identified as being aged three months to <16 years and starting RRT between 2001–2015 had a pre-emptive transplant.

Contrary to previous reports [1], there was no significant difference in pre-emptive transplantation rates by time period ($p = 0.09$).

There remained a significant difference in pre-emptive transplantation rates, with higher rates in boys ($p = 0.002$), although this difference was less significant ($p = 0.03$) when adjusted for other factors in a logistic regression (time period, ethnicity, age at start and PRD). Pre-emptive transplantation rates were higher in White versus non-White ethnicity ($p < 0.0001$). Analysis by age at start of RRT showed that, as expected, the lowest

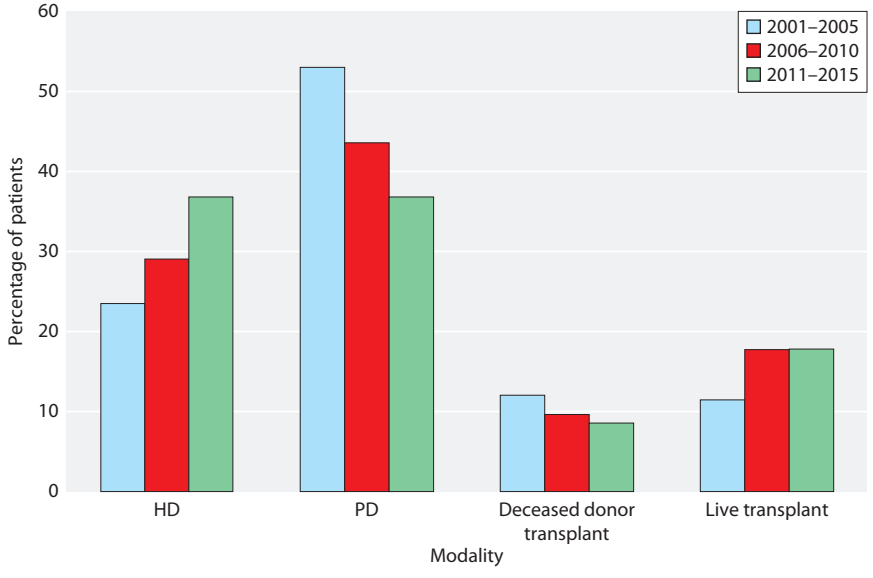

Fig. 4.4. Treatment modality at start of RRT for the UK paediatric incident ERF population <16 years old, by five-year time period

Table 4.13. Number* and percentage of primary renal diseases in the UK paediatric prevalent ERF population <16 years old, by five-year time period

	2001–2005		2006–2010		2011–2015	
Primary renal diagnosis	*N*	%	*N*	%	*N*	%
Renal dysplasia ± reflux	172	32.6	193	32.7	204	35.4
Obstructive uropathy	77	14.6	92	15.6	96	16.6
Glomerular disease	112	21.3	124	21.0	71	12.3
Tubulo-interstitial diseases	41	7.8	46	7.8	47	8.1
Congenital nephrotic syndrome	27	5.1	32	5.4	46	8.0
Uncertain aetiology	20	3.8	26	4.4	30	5.2
Polycystic kidney disease	15	2.8	14	2.4	26	4.5
Metabolic	26	4.9	30	5.1	26	4.5
Renovascular disease	18	3.4	22	3.7	22	3.8
Malignancy & associated disease	10	1.9	7	1.2	9	1.6
Drug nephrotoxicity	9	1.7	4	0.7	0	0.0

*Six children in 2001–2005, eight in 2006–2010 and seven in 2011–2015 with no primary renal diagnosis recorded are excluded from this table

rate of pre-emptive transplantation was in those aged three months to two years, whilst children aged four to 16 years had similar rates of pre-emptive transplantation. Following exclusion of the youngest age group, there was no statistical difference in pre-emptive transplantation rates by age. Rates differed with PRD (lower in glomerular diseases versus renal dysplasia ± reflux nephropathy and obstructive uropathies, $p < 0.0001$). Children with polycystic kidney disease, obstructive uropathy, metabolic causes, renal dysplasia ± reflux, uncertain aetiology and renovascular diseases had the highest rates of pre-emptive transplantation, whilst those with malignancy and congenital nephrotic syndrome had the lowest rates.

Transfer of patients to adult renal services in 2015

Eighty-five patients were reported by paediatric nephrology centres to have transferred to adult renal services in 2015, similar to the 93 who transferred during 2014 [1]. The median age of patients transferred out was 18.0 years with an inter-quartile range of 17.7–18.4 years. Table 4.15 shows that the demographics of those transferring out were very similar to those of the overall prevalent paediatric RRT population, but with 89.4% having a functioning transplant.

Survival of children on RRT during childhood

Of patients under 16 years of age, 1,561 were identified as starting RRT between 2001 and 2014 at paediatric centres in the UK and were included in the survival analyses. At the census date (31st December 2015) there were a total of 75 deaths reported in children on RRT <16 years of age at paediatric centres. The median follow up time (beyond day 90) was 3.4 years (range of three days to 14.7 years). Table 4.16 shows the survival hazard ratios (following adjustment for age at start of RRT, gender and RRT modality) and highlights that children starting RRT under two years of age had the worst survival outcomes, with a hazard ratio of 4.1 (CI 1.7–9.9, $p = 0.002$) when compared to 12–16 year olds. Being on dialysis was shown to lower survival significantly compared to having a functioning transplant, with a hazard ratio of 6.5 (CI 3.4–12.6, $p < 0.0001$). There was insufficient power to add PRD to the model; drug induced nephrotoxicity and metabolic PRDs had the worst survival but CIs were wide and included no effect. Figure 4.5 shows unadjusted Kaplan-Meier survival probabilities and highlights worse outcomes for those aged less than two years, particularly during the first year.

Mortality data in 2015

Nine deaths occurred in paediatric renal centres in 2015; the median age at death was 10.7 years (range 3.1–17.8 years). In children aged <18 years with treated ERF, the total reported mortality in 2015 in UK paediatric centres was 1.0% (9/941) and 5.5% (6/109) for those on dialysis.

Transplant deaths

In 2015, at the time of death, four children had received a kidney transplant. One child had a sudden unexplained death. The causes of death for the other three children were: malignant hyperthermia; viraemia and multiorgan failure; and an acute haematological malignancy.

Table 4.14. Demographic characteristics of pre-emptive transplantation in the UK paediatric ERF population aged three months to 16 years, 2001–2015, by five-year time period, gender, ethnicity, age at start of RRT and PRD

	N	*N* (%) pre-emptively transplanted
Total cohort analysed (2001–2015)	1,252	417 (33.3)
Time period		
2001–2005	389	115 (29.6)
2006–2010	420	155 (36.9)
2011–2015	443	147 (33.2)
Gender		
Male	791	288 (36.4)
Female	461	129 (28.0)
Ethnicity		
White	918	333 (36.3)
South Asian	207	46 (22.2)
Other	68	24 (35.3)
Black	40	6 (15.0)
Age at start of RRT (years)		
3 months–<2	134	7 (5.2)
2–<4	143	41 (28.7)
4–<8	226	93 (41.2)
8–<12	298	104 (34.9)
12–<16	451	172 (38.1)
Primary renal diagnosis		
Renal dysplasia ± reflux	438	185 (42.2)
Obstructive uropathy	226	105 (46.5)
Glomerular disease	204	25 (12.3)
Congenital nephrotic syndrome	87	4 (4.6)
Tubulo-interstitial diseases	78	16 (20.5)
Metabolic	66	29 (43.9)
Polycystic kidney disease	46	23 (50.0)
Renovascular disease	37	12 (32.4)
Uncertain aetiology	31	11 (35.5)
Malignancy & associated disease	16	1 (6.3)
Drug nephrotoxicity	5	1 (20.0)

Dialysis deaths

In 2015, at the time of death, five children were on dialysis (all HD). Two patients died due to malignancy, two due to septicaemia and another due to cardiac failure on the background of a metabolic disorder.

Discussion

This report provides the paediatric nephrology community with a unique resource of data on the demographics of the UK paediatric RRT population from the previous year, as well as allowing comparisons of trends over the last fifteen years. This information is vital for the commissioning of such a tertiary service and the data are also included in European registry reports to allow for international comparisons.

Table 4.15. Modality, gender, ethnicity and PRD of the UK paediatric ERF population <18 years old transferred out from paediatric nephrology centres to adult renal services in 2015

	N	%
Modality		
Transplant	76	89.4
HD	5	5.9
PD	4	4.7
Gender		
Male	52	61.2
Female	33	38.8
Ethnicity[a]		
White	58	69.9
South Asian	15	18.1
Other	7	8.4
Black	3	3.6
Primary renal diagnosis[bc]		
Renal dysplasia ± reflux	28	33.3
Glomerular disease	15	17.9
Obstructive uropathy	11	13.1
Tubulo-interstitial diseases	7	8.3
Congenital nephrotic syndrome	7	8.3
Polycystic kidney disease	6	7.1
Metabolic	4	4.8
Uncertain aetiology	3	3.6
Malignancy & associated disease	2	2.4
Renovascular disease	1	1.2

[a]Two children with no ethnicity recorded are excluded from this table
[b]One child with no primary renal diagnosis recorded is excluded from this table
[c]In 2015 there were no patients transferred out with 'drug nephrotoxicity'

Data returns

Paediatric nephrology in the UK faces the challenge of being mandated to submit electronic data on small numbers of patients to the UKRR, sometimes using renal computer systems designed to collect registry data for adult patients. This often results in the need for additional data collection for the paediatric-specific dataset. Overall, completeness of data items has fallen slightly. In spite of this all centres are included. Despite a standardised dataset, the extracts received by the UKRR usually require extensive input to allow them to be uploaded into the database. Once submitted data have been checked and validated they are returned to

Table 4.16. Survival hazard ratio during childhood for the UK paediatric ERF population <16 years old, adjusted for age at start of RRT, gender and RRT modality

	Hazard ratio	CI	*p*-value
Age (years)			
0–<2	4.1	1.7–9.9	0.002
2–<4	2.4	0.9–6.3	0.08
4–<8	2.7	1.1–7.0	0.04
8–<12	1.1	0.4–3.0	0.8
12–<16	1.0	–	–
Gender			
Female	1.3	0.7–2.2	0.4
Male	1.0	–	
RRT modality			
Dialysis	6.5	3.4–12.6	<0.0001
Transplant	1.0	–	

CI – confidence interval

submitting renal centres with the onus on clinicians to provide any missing data items. A system is being devised to mark unobtainable missing data and to write them off, thereby minimising requests to clinicians. Feedback on improving the process is always welcomed.

Highlights from the 2015 data

Incident and prevalent rates remained steady. Overall the prevalent population was largely White, male and predominantly aged over eight years, with a functioning transplant, although the proportion of those commencing RRT aged two to under four years and from ethnic minorities was increasing.

RRT start modality

PD remained the most frequent start modality in just under half of paediatric patients. However, since 2001, use of PD as a start treatment is falling, with pre-emptive live transplants and HD increasing. PD was still the most commonly used RRT modality in young children. It is encouraging that a third of patients are now being pre-emptively transplanted, with increased use of live transplants that rate was stable in the two most recent five-year periods. Pre-emptive transplantation was observed to be influenced by ethnicity and PRD. It is not unexpected that children and young people with, for example, glomerular disease may need to spend time on HD before transplantation is safe, but the reasons for reduced pre-emptive transplantation in children from ethnic backgrounds is unclear and needs further study.

Current treatment modality is subject to variation over time in the youngest children because of low patient numbers in those age groups. It is interesting to note that live kidney transplantation is more common than deceased transplantation in younger children, with the reverse ratio being seen in older children.

Primary renal disease

Structural renal disorders (renal dysplasia and obstructive uropathy) accounted for half of all causes of ERF. These children often present early in life, indeed some are diagnosed antenatally, so spend many years under paediatric nephrology care. Structural renal disorders are more likely to be transplanted pre-emptively, so perhaps we should be expecting to transplant a

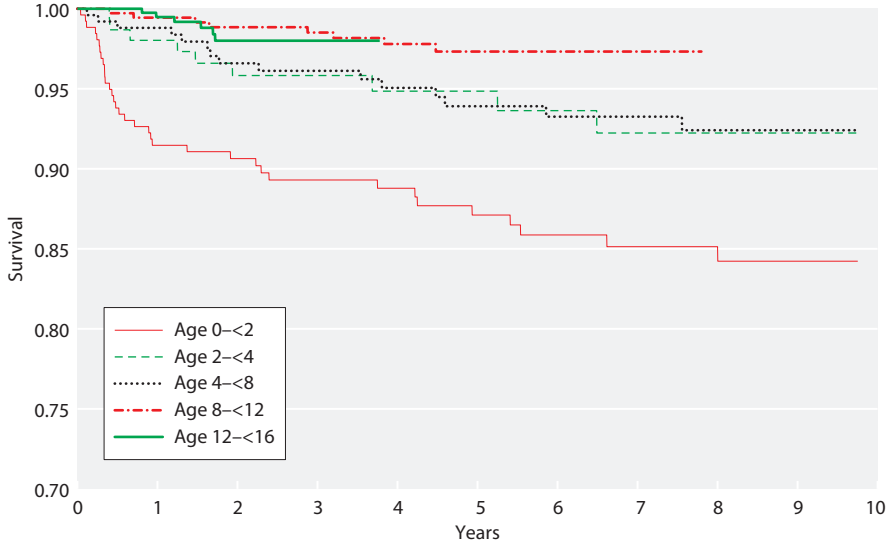

Fig. 4.5. Unadjusted Kaplan-Meier survival in the UK paediatric ERF population <16 years old starting RRT between 2001 and 2014, by age at start

greater number of children and young people pre-emptively. Some missing data may be due to a PRD not being assigned until the results of genetic tests have been received.

The proportion of glomerular disease in the paediatric RRT population has fallen by 10% since 2001–2005. With UKRR data expanding to capture earlier stages of chronic kidney disease (CKD) and resources such as the National Registry of Rare Kidney Disease (RaDaR), it should be possible to assess if better treatment is preserving renal function for longer and whether there is a corresponding increase in those with earlier stages of CKD due to glomerular pathologies.

Knowing that AKI leads to significant morbidity and mortality, the UKRR has recently contributed to work to prevent AKI nationally. Data on patients with AKI are requested by the UKRR, but most paediatric units are not yet in a position to provide those data, which would help determine the contribution of AKI to ERF. The current definitions of PRD do not pick up the contribution of AKI; often the cause of ERF is multifactorial rather than related solely to the underlying renal condition.

The incidence of renal disorders was higher in the Asian, Black and 'Other' groups compared with White. It would be interesting to look at PRD in these groups to see if there are differences in renal diseases causing ERF between populations.

Determining the representativeness of the comorbidity data could be addressed by confirming patient comorbidity data with each centre using the 2015 data. On the whole, it would appear that most paediatric patients start RRT without comorbidity, but it is known reporting varies by centre. It may be helpful to clarify the definitions of comorbidities to aid more standardised reporting.

The proportion of transplanted patients transferring to adult services remained consistently high at approximately 90% and underpins the need for well-planned transitions and transfers to ensure maximal long-term graft survival.

Survival analysis continued to show the negative influence of young age and dialysis modality. The relatively small numbers of deaths on RRT will allow a more detailed audit of deaths of children and young people on RRT. Individual units will be contacted and asked to provide more detailed information. This may help to develop more informative cause of death categories. A project using UKRR data has involved further survival analysis on a cohort of adolescents and young adults starting RRT. This project has highlighted the importance of transplant listing status on survival and the results will be published shortly.

Current and future work

Several projects are planned for the forthcoming year. A more detailed audit of deaths will be undertaken as described above. Similarly, the need for better comorbidity reporting has been discussed. Further planned work includes a report evaluating demographic and clinical factors associated with graft function post transplantation (evaluated as estimated glomerular filtration rate (eGFR)). An extended follow-up of a previously reported cohort of children who commenced dialysis aged under two years is also planned. This will provide more relevant data with five to 10 year outcomes of UK children.

Centres will be contacted with the aim of completing comorbidity and disability data for prevalent patients where this may have been submitted unclearly making it impossible to differentiate between a condition being not present in the patient or this information not being available at the time of submission. Once complete it will be possible to comment with more confidence if there are inter-centre differences in the rates of offering RRT to patients with additional comorbidities.

There is well-documented unexplained between centre variation in access to the waiting list, time taken for activation and receipt of a transplant once activated in both adult and paediatric units. Following on from the success of the Access to Transplantation and Transplant Outcome Measures (ATTOM) project in adults, the Access to Transplantation and Transplant Outcome Measures In Children (ATTOMic) project will begin by focusing on these aspects within paediatric nephrology centres, initially based on the work of declined deceased donor organs for prospective paediatric renal transplant recipients. The first stage will be for a questionnaire to be completed by the paediatric nephrologist or team caring for any child (aged <18 years) (i) on chronic dialysis; (ii) renal transplant recipient but with eGFR ≤ 30 ml/min/1.73 m^2; or (iii) CKD with eGFR ≤ 30 ml/min/1.73 m^2. Data will be requested for all prevalent children at each of the 13 paediatric nephrology centres on the census date of 31st December 2016.

The expansion of UKRR data collection to include CKD and AKI will widen the scope of our report and give insights into such questions as whether PRD proportions (for example glomerular disease, seen to be falling in the ERF population) are changing due to improved

management, delaying progression to ERF, as well as the impact of AKI on CKD disease progression.

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Conflicts of interest: the authors declare no conflicts of interest

References

1 Hamilton AJ, Braddon F, Casula A, Inward C, Lewis M, Mallett T, Maxwell H, O'Brien C, Tse Y, Sinha MD. UK Renal Registry 18th Annual Report: Chapter 4 Demography of Patients Receiving Renal Replacement Therapy in Paediatric Centres in the UK in 2014. Nephron. 2016; 132 (suppl 1):99–110. doi: 10.1159/000444818

2 NHS England. 2013/14 NHS Standard Contract for Paediatric Medicine: Renal. Particulars, Schedule 2 – The Services, A – Service Specification http://www.england.nhs.uk/wp-content/uploads/2013/06/e03-paedi-medi-renal.pdf

3 https://www.ons.gov.uk/census

4 Pruthi R, O'Brien C, Casula A, Braddon F, Lewis M, Maxwell H, Tse Y, Inward C, Sinha MD. UK Renal Registry 15th Annual Report (December 2011): Chapter 4 Demography of the UK Paediatric Renal Replacement Therapy Population in 2011. Nephron Clin Pract. 2013; 123(suppl 1):81–92. doi: 10.1159/000353323.

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UK Renal Registry 19th Annual Report: Chapter 5 Survival and Causes of Death in UK Adult Patients on Renal Replacement Therapy in 2015: National and Centre-specific Analyses

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Keywords

Causes of death · Comorbidity · Dialysis · End stage renal disease (ESRD)· Established renal failure (ERF) · Haemodialysis · Outcome · Peritoneal dialysis · Renal replacement therapy (RRT) · Survival · Transplant · Vintage

Summary

- Short-term (90 day) age-adjusted survival of incident RRT patients in 2014 was static compared with 2013 (96.8% versus 96.9%).
- One year after 90 day age adjusted survival for incident RRT patients in the 2014 cohort fell slightly to 90.2% compared with the previous year (91.4%).
- There was a difference in one year after 90 day incident survival by age group and diagnosis of diabetes: patients with diabetes aged <45 years have worse one year after 90 day survival than patients without diabetes, but for older patients with diabetes (⩾45 years) survival was similar compared to those without diabetes.
- One year age adjusted survival for prevalent dialysis patients was static at 88.3% in the 2014 cohort, compared with 88.6% in the 2013 cohort. Age adjusted one year survival for prevalent dialysis patients with diabetic primary renal disease has been declining slightly from 2012 onwards.
- Centre and UK country variability was evident in incident and prevalent patient survival after adjusting to age 60. Further adjustment for comorbidity was not possible due to missing data.
- The relative one year risk of death for prevalent RRT patients compared with the general population was approximately 22.0 for age group 35–39 compared with 2.3 at age 85+ years, but the relative risk of death for younger patients has improved over time.
- In the prevalent RRT population, cardiovascular disease was the most common cause of death and accounted for 22% of deaths, with infection accounting for 21%. In 2014 treatment withdrawal accounted for 18% of deaths and this represents an increase in recent years from historical levels.

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Introduction

The analyses presented in this chapter examine a) survival from the start of renal replacement therapy (RRT) of adult patients; b) survival amongst prevalent adult dialysis patients alive on 31st December 2014; c) the death rate in the UK compared to the general population; d) the causes of death for incident and prevalent adult patients. They encompass the outcomes of the total incident adult UK RRT population (2014) reported to the UK Renal Registry (UKRR), including the 19.2% who started on peritoneal dialysis and the 7.7% who received a pre-emptive renal transplant. These results are therefore a true reflection of the outcomes in the whole UK adult incident RRT population. Analyses of survival within the first year of starting RRT include patients who were recorded as having started RRT for established renal failure (as opposed to acute kidney injury) but who had died within the first 90 days of starting RRT, a group excluded from most other countries' registry data. As is common in other countries, survival analyses are also presented for the first year after 90 days.

The term established renal failure (ERF) used throughout this chapter is synonymous with the terms end stage renal failure (ESRF) and end stage renal disease (ESRD) which are in more widespread international usage. Within the UK, patients have disliked the term 'end stage'; the term ERF was endorsed by the English National Service Framework for Renal Services, published in 2004.

Since 2006, the UKRR has openly reported and published centre attributable RRT survival data. These are raw data which must be interpreted with caution. The UKRR adjusts for the different age distributions of patients in different centres, but lacks sufficient data from many participating centres to allow adjustment for primary renal diagnosis, other comorbidities at start of RRT (comorbidity, especially diabetes, is a major factor associated with survival [1–3]) and ethnic origin, which have been shown to have an impact on outcome (for instance, better survival is expected in centres with a higher proportion of Black and South Asian patients) [4]. This lack of data on the centre level case-mix makes interpretation of any apparent difference in survival between centres and UK countries difficult. Despite the uncertainty about apparent differences in outcome, any centre which appears to be an outlier will be subject to the UKRR clinical governance procedures as set out in chapter 2 of the 2009 UKRR Report [5].

Methods

The unadjusted survival probabilities (with 95% confidence intervals) were calculated using the Kaplan–Meier method, in which the probability of surviving more than a given time can be estimated for all members of a cohort of patients overall or by subgroup such as age group, but without any adjustment for confounding factors such as age that affect the chances of survival. Where centres are small, or the survival probabilities are greater than 90%, the confidence intervals are only approximate.

In order to estimate the difference in survival of different subgroups of patients within the cohort, a stratified proportional hazards model (Cox) was used where appropriate. The results from the Cox model were interpreted using a hazard ratio. When comparing two groups, the hazard ratio is the ratio of the estimated hazard for group A relative to group B, where the hazard is the risk of dying at time t given that the individual has survived until this time. The underlying assumption of a proportional hazards model is that the hazard ratio remains constant throughout the period under consideration. Whenever used, the assumptions of the proportional hazards model were tested by plotting the log(−log(survival)) versus the log of survival time or by testing time dependent covariates in the model.

To allow for comparisons between centres with differing age distributions, survival analyses were adjusted for age and reported as survival adjusted to age 60. This gives an estimate of what the survival would have been if all patients in that centre had been aged 60 at the start of RRT. This age was chosen because it was approximately the average age of patients starting RRT 16 years ago at the start of the UKRR's data collection. The average age of patients commencing RRT in the UK has recently stabilised around an age of 62 years, but the UKRR has maintained age adjustment to 60 years for comparability with all previous years' analyses. Diabetic patients were included in all analyses unless stated otherwise and for some analyses, diabetic and non-diabetic patients were analysed separately and compared. Non-diabetic patients were defined as all patients excluding those patients with diabetes as the primary renal disease.

Centre variability for incident and prevalent patient survival was analysed using a funnel plot. For any number of patients in the incident or prevalent cohort (x-axis), one can identify whether any given survival probability (y-axis) falls within, plus or minus two standard deviations (SDs) from the national mean (solid lines, 95% limits) or three SDs (dotted lines, 99.9% limits). All analyses were undertaken using SAS 9.3.

Definition of RRT start date

The incident survival figures quoted in this chapter are from the first day of RRT whether with dialysis or a pre-emptive transplant. In the UKRR all patients starting RRT for ERF are included from the date of the first RRT treatment wherever it took place (a date currently defined by the clinician) if the clinician considered the renal failure irreversible. Should a patient recover renal function within 90 days they were then excluded. These UK data therefore may include some patients who died within 90 days who had developed acute, potentially reversible renal failure but were recorded by the clinician as being in irreversible ERF.

Previously, the UKRR asked clinicians to re-enter a code for ERF in patients initially coded as having acute renal failure once it had become clear that there was no recovery of kidney function.

However, adherence to this requirement was very variable, with some clinicians entering a code for ERF only once a decision had been made to plan for long-term RRT [6]. All UK nephrologists have now been asked to record the date of the first haemodialysis session and to record whether the patient was considered to have acute kidney injury (acute renal failure) or to be in ERF at the time. For patients initially categorised as 'acute', but who were subsequently categorised as ERF, the UKRR assigns the date of this first 'acute' session as the date of start of RRT.

UKRR analyses of electronic data extracted for the immediate month prior to the start date of RRT provided by clinicians highlighted additional inconsistencies in the definition of this first date when patients started on peritoneal dialysis, with the date of start reported to the UKRR being later than the actual date of start. These findings are described in detail in chapter 13 of the 2009 Annual Report [6]. This concern is unlikely to be unique to the UK, but will be common to analyses from all renal centres and registries.

In addition to these problems of defining day 0 within one country, there is international variability when patient data are collected by national registries with some countries (often for financial re-imbursement or administrative reasons) defining the 90th day after starting RRT as day 0, whilst others collect data only on those who have survived 90 days and report as zero the number of patients dying within the first 90 days.

Thus, as many other national registries do not include reports on patients who do not survive the first 90 days, survival from 90 days onwards is also reported to allow international comparisons. This distinction is important, as there is a much higher death rate in the first 90 days, which would distort comparisons.

Methodology for incident patient survival

The incident population is defined as all patients over 18 who started RRT at UK renal centres. Patients were considered 'incident' at the time of their first RRT, thus patients re-starting dialysis after a failed transplant were not included in the incident RRT cohort (see appendix B for a detailed definition of the incident (take-on) population).

For incident survival analyses, patients newly transferred into a centre who were already on RRT were excluded from the incident population for that centre and were counted at the centre at which they started RRT. Some patients recovered renal function after more than 90 days but subsequently returned to RRT and for these patients the most recent start of RRT was used.

The incident survival cohort was **NOT** censored at the time of transplantation and therefore included the survival of the 7.7% who received a pre-emptive transplant. An additional reason for not censoring was to facilitate comparison between centres. Centres with a high proportion of patients of South Asian and Black origin are likely to have a healthier dialysis population, because South Asian and Black patients are less likely to undergo early transplantation [7], and centres with a high pre-emptive transplant rate are likely to have a less healthy dialysis population as transplantation selectively removes fitter patients. However, censoring at transplantation was performed in the 1997–2014 cohort to establish the effect on long term survival by age group and also in the 2011–2014 cohort to investigate the effect on the outlying status of centres.

The one year incident survival is for patients who started RRT from 1st October 2013 until the 30th September 2014 and followed up for one full year (e.g. patients starting RRT on 1st December 2013 were followed through to 30th November 2014). The 2015 incident patients could not be analysed as they had not yet been followed for a sufficient length of time. For analysis of one year after 90 day survival, patients who started RRT from 1st October 2013 until 30th September 2014 were included in the cohort and they were followed up for a full year after the first 90 days of RRT.

Two years' incident data (2013–2014) were combined to increase the size of the patient cohort, so that any differences between the four UK countries can be more reliably identified. To help identify any centre differences in survival from the small centres (where confidence intervals are large), an analysis of one year after 90 day survival using a rolling four year combined incident RRT cohort from 2011 to 2014 was also undertaken. A 10 year rolling cohort was used when analysing trends over time and for long term survival, a cohort from 1997 to 2014 was analysed.

The death rate per 1,000 patient years was calculated by dividing the number of deaths by the person years exposed. Person years exposed are the total years at risk for each patient (until death, recovery or lost to follow up). The death rate is presented by age group and UK nation.

Adjustment of one year after 90 day survival for the effect of comorbidity was undertaken using a rolling four year combined incident RRT cohort from 2011 to 2014. Twenty-eight centres returned $\geqslant 85\%$ of comorbidity data for patients in the combined cohort. Adjustment was first performed to a mean age of 60 years, then to the average distribution of primary diagnoses for the 28 centres. The individual centre data were then further adjusted for average distribution of comorbidity present at these centres.

Methodology for prevalent dialysis patient survival

The prevalent dialysis patient group was defined as all patients over 18 years old, alive and receiving dialysis on 31st December 2014 who had been on dialysis for at least 90 days at one of the UK adult renal centres. Prevalent dialysis patients on 31st December 2014 were followed-up in 2015 and were censored at transplantation. When a patient is censored at transplantation, this means that the patient is considered as alive up to the point of transplantation, but the patient's status post-transplant is not considered.

As discussed in previous reports, comparison of survival of prevalent dialysis patients between centres is complex. Survival of prevalent dialysis patients can be studied with or without censoring at transplantation and it is common practice in some registries to censor at transplantation. Censoring could cause apparent differences in survival between those renal centres with a high transplant rate and those with a low transplant rate, especially in younger patients where the transplant rate is highest. Censoring at transplantation systematically removes younger fitter patients from the survival data. The differences are likely to be small due to the relatively small proportion of patients being transplanted in a given year compared to the whole dialysis population (about 12% of the dialysis population aged under 65 and about 2% of the population aged 65 years and over). To allow comparisons with other registries the survival results for prevalent dialysis patients **CENSORED** for transplantation have been quoted. To understand survival of patients, including survival following transplantation, the incident patient analyses should be viewed.

The effect of not censoring at transplantation was performed in the 2014 cohort to investigate the effect on the outlying status of centres.

Methodology for comparing mortality in prevalent RRT patients with mortality in the general population

Data on the UK population in mid-2014 and the number of deaths in each age group in 2014 were obtained from the Office of National Statistics [8]. The age specific UK death rate was calculated as the number of deaths in the UK per thousand people in the population. The age specific expected number of deaths in the RRT population was calculated by applying the UK age specific death rate to the total of years exposed for RRT patients in that age group. This is expressed as deaths per 1,000 patient years. The age specific number of RRT deaths is the actual number of deaths observed in 2014 in RRT patients. The RRT observed death rate was calculated as number of deaths observed in 2014 per 1,000 patient years exposed. Relative risk of death was calculated as the ratio of the observed and expected death rates for RRT patients. The death rate was calculated for the UK general population by age group and compared with the same age group for prevalent patients on RRT on 31st December 2014.

Methodology of causes of death

The EDTA–ERA Registry codes for causes of death were used. These have been grouped into the following categories:

- Cardiac disease
- Cerebrovascular disease
- Infection
- Malignancy
- Treatment withdrawal
- Other
- Uncertain

Completeness of cause of death data was calculated for all prevalent patients on RRT that died in a specific year with cause of death data completed for that year. Patients that were lost to follow up or that recovered were not included in the cause of death completeness calculation.

Adult patients aged 18 years and over from England, Wales, Scotland and Northern Ireland were included in the analyses of cause of death. The incident patient analysis included all patients starting RRT in the years 2000–2014. Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 31st December 2014 and followed-up for one year in 2015.

Results

Incident (new RRT) patient survival

Overall survival

The 2014 incident RRT cohort included 7,251 patients who started RRT. Survival at 90 days (adjusted to age 60) for the 2014 cohort was 96.8%, and was unchanged compared to the previous year (96.9%) (table 5.1). One year after 90 days survival for incident patients starting RRT in 2014 (adjusted to age 60) fell slightly compared to the previous year: 90.2% compared to 91.4% in the 2013 cohort (table 5.1).

Survival by UK country

Survival at 90 days was highest in Scotland compared with the other nations (table 5.2), while one year after 90 day survival also differed between countries, with England having the highest survival (table 5.2). However, there are two important caveats for the interpretation of these data; they have not been adjusted for differences in primary renal diagnosis, ethnicity, socio-economic status or comorbidity, which may differ by country. Secondly, there are known regional differences in the life expectancy of the general population within the UK (which may be explained by some of the factors outlined above plus others). These general population differences are likely to contribute to the variation in survival between renal centres and UK countries. To illustrate this, table 5.3 shows general population life expectancy of the UK countries for the period 2013–2015.

Table 5.1. Survival of incident RRT patients, 2014 cohort

Interval	Unadjusted survival (%)	Adjusted survival (%)	*95% CI*	*N*
Survival at 90 days	95.5	96.8	*96.3–97.3*	7,251
Survival one year after 90 days	87.1	90.2	*89.4–91.1*	6,896

Table 5.2. Incident RRT survival across the UK countries, combined two year cohort (2013–2014), adjusted to age 60

Interval	England	N Ireland	Scotland	Wales	UK
Survival at 90 days (%)	96.7	96.5	98.0	96.6	96.8
95% CI	*96.4–97.1*	*94.9–98.1*	*97.2–98.7*	*95.5–97.6*	*96.5–97.2*
Survival 1 year after 90 days (%)	91.1	89.5	89.8	88.2	90.8
95% CI	*90.5–91.6*	*86.6–92.4*	*88.1–91.6*	*86.2–90.3*	*90.2–91.3*

Table 5.3. Life expectancy in years in the UK countries, 2013–2015 (source ONS [8])

	At birth		At age 65	
Country	Male	Female	Male	Female
England	79.4	83.1	18.6	21.0
Northern Ireland	78.3	82.3	18.1	20.5
Scotland	77.1	81.1	17.3	19.7
Wales	78.4	82.3	18.1	20.5
UK	**79.1**	**82.8**	**18.5**	**20.9**

Survival by modality

It is not possible to make truly valid comparisons of survival of cohorts of patients starting different RRT modalities, as modality selection is not random. In the UK, the cohort of patients starting peritoneal dialysis was younger and received a transplant more quickly than those starting haemodialysis. The age adjusted one year after 90 days survival estimates for incident patients starting RRT on haemodialysis (HD) and peritoneal dialysis (PD) in 2014 were 88.4% and 92.8% respectively, with both HD and PD patient survival falling slightly from the previous year (figure 5.1). This is the first time in five years that the one year after 90 days survival on haemodialysis has declined. PD patients' survival has remained relatively static over the last five years, with a small decline observed this year (figure 5.1).

Survival by age

Tables 5.4 and 5.5 show survival for the 2014 incident RRT cohort divided by age (⩾65 years and <65 years). Short term survival (at 90 days) decreased marginally for the younger age group, while it increased for those ⩾65 years compared with the 2013 cohort (98.1 to 97.8% for those aged 18–64 years and 91.6 to 93.2% for those ⩾65 years respectively). There was a small decline in one year after 90 day survival for both age groups compared to the 2013 cohort. There was a steep decline in survival with advancing age (figure 5.2).

Table 5.4. Unadjusted 90 day survival of incident RRT patients, 2014 cohort, by age

Age group	Survival (%)	*95% CI*	*N*
18–64	97.8	*97.3–98.2*	3,667
⩾65	93.2	*92.3–94.0*	3,584
All ages	95.5	*95.0–96.0*	7,251

Table 5.5. Unadjusted one year after day 90 survival of incident RRT patients, 2014 cohort, by age

Age group	Survival (%)	*95% CI*	*N*
18–64	93.3	*92.4–94.1*	3,562
⩾65	80.6	*79.2–81.9*	3,334
All ages	87.1	*86.3–87.9*	6,896

There was a curvilinear increase in the death rate per 1,000 patient years with increasing age for the one year period from 90 days after RRT start (figure 5.3). The overall death rate in Wales was higher than in the other UK countries, mostly due to a higher death rate in Wales for patients ⩾55 years old (figure 5.3) and a higher overall median age compared to other UK countries. A similar finding is reported in table 5.12, where there was evidence that the one year death rate in prevalent dialysis patients (2014 cohort) was higher in Wales compared to England. This is also consistent with the survival figures reported in table 5.2.

Figure 5.4 shows the long-term survival of incident patients from day 0 (start of RRT), according to age at

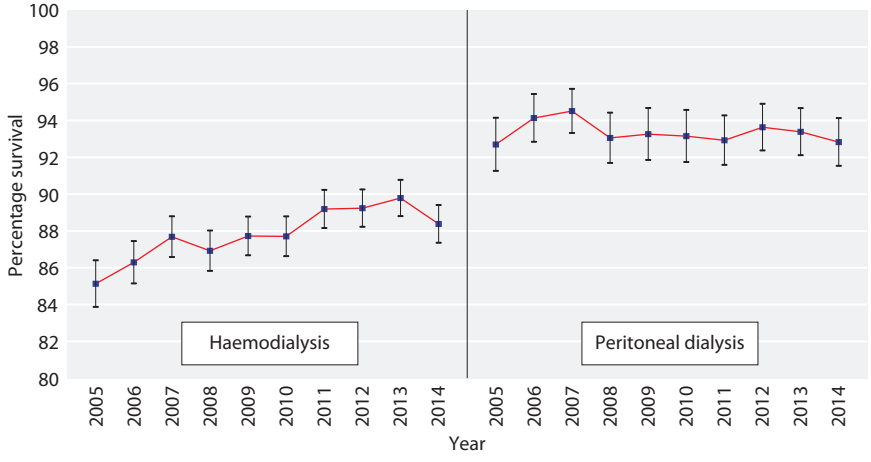

Fig. 5.1. Trend in one year after 90 day incident patient survival by first modality, 2005–2014 cohorts (adjusted to age 60, excluding patients whose first modality was transplantation)

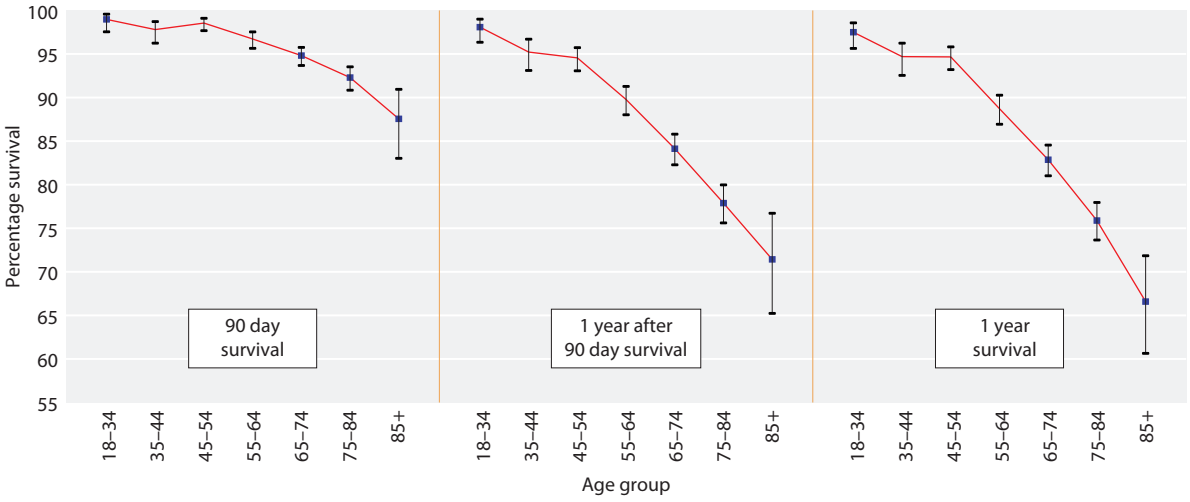

Fig. 5.2. Unadjusted survival of incident RRT patients by age group, 2014 cohort

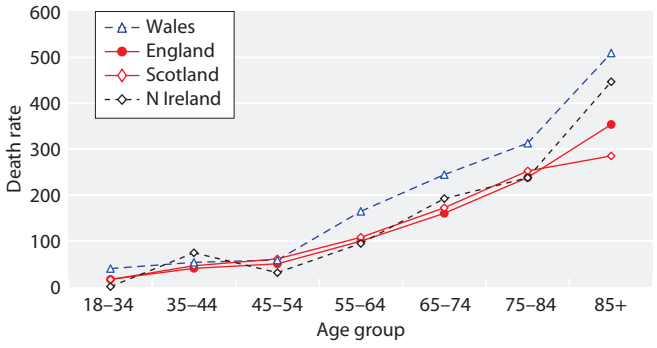

Fig. 5.3. One year after 90 days death rate per 1,000 patient years by UK country and age group for incident RRT patients, 2011–2014 cohort

RRT start. More than 50% of patients who were aged between 45–54 years when starting RRT survived for over 10 years. Median survival for those aged between 55–64 years at RRT start was around 6.0 years and median survival for those aged between 65–74 years was approximately 3.5 years.

Figure 5.5 illustrates the survival of incident patients, excluding those who died within the first 90 days and shows that median survival of patients aged between 55–64 years was approximately 6.5 years and median survival of patients aged between 65–74 years was approximately 4 years. These survival results are slightly better than survival from day 0 for the same age groups, as would be expected due to the higher mortality observed in the first 90 days of treatment (figure 5.4).

Censoring at transplantation removes the fittest patients from the survival cohort and affects the appearance of the longer-term outcomes of the younger patients (who are most likely to have undergone transplantation). Without censoring, the 10-year survival for patients aged 18–34 years was 83.7% (figure 5.4), however if survival is censored at transplantation this falls dramatically to 58.1% (data not shown). The 10 year survival without and with censoring at transplantation were 70.7% and 43.8% for age group 35–44 years and 54.6% and 30.7% for age group 45–54 years

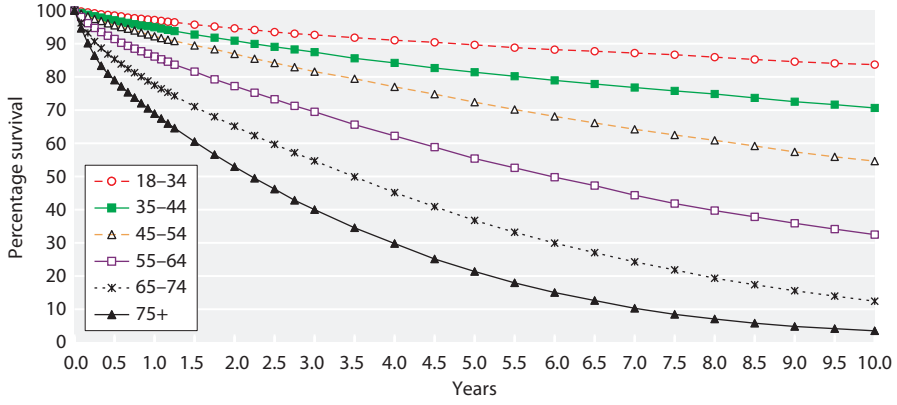

Fig. 5.4. Survival of incident RRT patients (unadjusted), 1997–2014 cohort (from day 0)

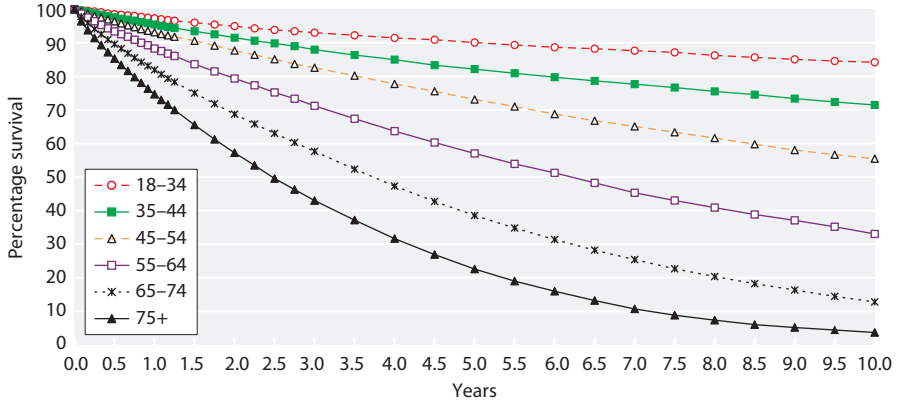

Fig. 5.5. Survival of incident RRT patients (unadjusted), 1997–2014 cohort (from day 90)

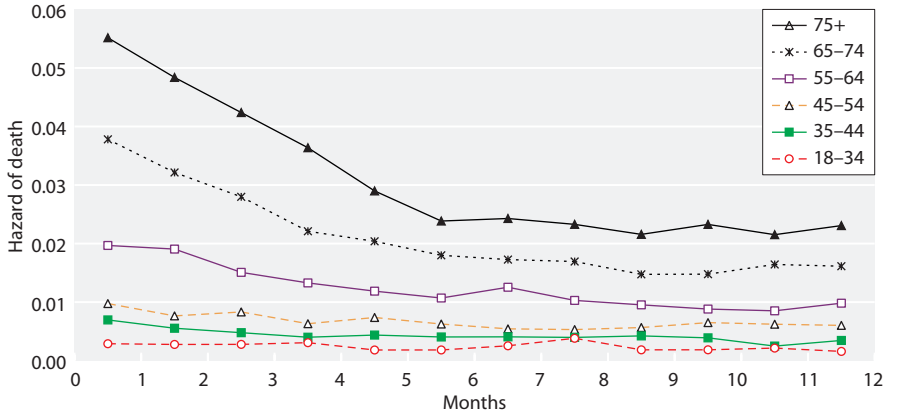

Fig. 5.6. First year monthly hazard of death, by age group, 1997–2014 combined incident RRT cohort

respectively. This difference in survival becomes less pronounced with increasing age, especially for patients aged 65+. This was previously examined in more detail in the 2008 Annual Report [9].

Age and the hazard of death

Figure 5.6 shows the monthly hazard of death from the first day of starting RRT by age group, which falls sharply during the first 4–5 months, particularly for older patients (⩾65 years), after which time the hazard remains relatively stable up to one year.

The hazard of death at 90 days per 10 year increase in patient age fell from 1.85 in the 2013 cohort to 1.61 (2014 cohort) while the hazard in the 1st year after 90 days also fell, but by a lesser magnitude (1.59 in the 2014 cohort compared to 1.65 in the 2013 cohort) (table 5.6).

Survival by gender

There was no survival difference between genders in the incident RRT cohort of patients starting RRT from 2003 to 2012 and followed up for a minimum of three years until 2015 (figure 5.7). There was also no evidence of a survival difference between genders in the first 90 days and one year after the first 90 days (data not shown).

Survival in the 2005–2014 cohort

The death rate per 1,000 patient years in the first year of starting RRT from 2005 to 2014 is shown in figure 5.8. There was essentially no change in the death rate from 2013 to 2014 on a background of a declining trend in the death rate overall and over the past decade, but with a more marked fall in the older age group (⩾65 years). It is important to note that these death rates may not be directly comparable with those produced by other registries (for instance the USRDS) if the first 90 day period, when death rates are higher than subsequent time periods, are excluded.

The time trend changes in one year after 90 days incident survival over the period 2005–2014 are shown in figure 5.9. The left hand plot, which includes only those

Table 5.6. Increase in proportional hazard of death for each 10 year increase in age, 2014 incident RRT cohort

Interval	Hazard of death for 10 year age increase	*95% CI*
First 90 days	1.61	*1.47–1.76*
1 year after first 90 days	1.59	*1.51–1.68*

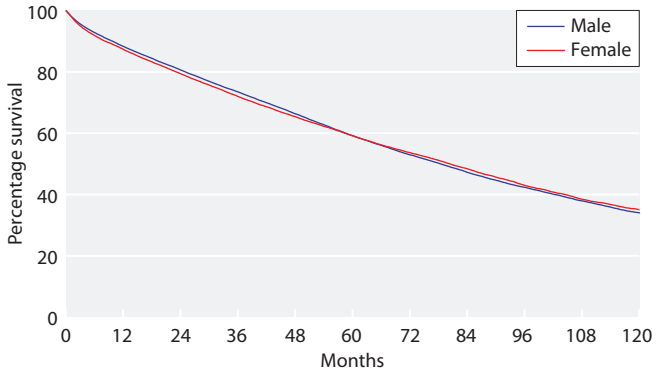

Fig. 5.7. Long term survival of incident RRT patients by gender, 2003–2012 combined cohort, adjusted to age 60, followed-up for a minimum of three years

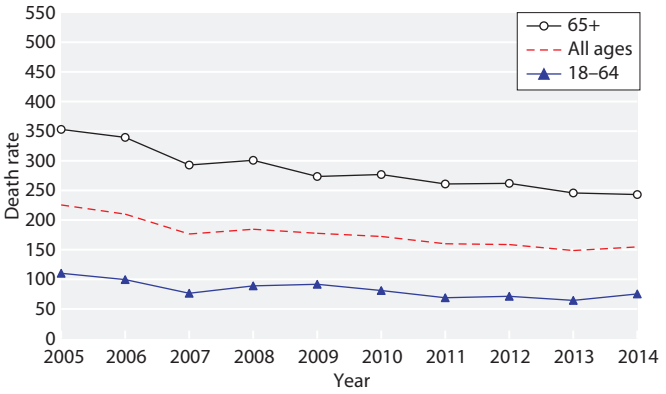

Fig. 5.8. One year incident RRT death rate per 1,000 patient years by age group, 2005–2014 cohort

centres that have been sending data continuously since the year 2000, shows a similar survival trend to the plot in which data from all renal centres were analysed, namely that the percentage of patients surviving one year after 90 days has fallen slightly in 2014 compared with the preceding year (from 91.4% to 90.2% for all renal centres).

One year after 90 days incident RRT patient survival in the 2005–2014 cohort by centre, UK country and overall, can be found in appendix 1, table 5.22.

Long term survival: trends up to 10 years post RRT start

The unadjusted survival analyses (tables 5.7, 5.8 and figures 5.10, 5.11) show an overall improvement in longer term survival between 1998 and 2014 for both those aged <65 years and those ⩾65 years. For example, five year survival amongst patients aged <65 years at start of RRT has improved from 64.1% in the 1998 cohort to 72.8% in the 2010 cohort. For those aged 65 years and above at RRT initiation during the same period, five year survival improved from 20.0% (1998) to 32.5% (2010).

Although survival improved overall between the 1998 and 2014 cohorts, the improvement was more pronounced in patients aged ⩾65: there has been a 16.1% absolute improvement in one year survival from the 1998 to 2014 cohorts (table 5.8), versus 5.2% in those <65 years during the same period. It is not possible to ascertain the specific reasons for this reduction in risk of death.

Survival by RRT vintage

Figure 5.12 shows the six monthly hazard of death for incident patients, by age group. There is little evidence of a worsening prognosis with increasing time on RRT (vintage) for the majority of incident RRT patients in the UK, except in incident patients aged 65 years and older where an increased hazard over time is evident. When the analysis is repeated with censoring for transplantation an apparent vintage effect is evident (data not shown) and this is, at least in part, because younger and healthier patients are only included in the survival

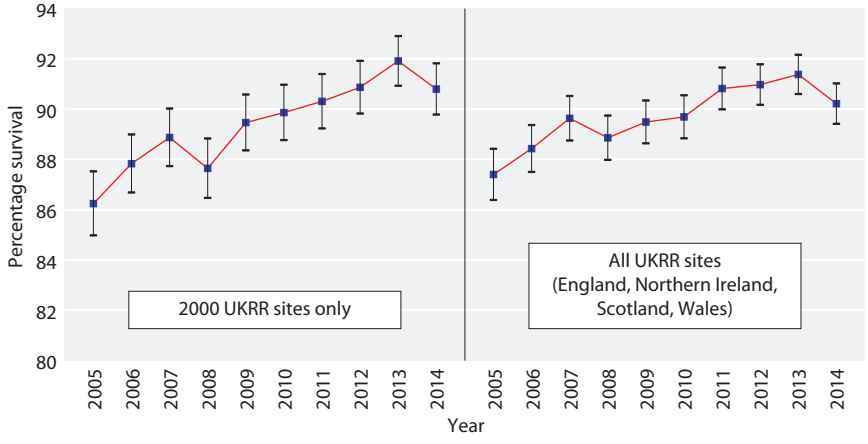

Fig. 5.9. Change in one year after 90 day survival, 2005–2014 incident RRT cohort (adjusted to age 60)
Showing 95% confidence intervals

Table 5.7. Unadjusted survival of incident RRT patients, 1998–2014 cohort for patients aged 18–64 years

Cohort	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year	*95% CI for latest year*	*N*
2014	**92.8**										***91.9–93.6***	**3,667**
2013	93.8	88.3									*87.2–89.3*	3,584
2012	93.1	87.4	81.9								*80.6–83.2*	3,538
2011	93.4	88.7	83.7	79.0							*77.5–80.3*	3,349
2010	92.2	86.7	81.7	77.3	72.8						*71.3–74.3*	3,368
2009	91.3	85.0	80.4	76.4	71.1	67.1					*65.4–68.7*	3,388
2008	91.5	86.0	81.1	76.9	73.1	69.4	65.6				*64.0–67.2*	3,445
2007	92.6	87.2	81.8	76.9	73.1	69.5	66.1	62.8			*61.1–64.5*	3,326
2006	90.6	84.9	80.0	75.6	72.0	68.0	64.1	61.2	58.1		*56.3–59.8*	3,162
2005	89.6	83.6	78.6	73.8	69.3	65.7	62.5	59.5	56.5	53.9	*52.0–55.7*	2,831
2004	89.6	83.4	78.0	72.5	67.8	64.1	61.0	57.1	54.6	53.0	*51.0–55.0*	2,562
2003	89.4	82.7	77.3	72.4	67.3	63.2	59.5	56.8	54.2	51.7	*49.6–53.7*	2,265
2002	88.5	80.7	74.7	69.1	65.1	61.2	57.8	54.8	51.6	49.6	*47.3–51.7*	2,020
2001	88.0	81.0	75.4	70.3	65.3	60.6	56.7	53.3	50.4	48.1	*45.7–50.5*	1,741
2000	89.0	81.3	74.4	69.2	63.7	59.0	55.5	52.4	50.0	47.3	*44.7–49.8*	1,532
1999	86.9	81.0	73.3	67.6	62.2	58.1	53.9	51.0	48.6	47.0	*44.3–49.6*	1,347
1998	87.5	80.2	74.4	69.5	64.1	59.2	55.2	53.1	49.9	47.7	*44.8–50.5*	1,167

Table 5.8. Unadjusted survival of incident RRT patients, 1998–2014 cohort for patients aged ⩾65 years

Cohort	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year	*95% CI for latest year*	*N*
2014	**78.6**										***77.3–79.9***	**3,584**
2013	78.5	64.6									*63.0–66.2*	3,439
2012	77.3	65.3	54.4								*52.7–56.1*	3,333
2011	77.4	62.8	51.4	41.1							*39.4–42.8*	3,361
2010	76.3	63.4	51.2	42.0	32.5						*30.8–34.1*	3,280
2009	76.5	63.2	52.5	41.5	32.9	26.1					*24.6–27.6*	3,374
2008	74.5	61.1	49.8	40.4	32.2	25.7	20.5				*19.1–22.0*	3,175
2007	75.0	61.1	49.7	40.4	31.9	25.3	20.1	15.5			*14.2–16.8*	3,211
2006	72.0	58.3	46.9	37.3	29.0	23.1	17.7	13.4	10.7		*9.6–11.9*	3,116
2005	71.1	57.2	45.3	36.2	27.9	21.2	16.6	12.5	10.0	7.8	*6.9–8.8*	2,940
2004	69.0	54.0	42.4	34.1	26.9	21.1	16.5	13.0	9.9	7.6	*6.7–8.7*	2,632
2003	68.4	53.6	41.7	31.8	24.3	18.1	14.3	11.1	8.5	6.8	*5.8–7.9*	2,318
2002	66.0	50.8	40.3	31.8	23.8	18.3	13.7	10.9	8.2	6.5	*5.5–7.6*	2,089
2001	66.5	51.7	38.3	28.7	21.7	15.9	11.8	8.9	7.1	5.5	*4.4–6.6*	1,708
2000	66.1	52.4	39.6	28.6	22.3	17.2	13.1	9.7	7.5	5.7	*4.6–7.0*	1,496
1999	68.3	51.5	39.0	29.8	22.2	16.1	11.5	8.3	6.1	4.8	*3.7–6.1*	1,214
1998	62.5	45.3	35.9	26.3	20.0	13.9	10.5	7.5	5.7	4.6	*3.5–6.1*	1,016

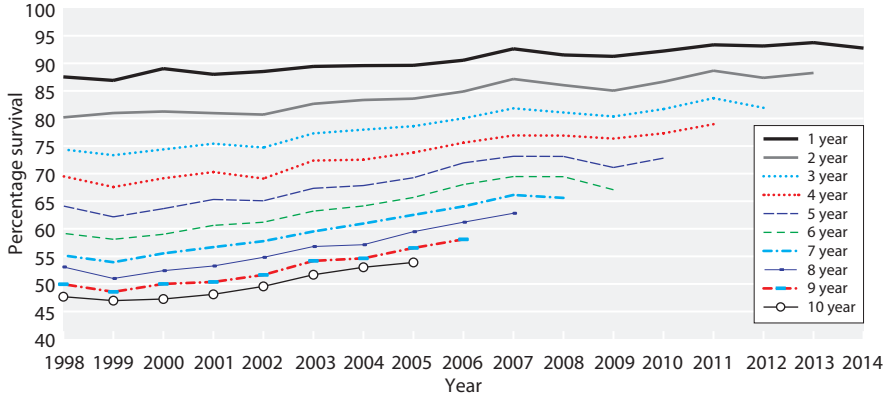

Fig. 5.10. Change in long term survival by year of starting RRT (1998–2014), for incident RRT patients aged 18–64 years

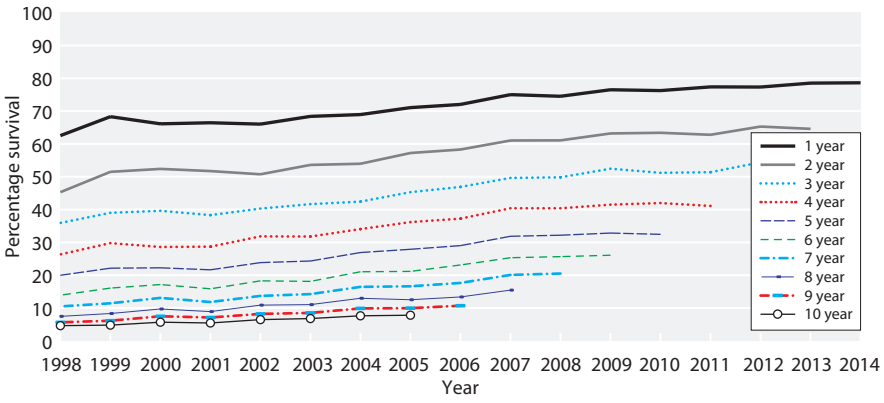

Fig. 5.11. Change in long term survival by year of starting RRT (1998–2014), for incident RRT patients aged ⩾65 years

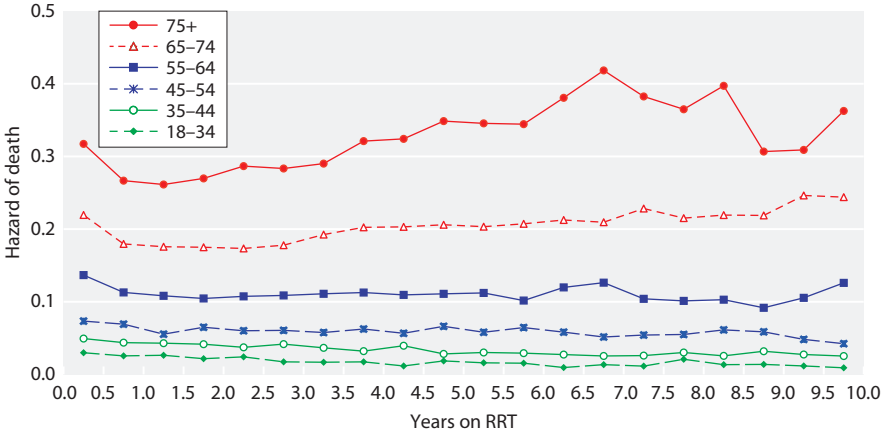

Fig. 5.12. Six monthly hazard of death, by vintage and age group, 1997–2014 incident RRT cohort after day 90

calculation up to the date of transplantation. In the oldest age group, the number of patients surviving beyond seven years was small, accounting for the variability seen. Figures 5.13 and 5.14 show the same analysis for patients without diabetes and with diabetes respectively. An increased hazard of death over time is evident for patients with diabetes predominantly ⩾65 years of age.

Centre variability in one year after 90 days survival

Due to small numbers of incident patients in any given year in each centre and resultant wide confidence intervals, variability by renal centre was assessed in a larger cohort across several years. Similar to previous years, sustained performance was assessed in a rolling four year cohort from 2011 to 2014. These data are presented as a funnel plot in figure 5.15. Table 5.9 allows centres to be identified on this graph by finding the number of patients treated by the centre and then looking up the corresponding number on the x-axis. Two centres (Cardiff and Swansea) had survival below the 95% lower limit whilst three centres (Aberdeen, London Guy's, Reading) had survival above the 95% upper limit. This

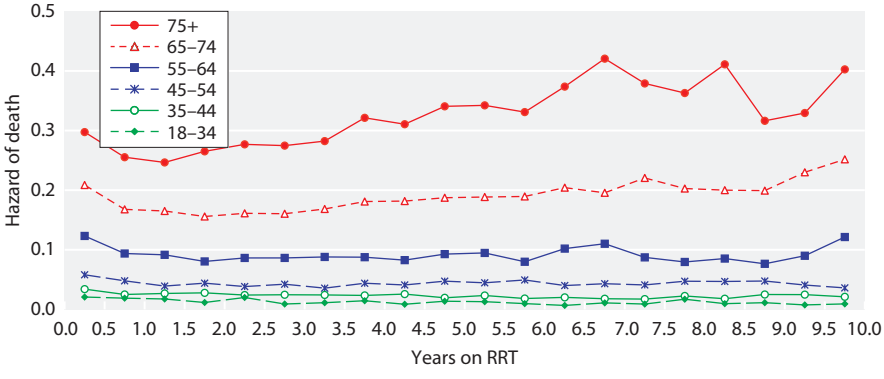

Fig. 5.13. Six monthly hazard of death, by vintage and age group, 1997–2014 incident RRT cohort without diabetes after day 90

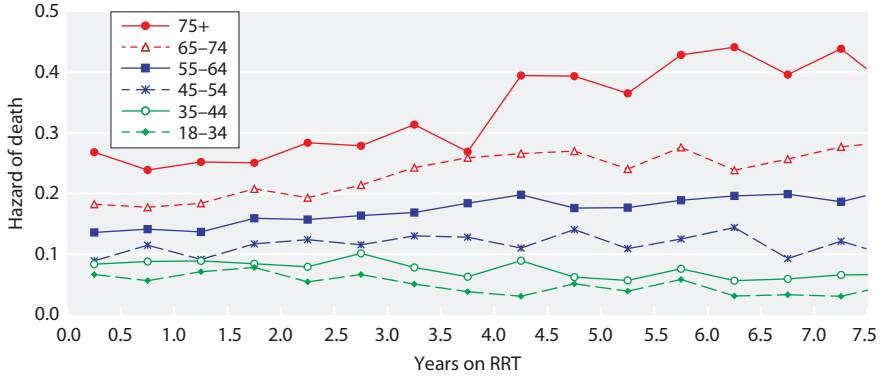

Fig. 5.14. Six monthly hazard of death, by vintage and age group, 1997–2014 incident RRT cohort with diabetes after day 90

is compared with last year when five centres were survival outliers above the 95% upper limit. With 71 centres included in the analysis it would be expected that three centres would be outside these limits by chance. It is important to highlight that these data have only been adjusted for age (i.e. no other patient factors such as comorbidity, primary renal disease or ethnicity) and have not been censored at transplantation. Therefore the effect of differing rates of transplantation by centre was not taken into account. Please see the following section for the effects of adjustment for primary renal disease and comorbidity.

Appendix 1 contains additional tables related to these survival analyses; tables 5.22 and 5.23 show unadjusted and adjusted survival together with 95% confidence intervals for incident patient survival one year after 90 days and at 90 days for the 2014 single year cohort. Table 5.24 in appendix 1 shows the one year after 90 day incident survival by centre for incident RRT cohort years 2005–2014, adjusted to age 60. One to five year survival after the first 90 days of RRT adjusted to age 60 is included in appendix 1, table 5.25 for incident RRT cohorts 2010–2014.

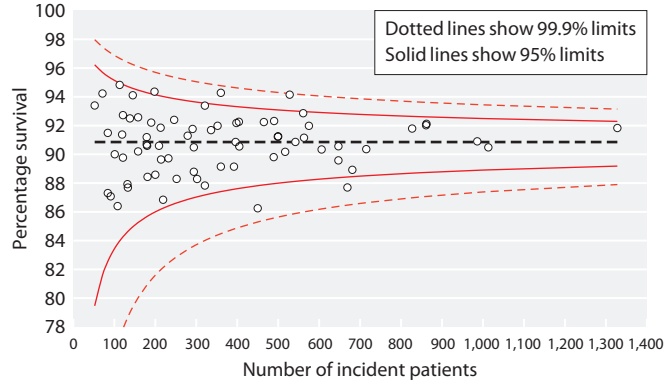

Fig. 5.15. Funnel plot for age adjusted one year after 90 days survival, 2011–2014 incident RRT cohort

Centre variability in one year after 90 day survival: impact of adjustment for comorbidity

Although comorbidity returns to the UKRR have remained poor, some centres have consistently returned ⩾85% comorbidity data for incident patients. The analyses in this section use a combined incident RRT cohort from 2011–2014 for the 28 centres who consistently returned comorbidity data for ⩾85% of patients during this period, and demonstrate the impact of sequential adjustment for age, primary renal diagnosis and comorbidity (table 5.10).

It can be seen that adjustment for age has the largest effect, most notably in those centres with the lower unadjusted survival figures. Survival improved for all centres after adjustment for age, as the average age for incident patients was higher than the adjustment to age 60 years. There were only minor changes in survival for most centres after adjustment for primary renal diagnosis, but survival did increase by ⩾1% for three centres (Newry, Swansea, Wolverhampton). In two centres (Newcastle, Swansea) adjustment for comorbidity had a noticeable effect (⩾1% increase) on adjusted survival (table 5.10, figure 5.16). After adjustment for age, primary renal diagnosis and comorbidity, Swansea, Antrim, Wrexham and Ulster had the largest improvement in survival of 9.4%, 8.7%, 7.0% and 6.9% respectively.

The largest survival improvement, as a result of adjustment for comorbidity was seen in Swansea. Adjustment for comorbidity may have an important differential effect for renal centres that have a higher comorbid burden in their RRT population. This could affect the status of centres as a survival outlier as shown in figure 5.15, such as Swansea or Cardiff. However due to poor comorbidity returns for many renal centres, comorbidity adjustment for the entire incident RRT population is not yet possible. Data completeness and data quality both have significant implications for the accuracy of analyses

Table 5.9. Age adjusted (to age 60) one year after 90 day survival, 2011–2014 incident RRT cohort

	1 year after 90 days			
			Limits for funnel plot	
Centre	*N*	Adjusted survival %	Lower 95% limit	Upper 95% limit
D & Gall	52	93.4	79.5	96.2
Inverns	71	94.2	81.6	95.7
Clwyd	84	87.3	82.6	95.4
Bangor	84	91.5	82.6	95.4
Newry	91	87.1	83.0	95.3
Ulster	101	90.0	83.5	95.1
Antrim	108	86.4	83.8	95.0
West NI	113	94.8	84.0	95.0
Carlis	119	91.4	84.2	94.9
Sthend	121	92.7	84.3	94.9
Wrexm	121	89.8	84.3	94.9
Klmarnk	132	87.9	84.6	94.7
Colchr	133	87.7	84.6	94.7
Krkcldy	138	92.5	84.8	94.7
Ipswi	145	94.1	85.0	94.6
Basldn	158	90.2	85.3	94.5
Truro	158	92.6	85.3	94.5
York	179	90.7	85.7	94.3
Dundee	179	91.2	85.7	94.3
Donc	180	90.6	85.7	94.3
Chelms	181	88.4	85.7	94.3
Dudley	190	92.2	85.8	94.2
Abrdn	198	94.4	86.0	94.2
Wirral	200	88.6	86.0	94.1
Airdrie	209	90.6	86.1	94.1
Plymth	213	91.9	86.2	94.1
Liv Ain	214	89.6	86.2	94.1
Shrew	219	86.8	86.3	94.0
Sund	232	89.7	86.4	93.9
Glouc	246	92.4	86.6	93.9
Bradfd	252	88.3	86.6	93.8
Derby	279	91.3	86.9	93.7
Belfast	291	91.8	87.0	93.7
Dorset	294	90.5	87.0	93.7
Edinb	294	88.8	87.0	93.7
Norwch	302	88.3	87.0	93.6
L St.G	321	93.4	87.2	93.6
Wolve	321	87.8	87.2	93.6
Stoke	336	91.7	87.3	93.5
Hull	352	92.0	87.4	93.5
Redng	360	94.3	87.4	93.4
Newc	360	89.1	87.4	93.4
Liv Roy	392	89.1	87.6	93.3
Middlbr	396	90.9	87.6	93.3
B Heart	398	92.2	87.6	93.3
Nottm	404	92.3	87.6	93.3
Covnt	405	90.6	87.6	93.3
Swanse	450	86.2	87.8	93.2
Exeter	465	92.2	87.9	93.2
Brightn	489	89.8	88.0	93.1
Camb	490	92.3	88.0	93.1
Kent	499	91.2	88.0	93.1
Stevng	500	91.2	88.0	93.1
Salford	517	90.2	88.0	93.1
L Guys	528	94.2	88.1	93.0
Sheff	542	90.9	88.1	93.0
Prestn	561	92.9	88.2	93.0
L Kings	563	91.2	88.2	93.0
Bristol	575	92.0	88.2	93.0
Leeds	606	90.3	88.3	92.9
M RI	647	89.6	88.4	92.8
Oxford	647	90.6	88.4	92.8
Cardff	672	87.7	88.4	92.8
Glasgw	681	88.9	88.4	92.8
Ports	715	90.4	88.5	92.8
B QEH	827	91.8	88.7	92.6
L Rfree	861	92.0	88.7	92.6
Carsh	862	92.1	88.7	92.6
Leic	986	90.9	88.9	92.5
L Barts	1,013	90.5	88.9	92.5
L West	1,328	91.8	89.2	92.3

such as these. Case mix adjustment performed in a cohort of incident patients starting RRT in England from 2002 to 2006 which was linked to the Hospital Episodes Statistics (HES) data, found that three of the four survival outliers at that time were no longer outliers after adjustment for HES-derived case mix. Swansea and Cardiff could not be evaluated in that analysis as HES only included English hospitals, but the study results highlight that observed variability in survival between centres is affected by case mix [10].

Survival in patients with diabetes

Patients with diabetes have been shown to have worse long term survival compared to patients without diabetes [3]. In the following analyses, 90 day survival, 1 year after 90 day survival and long term survival are presented according to the presence or absence of a diagnosis of diabetes.

In the UK in 2014, 90 day survival for incident patients with diabetes was better than those without diabetes across the age categories of 18–44 years, 45–64 years

Table 5.10. The effect of adjustment for age, primary renal diagnosis and comorbidity on survival, 2011–2014 incident RRT cohort, percentage survival one year after 90 days

Centre*	Unadjusted	Age adjusted	Age, PRD adjusted	Age, PRD and comorbidity adjusted
Antrim	79.0	86.7	87.2	87.6
Swanse	79.4	86.1	87.7	88.9
Newry	83.0	86.8	88.6	88.8
Cardff	83.3	87.5	88.2	89.0
Wrexm	83.5	89.5	90.4	90.5
Ulster	84.0	89.6	90.5	90.9
Dorset	85.3	90.5	90.8	91.4
Wolve	85.6	89.1	90.3	90.2
Bangor	85.9	90.8	91.1	91.3
Basldn	86.0	90.1	90.5	91.4
Bradfd	87.1	88.4	88.7	89.5
Middlbr	87.4	90.5	91.2	91.8
Sund	87.4	89.9	90.5	90.7
Kent	87.5	91.1	91.8	91.0
Oxford	88.0	90.4	90.7	91.0
Leeds	88.4	90.3	90.4	91.2
L Kings	88.7	91.0	91.1	91.4
York	88.8	91.1	91.8	92.1
Nottm	88.8	92.1	92.7	92.6
Newc	88.9	91.0	91.4	92.5
B Heart	89.7	92.6	93.0	93.0
Exeter	89.8	93.6	94.0	94.0
Bristol	90.0	93.0	93.2	93.9
Hull	90.2	92.5	92.6	92.8
Sthend	91.5	94.5	95.0	94.7
Redng	91.9	94.5	95.0	95.5
Derby	92.1	93.7	94.1	94.1
B QEH	93.0	94.5	95.0	94.7
All 28 centres	87.9	91.0	91.5	91.8

PRD primary renal diagnosis
*Centre included if ⩾85% comorbidity data available

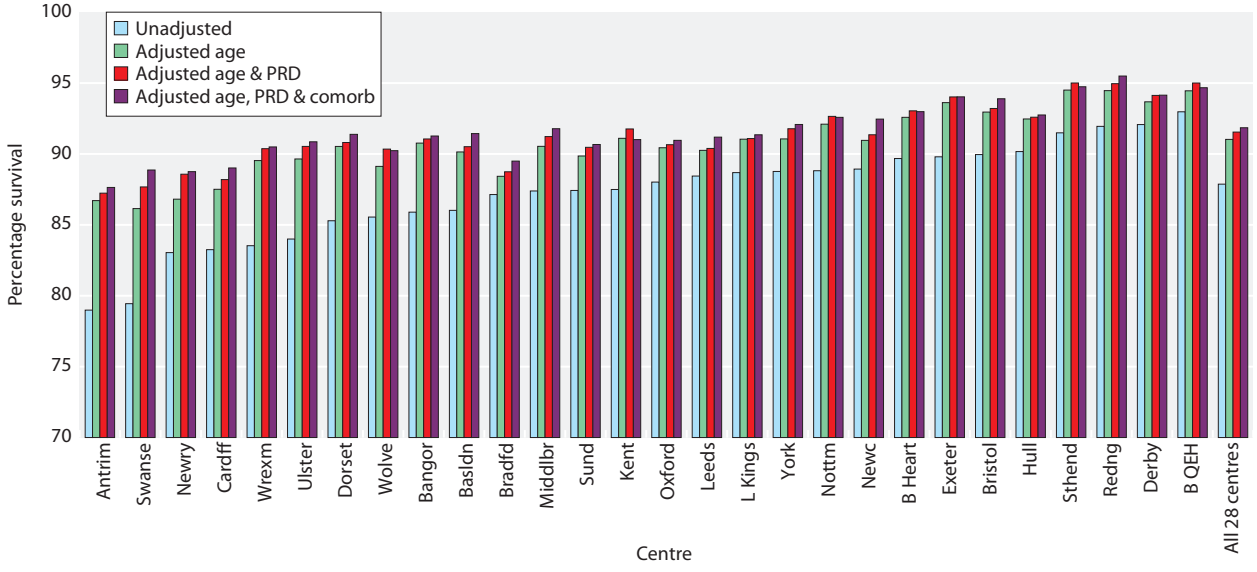

Fig. 5.16. The effect on one year after 90 day survival after sequential adjustment for age, primary renal diagnosis and comorbidity, 2011–2014 incident RRT cohort

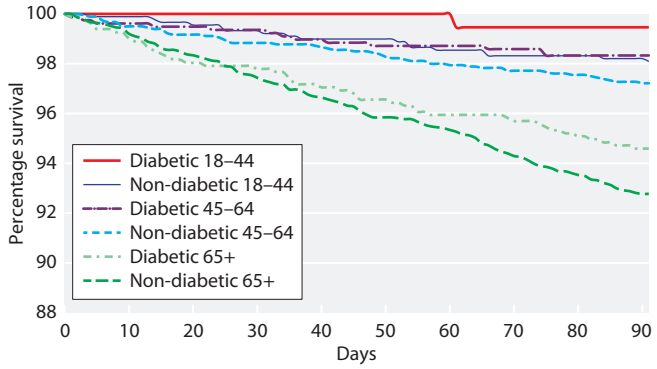

Fig. 5.17. Survival at 90 days for incident RRT patients with and without diabetes by age group, 2014 cohort

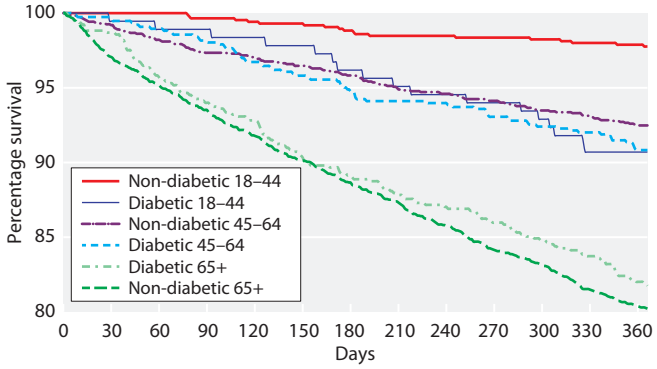

Fig. 5.18. Survival at one year after 90 days for incident RRT patients with and without diabetes by age group, 2014 cohort

and 65 years and over (figure 5.17). For one year survival after 90 days in the 2014 cohort, young patients (18–44 years) without diabetes had better survival than their counterparts with diabetes, whereas for the 45–64 years group and those 65 years and over, the survival was more similar (figure 5.18).

Long term survival for patients with diabetes and patients without diabetes is presented for the incident RRT cohort of patients starting RRT from 2003 to 2012 with a minimum of three years follow up (figure 5.19). These data show large differences between survival for

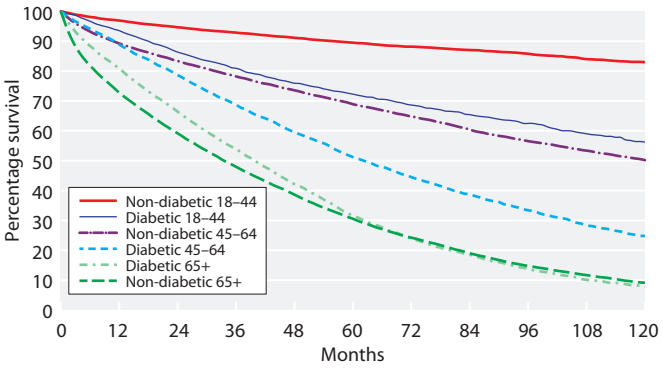

Fig. 5.19. Long term survival for incident RRT patients with and without diabetes by age group, 2003–2012 cohort, followed up for a minimum of three years

those with diabetes and those without diabetes in the age groups 18–44 years and 45–64 years. In the age group 18–44 years, 89.5% of patients without diabetes were alive five years after start of RRT compared to 72.3% for patients with diabetes. In the age group 45–64 years, 68.9% of patients without diabetes were alive five years after start of RRT compared to 51.2% for patients with diabetes (figure 5.19). The initial survival difference where incident RRT patients without diabetes in the older age group (⩾65 years) had poorer survival than incident patients with diabetes in the same age group, diminished over the years until there was very little difference in five year survival between these groups.

Survival in prevalent dialysis patients

Overall survival

Table 5.11 shows the one and two year survival for prevalent patients on dialysis. One year age adjusted survival for prevalent dialysis patients was essentially stable at 88.3% in the 2014 cohort compared to 88.6% in the 2013 cohort. Two year survival dropped slightly from 72.1% to 71.1%.

Table 5.11. One and two year survival of prevalent dialysis patients

Patient group	Patients *N*	Deaths *N*	Survival %	*95% CI*
1 year survival – 2014 cohort				
Unadjusted	26,437	3,955	84.4	*84.0–84.9*
Adjusted to age 60	26,437	3,955	88.3	*87.8–88.7*
2 year survival – 2013 cohort				
Unadjusted	26,130	6,956	71.1	*70.5–71.7*

2014 cohort: all dialysis patients alive on 31/12/2014
2013 cohort: all dialysis patients alive on 31/12/2013

Table 5.12. One year death rate per 1,000 prevalent dialysis patient years in the 2014 cohort and median age of prevalent dialysis patients by UK country

	England	N Ireland	Scotland	Wales
Death rate	166	167	188	217
95% CI	160–172	136–203	168–210	190–247
Median age	67.0	70.5	66.2	69.0

Survival by UK country

The one year death rate for prevalent dialysis patients in 2014 for each UK country is shown in table 5.12. The death rate rose in every UK nation compared to the 2013 cohort, except in Northern Ireland, with the median age of prevalent dialysis patients increasing in all four nations. The one year unadjusted death rate in Wales was significantly higher than in England. However, the higher median age in Wales and socio-economic factors such as general population life expectancy and area deprivation, may contribute to the death rate in Wales. These results are unadjusted for age, primary renal diagnosis or comorbidity.

One year survival of prevalent dialysis patients by centre

The age adjusted (adjusted to age 60) one year survival of dialysis patients by centre is illustrated in a funnel plot (figure 5.20). As there are 71 centres included in the analyses, it would be expected that three centres would fall outside the 95% (1 in 20) confidence limits, entirely by chance. The survival for patients attending two centres (Oxford and Manchester Royal Infirmary) was below the 95% confidence limit, and there were no centres below the 99% confidence limit. Comparing data over a number of years, there is no centre that has consistently been below the 95% confidence limits. One centre (West Northern Ireland) was above the 95% confidence limits, and two centres (London West and Birmingham Queen Elizabeth) were above the 99% confidence limit. A sensitivity analysis was performed, without censoring at transplantation, and the results for outlying centres were unchanged. These observed differences may have occurred by chance, may be true differences or may reflect differences in the case-mix of the renal centres. For incident patient survival, incomplete comorbidity returns prevent full adjustment for case mix.

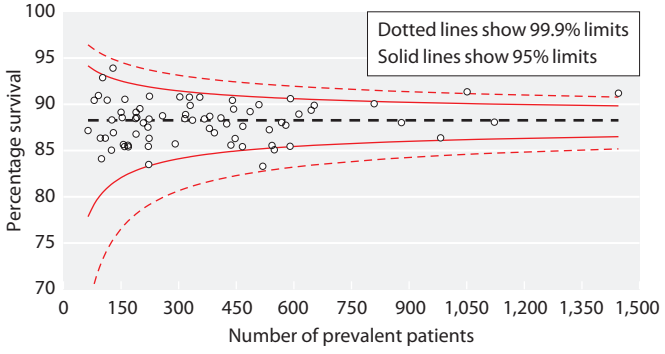

Fig. 5.20. One year survival funnel plot of prevalent dialysis patients by centre adjusted to age 60, 2014 cohort

Table 5.13 allows centres in figure 5.20 to be identified by finding the number of patients treated by the centre and the corresponding survival and then looking this up on the axes of the funnel plot.

One year survival of dialysis patients by centre is illustrated in figures 5.21 and 5.22 for patients aged <65 years and those aged $\geqslant 65$ years.

Survival by age group

Figure 5.23 shows the one year survival of prevalent dialysis patients who were alive and receiving dialysis on 31st December 2014, stratified by age group. This demonstrates a curvilinear decrease in survival with increasing age.

One year death rate in prevalent dialysis patients by age group, 2014 cohort

The death rates for prevalent patients on dialysis by age group are shown in figure 5.24. The younger patients included in this analysis are a selected higher risk group, as they remained on dialysis rather than undergoing transplantation. The increase in the death rate with age was not linear; in those aged <45 years, a 10 year increase in age was associated with a rise in the death rate of approximately 25 deaths per 1,000 patient years compared with those $\geqslant 75$ years where a 10 year increase in age was associated with a rise of about 100 deaths per 1,000 patient years.

Time trends in survival, 2005 to 2014

Figure 5.25 illustrates that one year survival for prevalent dialysis patients in England gradually improved from 2005 to 2011 with a gradual decrease thereafter. The numbers of patients were smaller in Scotland, Northern Ireland and Wales which resulted in variability and wide confidence intervals, so no firm conclusions can be drawn. The change in prevalent survival by centre between 2005 to 2014 is included in appendix 1, table 5.26.

Table 5.13. One year survival of prevalent dialysis patients in each centre (adjusted to age 60), 2014 cohort

Centre	N	Adjusted one year survival	Limits for funnel plot	
			Lower 95% limit	Upper 95% limit
D & Gall	64	87.2	77.9	94.2
Inverns	80	90.4	79.2	93.7
Carlis	91	91.0	79.9	93.4
Bangor	96	86.3	80.2	93.3
Clwyd	99	84.1	80.3	93.3
Newry	102	92.9	80.5	93.2
Ulster	109	86.3	80.8	93.1
Colchr	114	90.5	81.0	93.0
Wrexm	125	85.0	81.4	92.8
Antrim	126	88.3	81.4	92.8
West NI	129	93.9	81.5	92.8
Sthend	130	86.9	81.5	92.8
Ipswi	150	89.1	82.1	92.5
York	153	88.6	82.1	92.5
Truro	156	85.7	82.2	92.5
Krkcldy	159	85.4	82.3	92.4
Chelms	160	90.5	82.3	92.4
Klmarnk	168	85.6	82.5	92.3
Plymth	169	85.4	82.5	92.3
Airdrie	188	88.5	82.8	92.2
Liv Ain	189	86.8	82.9	92.1
Dundee	189	89.1	82.9	92.1
Basldn	191	88.6	82.9	92.1
Donc	199	89.5	83.0	92.1
Shrew	208	88.0	83.1	92.0
Bradfd	220	87.5	83.3	91.9
Sund	221	85.5	83.3	91.9
Wirral	222	83.5	83.3	91.9
Belfast	223	88.4	83.3	91.9
Abrdn	223	86.3	83.3	91.9
Dudley	224	90.9	83.4	91.9
Glouc	258	88.8	83.7	91.7
Edinb	291	85.7	84.0	91.5
Derby	303	90.8	84.1	91.4
Middlbr	316	88.5	84.2	91.4
Newc	318	88.9	84.2	91.4
Redng	328	90.8	84.3	91.3
Dorset	330	89.9	84.3	91.3
L St.G	336	88.3	84.4	91.3
Norwch	355	90.8	84.5	91.2
Wolve	367	88.4	84.6	91.2
Swanse	380	87.4	84.6	91.1
Hull	381	88.7	84.6	91.1
Stoke	393	86.9	84.7	91.1
Camb	410	88.5	84.8	91.0
Liv Roy	425	87.9	84.9	91.0
Covnt	436	85.6	84.9	91.0
Nottm	440	90.4	84.9	91.0
B Heart	443	89.5	84.9	91.0
Kent	447	86.3	84.9	90.9
Salford	466	85.4	85.0	90.9
Brightn	467	87.6	85.0	90.9
Exeter	486	89.2	85.1	90.8
Stevng	509	90.0	85.2	90.8
Oxford	519	83.3	85.2	90.8
Leeds	536	87.3	85.3	90.7
Cardff	543	85.6	85.3	90.7
M RI	549	85.1	85.3	90.7
Bristol	568	88.0	85.4	90.7
Prestn	579	87.7	85.4	90.7
Glasgw	590	85.5	85.4	90.6
L Kings	591	90.6	85.4	90.6
Sheff	613	88.9	85.5	90.6
Ports	645	89.4	85.6	90.5
L Guys	653	89.9	85.6	90.5
L Rfree	809	90.1	85.9	90.3
Carsh	880	88.0	86.0	90.2
Leic	982	86.4	86.1	90.1
B QEH	1,051	91.4	86.2	90.1
L Barts	1,122	88.1	86.3	90.0
L West	1,445	91.2	86.5	89.8

Survival in prevalent dialysis patients with diabetes

In patients aged <65 years, one year survival for prevalent dialysis patients with diabetes was 8.1% lower compared to the same age group without diabetes. In contrast, for prevalent dialysis patients aged 65+ years, survival was very similar for those with and without diabetes (only 1% lower, table 5.14).

Time trends in patients with a primary diagnosis of diabetes

The age adjusted one year survival for prevalent dialysis patients with a reported primary renal disease of diabetic nephropathy are shown in table 5.15.

Death rate on RRT compared with the UK general population

The death rate of patients on all RRT modalities compared to the general population is shown in table 5.16. The relative risk of death on RRT decreased with age from a peak of more than 30 times that of the general population at age 25–29 years to 2.3 times the general population at age 85 and over. Figure 5.26 shows that the relative risk of death has decreased substantially for the younger age groups (<50 years) in recent years, whereas the relative risk of death in patients aged over 55 has not changed greatly in the 2014 cohort compared

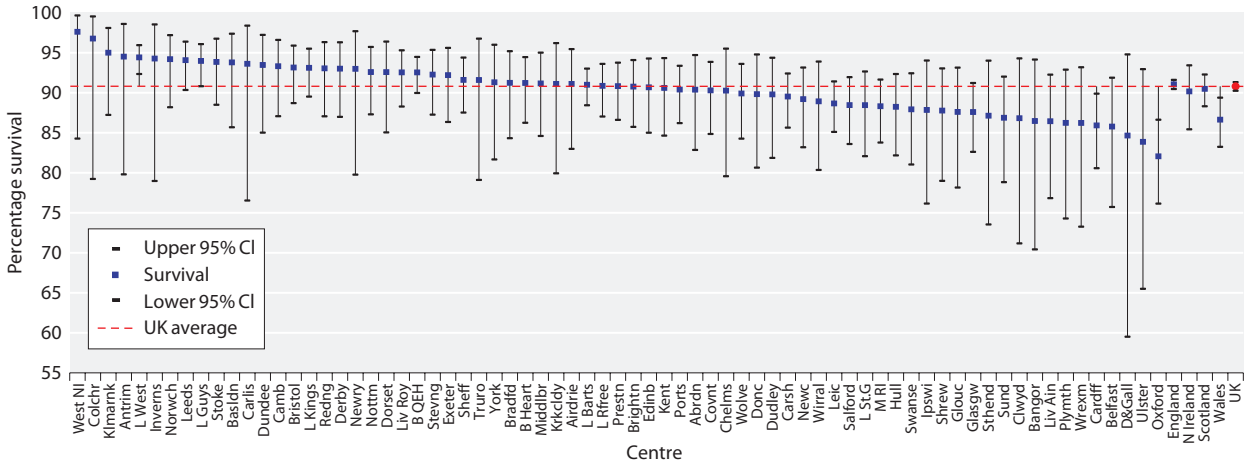

Fig. 5.21. One year survival of prevalent dialysis patients aged under 65 years by centre, 2014 cohort

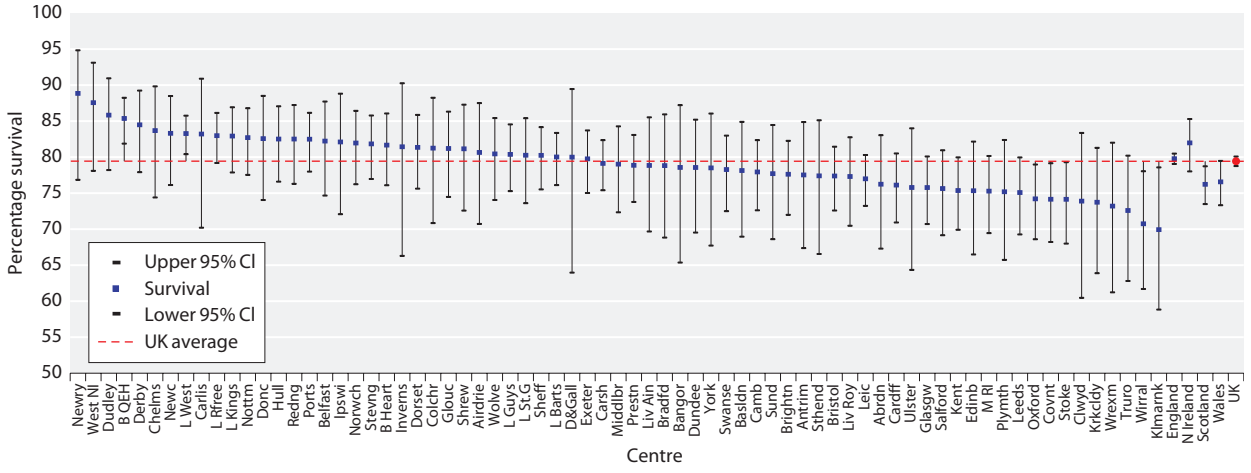

Fig. 5.22. One year survival of prevalent dialysis patients aged 65 years and over by centre, 2014 cohort

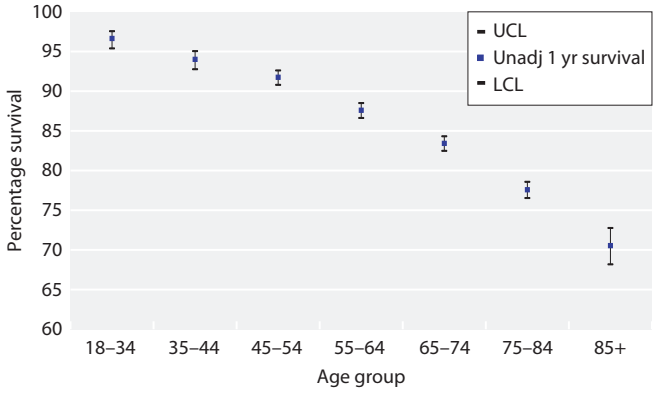

Fig. 5.23. One year survival of prevalent dialysis patients by age group, 2014 cohort

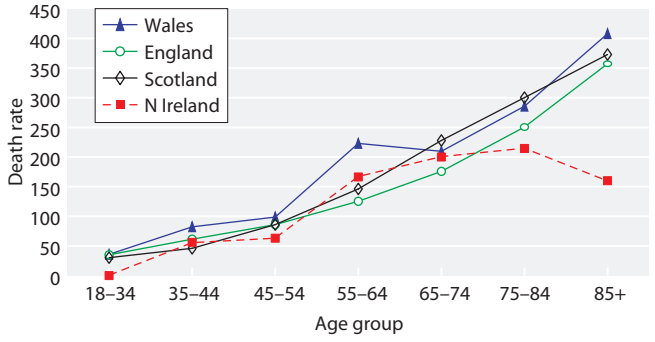

Fig. 5.24. One year death rate per 1,000 patient years by UK country and age group for prevalent dialysis patients, 2014 cohort

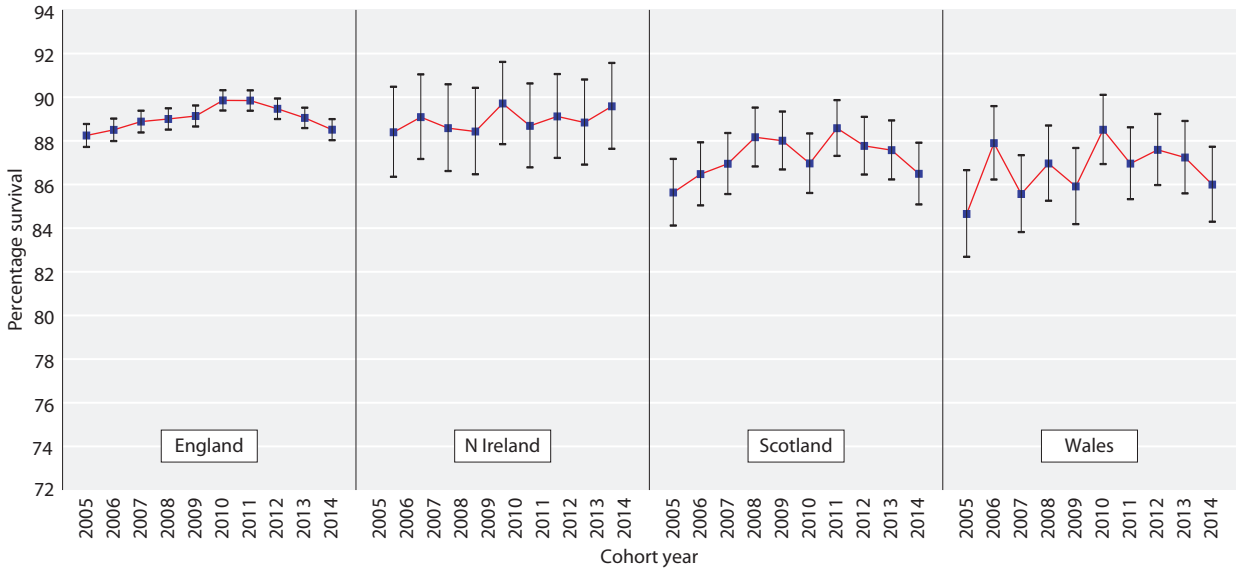

Fig. 5.25. Serial one year survival for prevalent dialysis patients by UK country, 2005 to 2014 cohort years, adjusted to age 60

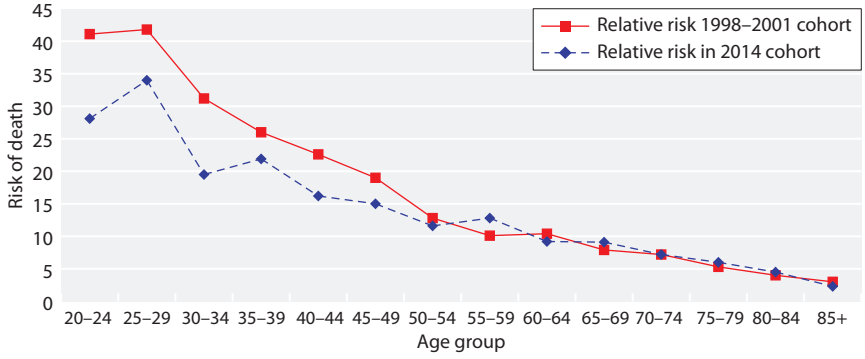

Fig. 5.26. Relative risk of death in prevalent RRT patients in the 2014 cohort compared to the 1998–2001 cohort

Table 5.14. One year survival of prevalent dialysis patients in the UK by age group and diagnosis of diabetes, 2014 cohort

Patient group	Patients *N*	Deaths *N*	Survival %	*95% CI*
Dialysis patients 2014 cohort				
All age <65	12,000	1,021	90.8	*90.3–91.3*
Non-diabetic <65	9,245	618	92.7	*92.1–93.3*
Diabetic <65	2,755	403	84.6	*83.2–85.9*
All age 65+	14,437	2,934	79.4	*78.8–80.1*
Non-diabetic 65+	11,207	2,251	79.7	*78.9–80.4*
Diabetic 65+	3,230	683	78.7	*77.2–80.0*

to the 1998–2001 cohort. The overall relative risk of death was 6.1 in the 2014 cohort and was similar to the relative risk in recent years.

Causes of death

Data completeness

Overall completeness of data for cause of death in the UK decreased slightly from 65.3% in 2014 to 63.5% in 2015, with falls in the returns from all four nations.

Table 5.15. Serial one year survival of prevalent dialysis patients with a primary diagnosis of diabetes, 2005–2014 cohort years

	Year									
Survival	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1 year survival	82.6	84.9	83.5	83.9	83.3	84.9	85.1	84.7	83.5	83.0
Number of patients	3,529	3,962	4,368	4,713	5,054	5,222	5,444	5,642	5,935	5,985

Table 5.16. Death rate by age group for prevalent RRT patients, 2014 cohort, compared with the general population and with previous analyses in the 1998–2001 cohort

Age group	UK population mid 2014 (thousands)	UK deaths in 2014	Death rate per 1,000 population	Expected number of deaths in UKRR population	UKRR deaths in 2014	UKRR death rate per 1,000 prevalent RRT patients	Relative risk of death in 2014	Relative risk of death 1998–2001 cohort
20–24	4,295	1,553	0.4	0	10	10	28.1	41.1
25–29	4,441	2,041	0.5	1	24	16	34.0	41.8
30–34	4,382	2,829	0.6	2	29	13	19.5	31.2
35–39	4,079	3,913	1.0	3	59	21	21.9	26.0
40–44	4,299	6,131	1.4	6	95	23	16.2	22.6
45–49	4,631	9,868	2.1	12	180	32	15.0	19.0
50–54	4,565	14,514	3.2	21	242	37	11.6	12.8
55–59	3,951	19,483	4.9	31	401	63	12.8	10.1
60–64	3,502	27,901	8.0	48	438	73	9.2	10.4
65–69	3,615	43,902	12.1	75	685	111	9.1	7.9
70–74	2,725	54,971	20.2	103	742	146	7.2	7.2
75–79	2,162	74,463	34.4	147	885	208	6.0	5.3
80–84	1,584	99,140	62.6	170	755	279	4.5	4.0
85+	1,526	236,970	155.3	199	458	358	2.3	3.0
Total	**49,757**	**597,679**	**12.0**	**816**	**5,003**	**90**	**6.1**	**7.7**

The largest fall in data completeness was an 8.3% fall in Scotland (appendix 1, table 5.27). There was substantial variability in the completeness of cause of death between centres, with some returning no data whilst others achieved 100% completeness. Several centres have shown substantial improvement in data returns (appendix 1, table 5.27).

Causes of death in incident RRT patients

The number and proportion of patients in the cohort with missing data for cause of death is shown in the last row of each table for cause of death (tables 5.17 to 5.21).

Causes of death within the first 90 days

In the first 90 days after start of RRT, cardiac disease was the most common cause of death in both age groups. However, infection and treatment withdrawal as a cause of death were more common in older patients (aged 65+), whereas malignancy was more common in younger patients (<65 years old) (table 5.17).

Causes of death within one year after 90 days

In the year after the first 90 days, treatment withdrawal as a cause of death was more common in older patients (aged 65+), whereas cardiac disease was more common in younger patients (<65 years old) (table 5.18).

Table 5.17. Causes of death in the first 90 days for incident RRT patients by age group, 2000–2014 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	830	26	192	28	638	26
Cerebrovascular disease	141	4	32	5	109	4
Infection	563	18	100	14	463	19
Malignancy	294	9	90	13	204	8
Treatment withdrawal	510	16	71	10	439	18
Other	713	22	179	26	534	21
Uncertain	134	4	27	4	107	4
Total	**3,185**		**691**		**2,494**	
Missing data	2,838	47	623	47	2,215	47

Table 5.18. Cause of death one year after 90 days for incident RRT patients by age group, 2000–2014 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	1,343	22	428	25	915	21
Cerebrovascular disease	292	5	91	5	201	5
Infection	1,138	19	315	18	823	19
Malignancy	698	11	219	13	479	11
Treatment withdrawal	1,024	17	158	9	866	20
Other	1,301	21	408	24	893	20
Uncertain	336	5	98	6	238	5
Total	**6,132**		**1,717**		**4,415**	
Missing data	5,137	45.6	1,428	0.0	3,709	45.4

Table 5.19. Cause of death in prevalent RRT patients by modality, 2014 cohort

	All modalities		Dialysis		Transplant	
Causes of death	*N*	%	*N*	%	*N*	%
Cardiac disease	714	22	613	23	101	18
Cerebrovascular disease	138	4	114	4	24	4
Infection	688	21	554	21	134	24
Malignancy	327	10	201	7	126	22
Treatment withdrawal	581	18	566	21	15	3
Other	666	20	534	20	132	24
Uncertain	144	4	115	4	29	5
Total	**3,258**		**2,697**		**561**	
Missing data	1,747	35	1,439	35	308	35

Although cardiac disease remained the leading cause of death in in both older and younger age groups at one year after the first 90 days, it has decreased over time. There has been a gradual increase in treatment withdrawal over recent years as cause of death at 90 days in older patients (aged 65+).

Cause of death in prevalent RRT patients in the 2014 cohort

Table 5.19 shows the comparison of cause of death for prevalent dialysis and transplant patients in the 2014 cohort. Cardiac disease as a cause of death was less common in patients with a transplant who were a highly

Table 5.20. Cause of death in prevalent dialysis patients by age group, 2014 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	613	23	196	27	417	21
Cerebrovascular disease	114	4	38	5	76	4
Infection	554	21	156	22	398	20
Malignancy	201	7	50	7	151	8
Treatment withdrawal	566	21	98	14	468	24
Other	534	20	155	21	379	19
Uncertain	115	4	32	4	83	4
Total	**2,697**		**725**		**1,972**	
No cause of death data	1,439	35	356	33	1,083	35

Table 5.21. Cause of death in prevalent transplant patients by age group, 2014 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	101	18	54	21	47	15
Cerebrovascular disease	24	4	13	5	11	4
Infection	134	24	58	23	76	25
Malignancy	126	22	58	23	68	22
Treatment withdrawal	15	3	3	1	12	4
Other	132	24	61	24	71	23
Uncertain	29	5	10	4	19	6
Total	**561**		**257**		**304**	
No cause of death data	308	35	142	36	166	35

selected group of patients. Malignancy was responsible for a far greater percentage of deaths in prevalent patients with a transplant than in those receiving dialysis, and to a lesser extent infection too. Treatment withdrawal was a more common cause of death in the prevalent dialysis population.

Table 5.20 shows the cause of death for prevalent dialysis patients in the 2014 cohort, divided into subgroups according to age. Again, cardiac disease was the leading cause of death overall. Cardiac disease represented a higher proportion of all deaths (amongst those where cause of death was known) in younger (<65 years) dialysis patients, although the absolute number of cardiac deaths were higher amongst those aged ⩾65 years (27% versus 21%). Prevalent dialysis patients aged ⩾65 years were substantially more likely to withdraw from treatment than younger patients (24% and 14% respectively).

Table 5.21 shows the cause of death for prevalent transplant patients in the 2014 cohort, divided into subgroups according to age. It shows that cardiac disease was more common in the younger age group (similar to that seen for dialysis patients). The proportions of other causes of death were relatively similar between older and younger patients.

Figure 5.27 shows cause of death for prevalent RRT patients over time between 2000 to 2014. Cardiovascular mortality decreased from year 2000 to 2005 and has remained static since, whilst treatment withdrawal as a cause of death has increased since 2009 onwards. Infection and malignancy as cause of death have remained static over the period (figure 5.27).

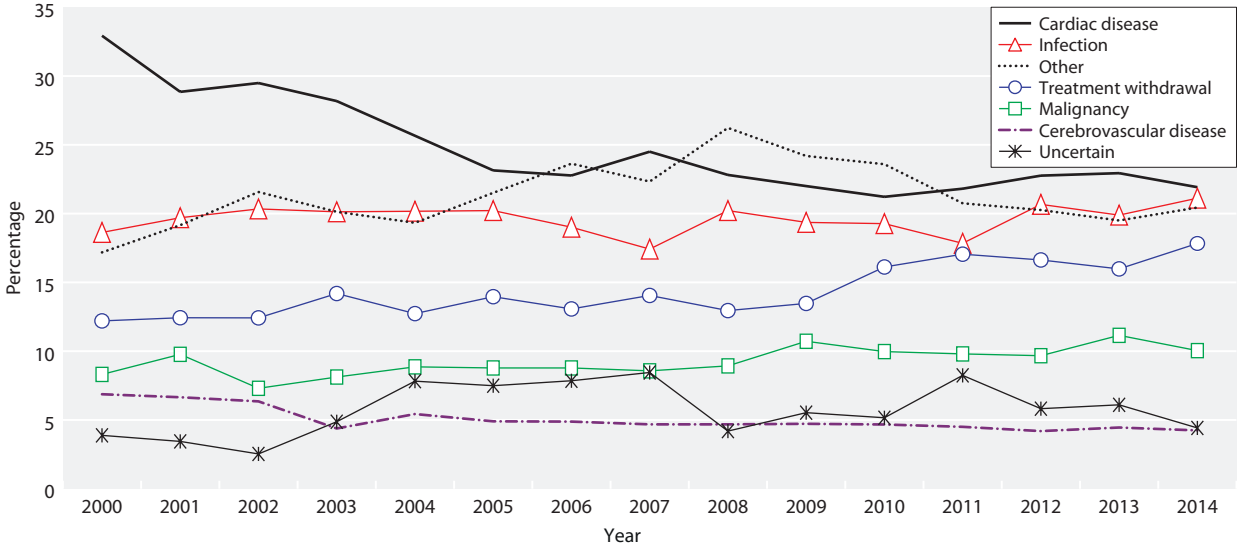

Fig. 5.27. Cause of death in prevalent RRT patients by cohort year (2000–2014)

Discussion

Survival of incident patients on RRT at 90 days (adjusted to age 60) was unchanged overall compared to the preceding year. When analysed according to age group, 90 day survival improved for those ⩾65 years whilst it fell for the younger patients. Incident one year after 90 days survival (adjusted to age 60) fell slightly in the 2014 cohort compared to 2013, and this was reflected in both age groups. There was no difference in survival by gender. Long term survival of incident patients on RRT continued to improve gradually over time.

There were differences in short term incident survival (90 days and one year after 90 days) by combined age group and diagnosis of diabetes: 90 day survival was better for those with diabetes across all age groups. For survival one year after 90 days, in the youngest group survival was much better for those without diabetes, however, this association was not seen in the older age groups, where survival was more similar between those with and without diabetes. Long-term survival showed a similar picture, where younger (<65 years) patients without diabetes survived much better than similar aged patients with diabetes. Survival was similar for older patients (⩾65 years) with and without diabetes.

One year age adjusted survival for prevalent dialysis patients was static in 2014 compared to 2013 (88.3% and 88.6% respectively). Prevalent dialysis patient survival in the UK seems to have peaked in 2011 and has been slightly lower in more recent years. The age adjusted one year survival for prevalent dialysis patients with diabetic primary renal disease in the UK has decreased slightly from 2012 onwards. The relative one year risk of death on RRT at age 20–24 years is 28 times that of the same age group in the general population, but has improved markedly over time (compared with a relative risk of 41 in the 1998–2001 cohort of the same age). For older patients (70–74 years) the relative risk is lower at 7.2 compared with the general population of a similar age, but this relative risk has not improved over time.

In the prevalent dialysis population for whom data regarding cause of death were available, cardiovascular disease was the most common cause of death accounting for 23% of deaths. Infection accounted for 21% of deaths and treatment withdrawal for 21% of deaths, with differences seen according to age group. In contrast, infection was the most common cause of death in prevalent transplant patients (24%), whilst malignancy accounted for 22% and cardiac disease 18% of all deaths. Trends in causes of death over time (2000–2014) show a decrease in cardiovascular disease, an increase in treatment withdrawal and a plateauing of deaths related to infection.

Variability in survival between centres was still evident, with some centres appearing as outliers in the data (below the lower 95% and above the upper 95% confidence limits) in incident RRT and prevalent dialysis patient survival. The survival analyses in this chapter have not been adjusted for any case-mix factors except for age. Differences in proportions of primary renal diagnosis, ethnicity and comorbidity have not been considered due to missing data from some renal centres. Although research has suggested that adjustment for comorbidity only explains a modest part of the variance in ERF patient outcomes [11], at centre level, the prevalence of comorbidities could vary substantially between renal centres and it would be expected that adjustment for comorbidity may explain a proportion of the variance in survival. The UK Renal Registry regularly evaluates the effect of adjusting for primary renal diagnosis and comorbidity in addition to age in those centres returning ⩾85% of comorbidities and repeatedly shows that, at centre level, there is clear benefit for some centres in adjusting for primary renal diagnosis and comorbidities. Research using comorbid conditions identified from hospital episode statistics (HES) data for RRT patients in England during 2002–2006 showed that adjustment for HES-derived case-mix, including comorbid conditions, affected the position on the funnel plot and outlying status of some renal centres for incident patients and reduced outlying centres from four to one [10].

Routine linkage of the UK Renal Registry data with hospital admissions information in the UK will allow the UKRR to report on survival adjusted for case-mix (age, ethnicity, primary renal diagnosis and comorbidity) in future UKRR reports. This will provide an improved comparison between centres and more accurate identification and location of outlying centres on funnel plots.

There is also considerable centre level variability in the early hazard of death (e.g. first six months) from start of RRT. The proportion of deaths in the first 90 days of starting RRT varied at centre level and, in some centres, the proportion was very low or even zero. This may be due to unreported deaths in patients that die within the first 90 days of starting RRT for ERF. Alternatively, it may be due to those patients being described as having acute kidney injury (AKI) and therefore not included in the historical UKRR data collection. From January 2015, the UKRR began collecting data for patients

receiving RRT for acute dialysis in renal centres in England and some Welsh centres, therefore future survival analyses will be able to take account of these discrepancies. In addition, from January 2016 the UKRR began collecting data for patients with chronic kidney disease (CKD) Stage 4 and 5 seen in renal centres in England, Wales and Northern Ireland, which will improve the identification of patients who opt for conservative care rather than RRT for their advanced kidney disease. These innovations in data collection will result in an improvement in the accuracy of survival estimates for patients with advanced kidney disease in the UK.

Conflicts of interest: the authors declare no conflicts of interest

References

1 Plantinga LC, Fink NE, Levin NW, et al. Early, Intermediate, and Long-Term Risk Factors for Mortality in Incident Dialysis Patients: The Choices for Healthy Outcomes in Caring for ESRD (CHOICE) Study. American journal of kidney diseases: the official journal of the National Kidney Foundation 2007;49(6):831–40

2 Miskulin DC, Meyer KB, Martin AA, et al. Comorbidity and its change predict survival in incident dialysis patients. American journal of kidney diseases: the official journal of the National Kidney Foundation 2003; 41(1):149–61

3 Nitsch D, Burden R, Steenkamp R, Ansell D, Byrne C, Caskey F, et al. Patients with diabetic nephropathy on renal replacement therapy in England and Wales. QJM-an International Journal of Medicine. 2007 Sep;100(9):551–60

4 Roderick P, Byrne C, Casula A, Steenkamp R, Ansell D, Burden R, et al. Survival of patients from South Asian and Black populations starting renal replacement therapy in England and Wales. Nephrology Dialysis Transplantation. 2009;24(12):3774–82

5 Tomson C, Maggs C. UK Renal Registry 12th Annual Report (December 2009): Chapter 2: introduction. Nephron Clin Pract. 2010;115(suppl 1): c3–8

6 Ford DJ, Fogarty DG, Steenkamp R, Tomson CRV, Ben-Shlomo Y, Ansell D. Chapter 13: The UK Renal Registry Advanced CKD Study: frequency of incorrect reporting of date of start of RRT. Nephron Clinical Practice;115(suppl 1):c271–c78

7 Malek SK, Keys BJ, Kumar S, Milford E, Tullius SG. Racial and ethnic disparities in kidney transplantation. Transplant International 2011;24(5):419–24 doi: 10.1111/j.1432-2277.2010.01205.x [published Online First: Epub Date]

8 Office for National Statistics. www.ons.gov.uk, http://www.ons.gov.uk/ons/dcp171778_238743.pdf

9 Ansell D, Roderick P, Hodsman A, Ford D, Steenkamp R, Tomson C. UK Renal Registry 11th Annual Report (December 2008): Chapter 7 Survival and cause of death of UK adult patients on renal replacement therapy in 2007: national and centre-specific analyses. Nephron Clin Pract. 2009;111(suppl 1):c113–39

10 Fotheringham, J., et al., Variation in centre-specific survival in patients starting renal replacement therapy in England is explained by enhanced comorbidity information from hospitalization data. Nephrology Dialysis Transplantation. 29(2): p. 422–430

11 van Manen JG, van Dijk PCW, Stel VS, Dekker FW, Cleries M, Conte F, et al. Confounding effect of comorbidity in survival studies in patients on renal replacement therapy. Nephrology Dialysis Transplantation. 2007; 22(1):187–95

Appendix 1: Survival tables

Table 5.22. One year after 90 day incident RRT survival percentage by centre, 2014 cohort, unadjusted and adjusted to age 60

Centre	Unadjusted one year after 90 days survival	Adjusted one year after 90 days survival	*Adjusted one year after 90 days 95% CI*
England			
B Heart	90.9	93.6	*89.8–97.5*
B QEH	87.7	90.3	*86.9–93.9*
Basldn	84.5	88.6	*79.9–98.3*
Bradfd	81.3	82.5	*74.0–91.9*
Brightn	86.7	90.6	*86.4–95.0*
Bristol	91.7	94.2	*90.9–97.6*
Camb	87.9	91.5	*87.4–95.7*
Carlis	84.5	88.3	*80.0–97.4*
Carsh	87.1	91.0	*88.0–94.1*
Chelms	85.1	88.1	*80.8–96.1*
Colchr	82.4	87.7	*79.2–97.2*
Covnt	88.7	92.4	*88.6–96.5*
Derby	94.9	95.7	*91.1–100.0*
Donc	88.5	91.6	*85.5–98.2*
Dorset	85.2	90.6	*85.7–95.8*
Dudley	88.5	91.4	*85.2–98.2*
Exeter	87.2	92.4	*88.9–96.1*
Glouc	88.2	92.7	*87.9–97.7*
Hull	89.3	92.2	*87.5–97.2*
Ipswi	97.1	98.6	*96.0–100.0*
Kent	87.4	91.4	*87.6–95.3*
L Barts	85.9	87.1	*83.4–91.0*
L Guys	91.9	93.0	*89.3–96.9*
L Kings	92.1	93.8	*90.4–97.2*
L Rfree	88.9	92.0	*88.9–95.1*
L St.G	89.7	91.7	*86.7–97.0*
L West	87.7	90.5	*87.7–93.4*
Leeds	88.6	89.6	*85.1–94.4*
Leic	88.9	91.4	*88.3–94.6*
Liv Ain	85.7	89.2	*82.1–97.0*
Liv Roy	85.6	87.4	*81.8–93.3*
M RI	82.7	85.4	*80.4–90.7*
Middlbr	89.1	92.8	*88.7–97.2*
Newc	88.7	91.3	*86.5–96.3*
Norwch	80.0	87.4	*81.7–93.6*
Nottm	89.6	92.5	*88.2–97.1*
Oxford	82.9	86.6	*82.1–91.3*
Plymth	84.0	88.8	*81.8–96.3*
Ports	85.4	88.5	*84.8–92.4*
Prestn	91.0	92.9	*89.3–96.7*
Redng	92.2	95.0	*91.4–98.7*
Salford	87.9	90.5	*86.1–95.0*
Sheff	86.3	90.6	*86.6–94.7*
Shrew	77.0	83.5	*75.9–91.8*
Stevng	87.3	90.9	*86.9–95.2*
Sthend	85.6	89.2	*80.0–99.5*
Stoke	87.2	91.8	*87.6–96.2*
Sund	84.6	87.9	*81.2–95.2*
Truro	78.9	85.4	*76.0–95.9*
Wirral	82.9	86.5	*78.3–95.6*
Wolve	82.7	88.3	*82.5–94.5*
York	83.0	87.6	*79.5–96.5*
N Ireland			
Antrim	69.8	81.8	*71.8–93.2*
Belfast	85.8	88.5	*81.3–96.2*
Ulster	90.9	92.8	*83.8–100.0*
West NI	83.8	88.7	*79.0–99.6*
Scotland			
Abrdn	92.6	94.1	*88.6–99.8*
Airdrie	85.7	88.1	*80.7–96.1*
D & Gall	95.0	97.1	*91.9–100.0*
Dundee	87.2	90.6	*83.8–98.0*
Edinb	89.1	88.5	*81.8–95.8*
Glasgw	82.9	86.3	*81.9–91.0*
Klmarnk	86.1	87.6	*78.2–98.1*
Wales			
Bangor	90.0	93.6	*85.6–100.0*
Clwyd	86.7	89.7	*80.9–99.6*
Cardff	82.5	87.1	*82.7–91.8*
Swanse	83.7	89.8	*85.3–94.6*
Wrexm	89.7	94.5	*88.7–100.0*
England	**87.4**	**90.4**	***89.6–91.2***
N Ireland	**83.2**	**87.4**	***82.9–92.2***
Scotland	**87.8**	**90.0**	***87.7–92.4***
Wales	**84.4**	**89.2**	***86.5–92.1***
UK	**87.1**	**90.2**	***89.4–91.1***

Excluded: Inverness, Kirkcaldy, Newry due to <20 patients or no deaths recorded for the year

Table 5.23. Ninety day incident RRT survival percentage by centre, 2014 cohort, unadjusted and adjusted to age 60

Centre	Unadjusted 90 day survival	Adjusted 90 day survival	*Adjusted 90 day 95% CI*
England			
B Heart	95.8	97.1	*94.6–99.6*
B QEH	96.1	97.0	*95.1–99.0*
Basldn	94.3	96.0	*90.8–100.0*
Bradfd	95.8	96.2	*92.1–100.0*
Brightn	95.6	97.0	*94.6–99.4*
Bristol	95.0	96.6	*94.1–99.1*
Camb	96.1	97.4	*95.1–99.7*
Carlis	97.5	98.2	*94.9–100.0*
Carsh	91.7	94.4	*92.1–96.8*
Colchr	94.4	96.5	*91.9–100.0*
Covnt	92.7	95.4	*92.4–98.4*
Derby	98.3	98.7	*96.1–100.0*
Donc	96.3	97.4	*94.0–100.0*
Exeter	96.9	98.3	*96.6–100.0*
Hull	95.6	96.9	*93.9–99.9*
Ipswi	97.4	98.7	*96.2–100.0*
Kent	97.9	98.6	*97.1–100.0*
L Barts	96.6	97.0	*95.2–98.9*
L Guys	98.1	98.3	*96.5–100.0*
L Kings	97.5	98.0	*96.1–100.0*
L Rfree	95.2	96.6	*94.7–98.6*
L St.G	97.8	98.3	*96.0–100.0*
L West	98.2	98.7	*97.6–99.7*
Leeds	92.6	93.6	*90.2–97.2*
Leic	93.2	94.9	*92.6–97.3*
Liv Ain	84.5	88.9	*82.3–96.0*
Liv Roy	90.6	92.6	*88.6–96.7*
M RI	93.6	95.1	*92.3–98.0*
Middlbr	94.9	96.8	*94.0–99.6*
Newc	95.1	96.3	*93.2–99.5*
Norwch	93.8	96.2	*93.0–99.5*
Nottm	94.3	96.0	*92.9–99.2*
Oxford	96.7	97.5	*95.6–99.5*
Plymth	86.2	91.3	*85.6–97.3*
Ports	98.2	98.7	*97.4–100.0*
Prestn	97.4	98.0	*96.0–100.0*
Redng	90.3	93.9	*90.3–97.7*
Salford	93.1	94.6	*91.4–97.9*
Sheff	95.9	97.3	*95.1–99.5*
Shrew	93.8	95.9	*92.0–99.9*
Stevng	93.9	95.7	*93.0–98.5*
Sthend	90.5	93.2	*86.2–100.0*
Stoke	97.1	98.2	*96.3–100.0*
Truro	92.1	94.6	*88.8–100.0*
Wirral	83.9	88.1	*81.1–95.7*
Wolve	96.2	97.4	*94.6–100.0*
York	93.5	95.4	*90.6–100.0*
N Ireland			
Belfast	96.6	97.5	*94.1–100.0*
Ulster	95.7	96.5	*90.1–100.0*
West NI	96.2	97.3	*92.3–100.0*
Scotland			
Abrdn	98.2	98.6	*95.8–100.0*
Edinb	95.6	95.6	*91.5–99.9*
Glasgw	98.3	98.8	*97.4–100.0*
Klmarnk	97.3	97.7	*93.5–100.0*
Krkcldy	94.3	96.6	*92.1–100.0*
Wales			
Bangor	95.2	97.0	*91.3–100.0*
Cardff	93.4	95.4	*92.7–98.1*
Clwyd	93.9	95.5	*89.6–100.0*
Swanse	96.3	97.8	*95.7–100.0*
England	**95.3**	**96.6**	***96.1–97.1***
N Ireland	**96.2**	**97.3**	***95.2–99.5***
Scotland	**98.0**	**98.4**	***97.5–99.4***
Wales	**95.0**	**96.8**	***95.3–98.3***
UK	**95.5**	**96.8**	***96.3–97.3***

Centres excluded 2014: <20 patients (Newry, Inverns), no deaths recorded in the first 90 days of RRT (Dudley, Chelms, Dorset, Glouc, Sund, Antrim, D&Gall, Dundee, Airdrie, Wrexm)

Table 5.24. One year after 90 day incident RRT survival percentage by centre for incident RRT cohort years 2005–2014, adjusted to age 60

	Cohort year									
Centre	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
England										
B Heart	83.6	88.5	93.5	93.6	83.7	92.0	94.4	87.0	93.5	93.6
B QEH	90.4	86.7	92.8	89.5	92.2	88.3	93.3	92.3	91.6	90.3
Basldn	92.9	90.8	89.9	89.3	87.4	85.7	91.6	89.7	90.7	88.6
Bradfd	86.2	81.3	83.8	84.1	91.6	87.9	88.9	86.8	95.5	82.5
Brightn	84.3	87.0	94.2	89.1	85.7	88.4	91.0	91.1	87.1	90.6
Bristol	82.9	92.4	91.4	84.0	89.2	88.9	94.5	88.1	91.3	94.2
Camb	89.8	90.7	93.4	91.1	87.3	89.5	91.8	92.5	93.6	91.5
Carlis	79.6	89.9	96.5	87.8	71.8	86.3	91.5		95.6	88.3
Carsh	90.6	88.2	87.1	86.6	88.0	89.9	94.3	89.6	94.0	91.0
Chelms	83.4	94.2	86.6	90.8	94.1	85.7	80.8	91.1	92.2	88.1
Colchr				85.0	86.3	93.9	84.1	82.7	97.9	87.7
Covnt	82.6	88.5	90.6	86.9	94.2	89.1	90.6	87.9	90.8	92.4
Derby	87.9	93.0	96.4	90.4	88.0	87.5	90.6	89.3	91.2	95.7
Donc				89.8	87.8	91.5	88.9	88.9	92.2	91.6
Dorset	82.6	86.2	90.4	93.5	92.4	87.5	88.2	90.2	93.2	90.6
Dudley	97.3	92.6	85.6	71.1	84.1	87.8	93.7	90.0	93.8	91.4
Exeter	86.2	88.7	86.4	87.0	89.2	95.3	88.5	93.0	94.9	92.4
Glouc	95.1	89.6	86.3	94.4	89.2	92.4	89.6	91.3	96.7	92.7
Hull	85.8	93.5	89.6	85.4	89.2	87.9	93.0	90.3	91.9	92.2
Ipswi	84.7	93.7	96.0	95.7	92.2	93.2	95.3	93.2	86.7	98.6
Kent			91.8	89.9	89.7	90.5	88.1	94.8	90.8	91.4
L Barts	91.1	93.9	86.3	92.5	90.8	91.8	93.7	90.7	91.3	87.1
L Guys	90.4	92.9	92.0	90.5	94.1	91.5	94.7	94.8	94.3	93.0
L Kings	91.7	84.5	87.5	89.6	85.5	89.7	90.8	89.8	90.0	93.8
L Rfree	93.3	89.7	94.4	95.2	89.1	90.3	90.9	93.6	91.6	92.0
L St.G			92.1	94.0	92.7	93.7	96.6	93.6	92.3	91.7
L West	94.1	92.8	92.8	94.2	93.1	88.8	90.7	92.5	93.9	90.5
Leeds	90.2	85.0	87.2	88.7	90.4	92.7	88.1	92.5	91.2	89.6
Leic	84.7	87.8	89.8	90.5	90.1	92.0	91.3	90.3	90.7	91.4
Liv Ain		86.9	82.8	78.5	82.8	89.0	86.3	95.1	85.9	89.2
Liv Roy	90.0	86.4	86.2	94.1	93.9	88.3	88.9	89.9	91.4	87.4
M RI			90.1	87.7	87.5	89.6	93.2	89.9	90.2	85.4
Middlbr	82.8	91.5	87.9	82.3	86.9	88.0	88.9	89.6	91.9	92.8
Newc	82.1	86.2	85.8	91.3	85.7	88.8	86.0	85.7	92.8	91.3
Norwch	90.7	86.5	91.0	89.0	89.7	92.2	89.5	88.3	88.0	87.4
Nottm	87.0	91.9	90.0	91.1	88.8	93.5	92.7	90.0	93.3	92.5
Oxford	87.9	89.9	89.2	87.1	91.6	90.6	88.8	93.9	93.6	86.6
Plymth	84.6	81.0	90.1	87.8	89.0	93.8	91.3	92.0	94.3	88.8
Ports	83.2	87.5	88.5	88.7	90.1	88.1	91.2	91.0	91.3	88.5
Prestn	88.5	83.5	91.4	82.1	87.5	87.6	91.7	92.8	93.9	92.9
Redng	88.5	91.3	90.1	95.3	89.0	93.0	93.0	96.0	93.2	95.0
Salford	88.3	90.5	89.2	86.0	88.5	86.4	91.9	89.0	89.1	90.5
Sheff	90.6	88.6	90.9	92.5	94.2	92.2	87.5	93.4	91.9	90.6
Shrew	86.2	87.7	91.8	93.0	84.8	86.9	91.7	85.0	86.2	83.5
Stevng	76.7	85.3	90.7	89.4	96.7	94.0	91.1	93.1	90.7	90.9
Sthend	91.1	94.8	91.8	86.5	91.5	82.0	94.3		89.6	89.2
Stoke			87.2	89.7	85.8	87.1	93.0	94.0	88.4	91.8
Sund	80.6	83.5	88.7	85.3	83.0	84.1	88.7	93.0	88.6	87.9
Truro	90.6	89.4	90.2	89.2	94.2	90.9	93.3	94.6	95.5	85.4
Wirral	87.0	85.9	88.9	90.4	84.8	93.1	86.2	86.3	93.4	86.5
Wolve	84.2	89.2	89.5	89.3	88.6	87.5	89.4	84.1	88.8	88.3
York	83.9	82.6	95.1	86.2	94.1	84.4	93.5	94.0	87.6	87.6

Table 5.24. Continued

	Cohort year									
Centre	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
N Ireland										
Antrim	85.0	93.9	85.2	88.6	97.4	85.9	85.9	86.7	92.4	81.8
Belfast	85.2	92.4	90.9	88.0	91.4	88.4	92.5	93.1	92.1	88.5
Newry	90.2					92.0	85.4	89.8	84.7	
Ulster						90.9	86.3	93.9	89.8	92.8
West NI		90.1	97.3	93.1	97.6	91.9	95.8		94.0	88.7
Scotland										
Abrdn	84.2	85.0	86.0	86.9	88.8	85.4	94.3	91.5	97.1	94.1
Airdrie	75.2	80.7	77.6	88.3	94.1	83.2	84.0	92.0	95.0	88.1
D & Gall					84.0					97.1
Dundee	83.4	89.2	81.2	85.2	87.7	90.2	90.5	93.4	90.8	90.6
Edinb	83.3	88.6	90.2	83.0	84.9	86.4	89.7	92.9	82.0	88.5
Glasgw	86.2	83.6	87.8	83.5	88.4	86.8	89.1	90.6	89.8	86.3
Inverns	84.3	83.8	90.6	87.1		96.7			95.0	
Klmarnk	96.3	82.7	86.7	90.1	84.1	88.4	91.0	90.9	83.3	87.6
Krkcldy	78.3	80.1	87.4	86.6	90.7	93.6	92.4	97.3	81.4	
Wales										
Bangor	82.3	81.4	92.2	87.8	87.3	89.1	94.4		89.0	93.6
Cardff	87.2	87.0	84.3	83.2	89.3	90.0	88.1	86.8	89.0	87.1
Clwyd	75.5	96.9			92.3					89.7
Swanse	82.7	84.2	89.0	85.1	81.7	86.8	85.0	83.8	84.9	89.8
Wrexm	97.7	85.5	89.9			82.1	88.8	86.1	88.2	94.5
England	**87.9**	**88.9**	**90.2**	**89.5**	**89.7**	**89.9**	**91.1**	**91.2**	**91.8**	**90.4**
N Ireland	**87.7**	**91.1**	**90.2**	**87.8**	**92.1**	**89.3**	**89.9**	**92.8**	**91.2**	**87.4**
Scotland	**84.4**	**84.7**	**86.4**	**85.4**	**87.2**	**87.9**	**90.4**	**91.8**	**89.5**	**90.0**
Wales	**86.0**	**86.1**	**86.7**	**84.4**	**87.3**	**88.8**	**87.6**	**85.5**	**87.6**	**89.2**
UK	**87.4**	**88.4**	**89.6**	**88.9**	**89.5**	**89.7**	**90.8**	**91.0**	**91.4**	**90.2**

Blank cells: centres with either less than 20 patients, no deaths or no data contribution to the UKRR for that year

Table 5.25. Incident RRT survival percentage after 90 days from start of RRT by centre for incident RRT cohort years 2010–2014, adjusted to age 60

Centre	5 year survival 2010 cohort	4 year survival 2011 cohort	3 year survival 2012 cohort	2 year survival 2013 cohort	1 year survival 2014 cohort
England					
B Heart	60.3	71.8	69.9	88.9	93.6
B QEH	63.2	72.7	78.9	85.7	90.3
Basldn	66.0	75.0	69.6	82.5	88.6
Bradfd	66.0	56.4	75.4	83.6	82.5
Brightn	61.4	65.8	79.4	78.0	90.6
Bristol	62.2	77.2	74.0	82.9	94.2
Camb	58.4	71.4	76.3	83.7	91.5
Carlis	67.7	73.7		88.6	88.3
Carsh	60.6	75.0	76.4	87.2	91.0
Chelms	63.1	65.2	72.3	87.7	88.1
Colchr	72.1	56.5	68.1	91.1	87.7
Covnt	58.8	69.4	69.0	81.1	92.4
Derby	53.1	68.3	75.5	83.5	95.7
Donc	52.6	70.3	75.9	88.1	91.6
Dorset	60.1	68.2	70.9	88.1	90.6
Dudley	58.6	75.4	75.6	81.3	91.4
Exeter	65.1	65.9	80.4	88.0	92.4
Glouc	61.8	67.8	78.3	93.3	92.7
Hull	53.5	72.5	73.5	87.1	92.2
Ipswi	65.5	74.6	78.1	79.0	98.6
Kent	59.0	63.4	79.2	82.4	91.4
L Barts	67.5	72.1	77.6	83.4	87.1
L Guys	66.6	78.3	80.3	89.6	93.0
L Kings	66.6	71.8	75.9	78.8	93.8
L Rfree	61.4	73.8	84.0	83.8	92.0
L St.G	71.8	75.4	79.6	86.0	91.7
L West	64.5	71.4	77.8	86.3	90.5
Leeds	61.4	67.6	75.6	81.5	89.6
Leic	64.9	67.1	73.9	80.9	91.4
Liv Ain	37.0	61.2	74.5	76.3	89.2
Liv Roy	64.5	55.3	66.2	85.6	87.4
M RI	57.5	70.1	72.7	83.0	85.4
Middlbr	69.3	66.2	70.8	83.5	92.8
Newc	51.8	72.1	74.1	85.4	91.3
Norwch	63.2	69.5	74.9	80.5	87.4
Nottm	62.6	76.0	70.5	85.9	92.5
Oxford	57.2	70.4	82.0	83.6	86.6
Plymth	49.1	69.4	73.3	79.8	88.8
Ports	59.6	67.7	73.8	84.0	88.5
Prestn	57.0	73.7	76.4	82.6	92.9
Redng	63.5	76.3	79.3	88.7	95.0
Salford	54.1	70.7	70.1	84.0	90.5
Sheff	69.1	67.8	76.9	82.4	90.6
Shrew	52.6	64.7	69.6	73.8	83.5
Stevng	66.2	71.4	83.4	86.0	90.9
Sthend	68.3	77.4	86.3	83.7	89.2
Stoke	56.1	68.2	78.4	79.4	91.8
Sund	59.2	50.9	80.1	82.4	87.9
Truro	64.0	76.0	80.6	88.9	85.4
Wirral	67.2	63.8	66.2	86.3	86.5
Wolve	60.7	59.9	70.4	80.1	88.3
York	63.2	76.5	75.9	75.2	87.6

Table 5.25. Continued

Centre	5 year survival 2010 cohort	4 year survival 2011 cohort	3 year survival 2012 cohort	2 year survival 2013 cohort	1 year survival 2014 cohort
N Ireland					
Antrim	44.8	76.4	75.9	89.8	81.8
Belfast	53.1	67.3	75.6	87.9	88.5
Newry	76.3	56.1	69.2	84.7	
Ulster	68.5	63.2	75.1	85.1	92.8
West NI	63.8	76.3	86.1	81.4	88.7
Scotland					
Abrdn	61.1	62.5	78.2	82.0	94.1
Airdrie	52.2	55.4	67.7	80.8	88.1
D & Gall					97.1
Dundee	62.0	71.2	82.3	86.4	90.6
Edinb	58.1	68.8	80.3	74.6	88.5
Glasgw	55.8	60.6	76.6	83.7	86.3
Inverns	73.8			89.8	
Klmarnk	57.6	50.4	77.8	74.1	87.6
Krkcldy	55.4	54.1	59.4	68.2	
Wales					
Bangor	47.4	57.8		84.0	93.6
Cardff	62.6	64.7	72.0	80.3	87.1
Clwyd	42.9				89.7
Swanse	55.7	65.2	69.0	76.6	89.8
Wrexm	57.7	60.9	61.1	80.6	94.5
England	**61.9**	**70.0**	**76.1**	**84.0**	**90.4**
N Ireland	**59.3**	**67.5**	**76.7**	**86.4**	**87.4**
Scotland	**57.8**	**62.5**	**76.1**	**80.5**	**90.0**
Wales	**57.9**	**63.6**	**69.8**	**79.1**	**89.2**
UK	**61.3**	**69.1**	**75.8**	**83.5**	**90.2**

Blank cells: centres with less than 20 patients for that year or no deaths or no data contribution to the UKRR for that year

Table 5.26. One year prevalent dialysis patient survival percentage by centre for prevalent cohort years 2005–2014, adjusted to age 60

	Cohort year									
Centre	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
England										
B Heart	86.6	87.8	90.4	90.9	87.4	89.5	88.4	89.1	87.8	89.5
B QEH	88.2	88.1	88.3	89.9	89.4	91.1	91.6	91.8	89.8	91.4
Basldn	89.9	90.3	92.6	91.6	88.6	91.0	88.5	92.7	87.2	88.6
Bradfd	82.9	84.3	87.8	84.5	89.3	88.0	87.7	85.1	87.8	87.5
Brightn	87.6	87.2	88.8	87.4	89.9	88.3	89.5	88.1	87.5	87.6
Bristol	87.7	89.2	87.4	85.1	85.8	89.8	90.8	90.0	89.5	88.0
Camb	89.3	88.0	92.6	90.0	91.4	93.1	89.1	92.8	87.8	88.5
Carlis	83.9	85.8	87.0	80.3	80.5	93.3	88.9	82.9	88.3	90.9
Carsh	89.2	88.4	89.8	88.7	89.2	89.6	91.0	90.6	90.1	88.0
Chelms	85.6	87.6	85.1	86.1	89.6	84.2	91.2	90.8	90.6	90.5
Colchr				91.1	86.6	89.0	89.3	86.0	88.4	90.5
Covnt	84.7	87.1	87.2	90.9	90.1	90.9	91.8	90.6	86.4	85.6
Derby	88.5	86.9	90.3	90.4	90.0	89.5	89.3	88.1	89.5	90.8
Donc			88.8	83.9	88.8	91.8	91.1	82.8	90.5	89.5
Dorset	87.0	87.5	89.9	90.1	93.0	90.0	90.5	91.9	92.3	89.9
Dudley	87.3	87.3	88.9	88.9	90.8	87.7	91.5	86.8	87.7	90.9
Exeter	91.1	87.3	85.5	85.5	86.7	88.4	88.3	91.7	90.2	89.2
Glouc	91.1	88.2	86.3	91.7	92.2	89.5	90.7	89.7	92.3	88.8
Hull	85.8	89.9	86.7	87.8	87.5	89.8	91.0	88.4	87.8	88.7
Ipswi	84.2	86.1	93.1	84.4	87.5	91.8	90.3	88.0	90.2	89.1
Kent			86.3	87.9	90.4	89.8	89.1	87.6	88.2	86.3
L Barts	88.3	89.3	88.7	90.8	92.9	91.7	89.8	91.2	90.5	88.1
L Guys	87.3	90.5	90.3	91.4	91.0	94.0	91.2	90.9	91.0	89.9
L Kings	88.7	84.3	87.5	87.6	88.6	89.7	89.4	88.9	90.6	90.6
L Rfree	90.0	90.3	91.3	89.7	90.3	91.5	90.3	90.9	90.4	90.1
L St.G			94.3	89.2	90.8	91.9	88.4	91.7	92.4	88.3
L West	91.2	91.5	90.3	92.0	90.6	90.7	91.7	90.2	90.3	91.2
Leeds	88.5	88.2	87.3	88.8	90.8	88.9	86.7	88.3	89.1	87.3
Leic	84.4	89.7	89.5	88.6	90.4	89.8	90.3	89.0	89.5	86.4
Liv Ain	86.8	90.5	88.3	91.9	89.7	89.7	83.8	84.3	87.7	86.8
Liv Roy	87.6	84.4	86.4	89.0	88.9	90.4	88.5	87.8	87.2	87.9
M RI			86.3	87.6	86.9	88.5	90.7	86.2	86.3	85.1
Middlbr	85.0	87.1	86.8	86.4	83.4	93.0	88.5	88.7	85.5	88.5
Newc	83.7	86.0	86.3	87.1	86.1	85.1	89.2	84.4	86.7	88.9
Norwch	90.3	87.7	91.2	89.6	90.0	91.3	91.5	88.7	88.8	90.8
Nottm	83.2	89.5	88.4	88.0	89.6	89.9	89.0	90.6	88.6	90.4
Oxford	86.8	86.8	87.7	88.3	87.1	87.9	88.1	89.5	88.0	83.3
Plymth	83.6	82.6	87.9	85.8	85.1	89.8	84.6	89.8	86.8	85.4
Ports	85.2	89.9	88.5	89.2	88.4	88.2	89.9	90.2	85.8	89.4
Prestn	86.3	90.8	90.2	89.7	90.1	88.2	90.8	89.2	88.8	87.7
Redng	89.0	90.3	88.9	92.4	88.9	89.5	90.9	90.9	90.0	90.8
Salford	85.4	87.6	86.0	87.5	84.6	87.0	88.4	87.5	89.3	85.4
Sheff	89.2	88.8	88.8	89.7	89.6	88.8	89.0	91.5	88.5	88.9
Shrew	86.6	89.1	88.9	87.8	85.6	87.4	89.9	83.8	86.5	88.0
Stevng	88.0	88.4	91.4	89.2	88.6	91.8	90.9	87.5	90.9	90.0
Sthend	83.4	86.4	90.3	91.0	92.5	90.3	87.8	91.8	90.7	86.9
Stoke			87.4	88.5	86.9	90.6	90.6	91.8	89.0	86.9
Sund	79.5	83.8	87.5	85.3	84.8	83.9	86.6	84.9	88.2	85.5
Truro	91.8	89.3	89.5	89.0	90.7	89.1	89.7	88.9	90.1	85.6
Wirral	88.4	88.2	89.3	90.2	88.6	90.7	90.2	90.8	84.7	83.5
Wolve	89.3	87.9	92.6	89.5	87.4	89.3	88.8	89.2	90.1	88.4
York	84.0	88.6	87.9	88.8	90.1	84.3	88.7	91.6	88.0	88.6

Table 5.26. Continued

	Cohort year									
Centre	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
N Ireland										
Antrim	92.1	85.3	87.9	89.6	88.1	91.6	90.0	90.6	85.7	88.3
Belfast	85.9	89.5	87.8	87.0	87.2	87.6	87.7	85.3	89.5	88.4
Newry	87.4	87.3	89.1	91.5	86.7	91.1	81.5	90.0	91.1	92.9
Ulster	91.6	89.5	89.6	87.4	89.8	89.0	91.0	90.8	91.3	86.3
West NI	83.4	90.2	92.7	89.3	91.0	90.8	91.5	91.8	87.5	93.9
Scotland										
Abrdn	86.3	87.3	90.0	89.5	89.5	89.2	91.5	88.1	84.1	86.3
Airdrie	79.8	78.9	85.6	85.5	89.5	88.0	86.4	85.9	85.7	88.5
D & Gall	80.4	90.0	83.6	86.4	87.6	90.9	86.8	89.9	86.6	87.2
Dundee	86.4	81.8	81.8	93.3	86.3	86.6	90.9	88.2	91.6	89.1
Edinb	85.7	87.0	87.0	85.8	88.2	81.3	89.3	89.1	88.0	85.7
Glasgw	85.7	87.4	87.0	88.1	88.0	87.3	87.7	87.3	87.7	85.5
Inverns	85.7	93.5	88.6	91.8	88.4	86.0	87.1	86.4	89.0	90.4
Klmarnk	91.8	86.8	88.4	87.9	88.4	88.9	89.6	86.9	91.8	85.6
Krkcldy	86.4	87.3	89.7	85.0	86.3	89.0	86.9	90.5	84.4	85.4
Wales										
Bangor	88.5	81.5	88.8	85.1	85.5	86.9	90.0	84.5	85.6	86.3
Cardff	84.2	88.8	82.5	86.5	85.9	88.3	86.5	87.7	87.0	85.5
Clwyd	77.3	90.5	87.1	88.8	78.3	93.1	90.0	86.3	89.2	84.1
Swanse	85.4	88.0	89.5	87.3	87.5	89.1	86.2	88.3	87.3	87.4
Wrexm	85.1	87.6	85.2	89.0	86.7	85.9	87.3	89.3	88.4	85.0
England	**88.2**	**88.5**	**88.9**	**89.0**	**89.1**	**89.9**	**89.8**	**89.5**	**89.1**	**88.5**
N Ireland	**87.3**	**88.4**	**89.1**	**88.6**	**88.4**	**89.7**	**88.7**	**89.1**	**88.8**	**89.6**
Scotland	**85.6**	**86.5**	**87.0**	**88.2**	**88.0**	**87.0**	**88.6**	**87.8**	**87.6**	**86.5**
Wales	**84.6**	**87.9**	**85.6**	**87.0**	**85.9**	**88.5**	**87.0**	**87.6**	**87.2**	**86.0**
UK	**87.8**	**88.3**	**88.5**	**88.8**	**88.9**	**89.5**	**89.6**	**89.2**	**88.9**	**88.3**

Blank cells: centres with less than 20 patients, no deaths or no data contribution to the UKRR for that year

Table 5.27. Percentage completeness of EDTA cause of death for prevalent patients by centre and year of death, 2006 to 2015

	Year of death									
Centre	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
England										
B Heart	85.7	84.5	93.9	100.0	96.6	96.1	96.6	95.0	65.6	93.8
B QEH	4.7	7.0	5.8	1.4	1.7	2.0	2.1	61.9	91.0	53.4
Basldn	21.7	45.5	47.6	76.2	66.7	84.6	88.9	90.9	90.0	86.4
Bradfd	92.2	86.5	92.5	81.8	97.0	97.5	97.7	97.9	98.0	90.2
Brightn	0.0	11.9	0.0	1.1	2.4	1.1	1.1	0.0	0.9	7.0
Bristol	61.0	60.3	66.4	70.7	89.4	96.1	82.2	82.0	94.5	61.2
Camb	1.3	1.1	1.6	5.1	10.4	62.0	94.1	80.5	42.3	0.0
Carlis	91.3	73.9	47.6	80.6	100.0	92.9	94.7	92.3	92.0	82.4
Carsh	0.0	0.8	1.5	0.8	6.7	25.0	40.8	17.4	16.3	24.9
Chelms	64.0	76.5	71.4	86.7	86.7	87.0	100.0	92.3	85.7	96.2
Colchr			33.3	66.7	85.2	82.6	100.0	91.7	77.3	90.0
Covnt			1.2	1.8	0.0	1.4	33.3	70.5	6.7	4.7
Derby	75.6	83.3	97.8	73.5	91.2	88.5	86.9	88.7	78.9	86.4
Donc			100.0	94.3	90.9	91.7	92.6	100.0	96.8	91.7
Dorset	65.1	87.2	88.9	85.2	95.7	95.0	89.1	98.3	90.6	90.2
Dudley	5.9	6.1	5.3	0.0	94.4	88.1	91.2	94.0	97.7	94.3
Exeter	19.0	4.7	3.1	3.0	89.5	84.6	95.1	98.6	96.5	85.3
Glouc	61.1	77.8	70.8	68.4	97.2	93.6	91.5	100.0	88.1	94.2
Hull	76.0	76.5	52.7	18.7	92.0	93.5	96.9	86.8	91.7	97.3
Ipswi	21.9	35.5	13.6	18.8	73.3	77.8	77.4	78.8	83.3	25.0
Kent			61.7	92.8	89.0	96.2	94.9	81.4	86.6	95.3
L Barts	87.4	74.6	77.0	69.5	73.9	82.6	79.9	82.9	83.3	49.2
L Guys	0.0	3.5	0.0	0.0	67.6	84.2	58.2	1.1	0.0	92.4
L Kings	87.9	75.8	86.2	67.1	94.8	97.6	100.0	98.9	98.7	96.7
L Rfree				0.9	1.7	0.0	7.1	5.7	16.1	16.1
L St.G		16.7	17.9	19.6	77.6	49.0	42.4	62.5	57.1	32.8
L West	31.3	18.9	6.3	2.2	2.2	95.0	97.3	96.4	94.6	96.7
Leeds	66.7	29.6	30.1	34.5	100.0	99.1	97.7	98.3	99.2	96.4
Leic	76.9	65.5	69.5	69.8	74.5	61.7	94.1	79.6	55.7	57.7
Liv Ain	81.3	73.3	66.7	100.0	89.5	95.7	0.0	0.0	0.0	12.5
Liv Roy	66.3	76.8	75.8	81.8	71.6	76.4	2.8	33.7	19.0	11.0
M RI		4.0	0.9	1.0	4.7	3.1	10.0	0.8	1.4	2.0
Middlbr	63.5	57.5	26.0	52.0	89.2	97.5	94.9	81.3	95.1	93.4
Newc	29.8	48.7	35.7	40.8	14.0	45.0	16.9	23.6	51.8	74.1
Norwch	21.4	18.2	21.2	44.4	75.8	70.3	76.5	91.0	74.0	48.6
Nottm	87.5	87.0	98.8	97.1	98.8	100.0	100.0	97.6	98.9	95.7
Oxford	0.0	0.0	1.0	0.0	84.6	97.4	92.7	96.5	98.3	96.9
Plymth	45.8	56.7	70.7	47.5	80.9	43.6	41.2	100.0	32.7	74.0
Ports	12.8	21.4	6.9	44.5	68.7	23.3	19.8	40.7	38.8	33.8
Prestn	55.4	47.8	38.1	17.9	95.7	98.9	97.6	99.0	96.2	80.3
Redng	77.1	97.8	89.6	83.0	100.0	96.7	91.2	91.9	79.7	76.7
Salford		1.3	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Sheff	9.2	12.9	0.9	1.9	3.0	0.8	0.8	1.9	0.9	0.8
Shrew	53.1	89.3	62.5	20.5	46.0	0.0	7.9	17.7	0.0	34.9
Stevng	60.8	55.1	66.1	74.3	86.3	86.8	67.7	69.8	9.3	62.1
Sthend	9.4	3.2	57.7	75.0	92.3	90.0	100.0	100.0	95.7	97.0
Stoke		16.1	21.0	28.6	54.7	57.9	89.6	55.9	53.5	75.0
Sund	60.0	60.5	50.0	78.9	93.5	95.1	97.4	82.6	97.4	98.0
Truro	6.9	0.0	18.4	28.9	93.3	94.9	78.8	100.0	97.1	98.0
Wirral	94.1	84.6	96.9	84.8	86.5	0.0	2.6	25.8	68.5	69.0
Wolve	48.5	51.5	65.8	76.4	98.4	94.1	92.2	85.1	85.2	62.5
York	83.3	38.5	62.1	67.9	96.7	97.3	100.0	100.0	97.4	94.7

Table 5.27. Continued

Centre	Year of death									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
N Ireland										
Antrim	10.0	8.6	3.4	26.9	96.8	95.2	100.0	93.1	100.0	93.9
Belfast	33.8	36.0	20.0	25.4	80.3	77.2	77.0	41.7	51.1	47.8
Newry	42.9	15.0	11.8	68.4	95.2	94.4	96.7	100.0	93.3	100.0
Ulster	85.7	92.9	69.2	75.0	95.0	90.9	100.0	95.7	90.0	96.0
West NI	57.7	35.0	22.2	45.8	92.3	80.0	96.6	96.2	93.9	100.0
Scotland										
Abrdn		2.1	100.0	100.0	100.0	100.0	97.1	91.1	68.3	46.7
Airdrie	26.3	100.0	100.0	100.0	100.0	97.1	93.9	100.0	97.6	97.5
D & Gall	78.6	100.0	93.3	94.4	100.0	100.0	87.5	100.0	100.0	69.2
Dundee	2.8	8.9	100.0	100.0	100.0	100.0	100.0	100.0	57.6	66.7
Edinb	29.3	48.3	100.0	97.5	100.0	98.8	100.0	96.4	96.2	92.6
Glasgw	55.1	59.1	100.0	98.5	97.8	99.3	100.0	99.3	100.0	91.4
Inverns			100.0	94.7	100.0	100.0	100.0	100.0	100.0	100.0
Klmarnk	11.1	15.6	100.0	96.7	100.0	100.0	100.0	100.0	100.0	97.4
Krkcldy	66.7	61.5	100.0	96.6	96.6	100.0	96.9	100.0	94.7	54.8
Wales	30.7	43.8	36.3	47.6	53.3	48.6	50.6	84.8	91.2	89.2
Bangor	35.0	86.2	52.4	76.9	73.9	90.0	100.0	95.8	95.0	90.0
Cardff	2.9	4.9	0.0	2.4	6.7	7.9	0.6	73.5	96.7	80.9
Clwyd	11.1	45.5	84.2	83.3	100.0	85.7	89.5	83.3	90.0	100.0
Swanse	92.4	97.3	94.8	89.8	98.0	87.5	98.1	95.7	82.6	94.9
Wrexm	3.4	22.7	69.2	100.0	95.7	92.6	100.0	95.7	87.0	97.4
England	**41.5**	**37.8**	**36.9**	**38.9**	**58.8**	**63.5**	**64.5**	**64.7**	**60.5**	**59.5**
N Ireland	**38.7**	**31.7**	**20.4**	**40.8**	**89.3**	**84.6**	**90.7**	**75.2**	**81.5**	**79.7**
Scotland	**34.0**	**44.8**	**99.8**	**98.1**	**99.0**	**99.3**	**98.5**	**98.4**	**90.6**	**82.3**
Wales	**30.7**	**43.8**	**36.3**	**47.6**	**53.3**	**48.6**	**50.6**	**84.8**	**91.2**	**89.2**
UK	**40.0**	**38.7**	**42.2**	**44.9**	**62.9**	**66.6**	**67.1**	**69.1**	**65.3**	**63.5**

Blank cells: data not available for that year

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UK Renal Registry 19th Annual Report: Chapter 6 Adequacy of Haemodialysis in UK Adult Patients in 2015: National and Centre-specific Analyses

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Adequacy · Haemodialysis · Urea reduction ratio

Summary

- Data regarding the urea reduction ratio (URR) were available for analysis from 63 renal centres in the UK.
- Fifty centres provided URR data on more than 90% of prevalent haemodialysis (HD) patients.
- The proportion of patients in the UK who met the Renal Association clinical practice guideline for URR (>65%) increased from 77.7% in 2002 to 88.1% in 2015.
- There was persistent variation observed between centres, 20 centres attaining the RA clinical practice guideline in >90% of patients and 36 centres attaining the guideline in 70–90% of patients.
- Patients over the age of 70 years achieved a higher median URR (76.0%) compared to younger patients (<70 years, URR 75.0%).
- The overall proportion of prevalent HD patients with a URR >65% has continued to improve over time.
- Whilst the majority of UK patients achieved the target URR there was wide variation between centres in the percentage of patients achieving the current guideline target.

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Introduction

Following the National Co-operative Dialysis Study (NCDS) [1], dialyser urea clearance has been used to assess the amount of dialysis treatment delivered to patients with chronic kidney disease. The most widely accepted measures of dialysis urea clearance are the dimensionless Kt/V urea, the ratio between the product of dialyser urea clearance (K) and dialysis session duration (t) divided by the volume of urea distribution in the body (V) [1] and the urea reduction ratio (URR), the percentage fall in serum urea (URR) following a haemodialysis treatment. URR does not consider ultrafiltration or the size of the patient, and although Kt/V urea takes both into account, both URR and Kt/V urea can over-estimate dialyser urea clearance due to the rebound in serum urea concentration at the end of dialysis, particularly when higher blood pump speeds are used, and if blood sampling does follow approved protocols [2]. Whilst Kt/V provides a better estimate of urea clearance, it requires additional data items not routinely reported by most UK kidney dialysis centres [3, 4]. As such, the UK Renal Registry (UKRR) has historically presented analyses based on URR rather than Kt/V urea for comparative audit of haemodialysis adequacy as these data are more readily available.

Although observational studies have reported that urea dialyser clearance influences patient survival [5, 6], the prospective multicentre Haemodialysis (HEMO) study failed to demonstrate that a higher haemodialysis Kt/V urea target improved survival [7]. Despite debates as to the toxicity of urea, or whether urea clearance equates to the clearance of other azotaemic toxins [8], errors in estimating urea volume of distribution [9], or the effect of energy expenditure [10, 11], clinical guidelines base dialysis dosing on dialyser urea clearance [12–14]. Despite the limited number of randomised prospective trials, there is marked uniformity for the recommendations of the various national and international guideline committees for the minimum amount of dialyser urea clearance, although there are some differences in the methodology advised [12–14]. Table 6.1 lists the current Renal Association (RA) audit measures relevant to haemodialysis patients and whether the audit measure is currently reported in the UKRR annual report [12].

The main objective of this chapter is to examine the extent to which patients with chronic kidney disease treated with haemodialysis (HD) in the UK, received the minimum dose of HD as determined by URR, recommended in the current UK RA clinical practice guidelines [12].

The RA clinical practice guidelines for HD dose apply specifically to patients undergoing thrice weekly HD. In these patients, it is recommended that blood for biochemical measurement (including pre-dialysis urea for URR) should be taken before the mid-week dialysis session [12].

Methods

Seventy renal centres in the UK submitted data electronically to the UKRR on a quarterly basis. Cambridge renal centre (Addenbrooke's) was unable to submit 2015 data at patient level prior to the UKRR closing date for data submission, but provided summary numbers of patients starting RRT by treatment modality. This centre is therefore excluded from most analyses in this chapter.

Table 6.1. Summary of recommended Renal Association audit measures relevant to haemodialysis adequacy

Haemodialysis adequacy RA audit measures	Included in UKRR annual report?	Reason for non-inclusion
The proportion of patients in the main renal unit and its satellite units who are on twice weekly haemodialysis	No	Varying levels of reporting between centres
Cumulative frequency curves of urea reduction ratio measured using a standard method of post-dialysis sampling	Yes, but data not presented in the cumulative frequency format	
The proportion of patient non-attendances for haemodialysis sessions and the proportion of dialysis sessions shortened at the patient's request	No	Data not available
The proportion of thrice weekly haemodialysis sessions which have prescribed treatment times less than 4 hours	Yes	
The proportion of hospital (main and satellite unit) and home haemodialysis patients who are prescribed more frequent than thrice weekly haemodialysis	Partly	Not for home haemodialysis patients

The majority of these centres have satellite units but for the purposes of this study the data from the renal centres and their associated satellite units were amalgamated. Data from two groups of patients were analysed. Firstly, analysis was undertaken using data from the prevalent adult HD patient population as of the 30th September 2015. For this analysis, data for URR were taken from the 3rd quarter of 2015 unless that data point was missing in which case data from the 2nd quarter were taken. The prevalent population only included patients receiving HD who were alive on 30th September 2015. Data from those patients who had died before that date have not been included in the analysis. The second analysis involved adult incident patients who had commenced treatment with HD during 2014. For these patients, analysis was undertaken using the last recorded URR in the quarter in which the patient had started dialysis. The incident HD patient cohort was followed up for one year and the last recorded URR in the quarter after one year follow-up was used for this analysis.

Data from patients known to be receiving more or less than thrice weekly HD were omitted from the analysis for both the incident and prevalent population. Patients who had missing data for the number of dialysis sessions per week, were assumed to be dialysing thrice weekly. However, because not all centres report frequency of HD, it is possible that data from a small number of patients receiving HD at a different frequency were included in the analyses. Home HD patients were excluded from the analysis.

Analyses of the data from both groups of patients included the calculation of the median URR and of the proportion of patients who had achieved the RA guideline (as outlined below) in each of the renal centres, the UK countries as well as for the UK as a whole. The median URR and proportion of patients who achieved the RA guideline were also calculated separately for males and females. The number of dialysis sessions per week and the time per dialysis session is shown by renal centre.

All patients with data were included in the statistical analyses at a national level, although centres with fewer than 20 patients, or providing less than 50% data completeness were excluded from the comparison between centres. The number preceding the centre name in each figure indicates the percentage of missing data for that centre.

The UK RA clinical practice guidelines [12] in operation at the time these data were collected, were as follows:

HD should take place at least three times per week in nearly all patients. Reduction of dialysis frequency to twice per week because of insufficient dialysis facilities is unacceptable.

Every patient receiving thrice weekly HD should have consistently:

- ***either URR >65%***
- ***or equilibrated Kt/V (eKt/V) of >1.2 (or single pool Kt/V of >1.3) calculated from pre- and post-dialysis urea values, duration of dialysis and weight loss during dialysis.***

To achieve a URR above 65% or eKt/V above 1.2 consistently in the vast majority of the HD population clinicians should aim for a minimum target URR of 70% or minimum eKt/V of 1.4 in individual patients.

The duration of thrice weekly HD in adult patients with minimal residual renal function should not be reduced below 4 hours without careful consideration.

Patients receiving HD twice weekly for reasons of geography should receive a higher sessional dose of HD. If this cannot be achieved, then it should be recognised that there is a compromise between the practicalities of HD and the patient's long-term health.

Measurement of the 'dose' or 'adequacy' of HD should be performed monthly in all hospital HD patients and may be performed less frequently in home HD patients. All dialysis units should collect and report this data to their regional network and the UKRR.

Post-dialysis blood samples should be collected either by the slow-flow method, the simplified stop-flow method, or the stop dialysate flow method. The method used should remain consistent within renal units and should be reported to the Registry.

The RA clinical practice guidelines for HD dose apply specifically to patients undergoing thrice weekly HD. In these patients, it is recommended that blood for biochemical measurement (including pre-dialysis urea for URR) should be taken before the mid-week dialysis session [12].

Results

Data completeness

Sixty three of the 71 UK renal centres submitted HD dose (URR) data to the UKRR (table 6.2). Data were available for 72.0% ($N = 14{,}866$) of the total prevalent population ($N = 20{,}653$) treated with HD who met the inclusion criteria for these analyses.

Fifty centres reported URR data on more than 90% of their patients. Seven centres reported URR data on less than 50% of prevalent patients (Brighton, Ipswich, Manchester Royal Infirmary, Newcastle, Reading, Shrewsbury and Sunderland). URR data were not received from eight centres (Cambridge, Carshalton, London St Bartholomew's, London Kings, London Royal Free, London St Georges, Liverpool Aintree and Liverpool Royal Infirmary).

Several centres had a reduction in the completeness of URR data submitted to the UKRR in 2015 compared with 2014, whereas others increased reporting, with an average change of 0.1% (range −99.1 to 99.4%). These changes may have occurred due to changes in computerised data bases and data extraction, or by centres moving to on-line Kt/V, or total Kt/V urea including residual renal urea clearance rather than URR as the preferred measure of haemodialysis dose.

Twelve centres, including all five centres in Wales, did not provide data on frequency of dialysis sessions, and 50 centres provided data on >90% of patients (table 6.3). Twelve centres did not provide data on dialysis session

Table 6.2. Percentage completeness of URR data returns for prevalent patients on HD by centre, on 30/9/2015

Centre	*N*	Percentage completeness	Centre	*N*	Percentage completeness
England					
B Heart	348	99.1	Sheff	471	94.9
B QEH	890	97.3	Shrew	162	1.9
Basldn	133	97.7	Stevng	398	98.5
Bradfd	199	99.0	Sthend	90	100.0
Brightn	352	11.1	Stoke	265	91.3
Bristol	445	100.0	Sund	193	1.6
Camb			Truro	115	85.2
Carlis	74	98.7	Wirral	157	99.4
Carsh	718	0.0	Wolve	273	93.0
Chelms	114	94.7	York	117	100.0
Colchr	111	92.8			
Covnt	320	99.7	**N Ireland**		
Derby	190	96.8	Antrim	107	100.0
Donc	148	98.0	Belfast	154	98.7
Dorset	249	86.4	Newry	74	85.1
Dudley	143	96.5	Ulster	86	100.0
Exeter	360	100.0	West NI	87	98.9
Glouc	208	100.0			
Hull	317	99.4	**Scotland**		
Ipswi	115	0.9	Abrdn	185	100.0
Kent	360	98.3	Airdrie	176	100.0
L Barts	918	0.0	D & Gall	46	97.8
L Guys	535	98.9	Dundee	159	100.0
L Kings	509	0.0	Edinb	241	99.6
L Rfree	652	0.0	Glasgw	512	99.4
L St.G	303	0.0	Inverns	64	98.4
L West	1,332	88.7	Klmarnk	123	100.0
Leeds	424	100.0	Krkcldy	139	99.3
Leic	783	99.0			
Liv Ain	141	0.0	**Wales**		
Liv Roy	274	0.0	Bangor	67	100.0
M RI	429	2.6	Cardff	428	100.0
Middlbr	303	100.0	Clwyd	70	100.0
Newc	255	15.3	Swanse	304	99.7
Norwch	277	98.2	Wrexm	97	100.0
Nottm	316	91.1			
Oxford	389	98.2	**England**	**17,534**	**67.1**
Plymth	120	95.0	**N Ireland**	**508**	**97.2**
Ports	491	99.0	**Scotland**	**1,645**	**99.6**
Prestn	485	80.0	**Wales**	**966**	**99.9**
Redng	275	10.6	**UK**	**20,653**	**72.0**
Salford	288	69.8			

Blank cells denote no data returned by the centre

times, and 45 centres provided data on >90% of patients (table 6.4).

Of the total incident patient population ($N = 4,591$) who started HD during 2014 and meeting the inclusion criteria for URR analyses, 43% ($N = 1,976$) had URR data available during the first quarter of treatment (data not shown). Ten centres did not provide data for the first quarter of treatment, and 42 centres provided data on >90% of incident patients during the first year.

Achieved URR

The median URR for prevalent HD patients was 75%, but ranged between centres from 70–83% (figure 6.1a). There was evidence that the median URR for female

Table 6.3. Number of dialysis sessions for prevalent patients on HD by centre, on 30/9/2015

Centre	*N*	Percentage completeness	Percentage		
			<3 sessions	3 sessions	>3 sessions
England					
B Heart	389	77.9	11.6	86.5	2.0
B QEH	890	0.0			
Basldn	141	97.2	0.0	94.2	5.8
Bradfd	210	99.5	5.3	94.7	0.0
Brightn	355	99.4	0.6	99.2	0.3
Bristol	465	100.0	3.2	95.7	1.1
Camb					
Carlis	75	93.3	1.4	98.6	0.0
Carsh	726	99.6	0.6	98.9	0.6
Chelms	131	97.7	11.7	86.7	1.6
Colchr	111	100.0	0.0	100.0	0.0
Covnt	320	1.9			
Derby	190	52.6	0.0	100.0	0.0
Donc	149	94.6	0.7	99.3	0.0
Dorset	260	99.6	3.9	95.8	0.4
Dudley	146	98.6	2.1	97.9	0.0
Exeter	383	99.7	4.2	94.0	1.8
Glouc	208	0.0			
Hull	317	1.0			
Ipswi	123	100.0	6.5	93.5	0.0
Kent	371	98.4	2.2	97.0	0.8
L Barts	918	0.0			
L Guys	576	97.9	4.1	92.7	3.2
L Kings	509	100.0	0.0	100.0	0.0
L Rfree	652	0.0			
L St.G	305	92.5	0.7	99.3	0.0
L West	1,342	55.4	0.9	98.7	0.4
Leeds	456	99.8	6.4	93.0	0.7
Leic	792	98.5	1.2	98.8	0.0
Liv Ain	147	97.3	0.7	95.8	3.5
Liv Roy	318	98.4	0.3	85.9	13.7
M RI	431	23.9			
Middlbr	304	21.7			
Newc	261	100.0	1.1	97.7	1.1
Norwch	284	99.7	1.4	97.5	1.1
Nottm	335	100.0	0.3	94.3	5.4
Oxford	389	99.2	0.0	100.0	0.0
Plymth	120	0.0			
Ports	545	98.2	6.4	89.9	3.7
Prestn	485	0.0			
Redng	277	98.2	0.4	99.3	0.4
Salford	347	99.7	1.7	82.9	15.3
Sheff	486	99.2	3.1	96.9	0.0
Shrew	177	100.0	5.1	91.5	3.4
Stevng	428	99.5	4.7	93.0	2.3
Sthend	105	100.0	14.3	85.7	0.0
Stoke	278	98.2	1.5	95.2	3.3
Sund	205	98.5	0.0	94.1	5.9
Truro	135	92.6	13.6	84.0	2.4
Wirral	169	96.5	0.6	92.6	6.7
Wolve	273	8.8			
York	129	99.2	0.8	90.6	8.6

Table 6.3. Continued

Centre	*N*	Percentage completeness	Percentage		
			<3 sessions	3 sessions	>3 sessions
N Ireland					
Antrim	108	98.2	0.0	99.1	0.9
Belfast	162	100.0	0.6	95.1	4.3
Newry	79	100.0	6.3	93.7	0.0
Ulster	90	100.0	2.2	95.6	2.2
West NI	101	100.0	2.0	86.1	11.9
Scotland					
Abrdn	196	96.9	1.1	94.2	4.7
Airdrie	177	94.9	0.6	99.4	0.0
D & Gall	47	100.0	0.0	97.9	2.1
Dundee	162	98.2	0.0	98.1	1.9
Edinb	248	98.8	0.8	97.1	2.0
Glasgw	516	94.2	0.4	99.2	0.4
Inverns	70	87.1	0.0	90.2	9.8
Klmarnk	123	97.6	0.0	100.0	0.0
Krkcldy	142	94.4	1.5	97.8	0.7
Wales					
Bangor	67	0.0			
Cardff	428	0.0			
Clwyd	70	0.0			
Swanse	304	0.0			
Wrexm	97	0.0			
England	**18,138**	**68.9**	**2.7**	**95.2**	**2.2**
N Ireland	**540**	**99.6**	**1.9**	**94.1**	**4.1**
Scotland	**1,681**	**95.8**	**0.6**	**97.8**	**1.7**
Wales	**966**	**0.0**			
UK	**21,325**	**68.7**	**2.4**	**95.4**	**2.2**

Blank cells denote no data returned by the centre

HD patients at 78% (centre range 72.0–86.5%) (figure 6.1b) was significantly greater than that of male HD patients, with a median URR at 74% (centre range 68–80%) (figure 6.1c).

The median sessional URR was lower for patients aged <70 years (median 75%) compared to older patients (⩾70 years, median 76%), and there was evidence that this difference was significant. Similarly, the median sessional URR was lower for both genders in the younger age group (<70 years) compared to the older age group (⩾70 years of age): median URR of 77% for females <70 years of age compared to a median URR of 78% for female patients aged ⩾70 years. Similarly, for male patients aged <70 years of age the median URR of 73.0% was lower than for male patients aged ⩾70 years (median URR 74.3%).

The current UK RA clinical guideline target is to achieve a minimum sessional URR of 65%, and this was achieved in 88.1% of HD prevalent patients (centre range 73.5–97.3%) (figure 6.2). Again, more female patients achieved this minimum target (92.3%, centre range 83.9–100.0%) compared to male patients (85.5%, centre range 63.4–96.5%) and there was evidence that this difference was significant.

Changes in URR over time

From 2002 there was an initial progressive increase in the percentage of patients achieving the current RA clinical practice guidelines (URR >65%) until 2011, after which there has been a plateau (figure 6.3). Similarly, the median URR in UK haemodialysis patients has risen from 71% to 75% during the same time period,

Table 6.4. Time per dialysis session for prevalent patients on HD by centre, on 30/9/2015

Centre	*N*	Percentage completeness	Percentage per dialysis session		
			<4 hours	4–5 hours	>5 hours
England					
B Heart	348	70.4	11.8	87.8	0.4
B QEH	890	0.0			
Basldn	133	97.0	38.0	61.2	0.8
Bradfd	199	98.0	25.1	74.9	0.0
Brightn	352	99.4	6.6	93.4	0.0
Bristol	445	100.0	20.0	80.0	0.0
Camb					
Carlis	74	93.2	11.6	88.4	0.0
Carsh	718	96.9	10.2	89.5	0.3
Chelms	114	97.4	40.5	59.5	0.0
Colchr	111	100.0	2.7	97.3	0.0
Covnt	320	3.8			
Derby	190	52.6	2.0	98.0	0.0
Donc	148	94.6	28.6	71.4	0.0
Dorset	249	100.0	10.8	89.2	0.0
Dudley	143	98.6	9.9	90.1	0.0
Exeter	360	100.0	48.9	51.1	0.0
Glouc	208	0.0			
Hull	317	2.2			
Ipswi	115	93.0	3.7	96.3	0.0
Kent	360	100.0	57.8	41.9	0.3
L Barts	918	0.0			
L Guys	535	90.8	19.5	80.0	0.4
L Kings	509	100.0	47.3	52.7	0.0
L Rfree	652	0.0			
L St.G	303	80.5	3.3	96.7	0.0
L West	1,332	55.8	16.4	82.1	1.5
Leeds	424	100.0	23.6	76.2	0.2
Leic	783	81.6	11.3	86.5	2.2
Liv Ain	141	98.6	27.3	72.7	0.0
Liv Roy	274	99.6	9.5	90.1	0.4
M RI	429	23.5			
Middlbr	303	99.7	38.1	61.9	0.0
Newc	255	100.0	10.2	87.8	2.0
Norwch	277	99.6	60.1	39.9	0.0
Nottm	316	100.0	9.2	90.8	0.0
Oxford	389	99.2	29.3	70.5	0.3
Plymth	120	0.0			
Ports	491	0.0			
Prestn	485	0.4			
Redng	275	96.4	13.2	86.8	0.0
Salford	288	97.2	22.9	77.1	0.0
Sheff	471	83.2	88.0	11.5	0.5
Shrew	162	99.4	52.2	47.2	0.6
Stevng	398	100.0	67.6	32.4	0.0
Sthend	90	100.0	45.6	54.4	0.0
Stoke	265	100.0	13.2	86.8	0.0
Sund	193	81.9	17.7	82.3	0.0
Truro	115	96.5	60.4	39.6	0.0
Wirral	157	100.0	24.8	74.5	0.6
Wolve	273	8.8			
York	117	98.3	7.0	93.0	0.0

Table 6.4. Continued

Centre	*N*	Percentage completeness	Percentage per dialysis session		
			<4 hours	4–5 hours	>5 hours
N Ireland					
Antrim	107	98.1	13.3	86.7	0.0
Belfast	154	100.0	16.2	83.8	0.0
Newry	74	100.0	44.6	55.4	0.0
Ulster	86	100.0	17.4	82.6	0.0
West NI	87	100.0	57.5	42.5	0.0
Scotland					
Abrdn	185	96.2	2.8	94.9	2.2
Airdrie	176	96.6	14.7	83.5	1.8
D & Gall	46	89.1	9.8	90.2	0.0
Dundee	159	98.1	13.5	86.5	0.0
Edinb	241	98.8	34.0	66.0	0.0
Glasgw	512	95.7	5.7	90.4	3.9
Inverns	64	85.9	23.6	76.4	0.0
Klmarnk	123	97.6	0.8	93.3	5.8
Krkcldy	139	94.2	30.5	68.7	0.8
Wales					
Bangor	67	0.0			
Cardff	428	0.0			
Clwyd	70	0.0			
Swanse	304	0.0			
Wrexm	97	0.0			
England	**17,534**	**64.7**	**26.7**	**72.9**	**0.4**
N Ireland	**508**	**99.6**	**27.1**	**72.9**	**0.0**
Scotland	**1,645**	**96.0**	**13.8**	**84.0**	**2.2**
Wales	**966**	**0.0**			
UK	**20,653**	**65.0**	**25.2**	**74.2**	**0.6**

Blank cells denote no data returned by the centre, <20 patients in the renal centre or data completeness was <50%

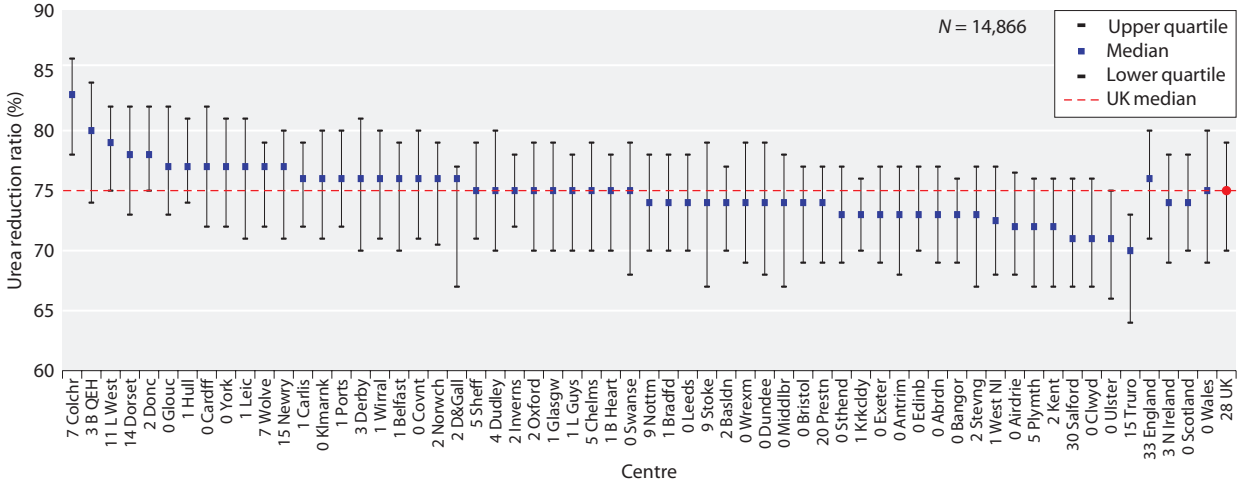

Fig. 6.1a. Median URR achieved in prevalent patients on HD by centre, 30/9/2015

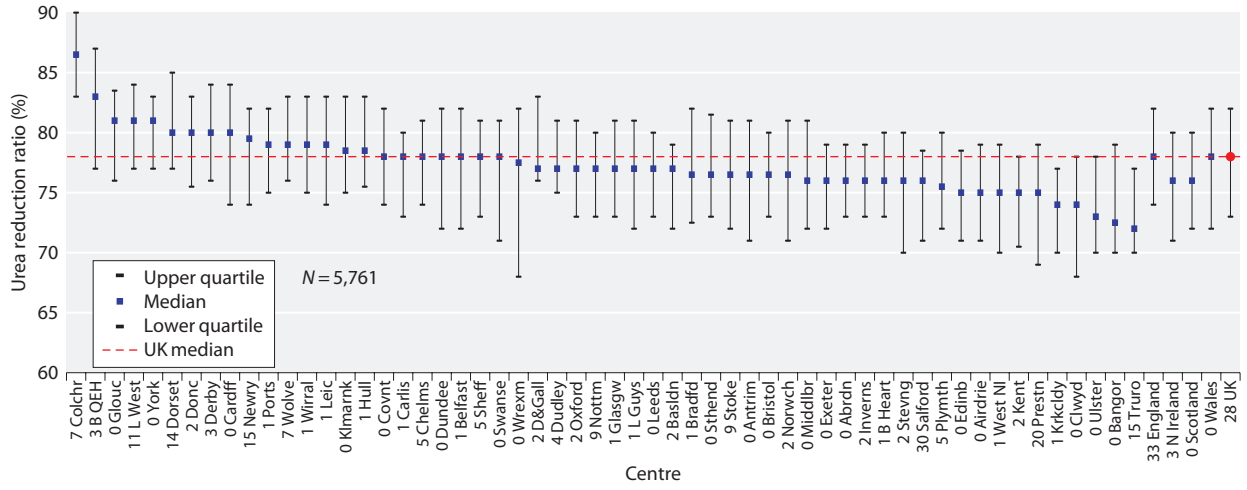

Fig. 6.1b. Median URR achieved in female prevalent patients on HD by centre, 30/9/2015

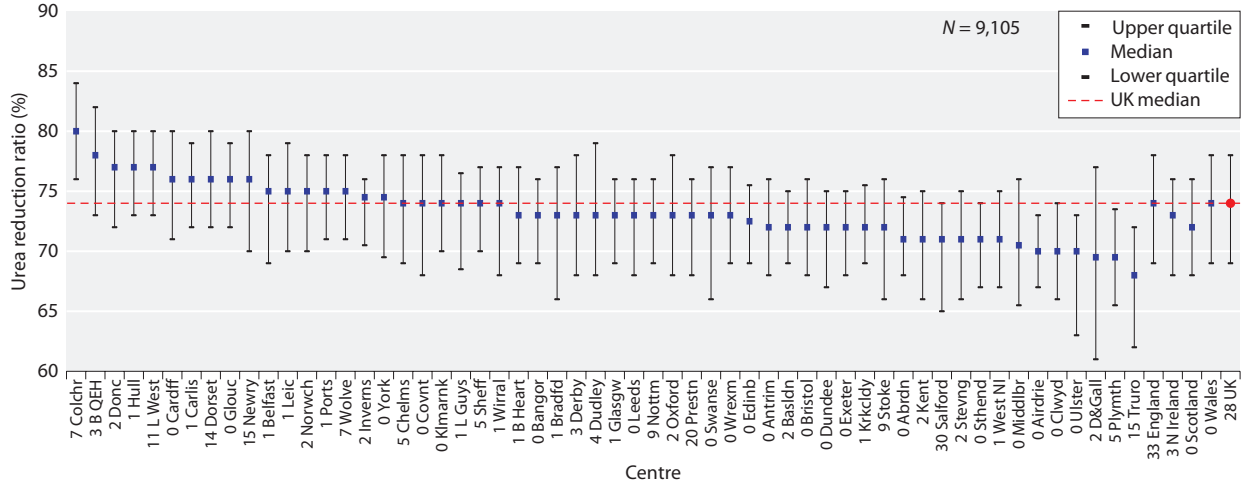

Fig. 6.1c. Median URR achieved in male prevalent patients on HD by centre, 30/9/2015

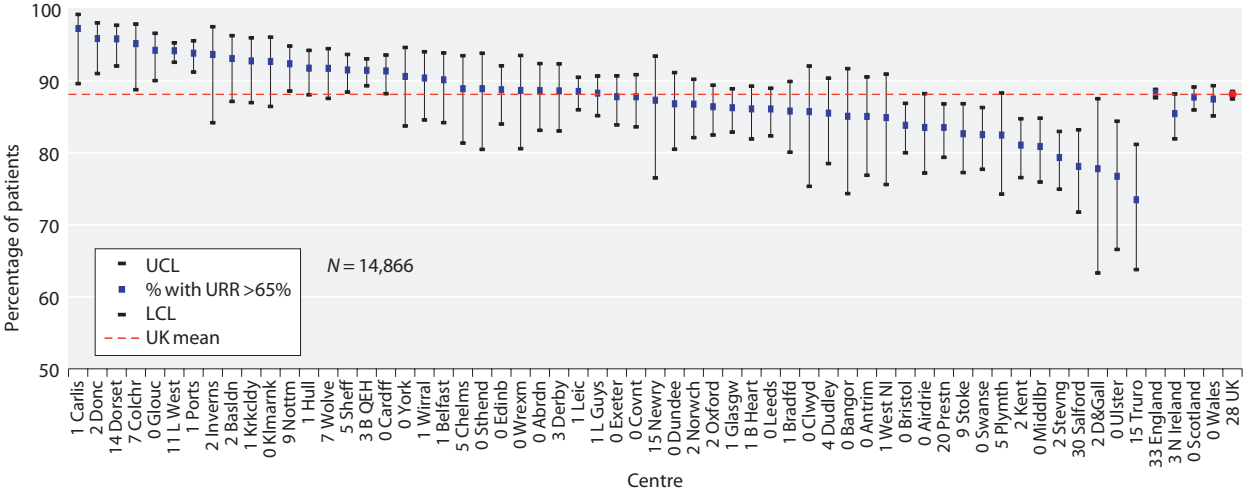

Fig. 6.2. Percentage of prevalent patients on HD with URR >65% by centre, 30/9/2015

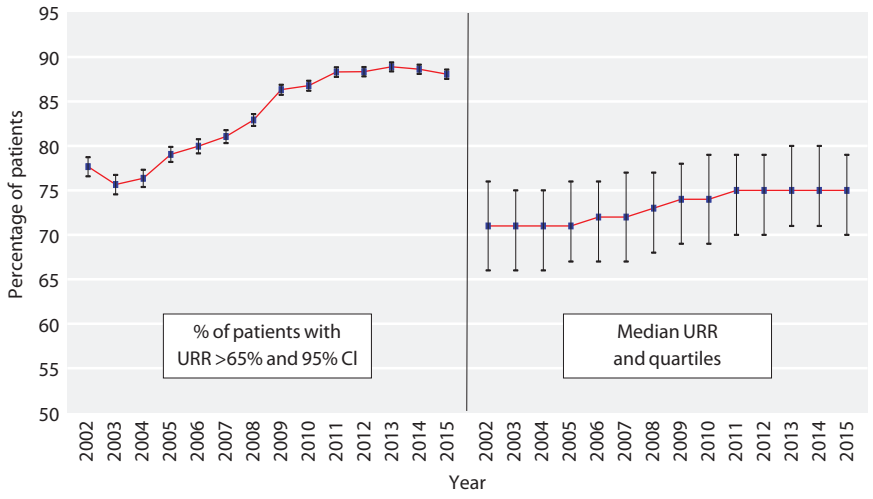

Fig. 6.3. Change in the percentage of prevalent patients on HD with URR >65% and the median URR between 2002 and 2015

with no substantial change in the median sessional URR from 2011.

Variation of achieved URR with time on dialysis

The proportion of patients who attained the UK RA clinical guideline for URR was greater for those who had been treated by haemodialysis for two years or longer compared to those who had been dialysing for <6 months (figure 6.4). For all strata of dialysis vintage, there has been an improvement in the proportion of patients receiving the sessional target dose of haemodialysis over the last 13 years, with the greatest increase in those dialysing for <6 months where the proportion of patients achieving the URR target increased from 54% to 75% from 2002 to 2015.

Changes in URR for incident patients

The median sessional URR during the first quarter after starting haemodialysis treatment in the UK was 68.0% (centre range 57.0–75.0%) (figure 6.5a) for incident HD patients in 2014. At the end of one year follow-up, the median URR had significantly increased to 74.0% (centre range 69.0–80.0%) (figure 6.5b).

There was evidence that the median sessional URR during the first three months after starting haemodialysis was significantly lower for patients aged <70 years (median URR 67.0%) compared to patients older than ⩾70 years (median URR 69.0%). Similarly, at the end of the first year of haemodialysis the median sessional URR was again lower for patients aged <70 years (median URR 73.0%) vs ⩾70 years of age (median URR 75.0%).

Haemodialysis session duration for prevalent HD patients

For those centres which returned data, the vast majority of prevalent patients (74.2%) dialysed between 4–5 hours, with 25.2% dialysing <4 hours per session, and only 0.6% dialysing for more than 5 hours (table 6.4). Median URR was similar for patients dialysing longer (⩾4 hours) vs shorter dialysis sessions (<4 hours).

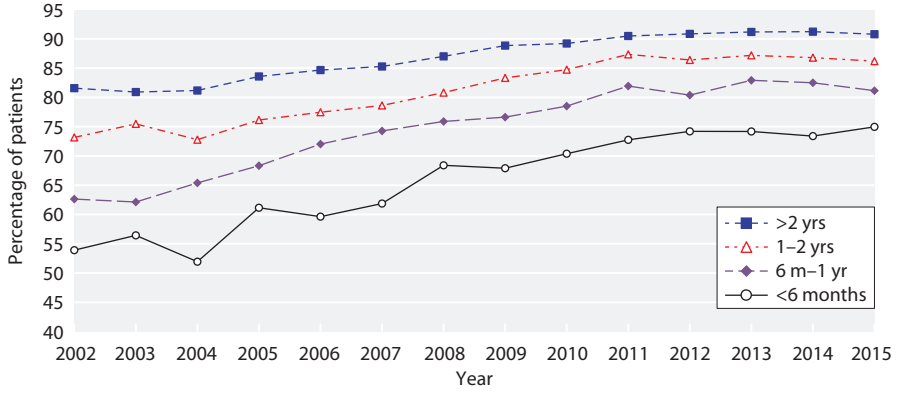

Fig. 6.4. Percentage of prevalent patients on HD achieving URR >65% by time on RRT between 2002 and 2015

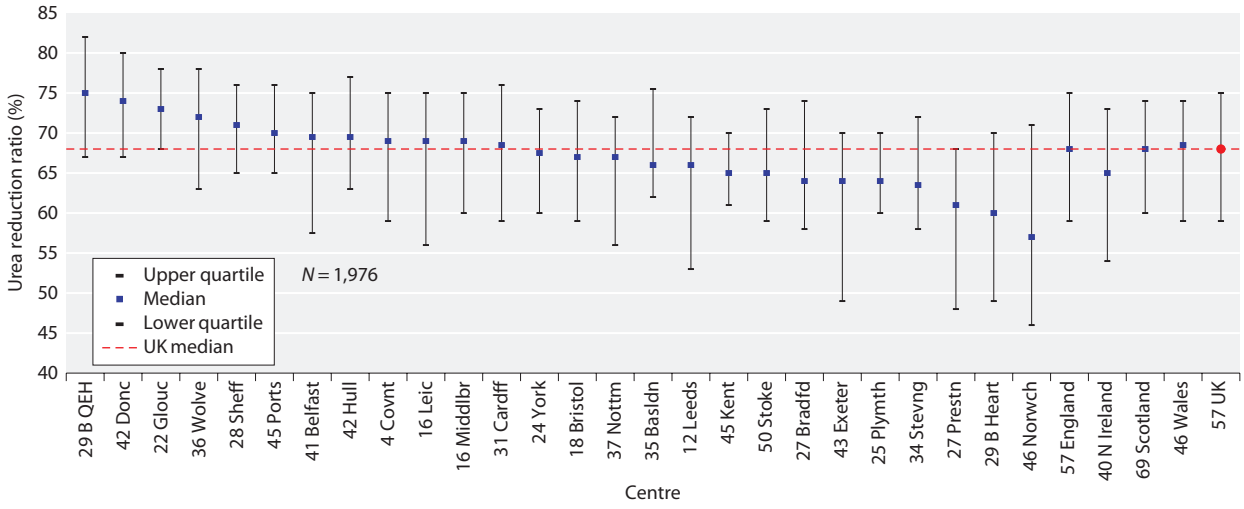

Fig. 6.5a. Median URR in the first quarter of starting RRT in incident patients who started HD in 2014

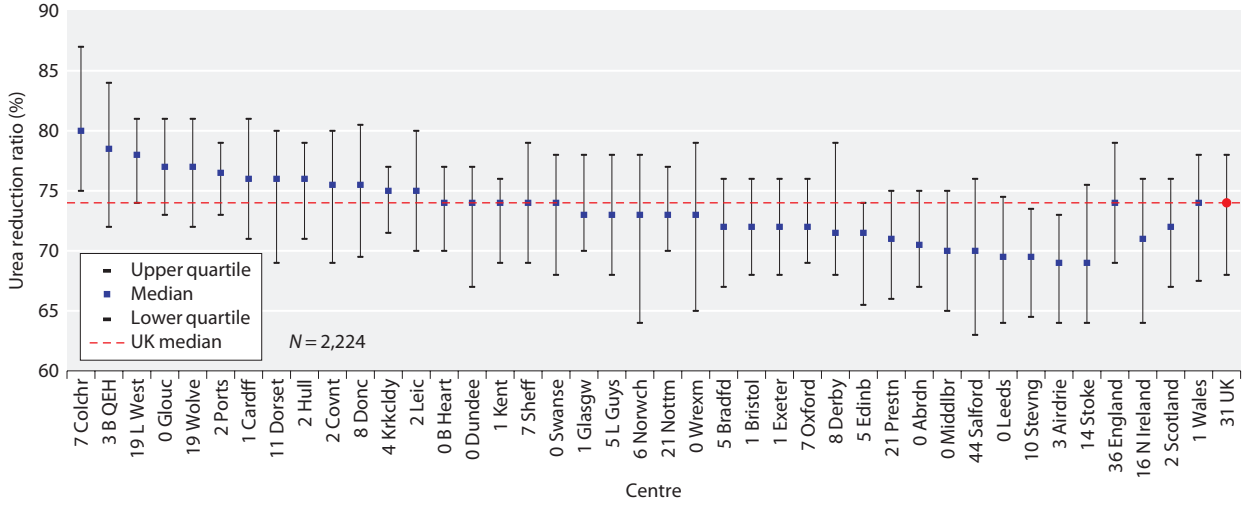

Fig. 6.5b. Median URR one year after starting RRT for incident patients who started HD in 2014

Haemodialysis session frequency for prevalent HD patients

Dialysis frequency data was available for 68.7% of patients (table 6.3). Although 95.4% of all prevalent haemodialysis patients dialysed thrice weekly, 2.4% dialysed less frequently and 2.2% more than thrice weekly, there were marked differences in centre practices. Centres reported dialysing between 0–14.3% of patients twice weekly or less, and between 0–15.3% more than thrice weekly. Four centres reported dialysing >10% of patients less than thrice weekly and three centres more often than thrice weekly. There was little evidence that sessional URR differed with dialysis frequency (median URR 74.0% for prevalent HD patients dialysising <3 times per week versus a median URR of 75.0% for patients dialysing ⩾3 times per week.

Discussion

The original NCDS trial studying different low flux dialyser urea clearance targets, recruited a much younger and less comorbid cohort of patients than currently dialysing in UK centres [1]. That trial showed no difference in one year mortality, but more patients dropped out of the trial with lower sessional dialyser urea clearances possibly affecting the results [1]. As such, patient well-being appears to depend on achieving a minimum

dialyser urea clearance target, but it remains unclear as to whether higher dialyser urea clearance targets increase patient survival [3, 5–7].

The current UK RA clinical guidelines recommend a minimum dialyser urea clearance of >66% [12], in keeping with many other international guideline recommendations [13, 14]. It is reassuring that the proportion of UK haemodialysis patients achieving this target URR has increased from 2002, with now more than 88% of the prevalent HD population achieving the guideline target in 2015. This improvement in delivered dialysis dose reflects improvements in not only clinical practice and haemodialysis technology [15], but also enhanced coverage and quality of the data collected by the UKRR from renal centres over time.

Observational studies and post hoc analyses of the HEMO study and observational studies have suggested that women may benefit from a greater dialyser urea clearance than men [16, 17]. Neither UK RA nor other clinical guidelines advocate different targets based on gender [12]. Typically, women are smaller than men and have lower dietary intakes, as such serum urea concentrations are lower, and as such less dialyser urea clearance is required to achieve a similar URR compared to a larger male. However, this effect of an over estimation of delivered dialysis dose also applies to Kt/V urea [18, 19]. Although women may be smaller and have a different body composition to men, they have a relatively greater resting energy expenditure [10, 20], and as such it has been suggested to adjust dialyser urea clearance for body surface area rather than body water [21]. It is therefore reassuring that in the UK, the median sessional URR was higher for women than men.

Previous studies have not investigated whether urea dialyser clearance targets should be adjusted for age. Over the last fifteen years the average age of patients dialysing in UK dialysis centres has steadily increased. It was found that the sessional urea clearance delivered to older prevalent patients was greater than that for younger patients. Body composition changes with age as muscle mass declines [22], and as such both resting and total energy expenditure tend to decline with age along with dietary intake [10]. As such it would be expected that younger more active patients would require greater clearances than older patients. Although the results paradoxically suggest lower clearances delivered to younger patients, these results may be confounded by higher pre-dialysis serum urea values in the younger patients, and differences in body composition [23, 24].

A difference between centres in achieving the URR sessional urea clearance target of >65% for prevalent HD patients, ranging from 73.5–97.3% of patients was noted. This is most likely to reflect genuine differences in patient mix between centres and centre level clinical practice. As such, understanding differences in patient populations (inner city compared to rural, ethnicity, age, comorbidity and centre practices including incremental approaches to dialysis [25], vascular access, and use of high flux dialysis and haemodiafiltration [26]) are important in understanding variation between centres.

Reimbursement for haemodialysis changed some years ago to payment per session to encourage the delivery of more frequent dialysis compared to the thrice weekly paradigm [27]. Despite financial encouragement to provide more frequent dialysis, most UK centres continue to provide thrice weekly dialysis to the clear majority of patients, although three of 71 (4.2%) centres now provide more frequent dialysis schedules to more than 10% of their prevalent HD patients, and nine centres (12.7%) treat >5% of patients with more frequent dialysis.

Interestingly, sessional URR was not significantly lower for more frequent dialysis compared to thrice weekly dialysis. However, as only 2.2% of patients dialysed more frequently it is unclear as to whether UK dialysis centres alter dialysis times when dialysing patients more frequently [28]. On the other hand, between 0–14.3% patients in different dialysis centres dialyse less than thrice weekly. Not all UK dialysis centres measure residual renal function on a regular basis, and the question arises as to whether this difference in practice reflects differences in centre practices in terms of measuring residual renal function and adding this clearance to dialyser clearance [29].

The great majority of prevalent patients dialysed between 4–5 hours, with 25.2% dialysing for shorter times (<4 hours) and 0.6% dialysing for longer (>5 hours). Again, centre practices showed marked differences, with a wide range (0.8–88.0%) of patients dialysing for less than four hours. Twenty-seven of the 55 centres that provided data on time dialysed (49.1%), dialysed >20% of patients for <4 hours. The median URR was similar whether patients dialysed for four hours or more, or less than four hours, suggesting potential differences in centre practices in terms of blood pump speeds, dialysate flow rates and dialyser surface area. However the differences in centre practices, in terms of shorter dialysis session times and reduced frequency of dialysis sessions, may additionally reflect some centres taking

into account residual renal function, centres reducing the amount of dialysis delivered to the elderly, but equally may also be due to the limitation of the provision of haemodialysis services, and these fundamental differences in centre practices require further investigation.

Most patients initiating HD have residual renal function, and as such some centres practice an incremental approach to patients starting HD [30]. Sessional URR increased with dialysis vintage in the incident patient group, with the median URR ranging from 57–75% between centres during the first three months of dialysis, which then increased to 69–80% after 12 months, suggesting that most UK centres practised some form of incremental dialysis, increasing dialysis session clearance as residual renal function declined. Observational studies have reported that preservation of residual renal function is associated with improved survival [31], however maintaining patients overhydrated on the basis that this may preserve residual renal function does not appear to sustain residual renal function [32], and indeed may potentially increase cardiovascular mortality. As most of the UK centres do not regularly measure residual renal function, the authors are unable to comment on differences in centre practices to initiating dialysis and outcomes.

How much individualisation of dialysis prescription based on residual renal function is practiced across UK renal centres remains to be determined. More importantly, studies are required to determine whether preservation of residual renal function improves patient survival. Similarly, there is a need to establish whether centre dialysis practices affect loss of residual renal function. Incompleteness of data returns by all centres, including dialysis session information and other important factors limits the interpretation of the data.

Although there is debate as to the relative toxicity of urea, and how representative urea clearance is of other azotaemic toxin clearances [8], dialyser urea clearance remains the standard for dialysis dosing. Other factors need to be considered, as the dialysis prescription should also include volume control, sodium and divalent cation balance and correction of metabolic acidosis. As such, using sessional dialyser urea clearance dose based simply on urea clearance has been criticised by some [17, 18], arguing that patient survival can be improved by longer sessional times [33, 34] and that clearance of 'middle molecules' have an important impact [35, 36]. However, no consensus has yet emerged on alternative markers of HD adequacy [37]. The UKRR has historically reported URR, predominantly for logistical reasons with the URR being the easiest measure to calculate, and the measure of dialysis adequacy that is most complete when returned to the UKRR. However, limitations of the URR must be recognised.

The new UKRR dataset, distributed to renal centres, should help contribute to further improvements in both URR data capture, as well as Kt/V reporting in addition to data on dialysis prescription practice.

Conflicts of interest: the authors declare no conflicts of interest

References

1 Gotch FA, Sargent JA. A mechanistic analysis of the National Cooperative Dialysis Study (NCDS). Kidney Int. 1985 Sep;28(3):526–34
2 Geddes CC, Traynor J, Walbaum D, Fox JG, Mactier RA. A new method of post-dialysis blood urea sampling: the 'stop dialysate flow' method. Nephrol Dial Transplant. 2000 Apr;15(4):517–23
3 Depner TA: Assessing adequacy of haemodialysis: urea modeling. Kidney Int 1994;45:1522–1535
4 Kumar S, Khosravi M, Massart A, Potluri M, Davenport A. The effects of racial differences on body composition and total body water measured by multifrequency bioelectrical impedance analysis influence delivered Kt/V dialysis dosing. Nephron Clin Pract. 2013;124(1–2):60–6
5 Owen WF, Lew NL, Liu Y, Lowrie EG, Lazarus JM: The Urea Reduction Ratio and Serum Albumin Concentration as Predictors of Mortality in Patients Undergoing Haemodialysis. N Engl J Med 1993;329:1001–1006
6 Held PJ, Port FK, Wolfe RA, Stannard DC, Carroll CE, Daugirdas JT, Bloembergen WE, Greer JW, Hakim RM: The dose of haemodialysis and patient mortality. Kidney Int 1996; 50:550–556
7 Eknoyan G, Beck GJ, Cheung AK, Daugirdas JT, Greene T, Kusek JW, Allon M, Bailey J, Delmez JA, Depner TA, Dwyer JT, Levey AS, Levin NW, Milford E, Ornt DB, Rocco MV, Schulman G, Schwab SJ, Teehan BP, Toto R; Haemodialysis (HEMO) Study Group. Effect of dialysis dose and membrane flux in maintenance haemodialysis. N Engl J Med. 2002; 347(25):2010–9
8 Vanholder R, Glorieux G, Eloot S. Once upon a time in dialysis: the last days of Kt/V? Kidney Int. 2015 Sep;88(3):460–5
9 Davenport A. Differences in prescribed Kt/V and delivered haemodialysis dose–why obesity makes a difference to survival for haemodialysis patients when using a 'one size fits all' Kt/V target. Nephrol Dial Transplant. 2013 Nov;28(suppl 4):iv219–23
10 Sridharan S, Vilar E, Davenport A, Ashman N, Almond M, Banerjee A, Roberts J, Farrington K. Scaling Hemodialysis Target Dose to Reflect Body Surface Area, Metabolic Activity, and Protein Catabolic Rate: A Prospective, Cross-sectional Study. Am J Kidney Dis. 2017; 69:3; 358–366
11 El-Kateb S, Sridharan S, Farrington K, Fan S, Davenport A. A single weekly Kt/V urea target for peritoneal dialysis patients does not provide an equal dialysis dose for all. Kidney Int. 2016 Dec;90(6):1342–1347
12 UK Renal Association Clinical Practice Guidelines Committee. Haemodialysis, 2009 http://www.renal.org/Clinical/GuidelinesSection/Haemodialysis.aspx
13 European Best Practice Guidelines Expert Group on Haemodialysis. Nephrol Dial Transplant 2002: 17(suppl 7):S16–S31

14 NKF-KDOQI clinical practice guidelines; update 2006. Am J Kidney Dis 2006: 48(suppl 1):S2–S90
15 Davenport A. How can dialyser designs improve solute clearances for haemodialysis patients? Hemodial Int. 2014 Oct;18(suppl 1):S43–7
16 Depner T, Daugirdas J, Greene T, Allon M, Beck G, Chumlea C, Delmez J, Gotch F, Kusek J, Levin N, Macon E, Milford E, Owen W, Star R, Toto R, Eknoyan G, Hemodialysis Study Group. Dialysis dose and the effect of gender and body size on outcome in the HEMO Study. Kidney Int. 2004;65(4):1386
17 Port FK, Wolfe RA, Hulbert-Shearon TE, McCullough KP, Ashby VB, Held PJ. High dialysis dose is associated with lower mortality among women but not among men. Am J Kidney Dis. 2004;43(6):1014
18 Lowrie EG: The Kinetic Behaviors of Urea and Other Marker Molecules During Haemodialysis. Am J Kidney Dis 2007;50:181–183
19 Spalding EM, Chandna SM, Davenport A, Farrington K. Kt/V underestimates the haemodialysis dose in women and small men. Kidney Int 2008; 74: 348–355
20 El-Kateb S, Sridharan S, Farrington K, Davenport A. Comparison of resting and total energy expenditure in peritoneal dialysis patients and body composition measured by dual-energy X-ray absorptiometry. Eur J Clin Nutr. 2016 Nov;70(11):1337–1339
21 Farrington K, Davenport A. Would prescribing target Kt dose adjusted for body surface area improve haemodialysis outcomes? Kidney Int. 2016;90 (6):1160–1162
22 Greenhall GH, Davenport A. Screening for muscle loss in patients established on peritoneal dialysis using bioimpedance. Eur J Clin Nutr 2017 Jan;71(1):70–75
23 Davenport A. Is Hemodialysis Patient Survival Dependent upon Small Solute Clearance (Kt/V)?: If So How Can Kt/V be Adjusted to Prevent Under Dialysis in Vulnerable Groups? Semin Dial. 2017 doi: 10.1111/sdi.12566
24 Davenport A, Peters SA, Bots ML, Canaud B, Grooteman MP, Asci G, Locatelli F, Maduell F, Morena M, Nubé MJ, Ok E, Torres F, Woodward M, Blankestijn PJ. Higher convection volume exchange with online haemodiafiltration is associated with survival advantage for dialysis patients: the effect of adjustment for body size. Kidney Int. 2016 Jan;89(1):193–9
25 Wong J, Vilar E, Davenport A, Farrington K. Incremental haemodialysis. Nephrol Dial Transplant. 2015 Oct;30(10):1639–48
26 Tattersall JE, Ward RA; EUDIAL group. Online haemodiafiltration: definition, dose quantification and safety revisited. Nephrol Dial Transplant. 2013 Mar;28(3):542–50
27 Vanholder R, Davenport A, Hannedouche T, Kooman J, Kribben A, Lameire N, Lonnemann G, Magner P, Mendelssohn D, Saggi SJ, Shaffer RN, Moe SM, Van Biesen W, van der Sande F, Mehrotra R; Dialysis Advisory Group of American Society of Nephrology. Reimbursement of dialysis: a comparison of seven countries. J Am Soc Nephrol. 2012 Aug;23(8):1291–8
28 Basile C, Lomonte C: Dialysis time is the crucial factor in the adequacy of hemodialysis. Kidney Int 2008;74:965–966
29 Lowenstein J, Grantham JJ. Residual renal function: a paradigm shift. Kidney Int. 2017 Mar;91(3):561–565
30 Tangvoraphonkchai K, Davenport A. Incremental Hemodialysis – A European Perspective. Semin Dial. 2017 Feb 9. doi: 10.1111/sdi.12583 PMID: 28185299
31 Hanson JA, Hulbert-Shearon TE, Ojo AO, et al: Prescription of twice-weekly haemodialysis in the USA. Am J Nephrol 19:625–633, 1999
32 McCafferty K, Fan S, Davenport A. Extracellular volume expansion, measured by multifrequency bioimpedance, does not help preserve residual renal function in peritoneal dialysis patients. Kidney Int. 2014;85(1):151–7
33 Marshall MR, Byrne BG, Kerr PG, McDonald SP: Associations of hemodialysis dose and session length with mortality risk in Australian and New Zealand patients. Kidney Int 2006;69:1229–1236
34 Eloot S, Van Biesen W, Dhondt A, Van de Wynkele H, Glorieux G, Verdonck P, Vanholder R: Impact of hemodialysis duration on the removal of uremic retention solutes. Kidney Int 2007;73:765–770
35 Eloot S, Torremans A, De Smet R, Marescau B, De Deyn PP, Verdonck P, Vanholder R: Complex Compartmental Behavior of Small Water-Soluble Uremic Retention Solutes: Evaluation by Direct Measurements in Plasma and Erythrocytes. Am J Kidney Dis 2007;50:279–288
36 Davenport A. How best to improve survival in haemodialysis patients: solute clearance or volume control? Kidney Int. 2011;80(10):1018–20
37 Wong J, Sridharan S, Berdeprado J, Vilar E, Viljoen A, Wellsted D, Farrington K. Predicting residual kidney function in haemodialysis patients using serum â-trace protein and â2-microglobulin. Kidney Int. 2016 May;89(5):1090–8

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UK Renal Registry 19th Annual Report: Chapter 7 Haemoglobin, Ferritin and Erythropoietin amongst UK Adult Dialysis Patients in 2015: National and Centre-specific Analyses

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Keywords

Anaemia · Chronic kidney disease · Dialysis · End stage renal disease · Epidemiology · Erythropoietin · Erythropoiesis stimulating agent · European Best Practice Guidelines · Ferritin · Haemodialysis · Haemoglobin · NICE · Peritoneal dialysis · Renal Association

Summary

In the UK in 2015:

- The median haemoglobin (Hb) of patients at the time of starting dialysis was 98 g/L with 47% of patients having a Hb ⩾100 g/L.
- The median Hb in patients starting haemodialysis (HD) was 96 g/L (IQR 87–105) and in patients starting peritoneal dialysis (PD) was 107 g/L (IQR 98–116).
- At the start of dialysis 51% of patients presenting early had Hb ⩾100 g/L compared with only 34% of patients presenting late.
- The median Hb of prevalent patients on HD was 110 g/L (IQR 101–119).
- The median Hb of prevalent patients on PD was 112 g/L (IQR 103–120).
- 79% of HD patients and 81% of PD patients had Hb ⩾100 g/L.
- 59% of HD patients and 57% of PD patients had Hb ⩾100 and ⩽120 g/L.
- The median serum ferritin in HD patients was 415 μg/L and 94% of HD patients had a ferritin ⩾100 μg/L.
- The median serum ferritin in PD patients was 295 μg/L and 88% of PD patients had a ferritin ⩾100 μg/L.

In England, Wales and Northern Ireland in 2015:

- The median erythropoiesis stimulating agent (ESA) dose in HD patients was 7,500 IU/week.
- The median ESA dose in PD patients was 4,000 IU/week.

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Introduction

Anaemia is a common feature of chronic kidney disease (CKD) and when untreated is strongly associated with poor outcomes resulting in increased hospitalisations and mortality. This chapter describes analyses of the management of anaemia in dialysis patients in the UK in 2015.

A number of clinical practice guidelines exist for the management of anaemia in patients with CKD. The Kidney Disease Improving Global Outcomes (KDIGO) Clinical Practice Guideline for Anemia in Chronic Kidney Disease was published in August 2012 [1]. Commentaries and position statements on this document were made by both the Kidney Disease Outcomes Quality Initiative (KDOQI), and the European Renal Best Practice Guidelines Group (ERBP) [2, 3]. The Renal Association Clinical Practice Guideline for Anaemia of CKD (5th edition) was published in 2010 with the 6th edition expected in 2017 [4]. The National Institute for Health and Care Excellence (NICE) Clinical Guideline on Chronic Kidney Disease: Managing Anaemia was published in June 2015, mid-way through the data collection period [5].

This chapter reports on the analyses of data items collected by the UK Renal Registry (UKRR) measured against the audit parameters set in the Renal Association Clinical Practice Guideline (5th edition) [4]. Table 7.1 lists the audit measures recommended in these guidelines alongside those parameters measured in this chapter and reasons for exclusion.

Methods

Most of the analyses in this chapter use the incident or prevalent renal replacement therapy (RRT) cohorts for 2015. Some analyses use data from earlier years. Haemoglobin levels are given in g/L as the majority of UK laboratories have now switched to reporting using these units rather than g/dl.

Table 7.1. Summary of recommended Renal Association audit measures

RA audit measure	Included in UKRR annual report?	Reason for exclusion
1. Proportion of CKD patients with eGFR <30 ml/min by 4 variable MDRD method with an annual Hb level	No	Data not available for the period covered by this report
2. Proportion of patients starting an ESA without prior measurement of serum ferritin and/or TSAT	No	UKRR does not know when all patients start ESA treatment. UKRR does not collect TSAT data
3. Proportion of patients on renal replacement therapy with Hb level <10 who are not prescribed an ESA	Yes	
4. Each renal unit should audit the type, route and frequency of administration and weekly dose of ESA prescribed	UKRR reports the completeness of these data items	
5. The proportion of CKD stage 4–5 patients with Hb 10–12 g/dl	No	Data not available for the period covered by this report
6. The proportion of patients treated with an ESA with Hb >12 g/dl	Yes	
7. Each renal unit should monitor ESA dose adjustments	No	UKRR does not collect this data
8. Proportion of patients with serum ferritin levels <100 ng/ml at start of treatment with ESA	No	UKRR does not know when all patients start ESA treatment
9. Proportion of pre-dialysis and PD patients receiving iron therapy; type: oral vs. parenteral	No	Data not available for the period covered by this report/poor data completeness
10. Proportion of HD patients receiving IV iron	No	Poor data completeness
11. Prevalence of resistance to ESA among renal replacement therapy patients	Yes	
12. Proportion of HD patients who received a blood transfusion within the past year	No	Data held at NHS Blood and Transplant

The UKRR extracted quarterly data electronically from renal centres in England, Wales and Northern Ireland (E,W&NI) taking the latest available result from each quarter. Data from Scotland were provided by the Scottish Renal Registry (SRR).

For the analyses of Hb for incident patients, those patients commencing RRT on PD or HD were included whilst those receiving a pre-emptive transplant were excluded. Hb measurements from after starting dialysis but still within the same quarter of the year were used. Therefore, depending on when in the quarter a patient started RRT the Hb data could be from zero to 90 days later. Due to possible deficiencies with extract routines it is possible that a small number of the values extracted electronically may actually be from before the person started dialysis. This problem will not occur for Scottish data. Patients who died within the first 90 days on treatment were excluded. Results are also shown with the cohort subdivided into early and late presenters (date first seen by a nephrologist, 90 or more days and less than 90 days before starting dialysis respectively). For these analyses only centres with at least 75% completeness of presentation time data were included.

For the analyses of prevalent dialysis patients those patients receiving dialysis on 31st December 2015 were included if they had been on the same modality of dialysis in the same centre for at least three months. In order to improve completeness, the last available measurement for each patient from the last two quarters was used for Hb and from the last three quarters for ferritin.

The completeness of data items was analysed at both centre and country level. All patients were included in analyses but centres with less than 50% completeness were excluded from the caterpillar and funnel plots showing centre level results. Centres providing relevant data from less than 10 patients were also excluded from the plots. The number preceding the centre name in the caterpillar plots is the percentage of patients who have data missing.

Summary statistics including minimum, maximum, interquartile ranges (IQR), averages (mean and median) and standard deviations were calculated. The median values and the IQRs are shown using caterpillar plots. The percentages achieving standards were also calculated and these are displayed using caterpillar plots with the percentages meeting the targets and 95% confidence intervals (CIs) shown. Funnel plots show the distribution of the percentages meeting the targets and also whether any of the centres were significantly different from the average. Longitudinal analyses were performed to show overall changes in achievement of standards over time.

Erythropoietin data from the last quarter of 2015 were used to define which patients were receiving erythropoietin stimulating agents (ESAs). Scotland was excluded from this analysis as data about ESAs were only available for May (and average doses over the year were used here – see later). Each individual was defined as being on ESA if a drug type and/or a dose was present in the data. Centres reporting fewer than 60% of HD patients or fewer than 40% of PD patients being treated with ESAs were considered to have incomplete data and were excluded from further analysis. It is recognised that these exclusion criteria are relatively arbitrary but they are in part based upon the frequency distribution graph of centres' ESA use as it appears in the data. The percentage of patients on ESAs was calculated from these data and incomplete data returns risk seriously impacting on any conclusions drawn.

For analyses of ESA dose, values are presented as weekly erythropoietin dose. Doses of less than 150 IU/week (likely to be darbepoietin) were harmonised with erythropoietin data by multiplying by 200. No adjustments were made with respect to route of administration. Patients who were not receiving ESAs were not included in analyses of dose (rather than being included with dose = 0). Many centres provided data on ESA dose but not on ESA frequency. The ESA dose field is defined as the weekly dose and the dose is presumed to have been converted accordingly on submission to the UKRR. This may be an incorrect assumption for a number of patients and this needs to be considered when interpreting the ESA information.

Starting with the cohort of patients receiving ESAs in the final quarter of the year and having a dose value present for that quarter, any further dose values available from the earlier three quarters of the year were used (provided the patient was on the same treatment and receiving the same drug in those quarters). The average (mean) of the available values was then used in analyses rather than the dose in the final quarter.

The ESA data were collected electronically from renal IT systems but in contrast to laboratory linked variables the ESA data required manual data entry. The reliability depended upon the data source, whether the entry was linked to the prescription or whether the prescriptions were provided by the primary care physician. In the latter case, doses may not be as reliably updated as the link between data entry and prescription is indirect.

Results

Anaemia management in incident dialysis patients

Haemoglobin in incident dialysis patients

As the UKRR does not collect comprehensive data on patients who are not yet receiving RRT Hb at the time of starting RRT is the only indication of concordance with anaemia clinical practice guidelines in the pre-dialysis (CKD not (yet) on dialysis) group. The percentage data returned and outcome Hb are listed in table 7.2. Cambridge was unable to submit any data prior to closing the database. About 33% of Sheffield's incident patients' data were entirely missing from the data extracts, including all their late presenters, so the cohort included is possibly not representative of all their incident dialysis patients. Stevenage did not submit any Hb data except for the first quarter of the year. The cause of this extraction problem has now been resolved and Stevenage are submitting Hb data for 2016.

The median Hb of patients at the time of starting dialysis in the UK in 2015 was 98 g/L. The median Hb for patients at the time of starting dialysis by renal centre is shown in figure 7.1. The percentage of patients starting dialysis with Hb $\geqslant$100 g/L is shown in figure 7.2. Using data from centres with adequate completeness for date of first presentation the difference in median Hb between early (100 g/L) and late (92 g/L) presenters is shown in

Table 7.2. Haemoglobin data for incident patients starting RRT on haemodialysis or peritoneal dialysis during 2015, both overall and by presentation time

	All incident dialysis patients			Early presenters (⩾90 days)		Late presenters (<90 days)	
Centre	% data return	Median Hb g/L	% Hb ⩾100 g/L	Median Hb g/L	% Hb ⩾100 g/L	Median Hb g/L	% Hb ⩾100 g/L
England							
B Heart	100	94	34	94	34		
B QEH	100	99	48	99	49	95	43
Basldn	98	89	25	98	33		
Bradfd	91	96	37	96	38		
Brightn	100	101	51	101	51	101	53
Bristol	100	105	78	104	79	104	73
Camb	n/a						
Carlis	100	109	72	110	77		
Carsh	100	97	40				
Chelms	100	106	66	107	67		
Colchr	72	97	39				
Covnt	98	96	47	100	50	95	39
Derby	98	100	51	100	53		
Donc	100	100	53	105	62		
Dorset	97	103	54	105	67	87	8
Dudley	95	103	56	104	59		
Exeter	100	106	80	106	80	104	73
Glouc	98	103	58	103	58		
Hull	77	100	51	102	55	94	39
Ipswi	93	99	50				
Kent	99	95	37	95	38	87	27
L Barts	100	98	44				
L Guys	100	92	25	94	30	85	0
L Kings	97	96	38	97	41	91	26
L Rfree	98	100	50	100	52	96	41
L St.G	86	92	29				
L West	90	104	62	105	66	97	44
Leeds	97	94	34	95	37	85	14
Leic	99	95	38	96	39	89	32
Liv Ain	97	99	48	102	52	93	30
Liv Roy	99	98	48	100	51	93	35
M RI	97	97	44	99	48	91	29
Middlbr	99	99	49	100	53	86	33
Newc	99	99	44	99	48	92	24
Norwch	99	96	37				
Nottm	99	92	32	92	33	81	8
Oxford	100	97	44	99	48	87	20
Plymth	100	100	52	108	65		
Ports	99	100	52				
Prestn	100	99	46	99	49	97	35
Redng	99	100	53	102	63	83	8
Salford	100	96	38				
Sheff*	100	100	51	100	51		
Shrew	98	102	57				
Stevng	26						
Sthend	100	96	43	97	45		
Stoke	97	101	56	102	59	94	38
Sund	97	99	48	99	47		
Truro	100	103	59	103	64	96	47
Wirral	96	99	48				
Wolve	96	93	40	97	44	80	21
York	92	97	43	98	47	95	30

Table 7.2. Continued

Centre	All incident dialysis patients			Early presenters (⩾90 days)		Late presenters (<90 days)	
	% data return	Median Hb g/L	% Hb ⩾100 g/L	Median Hb g/L	% Hb ⩾100 g/L	Median Hb g/L	% Hb ⩾100 g/L
N Ireland							
Antrim	100	103	63	103	59		
Belfast	96	104	60	103	54	107	70
Newry	96	103	56	103	55		
Ulster	100	107	63	105	65		
West NI	100	100	52				
Scotland							
Abrdn	90	98	42				
Airdrie	67	94	34				
D&Gall	50						
Dundee	83	99	49				
Edinb	61	95	41				
Glasgw	72	96	39				
Inverns	97	102	59				
Klmarnk	67	97	31				
Krkcldy	74	99	50				
Wales							
Bangor	100	99	44	99	48		
Cardff	98	101	54	101	53	95	41
Clwyd	96	100	52				
Swanse	97	97	47	99	49	96	36
Wrexm	97	99	47	102	55		
England	**96**	**98**	**47**	**100**	**51**	**92**	**33**
N Ireland	**98**	**103**	**59**	**103**	**58**	**108**	**65**
Scotland	**74**	**97**	**42**				
Wales	**98**	**100**	**50**	**100**	**52**	**95**	**33**
UK	**94**	**98**	**47**	**100**	**51**	**92**	**34**

n/a: not available
Blank cells: centres excluded from the analysis due to poor data completeness or low patient numbers
*Sheffield: approximately 33% of their incident patients were missing from the analysis, including all late presenters so the group analysed may not be representative of their whole cohort

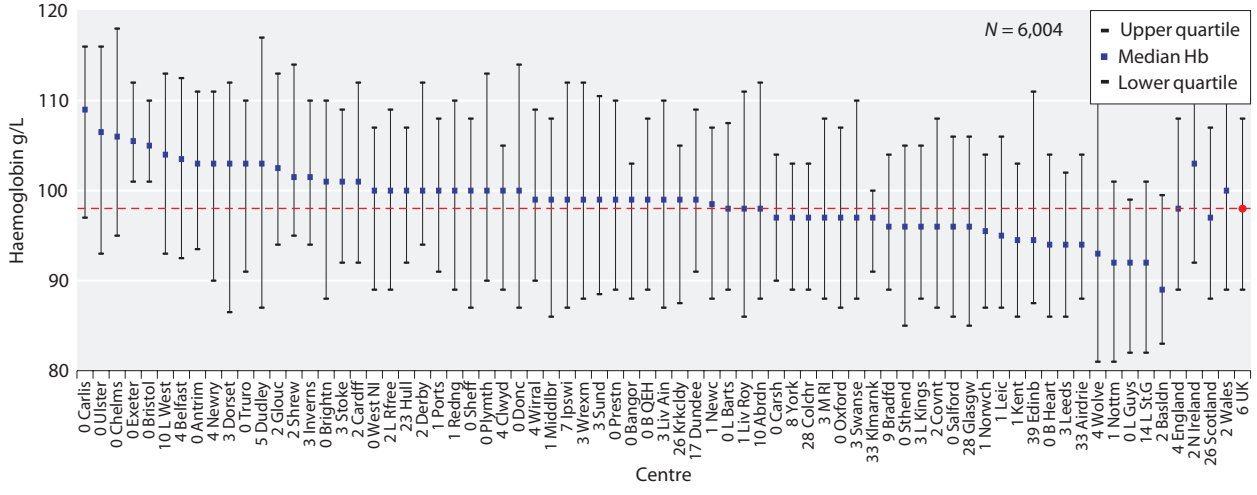

Fig. 7.1. Median haemoglobin for incident dialysis patients at start of dialysis treatment in 2015

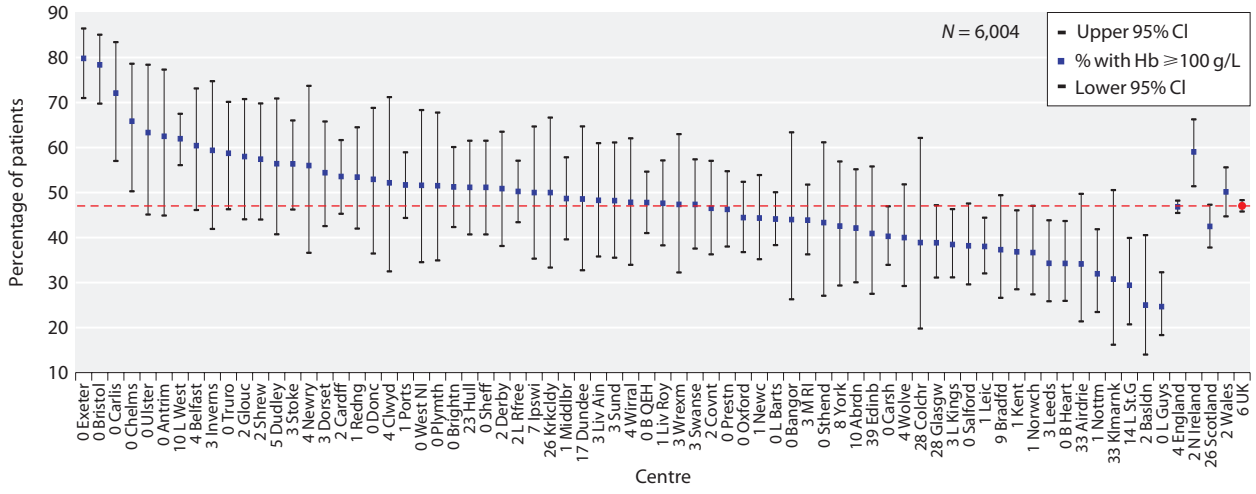

Fig. 7.2. Percentage of incident dialysis patients with Hb ⩾100 g/L at start of dialysis treatment in 2015

table 7.2. Of early presenters, 51% had a Hb ⩾100 g/L compared with 34% of late presenters.

Again, there is a substantial difference between Hb at the time of starting dialysis by modality. Patients starting on HD had a median Hb of 96 g/L (IQR 87–105) whilst those starting on PD had a median Hb of 107 g/L (IQR 98–116). Of HD patients, 40% started dialysis with a Hb ⩾100 g/L compared with 73% of PD patients.

Incident dialysis patients from 2014 were followed for one year and the median haemoglobin and percentage with ⩾100 g/L in survivors on the same treatment at the same centre were calculated for each quarter. Only patients with Hb data for each of the four time points were included in this analysis. Results by modality and length of pre-dialysis care are shown in figures 7.3 and 7.4. The 'PD-late' group consisted of only 30 patients so care should be taken in interpreting the results.

The distribution of Hb ranges in incident dialysis patients by year of start is shown in figure 7.5. The proportion of incident dialysis patients with Hb ⩾120 g/L has fallen from 17.2% in 2006 to 8.4% in 2015. In contrast, the proportion of patients starting dialysis with Hb <100 g/L has increased from 40.0% in 2006 to 53.2% in 2015.

The proportion of patients receiving an ESA by length of time on dialysis for patients starting dialysis in 2014 is shown in figure 7.6. The difference in ESA use between early and late starters was reduced substantially after six months of treatment. Only 11 patients presenting late to dialysis and starting on PD had ESA data so this group has not been included in the analysis.

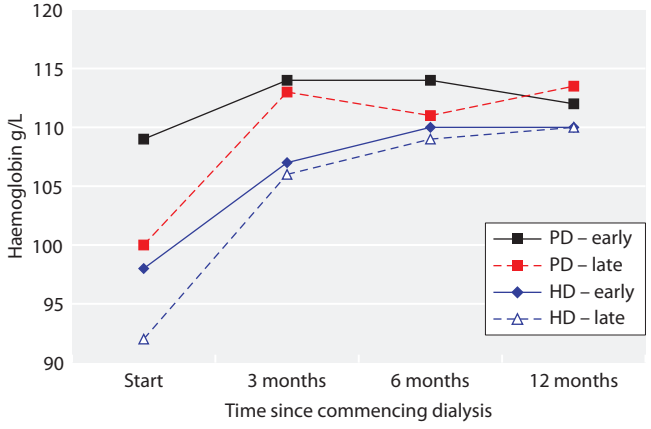

Fig. 7.3. Median haemoglobin, by time on dialysis and length of pre-RRT care, for incident dialysis patients in 2014

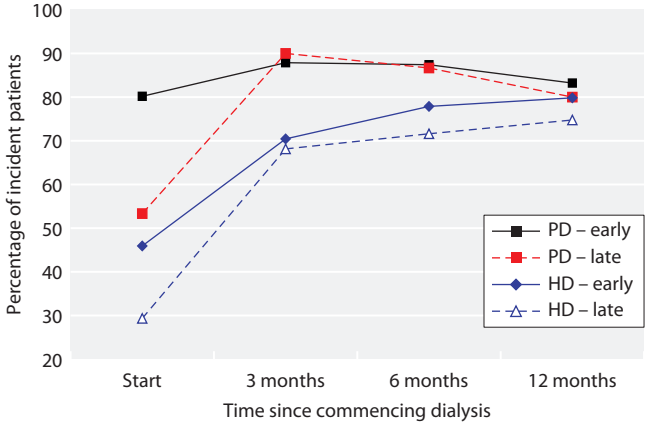

Fig. 7.4. Percentage of incident dialysis patients in 2014 with Hb ⩾100 g/L by time on dialysis and by length of pre-RRT care

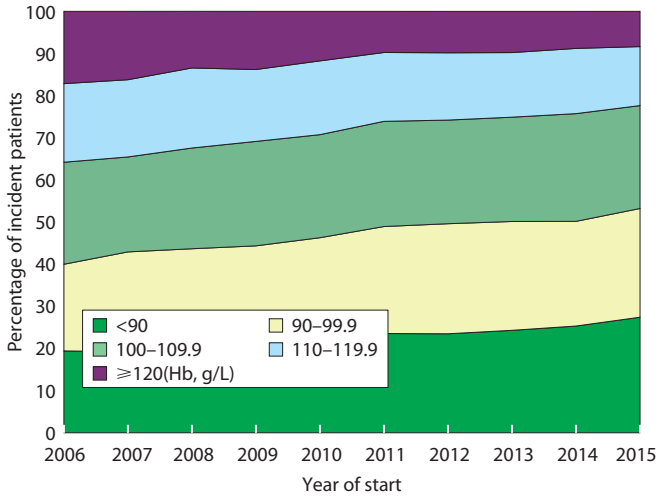

Fig. 7.5. Distribution of haemoglobin in incident dialysis patients by year of start

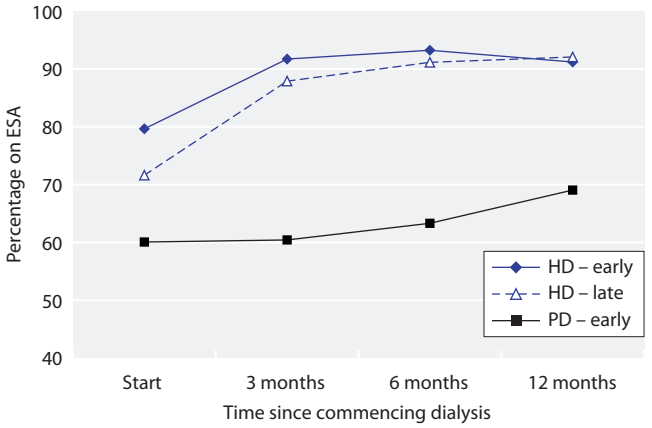

Fig. 7.6. Percentage of incident dialysis patients in 2014 on ESA, by time on dialysis and by length of pre-RRT care

Anaemia management in prevalent dialysis patients

Compliance with data returns for Hb and serum ferritin are shown in table 7.3. Data completeness was generally good for Hb and ferritin. Cambridge did not submit any data prior to closing the database. Stevenage did not submit any Hb data except for the first quarter of the year. This Q1 data has been shown in tables 7.4 and 7.5 but not used in the figures. Salford did not submit any ferritin data. Percentages of patients reportedly receiving ESAs are shown in table 7.3. These are as

Table 7.3. Percentage completeness of data returns for haemoglobin and serum ferritin and percentages on ESA for prevalent HD and PD patients in 2015

	HD				PD			
Centre	*N*	Hb	Ferritin	% on ESA	*N*	Hb	Ferritin	% on ESA
England								
B Heart	397	100	99	78	40	100	90	55
B QEH	933	100	99	88	121	100	100	64
Basldn	153	99	99	92	27	100	100	89
Bradfd	217	100	100	94	14	100	93	86
Brightn	402	100	99	83	60	100	97	2
Bristol	489	100	100	93	47	100	96	74
Camb								
Carlis	74	100	100	69	30	100	97	63
Carsh	761	100	99	13	101	95	92	0
Chelms	139	99	99	92	23	96	87	65
Colchr	111	95	94	5				
Covnt	332	100	100	84	76	99	96	61
Derby	222	100	100	0	73	100	97	0
Donc	163	100	100	89	18	100	100	67
Dorset	270	100	100	93	35	100	94	80
Dudley	155	100	100	3	52	100	94	2
Exeter	403	100	100	94	71	99	100	76
Glouc	216	100	96	90	28	100	93	61
Hull	327	100	100	62	66	98	98	47
Ipswi	129	100	100	67	27	100	100	0
Kent	397	100	100	94	54	100	98	46
L Barts	928	100	100	0	182	99	96	0
L Guys	629	100	100	0	29	100	93	0
L Kings	522	100	98	92	80	100	100	78
L Rfree	665	100	100	0	134	100	99	0
L St.G	311	97	96	0	45	98	100	0

Table 7.3. Continued

	HD				PD			
Centre	*N*	Hb	Ferritin	% on ESA	*N*	Hb	Ferritin	% on ESA
L West	1372	92	91	0	60	88	87	0
Leeds	470	100	100	92	50	100	100	82
Leic	839	100	100	97	95	100	98	84
Liv Ain	158	98	97	0	28	96	96	0
Liv Roy	356	100	99	0	61	100	100	0
M RI	475	94	83	0	58	98	97	0
Middlbr	323	100	99	72	15	93	93	53
Newc	285	100	100	67	38	100	95	0
Norwch	312	100	99	91	28	100	100	79
Nottm	350	99	100	87	64	100	100	73
Oxford	398	100	99	92	78	100	97	87
Plymth	129	99	97	2	28	100	100	0
Ports	617	100	99	7	60	100	97	7
Prestn	531	100	96	92	49	100	98	67
Redng	283	100	99	87	59	100	100	2
Salford	367	100	0	19	82	100	0	21
Sheff	517	100	100	88	53	100	96	42
Shrew	193	99	100	0	27	100	96	0
Stevng	468	0	99	0	13	0	85	0
Sthend	108	100	100	95	15	100	100	73
Stoke	308	98	97	1	70	100	99	0
Sund	206	100	75	90	14	93	57	71
Truro	145	100	99	0	19	100	89	0
Wirral	177	99	99	82	17	100	100	88
Wolve	286	100	99	85	68	99	99	62
York	145	100	100	91	22	95	95	73
N Ireland								
Antrim	114	100	100	94	17	100	100	76
Belfast	169	100	100	92	19	100	100	84
Newry	84	95	100	88	18	100	100	56
Ulster	97	100	100	91	6	100	100	100
West NI	113	100	100	93	9	100	100	89
Scotland								
Abrdn	205	100	97		21	100	95	
Airdrie	174	100	98		8	100	100	
D&Gall	52	96	96		10	100	100	
Dundee	173	99	98		16	100	100	
Edinb	252	100	99		19	95	95	
Glasgw	545	100	100		44	100	100	
Inverns	78	99	87		13	100	100	
Klmarnk	124	100	100		33	100	100	
Krkcldy	132	100	98		16	100	88	
Wales								
Bangor	78	100	100	81	13	100	100	15
Cardff	460	100	100	43	72	100	81	15
Clwyd	76	100	100	47	13	100	85	15
Swanse	342	100	100	93	55	100	93	62
Wrexm	99	100	100	30	33	100	100	6
England	**19,163**	**97**	**96**		**2,604**	**99**	**94**	
N Ireland	**577**	**99**	**100**		**69**	**100**	**100**	
Scotland	**1,735**	**100**	**98**		**180**	**99**	**98**	
Wales	**1,055**	**100**	**100**		**186**	**100**	**89**	
UK	**22,530**	**97**	**96**		**3,039**	**99**	**94**	

Blank cells denote centres with no PD patients or because data were not available
Percentages of patients receiving ESA are shown but centres with less than 60% HD patients or 40% PD patients on ESA have been excluded (see text). Therefore, country averages are not shown – these can be found in tables 7.4 and 7.5

Table 7.4. Summary statistics for haemoglobin, serum ferritin and ESA for prevalent HD patients in 2015

Centre	*N* with Hb data	Median Hb g/L	% Hb ⩾100 g/L	% Hb 100–120 g/L	Median ferritin μg/L	% ferritin ⩾100 μg/L	% ferritin >200 and ⩽500 μg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾100 g/L and not on ESA
England										
B Heart	396	109	76	57	295	92	58	78	6,667	20
B QEH	929	109	75	61	392	95	61	88	6,000	10
Basldn	152	110	77	60	294	91	72	92	7,000	7
Bradfd	217	109	77	54	474	95	42	94	7,000	4
Brightn	402	110	79	54	478	98	46	83	5,350	15
Bristol	489	112	92	69	540	95	35	93	8,000	7
Camb										
Carlis	74	114	85	53	745	95	16	69	5,333	30
Carsh	760	109	79	65	330	93	65			
Chelms	138	113	87	60	614	97	22	92	10,625	7
Colchr	105	112	90	68	532	96	38			
Covnt	332	106	69	59	396	96	61	84	9,000	13
Derby	221	115	86	59	485	96	38			
Donc	163	108	70	56	403	94	50	89	6,000	11
Dorset	270	112	86	64	452	99	55	93	7,000	7
Dudley	155	115	85	55	325	94	61			
Exeter	403	112	95	73	296	92	60	94	6,500	6
Glouc	216	109	79	65	421	91	45	90		10
Hull	326	113	81	55	389	96	58	62	5,000	30
Ipswi	129	112	82	67	539	96	36	67	7,385	29
Kent	395	109	76	56	418	90	37	94	8,875	6
L Barts	928	111	82	64	635	96	23			
L Guys	629	109	75	61	481	93	35			
L Kings	522	107	76	64	452	94	38	92	8,000	8
L Rfree	665	109	77	61	527	95	36			
L St.G	302	107	73	60	429	94	50			
L West	1,266	113	86	65	321	94	59			
Leeds	470	108	74	61	482	95	42	92	5,250	7
Leic	839	111	77	51	338	94	62	97	6,000	2
Liv Ain	155	108	70	54	407	86	34			
Liv Roy	355	112	81	55	332	88	43			
M RI	448	111	76	54	347	94	56			
Middlbr	323	111	78	57	939	97	18	72	5,250	24
Newc	285	111	79	55	347	90	43	67	13,267	29
Norwch	312	115	80	49	484	91	34	91	9,500	9
Nottm	346	110	80	61	496	97	44	87	7,500	13
Oxford	396	108	72	56	291	89	51	92	12,000	8
Plymth	128	111	78	57	741	93	21			
Ports	616	113	81	54	394	93	51			
Prestn	531	109	76	56	594	95	29	92		8
Redng	283	114	78	49	477	98	43	87	13,154	7
Salford	366	110	77	57						
Sheff	515	111	76	51	468	95	46	88	7,500	10
Shrew	192	116	86	52	348	94	61			
Stevng[a]		108[a]	76[a]	61[a]	667	98	23			
Sthend	108	108	80	71	315	95	81	95	9,250	4
Stoke	301	111	80	58	267	90	45			
Sund	205	112	77	51	344	94	40	90	9,615	9
Truro	145	106	76	66	408	99	59			
Wirral	176	109	83	68	432	95	52	82	9,000	16
Wolve	285	114	84	50	459	92	43	85	8,000	14
York	145	110	81	68	400	96	70	91	4,833	9
N Ireland										
Antrim	114	108	75	64	392	92	51	94	7,000	6
Belfast	169	110	80	56	465	92	37	92	8,000	6
Newry	80	109	76	60	384	93	49	88	5,750	13
Ulster	97	114	87	57	672	98	14	91	5,000	9
West NI	113	111	85	62	535	95	32	93	6,667	7

Table 7.4. Continued

Centre	*N* with Hb data	Median Hb g/L	% Hb ⩾100 g/L	% Hb 100–120 g/L	Median ferritin μg/L	% ferritin ⩾100 μg/L	% ferritin >200 and ⩽500 μg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾100 g/L and not on ESA
Scotland										
Abrdn	205	111	83	67	602	99	34			
Airdrie	174	113	80	60	754	96	23			
D&Gall	50	111	76	50	583	100	34			
Dundee	171	111	86	66	306	85	44			
Edinb	251	115	88	55	421	91	37			
Glasgw	544	111	77	54	458	92	37			
Inverns	77	111	87	69	373	93	60			
Klmarnk	124	110	77	59	282	89	49			
Krkcldy	132	113	80	48	436	87	28			
Wales										
Bangor	78	113	82	62	514	95	36	81		15
Cardff	459	111	78	55	316	94	55			
Clwyd	76	112	84	57	350	99	72			
Swanse	342	108	76	66	283	85	46	93	10,000	6
Wrexm	99	110	84	63	508	98	34			
England	**18,511**	**110**	**79**	**59**	**416**	**94**	**46**	**88**	**7,500**	**11**
N Ireland	**573**	**110**	**81**	**60**	**487**	**94**	**37**	**92**	**6,500**	**8**
Scotland	**1,728**	**112**	**81**	**58**	**447**	**92**	**37**			
Wales	**1,054**	**110**	**79**	**60**	**330**	**92**	**50**	**91**	**10,000**	**8**
UK	**21,866**	**110**	**79**	**59**	**415**	**94**	**46**	**88**[b]	**7,500**[b]	**11**[b]

Blank cells denote centres excluded from analyses due to poor data completeness or low patient numbers or because the data item was not available

[a]Data from Q1 only

[b]ESA summary results are for E, W & NI (not UK)

ESA data only shown for those centres where the percentage on ESA was 60% or more

Table 7.5. Summary statistics for haemoglobin, serum ferritin and ESA for prevalent PD patients in 2015

Centre	*N* with Hb data	Median Hb g/L	% Hb ⩾100 g/L	% Hb 100–120 g/L	Median ferritin μg/L	% ferritin ⩾100 μg/L	% ferritin >100 and ⩽500 μg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾100 g/L and not on ESA
England										
B Heart	40	107	78	65	208	81	72	55	6,000	35
B QEH	121	111	76	55	327	91	72	64	4,000	35
Basldn	27	104	78	78	185	81	70	89	4,250	11
Bradfd	14	109	79	64	237	85	46	86	8,000	14
Brightn	60	113	92	65	381	90	48			
Bristol	47	112	89	66	400	98	62	74	4,923	23
Camb										
Carlis	30	113	87	63	291	83	62	63	3,333	37
Carsh	96	108	79	59	186	81	73			
Chelms	22	116	91	55	156	55	50	65	2,500	36
Colchr	n/a									
Covnt	75	109	72	55	238	86	66	61	8,000	32
Derby	73	112	79	55	408	97	58			
Donc	18	116	89	50	338	89	78	67	4,125	33
Dorset	35	113	74	54	322	97	73	80	4,000	20
Dudley	52	114	81	54	135	63	59			
Exeter	70	115	94	64	232	87	75	76	4,000	24
Glouc	28	111	86	54	147	62	46	61		29
Hull	65	111	88	75	332	97	77	47	4,000	49
Ipswi	27	109	67	37	346	85	48			
Kent	54	109	81	67	274	94	77	46	4,000	43
L Barts	180	110	80	56	280	87	59			
L Guys	29	102	52	41	207	89	78			
L Kings	80	109	76	56	215	90	81	78	4,000	21
L Rfree	134	109	79	56	613	94	34			

Table 7.5. Continued

Centre	*N* with Hb data	Median Hb g/L	% Hb ⩾100 g/L	% Hb 100–120 g/L	Median ferritin µg/L	% ferritin ⩾100 µg/L	% ferritin >100 and ⩽500 µg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾100 g/L and not on ESA
L St.G	44	109	66	50	335	93	69			
L West	53	113	83	66	262	90	67			
Leeds	50	115	88	60	365	92	70	82	4,585	18
Leic	95	111	84	64	301	94	72	84	3,000	15
Liv Ain	27	116	89	44	492	89	44			
Liv Roy	61	113	75	43	243	92	75			
M RI	57	116	84	44	220	91	82			
Middlbr	14	118	100	71	388	93	64	53		43
Newc	38	111	82	58	455	92	50			
Norwch	28	119	86	39	306	82	54	79	4,000	21
Nottm	64	108	69	52	539	97	34	73	3,200	23
Oxford	78	110	85	67	256	89	76	87	6,000	13
Plymth	28	115	82	46	531	96	39			
Ports	60	113	92	63	412	98	62			
Prestn	49	117	88	57	433	96	48	67		33
Redng	59	113	80	56	385	95	63			
Salford	82	114	88	60						
Sheff	53	112	75	58	479	92	49	42	8,000	49
Shrew	27	108	70	52	182	85	69			
Stevng[a]		111[a]	82[a]	59[a]	260	91	73			
Sthend	15	116	80	60	244	87	73	73		27
Stoke	70	114	80	50	266	93	77			
Sund	13	110	85	54				71	2,769	31
Truro	19	117	79	37	206	88	88			
Wirral	17	109	71	71	453	100	65	88	6,000	12
Wolve	67	110	72	46	158	61	55	62	5,550	31
York	21	109	67	52	362	90	71	73	3,750	19
N Ireland										
Antrim	17	109	76	76	325	94	71	76	3,000	18
Belfast	19	114	95	74	361	95	63	84	3,875	16
Newry	18	109	78	56	371	100	78	56	4,000	44
Ulster	6									
West NI	9									
Scotland							66			
Abrdn	21	116	76	43	222	90	60			
Airdrie	8									
D&Gall	10	116	100	70	321	100	90			
Dundee	16	117	94	50	442	94	56			
Edinb	18	113	78	33	205	83	67			
Glasgw	44	117	84	50	191	80	64			
Inverns	13	106	77	46	210	92	92			
Klmarnk	33	115	82	55	219	91	73			
Krkcldy	16	117	94	63	256	71	29			
Wales										
Bangor	13	115	92	69	186	85	77			
Cardff	72	116	82	46	118	64	59			
Clwyd	13	108	85	62	417	91	55			
Swanse	55	112	84	60	318	90	65	62	4,125	36
Wrexm	33	112	82	58	303	88	70			
England	**2,566**	**112**	**81**	**57**	**301**	**89**	**63**	**69**	**4,000**	**28**
N Ireland	**69**	**111**	**84**	**62**	**361**	**96**	**65**	**77**	**4,000**	**22**
Scotland	**179**	**115**	**84**	**51**	**237**	**86**	**66**			
Wales	**186**	**113**	**83**	**55**	**217**	**80**	**64**	**62**	**4,125**	**36**
UK	**3,000**	**112**	**81**	**57**	**295**	**88**	**64**	**69**[b]	**4,000**[b]	**28**[b]

Blank cells denote centres excluded from analyses due to poor data completeness or low patient numbers or because the data item was not available

[a]Data from Q1 only

[b]ESA summary results are for E, W & NI (not UK)

ESA data only shown for those centres where the percentage on ESA was 40% or more

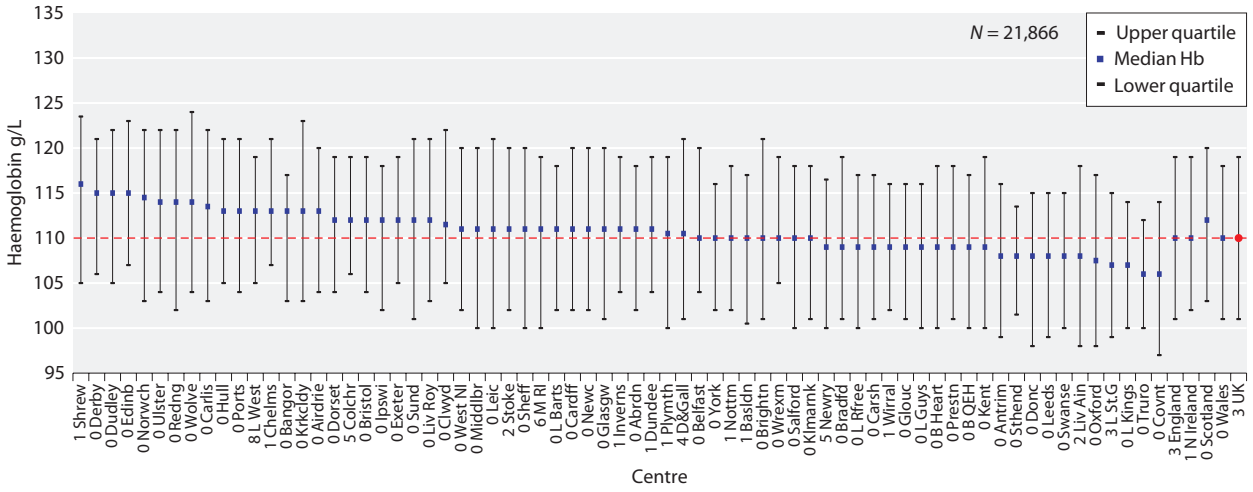

Fig. 7.7. Median haemoglobin in patients treated with HD by centre in 2015

received by the UKRR. As stated in the methods section, centres returning unexpectedly low ESA returns were assumed to have had problems with data entry and/or data transfer. Centres were excluded from further ESA analyses if they reported ESA use in less than 60% of HD patients or less than 40% of PD patients.

Summary statistics for haemoglobin, serum ferritin and ESA are shown in table 7.4 for HD and 7.5 for PD.

Haemoglobin in prevalent haemodialysis patients

The median Hb of patients on HD in the UK in 2015 was 110 g/L (IQR 101–119) and is shown in table 7.4. For HD patients 79% had a Hb ⩾100 g/L. Figure 7.7 shows the median Hb in HD patients by renal centre. Figure 7.8 shows the proportion of patients by centre with Hb within the Renal Association guideline range (100–120 g/L) and figure 7.9 shows the distribution of Hb within, above and below this range.

Funnel plots for the percentage of patients with Hb ⩾100 g/L (figure 7.10) and between 100–120 (figure 7.11) are shown with 95% and 99.9% confidence limits. Table 7.4 can be used to identify centres in these funnel plots.

Haemoglobin in prevalent peritoneal dialysis patients

The median Hb of patients on PD in the UK in 2015 was 112 g/L (IQR 103–120, table 7.5). For PD patients 81% had a Hb ⩾100 g/L. Figure 7.12 shows the median Hb in PD patients by centre. Figure 7.13 shows the proportion of patients by centre with Hb within the Renal Association guideline range (100–120 g/L) and

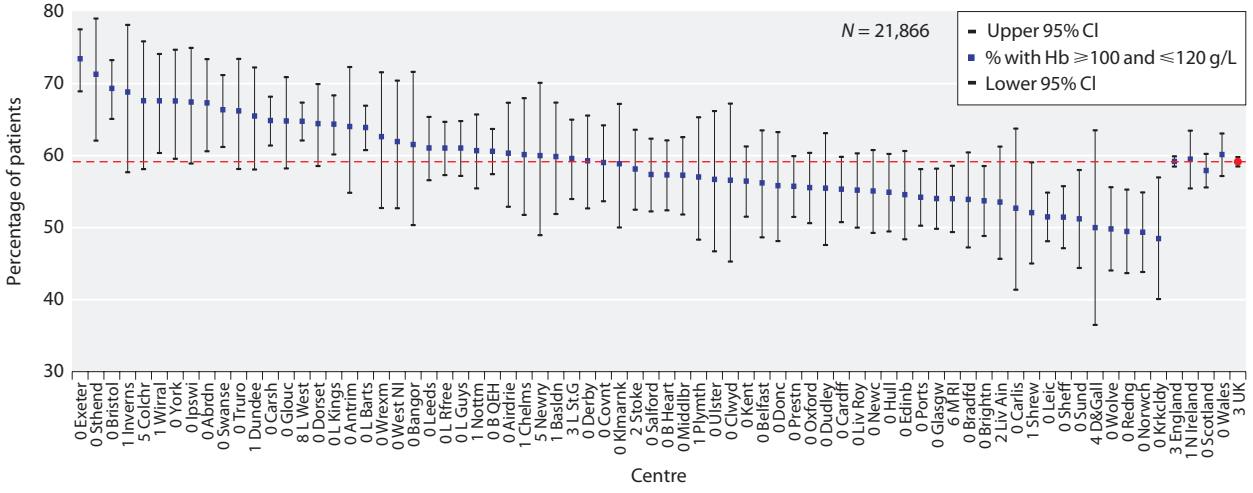

Fig. 7.8. Percentage of HD patients with Hb ⩾100 g/L and ⩽120 g/L by centre in 2015

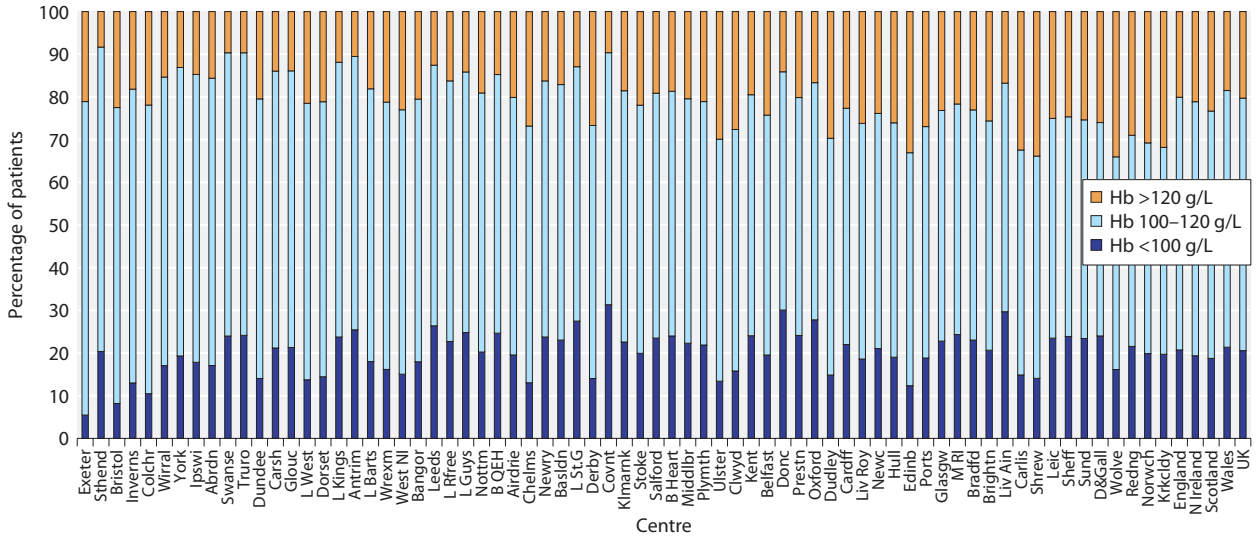

Fig. 7.9. Distribution of haemoglobin in patients treated with HD by centre in 2015

figure 7.14 shows the distribution of Hb within, above and below this range.

Figures 7.15 and 7.16 are funnel plots showing the percentage of PD patients by centre in 2015 with Hb ⩾100 g/L and Hb ⩾100 g/L and ⩽120 g/L respectively.

Relationship between Hb in incident and prevalent dialysis patients

The relationship between the percentage of incident and prevalent patients with Hb ⩾100 g/L is shown in figure 7.17. As expected, all centres had a higher percentage of prevalent patients achieving a Hb ⩾100 g/L than of incident patients.

Changes in achievement of Hb ⩾100 g/L by year of start in both incident and prevalent patients is shown in figure 7.18. This shows a continuing fall in the proportion of patients achieving a Hb ⩾100 g/L over the last decade.

Ferritin in prevalent haemodialysis patients

The median and IQR for serum ferritin for patients treated with HD are shown in figure 7.19. The percentages with serum ferritin ⩾100 μg/L, >200 μg/L to

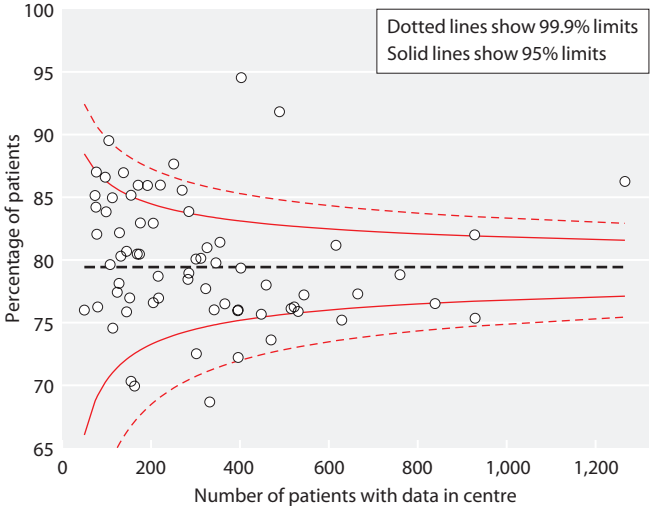

Fig. 7.10. Funnel plot of percentage of HD patients with Hb ⩾100 g/L by centre in 2015

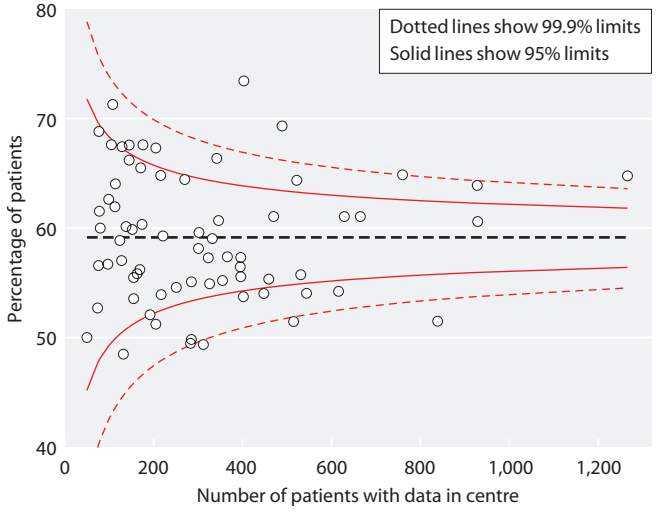

Fig. 7.11. Funnel plot of percentage of HD patients with Hb ⩾100 g/L and ⩽120 g/L by centre in 2015

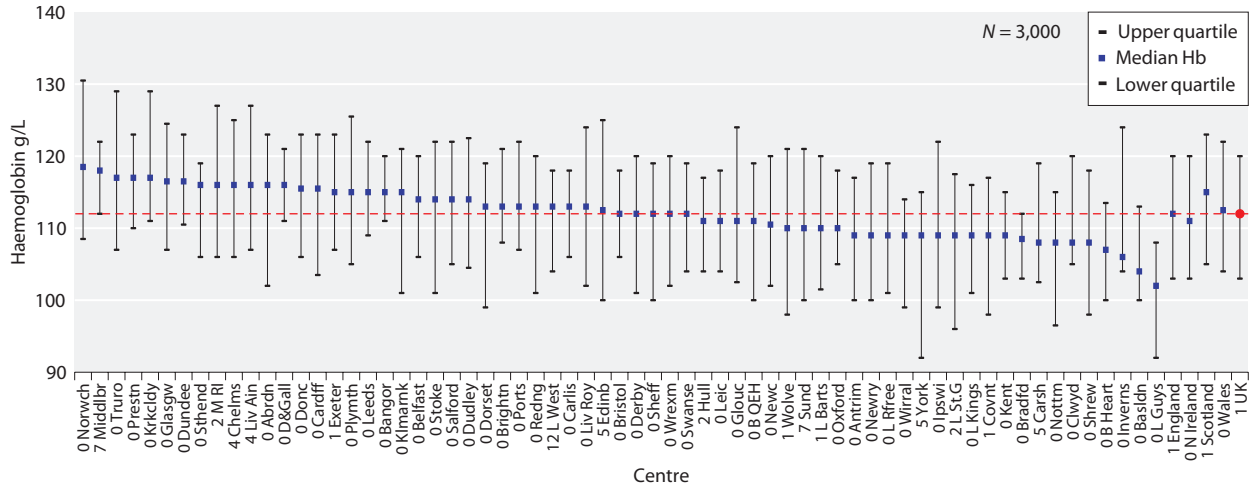

Fig. 7.12. Median haemoglobin in patients treated with PD by centre in 2015

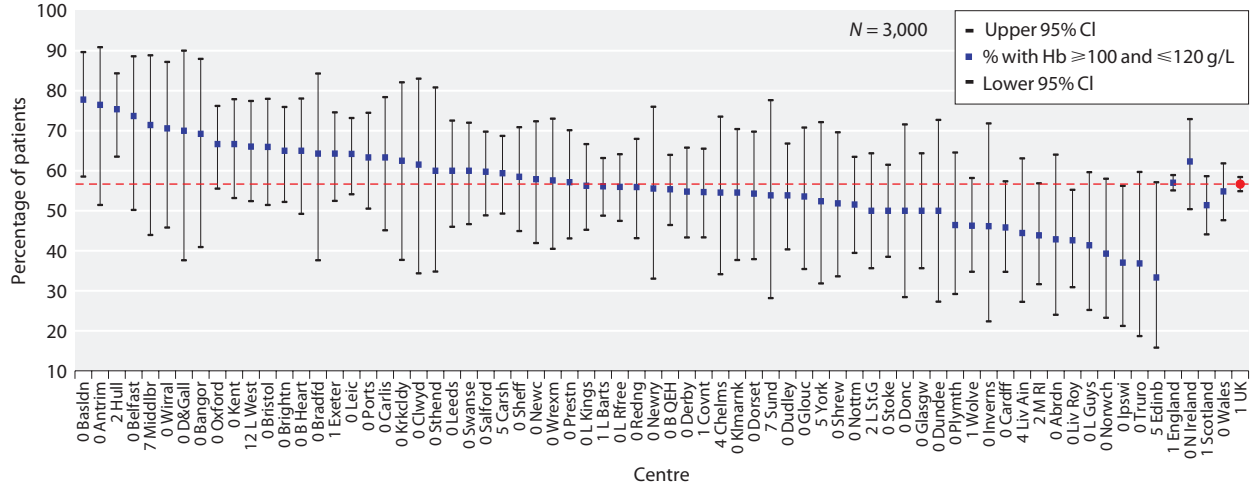

Fig. 7.13. Percentage of PD patients with Hb ⩾100 g/L and ⩽120 g/L by centre in 2015

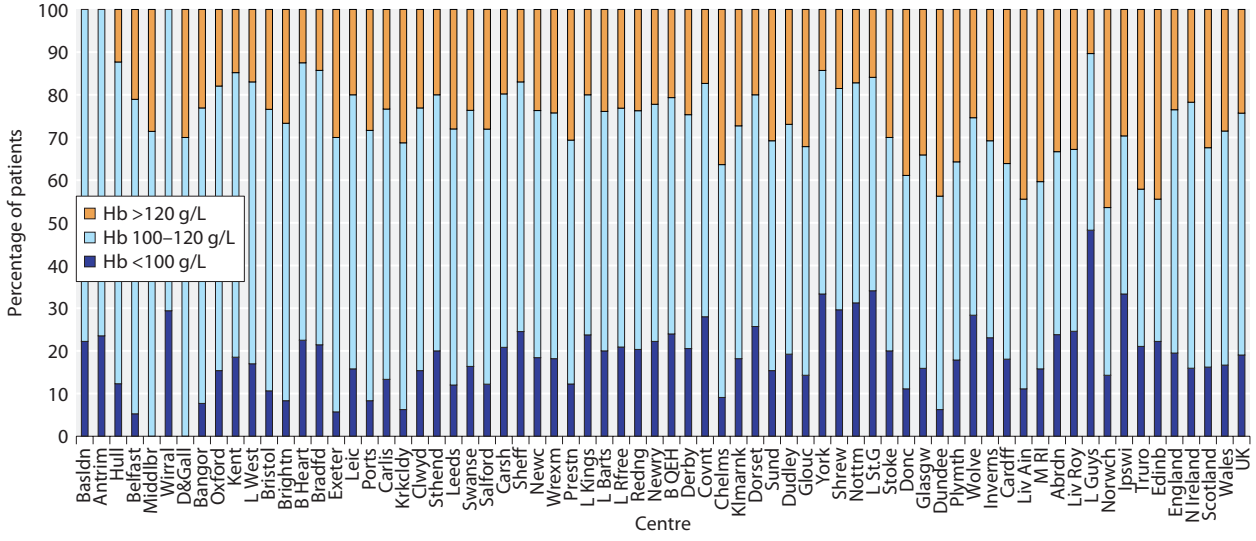

Fig. 7.14. Distribution of haemoglobin in patients treated with PD by centre in 2015

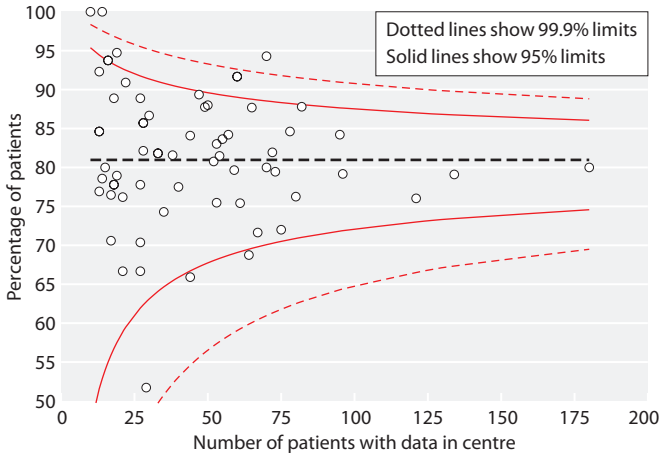

Fig. 7.15. Funnel plot of percentage of PD patients with Hb ⩾100 g/L by centre in 2015

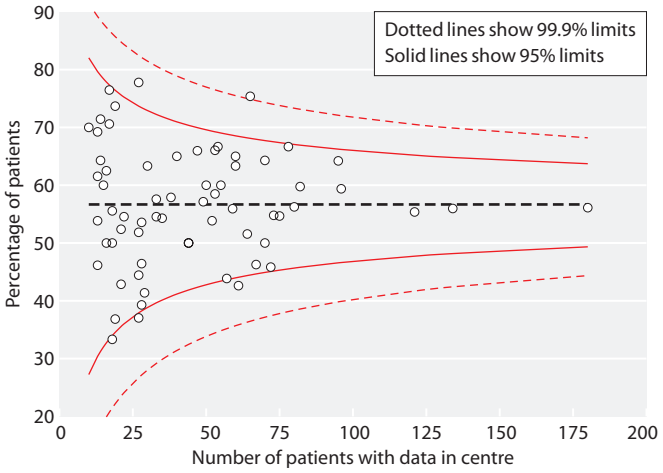

Fig. 7.16. Funnel plot of percentage of PD patients with Hb ⩾100 g/L and ⩽120 g/L by centre in 2015

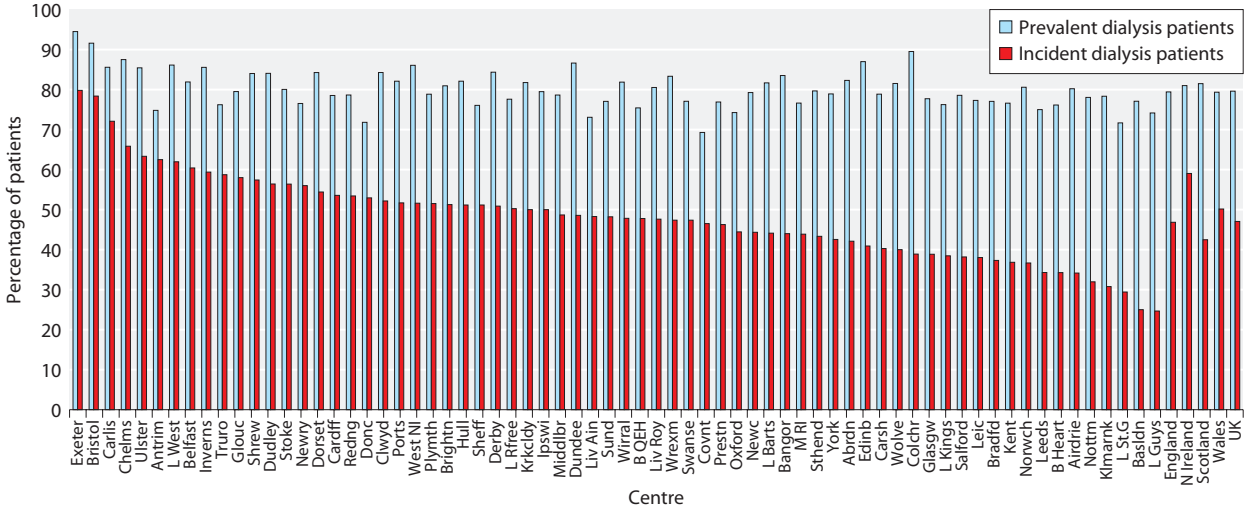

Fig. 7.17. Percentage of incident and prevalent dialysis patients with Hb ⩾100 g/L by centre in 2015

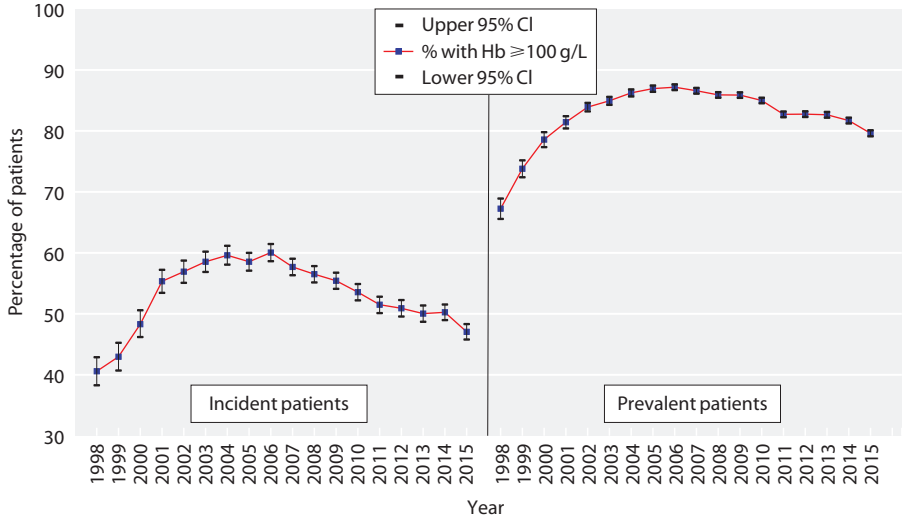

Fig. 7.18. Percentage of incident and prevalent dialysis patients (1998–2015) with Hb ⩾100 g/L

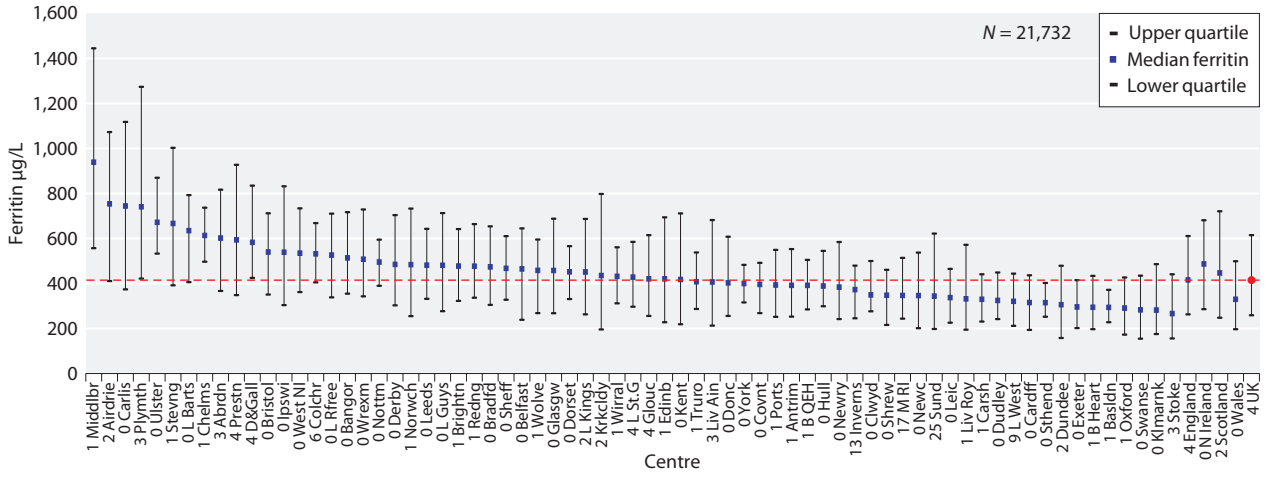

Fig. 7.19. Median ferritin in patients treated with HD by centre in 2015

⩽500 µg/L, and ⩾800 µg/L are shown in figures 7.20, 7.21 and 7.22 respectively. The median serum ferritin in HD patients was 415 µg/L with 94% of HD patients achieving a serum ferritin ⩾100 µg/L.

Ferritin in prevalent peritoneal dialysis patients

The median and IQR for serum ferritin for patients treated with PD are shown in figure 7.23. The percentages with serum ferritin ⩾100 µg/L, >100 µg/L to ⩽500 µg/L, and ⩾800 µg/L are shown in figures 7.24, 7.25 and 7.26 respectively. The median serum ferritin in PD patients was 295 µg/L with 88% of PD patients achieving a serum ferritin ⩾100 µg/L.

Erythropoiesis stimulating agents in prevalent haemodialysis patients

The median dose of ESA for prevalent HD patients in England, Wales and Northern Ireland was 7,500 IU/week with wide variation between centres from 4,833 IU/week (York) to 13,267 IU/week (Newcastle) (table 7.4). There was very little correlation between median ESA dose and either median Hb (figure 7.27) or compliance with Hb 100–120 g/L (figure 7.28). For these analyses only patients with both Hb and ESA data were included.

Erythropoiesis stimulating agents in prevalent peritoneal dialysis patients

The median dose of ESA for prevalent PD patients in England, Wales and Northern Ireland was 4,000 IU/week (table 7.5).

ESA prescription and association with achieved haemoglobin

Figures 7.9 and 7.14 show the distribution of Hb concordance with the RA guideline (100–120 g/L). Not all patients with Hb >120 g/L are receiving ESA. The

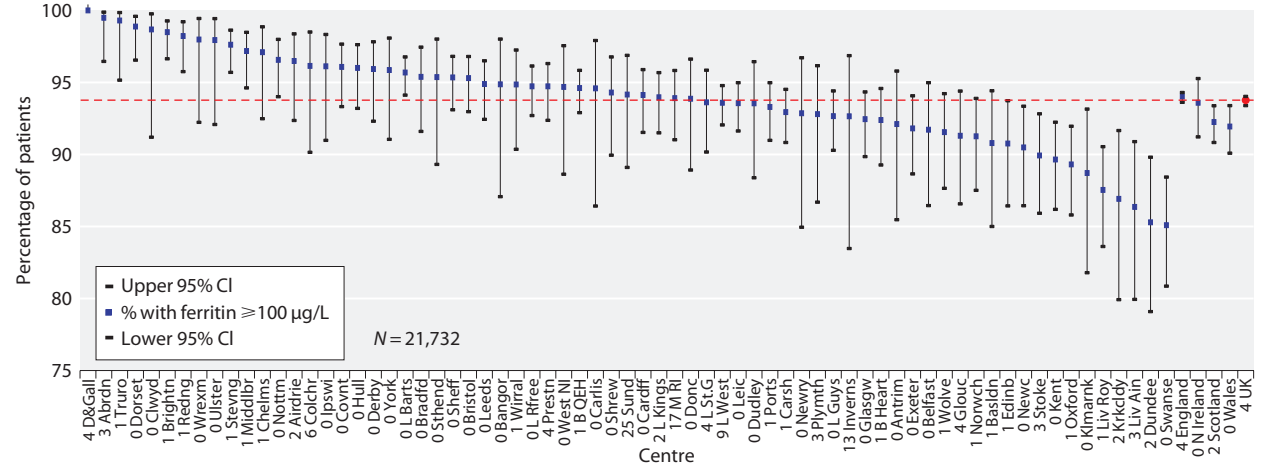

Fig. 7.20. Percentage of HD patients with ferritin ⩾100 µg/L by centre in 2015

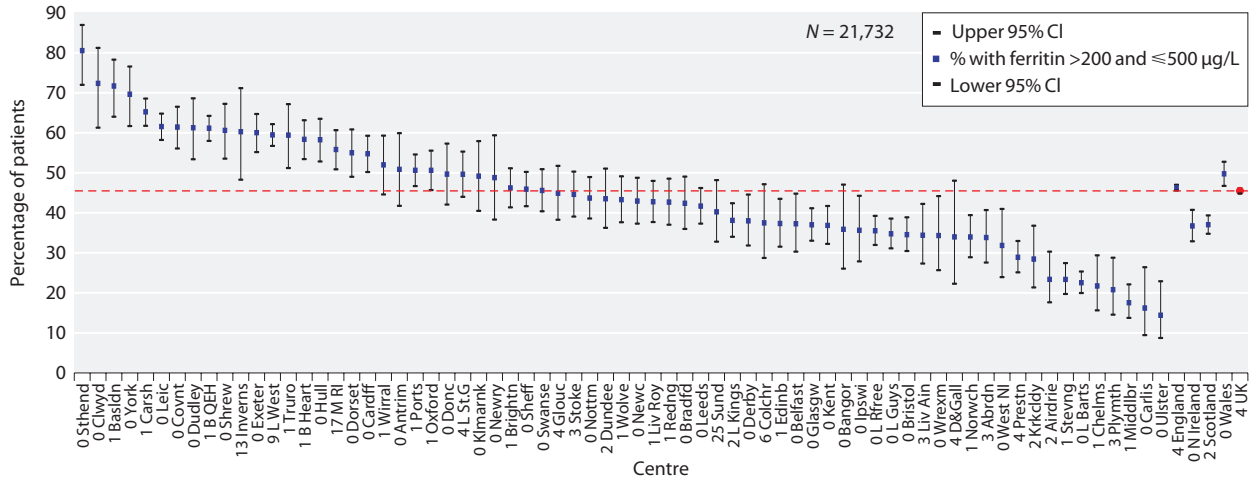

Fig. 7.21. Percentage of HD patients with ferritin >200 and ⩽500 µg/L by centre in 2015

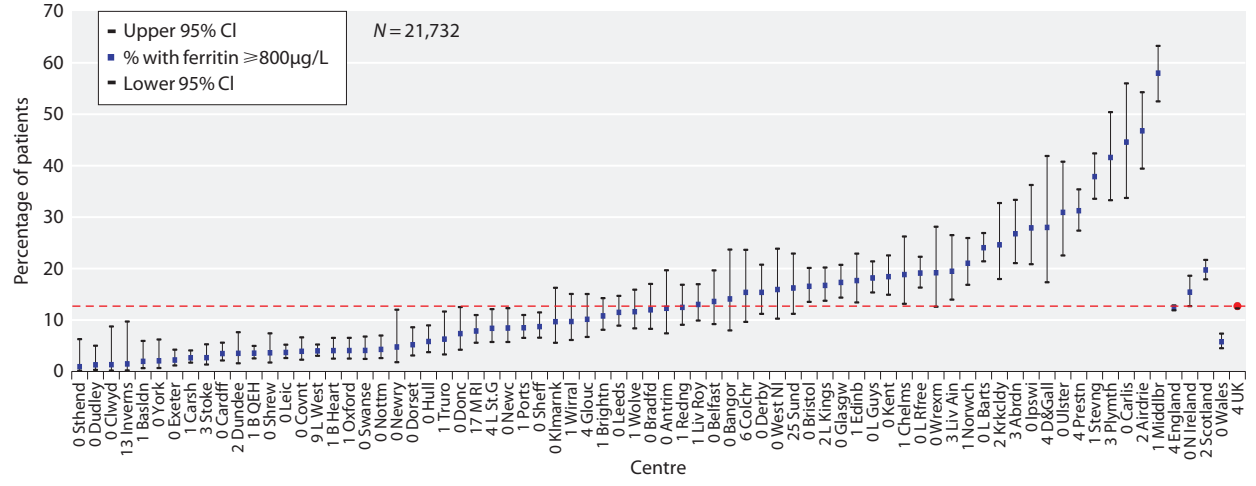

Fig. 7.22. Percentage of HD patients with ferritin ⩾800 µg/L by centre in 2015

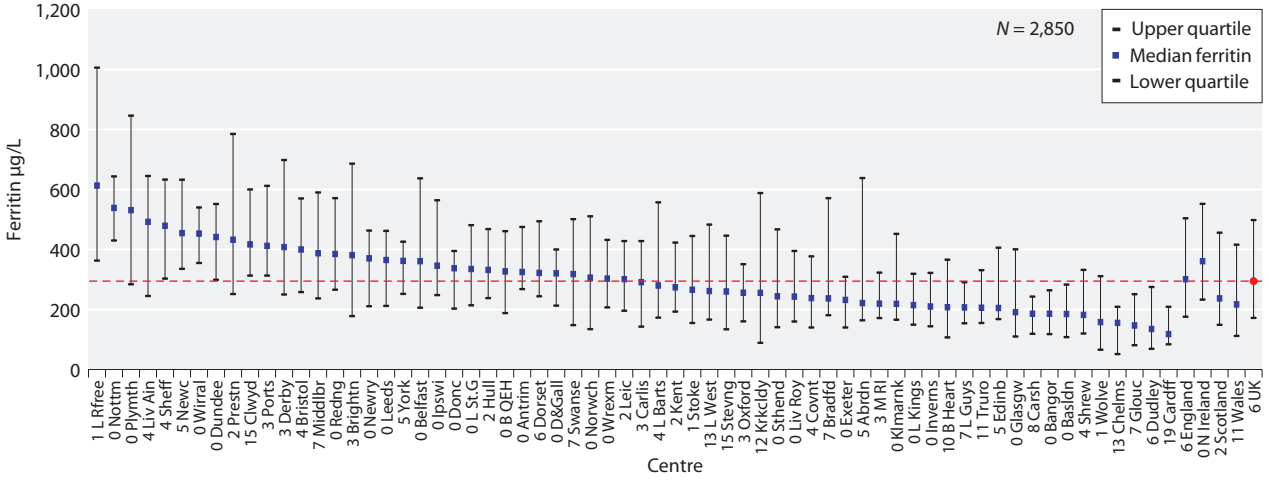

Fig. 7.23. Median ferritin in patients treated with PD by centre in 2015

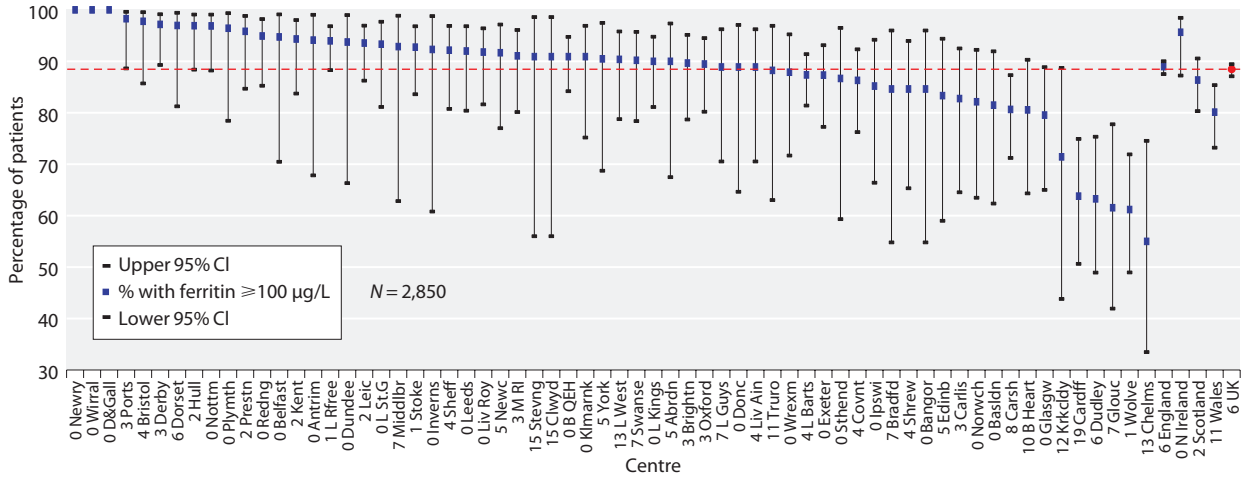

Fig. 7.24. Percentage of PD patients with ferritin ⩾100 µg/L by centre in 2015

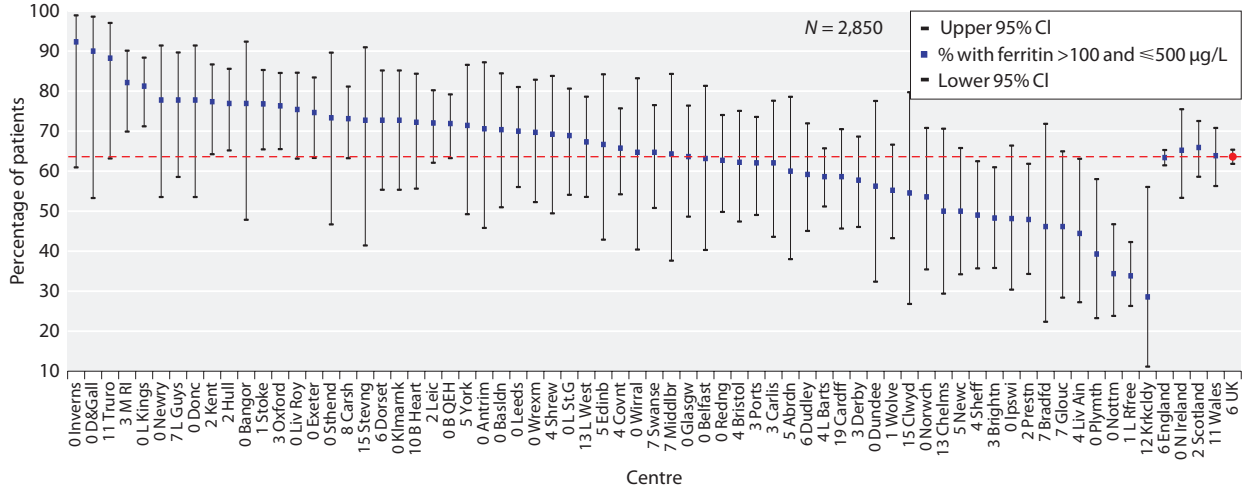

Fig. 7.25. Percentage of PD patients with ferritin >100 and ⩽500 µg/L by centre in 2015

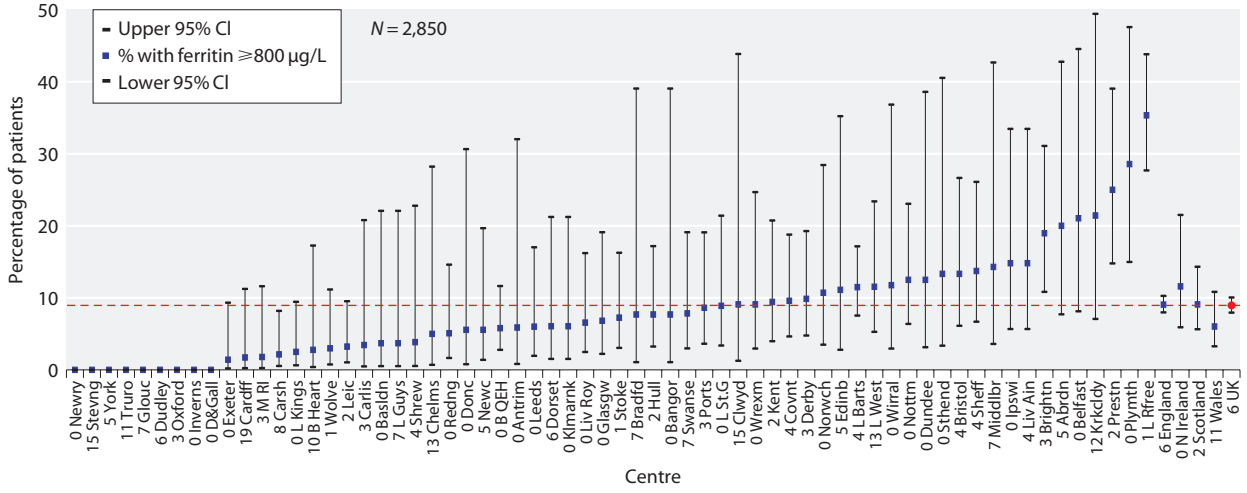

Fig. 7.26. Percentage of PD patients with ferritin ⩾800 µg/L by centre in 2015

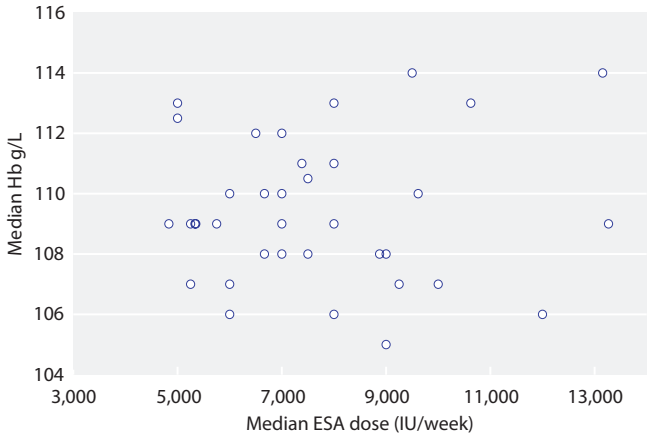

Fig. 7.27. Median Hb versus median ESA dose in HD patients on ESA, by centre in 2015

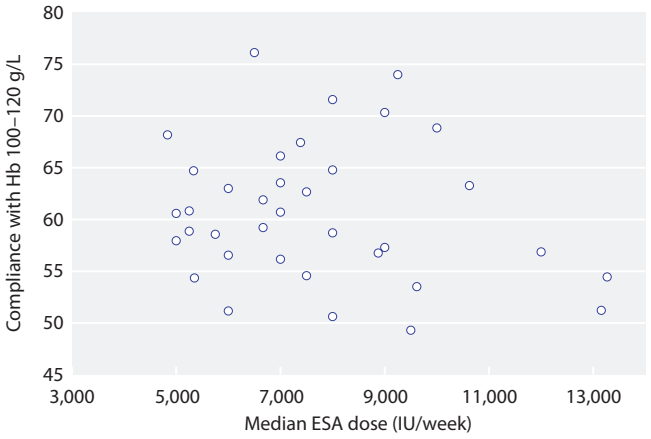

Fig. 7.28. Compliance with Hb 100–120 g/L versus median ESA dose in HD patients on ESA, by centre in 2015

consensus was that these patients should not be included in the group of patients not meeting this target. There are two reasons: first, the high Hb remains largely outside the control of the clinician; secondly, the trials suggesting it may be detrimental to achieve a high Hb in renal patients were based upon patients treated with ESAs [6–8]. Figures 7.29 and 7.30 therefore show the percentages of HD and PD patients in each centre whose Hb lies below, within or above the RA guideline range. For those patients with Hb >120 g/L it also differentiates between those receiving, or not, ESAs. In centres with useable ESA data, 20.0% of HD patients had a Hb >120 g/L and 4.9% had a Hb >120 g/L and were not receiving ESAs. For PD patients 21.3% had a Hb >120 g/L and 11.8% had a Hb >120 g/L and were not receiving ESAs.

ESA prescription: age and modality associations

The proportion of patients on ESA was higher for HD (88%) than for PD (69%). This difference was maintained across all age groups (figure 7.31). The proportion of patients with Hb ⩾100 g/L without requiring an ESA is shown (by age group and modality) in figure 7.32.

ESAs and time on renal replacement therapy

The percentage of patients on ESA by time on RRT and dialysis modality is shown in figure 7.33. This is a

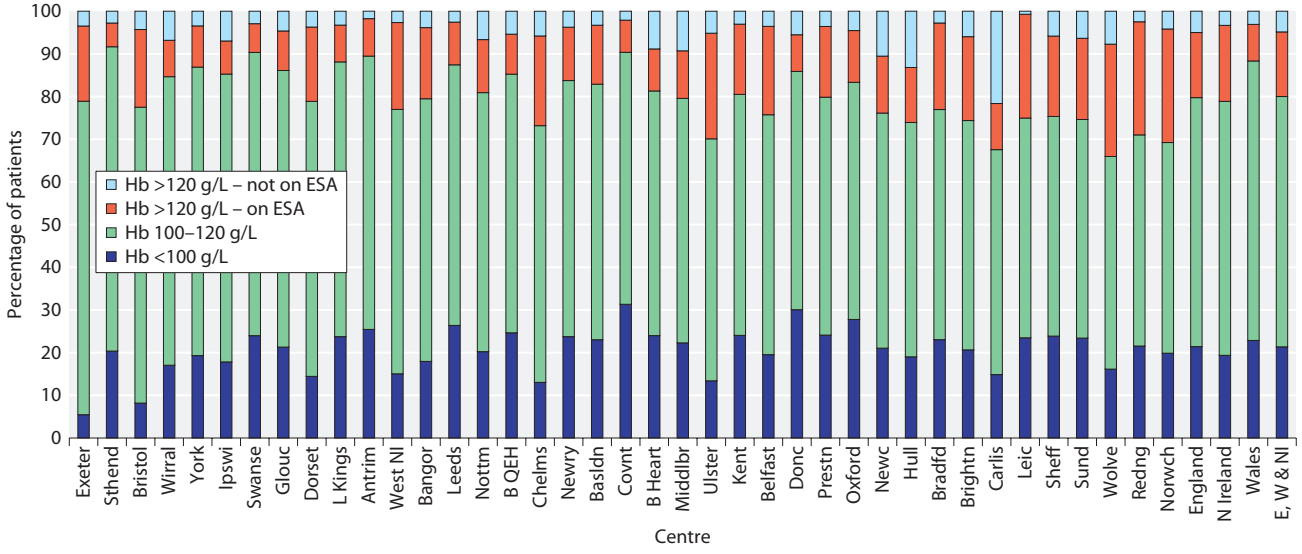

Fig. 7.29. Distribution of haemoglobin in patients treated with HD and the proportion of patients with Hb >120 g/L receiving ESA by centre in 2015

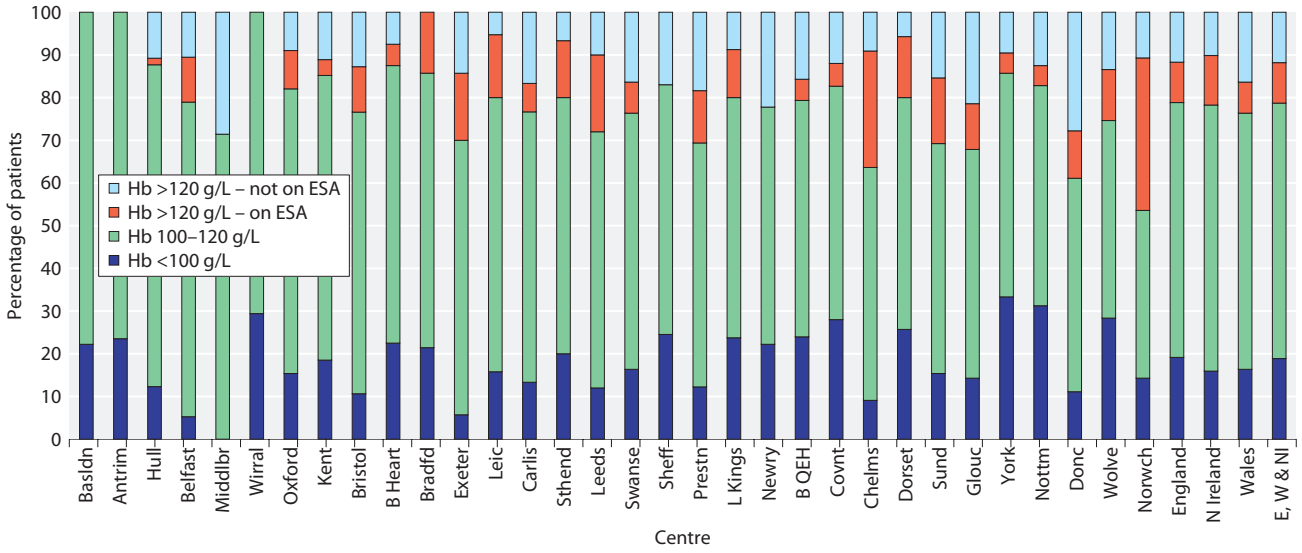

Fig. 7.30. Distribution of haemoglobin in patients treated with PD and the proportion of patients with Hb >120 g/L receiving ESA by centre in 2015

cross-sectional analysis of patients at the end of 2015. Patients who had previously changed RRT modality were included in the analysis. The proportion of PD patients receiving ESA rises with duration of RRT from 65% after 3–12 months to 84% after 10 or more years.

Resistance to ESA therapy

The Renal Association guidelines define resistance to ESA therapy as '***failure to reach the target Hb level despite sc epoetin dose >300 IU/kg/week (450 IU/kg/week iv epoetin) or darbepoetin dose >1.5 mcg/kg/week***' [4]. Figure 7.34 shows the frequency distribution of weekly ESA dose adjusted for weight by treatment modality. Centres included in this analysis were restricted to those with good completeness for weight (>75%) and ESA data. Thirty three centres were included for HD data and 20 centres for PD. The prevalence of PD patients receiving over 300 IU/kg/week was 1.6% with 6.1% of HD patients receiving more than 300 IU/kg/week and 1.1% more than 450 IU/kg/week.

Success with guideline compliance

The percentage of prevalent dialysis patients achieving a Hb ⩾100 g/L by year (1998–2015) is shown in

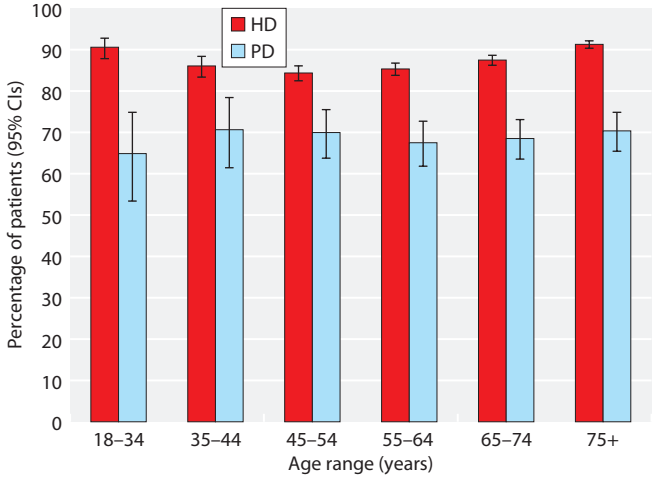

Fig. 7.31. Percentage of dialysis patients on ESA, by age group and treatment modality in 2015

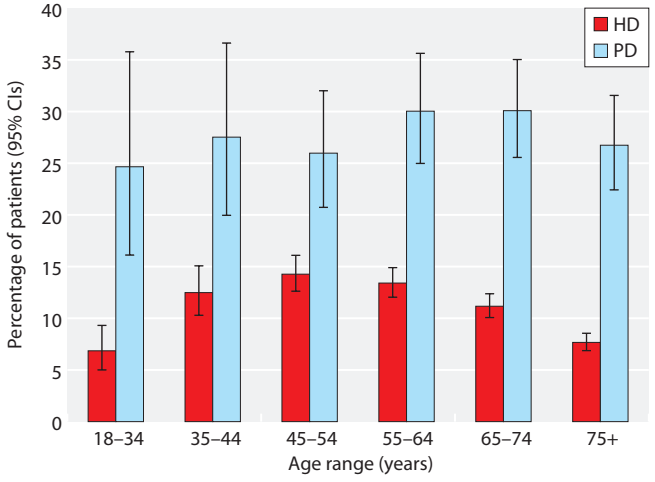

Fig. 7.32. Percentage of whole cohort (2015) who were not on ESA and had Hb ⩾100 g/L, by age group and treatment modality

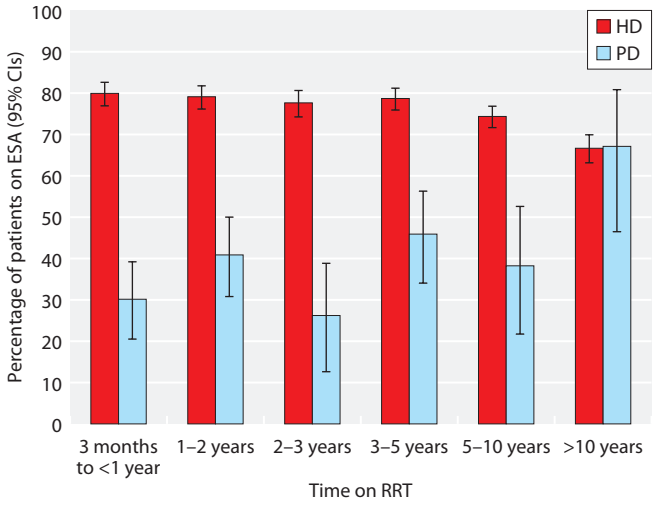

Fig. 7.33. Percentage of patients on ESA by time on RRT in 2015

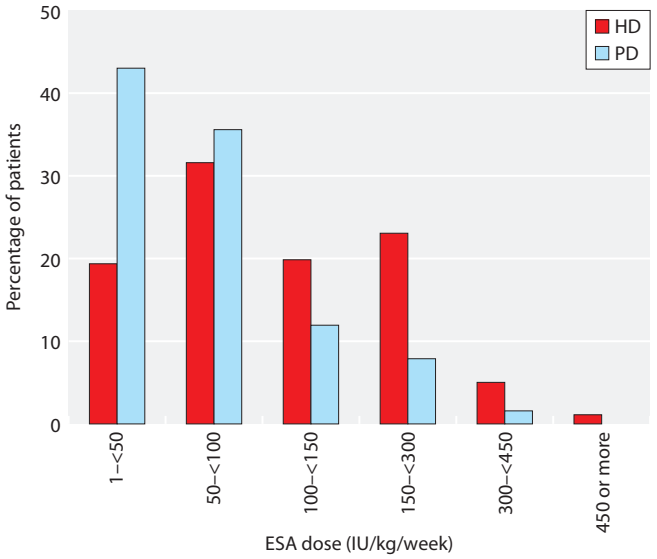

Fig. 7.34. Frequency distribution of mean weekly ESA dose corrected for weight in 2015

figure 7.35. This has shown a gradual fall in achievement of this guideline over the last decade.

Table 7.6 shows that the percentage of all patients treated with an ESA and having Hb >120 g/L ranged between 6–27% for HD and between 0–27% for PD.

Table 7.7 shows the percentage completeness for ESA type, dose, route and frequency for centres reporting ESA data. Even for this group of centres which is already restricted to those with useable ESA data, completeness of frequency and administration route average below 50%. Roughly half of the centres have very good completeness for these items and the other half did not submit at all.

Discussion

Anaemia is one of the major comorbidities associated with chronic kidney disease. This is largely caused by a reduction (absolute or relative) in erythropoietin production, though there are a number of other contributory factors including (absolute or relative) iron deficiency; inflammatory processes related to underlying kidney disease or other comorbidities; inflammatory processes related to dialysis; blood loss (CKD-associated platelet dysfunction, frequent phlebotomy, dialysis-associated

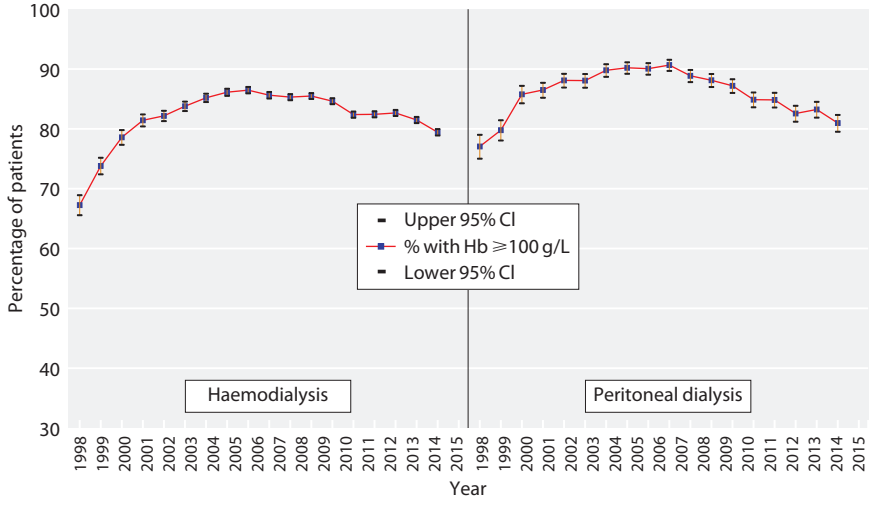

Fig. 7.35. Percentage of prevalent HD and PD patients (1998–2015) with Hb ⩾100 g/L

Table 7.6. Percentage of patients with Hb >120 g/L and on ESA and percentage of patients with serum ferritin <100 μg/L and on ESA, by modality

	HD		PD	
Centre	% with Hb >120 g/L and on ESA	% with ferr <100μg/L and on ESA	% with Hb >120 g/L and on ESA	% with ferr <100μg/L and on ESA
England				
B Heart	10	4	5	7
B QEH	9	2	5	0
Basldn	14	7	0	19
Bradfd	20	4	14	20
Brightn	20	1		
Bristol	18	4	11	0
Carlis	11	0	7	4
Chelms	21	2	27	35
Covnt	8	2	5	3
Donc	9	2	11	0
Dorset	17	0	14	4
Exeter	18	6	16	1
Glouc	9	4	11	15
Hull	13	2	2	0
Ipswi	8	2		
Kent	16	9	4	2
L Kings	9	6	11	8
Leeds	10	4	18	2
Leic	24	6	15	4
Middlbr	11	0	0	0
Newc	13	5		
Norwch	27	6	36	14
Nottm	12	1	5	0
Oxford	12	10	9	10
Prestn	17	3	12	0
Redng	27	1		
Sheff	19	2	0	0
Sthend	6	5	13	7
Sund	19	0	15	0
Wirral	9	1	0	0
Wolve	26	4	12	15
York	10	0	5	0
N Ireland				
Antrim	9	4	0	0
Belfast	21	6	11	6
Newry	13	7	0	0
Ulster	25	0		
West NI	20	4		
Wales				
Bangor	17	4		
Swanse	7	12	7	5
England	**15**	**4**	**9**	**5**
N Ireland	**18**	**5**	**12**	**3**
Wales	**9**	**11**	**7**	**5**
E, W & NI	**15**	**4**	**9**	**5**

Blank cells: centres excluded from analyses due to poor data completeness, small numbers with data or incomplete ESA data

Table 7.7. Percentage completeness for type, dose, route and frequency of administration of ESA

	HD					PD				
Centre	*N* on ESA	% with drug type	% with dose	% with frequency	% with administration route	*N* on ESA	% with drug type	% with dose	% with frequency	% with administration route
England										
B Heart	311	100	99	0	0	22	100	100	0	0
B QEH	822	100	100	100	0	77	100	100	100	0
Basldn	141	100	100	100	100	24	100	100	100	100
Bradfd	203	100	100	100	98	12	100	100	100	100
Brightn	333	100	100	0	0					
Bristol	454	100	100	0	0	35	100	100	0	0
Carlis	51	100	100	0	0	19	100	100	0	0
Chelms	128	100	100	99	100	15	100	100	100	100
Covnt	279	100	98	0	0	46	100	100	0	0
Donc	145	100	100	100	100	12	100	100	100	100
Dorset	251	100	100	97	100	28	100	100	86	100
Exeter	380	100	99	0	0	54	100	100	0	0
Glouc	195	100	0	0	0	17	100	0	0	0
Hull	204	100	100	100	100	31	100	90	90	100
Ipswi	86	100	100	0	0					
Kent	372	100	100	99	100	25	100	100	96	100
L Kings	480	100	100	0	0	62	100	100	0	0
Leeds	434	100	100	100	100	41	100	100	100	98
Leic	817	100	100	0	0	80	100	100	0	0
Middlbr	231	100	100	0	0					
Newc	191	100	100	0	0					
Norwch	284	100	100	98	100	22	100	100	82	100
Nottm	304	100	100	97	100	47	100	100	100	100
Oxford	367	100	99	0	0	68	100	91	0	0
Prestn	486	100	19	0	0	33	100	0	0	0
Redng	246	100	100	0	0					
Sheff	457	100	91	0	0	22	100	100	0	0
Sthend	103	100	97	0	0	11	100	55	0	0
Sund	186	100	100	0	0	10	100	100	0	0
Wirral	146	100	100	100	100	15	100	100	93	100
Wolve	243	100	100	98	100	42	100	100	98	98
York	132	100	100	100	98	16	100	100	100	100
N Ireland										
Antrim	107	100	100	100	100	13	100	100	100	100
Belfast	155	100	100	100	100	16	100	100	100	100
Newry	74	100	100	99	100	10	100	100	100	100
Ulster	88	100	100	100	100					
West NI	105	100	100	99	100					
Wales										
Bangor	63	100	0	0	0					
Swanse	318	100	96	96	98	34	91	85	85	91
England	**9,462**	**100**	**93**	**40**	**31**	**894**	**100**	**93**	**44**	**37**
N Ireland	**529**	**100**	**100**	**100**	**100**	**53**	**100**	**100**	**98**	**100**
Wales	**381**	**100**	**80**	**80**	**82**	**34**	**91**	**85**	**85**	**91**
E, W & NI	**10,372**	**100**	**93**	**44**	**37**	**981**	**100**	**93**	**48**	**42**

Blank cells: centres with useable data for HD patients but not for PD patients

blood loss); hyperparathyroidism and dialysis inadequacy.

Since the introduction of ESAs in the 1980s the management of renal anaemia has changed markedly, from the general acceptance of severe anaemia punctuated by intermittent blood transfusions, to the maintenance of acceptable Hb concentrations for patients with CKD. The understanding of what constitutes an acceptable Hb range has evolved with the published literature and is illustrated by the historic analyses in figures 7.18 and 7.35. These figures show a steady increase in Hb until the middle of the last decade followed by a steady fall during the last ten years. This change in trend followed the publication of the CHOIR and CREATE studies in 2006 which unexpectedly showed adverse outcomes from the physiological correction of haemoglobin with ESAs [6–7]. These findings were supported by the TREAT study in 2009 [8].

Haemoglobin outcomes were similar for both HD and PD patients with proportions of prevalent patients compliant with Hb 100–120 g/L of 59% and 57% respectively. Prevalent HD patients had a higher median serum ferritin (415 μg/L vs 295 μg/L), a higher proportion of patients requiring ESAs (88% vs 69%) and a higher median ESA dose in those receiving ESAs (7,500 IU/week vs 4,000 IU/week) compared with prevalent PD patients.

As expected, a greater proportion of prevalent patients than incident patients attained a Hb $\geqslant$100 g/L (80% vs 47%). Only 34% of late presenters achieved a Hb $\geqslant$100 g/L suggesting that part of this difference is because there was less opportunity for anaemia to be treated with iron or ESAs. The fact that even in the early presenting incident group of patients only 51% achieved Hb $\geqslant$100 g/L suggests that opportunity is only part of the explanation for incident patients. Alternative explanations include the fact that a number of patients commence dialysis at the time of an acute illness when acute anaemia is common.

The proportion of patients achieving a serum ferritin of $\geqslant$100 μg/L was 94% of HD patients and 88% of PD patients.

The NICE guideline on managing anaemia was published mid-way through the data collection period [5] and there are some fundamental differences between these and the previous Renal Association guideline, especially with respect to measurements of iron status. Specifically, the new NICE guidance recommends that percentage hypochromic red blood cells or reticulocyte haemoglobin are preferable markers of iron deficiency than serum ferritin or transferrin saturation. Renal centres will need to consider the incorporation of these changes into local guidelines as well as the need to ensure electronic collection of these data items. Assuming these recommendations are incorporated into the revised RA anaemia guidance, these additional iron indices will then need to be added to the UKRR dataset.

The analysis of ESA usage was limited by incomplete data returns. From the available data, 88% of HD patients and 69% of PD patients were receiving ESAs. The attainment of Hb targets correlated poorly with median ferritin and ESA usage.

There continued to be variation in concordance with anaemia guidelines between UK renal centres.

Conflicts of interest: the authors declare no conflicts of interest

References

1 Kidney Disease: Improving Global Outcomes (KDIGO) Anemia Work Group. KDIGO Clinical practice guideline for anemia in chronic kidney disease. Kidney Int Suppl. 2012;2:S279–S335

2 Kilger AS, et al. KDOQI US commentary on the 2012 KDIGO clinical practice guideline for anemia in CKD. Am J Kidney Dis. 2013; 62(5):849–859

3 Locatelli F, et al. Kidney Disease: Improving Global Outcomes guidelines on anaemia management in chronic kidney disease: a European Renal Best Practice position statement. Nephrol Dial Transplant 2013; 28:1346–1359

4 Renal Association Clinical Practice Guidelines Committee: Anaemia of CKD, 5th Edition. 2010 http://www.renal.org/docs/default-source/default-document-library/anaemia-in-ckd—5th-edition.pdf?sfvrsn=0

5 National Institute for Health and Care Excellence (NICE). Chronic kidney disease: managing anaemia. 2015 nice.org.uk/guidance/ng8

6 Singh AK, et al. Correction of anemia with epoetin alfa in chronic kidney disease. N Engl J Med. 2006;355(20):2085–2098

7 Drüeke TB, et al. Normalization of hemoglobin level in patients with chronic kidney disease and anemia. N Engl J Med. 2006; 355(20):2071–2084

8 Pfeffer MA, et al. A trial of darbepoetin alfa in type 2 diabetes and chronic kidney disease. N Engl J Med. 2009;361(21):2019–2032

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UK Renal Registry 19th Annual Report: Chapter 8 Biochemical Variables amongst UK Adult Dialysis Patients in 2015: National and Centre-specific Analyses

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Keywords

Bicarbonate · Biochemical variables · Calcium · Dialysis · Haemodialysis · Parathyroid hormone · Peritoneal dialysis · Phosphate · Quality improvement

Summary

In 2015

- 64.1% of haemodialysis (HD) patients and 60.5% of peritoneal dialysis (PD) patients achieved the Renal Association (RA) audit measure for phosphate (<1.7 mmol/L).
- 35.9% of HD and 39.5% of PD patients had a serum phosphate above the RA audit standard (⩾1.7 mmol/L).
- Simultaneous control of all three parameters (calcium, phosphate and parathyroid hormone (PTH)) within current target ranges was achieved by 27.6% of HD and 33.1% of PD patients.
- 79.3% of HD and 77.8% of PD patients had adjusted calcium in the recommended target range of 2.2–2.5 mmol/L.
- 57.1% of HD and 61.3% of PD patients had phosphate between 1.1–1.7 mmol/L.
- 56.8% of HD and 63.6% of PD patients had a serum PTH between 16–72 pmol/L.
- 18.8% of HD and 13.9% of PD patients had a serum PTH >72 pmol/L.
- 64.3% of HD and 80.4% of PD patients achieved the audit measure for bicarbonate 18–24 mmol/L for HD patients and 22–30 mmol/L for PD patients).

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Introduction

The UK Renal Registry (UKRR) collects routine biochemical data from clinical information systems in renal centres in England, Wales and Northern Ireland and receives data from Scotland via the Scottish Renal Registry. Annual cross-sectional analyses are undertaken on some of these variables to determine centre level performance against national (Renal Association (RA)) clinical performance measures [1]. This enables UK renal centres to compare their own performance against each other and to the UK average performance. International chronic kidney disease – mineral bone disorder (CKD-MBD) guidelines were published in 2009 [2] and this prompted changes in CKD-MBD guidelines around the world. Therefore a review of the 5th edition of the RA guidelines was undertaken in order to outline the UK response. These updated RA guidelines were one of the first published by the RA in the 6th edition of their guidelines in March 2015 [3]. Data from 2015 are reported in this chapter, from quarters 2–4, immediately after these updated guidelines were published. The updated RA guidelines offer two audit measures, firstly the proportion of patients with serum phosphate <1.7 mmol/L and secondly the proportion of patients with all bone parameters within target range. The target range for phosphate recommended in the guideline is 1.1–1.7 mmol/L (not <1.7 mmol/L as for the phosphate audit measure). Therefore the authors have interpreted the latter audit measure to include this recommended target range for phosphate of 1.1–1.7 mmol/L which results in different measures of phosphate being used at different points in the chapter and readers should be aware of this when interpreting these results.

Audit measures for kidney disease increasingly include tighter specification limits in conjunction with a growing evidence base. Out of range observations (e.g. hyperphosphataemia or PTH below target range) need to be interpreted cautiously as they may relate to different clinical problems or population characteristics. These will therefore require different strategies to improve centre performance of clinical audit measures. Summary statistical data have been provided to enhance understanding of the population characteristics of each centre and longitudinal analyses to demonstrate changes over time.

Data are also available on the UKRR data portal at www.renalreg.org.

Table 8.1 lists the recommended biochemical based audit measures from the RA which are relevant to the dialysis population. Several of the audit measures are not currently reported by the UKRR in its annual report; the reasons behind this are varied, but predominantly relate to a high proportion of incomplete data or the relevant variable not being within the specified UKRR dataset. The UKRR is actively working with renal centres to collect more granular and wide ranging data using new methods of data collection.

Methods

The analyses presented in this chapter relate to biochemical variables in the prevalent dialysis cohort in the UK. The cohort studied were patients prevalent on dialysis treatment on 31st December 2015. Patients receiving dialysis for less than 90 days and those who had changed modality or renal centre in the last 90 days were excluded. Haemodialysis (HD) and peritoneal dialysis (PD) cohorts were analysed separately. A full definition of the cohort including inclusion and exclusion criteria is available in appendix B (www.renalreg.org).

The biochemical variables analysed in this chapter were serum phosphate, calcium (adjusted for albumin), PTH and bicarbonate. The method of data collection and validation by the UKRR has been previously described [4]. In brief, for each quarter of 2015 the UKRR extracted biochemical data electronically from clinical information systems in renal centres in England, Wales and Northern Ireland (E,W&NI). Cambridge renal centre (Addenbrooke's) was not able to submit the 2015 data at patient level on time for the end of 2015 data collection period. Scottish centres have only been included in analyses relating to corrected calcium and phosphate control, with data for their prevalent dialysis cohort being supplied directly by the Scottish Renal Registry. The UKRR does not currently collect data regarding different assay methods mainly because a single dialysis centre may process samples in several different laboratories. The audit measure used for serum phosphate was <1.7 mmol/L in both the HD and PD cohorts [1, 3]. However, for the audit measure of composite control of bone parameters it is recommended that all parameters are within the target range and this includes phosphate within the range of 1.1–1.7 mmol/L, so two different phosphate measures are in use in this report. For centres providing adjusted calcium values, these data were analysed directly as it is these values on which clinical decisions within centres are based. For centres providing unadjusted calcium values, a formula in widespread use was used to calculate adjusted calcium [5]. The audit measure for adjusted calcium depends on the local reference range [3]. For the purposes of these analyses, the UKRR has used the RA guideline standard of adjusted calcium between 2.2–2.5 mmol/L as the audit measure [3]. There are also a variety of methods and reference ranges in use to measure PTH. To enable some form of comparative audit the UKRR has used two to nine times the median upper limit of the reference range (8 pmol/L) as the audit measure in line with the RA clinical practice guidelines and KDIGO 2009 guidance [2, 3]. This equates to a PTH range of 16–72 pmol/L. The audit measure used for serum bicarbonate in the HD cohort was 18–24 mmol/L as per the updated HD guidelines and in the PD cohort was 22–30 mmol/L. A summary

Table 8.1. Summary of Renal Association audit measures for biochemical variables [1]

RA audit measure or guideline	Included in UKRR annual report	Reason
CKD-MBD in CKD stage 5D audit measures		
Percentage of patients CKD5D with serum PO_4 <1.7 mmol/L	Yes	
Percentage of patients with all bone parameters within target range (Ca/P/PTH)	Yes	Target ranges used for this analysis: adjusted calcium 2.2–2.5 mmol/L, phosphate 1.1–1.7 mmol/L (please note this is different from audit measure of <1.7 mmol/L) and PTH 16–72 pmol/L (2–9 × upper end of reference range)
Peritoneal dialysis guidelines		
Cumulative frequency curves of plasma bicarbonate	No	Summary measures at centre and country level are presented in various formats but not as cumulative frequency curves
Haemodialysis guidelines		
Cumulative frequency curves of pre-dialysis potassium concentration	No	It is hoped for the next report that data completeness will enable analysis. There are also concerns that potential delays in blood sample processing may result in over estimates of potassium concentrations
Cumulative frequency curves of pre-dialysis serum calcium (adjusted for albumin) and phosphate concentrations	No	Summary measures at centre and country level are presented in various formats but not as cumulative frequency curves
Cardiovascular disease in CKD guidance		
Record of HbA1c concentrations in IFCC (mmol/mol) and/or DCCT (%) units	No	Poor data completeness
Cholesterol concentrations in patients prescribed HMG CoA reductase inhibitors	No	The UKRR has reported summary statistics for total cholesterol. These summary data were presented on 2013 data and will be presented again on 2016 data. Reliable information is not currently available within the UKRR data on statin prescription

IFCC International Federation of Clinical Chemistry
DCCT Diabetes Control and Complications Trial

of the current RA audit measures for these variables and conversion factors to SI units are given in table 8.2.

Quarterly values were extracted from the database for the last two quarters for calcium, phosphate and bicarbonate and the last three quarters for PTH. Patients who did not have these data were excluded from the analyses. Data completeness was analysed at centre and country level. All patients were included in analyses but centres with less than 50% completeness were excluded from plots and tables showing centre level performance. Data were also excluded from plots and tables when there were fewer than 10 patients with data, both at centre or country level. These data were analysed to calculate summary descriptive

Table 8.2. Summary of clinical guideline target ranges and conversion factors from SI units

Biochemical variable	Clinical guideline measure	Conversion factor from SI units
Phosphate*	HD patients: 1.1–1.7 mmol/L PD patients: 1.1–1.7 mmol/L	mg/dl = mmol/L × 3.1
Calcium (adjusted)	Normal range (ideally 2.2–2.5 mmol/L)	mg/dl = mmol/L × 4
Parathyroid hormone	2–9 times upper limit of normal	ng/L = pmol/L × 9.4
Bicarbonate	HD patients: 18–24 mmol/L PD patients: 22–30 mmol/L	mg/dl = mmol/L × 6.1

*There are two measures for phosphate in use: 1. phosphate clinical audit measure is <1.7 mmol/L while 2. the combined CKD-MBD audit measure assesses all parameters within the target ranges listed in the table which includes phosphate within 1.1–1.7 mmol/L

statistics (maximum, minimum, means with the corresponding standard deviation, medians and interquartile ranges). Where applicable, the percentage achieving the Renal Association standard or other surrogate clinical performance measure was also calculated.

The simultaneous control of all three components of bone and mineral disorder (BMD) parameters were analysed in combination. The proportion of patients with control of none, one, two or three parameters are presented. For the purpose of these analyses an adjusted calcium between 2.2–2.5 mmol/L, a phosphate level being maintained between 1.1–1.7 mmol/L and a PTH level between two and nine times the upper limit of normal (i.e. 16–72 pmol/L), were evaluated in combination.

Centres report several biochemical variables with different levels of accuracy, leading to problems in comparative evaluation. For example, in the case of serum bicarbonate, data can be submitted as integer values but some centres submit data to one decimal place. All data have been rounded in an attempt to make centres more comparable.

The number preceding the centre name in each figure indicates the percentage of missing data for that centre. Funnel plot analyses were used to identify outlying centres [6]. The percentage within range for each standard was plotted against centre size along with the upper and lower 95% and 99.9% limits. Centres can be identified on these plots by looking up the number of patients treated in each centre in the relevant table and finding this value on the x-axis. Longitudinal analyses were performed for some data to calculate overall changes in achievement of a performance measure annually from 2005 to 2015 and were recalculated for each previous year using the rounding procedure.

All data are presented unadjusted for case-mix.

Results

Mineral and bone variables

Phosphate

In 2015 the following Renal Association clinical practice guideline regarding phosphate management was applicable:

Guideline 3.2 CKD-MBD: Serum phosphate in dialysis patients

Audit measure: Percentage of patients CKD5D with serum PO_4 <1.7 mmol/L [3]

Overall, data from 22,081 HD and 3,002 PD patients across the UK were included in the analyses of serum

Table 8.3. Summary statistics for serum phosphate in haemodialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	99.8	396	1.6	0.5	1.6	1.3	1.9
B QEH	97.0	905	1.5	0.5	1.4	1.2	1.7
Basldn	99.4	152	1.5	0.5	1.4	1.2	1.8
Bradfd	100.0	217	1.5	0.5	1.4	1.1	1.7
Brightn	99.8	401	1.6	0.5	1.5	1.3	1.9
Bristol	100.0	489	1.6	0.5	1.5	1.2	1.8
Camb*							
Carlis	100.0	74	1.5	0.5	1.4	1.2	1.8
Carsh	99.7	759	1.5	0.5	1.5	1.2	1.8
Chelms	99.3	138	1.6	0.4	1.6	1.2	1.9
Colchr	94.6	105	1.5	0.4	1.4	1.2	1.7
Covnt	100.0	332	1.6	0.5	1.6	1.3	1.9
Derby	99.6	221	1.5	0.5	1.5	1.2	1.7
Donc	100.0	163	1.5	0.4	1.5	1.2	1.8
Dorset	100.0	270	1.5	0.4	1.4	1.2	1.7
Dudley	100.0	155	1.5	0.5	1.4	1.2	1.8
Exeter	100.0	403	1.5	0.5	1.4	1.2	1.8
Glouc	100.0	216	1.6	0.5	1.5	1.3	1.8
Hull	99.7	326	1.6	0.5	1.5	1.2	1.8
Ipswi	100.0	129	1.4	0.6	1.3	1.1	1.7
Kent	99.5	395	1.7	0.5	1.6	1.3	2.0
L Barts	100.0	928	1.6	0.5	1.5	1.2	1.9
L Guys	100.0	629	1.5	0.5	1.5	1.1	1.8
L Kings	100.0	522	1.5	0.4	1.4	1.1	1.7
L Rfree	100.0	665	1.5	0.5	1.4	1.2	1.8
L St.G	97.4	303	1.4	0.5	1.4	1.1	1.7

Table 8.3. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
L West	91.8	1,259	1.5	0.5	1.4	1.1	1.7
Leeds	100.0	470	1.6	0.5	1.5	1.2	1.9
Leic	100.0	839	1.6	0.5	1.5	1.2	1.8
Liv Ain	98.1	155	1.3	0.5	1.3	1.0	1.6
Liv Roy	99.4	354	1.5	0.5	1.5	1.2	1.8
M RI	93.7	445	1.5	0.5	1.5	1.1	1.9
Middlbr	100.0	323	1.6	0.5	1.6	1.3	1.9
Newc	100.0	285	1.6	0.5	1.5	1.2	1.9
Norwch	99.7	311	1.5	0.5	1.4	1.2	1.7
Nottm	100.0	350	1.5	0.4	1.4	1.2	1.7
Oxford	99.5	396	1.6	0.6	1.6	1.2	1.9
Plymth	98.5	127	1.6	0.5	1.5	1.3	1.9
Ports	99.7	615	1.6	0.5	1.6	1.3	1.9
Prestn	100.0	531	1.6	0.5	1.5	1.3	1.9
Redng	100.0	283	1.5	0.5	1.5	1.2	1.8
Salford	99.7	366	1.5	0.5	1.5	1.2	1.8
Sheff	99.6	515	1.5	0.4	1.5	1.2	1.8
Shrew	100.0	193	1.6	0.5	1.5	1.2	1.9
Stevng	100.0	468	1.6	0.5	1.6	1.3	1.9
Sthend	100.0	108	1.6	0.5	1.6	1.3	1.9
Stoke	97.4	300	1.5	0.5	1.5	1.2	1.8
Sund	0.0	0					
Truro	100.0	145	1.5	0.5	1.4	1.2	1.8
Wirral	99.4	176	1.5	0.5	1.4	1.2	1.8
Wolve	99.3	284	1.5	0.6	1.4	1.1	1.8
York	100.0	145	1.4	0.4	1.3	1.0	1.6
N Ireland							
Antrim	100.0	114	1.4	0.4	1.3	1.1	1.6
Belfast	100.0	169	1.5	0.6	1.4	1.1	1.8
Newry	100.0	84	1.6	0.5	1.6	1.3	1.8
Ulster	100.0	97	1.5	0.5	1.5	1.2	1.8
West NI	100.0	113	1.6	0.4	1.6	1.3	1.8
Scotland							
Abrdn	100.0	205	1.4	0.4	1.4	1.1	1.7
Airdrie	100.0	174	1.4	0.5	1.4	1.1	1.7
D & Gall	94.2	49	1.6	0.4	1.5	1.2	1.9
Dundee	98.8	171	1.7	0.5	1.7	1.3	2.0
Edinb	98.0	247	1.7	0.5	1.7	1.4	2.0
Glasgw	98.2	535	1.7	0.5	1.6	1.3	1.9
Inverns	98.7	77	1.7	0.4	1.7	1.4	2.0
Klmarnk	100.0	124	1.4	0.5	1.4	1.1	1.7
Krkcldy	100.0	132	1.5	0.4	1.5	1.2	1.8
Wales							
Bangor	100.0	78	1.5	0.5	1.4	1.1	1.7
Cardff	99.8	459	1.6	0.5	1.5	1.2	1.8
Clwyd	100.0	76	1.7	0.5	1.6	1.3	2.0
Swanse	100.0	342	1.5	0.5	1.5	1.2	1.7
Wrexm	100.0	99	1.2	0.5	1.2	0.9	1.4
England	**97.8**	**18,736**	**1.5**	**0.5**	**1.5**	**1.2**	**1.8**
N Ireland	**100.0**	**577**	**1.5**	**0.5**	**1.5**	**1.2**	**1.8**
Scotland	**98.8**	**1,714**	**1.6**	**0.5**	**1.6**	**1.2**	**1.9**
Wales	**99.9**	**1,054**	**1.5**	**0.5**	**1.4**	**1.2**	**1.7**
UK	**98.0**	**22,081**	**1.5**	**0.5**	**1.5**	**1.2**	**1.8**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
*Cambridge renal centre was unable to submit serum phosphate data for 2015

Table 8.4. Percentage of haemodialysis patients with serum phosphate below and equal to or above 1.7 mmol/L, as specified in the RA audit measure, by centre in 2015

Centre	*N*	% phos <1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos ⩾1.7 mmol/L	Change in % <1.7 mmol/L from 2014	95% LCL change	95% UCL change
England								
B Heart	396	58.1	53.2	62.9	41.9	−2.0	−8.8	4.8
B QEH	905	71.5	68.5	74.3	28.5	0.7	−3.5	5.0
Basldn	152	66.5	58.6	73.5	33.6	−4.5	−14.9	5.8
Bradfd	217	68.7	62.2	74.5	31.3	−0.2	−9.2	8.7
Brightn	401	57.1	52.2	61.9	42.9	−4.4	−11.2	2.4
Bristol	489	62.8	58.4	67.0	37.2	4.1	−2.0	10.2
Carlis	74	67.6	56.2	77.2	32.4	2.0	−14.0	18.0
Carsh	759	67.1	63.6	70.3	32.9	0.9	−4.0	5.8
Chelms	138	60.1	51.8	68.0	39.9	−11.0	−22.3	0.4
Colchr	105	71.4	62.1	79.2	28.6	3.8	−8.6	16.3
Covnt	332	57.2	51.8	62.5	42.8	1.9	−5.7	9.5
Derby	221	68.3	61.9	74.1	31.7	10.7	1.7	19.7
Donc	163	63.8	56.2	70.8	36.2	0.5	−9.9	11.0
Dorset	270	74.4	68.9	79.3	25.6	2.2	−5.3	9.7
Dudley	155	68.4	60.7	75.2	31.6	11.5	0.9	22.1
Exeter	403	67.7	63.0	72.1	32.3	−0.3	−6.9	6.2
Glouc	216	61.1	54.5	67.4	38.9	−7.8	−16.9	1.2
Hull	326	62.3	56.9	67.4	37.7	−6.2	−13.6	1.3
Ipswi	129	74.4	66.2	81.2	25.6	3.1	−8.1	14.3
Kent	395	52.9	48.0	57.8	47.1	−4.2	−11.2	2.8
L Barts	928	60.3	57.2	63.5	39.7	2.6	−1.9	7.1
L Guys	629	65.2	61.4	68.8	34.8	−0.1	−5.8	5.7
L Kings	522	74.0	70.0	77.5	26.1	−0.3	−5.7	5.0
L Rfree	665	65.9	62.2	69.4	34.1	0.8	−4.3	6.0
L St.G	303	71.0	65.6	75.8	29.0	1.9	−5.5	9.4
L West	1,259	69.3	66.7	71.8	30.7	1.6	−2.1	5.2
Leeds	470	60.4	55.9	64.8	39.6	1.5	−4.7	7.8
Leic	839	60.3	57.0	63.6	39.7	4.0	−0.7	8.7
Liv Ain	155	78.1	70.9	83.9	21.9	5.0	−4.6	14.6
Liv Roy	354	63.6	58.4	68.4	36.4	−1.3	−8.5	5.8
M RI*	445	62.5	57.9	66.9	37.5	−1.3	−7.6	5.1
Middlbr	323	58.8	53.4	64.1	41.2	−2.4	−10.0	5.3
Newc	285	63.2	57.4	68.6	36.8	−1.9	−9.9	6.1
Norwch	311	69.5	64.1	74.3	30.6	3.5	−3.8	10.9
Nottm	350	73.1	68.3	77.5	26.9	8.3	1.5	15.2
Oxford	396	56.6	51.6	61.4	43.4	−1.7	−8.5	5.1
Plymth	127	59.8	51.1	68.0	40.2	−3.0	−14.9	9.0
Ports	615	56.3	52.3	60.1	43.7	0.0	−5.7	5.7
Prestn	531	57.6	53.4	61.8	42.4	0.4	−5.6	6.4
Redng	283	65.4	59.6	70.7	34.6	−5.2	−13.0	2.6
Salford*	366	63.9	58.9	68.7	36.1	−1.3	−8.2	5.5
Sheff	515	64.7	60.4	68.7	35.3	1.4	−4.3	7.2
Shrew	193	60.1	53.0	66.8	39.9	0.9	−9.2	11.0
Stevng	468	58.6	54.0	62.9	41.5	−3.8	−10.1	2.6
Sthend	108	56.5	47.0	65.5	43.5	0.1	−13.0	13.3
Stoke	300	65.0	59.4	70.2	35.0	−1.1	−8.7	6.5
Truro	145	71.0	63.1	77.8	29.0	0.7	−10.0	11.3
Wirral	176	67.6	60.4	74.1	32.4	1.8	−7.9	11.5
Wolve	284	62.7	56.9	68.1	37.3	−2.6	−10.5	5.3
York	145	80.0	72.7	85.7	20.0	−2.3	−11.6	7.1

Table 8.4. Continued

Centre	*N*	% phos <1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos ⩾1.7 mmol/L	Change in % <1.7 mmol/L from 2014	95% LCL change	95% UCL change
N Ireland								
Antrim	114	76.3	67.7	83.2	23.7	1.6	−9.7	12.8
Belfast	169	63.3	55.8	70.2	36.7	−2.3	−12.2	7.6
Newry	84	64.3	53.5	73.8	35.7	5.0	−9.6	19.6
Ulster	97	63.9	53.9	72.8	36.1	2.2	−11.5	15.9
West NI	113	58.4	49.1	67.1	41.6	−0.6	−13.8	12.7
Scotland								
Abrdn	205	74.2	67.7	79.7	25.9	12.4	3.2	21.5
Airdrie	174	70.1	62.9	76.5	29.9	−1.1	−10.6	8.4
D & Gall	49	63.3	49.1	75.5	36.7	7.7	−12.1	27.5
Dundee	171	48.0	40.6	55.4	52.1	−4.2	−14.9	6.5
Edinb	247	49.4	43.2	55.6	50.6	−1.4	−10.1	7.3
Glasgw	535	54.2	50.0	58.4	45.8	−2.6	−8.6	3.4
Inverns	77	49.4	38.4	60.4	50.7	0.1	−16.3	16.5
Klmarnk	124	67.7	59.0	75.4	32.3	6.4	−5.3	18.1
Krkcldy	132	64.4	55.9	72.1	35.6	−1.3	−12.7	10.0
Wales								
Bangor	78	74.4	63.6	82.8	25.6	4.7	−9.3	18.8
Cardff	459	65.8	61.3	70.0	34.2	1.3	−4.9	7.4
Clwyd	76	54.0	42.7	64.8	46.1	−1.5	−17.0	14.0
Swanse	342	68.4	63.3	73.1	31.6	−0.8	−7.9	6.2
Wrexm	99	88.9	81.0	93.7	11.1	17.3	6.6	28.0
England	**18,736**	**64.3**	**63.6**	**65.0**	**35.7**	**0.3**	**−0.7**	**1.3**
N Ireland	**577**	**65.2**	**61.2**	**68.9**	**34.8**	**0.5**	**−5.0**	**6.0**
Scotland	**1,714**	**58.7**	**56.3**	**61.0**	**41.3**	**0.4**	**−2.9**	**3.7**
Wales	**1,054**	**68.6**	**65.7**	**71.3**	**31.4**	**2.3**	**−1.8**	**6.3**
UK	**22,081**	**64.1**	**63.5**	**64.7**	**35.9**	**0.4**	**−0.5**	**1.3**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Salford and Manchester RI have been involved in the SPIRiT study; an RCT comparing low phosphate control (0.8 to 1.4 mmol/L) with high phosphate group control (1.8 to 2.4 mmol/L); HD patients only were recruited

phosphate in 2015. The overall data completeness for serum phosphate across the UK was 98.0% for HD and 98.8% for PD patients, with some variation between centres (tables 8.3, 8.5). HD centre returns were all >90%, except Cambridge and Sunderland at 0%. For PD patients, Cambridge also returned no data and only one other centre (London West) returned less than 90% data, compared with five centres last year. Data completeness for serum phosphate has improved over the last decade, especially for HD patients from 73.2% to 98.0% but also for PD patients from 90.0% to 98.8%.

The individual centre means and standard deviations are shown in tables 8.3 and 8.5 for HD and PD patients respectively.

For those receiving HD, 64.1% of patients achieved a phosphate level below 1.7 mmol/L, the audit measure specified by the RA, and for those on PD this was 60.5% (tables 8.4, 8.6).

There was inter-centre and inter-modality variation in the proportion of patients below and equal to or above the phosphate target specified by the clinical performance audit measure (figures 8.1–8.4, tables 8.4, 8.6).

Funnel plots for HD patients with controlled phosphataemia (<1.7 mmol/L), show a number of centres attaining this standard in a significantly high proportion of patients: London West, Birmingham QEH, London Kings, Nottingham, Dorset, Wrexham, York and Liverpool Aintree. All these centres achieved above the 99.9% upper confidence interval following correction for centre size. In addition, a number of centres had achieved the serum phosphate control standard in a lower than expected proportion of patients (being below the lower 99.9% confidence interval): Portsmouth, Glasgow, Kent, Edinburgh and Dundee (figure 8.2).

Funnel plots for PD patients indicated that the control of phosphate levels were similar in all centres. No significant outliers were identified (figure 8.4).

Table 8.5. Summary statistics for phosphate in peritoneal dialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	100.0	40	1.8	0.6	1.7	1.4	2.1
B QEH	100.0	121	1.7	0.5	1.6	1.3	2.0
Basldn	100.0	27	1.6	0.4	1.5	1.3	1.8
Bradfd	100.0	14	1.8	0.4	1.9	1.4	2.0
Brightn	100.0	60	1.7	0.4	1.5	1.3	2.0
Bristol	100.0	47	1.6	0.4	1.5	1.3	1.8
Camb[a]							
Carlis	100.0	30	1.5	0.4	1.5	1.2	1.7
Carsh	92.1	93	1.6	0.4	1.6	1.3	1.8
Chelms	95.7	22	1.7	0.6	1.6	1.3	2.0
Colchr[b]	n/a						
Covnt	97.4	74	1.4	0.4	1.4	1.2	1.6
Derby	100.0	73	1.5	0.4	1.5	1.2	1.7
Donc	100.0	18	1.5	0.2	1.5	1.3	1.7
Dorset	100.0	35	1.5	0.3	1.5	1.3	1.6
Dudley	100.0	52	1.6	0.4	1.6	1.4	1.8
Exeter	98.6	70	1.5	0.4	1.4	1.3	1.7
Glouc	100.0	28	1.6	0.4	1.5	1.3	1.9
Hull	98.5	65	1.6	0.4	1.6	1.4	1.8
Ipswi	100.0	27	1.5	0.5	1.4	1.2	1.7
Kent	100.0	54	1.6	0.4	1.5	1.4	1.8
L Barts	98.4	179	1.6	0.4	1.5	1.3	1.8
L Guys	100.0	29	1.6	0.4	1.5	1.3	1.9
L Kings	100.0	80	1.6	0.4	1.6	1.3	1.9
L Rfree	99.3	133	1.6	0.4	1.6	1.3	1.8
L St.G	97.8	44	1.5	0.4	1.5	1.2	1.7
L West	86.7	52	1.5	0.4	1.4	1.2	1.8
Leeds	100.0	50	1.7	0.4	1.7	1.4	2.0
Leic	100.0	95	1.6	0.4	1.6	1.3	1.9
Liv Ain	96.4	27	1.6	0.4	1.5	1.4	1.9
Liv Roy	100.0	61	1.5	0.4	1.6	1.2	1.8
M RI	100.0	58	1.7	0.5	1.6	1.3	1.9
Middlbr	93.3	14	1.5	0.3	1.5	1.3	1.7
Newc	100.0	38	1.6	0.4	1.6	1.4	1.9
Norwch	100.0	28	1.6	0.4	1.6	1.3	1.9
Nottm	100.0	64	1.5	0.4	1.5	1.2	1.7
Oxford	100.0	78	1.7	0.5	1.5	1.3	1.9
Plymth	100.0	28	1.4	0.3	1.4	1.2	1.7
Ports	98.3	59	1.7	0.5	1.7	1.4	1.9
Prestn	100.0	49	1.5	0.3	1.5	1.2	1.7
Redng	100.0	59	1.5	0.3	1.4	1.3	1.6
Salford	98.8	81	1.7	0.5	1.7	1.4	2.0
Sheff	100.0	53	1.6	0.4	1.5	1.3	1.8
Shrew	100.0	27	1.6	0.3	1.6	1.4	1.8
Stevng	100.0	13	1.7	0.2	1.8	1.5	1.9
Sthend	100.0	15	1.5	0.4	1.5	1.2	1.7
Stoke	98.6	69	1.6	0.4	1.5	1.3	1.8
Sund	92.9	13	1.7	0.7	1.6	1.1	1.9
Truro	100.0	19	1.5	0.4	1.5	1.2	1.7
Wirral	100.0	17	1.9	0.5	1.8	1.6	2.1
Wolve	98.5	67	1.5	0.4	1.5	1.2	1.7
York	95.5	21	1.6	0.4	1.6	1.4	1.8

Table 8.5. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	17	1.5	0.4	1.5	1.3	1.8
Belfast	100.0	19	1.6	0.5	1.6	1.3	1.8
Newry	100.0	18	1.4	0.2	1.4	1.2	1.5
Ulster	100.0	6					
West NI	100.0	9					
Scotland							
Abrdn	100.0	21	1.7	0.4	1.8	1.4	2.0
Airdrie	100.0	8					
D & Gall	100.0	10	1.5	0.4	1.6	1.1	1.8
Dundee	100.0	16	1.6	0.3	1.6	1.4	1.9
Edinb	94.7	18	1.7	0.6	1.6	1.2	1.9
Glasgw	100.0	44	1.7	0.6	1.6	1.3	2.0
Inverns	100.0	13	1.7	0.5	1.7	1.3	2.0
Klmarnk	100.0	33	1.8	0.5	1.8	1.5	2.1
Krkcldy	100.0	16	1.7	0.5	1.6	1.4	1.9
Wales							
Bangor	100.0	13	1.6	0.4	1.7	1.4	1.8
Cardff	97.2	70	1.6	0.4	1.5	1.3	1.8
Clwyd	100.0	13	1.6	0.5	1.5	1.4	1.8
Swanse	100.0	55	1.6	0.4	1.5	1.3	1.9
Wrexm	100.0	33	1.6	0.4	1.6	1.3	1.9
England	**98.7**	**2,570**	**1.6**	**0.4**	**1.5**	**1.3**	**1.8**
N Ireland	**100.0**	**69**	**1.5**	**0.4**	**1.5**	**1.3**	**1.6**
Scotland	**99.4**	**179**	**1.7**	**0.5**	**1.7**	**1.3**	**2.0**
Wales	**98.9**	**184**	**1.6**	**0.4**	**1.5**	**1.3**	**1.9**
UK	**98.8**	**3,002**	**1.6**	**0.4**	**1.5**	**1.3**	**1.8**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
[a]Cambridge renal centre was unable to submit serum phosphate data for 2015
[b]n/a – no PD patients

Table 8.6. Percentage of peritoneal dialysis patients with serum phosphate below and equal to or above 1.7 mmol/L as specified in the RA audit measure in 2015

Centre	*N*	% phos <1.7 mmol/L	Lower 95% CI	Upper 95% CI	% with phos ⩾1.7 mmol/L	Change in % <1.7 mmol/L from 2014	95% LCL change	95% UCL change
England								
B Heart	40	50.0	35.0	65.0	50.0	−6.3	−29.4	16.9
B QEH	121	58.7	49.7	67.1	41.3	−5.1	−17.5	7.3
Basldn	27	51.9	33.6	69.6	48.2	−0.1	−27.3	27.0
Bradfd	14	35.7	15.7	62.4	64.3	−8.0	−43.0	26.9
Brightn	60	65.0	52.2	75.9	35.0	−1.7	−19.1	15.8
Bristol	47	61.7	47.2	74.4	38.3	19.9	0.8	38.9
Carlis	30	56.7	38.8	72.9	43.3	2.1	−25.2	29.5
Carsh	93	59.1	48.9	68.6	40.9	−3.9	−17.4	9.5
Chelms	22	54.6	34.1	73.5	45.5	10.1	−20.9	41.1
Covnt	74	77.0	66.1	85.2	23.0	4.9	−8.9	18.6
Derby	73	69.9	58.4	79.3	30.1	5.6	−9.8	21.0
Donc	18	66.7	42.9	84.2	33.3	4.2	−25.0	33.3
Dorset	35	77.1	60.5	88.1	22.9	7.6	−11.7	26.8
Dudley	52	61.5	47.8	73.7	38.5	25.5	6.8	44.3
Exeter	70	70.0	58.3	79.6	30.0	3.7	−11.1	18.5
Glouc	28	57.1	38.7	73.8	42.9	8.5	−15.9	32.9
Hull	65	55.4	43.2	66.9	44.6	−8.3	−25.0	8.5

Table 8.6. Continued

Centre	*N*	% phos <1.7 mmol/L	Lower 95% CI	Upper 95% CI	% with phos ⩾1.7 mmol/L	Change in % <1.7 mmol/L from 2014	95% LCL change	95% UCL change
Ipswi	27	66.7	47.3	81.7	33.3	−6.7	−30.5	17.1
Kent	54	68.5	55.1	79.5	31.5	1.3	−16.0	18.6
L Barts	179	62.6	55.3	69.4	37.4	−2.7	−12.5	7.1
L Guys	29	62.1	43.6	77.6	37.9	−7.9	−34.7	18.8
L Kings	80	57.5	46.5	67.8	42.5	−10.9	−25.8	4.1
L Rfree	133	57.1	48.6	65.3	42.9	−0.6	−12.7	11.5
L St.G	44	65.9	50.9	78.3	34.1	6.8	−13.4	27.0
L West	52	71.2	57.5	81.8	28.9	6.6	−11.7	24.9
Leeds	50	46.0	32.8	59.8	54.0	−3.0	−22.6	16.7
Leic	95	62.1	52.0	71.3	37.9	8.9	−4.6	22.4
Liv Ain	27	63.0	43.8	78.8	37.0	16.1	−9.0	41.2
Liv Roy	61	55.7	43.2	67.6	44.3	−19.8	−37.1	−2.4
M RI	58	58.6	45.7	70.5	41.4	−3.5	−21.2	14.3
Middlbr*	14	71.4	44.0	88.9	28.6			
Newc	38	57.9	41.9	72.4	42.1	5.5	−16.3	27.3
Norwch	28	60.7	42.0	76.7	39.3	−9.3	−33.7	15.1
Nottm	64	68.8	56.5	78.9	31.3	−2.5	−17.9	12.9
Oxford	78	56.4	45.3	66.9	43.6	−4.1	−19.7	11.4
Plymth	28	71.4	52.4	85.0	28.6	−1.9	−24.9	21.1
Ports	59	47.5	35.1	60.1	52.5	−10.6	−28.3	7.1
Prestn	49	69.4	55.3	80.6	30.6	−0.2	−18.7	18.3
Redng	59	76.3	63.8	85.4	23.7	9.1	−7.0	25.1
Salford	81	48.2	37.5	59.0	51.9	−4.8	−20.9	11.3
Sheff	53	56.6	43.1	69.2	43.4	−12.6	−30.9	5.7
Shrew	27	51.9	33.6	69.6	48.2	3.9	−23.3	31.0
Stevng	13	30.8	12.0	59.1	69.2	−53.9	−82.5	−25.2
Sthend	15	73.3	46.7	89.6	26.7	29.6	−3.5	62.6
Stoke	69	65.2	53.3	75.5	34.8	−3.8	−19.3	11.8
Sund	13	53.9	28.2	77.6	46.2	−3.3	−40.8	34.2
Truro	19	63.2	40.3	81.3	36.8	2.1	−29.2	33.3
Wirral	17	35.3	16.8	59.6	64.7	−18.0	−52.0	15.9
Wolve	67	71.6	59.8	81.1	28.4	15.3	−0.5	31.1
York	21	61.9	40.3	79.7	38.1	4.8	−24.9	34.4
N Ireland								
Antrim	17	70.6	45.8	87.2	29.4	9.1	−25.1	43.2
Belfast	19	63.2	40.3	81.3	36.8	23.2	−9.8	56.1
Newry	18	88.9	64.8	97.2	11.1	17.5	−10.3	45.2
Scotland								
Abrdn	21	42.9	24.0	64.0	57.1	0.5	−27.9	29.0
D & Gall	10	60.0	29.7	84.2	40.0	10.0	−31.5	51.5
Dundee	16	56.3	32.4	77.5	43.8	−10.4	−42.0	21.2
Edinb	18	55.6	33.0	76.0	44.4	2.6	−30.4	35.6
Glasgw	44	52.3	37.7	66.4	47.7	−10.6	−32.4	11.2
Inverns	13	46.2	22.4	71.8	53.9	−17.5	−56.8	21.8
Klmarnk	33	33.3	19.5	50.8	66.7	−18.1	−41.2	5.0
Krkcldy	16	50.0	27.3	72.7	50.0	−11.5	−47.6	24.5
Wales								
Bangor	13	46.2	22.4	71.8	53.9	−13.9	−50.6	22.9
Cardff	70	55.7	44.0	66.9	44.3	−8.1	−24.3	8.2
Clwyd	13	53.9	28.2	77.6	46.2	−6.2	−46.8	34.5
Swanse	55	58.2	44.9	70.4	41.8	−7.1	−25.8	11.5
Wrexm	33	57.6	40.5	73.0	42.4	1.1	−25.3	27.4
England	**2,570**	**61.3**	**59.4**	**63.2**	**38.7**	**−0.4**	**−3.0**	**2.2**
N Ireland	**54**	**74.1**	**60.9**	**84.0**	**25.9**	**13.7**	**−3.9**	**31.3**
Scotland	**171**	**48.0**	**40.6**	**55.4**	**52.1**	**−7.9**	**−18.5**	**2.6**
Wales	**184**	**56.0**	**48.7**	**63.0**	**44.0**	**−6.7**	**−16.9**	**3.6**
UK	**3,002**	**60.5**	**58.8**	**62.3**	**39.5**	**−0.8**	**−3.3**	**1.6**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Blank cells indicate no data for 2014

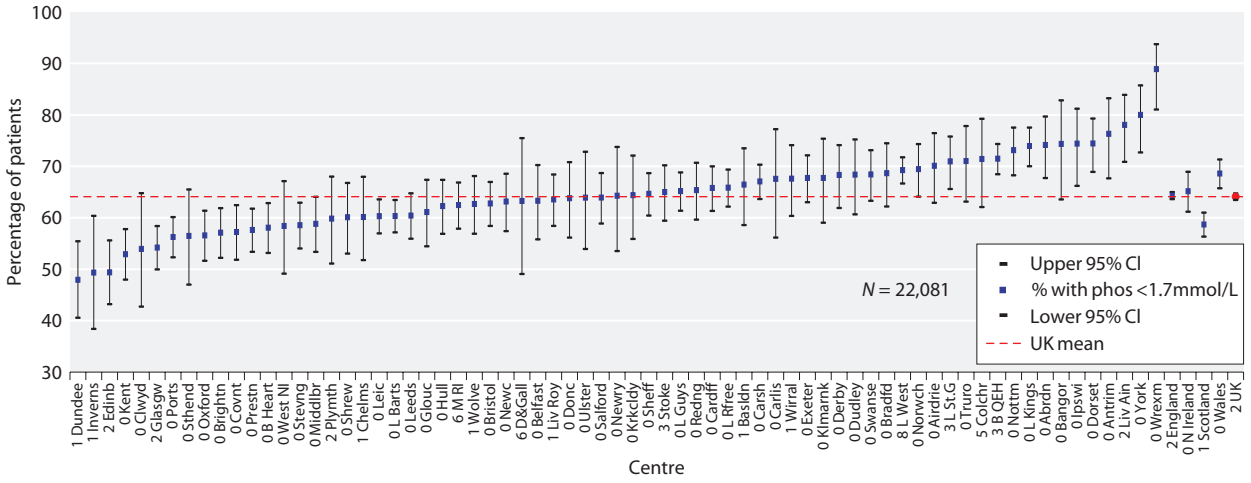

Fig. 8.1. Percentage of haemodialysis patients with serum phosphate below 1.7 mmol/L as specified by the RA audit measure, by centre in 2015

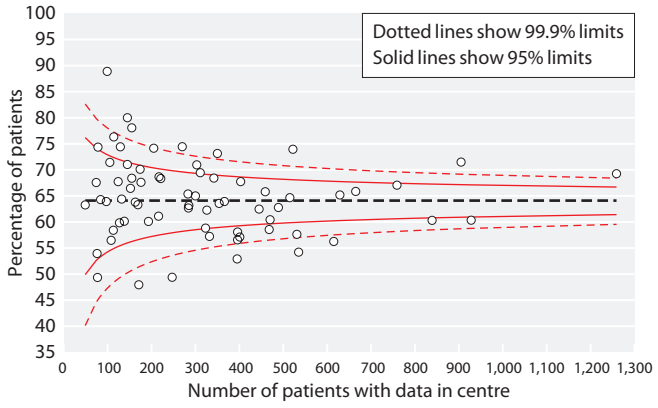

Fig. 8.2. Funnel plot of percentage of haemodialysis patients with serum phosphate below 1.7 mmol/L as specified by the RA clinical audit measure, by centre in 2015

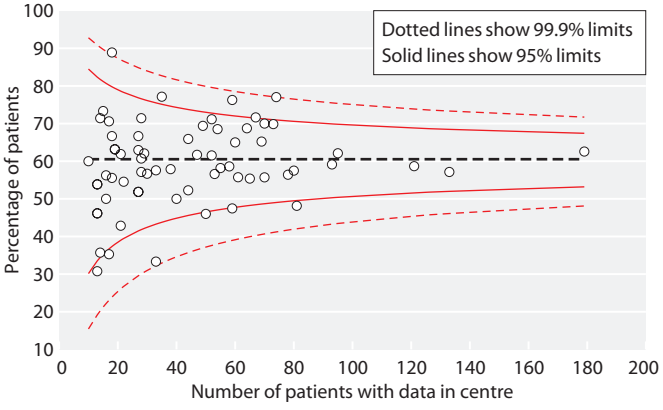

Fig. 8.4. Funnel plot of percentage of peritoneal dialysis patients with phosphate below 1.7 mmol/L as specified by the RA clinical audit measure, by centre in 2015

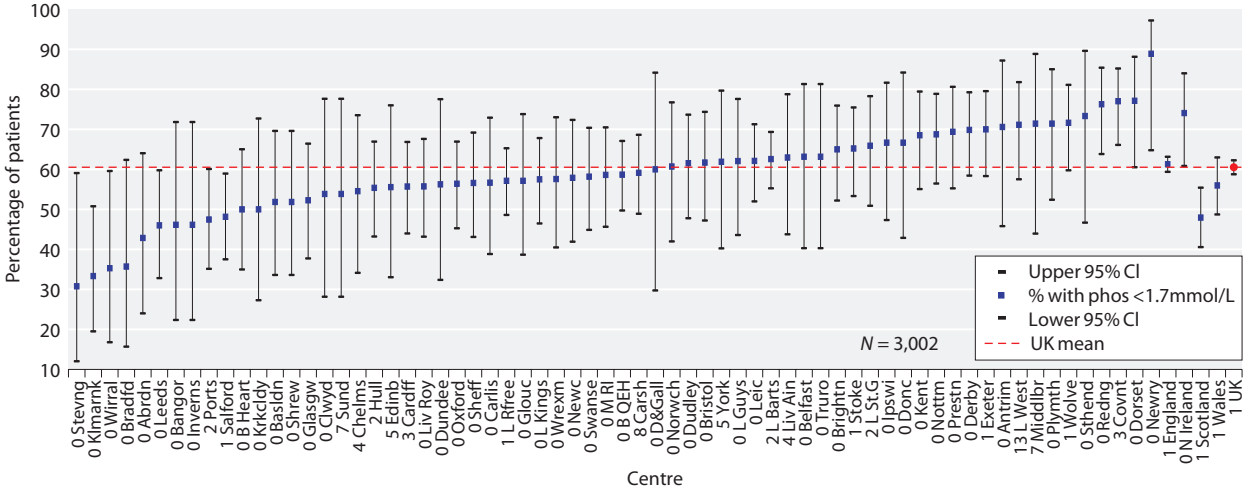

Fig. 8.3. Percentage of peritoneal dialysis patients with serum phosphate below 1.7 mmol/L as specified by the RA audit measure, by centre in 2015

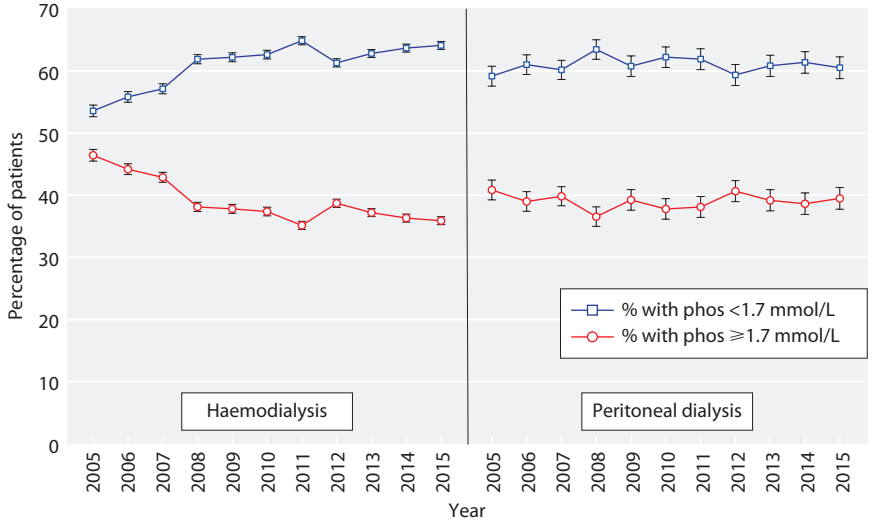

Fig. 8.5. Longitudinal change in percentage of patients with phosphate below and equal to or above 1.7 mmol/L, as specified by the RA clinical audit measure, by dialysis modality 2005–2015

The audit measure of phosphate <1.7 mmol/L is new in the updated 2015 clinical practice guideline [3] and comparable data for previous years have been calculated for comparison purposes. Longitudinal analysis demonstrated a small but continued improvement against the clinical performance measure for those receiving HD whilst the proportion of PD patients with hyperphosphataemia has remained stable (figure 8.5). Data showing the performance of centres in attaining phosphate control within the guideline target range (1.1–1.7 mmol/L) can be found in appendix 1 of this chapter (rather than the audit measure of <1.7 mmol/L presented here).

Simultaneous control of adjusted calcium, phosphate and PTH in preventing severe hyperparathyroidism

At the beginning of 2015 the following RA audit measure for combined biochemical control applied:

'Percentage of patients with all bone parameters within target range (Calcium/Phosphate/PTH)'

The RA guideline does not explicitly outline the target ranges to be used in the audit measure itself therefore the authors have interpreted this to include the target ranges suggested for each biochemical measure in the guideline. Therefore the combined audit measure comprised the following: phosphate 1.1–1.7 mmol/L, adjusted calcium 2.2–2.5 mmol/L and PTH 16–72 pmol/L. Please note this phosphate measure is discrepant with the preceding audit measure for phosphate alone (of <1.7 mmol/L). This section presents only the audit measure of composite control, however data regarding attainment of each of the three components individually can be found in appendix 1.

There were combined biochemical results to assess mineral bone disease available from 57 HD and 52 PD centres, including 17,811 HD and 2,336 PD patients, from England, Wales and Northern Ireland in 2015. Table 8.7 demonstrates the percentage of patients achieving results within the target range for none, one, two or all three bone mineral parameters, by centre for patients

Table 8.7. Percentage of haemodialysis patients achieving simultaneous control of the three key bone and mineral disorder parameters (adjusted calcium, phosphate and parathyroid hormone) by centre, in 2015

		Number of parameters			
Centre	*N*	None	One	Two	Three
England					
B Heart	393	7.4	21.1	40.5	31.0
Basldn	150	2.7	26.0	45.3	26.0
Bradfd	213	2.3	24.4	44.6	28.6
Brightn	394	3.6	22.1	50.5	23.9
Bristol	485	2.1	22.1	43.3	32.6
Carlis	72	4.2	31.9	43.1	20.8
Carsh	731	5.3	27.1	40.6	26.9
Chelms	138	2.9	27.5	42.8	26.8

Table 8.7. Continued

Centre	*N*	Number of parameters			
		None	One	Two	Three
Colchr	105	1.9	19.0	41.0	38.1
Covnt	330	7.3	23.9	42.1	26.7
Derby	221	3.6	21.7	43.0	31.7
Donc	162	3.1	16.7	45.1	35.2
Dorset	269	2.6	19.7	48.3	29.4
Dudley	151	4.0	22.5	44.4	29.1
Exeter	398	0.8	27.4	48.0	23.9
Glouc	206	2.9	21.4	42.7	33.0
Hull	324	4.9	28.1	41.7	25.3
Ipswi	128	8.6	19.5	40.6	31.3
Kent	390	6.2	26.9	39.2	27.7
L Barts	917	5.9	25.7	44.8	23.6
L Guys	623	5.1	27.9	40.6	26.3
L Kings	509	3.9	24.4	47.5	24.2
L Rfree	661	4.4	19.1	44.0	32.5
L St.G	288	4.2	31.3	36.1	28.5
L West	947	6.1	29.1	45.4	19.3
Leeds	466	4.7	23.8	44.6	26.8
Leic	823	6.0	26.7	43.0	24.3
Liv Ain	143	5.6	32.9	39.2	22.4
Liv Roy	283	4.9	27.6	41.3	26.1
M RI	426	3.1	26.8	44.6	25.6
Middlbr	315	6.0	25.7	42.9	25.4
Newc	284	4.2	24.6	39.8	31.3
Norwch	303	4.6	24.1	34.7	36.6
Nottm	341	2.9	22.6	37.0	37.5
Oxford	390	7.2	25.6	41.3	25.9
Plymth	121	7.4	19.0	43.0	30.6
Ports	603	3.6	29.0	41.6	25.7
Prestn	495	4.6	26.9	38.0	30.5
Redng	283	3.5	22.6	38.2	35.7
Shrew	189	6.9	24.9	36.5	31.7
Stevng	458	3.7	22.9	45.4	27.9
Sthend	96	10.4	26.0	40.6	22.9
Stoke	260	2.7	23.5	40.8	33.1
Truro	143	4.9	21.7	47.6	25.9
Wirral	169	2.4	24.3	45.0	28.4
Wolve	270	7.4	28.1	44.1	20.4
York	141	4.3	24.8	48.9	22.0
N Ireland					
Antrim	114	1.8	24.6	42.1	31.6
Belfast	165	1.2	31.5	47.9	19.4
Newry	84	1.2	19.0	36.9	42.9
Ulster	94	9.6	24.5	44.7	21.3
West NI	112	5.4	21.4	44.6	28.6
Wales					
Bangor	78	6.4	17.9	42.3	33.3
Cardff	446	3.1	23.8	42.2	30.9
Clwyd	74	0.0	35.1	40.5	24.3
Swanse	340	3.2	19.4	43.5	33.8
Wrexm	97	9.3	32.0	35.1	23.7
England	**16,207**	**4.7**	**25.1**	**42.8**	**27.4**
N Ireland	**569**	**3.5**	**25.1**	**43.9**	**27.4**
Wales	**1,035**	**3.8**	**23.5**	**41.8**	**30.9**
E, W & NI	**17,811**	**4.6**	**25.0**	**42.8**	**27.6**

Centres excluded if they did not have at least 50% completeness for all of the three variables

Table 8.8. Percentage of peritoneal dialysis patients achieving simultaneous control of the three key bone and mineral disorder parameters (adjusted calcium, phosphate and parathyroid hormone) by centre, in 2015

		Number of parameters			
Centre	*N*	None	One	Two	Three
England					
B Heart	37	10.8	18.9	45.9	24.3
Basldn	27	3.7	18.5	37.0	40.7
Bradfd	13	7.7	23.1	38.5	30.8
Brightn	59	5.1	22.0	40.7	32.2
Bristol	44	4.5	20.5	38.6	36.4
Carlis	27	0.0	11.1	48.1	40.7
Carsh	83	7.2	19.3	49.4	24.1
Chelms	20	15.0	35.0	20.0	30.0
Covnt	69	4.3	21.7	47.8	26.1
Derby	68	1.5	17.6	44.1	36.8
Donc	18	0.0	11.1	44.4	44.4
Dorset	29	0.0	24.1	34.5	41.4
Dudley	48	6.3	27.1	39.6	27.1
Exeter	69	2.9	14.5	55.1	27.5
Glouc	24	0.0	16.7	54.2	29.2
Hull	54	7.4	27.8	35.2	29.6
Ipswi	27	14.8	11.1	51.9	22.2
Kent	54	9.3	20.4	33.3	37.0
L Barts	172	3.5	17.4	39.0	40.1
L Guys	24	4.2	20.8	33.3	41.7
L Kings	72	2.8	29.2	40.3	27.8
L Rfree	123	4.1	21.1	38.2	36.6
L St.G	44	6.8	29.5	40.9	22.7
L West	45	11.1	20.0	37.8	31.1
Leeds	50	0.0	18.0	48.0	34.0
Leic	90	4.4	28.9	45.6	21.1
Liv Ain	20	5.0	15.0	45.0	35.0
Liv Roy	56	3.6	12.5	46.4	37.5
M RI	57	1.8	26.3	40.4	31.6
Newc	34	5.9	20.6	44.1	29.4
Norwch	18	16.7	5.6	38.9	38.9
Nottm	63	1.6	19.0	20.6	58.7
Oxford	77	1.3	11.7	49.4	37.7
Plymth	26	3.8	26.9	38.5	30.8
Ports	50	0.0	34.0	46.0	20.0
Prestn	49	2.0	20.4	42.9	34.7
Redng	55	0.0	12.7	36.4	50.9
Shrew	26	3.8	15.4	34.6	46.2
Stevng	11	9.1	18.2	54.5	18.2
Stoke	57	5.3	17.5	47.4	29.8
Sund	13	0.0	7.7	69.2	23.1
Truro	18	0.0	16.7	50.0	33.3
Wirral	16	6.3	6.3	68.8	18.8
Wolve	65	4.6	24.6	33.8	36.9
York	21	4.8	38.1	28.6	28.6
N Ireland					
Antrim	17	0.0	23.5	52.9	23.5
Belfast	19	5.3	21.1	31.6	42.1
Newry	18	0.0	22.2	44.4	33.3

Table 8.8. Continued

Centre	*N*	Number of parameters			
		None	One	Two	Three
Wales					
Bangor	13	0.0	38.5	30.8	30.8
Cardff	61	3.3	29.5	41.0	26.2
Swanse	53	3.8	17.0	50.9	28.3
Wrexm	33	3.0	18.2	45.5	33.3
England	**2,122**	**4.3**	**20.5**	**41.8**	**33.4**
N Ireland	**54**	**1.9**	**22.2**	**42.6**	**33.3**
Wales	**160**	**3.1**	**23.8**	**44.4**	**28.8**
E, W & NI	**2,336**	**4.2**	**20.7**	**42.0**	**33.1**

Centres excluded if they did not have at least 50% completeness for all of the three variables

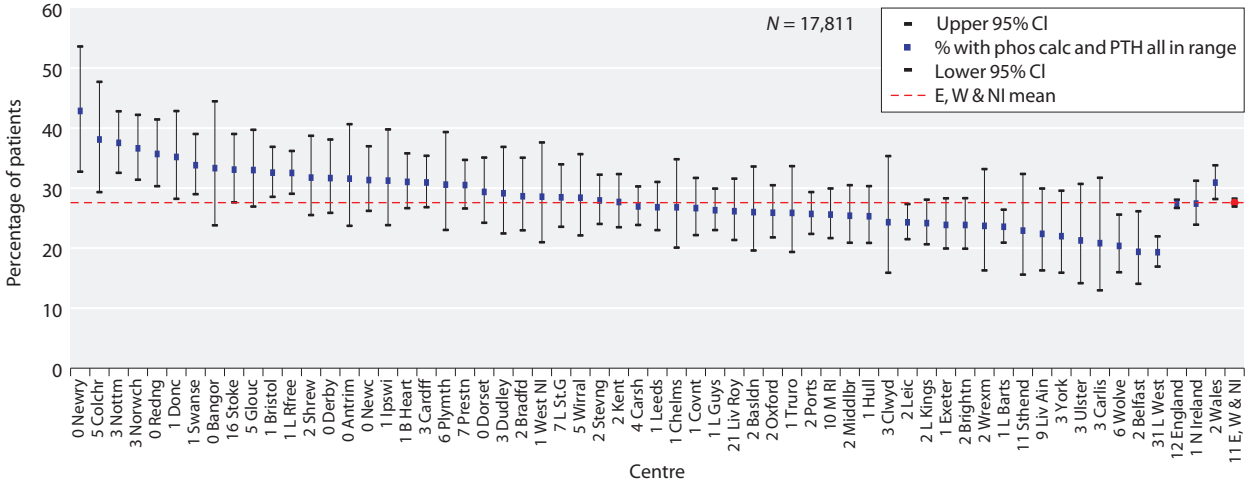

Fig. 8.6. Percentage of HD patients achieving simultaneous control of the three key mineral bone disorders (adjusted calcium, phosphate and parathyroid hormone) in preventing severe hyperparathyroidism, by centre in 2015

receiving HD and figure 8.6 shows the variation between centres in the proportion achieving control of all three parameters. Table 8.8 and figure 8.7 show the same data for patients receiving PD.

Overall, 4.6% of HD and 4.2% of PD patients across England, Wales and Northern Ireland had none of the three bone mineral parameters controlled within the target ranges described above. Control of one parameter was reported in 25.0% of HD and 20.7% of PD patients; of two parameters in 42.8% of HD and 42.0% of PD patients; of all three parameters in 27.6% of HD and 33.1% of PD patients (tables 8.7, 8.8).

Figures 8.8 and 8.9 are funnel plots showing the percentage with control of the three bone mineral parameters by centre (who contributed data to these analyses). There was little variation in the percentage achieving simultaneous control of the three bone mineral parameters for HD patients, with only one centre being above the 99.9% confidence interval and one below. There was even less variation for PD centres with one centre above and none below the 99.9% confidence interval.

Bicarbonate

In 2015 the following Renal Association clinical practice guidelines regarding bicarbonate management were applicable:

Haemodialysis Guideline 6.3: Pre-dialysis serum bicarbonate concentrations

'We suggest that pre-dialysis serum bicarbonate concentrations, measured with minimum delay after venepuncture, should be between 18 and 24 mmol/L' [7].

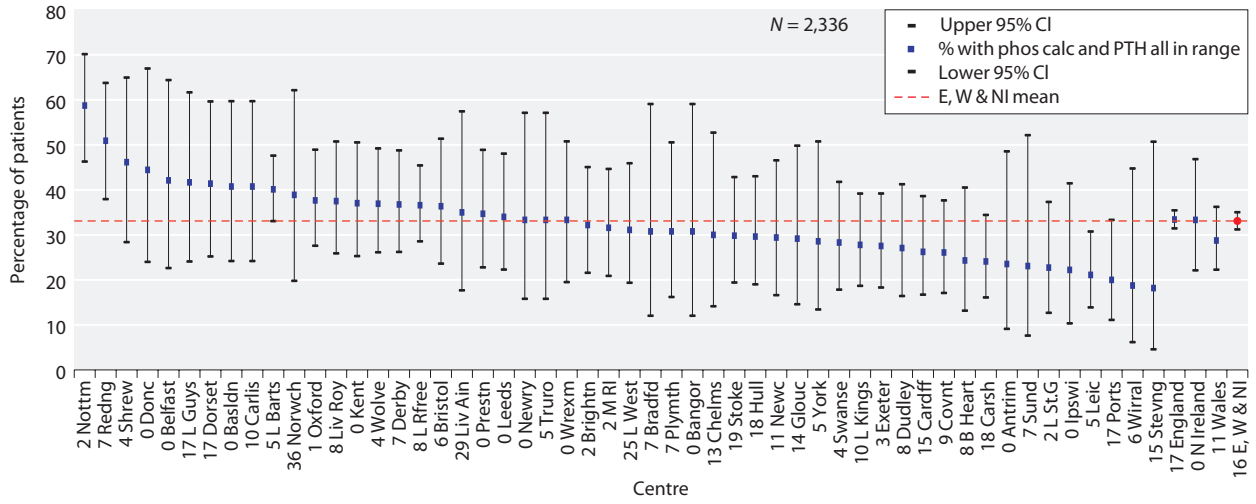

Fig. 8.7. Percentage of PD patients achieving simultaneous control of all three mineral bone disorders (adjusted calcium, phosphate and parathyroid hormone) in preventing severe hyperparathyroidism, by centre in 2015

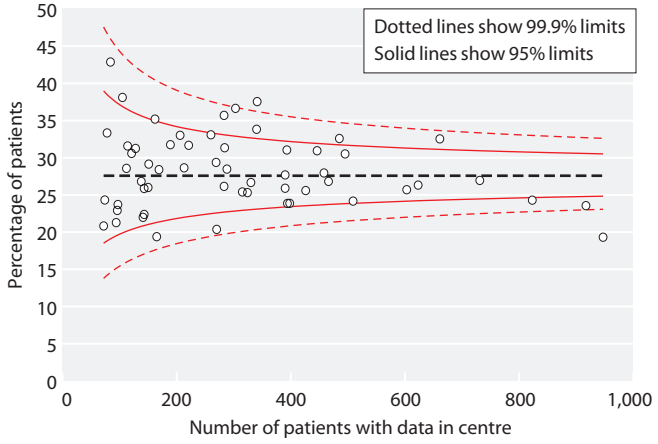

Fig. 8.8. Funnel plot of percentage of HD patients achieving simultaneous control of all three mineral bone disorders (adjusted calcium, phosphate and parathyroid hormone) in preventing severe hyperparathyroidism, by centre in 2015

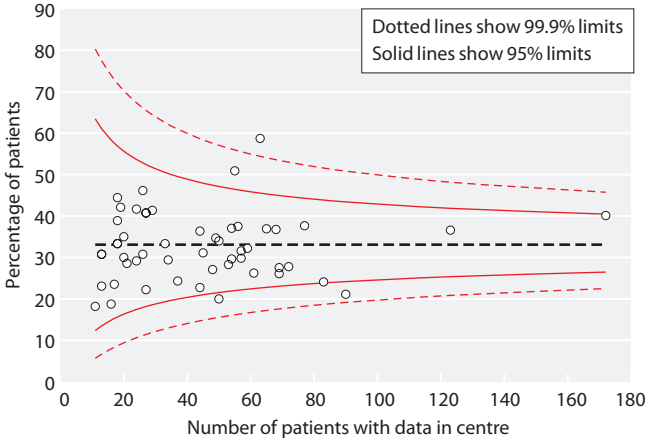

Fig. 8.9. Funnel plot of percentage of PD patients achieving simultaneous control of all three mineral bone disorders (adjusted calcium, phosphate and parathyroid hormone) in preventing severe hyperparathyroidism, by centre in 2015

Peritoneal Dialysis Guideline 6.2 – PD: Metabolic factors

'We recommend that plasma bicarbonate should be maintained within the normal range' [8].

A total of 19,253 HD and 2,560 PD patients' data were available for serum bicarbonate analysis from England, Wales and Northern Ireland in 2015. Data were 92.6% complete for HD patients and 89.5% complete for PD patients (tables 8.9, 8.11). Data completeness for serum bicarbonate levels in HD and PD patients has not changed significantly over a decade. The proportion of HD patients with serum bicarbonate within the audit measure range was 64.3% in 2015 (95% CI 63.7–65.0%) (table 8.10); the mean bicarbonate in HD patients was 23.2 mmol/L (table 8.9). The proportion with a serum bicarbonate within the audit standard in PD patients was 80.4% (CI 78.8–81.9%) (table 8.12). The mean bicarbonate level in PD patients was 24.8 mmol/L (table 8.11).

As in previous reports, inter-centre variation was observed in attainment of the audit standard (tables 8.10, 8.12, figures 8.10–8.13). The funnel plot of serum bicarbonate values in 2015 for HD patients (figure 8.11) showed a large dispersal of attainment, 22 centres being above the 99.9% limit and 13 below the 99.9% limit. In contrast, the funnel plot for PD patients (figure 8.13) showed few outliers. Sample processing, case-mix,

Table 8.9. Summary statistics for serum bicarbonate in haemodialysis patients by centre in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	98.2	390	22.0	3.1	22	20	24
B QEH	98.0	914	23.1	2.4	23	22	25
Basldn	99.4	152	21.9	2.3	22	20	23
Bradfd	100.0	217	24.3	2.9	24	23	26
Brightn	98.8	397	22.1	2.7	22	20	24
Bristol	100.0	489	22.1	2.4	22	21	24
Camb*							
Carlis	100.0	74	20.8	2.1	21	20	22
Carsh	72.7	553	24.9	2.4	25	23	26
Chelms	99.3	138	22.9	2.4	23	21	25
Colchr	94.6	105	22.6	1.6	23	21	23
Covnt	89.8	298	23.2	3.4	23	21	26
Derby	99.6	221	22.5	2.4	22	21	24
Donc	100.0	163	22.2	3.0	22	20	24
Dorset	100.0	270	22.1	2.6	22	21	24
Dudley	100.0	155	23.7	2.6	24	22	25
Exeter	100.0	403	22.7	2.7	23	21	24
Glouc	100.0	216	22.4	2.5	22	21	24
Hull	99.7	326	22.8	3.2	23	21	25
Ipswi	100.0	129	23.8	3.2	24	22	26
Kent	99.5	395	22.3	2.9	22	20	24
L Barts	100.0	928	21.9	3.0	22	20	24
L Guys	91.6	576	23.9	3.0	24	22	26
L Kings	100.0	522	23.7	2.1	24	22	25
L Rfree	100.0	665	22.4	2.5	22	21	24
L St.G	92.0	286	24.7	2.9	25	23	26
L West	55.8	765	20.4	2.7	20	19	22
Leeds	100.0	470	23.1	3.0	23	21	25
Leic	99.4	834	24.8	3.7	25	22	27
Liv Ain	98.1	155	24.2	3.1	24	23	26
Liv Roy	88.8	316	25.4	3.3	26	23	28
M RI	93.3	443	22.2	2.8	22	20	24
Middlbr	100.0	323	26.6	3.0	26	25	29
Newc	100.0	285	23.2	3.3	23	21	25
Norwch	98.7	308	22.7	2.6	23	21	24
Nottm	96.0	336	25.1	2.9	25	23	27
Oxford	99.5	396	22.8	3.3	23	21	25
Plymth	99.2	128	25.7	2.8	26	24	27
Ports	93.8	579	23.7	2.9	24	22	26
Prestn	99.1	526	23.6	2.6	24	22	25
Redng	100.0	283	23.8	2.9	24	22	25
Salford	10.6	39					
Sheff	99.6	515	23.1	2.6	23	21	25
Shrew	100.0	193	23.5	3.1	24	22	26
Stevng	99.8	467	22.4	2.9	22	21	24
Sthend	100.0	108	24.3	2.7	24	23	26
Stoke	83.4	257	25.6	3.1	26	24	27
Sund	100.0	206	27.9	2.6	28	27	29
Truro	100.0	145	22.4	2.8	23	21	24
Wirral	92.7	164	24.2	2.8	24	22	26
Wolve	99.3	284	19.2	2.6	19	17	21
York	100.0	145	23.5	2.4	24	22	25

Table 8.9. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	114	26.2	2.7	26	25	28
Belfast	100.0	169	21.9	2.9	22	20	24
Newry	100.0	84	23.1	2.2	23	22	25
Ulster	100.0	97	22.4	2.5	23	21	24
West NI	100.0	113	21.8	2.2	22	21	23
Wales							
Bangor	100.0	78	24.0	2.8	24	22	26
Cardff	93.3	429	23.5	2.8	24	22	25
Clwyd	100.0	76	23.4	2.8	23	21	25
Swanse	100.0	342	23.5	2.6	23	22	25
Wrexm	100.0	99	26.0	2.1	26	25	27
England	**92.1**	**17,652**	**23.2**	**3.2**	**23**	**21**	**25**
N Ireland	**100.0**	**577**	**23.0**	**3.0**	**23**	**21**	**25**
Wales	**97.1**	**1,024**	**23.8**	**2.8**	**24**	**22**	**26**
E, W & NI	**92.6**	**19,253**	**23.2**	**3.2**	**23**	**21**	**25**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
*Cambridge renal centre was unable to submit bicarbonate data for 2015

Table 8.10. Percentage of haemodialysis patients within, below and above the range for bicarbonate (18–24 mmol/L) by centre in 2015

Centre	*N*	% bicarb 18–24 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <18 mmol/L	% bicarb >24 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	390	78.5	74.1	82.3	5.4	16.2	3.1	−2.8	9.0
B QEH	914	70.6	67.5	73.4	1.4	28.0	8.0	3.7	12.4
Basldn	152	86.2	79.7	90.8	2.6	11.2	8.6	0.1	17.2
Bradfd	217	50.7	44.1	57.3	1.4	47.9	−3.4	−13.0	6.2
Brightn	397	78.3	74.0	82.1	4.3	17.4	1.5	−4.3	7.3
Bristol	489	85.1	81.6	88.0	2.5	12.5	6.3	1.5	11.1
Carlis	74	90.5	81.5	95.4	6.8	2.7	−2.9	−12.0	6.2
Carsh	553	43.0	39.0	47.2	0.2	56.8	5.1	−1.2	11.3
Chelms	138	72.5	64.4	79.3	1.5	26.1	−15.8	−25.1	−6.5
Colchr	105	85.7	77.7	91.2	0.0	14.3	15.2	4.2	26.2
Covnt	298	61.7	56.1	67.1	3.4	34.9	7.1	−0.9	15.0
Derby	221	79.6	73.8	84.4	2.7	17.7	5.5	−2.4	13.3
Donc	163	75.5	68.3	81.5	2.5	22.1	3.2	−6.3	12.7
Dorset	270	82.6	77.6	86.7	3.0	14.4	1.4	−5.2	7.9
Dudley	155	60.7	52.8	68.0	0.7	38.7	3.1	−7.8	13.9
Exeter	403	74.9	70.5	78.9	2.5	22.6	15.8	9.3	22.3
Glouc	216	77.3	71.3	82.4	3.7	19.0	24.4	15.6	33.2
Hull	326	65.0	59.7	70.0	6.4	28.5	4.2	−3.3	11.8
Ipswi	129	54.3	45.6	62.7	2.3	43.4	−3.5	−15.9	8.9

Table 8.10. Continued

Centre	*N*	% bicarb 18–24 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <18 mmol/L	% bicarb >24 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
Kent	395	77.0	72.6	80.9	4.1	19.0	0.9	−5.1	6.9
L Barts	928	78.0	75.2	80.6	6.1	15.8	4.0	0.1	7.9
L Guys	576	54.2	50.1	58.2	1.9	43.9	6.7	0.2	13.1
L Kings	522	65.7	61.5	69.7	0.6	33.7	−19.8	−24.9	−14.6
L Rfree	665	77.6	74.3	80.6	3.0	19.4	−2.3	−6.7	2.0
L St.G	286	46.5	40.8	52.3	1.4	52.1	30.6	23.4	37.8
L West*	765	80.4	77.4	83.1	13.6	6.0			
Leeds	470	67.2	62.9	71.3	3.0	29.8	−3.7	−9.6	2.2
Leic	834	43.9	40.6	47.3	2.0	54.1	−2.9	−7.6	1.9
Liv Ain	155	53.6	45.7	61.3	0.7	45.8	16.1	5.1	27.0
Liv Roy	316	37.3	32.2	42.8	1.0	61.7	−3.3	−10.8	4.2
M RI	443	77.7	73.5	81.3	2.9	19.4	2.0	−3.5	7.6
Middlbr	323	23.8	19.5	28.8	0.0	76.2	−1.5	−8.2	5.3
Newc	285	64.9	59.2	70.2	3.2	31.9	−1.4	−9.3	6.6
Norwch	308	73.7	68.5	78.3	2.9	23.4	−8.1	−14.6	−1.5
Nottm	336	39.0	33.9	44.3	1.5	59.5	1.7	−5.8	9.1
Oxford	396	64.1	59.3	68.7	6.1	29.8	14.5	7.8	21.2
Plymth	128	25.8	19.0	34.0	0.8	73.4	−15.5	−26.9	−4.0
Ports	579	58.2	54.1	62.2	2.3	39.6	−0.7	−6.6	5.1
Prestn	526	61.4	57.2	65.5	2.1	36.5	14.8	8.8	20.8
Redng	283	58.7	52.8	64.3	2.8	38.5	11.5	3.2	19.8
Sheff	515	71.1	67.0	74.8	1.9	27.0	14.9	9.2	20.5
Shrew	193	60.6	53.6	67.3	2.6	36.8	4.6	−5.6	14.7
Stevng	467	75.0	70.8	78.7	4.1	21.0	20.8	14.7	26.9
Sthend	108	51.9	42.5	61.1	0.0	48.2	8.2	−5.0	21.4
Stoke	257	33.9	28.3	39.9	0.4	65.8	−2.3	−10.7	6.0
Sund	206	6.3	3.7	10.6	0.5	93.2	−11.9	−18.2	−5.6
Truro	145	75.9	68.2	82.1	4.1	20.0	23.3	12.3	34.2
Wirral	164	54.3	46.6	61.7	0.6	45.1	5.9	−4.6	16.5
Wolve	284	72.5	67.1	77.4	25.0	2.5	−8.2	−15.1	−1.3
York	145	63.5	55.3	70.9	0.7	35.9	22.3	10.6	34.0
N Ireland									
Antrim	114	24.6	17.5	33.3	0.0	75.4	−2.5	−13.9	9.0
Belfast	169	82.3	75.7	87.3	5.9	11.8	1.8	−6.2	9.9
Newry	84	69.1	58.4	78.0	2.4	28.6	−1.9	−15.7	11.9
Ulster	97	84.5	75.9	90.5	1.0	14.4	25.0	12.7	37.2
West NI	113	88.5	81.2	93.2	2.7	8.9	11.5	1.4	21.6
Wales									
Bangor	78	62.8	51.6	72.8	0.0	37.2	26.1	11.0	41.2
Cardff	429	60.6	55.9	65.1	2.1	37.3	0.5	−6.0	6.9
Clwyd	76	67.1	55.8	76.7	1.3	31.6	22.5	7.5	37.6
Swanse	342	64.0	58.8	69.0	1.8	34.2	13.4	6.0	20.9
Wrexm	99	24.2	16.8	33.6	0.0	75.8	−43.9	−57.7	−30.0
England	**17,652**	**64.5**	**63.7**	**65.2**	**3.5**	**32.1**	**3.9**	**2.8**	**4.9**
N Ireland	**577**	**70.5**	**66.7**	**74.1**	**2.8**	**26.7**	**5.7**	**0.3**	**11.1**
Wales	**1,024**	**58.9**	**55.8**	**61.9**	**1.6**	**39.6**	**4.4**	**0.1**	**8.7**
E, W & NI	**19,253**	**64.3**	**63.7**	**65.0**	**3.3**	**32.3**	**3.9**	**3.0**	**4.9**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Blank cells indicate no data for 2014

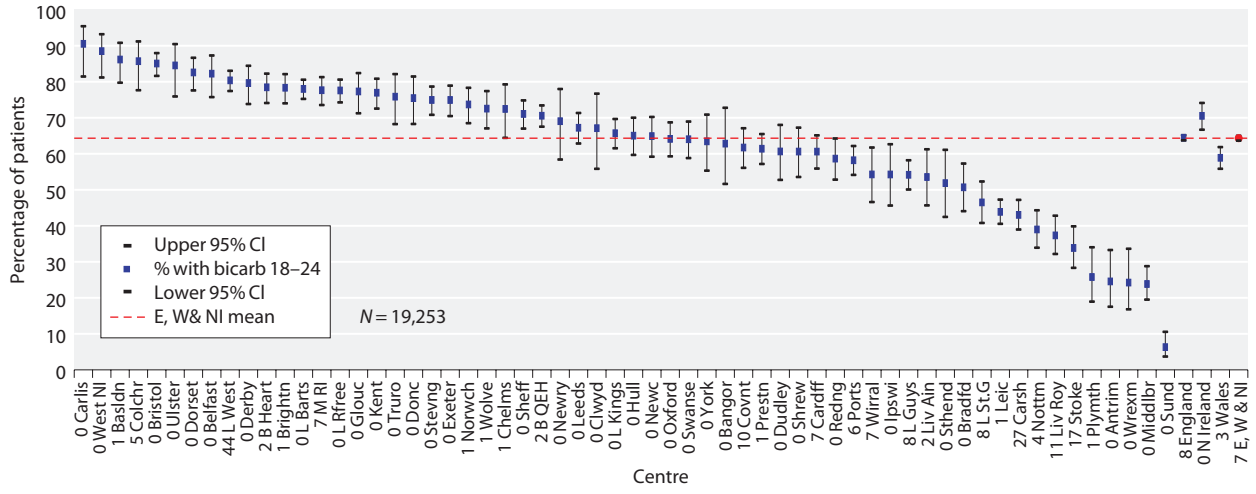

Fig. 8.10. Percentage of haemodialysis patients with serum bicarbonate within range (18–24 mmol/L) by centre in 2015

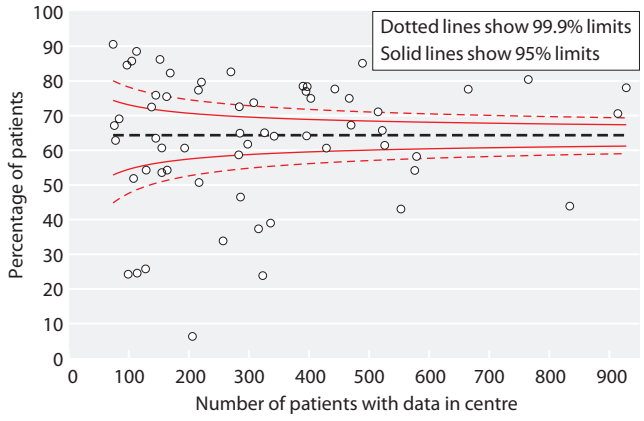

Fig. 8.11. Funnel plot for percentage of haemodialysis patients within range for bicarbonate (18–24 mmol/L) by centre in 2015

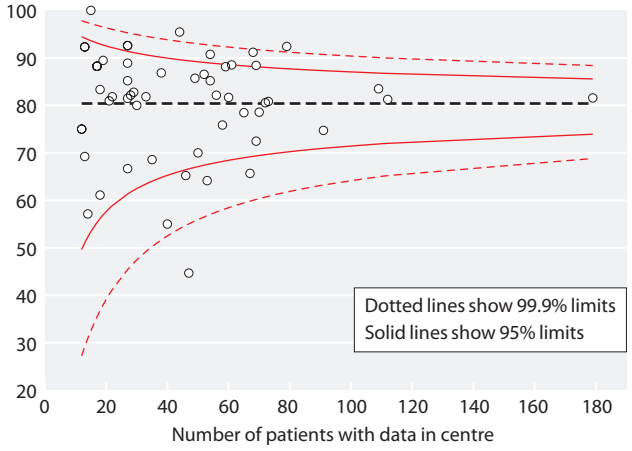

Fig. 8.13. Funnel plot for percentage of peritoneal dialysis patients within range for bicarbonate (22–30 mmol/L) by centre in 2015

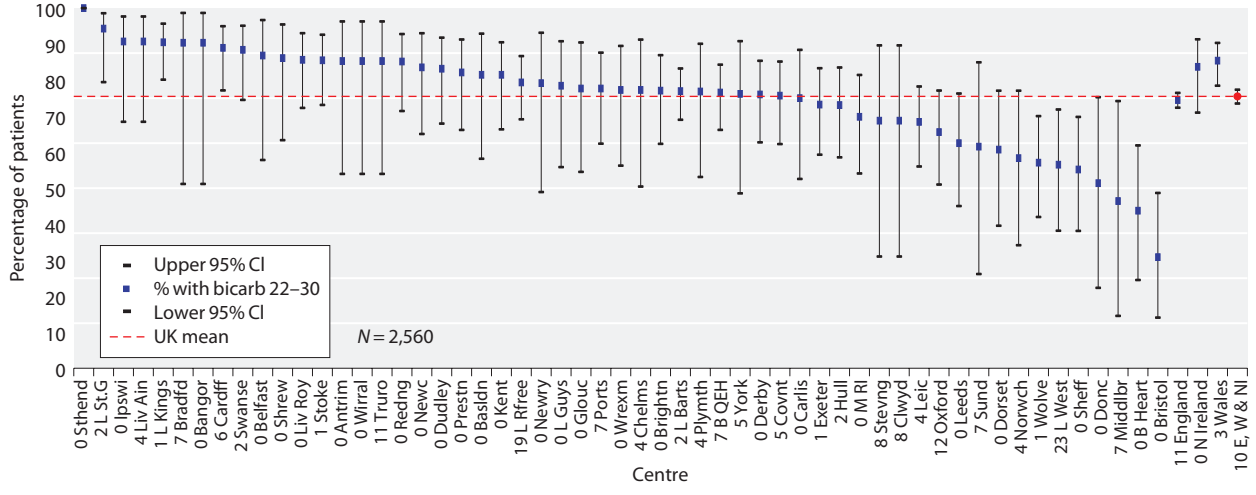

Fig. 8.12. Percentage of peritoneal dialysis patients with serum bicarbonate within range (22–30 mmol/L) by centre in 2015

Table 8.11. Summary statistics for serum bicarbonate in peritoneal dialysis patients by centre in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	100.0	40	22.0	2.8	22	20	24
B QEH	92.6	112	23.6	2.7	24	22	25
Basldn	100.0	27	25.2	3.1	25	23	27
Bradfd	92.9	13	26.9	1.8	27	26	28
Brightn	100.0	60	24.4	3.2	25	22	26
Bristol	100.0	47	21.7	2.1	21	20	23
Camb[a]							
Carlis	100.0	30	24.3	2.7	24	22	27
Carsh	0.0	0					
Chelms	95.7	22	24.7	2.8	24	23	26
Colchr[b]	n/a						
Covnt	94.7	72	24.6	3.0	25	23	26
Derby	100.0	73	24.1	3.4	24	22	26
Donc	100.0	18	22.4	2.2	22	21	24
Dorset	100.0	35	23.5	3.3	23	21	26
Dudley	100.0	52	25.7	3.3	26	23	28
Exeter	98.6	70	24.2	2.9	24	22	26
Glouc	100.0	28	24.4	3.3	25	23	27
Hull	98.5	65	24.9	3.5	25	22	27
Ipswi	100.0	27	25.5	3.0	25	24	28
Kent	100.0	54	24.5	2.8	25	23	26
L Barts	98.4	179	24.1	3.2	25	22	26
L Guys	100.0	29	23.6	2.4	24	22	25
L Kings	98.8	79	26.6	2.5	26	25	28
L Rfree	81.3	109	24.5	3.0	25	22	27
L St.G	97.8	44	24.4	2.2	24	23	26
L West	76.7	46	23.5	3.2	24	21	26
Leeds	100.0	50	26.9	3.6	28	25	29
Leic	95.8	91	25.6	3.9	25	23	28
Liv Ain	96.4	27	26.3	2.5	27	25	28
Liv Roy	100.0	61	25.3	2.7	26	24	27
M RI	100.0	58	23.3	2.7	23	22	25
Middlbr	93.3	14	29.6	2.8	30	28	32
Newc	100.0	38	24.9	3.3	25	23	27
Norwch	96.4	27	22.4	2.7	23	20	25
Nottm	48.4	31					
Oxford	88.5	69	23.5	3.9	24	21	26
Plymth	96.4	27	24.2	3.3	24	22	27
Ports	93.3	56	25.6	3.1	26	23	28
Prestn	100.0	49	26.6	3.1	27	24	29
Redng	100.0	59	27.0	2.6	27	25	29
Salford	14.6	12					
Sheff	100.0	53	22.8	3.1	23	21	25
Shrew	100.0	27	26.0	3.3	26	24	29
Stevng	92.3	12	24.3	3.6	23	22	27
Sthend	100.0	15	26.2	1.7	26	25	28
Stoke	98.6	69	27.5	2.7	28	26	29
Sund	92.9	13	23.4	3.2	23	21	26
Truro	89.5	17	26.8	2.7	27	26	28
Wirral	100.0	17	26.8	2.7	27	25	28
Wolve	98.5	67	23.0	2.8	23	21	25
York	95.5	21	25.8	3.5	26	25	28

Table 8.11. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	17	25.4	2.6	25	24	27
Belfast	100.0	19	25.1	3.6	25	24	28
Newry	100.0	18	26.3	3.7	27	23	29
Ulster	100.0	6					
West NI	100.0	9					
Wales							
Bangor	100.0	13	26.0	3.0	27	23	28
Cardff	94.4	68	25.7	2.8	26	25	27
Clwyd	92.3	12	23.5	2.5	24	22	25
Swanse	98.2	54	27.0	2.7	27	25	30
Wrexm	100.0	33	26.1	3.0	26	25	28
England	**88.8**	**2,311**	**24.7**	**3.3**	**25**	**22**	**27**
N Ireland	**100.0**	**69**	**25.2**	**3.3**	**25**	**23**	**27**
Wales	**96.8**	**180**	**26.0**	**2.9**	**26**	**25**	**28**
E, W & NI	**89.5**	**2,560**	**24.8**	**3.3**	**25**	**23**	**27**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
[a]Cambridge renal centre was unable to submit bicarbonate data for 2015
[b]n/a – no PD patients

Table 8.12. Percentage of peritoneal dialysis patients within, below and above the range for bicarbonate (22–30 mmol/L) by centre in 2015

Centre	*N*	% bicarb 22–30 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <22 mmol/L	% bicarb >30 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	40	55.0	39.6	69.5	45.0	0.0	−22.4	−43.7	−1.1
B QEH	112	81.3	73.0	87.4	18.8	0.0	−6.3	−15.9	3.4
Basldn	27	85.2	66.5	94.3	11.1	3.7	3.4	−17.6	24.3
Bradfd	13	92.3	60.9	98.9	0.0	7.7	−1.4	−20.2	17.3
Brightn	60	81.7	69.9	89.6	15.0	3.3	−1.7	−15.6	12.3
Bristol	47	44.7	31.3	58.9	55.3	0.0	−20.8	−39.7	−1.8
Carlis	30	80.0	62.1	90.7	20.0	0.0	−10.9	−29.6	7.8
Chelms	22	81.8	60.4	93.0	13.6	4.6	−7.1	−28.8	14.6
Covnt	72	80.6	69.8	88.1	15.3	4.2	−10.4	−21.5	0.8
Derby	73	80.8	70.2	88.3	17.8	1.4	−2.0	−14.7	10.6
Donc	18	61.1	37.9	80.2	38.9	0.0	−22.2	−49.2	4.8
Dorset	35	68.6	51.7	81.7	31.4	0.0	5.5	−15.2	26.3
Dudley	52	86.5	74.4	93.4	7.7	5.8	7.4	−7.4	22.1
Exeter	70	78.6	67.4	86.7	20.0	1.4	−9.4	−21.3	2.5
Glouc	28	82.1	63.6	92.4	17.9	0.0	−12.5	−28.4	3.5

Table 8.12. Continued

Centre	*N*	% bicarb 22–30 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <22 mmol/L	% bicarb >30 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
Hull	65	78.5	66.9	86.8	18.5	3.1	−7.7	−20.7	5.4
Ipswi	27	92.6	74.8	98.1	7.4	0.0	15.9	−2.2	34.0
Kent	54	85.2	73.1	92.4	14.8	0.0	0.7	−12.6	14.0
L Barts	179	81.6	75.2	86.6	18.4	0.0	4.2	−4.0	12.4
L Guys	29	82.8	64.7	92.6	17.2	0.0	17.8	−7.3	42.8
L Kings	79	92.4	84.1	96.6	2.5	5.1	−5.1	−11.8	1.7
L Rfree	109	83.5	75.3	89.3	13.8	2.8	−0.4	−10.4	9.7
L St.G	44	95.5	83.6	98.9	4.6	0.0	9.1	−2.8	21.0
L West	46	65.2	50.6	77.5	32.6	2.2	−7.5	−26.6	11.5
Leeds	50	70.0	56.0	81.0	14.0	16.0	−11.6	−28.3	5.1
Leic	91	74.7	64.8	82.6	13.2	12.1	−9.3	−20.7	2.2
Liv Ain	27	92.6	74.8	98.1	3.7	3.7	2.0	−12.2	16.1
Liv Roy	61	88.5	77.8	94.4	9.8	1.6	−3.3	−14.4	7.8
M RI	58	75.9	63.3	85.2	24.1	0.0	−8.6	−23.0	5.8
Middlbr*	14	57.1	31.6	79.4	0.0	42.9			
Newc	38	86.8	72.0	94.4	10.5	2.6	5.9	−10.1	21.9
Norwch	27	66.7	47.3	81.7	33.3	0.0	26.7	1.7	51.6
Oxford	69	72.5	60.8	81.7	26.1	1.5	−5.2	−19.7	9.4
Plymth	27	81.5	62.5	92.1	18.5	0.0	−4.2	−23.8	15.3
Ports	56	82.1	69.9	90.1	12.5	5.4	−0.9	−14.8	13.0
Prestn	49	85.7	72.9	93.0	2.0	12.2	9.6	−6.1	25.4
Redng	59	88.1	77.1	94.2	0.0	11.9	6.2	−6.5	18.9
Sheff	53	64.2	50.5	75.8	35.9	0.0	−12.8	−30.0	4.5
Shrew	27	88.9	70.7	96.4	7.4	3.7	−3.1	−19.0	12.8
Stevng	12	75.0	44.8	91.7	25.0	0.0	−16.7	−43.5	10.2
Sthend	15	100.0	0.0	100.0	0.0	0.0	6.3	−5.6	18.1
Stoke	69	88.4	78.5	94.1	1.5	10.1	5.1	−6.4	16.5
Sund	13	69.2	40.9	88.0	30.8	0.0	−16.5	−47.6	14.6
Truro	17	88.2	63.2	97.0	5.9	5.9	0.7	−21.6	23.0
Wirral	17	88.2	63.2	97.0	0.0	11.8	9.7	−16.7	36.1
Wolve	67	65.7	53.6	76.0	32.8	1.5	−10.4	−25.5	4.7
York	21	81.0	58.9	92.7	9.5	9.5	−9.5	−30.5	11.4
N Ireland									
Antrim*	17	88.2	63.2	97.0	5.9	5.9			
Belfast	19	89.5	66.3	97.4	10.5	0.0	2.8	−19.3	24.9
Newry	18	83.3	59.1	94.5	11.1	5.6	−2.4	−27.5	22.8
Wales									
Bangor	13	92.3	60.9	98.9	7.7	0.0	12.3	−12.6	37.2
Cardff	68	91.2	81.7	96.0	5.9	2.9	10.0	−1.4	21.4
Clwyd*	12	75.0	44.8	91.7	25.0	0.0			
Swanse	54	90.7	79.6	96.1	1.9	7.4	11.2	−2.5	24.8
Wrexm	33	81.8	65.0	91.6	12.1	6.1	−0.8	−21.1	19.5
England	**2,311**	**79.6**	**77.9**	**81.2**	**16.8**	**3.6**	**−2.3**	**−4.6**	**−0.1**
N Ireland	**69**	**87.0**	**76.8**	**93.1**	**10.1**	**2.9**	**1.3**	**−11.4**	**13.9**
Wales	**180**	**88.3**	**82.8**	**92.3**	**7.2**	**4.4**	**7.1**	**−0.5**	**14.7**
E, W & NI	**2,560**	**80.4**	**78.8**	**81.9**	**15.9**	**3.7**	**−1.6**	**−3.7**	**0.6**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Blank cells indicate no data for 2014

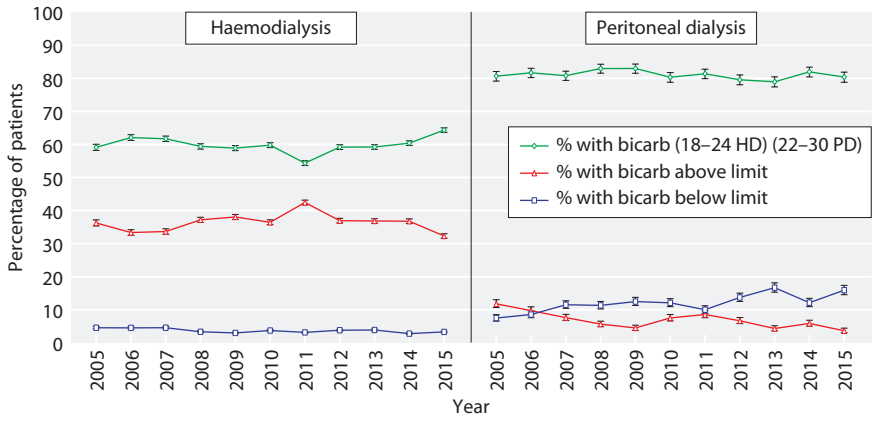

Fig. 8.14. Longitudinal change in percentage of patients within the range for bicarbonate by dialysis modality 2005–2015

differences in dialysis, residual renal function and oral bicarbonate prescriptions may all contribute to the variation observed.

Serial trends in serum bicarbonate measures between 2005 and 2015 by dialysis modality are presented in figure 8.14. Achievement of bicarbonate audit measures has not changed over the past decade for either modality. There has been a consistent difference between the modalities in the percentage with raised bicarbonate measures.

Discussion

A number of studies have demonstrated reduced dialysis patient survival with disordered calcium and phosphate levels [9, 10] as well as with inadequate simultaneous control of three MBD parameters [11–13]. This chapter presents the results of MBD management for established renal failure patients in the UK and demonstrates the overall ongoing improvement in achieving measures. However, the inter- and intra-centre variation in the control of MBD parameters remains a challenge. Some of these apparent differences may be as a result of confounding factors, rather than true differences in the quality of care. Analyses including adjustment for patient level factors will be undertaken in future years when the enhanced UKRR dataset is available from renal centres, such as comorbidity, phosphate binder, calcium mimetic and vitamin D analogue use and the dialysis dose and dialysate concentrations prescribed. In addition to adjusting for patient level factors (to account for case-mix) there are also centre level factors. The UKRR 7th Annual Report chapter 8 [14] discussed the problems related to variations in calcium and PTH measurements. It is an aspiration for future work also to integrate these into the analyses, such as assays used for the biochemical parameters and the local reference ranges. Overall data completeness was good for the biochemical variables presented in this chapter with some exceptions and data completeness has improved over the years. However, the UKRR will need to attain good data completeness for a host of other patient and centre level variables in order to undertake the adjusted analyses described.

Serum bicarbonate levels have not changed significantly compared with recent years, but a persistent fraction of HD patients still have raised bicarbonate levels. The UKRR has previously conducted a limited survey [15] into the possible underlying causes of serum bicarbonate variation. The study examined measures of sample processing and of dialysis treatment. It did not adjust for case-mix and was unable to detect any significant differences between centres. Studies have identified an increased risk of death stratified by a reduced predialysis serum bicarbonate level (<17 mmol/L) or with raised levels (>27 mmol/L) [16–17], as well as with raised dialysate bicarbonate concentrates [11]. Future analysis of management of acidosis will have to re-explore the factors associated with an increased trend in developing alkalosis in HD patients.

Conflicts of interest: the authors declare no conflict of interest

References

1 Renal Association. Clinical Practice Guidelines. 6th Edition. http://www.renal.org/guidelines/currentguidelines
2 Kidney Disease: Improving Global Outcomes (KDIGO) CKD–MBD Work Group. KDIGO clinical practice guideline for the diagnosis, evaluation, prevention, and treatment of chronic kidney disease–mineral and bone disorder (CKD–MBD). Kidney International 2009;76(Suppl 113): S1–S130

3 Steddon S, Sharples E. Renal Association Clinical Practice Guideline. CKD-Mineral and Bone Disorders, 2015. http://www.renal.org/docs/default-source/default-document-library/ckd-mineral-and-bone-disorders-(ckd-mbd)204ca231181561659443ff000014d4d8.pdf?sfvrsn=0
4 Ansell D, Tomson CRV, Chapter 15 UK Renal Registry Annual Report: U.K. Renal Registry, UKRR database, validation and methodology. Nephron Clin Pract. 2009;111(Suppl 1):c277–85
5 Morton AR, Garland JS, Holden RM: Is the calcium correct? Measuring serum calcium in dialysis patients. Semin Dial. 2010;23(3):283–289
6 Spiegelhalter DJ: Funnel plots for comparing institutional performance. Statistics in Medicine 2005;24:1185–1202
7 Mactier R, Hoenich N, Breen C. Renal Association Clinical Practice Guideline Haemodialysis, 2009. http://www.renal.org/guidelines/old-guidelines. Woodrow G, Davies S. Renal Association Clinical Practice Guideline Peritoneal Dialysis, 2010. http://www.renal.org/guidelines/old-guidelines
8 Noordzij M, Korevaar JC, Bos WJ, Boeschoten EW, Dekker FW, Bossuyt PM, Krediet RT: Mineral metabolism and cardiovascular morbidity and mortality risk: peritoneal dialysis patients compared with haemodialysis patients. Nephrol Dial Transplant 2006;21:2513–2520.
9 Kalantar-Zadeh K, Kuwae N, Regidor DL, Kovesdy CP, Kilpatrick RD, Shinaberger CS, McAllister CJ, Budoff MJ, Salusky IB, Kopple JD: Survival predictability of time-varying indicators of bone disease in maintenance hemodialysis patients. Kidney Int 2006;70:771–780.
10 Tentori F, Blayney MJ, Albert JM, Gillespie BW, Kerr PG, Bommer J, Young EW, Akizawa T, Akiba T, Pisoni RL, Robinson BM, Port FK: Mortality risk for dialysis patients with different levels of serum calcium, phosphorus, and PTH: the Dialysis Outcomes and Practice Patterns Study (DOPPS). Am J Kidney Dis 2008;52:519–530.
11 Block GA, Kilpatrick RD, Lowe KA, Wang W, Danese MD: CKD-mineral and bone disorder and risk of death and cardiovascular hospitalization in patients on hemodialysis. Clin J Am Soc Nephrol 2013;8:2132–2140.
12 Danese MD, Belozeroff V, Smirnakis K, Rothman KJ: Consistent control of mineral and bone disorder in incident hemodialysis patients. Clin J Am Soc Nephrol 2008;3:1423–1429.
13 Shaw C, Nicholas J, Pitcher D, Dawnay A: UK Renal Registry 17th Annual Report: Chapter 8 Biochemical Variables amongst UK Adult Dialysis Patients in 2013: National and Centre-specific Analyses. Nephron 2015;129(suppl 1):169–208.
14 Ansell D, Feest TG: Renal registry 7th annual report. Chapter 6: Adequacy of haemodialysis and serum bicarbonate, Renal registry 7th annual report. Chapter 6: Adequacy of haemodialysis and serum bicarbonate. 2004, pp 59–86.
15 Wu DY, Shinaberger CS, Regidor DL, McAllister CJ, Kopple JD, Kalantar-Zadeh K: Association between serum bicarbonate and death in hemodialysis patients: Is it better to be acidotic or alkalotic? Clinical Journal of the American Society of Nephrology 2006;1:70–78.
16 Lowrie EG, Lew NL: Death risk in hemodialysis patients: the predictive value of commonly measured variables and an evaluation of death rate differences between facilities. American Journal of Kidney Diseases 1990;15:458–482.
17 Bommer J, Locatelli F, Satayathum S, Keen ML, Goodkin DA, Saito A, Akiba T, Port FK, Young EW: Association of predialysis serum bicarbonate levels with risk of mortality and hospitalization in the Dialysis Outcomes and Practice Patterns Study (DOPPS). Am J Kidney Dis 2004;44:661–671.

Appendix 1 Attainment of individual standard for adjusted calcium, phosphate and PTH

This appendix includes analysis of the individual mineral bone measures that are included in the composite audit measure, namely adjusted calcium, phosphate and PTH within the recommended target ranges.

Adjusted calcium

In 2015, the following Renal Association clinical practice guideline regarding calcium management was applicable:

Guideline 2.2 CKD-MBD: Serum calcium in dialysis patients (stage 5D)

'We suggest that serum calcium, adjusted for albumin concentration, should be maintained within the normal reference range for the laboratory used, measured before a "short-gap" dialysis session in haemodialysis patients. Ideally, adjusted serum calcium should be maintained between 2.2 and 2.5 mmol/L, with avoidance of hypercalcaemic episodes (2D)' [3].

In 2015, data from 22,175 HD and 2,998 PD patients across the UK were available for serum adjusted calcium analysis. The data were 98.4% complete for HD patients and 98.7% complete for PD patients overall, although there was between centre variation (tables 8.13, 8.15). From 2004 to 2015 across UK centres, data completeness for serum adjusted calcium increased from 57.2% to 98.0% in HD patients and from 56.8% to 98.7% in PD patients.

London West and Belfast did not return locally adjusted calcium results for any patients, whilst Sunderland and Wirral returned adjusted calcium results for only a proportion of their patients. Hence these data are shown after adjustment using a generic formula that may not be applicable to the calcium and albumin methods used locally and may have over- or underestimated the adjusted calcium. These centres are served

Table 8.13. Summary statistics for adjusted calcium in haemodialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	99.8	396	2.4	0.2	2.4	2.3	2.5
B QEH	98.3	917	2.3	0.2	2.3	2.2	2.4
Basldn	99.4	152	2.4	0.2	2.4	2.3	2.5
Bradfd	100.0	217	2.4	0.1	2.3	2.3	2.4
Brightn	100.0	402	2.3	0.2	2.3	2.2	2.4
Bristol	100.0	489	2.4	0.1	2.4	2.3	2.5
Camb*							
Carlis	100.0	74	2.3	0.2	2.3	2.2	2.4
Carsh	99.7	759	2.3	0.2	2.3	2.2	2.4
Chelms	99.3	138	2.3	0.2	2.3	2.2	2.4
Colchr	94.6	105	2.4	0.1	2.4	2.3	2.4
Covnt	100.0	332	2.3	0.2	2.3	2.2	2.4
Derby	99.6	221	2.5	0.2	2.5	2.4	2.6
Donc	100.0	163	2.4	0.1	2.4	2.3	2.5
Dorset	100.0	270	2.3	0.1	2.3	2.2	2.4
Dudley	100.0	155	2.3	0.2	2.3	2.2	2.4
Exeter	100.0	403	2.4	0.1	2.3	2.3	2.4
Glouc	100.0	216	2.4	0.1	2.4	2.3	2.4
Hull	99.7	326	2.4	0.2	2.4	2.3	2.5
Ipswi	100.0	129	2.4	0.2	2.4	2.3	2.5
Kent	99.5	395	2.4	0.2	2.4	2.3	2.5
L Barts	100.0	928	2.3	0.2	2.3	2.2	2.4
L Guys	100.0	629	2.3	0.2	2.4	2.2	2.4
L Kings	100.0	522	2.3	0.2	2.3	2.2	2.4
L Rfree	100.0	665	2.3	0.2	2.3	2.2	2.4

Table 8.13. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
L St.G	97.4	303	2.4	0.2	2.4	2.3	2.5
L West	84.8	1,164	2.3	0.2	2.4	2.2	2.5
Leeds	100.0	470	2.4	0.2	2.3	2.3	2.4
Leic	100.0	839	2.4	0.2	2.4	2.3	2.5
Liv Ain	98.1	155	2.3	0.2	2.3	2.2	2.4
Liv Roy	99.4	354	2.4	0.2	2.4	2.3	2.4
M RI	93.7	445	2.4	0.2	2.4	2.3	2.5
Middlbr	100.0	323	2.3	0.2	2.3	2.1	2.4
Newc	100.0	285	2.3	0.2	2.4	2.2	2.4
Norwch	99.7	311	2.4	0.2	2.4	2.3	2.5
Nottm	100.0	350	2.4	0.2	2.4	2.3	2.4
Oxford	99.5	396	2.4	0.2	2.4	2.3	2.5
Plymth	98.5	127	2.3	0.2	2.3	2.2	2.4
Ports	99.8	616	2.4	0.2	2.3	2.2	2.4
Prestn	93.4	496	2.3	0.2	2.3	2.2	2.4
Redng	100.0	283	2.3	0.2	2.3	2.3	2.4
Salford	99.7	366	2.4	0.2	2.4	2.2	2.5
Sheff	99.6	515	2.3	0.2	2.3	2.2	2.4
Shrew	100.0	193	2.3	0.2	2.3	2.2	2.4
Stevng	100.0	468	2.3	0.2	2.3	2.2	2.4
Sthend	100.0	108	2.4	0.2	2.4	2.3	2.5
Stoke	95.5	294	2.3	0.2	2.3	2.3	2.4
Sund	100.0	206	2.3	0.2	2.2	2.2	2.3
Truro	100.0	145	2.4	0.2	2.4	2.3	2.5
Wirral	99.4	176	2.4	0.2	2.4	2.2	2.5
Wolve	99.3	284	2.4	0.2	2.4	2.3	2.5
York	100.0	145	2.4	0.1	2.4	2.3	2.5
N Ireland							
Antrim	100.0	114	2.3	0.2	2.4	2.3	2.4
Belfast	100.0	169	2.4	0.2	2.3	2.3	2.4
Newry	100.0	84	2.4	0.1	2.4	2.3	2.4
Ulster	99.0	96	2.5	0.2	2.5	2.4	2.6
West NI	100.0	113	2.3	0.1	2.3	2.2	2.4
Scotland							
Abrdn	100.0	205	2.4	0.2	2.4	2.2	2.5
Airdrie	100.0	174	2.4	0.2	2.4	2.3	2.5
D & Gall	96.2	50	2.3	0.2	2.3	2.2	2.4
Dundee	98.8	171	2.4	0.2	2.4	2.3	2.5
Edinb	98.8	249	2.5	0.2	2.5	2.3	2.6
Glasgw	99.6	543	2.4	0.2	2.4	2.3	2.5
Inverns	98.7	77	2.3	0.2	2.3	2.2	2.4
Klmarnk	100.0	124	2.4	0.2	2.4	2.3	2.5
Krkcldy	100.0	132	2.3	0.2	2.3	2.2	2.4
Wales							
Bangor	100.0	78	2.3	0.2	2.2	2.2	2.4
Cardff	99.8	459	2.4	0.2	2.3	2.2	2.5
Clwyd	100.0	76	2.4	0.2	2.4	2.3	2.5
Swanse	100.0	342	2.4	0.2	2.3	2.3	2.4
Wrexm	100.0	99	2.3	0.2	2.3	2.2	2.4
England	**98.2**	**18,820**	**2.3**	**0.2**	**2.3**	**2.2**	**2.4**
N Ireland	**99.8**	**576**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Scotland	**99.4**	**1,725**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Wales	**99.9**	**1,054**	**2.3**	**0.2**	**2.3**	**2.2**	**2.4**
UK	**98.4**	**22,175**	**2.3**	**0.2**	**2.3**	**2.2**	**2.4**

*Cambridge renal centre was unable to submit adjusted calcium data for 2015

Table 8.14. Percentage of haemodialysis patients within, below and above the range for adjusted calcium (2.2–2.5 mmol/L) in 2015

Centre	*N*	% adjusted Ca 2.2–2.5 mmol/L	Lower 95% CI	Upper 95% CI	% adjusted Ca <2.2 mmol/L	% adjusted Ca >2.5 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	396	80.8	76.6	84.4	8.6	10.6	12.5	6.5	18.5
B QEH	917	76.4	73.6	79.1	18.0	5.6	2.2	−1.7	6.2
Basldn	152	82.2	75.3	87.5	4.0	13.8	1.5	−7.2	10.1
Bradfd	217	88.9	84.0	92.5	4.6	6.5	7.8	0.9	14.7
Brightn	402	82.1	78.0	85.5	9.2	8.7	−1.2	−6.5	4.1
Bristol	489	89.8	86.8	92.2	1.6	8.6	5.4	1.2	9.5
Carlis	74	71.6	60.4	80.7	17.6	10.8	−8.7	−23.0	5.6
Carsh	759	76.7	73.5	79.6	15.2	8.2	−0.3	−4.7	4.0
Chelms	138	78.3	70.6	84.4	16.7	5.1	−6.9	−16.1	2.3
Colchr	105	89.5	82.1	94.1	0.0	10.5	−3.8	−11.4	3.7
Covnt	332	78.9	74.2	83.0	11.1	9.9	0.2	−6.0	6.4
Derby	221	71.0	64.7	76.6	1.4	27.6	−1.3	−9.7	7.1
Donc	163	85.9	79.7	90.4	6.8	7.4	−0.9	−8.3	6.6
Dorset	270	85.9	81.3	89.6	8.9	5.2	4.2	−2.1	10.4
Dudley	155	80.0	73.0	85.6	11.0	9.0	1.1	−7.8	10.0
Exeter	403	90.8	87.6	93.3	1.7	7.4	2.1	−2.2	6.3
Glouc	216	86.6	81.4	90.5	5.1	8.3	2.6	−4.2	9.4
Hull	326	76.1	71.1	80.4	7.1	16.9	−8.7	−14.8	−2.5
Ipswi	129	75.2	67.0	81.9	4.7	20.2	−7.4	−17.6	2.8
Kent	395	73.7	69.1	77.8	7.3	19.0	−3.3	−9.4	2.8
L Barts	928	72.4	69.5	75.2	18.5	9.1	−0.6	−4.7	3.5
L Guys	629	80.9	77.7	83.8	10.7	8.4	−0.7	−5.4	4.0
L Kings	522	81.0	77.4	84.2	15.5	3.5	−1.4	−6.2	3.3
L Rfree	665	80.9	77.7	83.7	10.8	8.3	1.9	−2.4	6.2
L St.G	303	78.2	73.2	82.5	9.6	12.2	−4.2	−10.6	2.3
L West	1,164	73.5	70.9	76.0	13.9	12.5	2.0	−1.8	5.8
Leeds	470	84.5	80.9	87.5	6.2	9.4	5.1	0.2	10.0
Leic	839	80.7	77.9	83.2	7.6	11.7	1.0	−2.8	4.8
Liv Ain	155	85.2	78.7	89.9	8.4	6.5	4.9	−3.5	13.3
Liv Roy	354	80.5	76.1	84.3	10.5	9.0	−0.2	−6.1	5.7
M RI	445	81.6	77.7	84.9	5.6	12.8	5.0	−0.3	10.3
Middlbr	323	65.9	60.6	70.9	30.3	3.7	−1.5	−8.9	5.9
Newc	285	80.7	75.7	84.9	10.2	9.1	1.0	−5.7	7.7
Norwch	311	75.6	70.5	80.0	5.8	18.7	−3.7	−10.2	2.9
Nottm	350	83.1	78.9	86.7	6.9	10.0	−2.2	−7.6	3.2
Oxford	396	78.3	74.0	82.1	10.4	11.4	−1.5	−7.1	4.1
Plymth	127	74.8	66.5	81.6	21.3	3.9	−5.5	−15.7	4.7
Ports	616	78.7	75.3	81.8	10.1	11.2	−1.6	−6.2	3.0
Prestn	496	81.7	78.0	84.8	14.5	3.8	2.3	−2.6	7.2
Redng	283	79.9	74.8	84.1	12.4	7.8	−8.4	−14.5	−2.4
Salford	366	75.4	70.7	79.6	10.7	13.9	−5.1	−11.1	0.8
Sheff	515	80.8	77.1	84.0	11.7	7.6	0.2	−4.5	5.0
Shrew	193	79.8	73.5	84.9	10.9	9.3	−1.2	−9.4	6.9
Stevng	468	78.6	74.7	82.1	14.5	6.8	−7.0	−12.0	−2.1
Sthend	108	74.1	65.0	81.5	4.6	21.3	−3.2	−14.6	8.2
Stoke	294	85.0	80.5	88.7	7.5	7.5	4.0	−2.0	10.1
Sund	206	72.3	65.8	78.0	19.9	7.8	−1.9	−10.5	6.7
Truro	145	86.2	79.6	90.9	5.5	8.3	7.7	−1.2	16.6
Wirral	176	81.3	74.8	86.4	10.2	8.5	2.8	−5.5	11.0
Wolve	284	78.5	73.4	82.9	6.0	15.5	4.5	−2.5	11.5
York	145	87.6	81.2	92.0	2.8	9.7	5.3	−3.3	13.9

Table 8.14. Continued

Centre	*N*	% adjusted Ca 2.2–2.5 mmol/L	Lower 95% CI	Upper 95% CI	% adjusted Ca <2.2 mmol/L	% adjusted Ca >2.5 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
N Ireland									
Antrim	114	78.1	69.6	84.7	14.9	7.0	−0.3	−11.1	10.5
Belfast	169	87.0	81.0	91.3	8.3	4.7	6.6	−1.0	14.2
Newry	84	95.2	88.0	98.2	2.4	2.4	19.7	9.5	29.8
Ulster	96	59.4	49.3	68.7	2.1	38.5	−14.5	−27.8	−1.2
West NI	113	74.3	65.5	81.5	20.4	5.3	−4.7	−16.0	6.7
Scotland									
Abrdn	205	72.2	65.7	77.9	14.2	13.7	−9.5	−17.7	−1.3
Airdrie	174	81.6	75.2	86.7	3.5	14.9	−4.3	−12.0	3.4
D & Gall	50	76.0	62.3	85.8	12.0	12.0	−6.2	−22.5	10.1
Dundee	171	83.6	77.3	88.5	6.4	9.9	0.7	−7.3	8.7
Edinb	249	63.5	57.3	69.2	7.6	28.9	−5.1	−13.4	3.1
Glasgw	543	83.4	80.1	86.3	6.1	10.5	−5.3	−9.4	−1.1
Inverns	77	81.8	71.6	88.9	11.7	6.5	7.2	−6.3	20.7
Klmarnk	124	79.8	71.9	86.0	3.2	16.9	2.6	−7.5	12.6
Krkcldy	132	79.6	71.8	85.6	12.1	8.3	−2.0	−11.4	7.4
Wales									
Bangor	78	80.8	70.5	88.1	15.4	3.9	−5.3	−16.9	6.3
Cardff	459	76.3	72.1	79.9	12.0	11.8	−1.9	−7.3	3.6
Clwyd	76	81.6	71.3	88.8	7.9	10.5	8.1	−4.8	21.0
Swanse	342	83.3	79.0	86.9	7.3	9.4	6.3	0.3	12.4
Wrexm	99	78.8	69.6	85.7	15.2	6.1	1.3	−10.1	12.8
England	**18,820**	**79.4**	**78.8**	**80.0**	**10.8**	**9.8**	**0.4**	**−0.4**	**1.2**
N Ireland	**576**	**79.3**	**75.8**	**82.5**	**10.1**	**10.6**	**1.3**	**−3.4**	**6.0**
Scotland	**1,725**	**78.2**	**76.2**	**80.1**	**7.7**	**14.1**	**−3.7**	**−6.3**	**−1.0**
Wales	**1,054**	**79.5**	**77.0**	**81.8**	**10.7**	**9.8**	**1.6**	**−1.9**	**5.1**
UK	**22,175**	**79.3**	**78.8**	**79.8**	**10.6**	**10.1**	**0.2**	**−0.6**	**0.9**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness

by laboratories that report adjusted calcium results and therefore it should be possible to report the adjusted values to the UKRR.

Of HD patients, 79.3% (95% CI 78.8–79.8%) and of PD patients 77.8% (95% CI 76.3–79.2%) had an adjusted calcium between 2.2–2.5 mmol/L (tables 8.14, 8.16, figures 8.15, 8.17).

The proportion of hypocalcaemic patients in the UK was 10.6% for HD and 7.4% for PD (tables 8.14, 8.16). The proportion of hypercalcaemic patients in the UK was 10.1% for HD and 14.8% for PD (tables 8.14, 8.16).

Figure 8.16 presents the funnel plot of HD patients attaining adjusted calcium levels between 2.2 and 2.5 mmol/L in 2015. Five centre's results fell below the lower 99.9% confidence interval: Ulster, Edinburgh, Middlesbrough, London St Bartholomew's and London West. However, the London West data may be misleading since the centre failed to return locally adjusted calcium results. The percentage of HD patients with serum calcium within the reference range was significantly higher than the average (above the 99.9% confidence limit) in Newry, Colchester, Bradford, Exeter and Bristol.

Figure 8.18 presents the funnel plot of PD patients attaining the adjusted calcium levels between 2.2 and 2.5 mmol/L in 2015. Once corrected for centre size, no centre was significantly lower than the national average. There were three centres achieving a significantly higher percentage compared with the UK average: Truro, Leeds and Oxford.

Longitudinal changes in the control measures of serum adjusted calcium show improvements in the attained national standards. Hypocalcaemia in HD patients has declined since 2010, with no significant changes being observed in PD patients. In the same time period there has been a modest fall in hypercalcaemia in both modalities (figure 8.19).

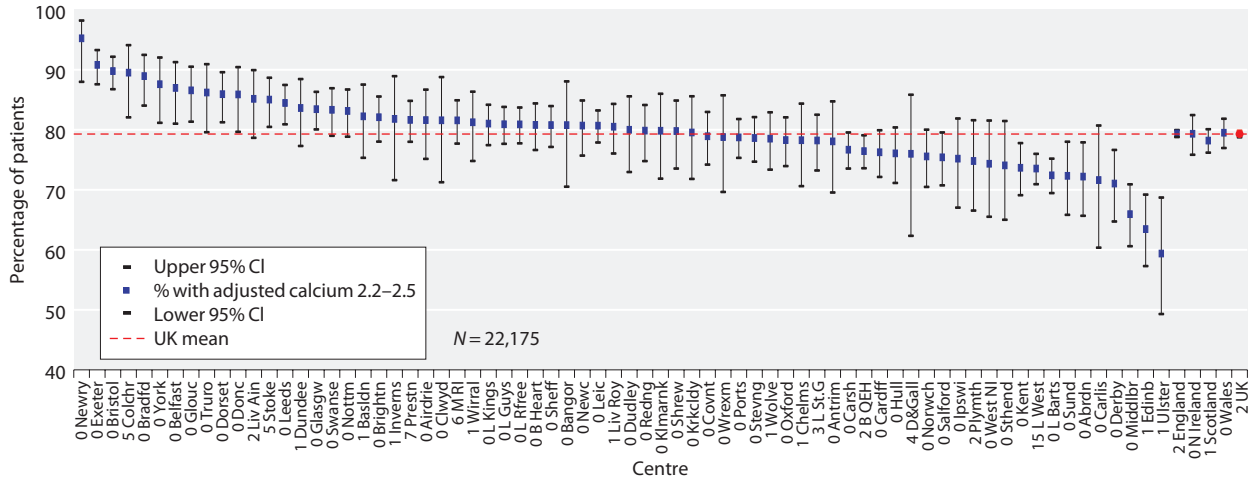

Fig. 8.15. Percentage of haemodialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2015

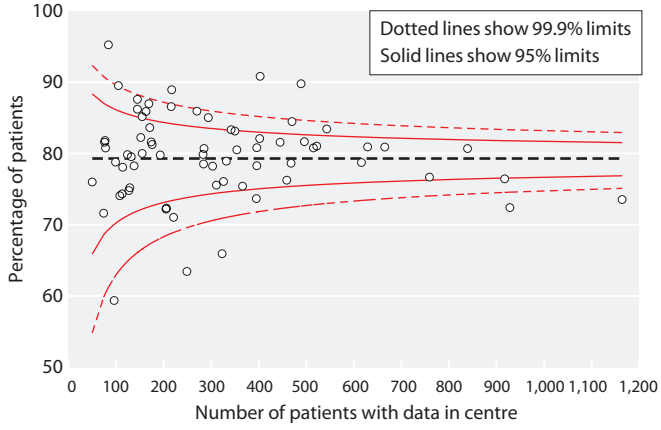

Fig. 8.16. Funnel plot of percentage of haemodialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2015

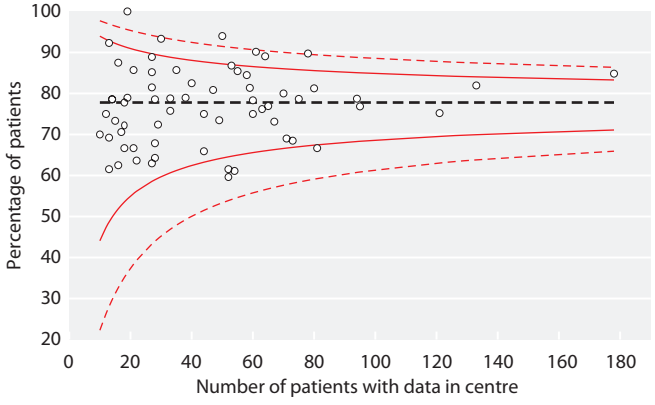

Fig. 8.18. Funnel plot of percentage of peritoneal dialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2015

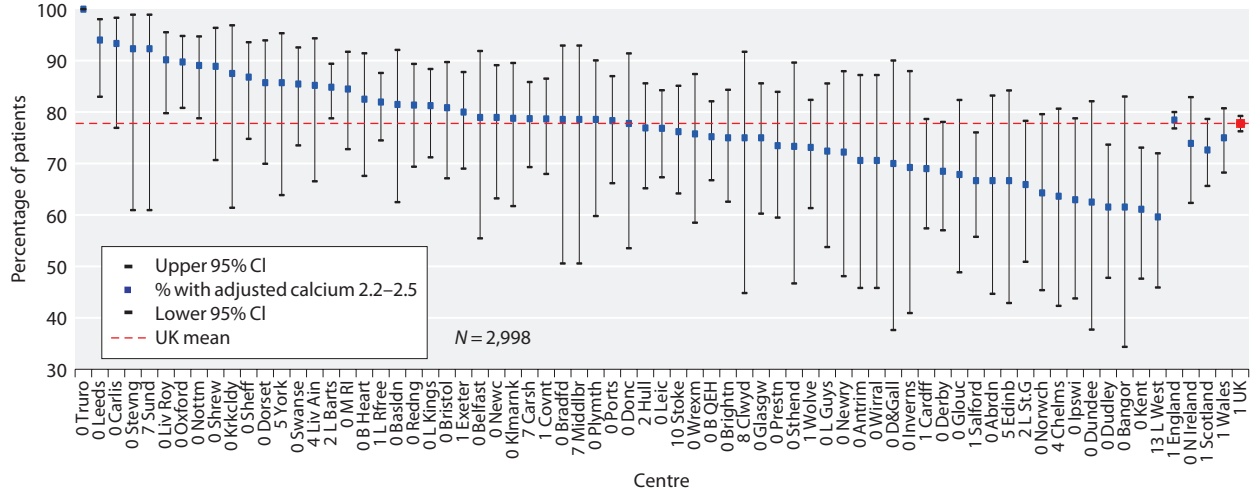

Fig. 8.17. Percentage of peritoneal dialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2015

Table 8.15. Summary statistics for adjusted calcium in peritoneal dialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	100.0	40	2.4	0.2	2.4	2.3	2.5
B QEH	100.0	121	2.3	0.2	2.3	2.2	2.5
Basldn	100.0	27	2.4	0.2	2.4	2.3	2.5
Bradfd	100.0	14	2.4	0.2	2.4	2.3	2.5
Brightn	100.0	60	2.4	0.2	2.4	2.3	2.5
Bristol	100.0	47	2.4	0.1	2.4	2.3	2.5
Camb[a]							
Carlis	100.0	30	2.3	0.1	2.3	2.2	2.3
Carsh	93.1	94	2.3	0.2	2.3	2.2	2.4
Chelms	95.7	22	2.3	0.2	2.3	2.2	2.4
Colchr[b]							
Covnt	98.7	75	2.4	0.2	2.3	2.2	2.4
Derby	100.0	73	2.5	0.1	2.5	2.4	2.6
Donc	100.0	18	2.4	0.2	2.4	2.3	2.5
Dorset	100.0	35	2.3	0.2	2.3	2.3	2.4
Dudley	100.0	52	2.5	0.2	2.5	2.4	2.6
Exeter	98.6	70	2.4	0.2	2.4	2.3	2.5
Glouc	100.0	28	2.4	0.2	2.4	2.3	2.5
Hull	98.5	65	2.4	0.1	2.4	2.3	2.5
Ipswi	100.0	27	2.3	0.2	2.3	2.2	2.4
Kent	100.0	54	2.5	0.1	2.5	2.4	2.6
L Barts	97.8	178	2.3	0.2	2.3	2.2	2.4
L Guys	100.0	29	2.4	0.1	2.4	2.3	2.5
L Kings	100.0	80	2.3	0.2	2.3	2.2	2.4
L Rfree	99.3	133	2.4	0.2	2.4	2.3	2.5
L St.G	97.8	44	2.5	0.2	2.5	2.4	2.6
L West	86.7	52	2.5	0.2	2.5	2.3	2.6
Leeds	100.0	50	2.4	0.1	2.4	2.3	2.4
Leic	100.0	95	2.4	0.2	2.4	2.3	2.5
Liv Ain	96.4	27	2.4	0.1	2.4	2.3	2.5
Liv Roy	100.0	61	2.4	0.1	2.3	2.3	2.4
M RI	100.0	58	2.4	0.2	2.4	2.3	2.5
Middlbr	93.3	14	2.2	0.2	2.2	2.2	2.3
Newc	100.0	38	2.4	0.2	2.4	2.3	2.5
Norwch	100.0	28	2.5	0.1	2.5	2.4	2.6
Nottm	100.0	64	2.4	0.2	2.4	2.3	2.5
Oxford	100.0	78	2.4	0.1	2.4	2.3	2.5
Plymth	100.0	28	2.3	0.2	2.3	2.2	2.4
Ports	100.0	60	2.4	0.2	2.4	2.3	2.5
Prestn	100.0	49	2.3	0.2	2.3	2.2	2.4
Redng	100.0	59	2.4	0.2	2.4	2.3	2.5
Salford	98.8	81	2.4	0.2	2.4	2.3	2.6
Sheff	100.0	53	2.3	0.1	2.3	2.2	2.4
Shrew	100.0	27	2.4	0.1	2.3	2.2	2.4
Stevng	100.0	13	2.3	0.1	2.3	2.2	2.4
Sthend	100.0	15	2.5	0.1	2.4	2.4	2.6
Stoke	90.0	63	2.4	0.2	2.4	2.3	2.5
Sund	92.9	13	2.4	0.1	2.4	2.3	2.4
Truro	100.0	19	2.4	0.1	2.4	2.3	2.4
Wirral	100.0	17	2.3	0.2	2.3	2.2	2.4
Wolve	98.5	67	2.4	0.2	2.4	2.3	2.4
York	95.5	21	2.4	0.1	2.5	2.3	2.5

Table 8.15. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	17	2.4	0.2	2.4	2.4	2.5
Belfast	100.0	19	2.4	0.2	2.4	2.2	2.4
Newry	100.0	18	2.4	0.1	2.4	2.4	2.5
Ulster	100.0	6					
West NI	100.0	9					
Scotland							
Abrdn	100.0	21	2.3	0.2	2.3	2.1	2.4
Airdrie	100.0	8					
D & Gall	100.0	10	2.4	0.2	2.4	2.2	2.5
Dundee	100.0	16	2.5	0.2	2.5	2.4	2.6
Edinb	94.7	18	2.5	0.1	2.5	2.4	2.6
Glasgw	100.0	44	2.4	0.2	2.4	2.3	2.5
Inverns	100.0	13	2.4	0.3	2.4	2.3	2.5
Klmarnk	100.0	33	2.4	0.2	2.4	2.3	2.5
Krkcldy	100.0	16	2.3	0.2	2.3	2.2	2.4
Wales							
Bangor	100.0	13	2.3	0.2	2.3	2.1	2.5
Cardff	98.6	71	2.4	0.2	2.5	2.3	2.5
Clwyd	92.3	12	2.5	0.2	2.5	2.5	2.5
Swanse	100.0	55	2.4	0.2	2.4	2.3	2.5
Wrexm	100.0	33	2.3	0.2	2.3	2.2	2.3
England	**98.5**	**2,566**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
N Ireland	**100.0**	**69**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Scotland	**99.4**	**179**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Wales	**98.9**	**184**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
UK	**98.7**	**2,998**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
[a]Cambridge renal centre was unable to submit adjusted calcium data for 2015
[b]n/a – no PD patients

Table 8.16. Percentage of peritoneal dialysis patients within, below and above the range for adjusted calcium (2.2–2.5 mmol/L) in 2015

Centre	*N*	% adjusted Ca 2.2–2.5 mmol/L	Lower 95% CI	Upper 95% CI	% adjusted Ca <2.2 mmol/L	% adjusted Ca >2.5 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	40	82.5	67.6	91.4	7.5	10.0	−1.9	−19.1	15.4
B QEH	121	75.2	66.8	82.1	14.9	9.9	−7.7	−18.0	2.6
Basldn	27	81.5	62.5	92.1	3.7	14.8	1.5	−20.0	22.9
Bradfd	14	78.6	50.6	92.9	7.1	14.3	−8.1	−35.6	19.4
Brightn	60	75.0	62.6	84.3	10.0	15.0	−8.3	−23.1	6.5
Bristol	47	80.9	67.1	89.7	0.0	19.2	6.3	−9.8	22.4
Carlis	30	93.3	76.9	98.3	6.7	0.0	20.6	0.0	41.2
Carsh	94	78.7	69.3	85.8	10.6	10.6	−1.5	−12.6	9.7
Chelms	22	63.6	42.3	80.7	22.7	13.6	−25.8	−50.2	−1.4
Covnt	75	78.7	68.0	86.5	8.0	13.3	0.4	−12.5	13.2
Derby	73	68.5	57.0	78.1	0.0	31.5	−0.1	−15.3	15.1
Donc	18	77.8	53.5	91.4	5.6	16.7	−5.6	−29.9	18.8
Dorset	35	85.7	70.0	93.9	5.7	8.6	−7.8	−21.4	5.8
Dudley	52	61.5	47.8	73.7	1.9	36.5	−14.5	−32.2	3.3
Exeter	70	80.0	69.0	87.8	7.1	12.9	−10.4	−21.7	1.0
Glouc	28	67.9	48.9	82.4	14.3	17.9	−15.9	−36.9	5.1

Table 8.16. Continued

Centre	*N*	% adjusted Ca 2.2–2.5 mmol/L	Lower 95% CI	Upper 95% CI	% adjusted Ca <2.2 mmol/L	% adjusted Ca >2.5 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
Hull	65	76.9	65.2	85.6	3.1	20.0	−0.3	−14.7	14.0
Ipswi	27	63.0	43.8	78.8	22.2	14.8	−10.4	−34.5	13.8
Kent	54	61.1	47.6	73.1	1.9	37.0	−6.1	−23.9	11.6
L Barts	178	84.8	78.8	89.4	11.2	3.9	9.0	1.0	17.1
L Guys	29	72.4	53.8	85.6	3.5	24.1	−27.6	−43.9	−11.3
L Kings	80	81.3	71.2	88.4	16.3	2.5	4.0	−8.6	16.6
L Rfree	133	82.0	74.5	87.6	9.0	9.0	0.7	−8.8	10.1
L St.G	44	65.9	50.9	78.3	0.0	34.1	−20.5	−37.7	−3.2
L West	52	59.6	45.9	72.0	0.0	40.4	3.4	−16.0	22.7
Leeds	50	94.0	83.0	98.1	2.0	4.0	2.2	−7.9	12.3
Leic	95	76.8	67.3	84.2	7.4	15.8	−5.7	−16.8	5.3
Liv Ain	27	85.2	66.5	94.3	0.0	14.8	13.3	−7.2	33.9
Liv Roy	61	90.2	79.8	95.5	3.3	6.6	8.5	−4.6	21.7
M RI	58	84.5	72.8	91.7	1.7	13.8	6.9	−7.3	21.1
Middlbr*	14	78.6	50.6	92.9	21.4	0.0			
Newc	38	79.0	63.2	89.1	5.3	15.8	0.4	−17.6	18.3
Norwch	28	64.3	45.4	79.6	0.0	35.7	4.3	−20.7	29.2
Nottm	64	89.1	78.8	94.7	4.7	6.3	15.5	2.7	28.2
Oxford	78	89.7	80.8	94.8	3.9	6.4	5.5	−5.1	16.1
Plymth	28	78.6	59.8	90.0	17.9	3.6	−11.4	−30.0	7.2
Ports	60	78.3	66.2	87.0	8.3	13.3	−7.2	−20.8	6.5
Prestn	49	73.5	59.5	83.9	14.3	12.2	−2.6	−20.1	14.8
Redng	59	81.4	69.4	89.4	5.1	13.6	−5.5	−18.6	7.5
Salford	81	66.7	55.8	76.0	1.2	32.1	−14.2	−28.1	−0.3
Sheff	53	86.8	74.8	93.6	5.7	7.6	−1.7	−14.3	10.9
Shrew	27	88.9	70.7	96.4	0.0	11.1	−3.1	−19.0	12.8
Stevng	13	92.3	60.9	98.9	7.7	0.0	3.9	−15.1	22.8
Sthend	15	73.3	46.7	89.6	0.0	26.7	−1.7	−32.5	29.2
Stoke	63	76.2	64.2	85.1	6.4	17.5	−1.3	−15.6	13.1
Sund	13	92.3	60.9	98.9	0.0	7.7	28.0	−1.0	57.0
Truro	19	100.0	0.0	100.0	0.0	0.0	22.2	3.0	41.4
Wirral	17	70.6	45.8	87.2	23.5	5.9	−16.1	−43.7	11.6
Wolve	67	73.1	61.3	82.4	13.4	13.4	−1.5	−16.2	13.1
York	21	85.7	63.9	95.3	0.0	14.3	−4.8	−24.3	14.8
N Ireland									
Antrim	17	70.6	45.8	87.2	11.8	17.7	−6.3	−37.9	25.2
Belfast	19	79.0	55.5	91.9	5.3	15.8	5.6	−23.3	34.5
Newry	18	72.2	48.1	87.9	5.6	22.2	0.8	−30.6	32.2
Scotland									
Abrdn	21	66.7	44.7	83.2	28.6	4.8	−2.6	−29.4	24.3
D & Gall	10	70.0	37.6	90.0	10.0	20.0	−8.6	−44.2	27.0
Dundee	16	62.5	37.7	82.1	0.0	37.5	−13.7	−43.6	16.2
Edinb	18	66.7	42.9	84.2	0.0	33.3	−7.0	−36.4	22.4
Glasgw	44	75.0	60.3	85.6	2.3	22.7	−8.3	−26.0	9.3
Inverns	13	69.2	40.9	88.0	7.7	23.1	−21.7	−52.0	8.6
Klmarnk	33	78.8	61.7	89.5	0.0	21.2	10.2	−10.5	31.0
Krkcldy	16	87.5	61.4	96.9	6.3	6.3	−4.8	−26.5	16.9
Wales									
Bangor	13	61.5	34.4	83.0	30.8	7.7	−11.8	−46.4	22.9
Cardff	71	69.0	57.4	78.7	7.0	23.9	−9.3	−23.8	5.3
Clwyd	12	75.0	44.8	91.7	8.3	16.7	−5.0	−39.9	29.9
Swanse	55	85.5	73.5	92.6	5.5	9.1	−0.3	−13.8	13.3
Wrexm	33	75.8	58.5	87.4	21.2	3.0	−15.5	−34.2	3.1
England	**2,566**	**78.5**	**76.8**	**80.0**	**7.2**	**14.4**	**−1.4**	**−3.6**	**0.8**
N Ireland	**69**	**73.9**	**62.3**	**82.9**	**8.7**	**17.4**	**−1.5**	**−16.8**	**13.7**
Scotland	**179**	**72.6**	**65.6**	**78.7**	**6.2**	**21.2**	**−4.3**	**−13.2**	**4.7**
Wales	**184**	**75.0**	**68.2**	**80.7**	**10.9**	**14.1**	**−6.9**	**−15.5**	**1.6**
UK	**2,998**	**77.8**	**76.3**	**79.2**	**7.4**	**14.8**	**−1.9**	**−4.0**	**0.1**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Blank cells indicate no data for 2014

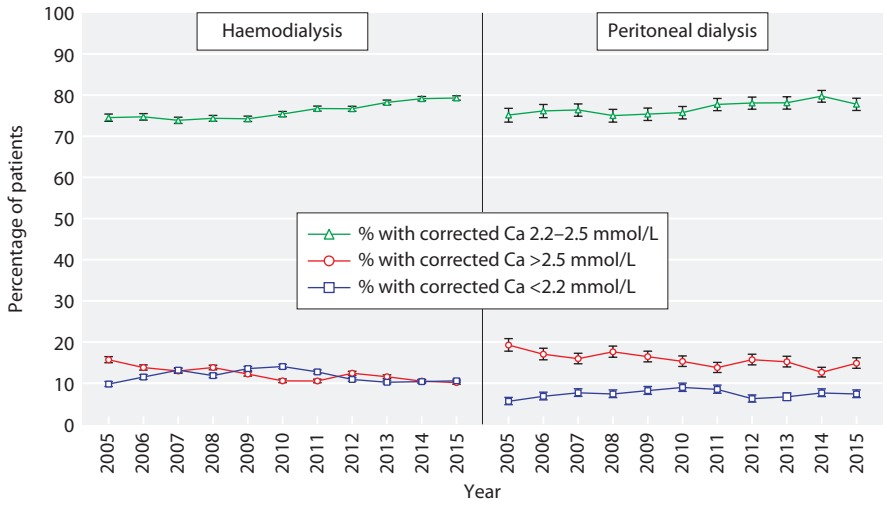

Fig. 8.19. Longitudinal change in percentage of patients with adjusted calcium <2.2 mmol/L, 2.2–2.5 mmol/L and >2.5 mmol/L by dialysis modality 2005–2015

Phosphate

In 2015 the following Renal Association clinical practice guideline regarding phosphate management was applicable:

Guideline 3.2 CKD-MBD: Serum phosphate in dialysis patients

'We suggest that serum phosphate in dialysis patients, measured before a "short-gap" dialysis session in haemodialysis patients, should be maintained between 1.1 and 1.7 mmol/L (2C)' [3]

For those receiving HD, 57.1% of patients achieved a phosphate level between 1.1–1.7 mmol/L, the guideline

Table 8.17. Percentage of haemodialysis patients with serum phosphate within, below or above the target range of 1.1–1.7 mmol/L, as specified in the RA guidelines, by centre in 2015

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	396	54.8	49.9	59.6	10.6	34.6	−0.3	−14.4	13.8
B QEH	905	62.7	59.5	65.8	14.6	22.8	−1.1	−13.6	11.5
Basldn	152	54.0	46.0	61.7	17.1	29.0	−2.2	−17.6	13.2
Bradfd	217	57.6	50.9	64.0	17.5	24.9	2.5	−12.2	17.2
Brightn	401	56.4	51.5	61.1	10.2	33.4	−2.1	−16.0	11.8
Bristol	489	60.5	56.1	64.8	10.8	28.6	4.3	−9.0	17.5
Carlis	74	52.7	41.4	63.8	16.2	31.1	−3.0	−21.3	15.2
Carsh	759	60.0	56.4	63.4	14.5	25.6	−2.4	−15.5	10.7
Chelms	138	52.2	43.9	60.4	12.3	35.5	−11.9	−27.7	3.9
Colchr	105	67.6	58.1	75.9	9.5	22.9	9.5	−5.6	24.6
Covnt	332	57.5	52.2	62.7	9.0	33.4	−2.4	−16.3	11.6
Derby	221	58.4	51.8	64.7	16.7	24.9	0.3	−14.1	14.7
Donc	163	63.8	56.2	70.8	8.0	28.2	−1.3	−15.4	12.9
Dorset	270	65.9	60.1	71.3	13.7	20.4	1.3	−11.9	14.4
Dudley	155	62.6	54.7	69.8	11.0	26.5	0.1	−14.4	14.5
Exeter	403	60.6	55.7	65.2	14.4	25.1	−0.2	−13.6	13.3
Glouc	216	59.7	53.1	66.1	10.2	30.1	−5.3	−19.6	8.9
Hull	326	57.4	51.9	62.6	12.0	30.7	−6.1	−20.1	7.9
Ipswi	129	58.1	49.5	66.3	22.5	19.4	3.4	−12.4	19.1
Kent	395	54.9	50.0	59.8	7.3	37.7	−2.7	−16.8	11.4
L Barts	928	51.5	48.3	54.7	16.7	31.8	3.3	−10.7	17.4

Table 8.17. Continued

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
L Guys	629	54.9	50.9	58.7	17.7	27.5	0.4	−13.6	14.4
L Kings	522	61.7	57.4	65.8	17.1	21.3	−5.2	−18.2	7.8
L Rfree	665	58.7	54.9	62.3	15.0	26.3	2.1	−11.2	15.4
L St.G	303	54.5	48.8	60.0	23.4	22.1	−5.4	−19.8	9.0
L West	1,259	57.9	55.2	60.6	18.5	23.6	2.9	−10.3	16.0
Leeds	470	54.7	50.2	59.1	13.2	32.1	2.4	−11.6	16.3
Leic	839	55.1	51.7	58.4	13.0	31.9	−1.2	−14.8	12.5
Liv Ain	155	58.1	50.2	65.6	27.1	14.8	6.1	−9.0	21.2
Liv Roy	354	58.5	53.3	63.5	13.3	28.3	3.8	−10.0	17.6
M RI*	445	51.9	47.3	56.5	16.6	31.5	−2.4	−16.7	12.0
Middlbr	323	57.9	52.4	63.2	8.4	33.8	1.0	−13.0	15.0
Newc	285	57.9	52.1	63.5	11.2	30.9	−1.1	−15.3	13.0
Norwch	311	65.0	59.5	70.1	12.5	22.5	2.3	−10.8	15.4
Nottm	350	64.6	59.4	69.4	14.6	20.9	8.0	−5.1	21.1
Oxford	396	49.2	44.3	54.2	14.4	36.4	−0.6	−15.3	14.0
Plymth	127	60.6	51.9	68.7	9.5	29.9	1.7	−13.5	16.9
Ports	615	50.4	46.5	54.4	12.7	36.9	−0.3	−14.7	14.1
Prestn	531	57.1	52.8	61.2	8.9	34.1	3.7	−10.0	17.3
Redng	283	59.4	53.5	64.9	12.0	28.6	−7.8	−21.7	6.1
Salford*	366	52.5	47.3	57.5	17.8	29.8	2.2	−12.2	16.6
Sheff	515	60.6	56.3	64.7	11.8	27.6	0.4	−12.7	13.5
Shrew	193	58.6	51.5	65.3	9.3	32.1	−1.8	−16.5	12.9
Stevng	468	56.0	51.5	60.4	9.8	34.2	−4.8	−18.6	9.1
Sthend	108	52.8	43.4	62.0	12.0	35.2	−5.4	−21.6	10.8
Stoke	300	55.0	49.3	60.5	16.0	29.0	−6.8	−21.1	7.5
Truro	145	63.5	55.3	70.9	11.0	25.5	−4.0	−18.5	10.6
Wirral	176	51.1	43.8	58.4	21.0	27.8	−0.7	−16.1	14.6
Wolve	284	48.6	42.8	54.4	23.2	28.2	−4.4	−19.5	10.7
York	145	60.0	51.8	67.7	25.5	14.5	−2.9	−18.1	12.3
N Ireland									
Antrim	114	61.4	52.2	69.9	20.2	18.4	1.9	−13.5	17.4
Belfast	169	46.2	38.8	53.7	23.7	30.2	−2.0	−17.8	13.8
Newry	84	59.5	48.8	69.5	9.5	31.0	2.5	−13.9	19.0
Ulster	97	60.8	50.8	70.0	13.4	25.8	2.3	−13.7	18.3
West NI	113	61.1	51.8	69.6	3.5	35.4	5.1	−10.8	20.9
Scotland									
Abrdn	205	59.0	52.2	65.6	18.5	22.4	0.4	−14.2	14.9
Airdrie	174	56.3	48.9	63.5	20.7	23.0	−3.0	−17.9	11.9
D & Gall	49	63.3	49.1	75.5	6.1	30.6	9.9	−9.1	29.0
Dundee	171	50.3	42.9	57.7	7.6	42.1	−2.5	−18.1	13.2
Edinb	247	53.9	47.6	60.0	7.3	38.9	0.8	−13.9	15.4
Glasgw	535	53.1	48.8	57.3	8.8	38.1	−1.8	−15.9	12.4
Inverns	77	49.4	38.4	60.4	9.1	41.6	−7.4	−25.4	10.7
Klmarnk	124	58.1	49.2	66.4	20.2	21.8	2.0	−13.4	17.4
Krkcldy	132	60.6	52.0	68.6	10.6	28.8	−3.7	−18.6	11.2
Wales									
Bangor	78	65.4	54.2	75.1	12.8	21.8	−0.4	−16.4	15.5
Cardff	459	59.7	55.1	64.1	13.1	27.2	1.7	−11.7	15.1
Clwyd	76	52.6	41.5	63.5	9.2	38.2	0.8	−16.3	17.9
Swanse	342	62.3	57.0	67.3	14.3	23.4	−3.3	−16.6	10.1
Wrexm	99	53.5	43.7	63.1	36.4	10.1	−2.3	−18.8	14.1
England	**18,736**	**57.2**	**56.5**	**57.9**	**14.3**	**28.6**	**−0.4**	**−13.2**	**12.5**
N Ireland	**577**	**56.5**	**52.4**	**60.5**	**15.3**	**28.3**	**1.8**	**−11.8**	**15.5**
Scotland	**1,714**	**55.0**	**52.7**	**57.4**	**11.7**	**33.3**	**−1.2**	**−14.6**	**12.2**
Wales	**1,054**	**59.9**	**56.9**	**62.8**	**15.4**	**24.8**	**−0.3**	**−13.2**	**12.6**
UK	**22,081**	**57.1**	**56.5**	**57.8**	**14.1**	**28.7**	**−0.4**	**−13.2**	**12.5**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness

*Salford and Manchester RI have been involved in the SPIRiT study – an RCT comparing low phosphate control (0.8 to 1.4 mmol/L) with high phosphate group control (1.8 to 2.4 mmol/L); HD patients only were recruited

Table 8.18. Percentage of peritoneal dialysis patients within, below and above the range specified in the RA guideline for phosphate (1.1–1.7 mmol/L) in 2015

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	40	50.0	35.0	65.0	10.0	40.0	−3.1	−26.3	20.1
B QEH	121	56.2	47.3	64.8	6.6	37.2	−6.7	−19.2	5.7
Basldn	27	59.3	40.3	75.8	7.4	33.3	3.3	−23.6	30.1
Bradfd	14	35.7	15.7	62.4	7.1	57.1	−1.8	−36.3	32.7
Brightn	60	68.3	55.6	78.8	0.0	31.7	−3.9	−20.7	12.9
Bristol	47	63.8	49.3	76.2	4.3	31.9	9.3	−9.7	28.3
Carlis	30	63.3	45.1	78.4	13.3	23.3	−9.4	−34.8	16.0
Carsh	93	58.1	47.8	67.6	9.7	32.3	−3.2	−16.7	10.3
Chelms	22	40.9	22.8	61.8	13.6	45.5	−9.1	−40.0	21.8
Covnt	74	67.6	56.2	77.2	13.5	18.9	−5.9	−20.3	8.6
Derby	73	67.1	55.6	76.9	11.0	21.9	2.8	−12.7	18.4
Donc	18	83.3	59.1	94.5	0.0	16.7	20.8	−5.1	46.7
Dorset	35	77.1	60.5	88.1	5.7	17.1	9.8	−9.7	29.2
Dudley	52	69.2	55.5	80.2	1.9	28.9	31.2	12.8	49.6
Exeter	70	72.9	61.3	82.0	7.1	20.0	3.0	−11.4	17.3
Glouc	28	60.7	42.0	76.7	7.1	32.1	−1.5	−25.4	22.5
Hull	65	58.5	46.2	69.7	6.2	35.4	−8.2	−24.7	8.3
Ipswi	27	63.0	43.8	78.8	14.8	22.2	−3.7	−28.5	21.1
Kent	54	66.7	53.2	77.9	7.4	25.9	9.8	−8.1	27.7
L Barts	179	60.3	53.0	67.2	10.1	29.6	−1.8	−11.7	8.2
L Guys	29	65.5	46.9	80.3	3.5	31.0	0.5	−26.6	27.7
L Kings	80	58.8	47.7	69.0	8.8	32.5	−12.1	−26.9	2.6
L Rfree	133	60.9	52.4	68.8	6.0	33.1	4.0	−8.1	16.0
L St.G	44	65.9	50.9	78.3	11.4	22.7	6.8	−13.4	27.0
L West	52	63.5	49.7	75.3	7.7	28.9	1.0	−18.0	19.9
Leeds	50	48.0	34.6	61.7	8.0	44.0	−13.2	−32.7	6.2
Leic	95	59.0	48.8	68.4	7.4	33.7	4.8	−8.8	18.4
Liv Ain	27	59.3	40.3	75.8	7.4	33.3	6.1	−19.2	31.5
Liv Roy	61	54.1	41.6	66.1	11.5	34.4	−13.3	−31.4	4.9
M RI	58	51.7	39.0	64.2	8.6	39.7	−13.8	−31.5	3.9
Middlbr*	14	71.4	44.0	88.9	7.1	21.4			
Newc	38	60.5	44.5	74.6	5.3	34.2	10.5	−11.2	32.2
Norwch	28	60.7	42.0	76.7	3.6	35.7	4.0	−21.3	29.4
Nottm	64	71.9	59.7	81.5	6.3	21.9	4.8	−10.6	20.2
Oxford	78	61.5	50.4	71.6	3.9	34.6	−5.6	−20.7	9.5
Plymth	28	64.3	45.4	79.6	17.9	17.9	−19.0	−41.2	3.2
Ports	59	54.2	41.5	66.4	3.4	42.4	−0.6	−18.3	17.1
Prestn	49	65.3	51.1	77.2	12.2	22.5	−8.6	−27.0	9.8
Redng	59	78.0	65.7	86.8	5.1	17.0	7.5	−8.1	23.1
Salford	81	56.8	45.9	67.1	3.7	39.5	2.4	−13.6	18.4
Sheff	53	66.0	52.4	77.4	5.7	28.3	−14.7	−31.4	1.9
Shrew	27	66.7	47.3	81.7	3.7	29.6	10.7	−15.7	37.0
Stevng	13	46.2	22.4	71.8	0.0	53.9	−38.5	−68.9	−8.0
Sthend	15	66.7	40.6	85.4	13.3	20.0	16.7	−17.5	50.9
Stoke	69	66.7	54.8	76.7	2.9	30.4	−0.9	−16.5	14.6
Sund	13	46.2	22.4	71.8	7.7	46.2	−3.9	−41.5	33.8
Truro	19	63.2	40.3	81.3	15.8	21.1	−14.6	−43.6	14.4
Wirral	17	47.1	25.5	69.7	0.0	52.9	20.4	−12.2	53.0
Wolve	67	67.2	55.1	77.3	11.9	20.9	9.4	−6.7	25.5
York	21	57.1	36.0	76.0	14.3	28.6	0.0	−29.9	29.9

Table 8.18. Continued

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
N Ireland									
Antrim	17	58.8	35.2	79.0	11.8	29.4	−2.7	−38.0	32.6
Belfast	19	63.2	40.3	81.3	10.5	26.3	9.8	−23.5	43.1
Newry	18	83.3	59.1	94.5	11.1	5.6	4.8	−22.8	32.3
Scotland									
Abrdn	21	42.9	24.0	64.0	4.8	52.4	−14.8	−43.3	13.6
D & Gall	10	40.0	15.8	70.3	20.0	40.0	−10.0	−51.5	31.5
Dundee	16	56.3	32.4	77.5	12.5	31.3	−19.9	−50.3	10.4
Edinb	18	61.1	37.9	80.2	11.1	27.8	−15.4	−45.6	14.9
Glasgw	44	61.4	46.4	74.5	6.8	31.8	−1.5	−23.0	20.0
Inverns	13	46.2	22.4	71.8	7.7	46.2	−17.5	−56.8	21.8
Klmarnk	33	39.4	24.4	56.7	3.0	57.6	−14.9	−38.4	8.6
Krkcldy	16	68.8	43.3	86.4	0.0	31.3	30.3	−4.6	65.2
Wales									
Bangor	13	46.2	22.4	71.8	7.7	46.2	−0.5	−37.6	36.5
Cardff	70	62.9	51.0	73.3	1.4	35.7	−6.7	−22.4	9.0
Clwyd	13	53.9	28.2	77.6	15.4	30.8	−6.2	−46.8	34.5
Swanse	55	58.2	44.9	70.4	10.9	30.9	−1.0	−20.0	18.0
Wrexm	33	57.6	40.5	73.0	3.0	39.4	1.1	−25.3	27.4
England	**2,570**	**61.9**	**60.0**	**63.7**	**7.6**	**30.6**	**−0.7**	**−3.3**	**2.0**
N Ireland	**69**	**71.0**	**59.3**	**80.5**	**10.1**	**18.8**	**2.6**	**−13.5**	**18.7**
Scotland	**179**	**52.5**	**45.2**	**59.7**	**7.3**	**40.2**	**−9.1**	**−19.3**	**1.2**
Wales	**184**	**58.7**	**51.5**	**65.6**	**6.0**	**35.3**	**−3.3**	**−13.6**	**6.9**
UK	**3,002**	**61.3**	**59.6**	**63.1**	**7.5**	**31.2**	**−1.2**	**−3.7**	**1.2**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Blank cells indicate no data for 2014

specified by the RA (as opposed to the audit measure), and for those on PD this was 61.3% (tables 8.17, 8.18).

There was inter-centre and inter-modality variation in the proportion of patients within the phosphate target range specified by the clinical guideline (figures 8.20–8.23, tables 8.17, 8.18).

Funnel plots for HD patients with phosphate within the target range (1.1–1.7 mmol/L), show one centre (Birmingham Queen Elizabeth) attaining this standard in a significantly high proportion of patients (being above the 99.9% upper confidence interval following correction for centre size). In addition, two centres had achieved the serum phosphate control standard in a lower than expected proportion of patients (being below the lower 99.9% confidence interval): Portsmouth and London St Bartholomew's (figure 8.21). Differences in outlier status can be seen when this guideline target measure is applied compared to the audit measure of phosphate <1.7 mmol/L, namely fewer centres are found to be outliers.

The funnel plot for PD patients indicated that the control of phosphate levels was similar in all centres. No significant outliers were identified (figure 8.23).

Longitudinal analysis demonstrated a stable performance against the clinical guideline recommendation for those receiving HD and PD (figure 8.24).

Parathyroid hormone

At the beginning of 2015 the following RA guideline for PTH applied:

Guideline 4.2.1 CKD-MBD: Target range of serum PTH in patients on dialysis

'We suggest that the target range for parathyroid hormone measured using an intact PTH assay should be between 2 and 9 times the upper limit of normal for the assay used (2C)' [3].

PTH results from 18,880 HD patients and 2,412 PD patients from England, Northern Ireland and Wales

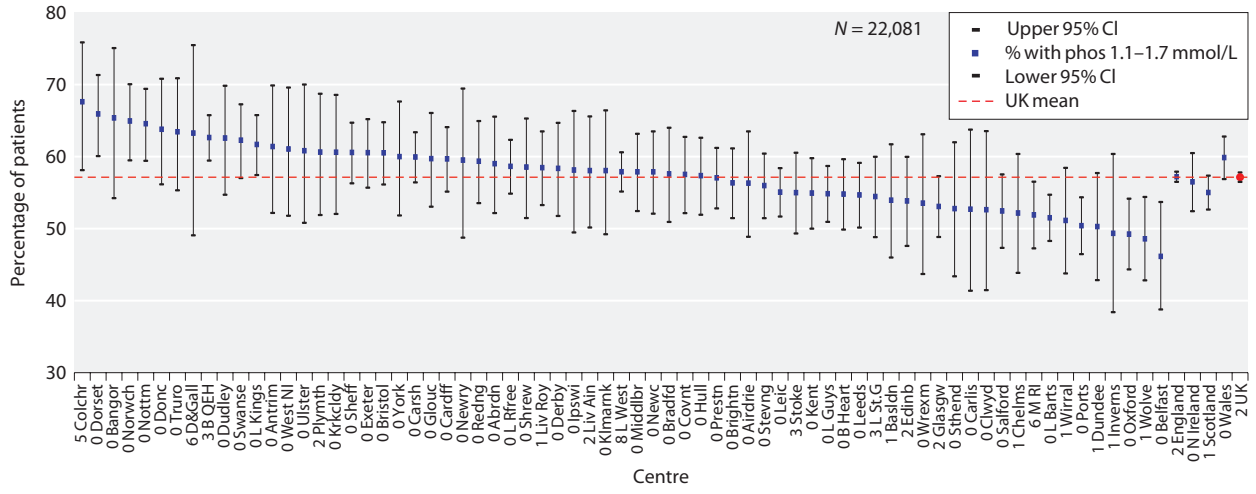

Fig. 8.20. Percentage of haemodialysis patients with phosphate within the range specified by the RA guideline (1.1–1.7 mmol/L) by centre in 2015

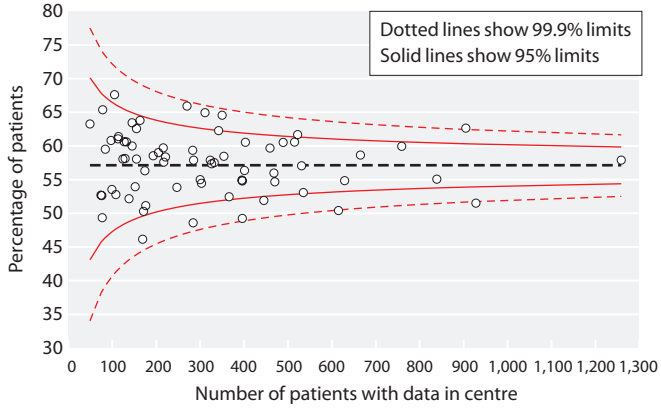

Fig. 8.21. Funnel plot of percentage of haemodialysis patients with phosphate within the range specified by the RA guideline (1.1–1.7 mmol/L) by centre in 2015

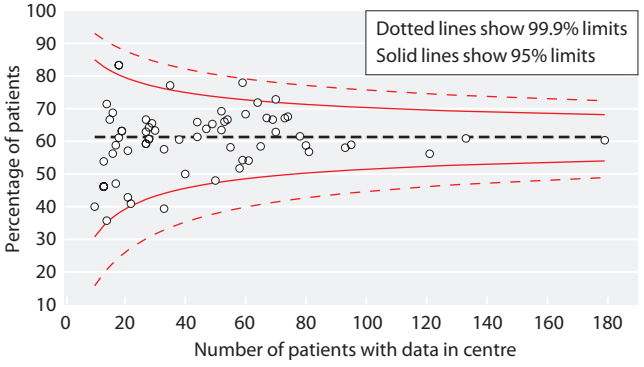

Fig. 8.23. Funnel plot of percentage of peritoneal dialysis patients with phosphate within the range specified by the RA guideline (1.1–1.7 mmol/L) by centre in 2015

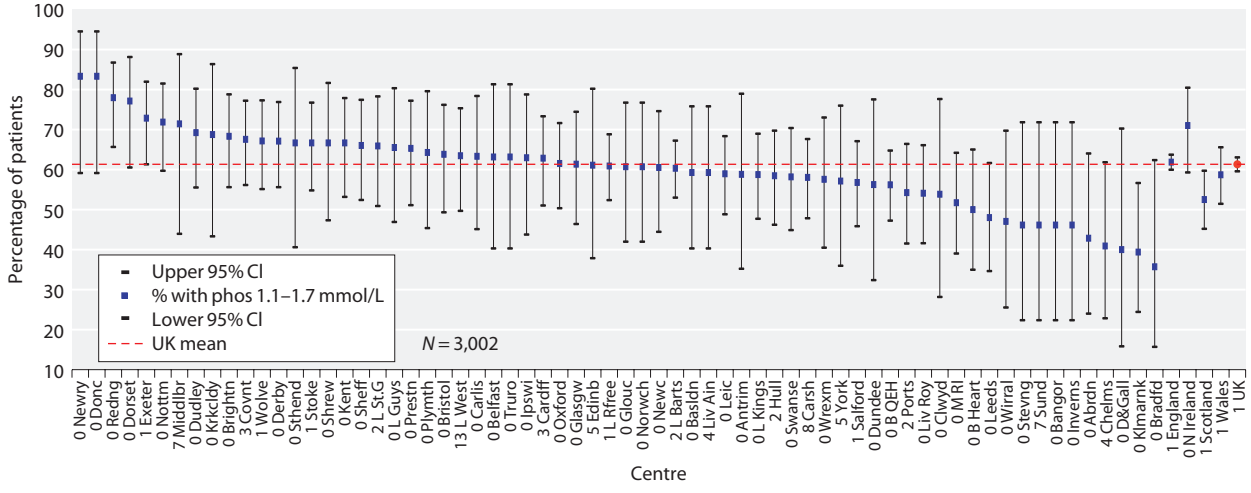

Fig. 8.22. Percentage of peritoneal dialysis patients with phosphate within the range specified by the RA guideline (1.1–1.7 mmol/L) by centre in 2015

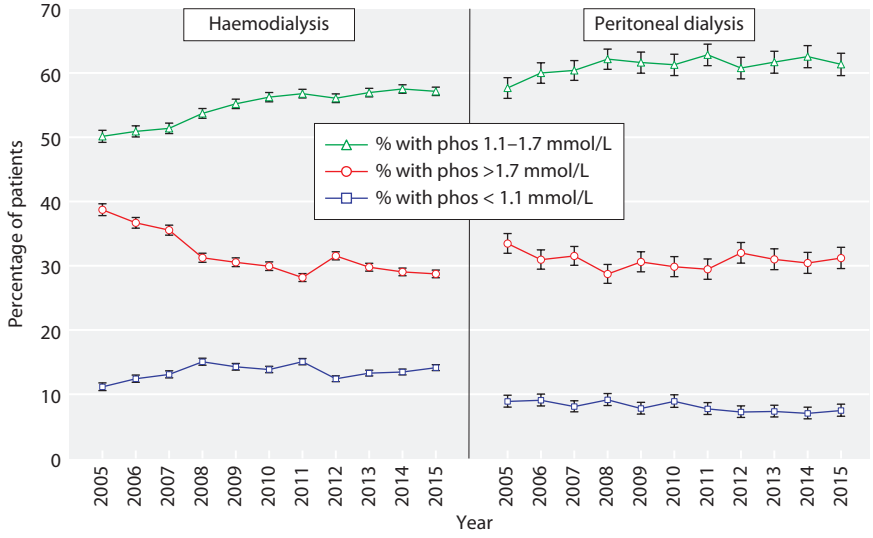

Fig. 8.24. Longitudinal change in percentage of patients with phosphate below, within and above the RA guideline by dialysis modality 2005–2015

were available for analysis from 2015. The data were 90.8% complete for HD patients and 84.4% for PD patients overall, although there was between centre variation (tables 8.19, 8.21). For the analyses, Birmingham Queen Elizabeth, Salford, Sheffield and Cambridge were excluded due to poor data completeness (including 0% returns from Cambridge for HD and PD patients and 0% returns from Salford for PD patients).

From 2004 to 2015 across the three countries, data completeness for PTH increased from 76.6% to 90.8% in HD patients, although this latest figure represents a 3% fall compared to 2014. For PD patients, the improvement in data completeness has been less marked: from 80.1% to 84.4% during 2004–2015 and this latest figure represents a fall from 91.7% in 2014.

Median PTH amongst HD patients was 32 pmol/L (IQR 16–60 pmol/L) and amongst PD patients was 30 pmol/L (IQR 17–53 pmol/L) for the three countries.

Of HD patients, 56.8% (95% CI 56.1–57.5%) and of PD patients, 63.6% (95% CI 61.6–65.5%) achieved a PTH between 16–72 pmol/L (tables 8.20, 8.22, figures 8.25, 8.27).

Table 8.19. Summary statistics for PTH in haemodialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	99.0	393	51.8	47.5	40	21	68
B QEH	40.7	380					
Basldn	98.0	150	43.7	35.9	33	18	59
Bradfd	98.2	213	39.1	40.2	26	13	47
Brightn	98.3	395	43.2	43.9	30	15	55
Bristol	99.2	485	39.2	40.0	28	14	51
Camb*							
Carlis	97.3	72	28.5	26.3	24	10	37
Carsh	96.2	732	66.8	63.0	47	25	89
Chelms	99.3	138	46.9	41.4	33	19	62
Colchr	94.6	105	31.0	33.0	21	12	37
Covnt	99.4	330	34.6	38.8	23	12	43
Derby	99.6	221	38.8	36.6	31	18	48
Donc	99.4	162	59.6	48.1	46	27	74
Dorset	99.6	269	30.0	33.5	20	11	37
Dudley	97.4	151	37.2	35.6	27	11	54
Exeter	98.8	398	20.4	20.3	15	7	26
Glouc	95.4	206	35.9	38.9	25	13	49
Hull	99.1	324	46.4	51.5	31	14	60

Table 8.19. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
Ipswi	99.2	128	26.7	25.0	20	13	33
Kent	98.5	391	62.9	49.3	48	29	76
L Barts	98.8	917	52.2	50.3	38	21	67
L Guys	99.1	623	57.8	55.8	44	21	77
L Kings	97.5	509	42.1	45.0	27	12	57
L Rfree	99.4	661	40.9	37.9	31	18	53
L St.G	92.6	288	53.5	51.4	40	19	69
L West	76.3	1,047	69.5	65.6	50	23	91
Leeds	99.2	466	38.6	43.2	24	12	48
Leic	98.1	823	45.5	49.0	29	12	63
Liv Ain	90.5	143	18.5	23.5	11	5	24
Liv Roy	79.5	283	38.4	36.6	28	12	54
M RI	89.7	426	49.9	52.5	34	18	64
Middlbr	97.5	315	51.7	50.2	36	20	64
Newc	99.7	284	48.1	42.6	37	18	66
Norwch	97.1	303	37.8	36.7	30	14	52
Nottm	97.4	341	40.7	38.9	30	16	53
Oxford	98.2	391	54.1	49.7	40	21	73
Plymth	93.8	121	47.2	48.2	32	18	61
Ports	98.1	605	54.5	56.4	38	21	67
Prestn	99.8	530	44.7	43.1	33	16	59
Redng	100.0	283	44.0	36.7	33	21	58
Salford	30.5	112					
Sheff	44.1	228					
Shrew	97.9	189	43.1	37.7	29	15	65
Stevng	97.9	458	53.8	39.0	48	29	76
Sthend	88.9	96	65.3	58.2	45	20	97
Stoke	85.7	264	48.4	44.2	38	21	62
Sund	97.6	201	49.4	53.5	32	15	60
Truro	98.6	143	22.8	22.4	15	7	33
Wirral	96.1	170	36.3	25.9	29	18	46
Wolve	94.4	270	41.7	51.1	26	11	52
York	97.2	141	26.0	30.7	14	6	37
N Ireland							
Antrim	100.0	114	34.5	35.6	27	14	39
Belfast	97.6	165	34.3	42.1	21	10	47
Newry	100.0	84	29.6	22.7	24	15	35
Ulster	97.9	95	30.0	30.7	21	10	37
West NI	99.1	112	31.6	26.0	24	13	46
Wales							
Bangor	100.0	78	30.9	32.4	22	13	38
Cardff	97.2	447	44.8	44.1	35	19	55
Clwyd	97.4	74	33.6	34.9	23	10	47
Swanse	99.4	340	38.0	38.1	27	15	49
Wrexm	98.0	97	30.0	41.1	16	5	35
England	**90.1**	**17,274**	**47.1**	**48.1**	**33**	**16**	**62**
N Ireland	**98.8**	**570**	**32.4**	**33.6**	**23**	**12**	**40**
Wales	**98.2**	**1,036**	**39.3**	**40.8**	**29**	**15**	**50**
E, W & NI	**90.8**	**18,880**	**46.3**	**47.4**	**32**	**16**	**60**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
*Cambridge renal centre was unable to submit PTH data for 2015

Table 8.20. Percentage of haemodialysis patients within, below and above the range for PTH (16–72 pmol/L) in 2015

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	393	59.0	54.1	63.8	18.6	22.4	3.8	−3.1	10.7
Basldn	150	58.0	50.0	65.6	22.7	19.3	−1.0	−12.0	10.1
Bradfd	213	54.0	47.3	60.6	31.0	15.0	−2.0	−11.7	7.7
Brightn	395	56.5	51.5	61.3	25.6	18.0	0.8	−6.2	7.7
Bristol	485	56.1	51.6	60.4	28.0	15.9	−3.1	−9.3	3.2
Carlis	72	55.6	44.0	66.6	36.1	8.3	3.9	−13.2	21.0
Carsh	732	52.6	49.0	56.2	14.6	32.8	−4.8	−10.0	0.4
Chelms	138	63.0	54.7	70.7	17.4	19.6	−6.8	−18.2	4.6
Colchr	105	58.1	48.5	67.1	33.3	8.6	−0.7	−14.1	12.7
Covnt	330	51.8	46.4	57.2	36.1	12.1	0.6	−7.1	8.3
Derby	221	73.3	67.1	78.7	17.2	9.5	−3.2	−11.3	4.9
Donc	162	62.4	54.7	69.5	11.7	25.9	−12.4	−22.3	−2.4
Dorset	269	52.4	46.4	58.3	39.0	8.6	2.2	−6.3	10.8
Dudley	151	55.0	47.0	62.7	31.8	13.3	1.4	−9.7	12.6
Exeter	398	43.7	38.9	48.6	53.0	3.3	1.4	−5.6	8.3
Glouc	206	59.2	52.4	65.7	30.6	10.2	−0.5	−10.0	9.0
Hull	324	53.7	48.3	59.1	28.1	18.2	0.1	−7.8	8.0
Ipswi	128	60.2	51.5	68.3	35.2	4.7	1.9	−10.5	14.3
Kent	391	60.1	55.2	64.8	9.0	31.0	−6.1	−13.0	0.7
L Barts	917	62.2	59.0	65.2	16.6	21.3	−3.4	−7.8	1.0
L Guys	623	52.3	48.4	56.2	18.8	28.9	−0.6	−6.9	5.7
L Kings	509	49.3	45.0	53.7	33.4	17.3	−2.3	−8.5	3.9
L Rfree	661	65.5	61.8	69.0	21.5	13.0	3.7	−1.5	8.9
L St.G	288	55.6	49.8	61.2	21.2	23.3	4.8	−3.5	13.1
L West	1,047	49.0	46.0	52.0	16.1	34.9	−0.7	−5.1	3.6
Leeds	466	54.1	49.5	58.6	30.9	15.0	−0.7	−7.1	5.7
Leic	823	49.9	46.5	53.4	30.4	19.7	−1.2	−6.1	3.6
Liv Ain	143	37.1	29.6	45.3	60.8	2.1	−1.0	−12.2	10.1
Liv Roy	283	51.2	45.4	57.0	33.2	15.6	−4.4	−12.3	3.5
M RI	426	59.4	54.7	64.0	20.2	20.4	2.1	−4.6	8.8
Middlbr	315	62.5	57.1	67.7	17.8	19.7	5.0	−2.8	12.8
Newc	284	59.2	53.3	64.7	20.4	20.4	−1.4	−9.6	6.8
Norwch	303	62.7	57.1	68.0	27.1	10.2	−0.9	−8.6	6.8
Nottm	341	61.3	56.0	66.3	24.1	14.7	2.5	−4.9	9.8
Oxford	391	58.6	53.6	63.4	15.6	25.8	0.0	−6.9	6.8
Plymth	121	60.3	51.4	68.6	21.5	18.2	4.3	−8.0	16.6
Ports	605	60.7	56.7	64.5	17.4	22.0	2.1	−3.7	7.8
Prestn	530	57.9	53.7	62.1	24.0	18.1	−0.3	−6.2	5.7
Redng	283	66.8	61.1	72.0	18.7	14.5	1.1	−6.8	9.0
Shrew	189	54.0	46.8	61.0	25.9	20.1	−3.0	−13.3	7.2
Stevng	458	63.3	58.8	67.6	10.9	25.8	−3.4	−9.7	2.8
Sthend	96	49.0	39.1	58.9	17.7	33.3	−8.6	−22.3	5.1
Stoke	264	65.2	59.2	70.7	17.4	17.4	5.2	−3.2	13.7
Sund	201	53.7	46.8	60.5	25.9	20.4	3.7	−6.2	13.6
Truro	143	45.5	37.5	53.7	50.4	4.2	−2.3	−14.1	9.4
Wirral	170	67.7	60.3	74.3	21.2	11.2	5.3	−4.6	15.2
Wolve	270	50.4	44.4	56.3	34.1	15.6	0.0	−8.3	8.4
York	141	41.1	33.3	49.4	50.4	8.5	−5.0	−17.2	7.1
N Ireland									
Antrim	114	64.0	54.8	72.3	28.1	7.9	−9.8	−21.8	2.2
Belfast	165	52.7	45.1	60.2	37.6	9.7	6.8	−3.7	17.2
Newry	84	66.7	56.0	75.9	26.2	7.1	9.0	−5.5	23.6
Ulster	95	56.8	46.7	66.4	36.8	6.3	4.7	−9.5	18.9
West NI	112	60.7	51.4	69.3	32.1	7.1	1.7	−11.5	14.9

Table 8.20. Continued

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
Wales									
Bangor	78	56.4	45.3	66.9	35.9	7.7	–4.4	–19.7	11.0
Cardff	447	64.9	60.3	69.2	19.2	15.9	5.0	–1.4	11.3
Clwyd	74	54.1	42.7	65.0	35.1	10.8	1.6	–14.2	17.3
Swanse	340	62.7	57.4	67.6	25.6	11.8	–3.6	–11.6	4.4
Wrexm	97	42.3	32.9	52.3	48.5	9.3	–12.9	–26.9	1.0
England	**17,274**	**56.5**	**55.7**	**57.2**	**24.0**	**19.5**	–0.9	–1.9	0.2
N Ireland	**570**	**59.3**	**55.2**	**63.3**	**32.8**	**7.9**	3.0	–2.8	8.7
Wales	**1,036**	**60.6**	**57.6**	**63.6**	**26.5**	**12.9**	0.2	–4.1	4.5
E, W & NI	**18,880**	**56.8**	**56.1**	**57.5**	**24.4**	**18.8**	–0.7	–1.7	0.3

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness

Table 8.21. Summary statistics for PTH in peritoneal dialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	92.5	37	62.7	37.0	57.0	37.0	89.0
B QEH	0.0	0					
Basldn	100.0	27	34.7	24.6	27.0	19.0	48.0
Bradfd	92.9	13	59.6	29.4	56.0	41.0	66.0
Brightn	98.3	59	34.9	32.0	30.0	10.0	42.0
Bristol	93.6	44	36.9	33.7	25.5	15.0	50.0
Camb*							
Carlis	90.0	27	28.7	21.6	22.0	12.0	43.0
Carsh	85.2	86	72.6	54.1	60.0	35.0	108.0
Chelms	91.3	21	69.2	62.7	53.0	23.0	79.0
Colchr	n/a						
Covnt	90.8	69	29.9	28.6	21.0	10.0	41.0
Derby	93.2	68	29.3	16.2	26.5	18.0	37.0
Donc	100.0	18	36.3	25.4	30.5	20.0	46.0
Dorset	82.9	29	26.3	20.1	19.0	12.0	31.0
Dudley	92.3	48	30.0	23.1	26.5	10.5	42.5
Exeter	98.6	70	28.3	24.8	21.0	12.0	33.0
Glouc	85.7	24	31.0	16.0	27.5	22.0	35.0
Hull	81.8	54	27.2	27.0	21.0	12.0	32.0
Ipswi	100.0	27	39.4	36.2	24.0	14.0	46.0
Kent	100.0	54	53.2	42.2	38.0	19.0	67.0
L Barts	96.2	175	41.6	27.8	35.0	21.0	56.0
L Guys	82.8	24	34.3	23.0	26.5	18.0	52.0
L Kings	90.0	72	65.8	54.8	45.5	23.0	108.5
L Rfree	91.8	123	40.3	33.1	30.0	17.0	53.0
L St.G	97.8	44	29.1	28.0	19.0	11.0	35.5
L West	81.7	49	45.0	29.1	44.0	21.0	61.0
Leeds	100.0	50	35.9	26.7	31.0	19.0	43.0
Leic	94.7	90	41.2	44.8	26.5	12.0	47.0
Liv Ain	71.4	20	19.9	19.7	18.5	8.5	24.0
Liv Roy	91.8	56	24.9	15.0	22.0	14.5	29.5
M RI	98.3	57	52.6	41.1	40.0	24.0	68.0

Table 8.21. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
Middlbr	60.0	9					
Newc	89.5	34	41.5	66.0	28.0	12.0	51.0
Norwch	64.3	18	34.7	24.2	30.5	22.0	43.0
Nottm	98.4	63	45.6	43.7	36.0	20.0	55.0
Oxford	98.7	77	40.5	26.4	35.0	20.0	59.0
Plymth	92.9	26	23.2	17.6	17.0	10.0	35.0
Ports	83.3	50	43.1	47.5	30.0	15.0	51.0
Prestn	100.0	49	30.9	20.9	27.0	16.0	41.0
Redng	93.2	55	36.2	20.7	33.0	22.0	49.0
Salford	0.0	0					
Sheff	32.1	17					
Shrew	96.3	26	40.4	30.2	31.0	16.0	62.0
Stevng	84.6	11	48.0	36.7	38.0	10.0	86.0
Sthend	60.0	9					
Stoke	90.0	63	48.8	34.5	38.0	20.0	73.0
Sund	92.9	13	32.9	18.8	32.0	23.0	43.0
Truro	94.7	18	31.1	28.3	19.5	12.0	39.0
Wirral	94.1	16	30.6	18.6	26.0	21.0	40.0
Wolve	95.6	65	37.7	32.9	31.0	14.0	50.0
York	100.0	22	37.8	36.9	18.0	10.0	72.0
N Ireland							
Antrim	100.0	17	33.8	34.4	20.0	17.0	48.0
Belfast	100.0	19	32.3	27.3	28.0	16.0	38.0
Newry	100.0	18	22.2	13.0	21.0	12.0	29.0
Ulster	100.0	6					
West NI	100.0	9					
Wales							
Bangor	100.0	13	39.1	25.5	35.0	22.0	58.0
Cardff	86.1	62	59.1	45.0	45.0	26.0	83.0
Clwyd	46.2	6					
Swanse	96.4	53	28.8	26.1	20.0	14.0	36.0
Wrexm	100.0	33	39.9	25.8	33.0	23.0	50.0
England	**83.6**	**2,176**	**40.5**	**36.0**	**30.0**	**17.0**	**53.0**
N Ireland	**100.0**	**69**	**29.4**	**26.9**	**23.0**	**13.0**	**36.0**
Wales	**89.8**	**167**	**44.4**	**36.7**	**31.0**	**19.0**	**58.0**
E, W & NI	**84.4**	**2,412**	**40.4**	**35.9**	**30.0**	**17.0**	**53.0**

Blank cells: centres excluded from analysis due to small numbers or poor data completeness
*Cambridge renal centre was unable to submit PTH data for 2015
n/a – no PD patients

In 2015, the proportion of HD patients with a PTH above the upper limit of the range (>72 pmol/L) was 18.8% and the proportion below the lower limit of the range (<16 pmol/L) was 24.4%.

The proportion of PD patients with PTH above the upper limit (>72 pmol/L) of the range was 13.9% and the proportion below the lower limit of the range (<16 pmol/L) was 22.6% (tables 8.20, 8.22).

There was significant variation by centre following unadjusted analyses for the proportion of patients below, within and above the range specified by the clinical performance measures. The funnel plot (figure 8.26) for HD patients showed above average achievement of the target range in Cardiff, Derby, Reading, London St Bartholomew's and London Royal Free and below average achievement for Liverpool Aintree, Exeter, Leicester, London Kings, London West and York. For PD patients (figure 8.28) Derby and Reading were above average achievement of the target range and there were no outliers below the 99.9% confidence interval for the target.

Longitudinal analysis of PTH control measures at the level of the three countries noted sustained reduction in the proportion of patients with low PTH levels

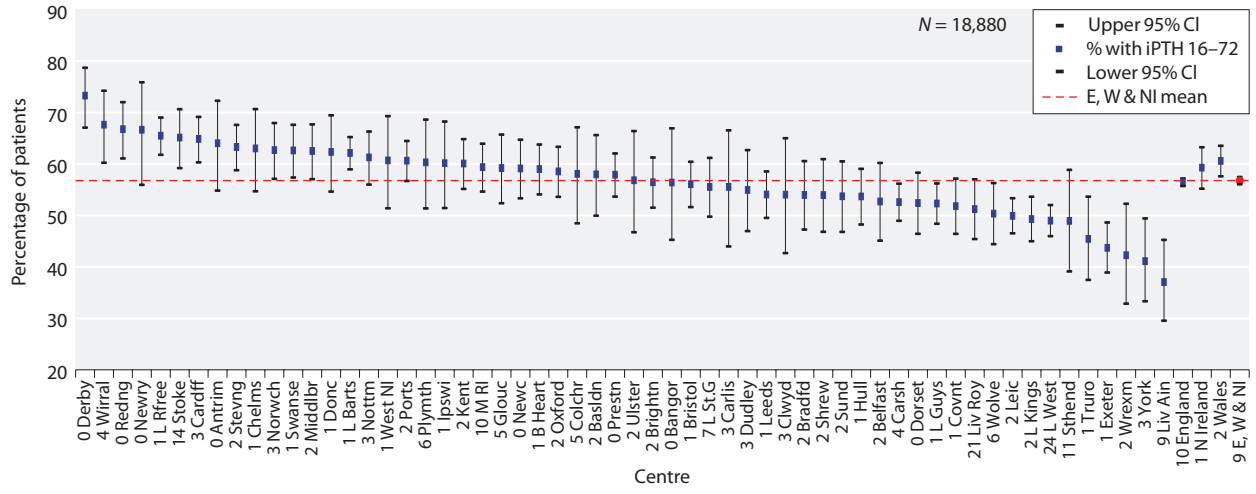

Fig. 8.25. Percentage of haemodialysis patients with PTH within range (16–72 pmol/L) by centre in 2015

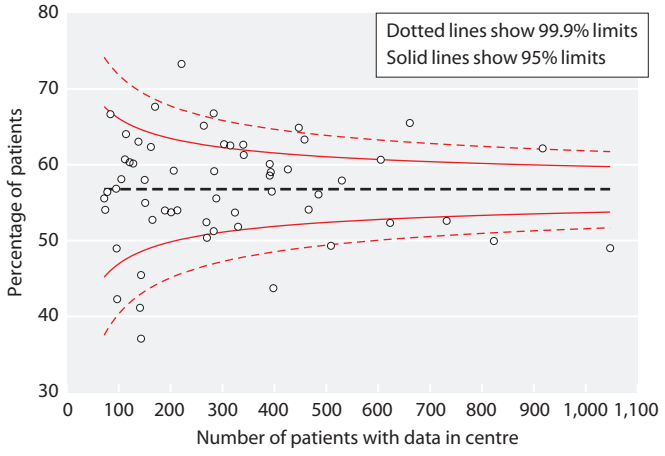

Fig. 8.26. Funnel plot of percentage of haemodialysis patients with PTH within range (16–72 pmol/L) by centre in 2015

Fig. 8.28. Funnel plot of percentage of peritoneal dialysis patients with PTH within range (16–72 pmol/L) by centre in 2015

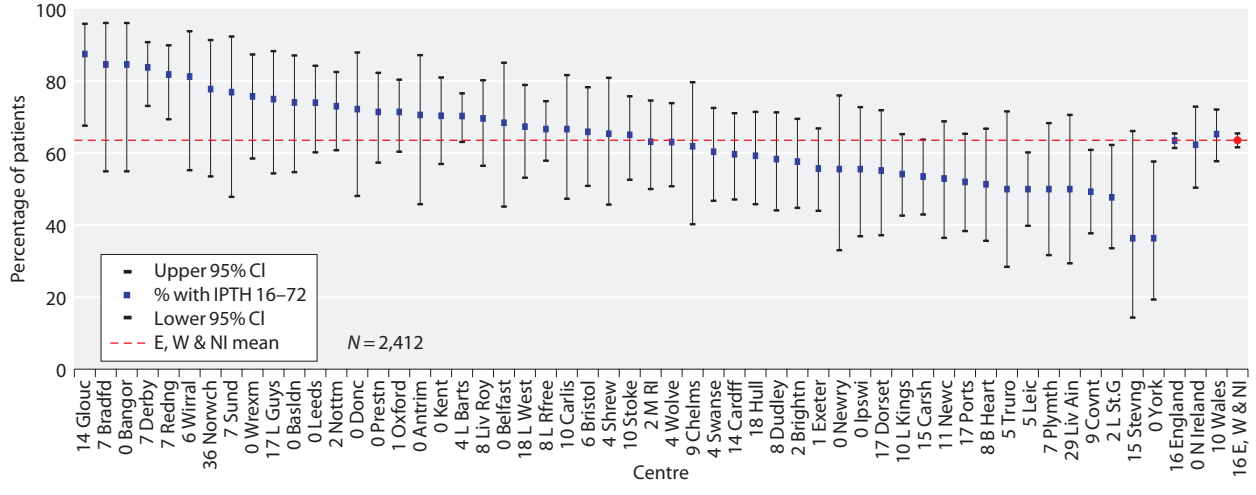

Fig. 8.27. Percentage of peritoneal dialysis patients with PTH within range (16–72 pmol/L) by centre in 2015

Table 8.22. Percentage of peritoneal dialysis patients within, below and above the range for PTH (16–72 pmol/L) in 2015

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	37	51.4	35.7	66.8	10.8	37.8	–18.7	–41.6	4.3
Basldn	27	74.1	54.7	87.1	18.5	7.4	10.1	–15.0	35.1
Bradfd	13	84.6	54.9	96.1	0.0	15.4	11.3	–18.5	41.0
Brightn	59	57.6	44.8	69.5	32.2	10.2	7.6	–11.1	26.4
Bristol	44	65.9	50.9	78.3	25.0	9.1	–0.1	–19.1	18.8
Carlis	27	66.7	47.3	81.7	29.6	3.7	6.7	–21.2	34.5
Carsh	86	53.5	43.0	63.7	9.3	37.2	–10.9	–25.0	3.2
Chelms	21	61.9	40.3	79.7	4.8	33.3	3.1	–28.2	34.4
Covnt	69	49.3	37.7	60.9	42.0	8.7	–5.7	–21.8	10.3
Derby	68	83.8	73.1	90.8	14.7	1.5	11.0	–2.6	24.6
Donc	18	72.2	48.1	87.9	16.7	11.1	–10.4	–36.2	15.5
Dorset	29	55.2	37.2	71.9	37.9	6.9	6.6	–17.9	31.1
Dudley	48	58.3	44.1	71.3	35.4	6.3	–9.8	–29.1	9.5
Exeter	70	55.7	44.0	66.9	37.1	7.1	0.1	–15.7	16.0
Glouc	24	87.5	67.6	95.9	8.3	4.2	26.6	2.7	50.6
Hull	54	59.3	45.8	71.5	37.0	3.7	–8.0	–25.8	9.8
Ipswi	27	55.6	36.9	72.8	25.9	18.5	–16.9	–41.7	8.0
Kent	54	70.4	57.0	81.0	9.3	20.4	5.5	–11.9	22.8
L Barts	175	70.3	63.1	76.6	16.0	13.7	6.7	–3.0	16.4
L Guys	24	75.0	54.4	88.3	20.8	4.2	–7.3	–32.4	17.7
L Kings	72	54.2	42.6	65.3	12.5	33.3	–2.4	–18.4	13.6
L Rfree	123	66.7	57.9	74.4	19.5	13.8	5.2	–7.2	17.6
L St.G	44	47.7	33.6	62.3	43.2	9.1	–18.2	–38.5	2.2
L West	49	67.4	53.2	78.9	14.3	18.4	4.1	–14.8	22.9
Leeds	50	74.0	60.2	84.3	18.0	8.0	0.5	–16.8	17.9
Leic	90	50.0	39.8	60.2	34.4	15.6	–12.8	–26.7	1.2
Liv Ain	20	50.0	29.4	70.6	45.0	5.0	–8.1	–36.0	19.9
Liv Roy	56	69.6	56.5	80.2	28.6	1.8	–0.6	–18.3	17.2
M RI	57	63.2	50.0	74.6	12.3	24.6	–4.8	–22.8	13.2
Newc	34	52.9	36.5	68.8	35.3	11.8	–9.6	–32.1	12.9
Norwch	18	77.8	53.5	91.4	16.7	5.6	8.2	–18.7	35.1
Nottm	63	73.0	60.8	82.5	15.9	11.1	3.6	–11.7	18.9
Oxford	77	71.4	60.4	80.4	15.6	13.0	3.9	–10.8	18.5
Plymth	26	50.0	31.7	68.3	46.2	3.9	0.0	–26.7	26.7
Ports	50	52.0	38.4	65.4	28.0	20.0	–7.3	–26.3	11.8
Prestn	49	71.4	57.4	82.3	24.5	4.1	–4.7	–22.3	13.0
Redng	55	81.8	69.4	89.9	12.7	5.5	2.2	–12.3	16.6
Shrew	26	65.4	45.7	80.9	19.2	15.4	–7.4	–33.4	18.7
Stevng	11	36.4	14.3	66.1	27.3	36.4	–27.6	–61.7	6.5
Stoke	63	65.1	52.6	75.8	9.5	25.4	4.0	–12.3	20.3
Sund	13	76.9	47.9	92.4	23.1	0.0	19.8	–14.8	54.4
Truro	18	50.0	28.4	71.6	38.9	11.1	–27.8	–57.8	2.3
Wirral	16	81.3	55.3	93.8	18.8	0.0	27.9	–3.8	59.6
Wolve	65	63.1	50.8	73.9	26.2	10.8	–5.6	–21.7	10.6
York	22	36.4	19.3	57.7	40.9	22.7	–11.3	–40.6	18.1
N Ireland									
Antrim	17	70.6	45.8	87.2	23.5	5.9	24.4	–10.3	59.1
Belfast	19	68.4	45.2	85.1	21.1	10.5	1.8	–30.0	33.5
Newry	18	55.6	33.0	76.0	44.4	0.0	–15.9	–48.8	17.1

Table 8.22. Continued

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
Wales									
Bangor	13	84.6	54.9	96.1	7.7	7.7	13.2	–17.5	43.9
Cardff	62	59.7	47.1	71.1	11.3	29.0	–14.4	–31.3	2.5
Swanse	53	60.4	46.8	72.5	32.1	7.6	–11.1	–29.3	7.2
Wrexm	33	75.8	58.5	87.4	15.2	9.1	–11.2	–31.3	8.9
England	**2,176**	**63.5**	**61.4**	**65.5**	**22.7**	**13.9**	**–1.2**	**–4.0**	**1.5**
N Ireland	**69**	**62.3**	**50.4**	**72.9**	**31.9**	**5.8**	**0.9**	**–16.1**	**18.0**
Wales	**167**	**65.3**	**57.8**	**72.1**	**18.0**	**16.8**	**–9.1**	**–19.1**	**1.0**
E, W & NI	**2,412**	**63.6**	**61.6**	**65.5**	**22.6**	**13.9**	**–1.6**	**–4.2**	**1.0**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness

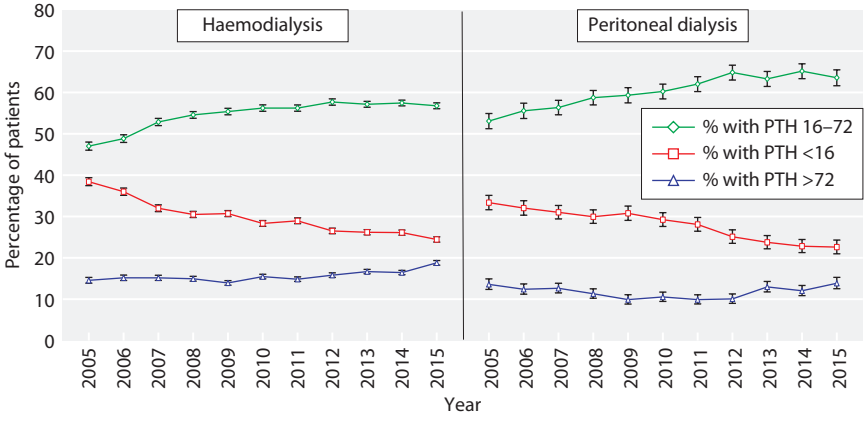

Fig. 8.29. Longitudinal change in percentage of patients with PTH within range (16–72 pmol/L) by dialysis modality 2005–2015

(<16 pmol/L) in HD and PD patients. Similarly, there has been a corresponding increase in the fraction of HD and PD patients with PTH levels being maintained within the 16–72 pmol/L range. The fraction of patients with PTH above range (>72 pmol/L) increased from 14.6% in 2005 to 18.8% in 2015 in those receiving HD but was unchanged in those receiving PD during the same period (figure 8.29).

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UK Renal Registry 19th Annual Report: Chapter 9 Clinical, Haematological and Biochemical Parameters in Patients on Renal Replacement Therapy in Paediatric Centres in the UK in 2015: National and Centre-specific Analyses

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Keywords

Adolescents · Biochemical variables · Blood pressure · Body mass index · Children · Dialysis · Established renal failure · Growth · Haemoglobin · Height · Hypertension · Paediatric · Quality improvement · Renal replacement therapy · Transplant · Weight · Young adults

Summary

- The median height z-score for paediatric patients on dialysis in 2015 was −1.8 and for those with a functioning transplant −1.2. Children transplanted before the age of 12 years improved their height z-score over the subsequent five years, whereas those older than 12 years maintained their height z-score, with all transplanted patients having a similar median height z-score after five years of starting renal replacement therapy (RRT).
- The median weight z-score for children on dialysis in 2015 was −1.1, whereas children with a functioning transplant had a near normal weight for age and sex with a median z-score of −0.2.
- Of those with data, 75% of the prevalent paediatric RRT population in 2015 had one or more 'traditional' risk factors for cardiovascular disease, with 7% having all three risk factors present.
- For the 12 centres reporting quarterly laboratory data, the median creatinine in transplant patients in 2015 was 79 μmol/L; on average, dialysis patients in 2015 had normal anaemia and acidosis parameters and evidence of secondary hyperparathyroidism, with a median parathyroid hormone (PTH) of 21 pmol/L.
- For transplant patients, 82% achieved the systolic blood pressure (SBP) standard and 93% achieved the haemoglobin standard in 2015.
- For haemodialysis patients, 63% achieved the SBP standard, 73% achieved the haemoglobin standard,

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76% achieved the calcium standard, 48% achieved the phosphate standard and 45% achieved the PTH standard in 2015.
- For peritoneal dialysis patients, 63% achieved the SBP standard, 75% achieved the haemoglobin standard, 70% achieved the calcium standard, 52% achieved the phosphate standard and 32% achieved the PTH standard in 2015.

Introduction

This chapter focuses on the following variables for the prevalent paediatric dialysis and transplantation cohort on 31st December 2015:

1. The completeness of data returns to the UK Renal Registry (UKRR)
2. Anthropometric characteristics and growth
3. Cardiovascular risk factors (CVRFs)
4. Laboratory and clinical indices, including anaemia control and biochemical findings.

Analyses of prevalent paediatric patients aged <18 years receiving renal replacement therapy (RRT) for the year 2015 and for the period 2003–2015 inclusive, are reported. A single dataset was collected for each patient per year during this time period. Where possible, analyses of incident cohorts were conducted, with centre-specific data for each paediatric nephrology centre in the UK also being provided.

Methods

Processes for data collection for the paediatric UKRR are described in chapter 4. The data presented in this chapter relate to the annual census date of 31st December 2015.

Standards and standardisation

Standards are in bold text and are from the Renal Association's (2002) '*Treatment of adults and children with renal failure: standards and audit measures (third edition)*' [1], unless otherwise stated.

Where the value of clinical parameters in childhood varies with age, sex and size, data are presented as z-scores.

Anthropometry

'Measures of supine length or standing height and weight should be monitored at each clinic visit. All measurements should be plotted on European reference growth charts for healthy children.'

The reference range for height (Ht), weight (Wt) and body mass index (BMI) in childhood varies with gender and age. BMI was calculated using the formula BMI = Wt (kg)/Ht^2 (m). Ht and Wt were adjusted for age. To account for discrepancies in linear growth secondary to renal disease, BMI was expressed according to Ht-age, rather than chronological age. The International Obesity Taskforce definition [2] was used to define overweight and obesity; z-scores were calculated based on the British 1990 reference data for Ht and Wt [3].

Blood pressure

'Blood pressure varies throughout childhood and should be maintained within two standard deviations of the mean for normal children of the same height and sex. The systolic blood pressure during peritoneal dialysis or after haemodialysis should be maintained at <90th centile for age, gender and height.'

'In paediatric renal transplant patients, the systolic blood pressure should be maintained at <90th percentile for age, gender and height.'

The analyses of systolic blood pressure (SBP) in this report present the achievement of SBPs at or below the 90th percentile. Guidance for blood pressure in paediatric renal transplant patients was based on 2011 British Association for Paediatric Nephrology recommendations [4].

The reference range for SBP varies with gender, age and Ht. The data are therefore presented as z-scores based on data from the fourth report of the National High Blood Pressure Education Programme working group in the United States [5].

Cholesterol

The National Heart Lung and Blood Institute recommends screening for dyslipidaemias in children with chronic kidney disease (CKD)/established renal failure (ERF)/post renal transplant (deemed high risk) between the ages of two and 17 years, and defines high total cholesterol as ≥5.2 mmol/L [6]. This cut-off has been adopted for this report.

Haemoglobin and ferritin

Guidance on the management of anaemia in adults and children with CKD was updated and published by the National Institute for Health and Care Excellence in February 2011 (clinical guideline 114) [7]. Subsequent guidance was issued during the 2015 data collection period and uses the same haemoglobin (Hb) parameters as previously but recommends newer methods of assessing iron stores over ferritin.

'Typically maintain the aspirational Hb range between 100 and 120 g/L for young people and children aged 2 years and older, and between 95 and 115 g/L for children younger than 2 years of age, reflecting the lower normal range in that age group.'

Hb and ferritin were analysed using age-related laboratory reference ranges as in table 9.1.

Calcium, phosphate and parathyroid hormone (PTH)

'Serum phosphate and calcium should be kept within the normal range. PTH levels should be maintained within twice the upper limit of the normal range but, contrary to adult standards, may be kept within the normal range if growth is normal.'

Table 9.1. Summary of relevant biochemical clinical audit measures

	Age (years)			
Parameter	<1	1–5	6–12	>12
Hb (g/L), NICE guideline CG 114	Maintain 95–115 if aged <2 years	Maintain 100–120 if aged >2 years	100–120	100–120
Ferritin (μg/L)	200–500	200–500	200–500	200–500
Corrected calcium (mmol/L)	2.24–2.74	2.19–2.69	2.19–2.69	2.15–2.55
Phosphate (mmol/L)	1.10–1.95	1.05–1.75	1.05–1.75	1.05–1.75
PTH (individual centre)	Within twice the normal range Levels may be maintained within normal range if growing appropriately			
Bicarbonate (mmol/L)	Reported as either within or outside centre reference range			

Hb – haemoglobin; NICE – National Institute for Health and Care Excellence; PTH – parathyroid hormone

Calcium, phosphate and PTH were analysed using age-related laboratory reference ranges as in table 9.1. Individual variable data analysis has been performed per centre and nationally. It should be noted that 'normal' growth is difficult to determine in the setting of paediatric RRT.

Bicarbonate

'Serum bicarbonate concentrations should be between 20 and 26 mmol/L.'

Bicarbonate reference ranges vary by centre and are reported as within or outside the reference range as given in table 9.1.

Cardiovascular risk factors

A cross-sectional evaluation of the prevalence of traditional risk factors for cardiovascular disease, including hypertension, overweight/obesity and hypercholesterolaemia in children with ERF is presented. In this analysis, the prevalence of one or more CVRFs in children with ERF in the UK is shown. Evidence for the use of total cholesterol and the relationship of childhood CVRFs with adult CVRFs is available from The National Heart Lung and Blood Institute [6].

Statistical analyses

Annual and quarterly clinical and laboratory data have been analysed separately, with annual data being used unless stated otherwise. Data were analysed to calculate summary statistics (maximum, minimum, mean and median values in addition to standard deviation and quartile ranges). Where applicable, the percentage achieving the audit standard was also calculated. If a patient had missing data, they were excluded from the relevant analyses.

Estimated glomerular filtration rate (eGFR) was calculated using the Schwartz formula [8], using centre-specific individual correction factors submitted to the UKRR.

Longitudinal analyses of attainment of standards were also performed. These were based on a single data point per ERF patient per year collected as described previously. Caution should be exercised in the interpretation of analyses based on data items from a single annual measurement per patient. This is due to changing audit standards over time and variable data returns for previous years. Furthermore, for biochemical variables there are not only differences between assays used at different centres to consider, but also differences in the timing of the result between modalities. All analyses were performed using SAS 9.3.

Results

Data completeness

Annual data

Tables 9.2 and 9.3 show the completeness of annual data returns for transplant and dialysis patients for 2015.

Overall, completeness was excellent for key variables in both groups, with the larger group of transplant patients having better completeness for Ht, BMI, and SBP and the smaller group of dialysis patients having better completeness for PTH. Ferritin completeness was relatively low in transplant patients, which may reflect satisfactory graft function and anaemia control, or use of alternative methods of assessing iron stores. Reporting of therapy for anaemia remained patchy and a cholesterol value was reported to the paediatric UKRR for only half of the patients.

Quarterly data

Twelve centres supplied quarterly 2015 data to the UKRR. Completeness of these data is shown for transplant patients in table 9.4 and dialysis patients in table 9.5. For transplant patients, ferritin and PTH were included in quarterly returns, but were not widely used; the overall quarterly completeness for ferritin in transplant patients was 40% and for PTH was 59%.

Table 9.2. Percentage data completeness for transplant patients <18 years old by centre for each variable and total number of patients per centre on 31st December 2015

	Transplant patients % completeness														
Centre	*N*	Ht	Wt	BMI	SBP	Hb	Creat	Ferr	ESA	IV iron	Chol	Bicarb	PTH	Ca	Phos
Bham_P*	85	100.0	100.0	100.0	100.0	98.8	98.8	51.9	0.0	0.0	1.2	98.8	96.4	98.8	98.8
Blfst_P*	18	100.0	100.0	100.0	100.0	100.0	100.0	94.4	100.0	100.0	88.2	100.0	88.9	100.0	100.0
Brstl_P*	39	92.3	97.4	92.3	84.6	100.0	100.0	52.6	100.0	89.7	68.4	97.4	65.8	100.0	100.0
Cardf_P	23	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.7	100.0	100.0	100.0	100.0
Glasg_P*	42	100.0	100.0	100.0	100.0	100.0	100.0	67.5	100.0	100.0	43.9	100.0	100.0	100.0	100.0
L Eve_P*	82	97.6	98.8	97.6	98.8	98.8	93.9	95.1	100.0	100.0	81.5	93.9	93.9	93.9	93.9
L GOSH_P*	150	100.0	100.0	100.0	99.3	100.0	100.0	92.0	88.0	87.3	61.9	98.7	98.0	100.0	100.0
Leeds_P*	68	89.7	100.0	89.7	97.1	100.0	100.0	79.4	100.0	100.0	41.8	100.0	88.2	100.0	100.0
Livpl_P	43	93.0	93.0	93.0	93.0	93.0	93.0	73.8	90.7	93.0	72.1	93.0	7.1	93.0	93.0
Manch_P*	61	98.4	100.0	98.4	100.0	100.0	100.0	73.8	96.7	96.7	16.4	100.0	100.0	100.0	100.0
Newc_P*	27	100.0	100.0	100.0	100.0	100.0	100.0	92.6	100.0	100.0	88.0	100.0	88.9	100.0	100.0
Nottm_P*	69	86.6	88.1	86.6	82.4	92.5	92.7	82.8	92.7	1.5	84.1	92.7	75.8	92.7	92.7
Soton_P	25	96.0	100.0	96.0	88.0	100.0	100.0	88.0	96.0	96.0	64.0	100.0	100.0	100.0	100.0
UK	**732**	**96.4**	**98.2**	**96.4**	**96.2**	**98.6**	**98.1**	**79.9**	**84.3**	**75.2**	**56.3**	**97.7**	**87.3**	**98.1**	**98.1**

Ht – height; Wt – weight; BMI – body mass index; SBP – systolic blood pressure; Hb – haemoglobin; Creat – creatinine; Ferr – ferritin; ESA – erythropoietin stimulating agent; IV – intravenous; Chol – cholesterol; Bicarb – bicarbonate; PTH – parathyroid hormone; Ca – calcium; Phos – phosphate

*Denotes centre undertaking paediatric kidney transplantation

Table 9.3. Percentage data completeness for dialysis patients <18 years old by centre for each variable and total number of patients per centre on 31st December 2015

	Dialysis patients % completeness													
Centre	*N*	Ht	Wt	BMI	SBP	Hb	Ferr	ESA	IV iron	Chol	Bicarb	PTH	Ca	Phos
Bham_P	25	92.0	88.0	88.0	96.0	96.0	89.7	0.0	0.0	0.0	96.0	92.6	96.0	96.0
Blfst_P	7	87.5	100.0	87.5	100.0	100.0	100.0	100.0	100.0	62.5	100.0	100.0	100.0	100.0
Brstl_P	17	94.1	100.0	94.1	100.0	100.0	100.0	100.0	82.4	77.8	100.0	94.4	100.0	100.0
Cardf_P	8	100.0	100.0	100.0	87.5	100.0	100.0	100.0	100.0	62.5	100.0	100.0	100.0	100.0
Glasg_P	14	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	73.3	100.0	100.0	100.0	100.0
L Eve_P	18	11.1	27.8	11.1	27.8	88.9	100.0	100.0	100.0	63.2	94.4	94.4	94.4	94.4
L GOSH_P	29	93.1	100.0	93.1	100.0	100.0	86.7	86.2	86.2	62.5	100.0	100.0	100.0	100.0
Leeds_P	14	85.7	92.9	85.7	92.9	100.0	100.0	100.0	100.0	60.0	100.0	100.0	100.0	100.0
Livpl_P	13	69.2	84.6	69.2	84.6	84.6	78.6	92.3	76.9	30.8	61.5	85.7	92.3	92.3
Manch_P	30	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	55.6	100.0	100.0	100.0	100.0
Newc_P	9	88.9	88.9	88.9	88.9	100.0	100.0	100.0	100.0	90.9	100.0	100.0	100.0	100.0
Nottm_P	18	85.0	85.0	85.0	57.9	100.0	100.0	100.0	42.1	55.6	100.0	100.0	100.0	100.0
Soton_P	7	100.0	100.0	100.0	57.1	85.7	100.0	85.7	85.7	14.3	100.0	100.0	100.0	100.0
UK	**209**	**84.9**	**89.1**	**84.4**	**85.7**	**97.2**	**95.5**	**85.2**	**77.6**	**53.8**	**96.7**	**97.2**	**98.6**	**98.6**

Ht – height; Wt – weight; BMI – body mass index; SBP – systolic blood pressure; Hb – haemoglobin; Ferr – ferritin; ESA – erythropoietin stimulating agent; IV – intravenous; Chol – cholesterol; Bicarb – bicarbonate; PTH – parathyroid hormone; Ca – calcium; Phos – phosphate

Growth

Height

Figures 9.1 and 9.2 show that children receiving RRT were short for their age and sex and that those on dialysis were significantly shorter than those with renal transplants. The overall median z-score (shown by the dotted line) was −1.2 in the transplanted group and −1.8 in the dialysis group ($p < 0.0001$). Evelina was excluded from figure 9.2 because few Ht data for dialysis patients were reported. Figure 9.3 demonstrates that by the

Table 9.4. Percentage data completeness for transplant patients <18 years old by centre reporting quarterly laboratory data and total number of patients per centre on 31st December 2015

		Transplant patients % completeness				
Centre	*N*	Creatinine	Hb	Calcium	Phosphate	Bicarbonate
Bham_P	85	91.8	93.1	90.9	91.2	90.3
Blfst_P	18	100.0	98.6	100.0	100.0	100.0
Brstl_P	39	96.1	92.8	91.4	91.4	86.8
Cardf_P	23	96.5	94.1	96.5	96.5	96.5
Glasg_P	42	100.0	99.4	99.4	99.4	100.0
L Eve_P	82	94.3	71.7	94.3	94.3	94.3
L GOSH_P	150	95.2	94.8	95.2	94.8	92.9
Leeds_P	68	94.4	94.0	94.0	93.6	92.8
Manch_P	61	100.0	99.5	100.0	100.0	100.0
Newc_P	27	88.0	84.0	88.0	88.0	84.0
Nottm_P	69	86.7	83.8	85.1	85.9	84.2
Soton_P	25	63.6	58.6	59.6	59.6	59.6
UK	**689**	**93.2**	**89.6**	**92.4**	**92.4**	**91.2**

Hb – haemoglobin

Table 9.5. Percentage data completeness for dialysis patients <18 years old by centre reporting quarterly laboratory data and total number of patients per centre on 31st December 2015

		Dialysis patients % completeness					
Centre	*N*	Hb	Ferritin	Calcium	Phosphate	PTH	Bicarbonate
Bham_P	25	91.0	73.0	92.0	92.0	83.0	91.0
Blfst_P	7	100.0	96.6	96.6	100.0	93.1	100.0
Brstl_P	17	100.0	84.8	100.0	100.0	97.0	100.0
Cardf_P	8	100.0	100.0	100.0	100.0	96.8	100.0
Glasg_P	14	100.0	96.4	98.2	98.2	92.7	100.0
L Eve_P	18	65.1	72.3	84.3	84.3	83.1	84.3
L GOSH_P	29	100.0	45.0	100.0	100.0	100.0	100.0
Leeds_P	14	96.7	88.5	95.1	95.1	93.4	96.7
Manch_P	13	96.0	95.2	96.0	95.2	96.0	96.0
Newc_P	9	97.3	100.0	100.0	97.3	100.0	97.3
Nottm_P	18	97.4	93.4	97.4	97.4	89.5	96.1
Soton_P	7	85.7	100.0	100.0	100.0	92.9	100.0
UK	**179**	**94.0**	**82.0**	**96.2**	**96.1**	**93.0**	**96.1**

Hb – haemoglobin; PTH – parathyroid hormone

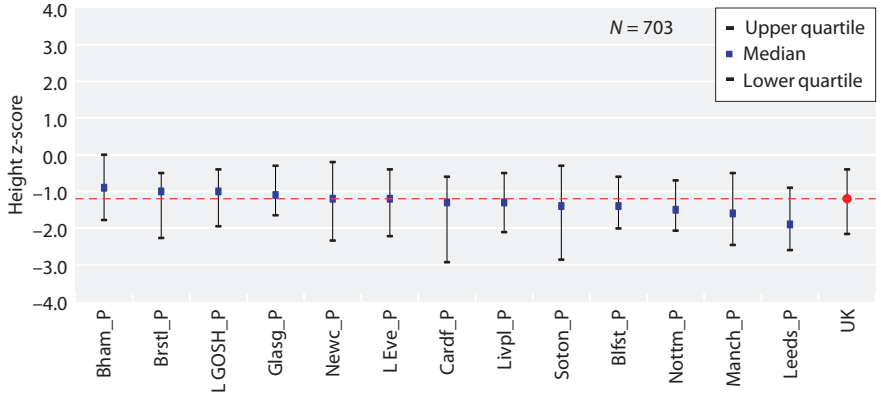

Fig. 9.1. Median height z-scores for transplant patients <18 years old on 31st December 2015, centre specific and national averages

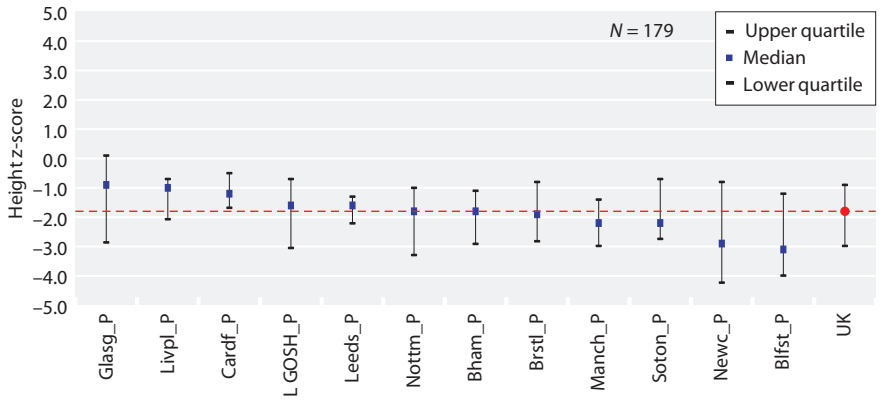

Fig. 9.2. Median height z-scores for dialysis patients <18 years old on 31st December 2015, centre specific and national averages

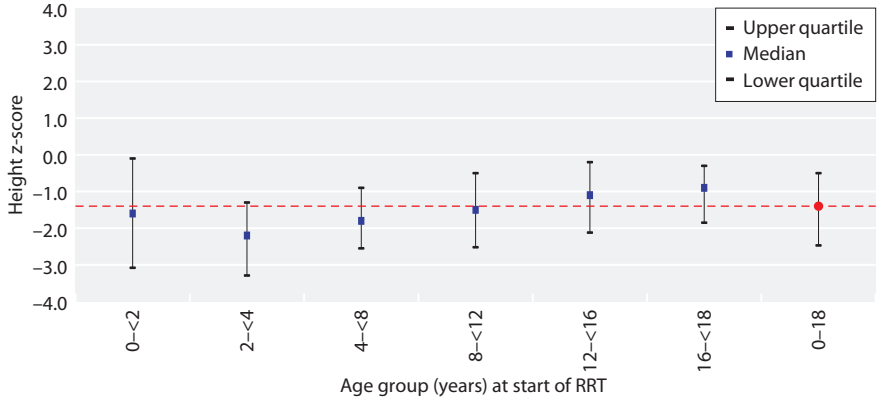

Fig. 9.3. Median height z-scores at start of RRT for patients <18 years old between 2003 and 2015, by age at start

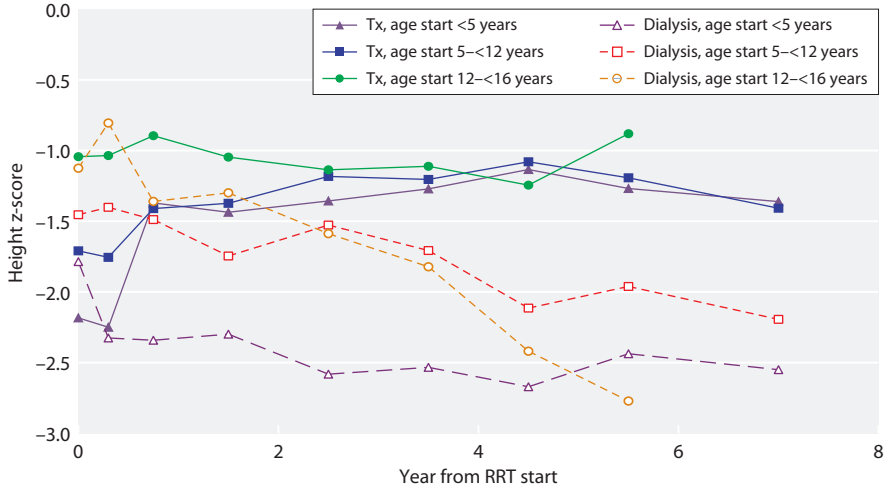

Fig. 9.4. Median height z-scores for patients <16 years old, by time on RRT and treatment modality

time of RRT start, children were already short for their age and sex with an overall median z-score of −1.4, with younger children aged two to eight years most affected. Figure 9.4 shows that although transplanted paediatric patients aged up to 12 years improved their Ht z-score in the first five years of starting RRT, those older than 12 years started with a better Ht z-score which was maintained. In contrast, all dialysis patients had a worsening Ht z-score over time. Poor growth was more pronounced in the oldest children, who exhibited better growth at RRT start. Due to changes in modality, groups are not strictly sequential in this analysis and because most patients received a transplant, there are small numbers of dialysis patients at five years

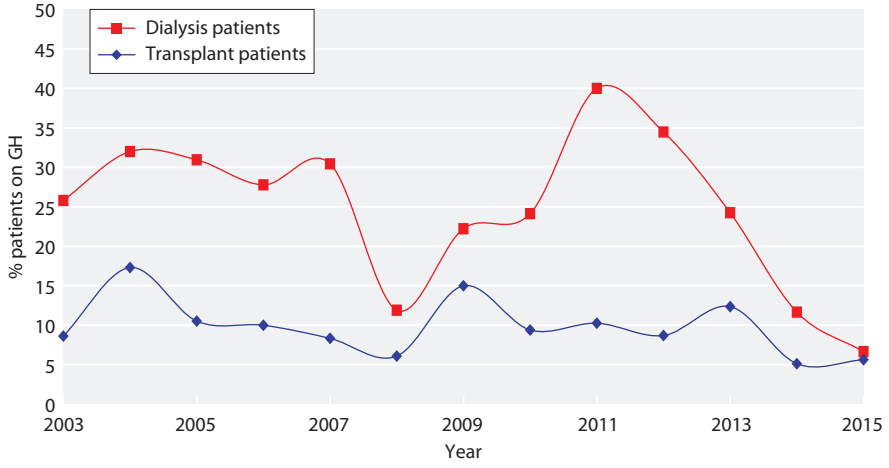

Fig. 9.5. Use of growth hormone in children <18 years old with a height under two SDs between 2003 and 2015

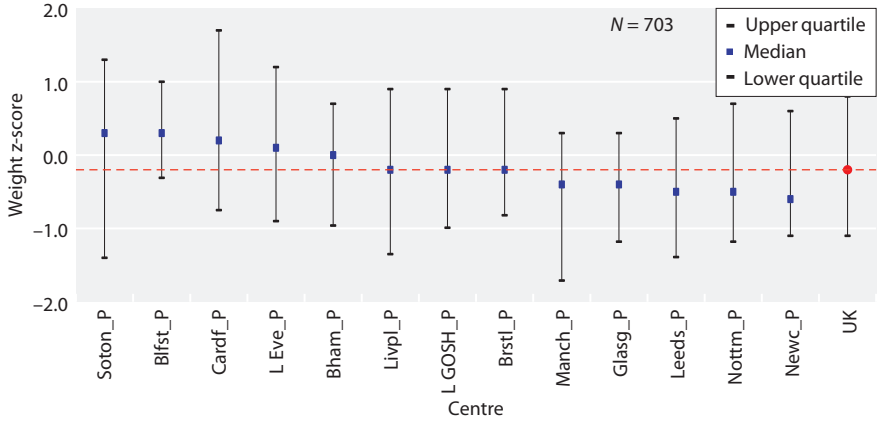

Fig. 9.6. Median weight z-scores for transplant patients <18 years old on 31st December 2015, centre specific and national averages

after starting RRT. Data for 16–18 year olds were omitted owing to small group numbers.

The proportion of patients aged two to 18 years with a Ht less than two standard deviations (SDs) in 2015 was much higher for those on dialysis (43.4% for haemodialysis (HD) and 34.4% for peritoneal dialysis (PD)) compared to those with a functioning transplant (27.1%), excluding patients with syndromes and those born prematurely where growth might be compromised.. Figure 9.5 shows large variation over the 13 years to 2015 in the use of growth hormone in those with a Ht less than two SDs. The proportion of patients with a Ht less than two SDs whose growth hormone status was not known is high (changing from approximately 10% in 2010 to 50% in 2011) and this limits meaningful interpretation. Average use of growth hormone for patients aged <18 years with a Ht less than two SDs since 2003 was 18.1% for dialysis patients and 7.4% for transplant patients.

Weight

Figures 9.6 and 9.7 show that paediatric patients receiving dialysis were significantly more underweight for age and sex than those with renal transplants. The overall median z-score was −0.2 in the transplanted group and −1.1 in the dialysis group ($p < 0.0001$). Centre level comparison for dialysis patients in particular should be avoided due to low numbers per centre.

When taking Ht into account and examining BMI rather than Wt alone, figures 9.8 and 9.9 show that BMI z-scores were mostly within the upper half of the normal range for transplant patients and spread throughout the normal range in dialysis patients. Evelina was excluded from figure 9.9 as stated above. The majority of paediatric RRT patients had a BMI within the normal range, as shown in figure 9.10.

Cardiovascular risk factor evaluation

Obesity

Figures 9.8 and 9.9 show that children with renal transplants had a significantly higher BMI for age and sex than those receiving dialysis. The overall median z-score was 1.0 in the transplanted group and 0.2 in the dialysis group ($p < 0.0001$).

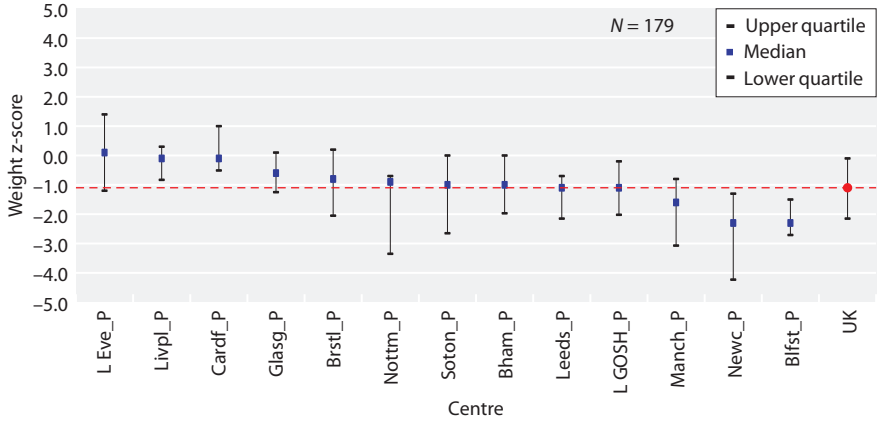

Fig. 9.7. Median weight z-scores for dialysis patients <18 years old on 31st December 2015, centre specific and national averages

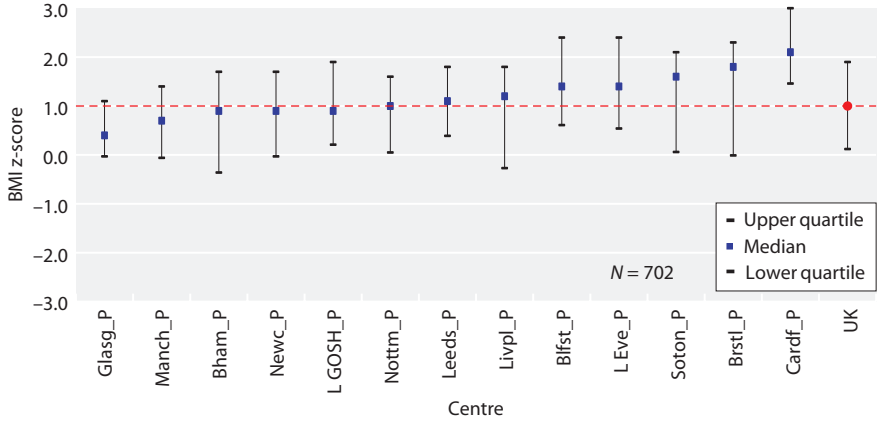

Fig. 9.8. Median BMI z-scores for transplant patients <18 years old on 31st December 2015, centre specific and national averages

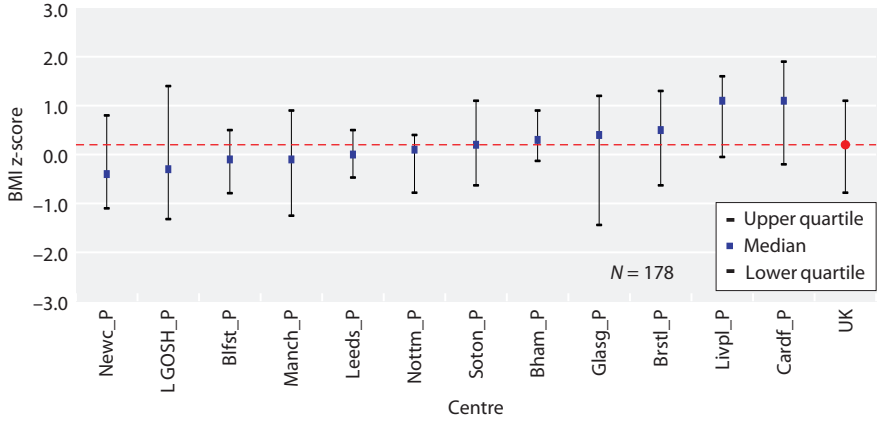

Fig. 9.9. Median BMI z-scores for dialysis patients <18 years old on 31st December 2015, centre specific and national averages

Figure 9.10 demonstrates higher proportions of overweight and obese children in those with renal transplants (43.6%) compared to those receiving dialysis (21.9%). There was a higher proportion of underweight children in the dialysis group (6.2%) compared to those with renal transplants (0.7%).

Of those aged 16 to <18 years, 45.1% were overweight or obese compared to 19.4% of those aged zero to under five years, but there was no significant difference by age in the transplant patient group alone. There were no statistically significant differences between proportions of those underweight, normal, overweight or obese in terms of sex, ethnicity or donor source (deceased or living).

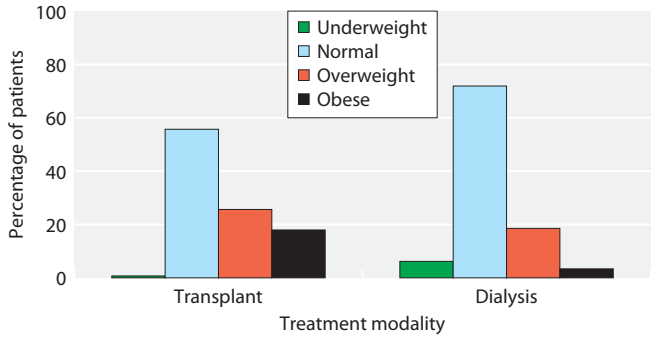

Fig. 9.10. BMI categorisation in children <18 years old by modality on 31st December 2015

Hypertension

Figures 9.11 and 9.12 show paediatric patients receiving RRT were hypertensive compared to the healthy population and those receiving dialysis had a significantly higher median SBP than those with renal transplants. There was wide inter-centre variability in median SBP z-score. The median SBP z-score was maintained at or below the 90th percentile by all centres for transplant patients and in nine centres for dialysis patients. The overall median SBP z-score was 0.5 in the transplanted group and 0.8 in the dialysis group ($p < 0.0001$). Of those aged <18 years, 81.8% of children with a functioning kidney transplant and 63.0% of those receiving dialysis had an SBP <90th percentile in 2015 (no difference between HD and PD). No comments can be made at centre level or for dialysis patient subgroups due to small patient numbers. Table 9.6 shows that there were significant differences in the percentage below the 90th percentile for SBP between different age groups, gender and RRT modality. There was no significant difference in SBP between ethnicity, HD and PD or between living and deceased donor transplants.

Prevalence of cardiovascular risk factors

Table 9.7 shows that the percentage of patients with no CVRFs was 24.8%, one CVRF was 40.9%, two CVRFs was 27.3% and the percentage of those with all evaluated CVRFs was 7.0%. This analysis is restricted to the 487 of 941 (51.8%) patients with complete data for all three items. Thus, of the included prevalent paediatric RRT population three quarters had one or more risk factors

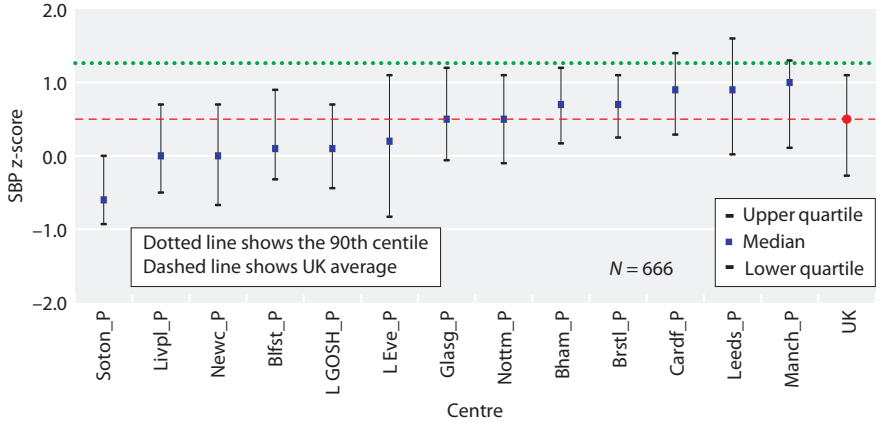

Fig. 9.11. Median SBP z-scores for transplant patients <18 years old on 31st December 2015, centre specific and national averages

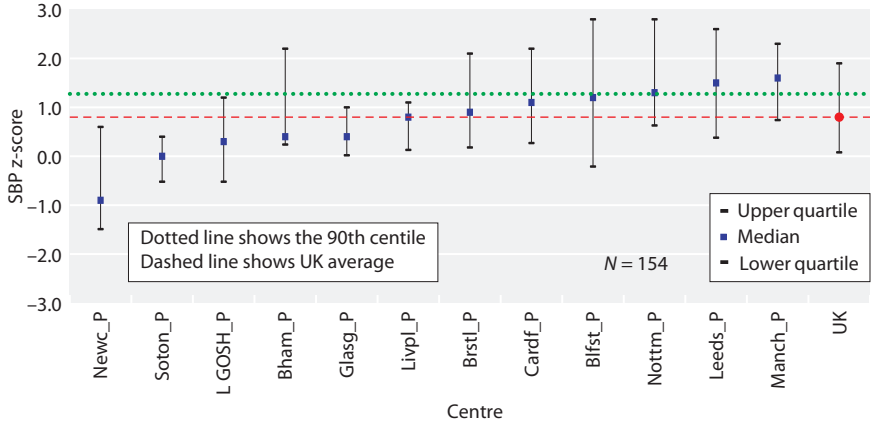

Fig. 9.12. Median SBP z-scores for dialysis patients <18 years old on 31st December 2015, centre specific and national averages

Table 9.6. Percentage of patients <18 years old achieving the standard for SBP on 31st December 2015

	N	% below 90th percentile	*p*-value
Total	820	78.3	
Age group (years)			0.001
0–<5	94	70.2	
5–<12	337	73.9	
12–<16	250	86.4	
16–<18	139	79.9	
Gender			0.04
Male	518	80.7	
Female	302	74.2	
Ethnicity			0.6
Black	31	83.9	
Other	65	75.4	
South Asian	128	75.8	
White	568	79.2	
RRT modality			<0.0001
Dialysis	154	63.0	
Transplant	666	81.8	

for cardiovascular disease. Of those included in this analysis, 151 (31.0%) had hypertension, 214 (43.9%) were overweight/obese and 202 (41.5%) had hypercholesterolaemia. There were no statistically significant differences in number of CVRFs according to age, gender, ethnicity or modality.

Laboratory and clinical indices – quarterly data

Tables 9.8 and 9.10 display the median values and interquartile ranges (IQRs) for quarterly laboratory parameters for paediatric transplant and dialysis patients in 2015 by centre, with table 9.9 showing age-specific creatinine results. The total number of data points for each parameter varied depending on completeness, ranging from 2,384 data points for creatinine in transplant patients to 645 data points for ferritin in dialysis patients.

For transplant patients, these results demonstrate excellent average renal allograft function in the paediatric population, with associated good anaemia control and normal bone metabolism markers. For comparison, the median eGFR for all transplant patients (based on annual rather than quarterly data) was 61 ml/min/1.73 m^2 and fell with age (83 if aged <five years; 65 if aged five to <12 years; 60 if aged 12–<16 years; and 52 if aged 16–<18 years). The overall median ferritin in transplant patients was 66 μg/L (IQR 32–145) based on 40% completeness. Similarly, the overall median PTH in transplant patients was 6.9 pmol/L (IQR 4.6–10.6) based on 59% completeness.

For dialysis patients, the average Hb and ferritin were within the target range. For bone biochemistry, although average calcium and phosphate were in range, there was evidence of hyperparathyroidism with average PTH over target at more than twice the upper limit of normal, with variation between centres. Control of acidosis was also within the desired range.

Laboratory and clinical indices – annual data

Haemoglobin and ferritin

The percentage of patients aged <18 years on dialysis achieving the Hb standard in 2015 was 72.9% for those on HD and 74.5% for those on PD, compared to 92.8% for those with a renal transplant. There was no pattern by age and no comments could be made at centre level or for dialysis patients due to small patient numbers. During 2013–2015, 72.9% of dialysis patients and 92.2% of

Table 9.7. Frequency of number of CVRFs in prevalent RRT patients <18 years old on 31st December 2015

Number of CV risk factors	Hypertensive	OW/Obese	Hypercholesterolaemic	*N*	%	Total %
0	No	No	No	121	24.8	**24.8**
1	Yes	No	No	45	9.2	
	No	Yes	No	84	17.2	**40.9**
	No	No	Yes	70	14.4	
2	Yes	Yes	No	35	7.2	
	Yes	No	Yes	37	7.6	**27.3**
	No	Yes	Yes	61	12.5	
3	Yes	Yes	Yes	34	7.0	**7.0**
N	151	214	202			
Total %	**31.0**	**43.9**	**41.5**			

CV – cardiovascular; OW – overweight

Table 9.8. Median quarterly laboratory data by centre in prevalent transplant patients <18 years old on 31st December 2015

	Transplant patients				
Centre	Creatinine (μmol/L)	Haemoglobin (g/L)	Calcium (mmol/L)	Phosphate (mmol/L)	Bicarbonate (mmol/L)
Bham_P	70	120	2.46	1.31	25
Blfst_P	77	124	2.47	1.21	22
Brstl_P	76	127	2.43	1.24	23
Cardf_P	65	126	2.50	1.32	23
Glasg_P	79	120	2.45	1.26	22
L Eve_P	84	120	2.46	1.20	22
L GOSH_P	81	124	2.48	1.49	25
Leeds_P	86	115	2.41	1.30	24
Manch_P	88	119	2.48	1.26	22
Newc_P	79	124	2.42	1.21	22
Nottm_P	76	124	2.43	1.28	25
Soton_P	94	115	2.50	1.30	24
UK median	**79**	**122**	**2.46**	**1.31**	**24**
IQR	**(59–107)**	**(111–131)**	**(2.39–2.52)**	**(1.15–1.49)**	**(22–26)**

IQR interquartile range

Table 9.9. Median quarterly creatinine by age group, centre and time since transplant in prevalent transplant patients <18 years old on 31st December 2015

	Age (years)							
	0–<5		5–<12		12–<16		16–<18	
Centre	*N*	Creatinine (μmol/L)	*N*	Creatinine (μmol/L)	*N*	Creatinine (μmol/L)	*N*	Creatinine (μmol/L)
Bham_P	12	44	123	62	128	78	29	105
Blfst_P	5	46	52	84	10	57	2	
Brstl_P	3	149	86	65	34	86	23	100
Cardf_P	6	41	39	63	29	69	8	72
Glasg_P	5	38	61	60	49	87	41	104
L Eve_P	23	41	96	71	103	89	58	116
L GOSH_P	43	39	233	69	184	94	92	123
Leeds_P	20	46	82	67	89	95	46	102
Manch_P	13	46	109	64	53	97	35	114
Newc_P	4	54	23	47	31	80	30	93
Nottm_P	16	31	96	74	62	77	35	108
Soton_P	9	51	26	95	23	95	5	98
Total *N* and UK median	**159**	**41**	**1,026**	**67**	**795**	**88**	**404**	**107**
IQR		**(34–52)**		**(53–87)**		**(70–115)**		**(88–135)**
Time since transplantation (years)								
3 months	54	40	95	55	49	82	38	103
1 year	62	42	137	66	90	81	50	109
2.5 years	42	43	335	60	158	88	78	92
5 years	1		353	73	211	79	96	105
≥7 years	0		106	79	287	100	142	119

IQR interquartile range

Table 9.10. Median quarterly laboratory data by centre in prevalent dialysis patients <18 years old on 31st December 2015

	Dialysis patients					
Centre	Hb (g/L)	Ferritin (μg/L)	Calcium (mmol/L)	Phosphate (mmol/L)	PTH (pmol/L)	Bicarbonate (mmol/L)
Bham_P	111	283	2.61	1.71	10.3	27
Blfst_P	117	1272	2.56	1.57	17.2	26
Brstl_P	111	284	2.52	1.41	16.0	25
Cardf_P	128	224	2.61	1.50	52.2	25
Glasg_P	116	210	2.49	1.14	22.1	24
L Eve_P	104	382	2.51	1.40	24.6	24
L GOSH_P	128	337	2.64	2.01	17.0	30
Leeds_P	100	311	2.44	1.95	58.4	25
Manch_P	107	149	2.58	1.65	31.0	25
Newc_P	108	278	2.60	1.32	9.7	23
Nottm_P	103	238	2.54	1.64	16.3	27
Soton_P	85	150	2.50	1.50	6.6	25
UK median	**111**	**278**	**2.55**	**1.62**	**21.0**	**26**
IQR	**(99–124)**	**(129–467)**	**(2.46–2.65)**	**(1.30–1.99)**	**(8.5–47.6)**	**(23–29)**

Hb – haemoglobin; PTH – parathyroid hormone; IQR – interquartile range

transplant patients achieved the standard for Hb, which has remained consistent since the 2003–2006 period. The proportion of patients with a ferritin in range during 2013–2015 was 35.8% for dialysis patients and 13.4% for transplant patients. It is not possible to draw conclusions on ferritin data trends, because the data completeness for transplant patients was only 42.1% in the 2003–2006 period, but had improved to 79.0% in the 2013–2015 period. A similar improvement was also seen for dialysis ferritin data, increasing from 75.0% to 95.1% over the same time periods.

At first inspection, table 9.11 appears to show over time an increasing use of erythropoietin stimulating agents (ESAs) in transplant patients and a decrease in use of ESAs in dialysis patients. However, the amount of missing data increased from 2.1% in the 2003–2006 period to 16.0% in the most recent period for dialysis patients, and by a similar margin for the transplant patients.

Table 9.11. Proportion of paediatric RRT patients on ESA, by Hb attainment, across time

Time period	Hb below standard % on ESA	Hb above standard % on ESA
Transplant patients		
2003–2006	21.1	4.2
2007–2009	21.4	5.6
2010–2012	20.0	5.7
2013–2015	31.9	3.6
Dialysis patients		
2003–2006	97.1	93.2
2007–2009	95.9	91.0
2010–2012	82.9	81.0
2013–2015	87.5	96.1

Hb – haemoglobin; ESA – erythropoietin stimulating agent

Overall, figure 9.13 shows high usage of ESAs in dialysis patients without a clear difference by Hb standard, noting erratic results from 2010 when there was a reduction in data completeness. Usage of ESAs in transplant patients remained low and reasonably stable with a more discernible separation by Hb standard. Figure 9.14 further demonstrates wider variation for usage of intravenous (IV) iron for dialysis patients by Hb standard, in keeping with low completeness for past years, and low usage of IV iron in transplant patients.

Calcium

The percentage of patients aged <18 years on HD ($N = 108$) achieving the calcium standard in 2015 was 75.9%, with 3.7% of patients being hypocalcaemic and 20.4% being hypercalcaemic. The percentage of patients aged <18 years on PD ($N = 99$) achieving the calcium standard in 2015 was 69.7%, with 1.0% being hypocalcaemic and 29.3% being hypercalcaemic. Small cohort numbers prevent commentary at centre level or by age group.

Phosphate

The percentage of patients aged <18 years on HD ($N = 108$) achieving the phosphate standard in 2015

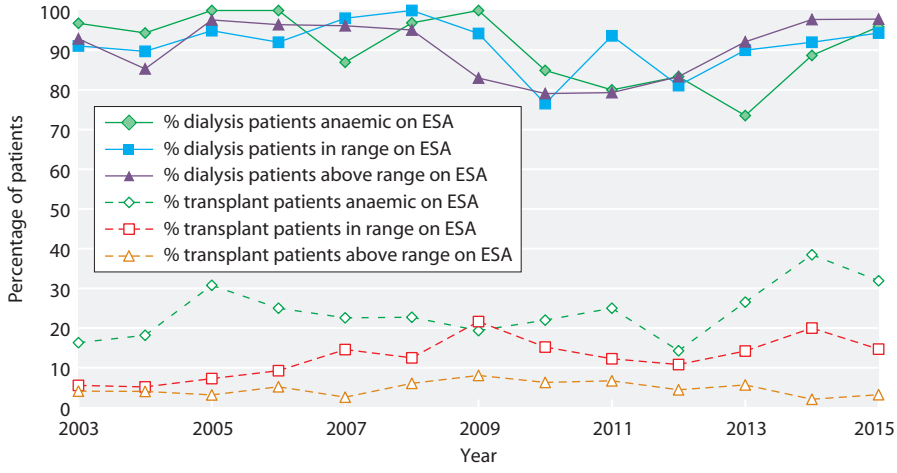

Fig. 9.13. The use of ESA by Hb standard and treatment modality between 2003 and 2015 in prevalent RRT patients <18 years old

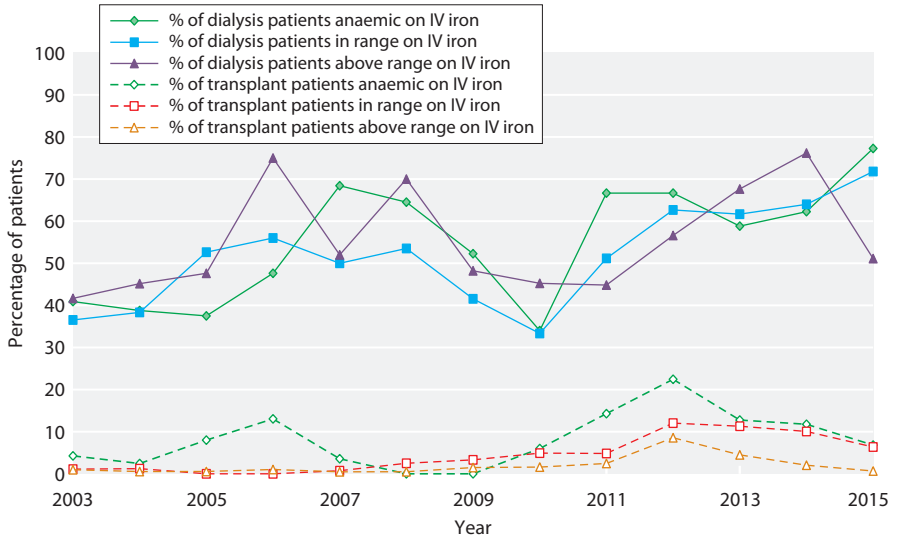

Fig. 9.14. The use of IV iron by Hb standard and treatment modality between 2003 and 2015 in prevalent RRT patients <18 years old

was 48.2%, with 18.5% of patients being hypophosphataemic and 33.3% being hyperphosphataemic. The percentage of patients aged <18 years on PD ($N = 99$) achieving the phosphate standard in 2015 was 51.5%, with 8.1% of patients being hypophosphataemic and 40.4% being hyperphosphataemic. Small cohort numbers prevent commentary at centre level or by age group.

Parathyroid hormone

The percentage of patients aged <18 years with a renal transplant ($N = 633$) achieving the PTH standard in 2015 was 80.6%, with 19.4% having hyperparathyroidism. The percentage of patients aged <18 years on HD ($N = 110$) achieving the PTH standard in 2015 was 44.6%, with 55.4% having hyperparathyroidism. The percentage of patients aged <18 years on PD ($N = 99$) achieving the PTH standard in 2015 was 32.3%, with 67.7% having hyperparathyroidism. Small cohort numbers and low completeness from some centres for transplant patients prevent commentary at centre level or by age group.

Bicarbonate

The percentage of patients aged <18 years with a renal transplant ($N = 714$) achieving the bicarbonate standard in 2015 was 87.0%, with 9.5% being below and 3.5% being above the standard. The percentage of patients aged <18 years on HD ($N = 105$) achieving the bicarbonate standard in 2015 was 74.3%, with 10.5% being below and 15.2% being above the standard. The percentage of patients aged <18 years on PD ($N = 98$) achieving the bicarbonate standard in 2015 was 58.2%, with 6.1% being below and 35.7% being above the standard. Small cohort numbers prevent commentary at centre level or by age group.

Discussion

This chapter provides information describing clinical and laboratory parameters of paediatric RRT patients in the UK. This enables comparison against national standards and guidelines, assessment of quality of care and benchmarking the performance of UK tertiary paediatric nephrology centres. Data from 2015 and trends over the last 13 years have been analysed. The results and conclusions are a valuable resource for the paediatric renal community and these data account for nearly 20% of the European Paediatric Renal Registry data.

Quarterly data

Twelve centres provided quarterly data for analyses, an increase of two centres from the previous year. The data show excellent graft function for those with a transplant, with a breakdown by centre, age and time following kidney transplant, which may be of value for clinicians. The reporting of eGFR using quarterly data is not possible due to low completeness of Ht data, but eGFR using annual data to add to the assessment of transplant function is given. For dialysis patients, the data again demonstrate good control of anaemia and acidosis, with a median PTH of 21 pmol/L, varying widely between centres.

The ongoing challenge is to continue to work with the remaining centre to achieve quarterly returns and to improve extracts to allow new data to be loaded into a single UKRR database.

Highlights from the 2015 data

For core items there was very good completeness; ESA and IV iron data were limited in transplant patients perhaps because these patients tend not to be anaemic. Cholesterol and growth hormone remained the most limited variables in terms of completeness, but reporting levels were above the threshold to be used in analyses.

Growth

As previously reported, dialysis patients had lower median height z-scores than transplanted patients, but only constitute between a fifth and a quarter of the population. After taking completeness and IQRs into account, the median Ht z-scores were similar between centres for transplant patients (differing by a SD) and more widely spread for dialysis patients, which is not surprising given the smaller numbers per unit.

Taking into account 13 years of data, the overall median Ht z-score at RRT start for UK children was −1.4 (again with a wide IQR), demonstrating the impact of a chronic disease in childhood and suggesting there are opportunities to improve growth at earlier stages of CKD. The data show that once transplanted, patients maintained their Ht over the following five years, with those transplanted under the age of five years showing an improvement in Ht z-score since the start of RRT.

Use of growth hormone remains difficult to interpret due to a high proportion of missing data, notwithstanding the fact that there are alternative interventions to improve growth which the UKRR does not collect. Further, adjustment for situations where use of growth hormone is not recommended, such as in newly transplanted patients and in those demonstrating catch-up growth was not possible. There are plans to look at reasons why short children are not on growth hormone therapy and to look at the effects of steroid avoidance on growth in transplanted patients. A significant percentage of transplant patients were overweight or obese and steroid use may also contribute to weight gain.

While the median Wt z-score for transplant patients was near that of the healthy population, the dialysis patients were underweight, again accepting a wide IQR. As dialysis patients and transplant patients were both shorter on average than their healthy peers, this meant that transplant patients had a higher BMI than their healthy peers, with dialysis patients having relatively normal BMI. Improvements to the completeness of Ht and Wt in the quarterly data should allow growth rates to be evaluated in the future. These data will also allow evaluation of excessive Wt gain following kidney transplantation [9], identified as the most prevalent CVRF in children receiving RRT.

Cardiovascular risk factor evaluation

The analysis of SBP across different centres in 2015 continued to show variability both between and within centres. Statistically fewer younger patients, girls and dialysis patients achieved the SBP standard.

The data continue to show that the majority of children on RRT have CVRFs – accepting the low completeness of cholesterol data – consistent with previous reports of RRT and pre-dialysis CKD cohorts [10, 11]. Given the good completeness of other data it is interesting to speculate on the reason for lack of measurement of cholesterol in children and young people. Many clinicians are reluctant to treat mild to moderate hypercholesterolaemia due to lack of data on tolerability and efficacy of treatment in these populations.

Being overweight was the most common CVRF, suggesting that weight should be a specific target for intervention for long-term cardiovascular health of paediatric RRT patients. Whilst 80% of patients had a blood pressure below the 90th centile, there was evidence in paediatric CKD patients that suggests lower targets may be appropriate [12].

Laboratory and clinical indices

Annual data regarding attainment of standards for laboratory measures were similar to previous years for Hb, ferritin, calcium, phosphate, PTH and bicarbonate. There is a new NICE guideline on the treatment of anaemia in CKD and centres may be switching the way they monitor iron stores. The data collected were from before the introduction of the new guideline, which may in part explain the low figures for ferritin measurement. The new guidance should be reflected in the 2016 data.

The proportion of dialysis patients achieving the standards appears low. However, over-interpretation of single measurements of variable completeness from a small proportion of the cohort should be avoided. Once all centres are reporting quarterly biochemistry data, replacement of the assessment of achievements of standards on the quarterly median rather than the annual result will be possible.

Future work

The goals of the paediatric UKRR remain the reporting of quarterly data for all paediatric renal centres, improving data extracts and then combining the adult and paediatric UKRR databases.

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Conflicts of interest: the authors declare no conflicts of interest

References

1 Renal Association standards, 3rd edition, 2002 http://www.renal.org/docs/default-source/guidelines-resources/Renal_Association_Standards_3rd_Edition_2002-2007.pdf?sfvrsn=0 (last accessed 14th November 2016).

2 Cole TJ, Flegal KM, Nicholls D, Jackson AA. Body Mass Index cut offs to define thinness in children and adolescents: international study. *BMJ* 2007; 335 (7612): 194.

3 Freeman JV, Cole TJ, Chinn S et al. Cross sectional stature and weight reference curves for the UK, 1990. Arch Dis Child 1995;73:17–24.

4 BAPN Standards for Hypertension in Paediatric Renal Transplant Recipients, 2011 http://www.renal.org/docs/default-source/special-interest-groups/bapn/clinical-standards/bapn-standards-for-hypertension-in-renal-transplant-recipients.pdf?sfvrsn=2 (last accessed 14th November 2016).

5 National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents. Pediatrics 2004;114(2):555–76.

6 Expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents: summary report. Pediatrics 2011 Dec; 128(suppl 5):S213-56. doi: 10.1542/peds.2009-2107C.

7 NICE clinical guideline 114. Anaemia management in people with chronic kidney disease. London: National Institute for Health and Clinical Excellence, 2011.

8 Schwartz GJ, Gauthier B. A simple estimate of glomerular filtration rate in adolescent boys. J Pediatr. 1985 Mar;106(3):522–6.

9 Plumb LA, Pitcher D, Tse Y, Shield JP, Inward C, Sinha MD. British Association for Paediatric Nephrology. Longitudinal changes in body mass index following renal transplantation in UK children. Nephrol Dial Transplant. 2014;29(1):196–203. doi:10.1093/ndt/gft395.

10 Wilson AC, Schneider MF, Cox C, Greenbaum LA, Saland J, White CT, Furth S, Warady BA, Mitsnefes MM. Prevalence and Correlates of Multiple Cardiovascular Risk Factors in Children with Chronic Kidney Disease. Clin J Am Soc Nephrol. 2011 Dec; 6(12):2759–65. doi: 10.2215/CJN.03010311.

11 Mitsnefes M. Cardiovascular Disease in Children with Chronic Kidney Disease. J Am Soc Nephrol 2012 23:578–585. doi: 10.1681/ASN.2011111115.

12 ESCAPE Trial Group, Wühl E, Trivelli A, Picca S, Litwin M, Peco-Antic A, Zurowska A, Testa S, Jankauskiene A, Emre S, Caldas-Afonso A, Anarat A, Niaudet P, Mir S, Bakkaloglu A, Enke B, Montini G, Wingen AM, Sallay P, Jeck N, Berg U, Caliskan S, Wygoda S, Hohbach-Hohenfellner K, Dusek J, Urasinski T, Arbeiter K, Neuhaus T, Gellermann J, Drozdz D, Fischbach M, Möller K, Wigger M, Peruzzi L, Mehls O, Schaefer F. Strict blood-pressure control and progression of renal failure in children. N Engl J Med 2009;361(17):1639–50. doi:10.1056/NEJMoa0902066.

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UK Renal Registry 19th Annual Report: Chapter 10 Epidemiology of Reported Infections in Patients Receiving Dialysis in England between January 2015 and December 2015: a Joint Report from Public Health England and the UK Renal Registry

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Keywords

Clostridium difficile · Dialysis · Epidemiology · *Escherichia coli* · Established renal failure · Infection · MRSA · MSSA · *Staphylococcus*

Summary

- Between January 2015 and December 2015 there were a total of 31 episodes of Methicillin Resistant *Staphylococcus aureus* (MRSA) bacteraemia in patients receiving dialysis for end stage renal disease.
- The rate of MRSA episodes per 100 dialysis patient years was 0.13 compared to 0.15 the previous year.
- Rates of Methicillin Sensitive *Staphyloccoccus aureus* (MSSA) continued their gradual increase with a rate of 2.35 per 100 patient years compared with 2.26 the year before. This was a result of 560 episodes of bloodstream infection between January and December.
- Rates of *Clostridium difficile* infection (CDI) were stable with 245 recorded episodes giving a rate of 1.03 per 100 patient years.
- *Escherichia coli* (E.coli) infections occurred at a rate of 1.7 per 100 dialysis patient years, an increase on the previous year's rate of 1.49.
- As found in previous years, a tunnelled catheter was associated with a higher number of infection episodes than other forms of access in those patients with a staphylococcal bacteraemia.

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Introduction

Infection remains one of the leading causes of death in patients receiving renal replacement therapy (RRT) for established renal failure (ERF) [1]. The causes of these high rates of systemic infection are multi-factorial and include an impaired immune system and the type of vascular access used [2]. This chapter covers reporting for Methicillin Resistant *Staphylococcus aureus* (MRSA), Methicillin Sensitive *Staphylococcus aureus* (MSSA) and *Escherichia coli* (E Coli) bloodstream infections as well as episodes of *Clostridium difficile* infection (CDI) in patients receiving dialysis for ERF. These infections are subject to mandatory reporting to Public Health England (PHE) and previous UK Renal Registry reports have detailed the epidemiology of these infections in dialysis patients.

Methods

The reporting of MRSA, MSSA, E Coli and CDI episodes to PHE is mandatory, however the completion of data relating to whether patients are in established renal failure is voluntary and depends on the data entry policy of each individual trust. The methods used for reporting of infections to PHE have been detailed in previous registry reports [3]. To account for potential differences in reporting policy, the 2015 UKRR report introduced a new method to standardise the case identification process by linking the UKRR database of patients receiving dialysis to the PHE database of reported positive blood cultures. This process is outlined in more detail in the report from that year [4]. Linked data were again validated by securely emailing clinical or infection control leads at each renal centre and asking them to confirm the following:

1 That each of the cases in the PHE file was correct, i.e. that it related to a dialysis patient receiving treatment at their centre at the time of the infection and
   a Removing any cases that occurred in patients not on dialysis and receiving treatment at their centre at the time of the infection
   b Adding any cases that were not known to PHE but occurred in patients on dialysis and receiving treatment at their centre at the time of the infection
2 The dialysis modality
3 For MRSA and MSSA bloodstream infections to provide details on the access in use at the time of the infection.

PHE reports individual blood culture results. However this report details individual infection episodes; repeated positive blood cultures within a four-week timeframe are treated as a single infection episode, beyond four weeks they are treated as a new episode or re-infection. Centre specific rates for each infection are presented per 100 dialysis patient years. The denominator for this rate was calculated for each centre by summing the number of days that each dialysis patient contributed between the 1st of January and 31st of December 2015. When calculating the modality specific rates, the number of days that every dialysis patient spent on each modality during the collection period was totalled. The number of patient years at risk by access type was estimated using data from the 2015 dialysis access audit. The percentage of prevalent patients on each form of vascular access on 31st December 2015 was multiplied by the total number of patients on Haemodialyis (HD) on 31st December 2015 to give an estimate of the overall number of patient years at risk.

Finally, in order to adjust for variation in precision of the estimated rate, the rate of bacteraemia/CDI per 100 dialysis patient years has been plotted against the centre size in a funnel plot. This has been plotted for each infection.

The last UKRR report covered the period between May 2013 and April 2014. This year data are presented between January 2015 and December 2015 in order to bring the data collection period in this chapter in line with the rest of the UKRR report. This year's report is the first opportunity to directly compare data collected using the new linkage method across years.

Results

Table 10.1 displays the number of positive blood cultures reported to PHE and the final number following the validation process. Centres added 25 infection episodes this year in comparison with 17 last year. Thirteen episodes were not confirmed by centres as being associated with a dialysis patient during the validation process.

Table 10.2 shows the overall number of episodes for each infection in the period covered by the report. It also shows the split between dialysis modalities and the overall rate per 100 dialysis patient years.

Centre level data are shown in table 10.3.

Table 10.1. Number of infectious episodes reported to Public Health England (PHE) and validated by renal centres in 2015

	MRSA	MSSA	CDI	*E.coli*
Number of infectious episodes reported to PHE	29	580	281	426
Number of episodes rejected by centres during validation	0	1	2	10
Number of episodes added by centres during validation	2	13	2	10
Number of duplicate episodes reported to PHE	0	32	36	21
Total number of episodes after validation process	**31**	**560**	**245**	**405**

Table 10.2. Overall number of episodes by modality and rate per 100 dialysis patient years in 2015

	Infection			
	MRSA	MSSA	CDI	*E.coli*
Number of episodes				
Total	**31**	**560**	**245**	**405**
HD	31	548	216	376
PD		12	29	29
Rate *(95% CI)* per 100 patient years				
Total	**0.13** ***(0.09–0.18)***	**2.35** ***(2.16–2.56)***	**1.03** ***(0.9–1.17)***	**1.7** ***(1.54–1.88)***
HD	0.15 *(0.1–0.21)*	2.65 *(2.43–2.88)*	1.04 *(0.91–1.19)*	1.82 *(1.64–2.01)*
PD	0	0.39 *(0.2–0.67)*	0.93 *(0.62–1.34)*	0.93 *(0.62–1.34)*

HD haemodialyis
PD peritoneal dialysis

Methicillin resistant Staphylococcus aureus

There were a total of 31 MRSA infection episodes in the period covered by the report at a rate of 0.13 (95% CI 0.09–0.18) per 100 dialysis patient years (table 10.2). This is very similar to last year's rate of 0.15 per 100 patient years, and as shown by the box and whisker plot of MRSA rates over the last few years (figure 10.1), continues to suggest that the MRSA rate amongst dialysis patients has reached a plateau. All recorded MRSA episodes occurred in patients receiving haemodialysis.

Only one centre (Bradford) had an MRSA rate in excess of 1.0 per 100 dialysis patient years which is the Renal Association audit standard. The funnel plot in figure 10.2 plots each centre's estimated rate against the number of patient years to take into account the greater variation expected as centre size decreases, however the low numbers of episodes at each centre makes the comparison of rates unreliable.

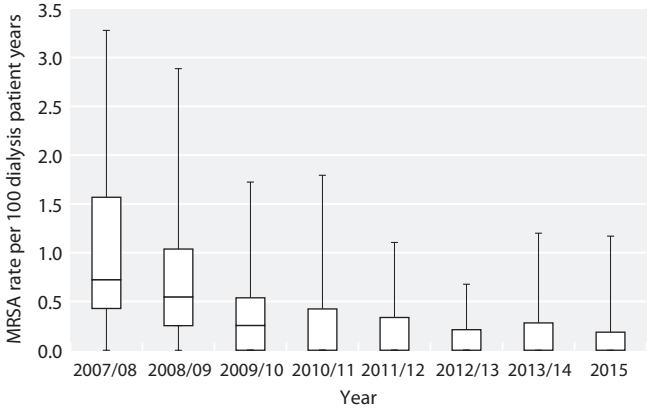

Fig. 10.1. Box and whisker plot of MRSA rates by renal centre per 100 dialysis patient years, by reporting year

Methicillin sensitive Staphylococcus aureus

In total, there were 560 episodes of MSSA infection in the period covered at a rate of 2.35 (95% CI 2.16–2.56) per 100 dialysis patient years. This represents a slight increase from last year's rate of 2.23 per 100 dialysis patient years. Figure 10.3 demonstrates the trend in MSSA infection rates. In previous years the methods of data collection and validation have varied making absolute comparisons difficult, however this collection and validation method was identical to that used last year allowing direct comparisons to be made.

There was considerable variation between centres in the rate of MSSA bloodstream infection per 100 dialysis patient years with a low figure of 0.30 and a high figure of 7.65. The funnel plot (figure 10.4) allows comparison between centres' estimated rates. There were also differences by dialysis modality where the rate of infection is

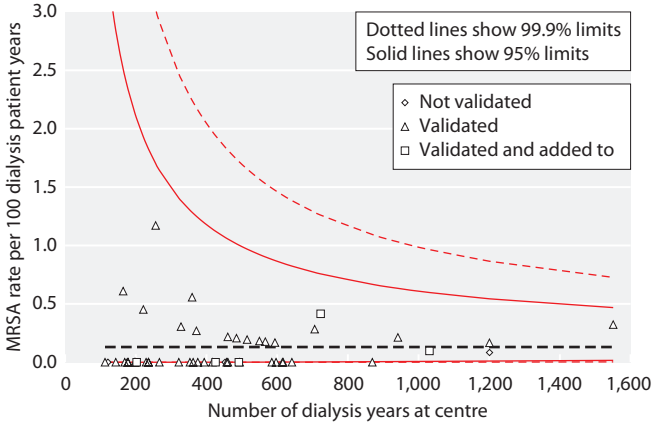

Fig. 10.2. Funnel plot of the MRSA bacteraemia rate per 100 dialysis patient years by renal centre, 1st January 2015 to 31st December 2015
Dotted line depicts rate for whole cohort

Table 10.3. Number and rate of infectious episodes in patients with established renal failure by renal centre

Centre	Dialysis patient years	Number of episodes (1/01/2015–31/12/2015)				Rate per 100 dialysis patient years			
		MRSA	MSSA	CDI	*E.coli*	MRSA	MSSA	CDI	*E.coli*
B Heart	460	1	3	4	4	0.22	0.65	0.87	0.87
B QEH	1,201	2	23	12	17	0.17	1.92	1.00	1.42
Basldn	197	0	1	1	0	0.00	0.51	0.51	0.00
Bradfd	256	3	10	1	8	1.17	3.90	0.39	3.12
Brightn	492	0	10	2	13	0.00	2.03	0.41	2.64
Bristol	597	0	10	5	4	0.00	1.68	0.84	0.67
Camb*									
Carlis	113	0	6	1	2	0.00	5.32	0.89	1.77
Carsh	942	2	13	2	14	0.21	1.38	0.21	1.49
Chelms	164	1	1	1	3	0.61	0.61	0.61	1.83
Colchr	121	0	4	0	3	0.00	3.31	0.00	2.48
Covnt	457	0	8	6	5	0.00	1.75	1.31	1.09
Derby	328	1	1	2	5	0.30	0.30	0.61	1.52
Donc	200	0	6	2	7	0.00	3.00	1.00	3.50
Dorset	322	0	4	3	5	0.00	1.24	0.93	1.55
Dudley	229	0	13	3	6	0.00	5.67	1.31	2.62
Exeter	515	1	8	10	15	0.19	1.55	1.94	2.91
Glouc	267	0	8	4	3	0.00	3.00	1.50	1.12
Hull	426	0	16	2	10	0.00	3.76	0.47	2.35
Ipswi	173	0	7	3	2	0.00	4.04	1.73	1.16
Kent	485	1	16	2	8	0.21	3.30	0.41	1.65
L Barts	1,201	1	37	10	24	0.08	3.08	0.83	2.00
L Guys	706	2	18	8	14	0.28	2.55	1.13	1.98
L Kings	642	0	3	0	1	0.00	0.47	0.00	0.16
L Rfree	869	0	9	10	15	0.00	1.04	1.15	1.73
L St.G	372	1	7	4	3	0.27	1.88	1.08	0.81
L West	1,551	5	31	15	28	0.32	2.00	0.97	1.81
Leeds	566	1	20	7	11	0.18	3.53	1.24	1.94
Leic	1,031	1	27	10	18	0.10	2.62	0.97	1.75
Liv Ain	202	0	7	3	7	0.00	3.46	1.48	3.46
Liv Roy	453	0	10	8	10	0.00	2.21	1.77	2.21
M RI	585	0	14	10	8	0.00	2.39	1.71	1.37
Middlbr	359	2	13	6	9	0.56	3.62	1.67	2.50
Newc	353	0	27	5	5	0.00	7.65	1.42	1.42
Norwch	362	0	5	6	7	0.00	1.38	1.66	1.93
Nottm	461	0	11	5	17	0.00	2.39	1.09	3.69
Oxford	550	1	14	9	8	0.18	2.55	1.64	1.46
Plymth	169	0	2	3	5	0.00	1.19	1.78	2.97
Ports	723	3	23	5	17	0.41	3.18	0.69	2.35
Prestn	617	0	12	7	10	0.00	1.95	1.13	1.62
Redng	375	0	10	3	9	0.00	2.66	0.80	2.40
Salford	494	0	15	7	4	0.00	3.04	1.42	0.81
Sheff	615	0	10	7	8	0.00	1.63	1.14	1.30
Shrew	236	0	6	3	6	0.00	2.55	1.27	2.55
Stevng	594	1	12	3	3	0.17	2.02	0.51	0.51
Sthend	143	0	8	0	3	0.00	5.58	0.00	2.09
Stoke	417	0	6	9	8	0.00	1.44	2.16	1.92
Sund	236	0	7	3	0	0.00	2.96	1.27	0.00
Truro	178	0	6	5	2	0.00	3.37	2.81	1.12
Wirral	221	1	8	4	2	0.45	3.62	1.81	0.90
Wolve	394	0	7	3	5	0.00	1.78	0.76	1.27
York	178	0	7	1	4	0.00	3.94	0.56	2.25
England	**23,794**	**31**	**560**	**245**	**405**	**0.13**	**2.35**	**1.03**	**1.70**

*Cambridge were unable to submit data to the UKRR for 2015

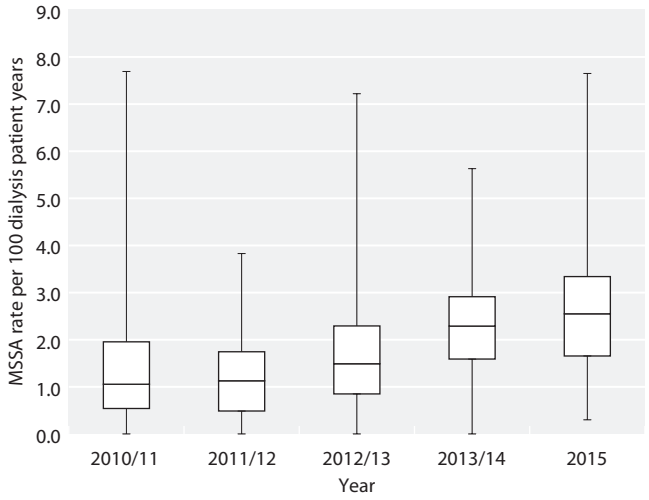

Fig. 10.3. Box and whisker plot of MSSA rates by renal centre per 100 dialysis patient years, by reporting year

seven-fold higher in the HD population than in the PD population (table 10.2).

Vascular access type

For MRSA bacteraemia episodes, access data were available for 20 of the 31 infection episodes. Of these 20 episodes, 14 occurred while patients were using a central venous catheter as access, five occurred in patients with an arteriovenous fistula and one occurred in a patient with an arteriovenous graft. Of the 560 episodes with a confirmed MSSA, vascular access data were provided for 453 episodes. Two hundred and seventy one episodes occurred while patients had either a tunnelled or non-tunnelled central venous catheter (almost 60% of the total episodes). The access data for these infections are summarised in table 10.4. The estimated number of patient years at risk is also shown. Absolute risk rates cannot be calculated because vascular access has, until now, only been captured at one time point every 12 months, so the time at risk while exposed to each form of access was not available. Instead the estimated number of patient years at risk is given based on the distribution of access types using data from the 33 centres in England who provided prevalent access data in the 2015 dialysis access audit return. This distribution was then applied to the total number of patients on HD in England on 31st December 2015 to give an overall estimate for England.

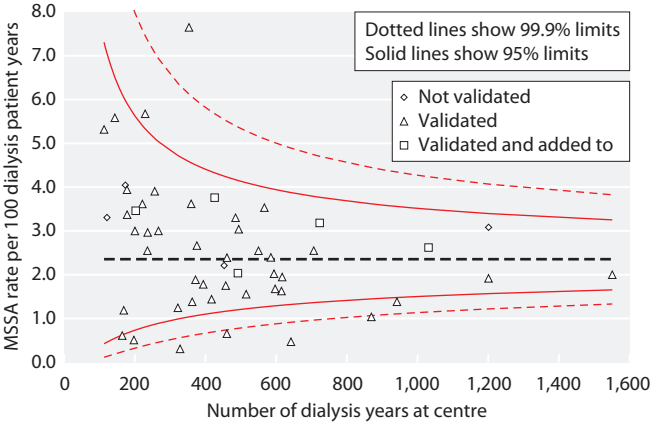

Fig. 10.4. Funnel plot of the MSSA bacteraemia rate per 100 dialysis patient years by renal centre, 1st January 2015 to 31st December 2015
Dotted line depicts rate for whole cohort

Table 10.4. Type of dialysis access in use at the time of infection for HD patients

	Number of episodes (1/01/2015–31/12/2015)				
	AVF	AVG	CVC	PD	No data
Estimated number of patient years at risk	12,938	1,368	7,026*	3,093	
MRSA	7	1	17		6
MSSA	153	20	271	9	107

*Only data for combined non-tunnelled and tunnelled catheters available
AVF arteriovenous fistula; AVG arteriovenous graft; CVC central venous catheter; PD peritoneal dialysis

Clostridium difficile

There were a total of 245 *Clostridium difficile* infection episodes reported this year representing a rate of 1.03 per 100 dialysis patient years. This is comparable to results in last year's report where there were 247 infection episodes representing a rate of 1.05 per 100 dialysis patient years. Rates were comparable between the PD and HD populations (table 10.2). Three centres reported no episodes, the highest reported rate was 2.81 per 100 dialysis patient years. The funnel plot in figure 10.5 demonstrates that no centres were exceeding their estimate rate.

Escherichia coli

A total of 405 episodes of *E.coli* bacteraemia were reported in the time period covered by this report, giving a national rate of 1.7 per 100 patient years (95% CI 1.54–1.88). This compares with a rate of 1.49 reported last year. There was considerable variation once again between centres, two of which did not report any episodes. The highest rate was 3.69 per 100 patient years. Figure 10.6

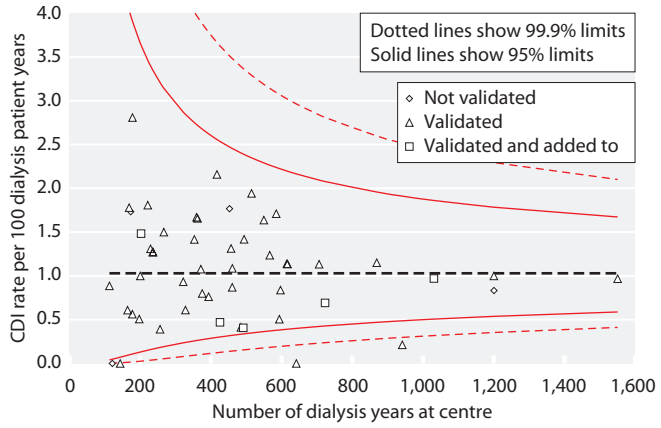

Fig. 10.5. Funnel plot of the CDI rate per 100 dialysis patient years by renal centre, 1st January 2015 to 31st December 2015
Dotted line depicts rate for whole cohort

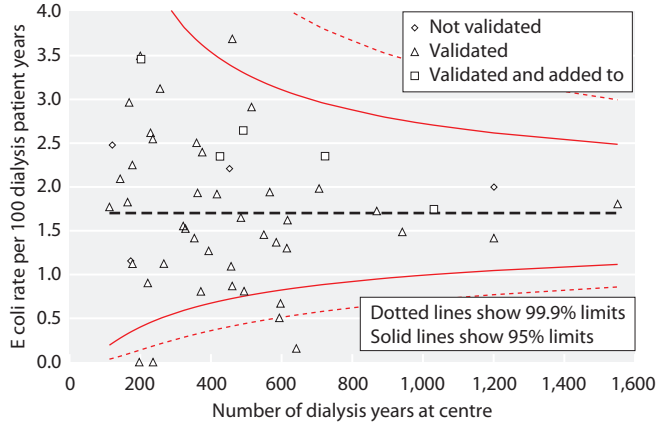

Fig. 10.6. Funnel plot of the *Escherichia coli* bacteraemia rate per 100 dialysis patient years by renal centre, 1st January 2015 to 31st December 2015
Dotted line depicts rate for whole cohort

plots each centre's estimated rate against the number of patient years to take into account the greater variation expected as centre size decreases. The rate in the HD population was twice as high compared to the PD population.

Discussion

This report presents data from one year of infections in patients receiving dialysis for ERF and continues the work of previous joint reports from PHE and the UKRR. It represents the second consecutive year where infections reported to PHE have been cross-checked with the UKRR database of patients receiving dialysis. For the first time, this allows a direct comparison with the previous year and removes the caution previously expressed due to differences in data collection and validation methods.

The rate of MRSA infections across England has remained stable year-on-year since 2011 following the earlier improvement in rates across England. This reflects the impact of increased awareness, training and screening. The enhanced attention given to this by dialysis units has resulted in this sustained improvement since reporting began in 2007/8 and represents a genuine success story.

This report presents the fourth full year of reporting of MSSA bacteraemia rates. The rate remains much higher than MRSA with a reporting rate 18-fold higher. MSSA rates amongst dialysis patients has increased for the periods covered by each of the last three reports and while changes in reporting patterns undoubtedly account for some of this increase it does suggest that MSSA remains a significant issue in dialysis units in England. While no case-mix adjustment has been performed to take into account factors associated with catheter usage, combined data from this report and the 2015 vascular access report suggests that the presence of a central venous catheter remains a risk factor for development of staphylococcal infection. It also demonstrates that there is risk associated with an arteriovenous fistula. It is notable that there is much variation between centres in terms of MSSA infection rates. This may represent differences in screening programmes, access rates and methods of access care. Studying local variation in policies more closely may provide insight into the reasons for the variation in rates. Rates of MRSA have remained low whilst rates of MSSA have risen over the years. There is considerable incentive for hospital trusts to keep the rates of MRSA low, meaning much time, effort and resource is devoted to MRSA screening and eradication programmes.

This year's report includes further data on CDI and *E.coli* blood stream infection. CDI rates amongst dialysis patients remained stable. Antibiotic policies vary considerably between centres and there are no centre level data on antibiotic usage. Like MRSA there is considerable effort being made in all trusts to keep rates of CDI low with enhanced screening, isolation and change in antibiotic prescribing practices all being put in place. The national rate of *E. coli* bacteraemia amongst dialysis patients is similar to that observed last year. It is worth noting that Public Health England reported rises in

incidence of MSSA and *E. coli* bacteraemia in the general population and so these increases are consistent with the overall trend in these infections [5].

Future reports will give more information regarding the long-term trends. The improved data accuracy and completeness that has resulted from linkage between PHE and UKRR databases will allow any trends to be more clearly identified. Antimicrobial resistance will also become an increasing focus. Public Health England launched a five year antimicrobial resistance strategy in 2014 [6]. Whilst there has been significant progress in reduction of the incidence of MRSA, the rise in multi drug resistant organisms represents a serious challenge to healthcare in the 21st century. For example, PHE is working with clinicians to develop guidance for screening and management of Carbapenemase-producing Enterobacteriaceae within dialysis facilities. NHS Improvement are leading on a strategy to halve gram negative blood stream infections by 2021 [7] with a focus on *E. coli* which accounts for about 55% of those. As part of that strategy, the UKRR will need to consider broadening data collection to other organisms and antibiotic usage as well as supporting improvement initiatives within renal services.

Conflicts of interest: the authors declare no conflicts of interest

Acknowledgement

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References

1 Steenkamp R, Rao A, Fraser S. UK Renal Registry 18th Annual Report (December 2015) Chapter 5: Survival and Causes of Death in UK Adult Patients on Renal Replacement Therapy in 2014: National and Centre-specific Analyses. Nephron. 2016;132 Suppl:111–44.

2 Bray BD, Boyd J, Daly C, Donaldson K, Doyle A, Fox JG, et al. Vascular access type and risk of mortality in a national prospective cohort of haemodialysis patients. QJM. 2012 Nov;105(11):1097–103.

3 Fluck R, Wilson J, Tomson CRV. UK Renal Registry 12th Annual Report (December 2009): chapter 12: Epidemiology of methicillin resistant Staphylococcus aureus bacteraemia amongst patients receiving dialysis for established renal failure in England in 2008: a joint report from the UK Renal Registry and the Health Protection Agency. Nephron Clin Pract. 2010;115 Suppl:c261–70.

4 Evans R, Caskey F, Fluck R, Crowley L, Davies J, Nsonwu O, et al. UK Renal Registry 18th Annual Report: Chapter 12 Epidemiology of Reported Infections amongst Patients Receiving Dialysis for Established Renal Failure in England 2013 to 2014: a Joint Report from Public Health England and the UK Renal Registry. Nephron. 2016;132 Suppl: 279–88.

5 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/625784/Annual_epidemiological_commentary_2017.pdf

6 https://www.gov.uk/government/collections/antimicrobial-resistance-amr-information-and-resources

7 https://improvement.nhs.uk/resources/preventing-gram-negative-bloodstream-infections/

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UK Renal Registry 19th Annual Report: Chapter 11 Centre Variation in Access to Kidney Transplantation (2010–2015)

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Keywords

Centre variation · Comorbidity · Donor after brainstem death · Donor after cardiac death · Equity of access · Living kidney donor · Outcomes · Patient factors · Quality improvement · Renal transplantation · Transplant waiting list

Summary

- Patients of non-White ethnicity had, for the first time, an equal chance of being listed to receive a kidney transplant within two years of starting renal replacement therapy (OR 1.03, 95% CI 0.93–1.15). This overall improvement in equity of access to transplantation belies a persisting reduced odds of receiving a transplant once on the waiting list.
- Patients treated at non-transplanting renal centres were less likely to be wait listed for transplantation compared to patients treated at transplanting renal centres (OR 0.78, 95% CI 0.72–0.85).
- Patients treated at non-transplanting renal centres were less likely to receive a transplant from a donor after cardiac death or living kidney donor compared to patients treated at a transplanting renal centre (OR 0.79, 95% CI 0.71–0.89).
- Once wait listed for transplantation, patients from both transplanting and non-transplanting renal centres had an equal chance of receiving a transplant from a donor after brainstem death (OR 1.03, 95% CI 0.88–1.20).
- After adjustment for case mix, there were significant differences between renal centres in the rate of transplant wait listing ($p < 0.0001$), time from start of renal replacement therapy to wait listing ($p < 0.0001$), rate of transplantation from a donor after brainstem death ($p = 0.0046$) and rate of transplantation from a donor after cardiac death or living donor ($p < 0.0001$).

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Introduction

Kidney transplantation is associated with improved clinical outcomes and quality of life compared to dialysis [1–3], so is the preferred method of renal replacement therapy (RRT) for clinically-suitable patients. Early transplantation minimises time on dialysis, a factor associated with reduced graft and patient survival. Further, early transplant wait listing increases the probability of transplantation from a deceased donor because the current national kidney allocation scheme [4] prioritises potential transplant recipients who have accrued more time on the waiting list. Therefore, renal centres achieving earlier transplant wait listing provide their patients with a clinical advantage.

This analysis aims to evaluate whether access to transplant wait listing and access to transplantation is equitable in the UK. Rates of wait listing and rates of transplantation after wait listing (i.e. conversion efficiency from wait listing to transplantation) were analysed according to patient characteristics. Time taken to wait listing was also analysed. Differences between renal centres and between transplanting versus non-transplanting renal centres were analysed, with adjustment for case mix.

Methods

Study population

To identify factors which influence the likelihood of wait listing for transplantation, an incident RRT cohort was analysed. All adult patients starting RRT between 1st January 2010 and 31st December 2012 at renal centres returning data to the UK Renal Registry ($N = 71$ centres) were considered for inclusion ($N = 20{,}268$ patients). Patients aged 65 years and over (10,026), patients listed for multi-organ transplants other than kidney and pancreas ($N = 41$) and patients who were suspended for more than 30 days within 90 days of wait listing ($N = 464$) were excluded. The latter exclusion avoided any potential bias from centres that may activate patients on the transplant list and then immediately suspend them before reactivation after medical assessment of a patient's fitness for transplantation. The remaining 9,737 patients were followed until two years from RRT start (latest 31st December 2014), until they were registered on the waiting list for a kidney transplant alone or kidney and pancreas transplant, or until death, whichever was earliest.

To identify factors which influence the likelihood of transplantation, patients from the above cohort who were wait listed before 31st December 2013 were identified. These 5,555 patients were followed until two years after wait listing (latest 31st December 2015), until they received a kidney transplant alone or kidney and pancreas transplant, or until death, whichever was earliest.

For patients transplanted after starting dialysis, renal centre is recorded by the UKRR as the centre providing dialysis. For patients transplanted pre-emptively, there may be instances where the renal centre recorded is the transplanting centre, even when work-up has taken place in a non-transplanting centre.

Data analysed

Baseline data

UK Renal Registry (UKRR) data included start date of RRT and patient characteristics including age group (18–29, 30–39, 40–49, 50–59, or 60–64 years), gender, ethnicity (White, non-White, missing) and primary renal diagnosis (PRD, classified as: diabetes, other, missing). Date of wait listing and date of transplantation were provided by the UK Transplant Registry, held by the Organ Donation and Transplantation Directorate of NHS Blood and Transplant.

Outcome variables

Proportion of incident dialysis patients wait listed within two years of RRT start. In addition to patients wait listed during the study period, any patient who received a living donor transplant within two years of RRT start was also included, even if they were not on the national transplant waiting list before transplantation.

Days from RRT start to transplant wait listing. For all patients formally wait listed after starting dialysis, time from dialysis start to wait listing was used. Patients receiving a pre-emptive transplant (living or deceased-donor) were recorded as wait listed on the day of starting RRT (i.e. time to wait listing: zero days). Patients who received a living donor transplant after starting dialysis who had not been formally wait listed prior to transplantation were recorded as wait listed on the day of transplantation.

Conversion efficiency: the proportion of wait listed patients receiving a transplant within two years of listing. Transplants from donors after brainstem death were considered separately from transplants from donors after cardiac death or living donors, because of differences in the process of allocation. Kidneys from donors after brainstem death are allocated according to national allocation policy, while kidneys from donors after cardiac death are allocated regionally according to the 2006 donor after brainstem death kidney allocation scheme, and one kidney from each donor is offered to the local transplant centre [4]. The process of living donor transplantation is managed by the transplanting centre (and referring non-transplanting centre).

Statistical methods

Logistic regression models were fitted to examine the relationship between patient characteristics (age group, ethnicity, gender and PRD) and transplant wait listing within two years of RRT start, or receipt of a transplant within two years of wait listing. The proportion of all incident RRT patients listed for transplantation within two years of RRT start and the proportion of wait listed patients who were transplanted within two years were calculated for each renal centre, with adjustment for the above patient characteristics. Differences in outcome measures between transplanting and non-transplanting renal centres were assessed. The overall effect of renal centre on each outcome variable was measured by including renal centre as a random effect in a risk-adjusted logistic regression model. The significance of any variation between centres was determined using a log likelihood

ratio test that provided the change in the value of −2 Log L on inclusion of the random centre effect.

Median time from RRT start to wait listing at each renal centre was estimated by Kaplan-Meier analysis, censored at death or on 31st December 2014, whichever was earlier. This methodology takes into account all patients at risk of wait listing during the study period, not only those who were wait listed. The effect of renal centre on time to wait listing was calculated by including renal centre as a covariate in a Cox regression model for time to wait listing amongst patients from all centres. Median times to wait listing by centre (and their confidence intervals) were derived by simulations based on the actual data.

Funnel plots are used to present the results for each outcome variable, providing a visual comparison of the relative performance of renal centres. Where appropriate, funnel plots are adjusted for patient characteristics known to influence each outcome, based on the results of the logistic regression models described above. The solid black line in each funnel plot indicates the national average. Dashed lines indicate 95% and 99.8% confidence intervals, which correspond to two and three standard deviations from the mean. Each point on the plot represents one renal centre. For each outcome measure, if no significant between-centre variation is present, three of 71 renal centres would be expected to fall between the 95% and 99.8% confidence intervals and no centre should fall outside the 99.8% confidence interval. Funnel plots showing the proportion of patients transplanted at two years after wait listing excluded those centres ($N = 2$) with fewer than 10 patients wait listed at the start of the study period.

SAS 9.3 was used for all analyses. A P value below 5% was considered statistically significant. The analysis described is based on the methodology described in chapter 11 of the UKRR 17th Annual Report [5] and a previous independently peer-reviewed publication [6].

Results

Table 11.1 shows results from logistic regression analysis of the relationship between patient characteristics and the odds of transplant wait listing at two years from RRT start. There were missing ethnicity data for 7.8% of patients and missing PRD data for 3.7%.

Tables 11.2 and 11.3 show results from logistic regression analyses of the relationship between patient characteristics and the likelihood of receiving a transplant from a donor after brainstem death or from a donor after cardiac death/living kidney donor within two years of wait listing, respectively. Ethnicity data were missing for 7.1% of patients and PRD for 3.3%.

A patient starting dialysis in a non-transplanting renal centre was less likely to be wait listed for transplantation (OR 0.78, 95% CI 0.72–0.85) or receive a transplant from a donor after cardiac death or living donor (OR 0.79, 95% CI 0.71–0.89) compared with patients managed in transplanting renal centres. Once active on the transplant waiting list, patients in both transplanting and non-transplanting renal centres had an equal chance of receiving a transplant from a donor after brainstem death (OR 1.03, 95% CI 0.88–1.20).

After adjusting for patient characteristics, there were significant differences between renal centres in the proportion of patients wait listed for transplantation at two years from RRT start (change in $-2 \log L = 164.6$,

Table 11.1. Logistic regression model showing the relationship between patient characteristics and odds of transplant wait listing within two years of RRT start

Factor	Category (at baseline)	Patients *N* (%)	Odds ratio	95% CI	*P* value
Age	18–29	851 (8.7)	1	ref	n/a
	30–39	1,288 (13.2)	0.75	0.60–0.93	0.0076
	40–49	2,337 (24.0)	0.50	0.41–0.60	<0.0001
	50–59	3,198 (32.8)	0.27	0.22–0.32	<0.0001
	60–64	2,063 (21.2)	0.14	0.11–0.17	<0.0001
Ethnicity	White	6,629 (68.1)	1	ref	n/a
	Non-White	2,348 (24.1)	1.03	0.93–1.15	0.54
	Missing	760 (7.8)	0.85	0.73–1.01	0.057
Gender	Male	5,914 (60.7)	1	ref	n/a
	Female	3,823 (39.3)	0.85	0.78–0.93	0.0002
PRD	Not diabetic	6,826 (70.1)	1	ref	n/a
	Diabetic	2,546 (26.2)	0.45	0.41–0.50	<0.0001
	Missing	365 (3.7)	0.64	0.51–0.79	<0.0001

ref – reference category; n/a – not applicable

Table 11.2. Logistic regression model showing the relationship between patient characteristics and odds of receiving a transplant from a donor after brainstem death within two years of wait listing

Factor	Category (at baseline)	Patients *N* (%)	Odds ratio	95% CI	*P* value
Age	18–29	702 (12.6)	1	ref	n/a
	30–39	971 (17.5)	1.18	0.91–1.53	0.20
	40–49	1,535 (27.6)	0.89	0.70–1.14	0.36
	50–59	1,626 (29.3)	0.47	0.36–0.61	<0.0001
	60–64	721 (13.0)	0.35	0.24–0.49	<0.0001
Ethnicity	White	3,770 (67.9)	1	ref	n/a
	Non-White	1,387 (25.0)	0.79	0.65–0.95	0.0012
	Missing	398 (7.1)	1.29	0.97–1.70	0.078
Gender	Male	3,430 (61.8)	1	ref	n/a
	Female	2,125 (38.2)	1.12	0.96–1.31	0.17
PRD	Not diabetic	4,341 (78.1)	1	ref	n/a
	Diabetic	1,031 (18.6)	2.72	2.28–3.24	<0.0001
	Missing	183 (3.3)	1.18	0.76–1.83	0.46

ref – reference category; n/a – not applicable

Table 11.3. Logistic regression model showing the relationship between patient characteristics and the odds of receiving a transplant from a donor after cardiac death or living kidney donor within two years of wait listing

Factor	Category (at baseline)	Patients *N* (%)	Odds ratio	95% CI	*P* value
Age	18–29	702 (12.6)	1	ref	n/a
	30–39	971 (17.5)	0.64	0.52–0.78	<0.0001
	40–49	1,535 (27.6)	0.47	0.39–0.56	<0.0001
	50–59	1,626 (29.3)	0.46	0.38–0.55	<0.0001
	60–64	721 (13.0)	0.44	0.36–0.55	<0.0001
Ethnicity	White	3,770 (67.9)	1	ref	n/a
	Non-White	1,387 (25.0)	0.45	0.39–0.51	<0.0001
	Missing	398 (7.1)	0.62	0.50–0.77	<0.0001
Gender	Male	3,430 (61.8)	1	ref	n/a
	Female	2,125 (38.2)	0.87	0.78–0.98	0.018
PRD	Not diabetic	4,341 (78.1)	1	ref	n/a
	Diabetic	1,031 (18.6)	0.54	0.46–0.63	<0.0001
	Missing	183 (3.3)	0.90	0.66–1.22	0.50

ref – reference category; n/a – not applicable

df (degrees of freedom) = 1, $p < 0.0001$, see figure 11.1 and table 11.4).

After adjusting for patient characteristics, there were significant differences between renal centres in the proportion of patients receiving a renal transplant within two years of wait listing. This was true for transplants from donors after brainstem death (change in $-2 \log L = 8.1$, df = 1, $p = 0.0046$, see figure 11.2 and table 11.5) and transplants from donors after cardiac death or living donors (change in $-2 \log L = 162.6$, df = 1, $p < 0.0001$, see figure 11.3, table 11.5). Several centres fell outside the 95% and 99.8% confidence intervals.

Table 11.6 shows unadjusted median days from RRT start to transplant wait listing for each renal centre.

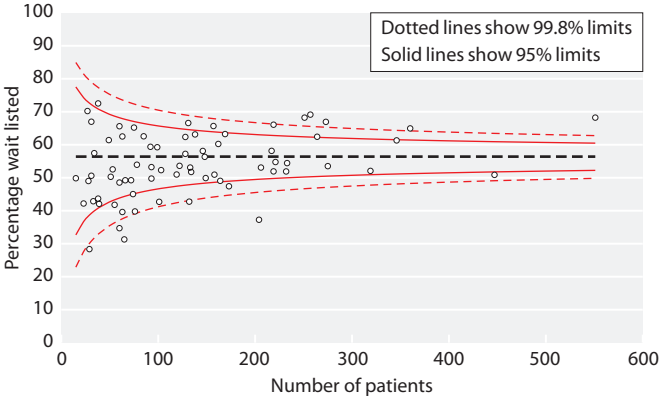

Fig. 11.1. Proportion of patients wait listed within 2 years of RRT start

Table 11.4. Proportion of patients in each renal centre wait listed for a kidney transplant prior to or within two years of RRT start

Centre	RRT *N*	Wait listed at 2 years *N*	% wait listed	
			Unadjusted	Risk-adjusted
England				
B Heart	148	83	56.1	56.3
B QEH	319	170	53.3	52.1
Basldn	63	23	36.5	39.6
Bradfd	103	55	53.4	52.3
Brightn	149	73	49.0	49.9
Bristol	217	135	62.2	58.1
Camb	138	92	66.7	63.1
Carlis	38	27	71.1	72.5
Carsh	275	148	53.8	53.5
Chelms	63	38	60.3	62.5
Colchr	39	16	41.0	42.1
Covnt	164	85	51.8	49.1
Derby	101	41	40.6	42.7
Donc	60	38	63.3	65.6
Dorset	85	51	60.0	62.6
Dudley	60	20	33.3	34.7
Exeter	128	76	59.4	62.4
Glouc	72	35	48.6	49.2
Hull	122	64	52.5	53.6
Ipswi	60	30	50.0	48.5
Kent	162	100	61.7	60.2
L Barts	447	239	53.5	50.9
L Guys	232	123	53.0	51.9
L Kings	204	76	37.3	37.3
L Rfree	346	220	63.6	61.3
L St.G	128	75	58.6	57.2
L West	551	376	68.2	68.2
Leeds	219	119	54.3	51.9
Leic	360	232	64.4	65.0
Liv Ain	76	30	39.5	39.8
Liv Roy	173	86	49.7	47.4
M RI	264	173	65.5	62.4
Middlbr	157	104	66.2	65.7
Newc	158	82	51.9	50.9
Norwch	93	48	51.6	49.7
Nottm	146	85	58.2	58.1
Oxford	273	183	67.0	66.9
Plymth	75	47	62.7	65.2
Ports	251	168	66.9	68.2
Prestn	206	108	52.4	53.1
Redng	131	87	66.4	66.6
Salford	219	135	61.6	66.1
Sheff	221	120	54.3	54.8
Shrew	65	18	27.7	31.3
Stevng	169	110	65.1	63.2
Sthend	31	21	67.7	67.0
Stoke	99	58	58.6	59.2
Sund	93	49	52.7	53.2
Truro	49	29	59.2	61.4
Wirral	74	31	41.9	45.0
Wolve	132	57	43.2	42.8
York	66	34	51.5	49.2
N Ireland				
Antrim	34	18	52.9	57.5
Belfast	119	63	52.9	51.0
Newry	28	12	42.9	49.0
Ulster	31	14	45.2	50.6
West NI	33	15	45.5	42.9
Scotland				
Airdrie	92	52	56.5	59.4
Abrdn	78	40	51.3	53.9
D & Gall	15	7	46.7	49.8
Dundee	55	21	38.2	41.8
Edinb	133	66	49.6	53.1
Glasgw	257	167	65.0	69.1
Inverns	27	19	70.4	70.2
Klmarnk	51	23	45.1	50.3
Krkcldy	53	25	47.2	52.5
Wales				
Bangor	29	7	24.1	28.4
Cardff	233	126	54.1	54.4
Clwyd	23	10	43.5	42.2
Swanse	134	68	50.7	51.7
Wrexm	38	16	42.1	43.7

Figure 11.4 shows a funnel plot of adjusted median days from RRT start to transplant wait listing, with confidence intervals. These values were derived from simulations based on the actual data and for four centres (those with fewer events and/or longer waiting times), median values could not be estimated, so final event times are shown. The Cox model giving a risk-adjusted analysis of time to wait listing identified significant variation between renal centres (change in $-2 \log L = 313.2$, $df = 70$, $p < 0.0001$). In general, renal centres with the longest unadjusted waiting times also had the longest risk-adjusted waiting times. The centre lying outside the upper 99.8% confidence limit had a hazard ratio that indicated a significant delay in the chance of wait listing compared with a baseline centre that had a median time comparable to the national median.

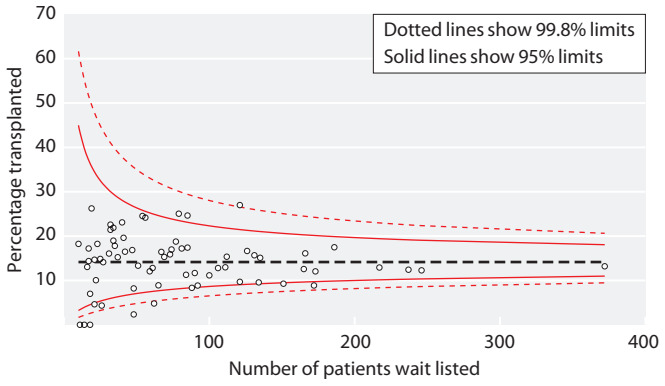

Fig. 11.2. Proportion of patients receiving a donor after brainstem death transplant within 2 yrs of wait listing (excluding centres with <10 patients wait listed)

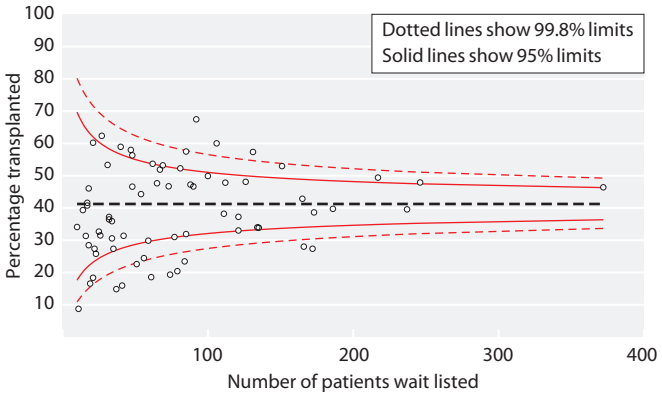

Fig. 11.3. Proportion of patients receiving a transplant from a donor after cardiac death or living donor within 2 yrs of wait listing (excluding centres with <10 patients wait listed)

Table 11.5. Proportion of patients receiving a transplant within two years of wait listing, by donor type and renal centre

		Organ from donor after brainstem death			Organ from donor after cardiac death/living kidney donor		
			Proportion transplanted within 2 years of wait listing (%)			Proportion transplanted within 2 years of wait listing (%)	
Centre	Wait listed *N*	Transplanted *N*	Unadjusted	Risk-adjusted	Transplanted *N*	Unadjusted	Risk-adjusted
Transplanting centre median (IQR)			–	13.2 (11.7–16.8)	–	–	46.7 (37.3–52.3)
Non-transplanting centre median (IQR)			–	14.8 (9.7–18.5)	–	–	34 (25.2–47.5)
England							
B Heart	84	10	11.9	11.3	18	21.4	23.5
B QEH	**172**	**13**	**7.6**	**8.9**	**47**	**27.3**	**27.4**
Basldn	26	1	3.8	4.3	8	30.8	31.5
Bradfd	54	13	24.1	24.5	21	38.9	44.3
Brightn	74	11	14.9	17.0	16	21.6	19.3
Bristol	**134**	**12**	**9.0**	**9.6**	**51**	**38.1**	**34.0**
Camb	**92**	**8**	**8.7**	**8.8**	**69**	**75.0**	**67.5**
Carlis	27	4	14.8	14.1	19	70.4	62.4
Carsh	151	13	8.6	9.3	78	51.7	53.0
Chelms	40	9	22.5	23.1	24	60.0	58.9
Colchr	17	3	17.6	14.4	8	47.1	41.6
Covnt	**90**	**10**	**11.1**	**11.7**	**47**	**52.2**	**46.7**
Derby	41	7	17.1	19.6	7	17.1	16.0
Donc	37	6	16.2	15.2	6	16.2	14.9
Dorset	51	7	13.7	13.3	13	25.5	22.6
Dudley	21	1	4.8	4.6	4	19.0	18.4
Exeter	77	14	18.2	18.8	26	33.8	31.0
Glouc	34	7	20.6	21.9	11	32.4	30.6
Hull	65	6	9.2	8.9	35	53.8	47.7
Ipswi	31	5	16.1	16.1	19	61.3	53.3
Kent	100	13	13.0	11.1	52	52.0	49.9
L Barts	**246**	**28**	**11.4**	**12.3**	**101**	**41.1**	**47.9**
L Guys	**131**	**20**	**15.3**	**15.7**	**68**	**51.9**	**57.4**
L Kings	79	17	21.5	25.0	14	17.7	20.4
L Rfree	**217**	**26**	**12.0**	**12.9**	**95**	**43.8**	**49.4**
L St.G	**73**	**11**	**15.1**	**15.9**	**31**	**42.5**	**46.7**

Table 11.5. Continued

Centre	Wait listed *N*	Organ from donor after brainstem death			Organ from donor after cardiac death/living kidney donor		
		Transplanted *N*	Proportion transplanted within 2 years of wait listing (%)		Transplanted *N*	Proportion transplanted within 2 years of wait listing (%)	
			Unadjusted	Risk-adjusted		Unadjusted	Risk-adjusted
L West	**372**	**46**	**12.4**	**13.2**	**143**	**38.4**	**46.4**
Leeds	**121**	**32**	**26.4**	**27.0**	**48**	**39.7**	**37.3**
Leic	**237**	**27**	**11.4**	**12.4**	**93**	**39.2**	**39.6**
Liv Ain	32	7	21.9	22.6	13	40.6	36.5
Liv Roy	**81**	**13**	**16.0**	**17.2**	**46**	**56.8**	**52.3**
M RI	**173**	**22**	**12.7**	**12.0**	**68**	**39.3**	**38.6**
Middlbr	106	14	13.2	12.8	70	66.0	60.0
Newc	**85**	**14**	**16.5**	**17.4**	**54**	**63.5**	**57.5**
Norwch	48	4	8.3	8.2	26	54.2	46.6
Nottm	**85**	**20**	**23.5**	**24.6**	**29**	**34.1**	**31.9**
Oxford	**186**	**36**	**19.4**	**17.5**	**71**	**38.2**	**39.7**
Plymth	**47**	**7**	**14.9**	**16.8**	**31**	**66.0**	**58.0**
Ports	**166**	**28**	**16.9**	**16.1**	**48**	**28.9**	**28.0**
Prestn	111	14	12.6	13.0	45	40.5	38.2
Redng	88	8	9.1	8.3	37	42.0	47.2
Salford	135	20	14.8	15.1	47	34.8	33.9
Sheff	**121**	**12**	**9.9**	**9.7**	**42**	**34.7**	**33.0**
Shrew	18	1	5.6	7.0	9	50.0	46.1
Stevng	112	17	15.2	15.3	52	46.4	47.8
Sthend	21	3	14.3	14.7	14	66.7	60.2
Stoke	59	7	11.9	12.1	20	33.9	29.9
Sund	48	1	2.1	2.3	30	62.5	56.3
Truro	32	8	25.0	21.4	13	40.6	37.2
Wirral	35	7	20.0	17.8	10	28.6	27.4
Wolve	61	7	11.5	12.8	11	18.0	18.6
York	34	7	20.6	19.0	15	44.1	35.9
N Ireland							
Antrim	18	0	0.0	0.0	6	33.3	28.5
Belfast	**62**	**3**	**4.8**	**4.8**	**38**	**61.3**	**53.7**
Newry	11	0	0.0	0.0	1	9.1	8.8
Ulster	14	0	0.0	0.0	6	42.9	39.3
West NI	16	2	12.5	13.0	6	37.5	31.3
Scotland							
Abrdn	42	9	21.4	16.5	12	28.6	31.4
Airdrie	56	15	26.8	24.2	14	25.0	24.5
D & Gall	7	0	0.0	0.0	4	57.1	66.8
Dundee	22	3	13.6	10.1	5	22.7	27.4
Edinb	**67**	**14**	**20.9**	**16.4**	**30**	**44.8**	**51.9**
Glasgw	**165**	**25**	**15.2**	**12.6**	**60**	**36.4**	**42.9**
Inverns	19	5	26.3	26.2	3	15.8	16.6
Klmarnk	23	5	21.7	18.2	5	21.7	25.8
Krkcldy	25	5	20.0	14.9	7	28.0	32.7
Wales							
Bangor	8	3	37.5	44.8	2	25.0	21.7
Cardff	**126**	**23**	**18.3**	**16.6**	**66**	**52.4**	**48.1**
Clwyd	10	2	20.0	18.2	4	40.0	34.1
Swanse	69	12	17.4	15.3	41	59.4	53.2
Wrexm	17	3	17.6	17.2	8	47.1	40.8

Transplanting renal centres are shown in bold

Table 11.6. Median time to transplant wait listing by renal centre

Centre	RRT *N*	Wait listed at 2 years *N*	Median time to listing (days)
England			
B Heart	148	91	453
B QEH	319	183	431
Basldn	63	28	1011
Bradfd	103	58	458
Brightn	149	79	671
Bristol	217	141	204
Camb	138	97	23
Carlis	38	27	159
Carsh	275	161	435
Chelms	63	42	320
Colchr	39	18	748
Covnt	164	93	531
Derby	101	43	***1,230****
Donc	60	41	200
Dorset	85	54	320
Dudley	60	23	***1,011****
Exeter	128	79	375
Glouc	72	37	684
Hull	122	69	414
Ipswi	60	32	423
Kent	162	106	292
L Barts	447	269	531
L Guys	232	142	468
L Kings	204	91	1,305
L Rfree	346	233	225
L St.G	128	82	371
L West	551	397	256
Leeds	219	126	340
Leic	360	242	108
Liv Ain	76	35	837
Liv Roy	173	89	613
M RI	264	185	225
Middlbr	157	111	159
Newc	158	92	350
Norwch	93	50	324
Nottm	146	85	152
Oxford	273	192	95
Plymth	75	48	290
Ports	251	176	133
Prestn	206	118	568
Redng	131	91	173
Salford	219	141	181
Sheff	221	128	396
Shrew	65	19	***1,037****
Stevng	169	115	270
Sthend	31	21	181
Stoke	99	61	308
Sund	93	53	487
Truro	49	33	153
Wirral	74	35	835
Wolve	132	64	957
York	66	35	474
N Ireland			
Antrim	34	19	442
Belfast	119	67	514
Newry	28	15	1,000
Ulster	31	15	689
West NI	33	17	1,133
Scotland			
Abrdn	78	43	543
Airdrie	92	58	435
D & Gall	15	7	***231****
Dundee	55	26	1,099
Edinb	133	71	613
Glasgw	257	171	203
Inverns	27	19	131
Klmarnk	51	25	702
Krkcldy	53	26	604
Wales			
Bangor	29	9	***1,283****
Cardff	233	127	307
Clwyd	23	10	***553****
Swanse	134	70	477
Wrexm	38	17	776

*A result in ***bold italics*** is a final event time as median time could not be estimated

Discussion

Patient characteristics and access to transplantation

Increasing patient age was associated with reduced odds of wait listing and of transplantation from any donor type. This is an expected finding because of the effect of age on the risks and benefits of transplantation: older age is associated with increasing comorbidity and therefore increased clinical risk of transplantation, while the potential benefit of transplantation in extending life reduces with increasing age. Older patients who are suitable for transplantation would be expected to have increased comorbidity and therefore require more screening investigations before being wait listed, reducing the chance of wait listing within two years of RRT start. Reduced odds of receiving a transplant from a donor after brainstem death in older patients reflects the role of age in the national kidney allocation scheme [4].

Patients with a PRD of diabetes were less likely to be wait listed or to receive a transplant from a donor after cardiac death/living donor. The expected increased comorbidity among patients with diabetes may preclude

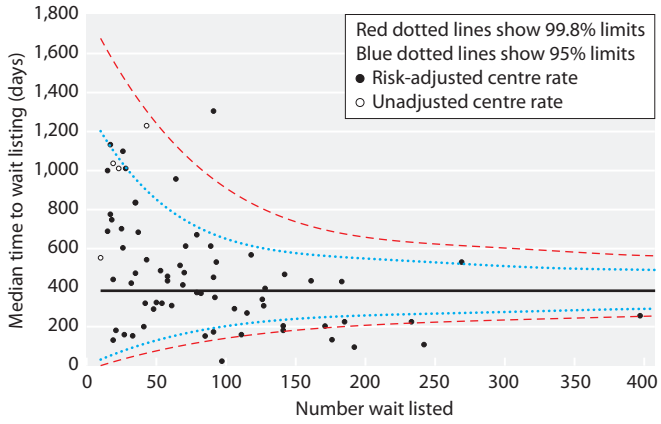

Fig. 11.4. Median time from RRT start to wait listing.
Centres represented by an unfilled circle have the final event time as the plotting position as the median time could not be estimated

transplantation or lengthen the medical evaluation process, explaining this finding. Patients with a PRD of diabetes were found to be more likely to receive a transplant from a donor after brainstem death once on the waiting list. This is likely to reflect the prioritisation of dual organ transplantation in organ allocation policy, in addition to the increase in the number of simultaneous kidney pancreas transplants during the study period.

Unlike previous reports, non-White ethnicity did not significantly influence the likelihood of wait listing (OR: 1.03; 95% CI: 0.93–1.15, compared with 0.80, 0.72–0.89 in the 2014 Seventeenth Annual Report) [5]. Further, the effect of non-White ethnicity in reducing the chance of transplantation from a donor after brainstem death within two years of listing has diminished compared to data from previous years (OR 0.79; 95% CI: 0.65–0.95 compared to 0.65; 95% CI: 0.52–0.81 in analyses from 2008–2010) [5]. The overall effect of these changes is that patients with non-White ethnicity no longer have reduced access to transplantation from donors after brainstem death. This may reflect changes in the practice of transplant wait listing, changes in the demographics of potential transplant recipients with non-White ethnicity, and alterations in the national kidney allocation scheme, which now has less strict criteria in relation to HLA matching. The latter change means that recipients with non-White ethnicity are less likely to be disadvantaged by the relative lack of organs from non-White donors. It should be noted that differences in socioeconomic status between ethnic groups have been found previously to explain differences in access to transplantation by ethnicity [7, 8]. Lack of adjustment for socioeconomic status therefore limits the reliability of these results. The UKRR is collaborating with the Access to Transplant and Transplant Outcome Measures (ATTOM) study, whose forthcoming results include analyses with detailed adjustment for comorbidity and individual level socioeconomic status.

When interpreting the analyses in this chapter it is also important to consider the potential impact of missing data on the results. Data are missing either because a renal centre fails to complete relevant fields on their renal IT system or from a failure to extract this data. Missing data may not be at random: patients with increased comorbidity are likely to die sooner, allowing inadequate time for their physician to enter relevant comorbidity data. The very process of working up and listing a patient makes it less likely that data will be missing. It is therefore perhaps not surprising that patients on the national kidney transplant waiting list are more likely to have ethnicity and PRD data reported ($p < 0.0001$).

Centre variation in access to transplantation

The analyses presented here suggest significant inter-centre variation in access to the transplant waiting list and access to transplantation from any donor type, after adjustment for patient demographics and PRD. However, such results should be interpreted with caution. Adjustment for comorbidity included only diabetes as PRD. Other comorbidities, unaccounted for in these analyses, may also preclude or delay wait listing and transplantation. Adjustment for several other factors known to influence access to transplantation, including socioeconomic status, PRD other than diabetes, comorbidity, and HLA sensitisation was not performed. Also, in the analysis of time to transplant wait listing, patients receiving a live donor transplant after starting dialysis but without prior wait listing were recorded as wait listed on the day of transplantation. In reality, such patients are likely to have been adequately prepared for listing before this time.

Whilst the processes of wait listing or transplantation from a donor after cardiac death/living donor are directly influenced by individual centre practice, the allocation of transplants from donors after brainstem death is controlled by the national kidney allocation scheme. Therefore, rates of transplantation from donors after brainstem death should be relatively independent of centre practice differences (except for variation in the acceptance criteria of individual clinicians). As such, the persistence of significant inter-centre variation in rates of transplantation from donors after brainstem

death is consistent with under-adjustment for patient factors.

After adjustment for patient characteristics, patients treated at transplanting renal centres had increased access to transplant wait listing and to transplantation from a donor after cardiac death or living donor. There was no difference in access to transplants from donors after brainstem death once patients were wait listed. These have been consistent findings in UKRR analyses since 2010, suggesting that reduced contact with clinicians directly involved in transplantation and increased geographical distance to transplanting centres reduces access to transplantation. Of course, this analysis is also subject to concerns about lack of conclusive adjustment for case mix. It also allocates many pre-emptive transplants to transplanting centres, even if the work-up has been initiated in a timely fashion by the non-transplanting centre. Lastly, there is competition between the two outcome variables (transplant from a donor after brainstem death versus transplant from a donor after cardiac death/living donor). As such, patients from centres with a higher rate of transplantation from a donor after cardiac death/living donor may have reduced odds of transplantation from a donor after brainstem death (and vice versa). These issues will be addressed in future analyses, allocating patients according to their location of residence (rather than their treatment centre), and using methodology which accounts for competing risk. In addition, the results of analyses from the ATTOM study with more detailed adjustment for case mix are forthcoming.

Conflicts of interest: the authors declare no conflicts of interest

References

1 Foley RN, Parfrey PS, Sarnak MJ. Clinical epidemiology of cardiovascular disease in chronic renal disease. Am J Kidney Dis 1998; 32(5(suppl 3)):S112–119

2 Wolfe RA, Ashby VB, Milford EL, Ojo AO, Ettenger RE, Agodoa LY, Held PJ, Port FK. Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. The New England Journal of Medicine 1999; 341:1725–1730

3 Neipp M, Karavul B, Jackobs S, Meyer zu Vilsendorf A, Richter N, Becker T, Schwarz A, Klempnauer J. Quality of life in adult transplant recipients more than 15 years after kidney transplantation. Transplantation 2006;81(12):1640–1644

4 NHS Blood and Transplant. Policy POL186/7: Kidney Transplantation: Deceased Donor Organ Allocation. http://odt.nhs.uk/pdf/kidney_allocation_policy.pdf Accessed 2017

5 Pruthi R, Curnow E, Roderick P, Ravanan R. UK Renal Registry 17th Annual Report: Chapter 11 Centre Variation in Access to Renal Transplantation in the UK (2008–2010). Nephron 2015;129(suppl 1): 247–256

6 Ravanan R, Udayaraj U, Ansell D, Collett D, Johnson R, O'Neill J, Tomson CR, Dudley CR. Variation between centres in access to renal transplantation in UK: longitudinal cohort study. BMJ 2010;341:c3451

7 Udayaraj U, Ben-Shlomo Y, Roderick P, Casula A, Dudley C, Collett D, Ansell D, Tomson C, Caskey F. Social deprivation, ethnicity, and uptake of living kidney donor transplantation in the United Kingdom. Transplantation 2012;93(6):610–616

8 Udayaraj U, Ben-Shlomo Y, Roderick P, Casula A, Dudley C, Johnson R, Collett D, Ansell D, Tomson C, Caskey F. Social deprivation, ethnicity, and access to the deceased donor kidney transplant waiting list in England and Wales. Transplantation 2010;90(3):279–285

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UK Renal Registry 19th Annual Report: Chapter 12 Multisite Dialysis Access Audit in England, Northern Ireland and Wales in 2015 and 2014 PD One Year Follow-up: National and Centre-specific Analyses

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Keywords

Chronic kidney disease · Diabetes · Dialysis · End stage renal disease · Established renal failure · Haemodialysis · Peritoneal dialysis · Prevalence · Renal replacement therapy · Transplantation · Treatment modality · Vascular access

Summary

- Data are presented from the fifth combined vascular and peritoneal dialysis (PD) access audit.
- In 2015, 53 of 62 centres in England, Wales and Northern Ireland returned data on first access for 4,032 incident haemodialysis (HD) and 1,075 incident PD recipients.
- Of the 5,107 incident patients, 21.0% started PD, 30.3% started HD with an arteriovenous fistula (AVF) or graft (AVG), 28.7% with a tunnelled line (TL) and 19.9% with a non-tunnelled line (NTL).
- Wide variation in definitive access use (defined as primary AVF, AVG or PD) was apparent between centres.
- Only 10 centres achieved the 60% target for AVF/AVG use amongst incident HD recipients.
- Seventeen centres achieved the 80% target for AVF/AVG/PD use amongst prevalent dialysis recipients.
- Timely presentation to a nephrologist and referral to a dialysis access surgeon were key determinants of the likelihood of definitive access:
  - 60.0% of patients known to a nephrologist for over 90 days initiated dialysis with definitive access compared with 15.2% of those who were known to a nephrologist for 90 days or less.
  - Among incident HD patients who were reviewed by a surgeon three months prior to starting dialysis, AVF/AVG use was 70.9% compared with 10.0% in those who were not.
- AVF/AVG use amongst incident HD recipients increased with rising age and body mass index (BMI). This was due to lower rates of PD and preemptive transplant (PTx) amongst older patients and the obese.
- In centres that placed non-surgical PD catheters, 25.9% of incident renal replacement therapy (RRT) patients started PD, compared with 21.0% overall.

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- For centres returning data on one-year PD access outcomes, 76.6% of patients starting PD continued to use this modality one year later after censoring for death, withdrawal from dialysis and transplantation.
- The median one-year PD catheter failure rate was 13.3%.
- This report demonstrates wide variation in practice between centres across several domains in the provision of dialysis access. Further work is required to understand the underlying reasons.

Introduction

Provision of definitive dialysis access is an important measure of good clinical care for patients with established renal failure. Relevant recommendations and audit standards are presented in the Renal Association clinical practice guidelines (table 12.1). The annual multisite dialysis access audit provides centre-level information on access provision in England, Wales and Northern Ireland. Although the Renal Association undertook a national vascular access audit in 2005, published with outcomes data in 2012 by the UK Renal Registry (UKRR) [1], this is the fifth annual audit that combines peritoneal and vascular access, presenting information for patients starting dialysis between 1st January and 31st December 2015.

One objective of this audit has been to highlight centre-level performance variation and explore factors that may contribute to the provision of high quality vascular and peritoneal access. For the 19th Annual Report, this chapter is expanded to allow more detailed examination of dialysis access patterns through the incorporation of UKRR data. The resulting improved data completeness allowed more detailed analysis and data presentation, for example, permitting analysis of the relationship between dialysis access and PTx. The chapter is presented in two parts: part 1 presents detailed data from the fifth multisite dialysis access

Table 12.1. Summary of relevant audit standards stated in the Renal Association (RA) clinical practice guidelines

RA audit measure/guideline*		Reported	Notes
1	Proportion of planned renal replacement therapy initiations with established access or pre-emptive transplantation (no minimum audit standard)	Yes	Table 12.3 Table 12.4 Table 12.9 Table 12.10
2	60% of all incident patients with established end stage kidney disease commencing planned haemodialysis should receive dialysis via a functioning arteriovenous fistula or arteriovenous graft	Yes	Table 12.3 Table 12.4 Table 12.9 Table 12.10 Figure 12.9
3	80% of all prevalent long-term dialysis patients should receive dialysis treatment via 'definitive access': arteriovenous fistula, arteriovenous graft or peritoneal dialysis	Yes	Figure 12.11 Table 12.10
4	Catheter patency – more than 80% of catheters should be patent at one year (censoring for death and elective modality change)	Yes	Figure 12.17 Figure 12.19
5	Complications following peritoneal dialysis catheter insertion:	Partly	Figure 12.18 Figure 12.19
5a	Bowel perforation <1%	No	Not captured by the audit
5b	Significant haemorrhage <1%	No	Not captured by the audit
5c	Exit site infection within two weeks of catheter insertion <5%	No	Not captured by the audit
5d	Peritonitis within two weeks of catheter insertion <5%	No	Low data completeness
5e	Functional catheter problem requiring manipulation or replacement or leading to technique failure <20%	No	Not captured by the audit

*Audit standards from the most recent Renal Association guidelines (June 2017) are presented. Current and previous guidelines are available on the Renal Association website (http://www.renal.org/guidelines/current-guidelines)

audit; and part 2 presents summary data over the five years since the annual collection was started in 2011.

The term 'established renal failure' used within this chapter is synonymous with the terms 'end stage renal failure' and 'end stage kidney disease'. These alternative terms are in widespread international use, but are less acceptable to patients.

Methods

In 2016, all adult renal centres in England, Wales and Northern Ireland were asked to provide vascular and peritoneal access data for incident (1st January to 31st December 2015) and prevalent dialysis patients. Access data for incident patients were collected at patient level, whereas centre-level data were submitted for prevalent patients. Table 12.2 presents a full glossary of collected variables. Data were collected using Microsoft Excel spreadsheets circulated by the UKRR.

Table 12.2. Glossary of variables collected in the 2015 multisite dialysis access audit

Audit data item	Definition [format]	PD/HD or both
ID	Local hospital number [numerical]	Both
NHS number	NHS number (England & Wales) [numerical]	Both
Surname	[text]	Both
Forename	[text]	Both
DoB	Date of birth [DD/MM/YY]	Both
Gender	[Male/Female/Unknown]	Both
Date of death	[DD/MM/YY]	Both
Postcode	The postcode of the patient's usual address [alpha-numerical]	Both
First RRT treatment centre code	Renal treatment centre where first dialysis took place [treatment centre ID code]	Both
Primary renal diagnosis	Primary renal diagnosis [EDTA four digit diagnosis code]	Both
BMI	BMI at time of access insertion (weight in kg/height in m^2) [numerical]	Both
Date first seen by renal physician	The date the patient was first seen by a renal physician (as an outpatient or inpatient) [DD/MM/YY]	Both
Assessed by surgeon for an AVF, AVG or PD catheter at least three months before dialysis?	Was the patient assessed by a surgeon regarding dialysis access at least three months before their first dialysis date? [Yes/No]	Both
Was an AVF/AVG attempted before 1st dialysis?	Was an AVF/AVG attempted before the first ever dialysis session? [Yes/No/Unknown]	Both
Date FIRST EVER dialysis session	Date of first ever dialysis session [DD/MM/YY]	Both
First ever modality	First ever renal replacement modality [HD/PD]	Both
Access in use at first ever dialysis	Dialysis access in use at first dialysis (may not be first access created) [AVF/AVG/vein loop/TL/NTL/PD/temporary PD catheter]	Both
Access in use at three months	Dialysis access in use three months after the start of first treatment [AVF/AVG/vein loop/TL/NTL/PD/temporary PD catheter/recovered/transplant/conservative/death/lost to follow-up/transferred out]	Both
Date of first ever access insertion/construction	Date of creation/insertion of first ever dialysis access (if Moncrief PD catheter, date of externalisation) [DD/MM/YY]	Both
Diabetes at time of access creation	Does the patient have diabetes mellitus (type 1 or 2) at time of dialysis access creation? [Yes/No]	Both
PD catheter insertion technique	Technique used to insert PD catheter [open/laparoscopic/peritoneoscopic/percutaneous]	PD only
Peritonitis episode	Peritonitis episode within two weeks of insertion? [Yes/No]	PD only
Access complication	Reason for access failure/discontinuation [selection from 27 item list]	Both
Date of access failure/discontinuation	Date access is no longer usable for treatment [DD/MM/YY]	Both
Comments	Any relevant comments [text]	Both

RRT – renal replacement therapy; BMI – body mass index; HD – haemodialysis; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

Records were validated against the UKRR database to confirm that the population collected at each centre for the audit was the same as, or representative of, the incident population at that centre collected via the routine quarterly return. Data checks were made by cross-referencing with the UKRR database. Any patients identified from the UKRR as not incident to dialysis between 1st January 2015 and 31st December 2015 were excluded. For the purposes of this audit, patients were categorised as having acute kidney injury (AKI) if their access at three months was recorded as 'recovered renal function' and were therefore excluded from analysis. Patients with missing information for access at start, age and date of starting RRT were excluded from the analysis. Patients were excluded when there was no matching record in the UKRR database (patient assumed to be AKI) and when aged <18 years. If a centre reported prevalent numbers that differed by more than 10% from those in the UKRR database, it was excluded. Cross-referencing also enabled ascertainment of mortality within three months of commencing dialysis.

Patients starting HD were grouped by type of first vascular access: arteriovenous fistula, arteriovenous graft, tunnelled dialysis line, non-tunnelled dialysis line. Patients starting PD were categorised by the insertion technique: open surgery, laparoscopic, peritoneoscopic or percutaneous. Access at three months was defined as the type of access in use at three months after starting dialysis. If a patient was no longer receiving dialysis at three months (but had not recovered renal function), the reason was recorded instead, for example, 'death' or 'transplantation'. Referral time was defined as the number of days between the date of first being seen by a renal physician (as an inpatient or outpatient) and the date of commencing dialysis. A patient was classified as presenting 'late' if they had a referral time of less than 90 days.

Access failure was defined when it was no longer usable for dialysis with the date and cause of access failure reported. For the purposes of analysis, HD access failure was grouped into five causes: maturation, mechanical, infection, other and unknown. PD technique failure was grouped into six causes: infection, catheter related, solute/water clearance, leaks/hernia, other and unknown. Access failure was censored for death, transplantation, withdrawal from RRT and elective switching of access type. It was the intention to only capture access failures relating to the first access that was performed. If the reason recorded for access failure was not related to the first type of access recorded, then the data were not included in this analysis.

Centres that reported data on PD patients in the 2014 vascular and peritoneal access audit were asked to complete a one year follow-up of their PD patients. Additional information was requested on the date of PD catheter failure, the reason for catheter failure, the number of catheters used during the year and the modality in use at one year after starting PD. Analyses that use these data are titled 'PD follow-up audit'.

For the first time this chapter includes data for PTx recipients. This reflects the amended (2015) Renal Association guidelines for planned RRT initiation, which include PTx in the audit standard (table 12.1). Where possible, these data have been included at centre level to aid in the interpretation of the effects of PTx upon rates of definitive and non-definitive dialysis access. Transplant and non-transplant centres work together to prepare patients for PTx, but for the purpose of these analyses, patients have been allocated to their most likely treatment centre (transplant or non-transplant) using the approach of Judge *et al.* [2]; this is based on patient postcode and the likelihood of receiving care in a centre.

Separate and combined analyses were performed for incident HD and PD patients as appropriate. Due to the exploratory nature of the audit the analyses have been limited to descriptive statistics of frequencies, percentages and unadjusted associations between variables. Centre-to-centre performance comparisons are made in the context of varying patient demography, case mix and volume. If a centre had >50% missing returns for a particular data field, then all patients from that centre were excluded from analyses involving that data field. The data were analysed using SAS 9.3.

Part 1 – Results from the 2015 Multisite Dialysis Access audit

Of 62 centres contacted, 53 returned data on first dialysis access and data from 52 centres were used. After individual patient exclusions, 5,107 patients were included, comprising 4,032 starting HD and 1,075 starting PD (figure 12.1, table 12.3). UKRR 2015 incident

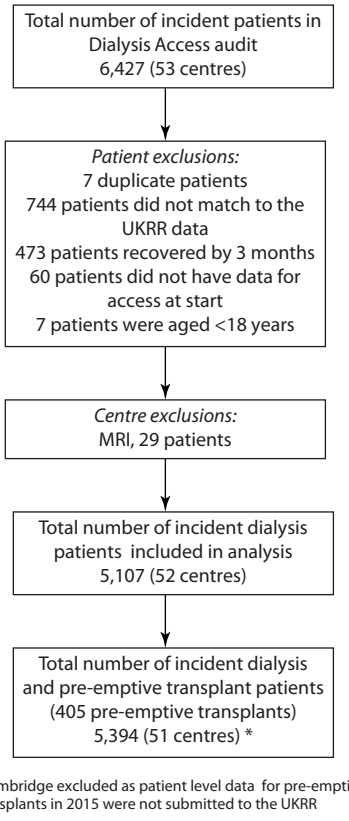

Fig. 12.1. STROBE flow diagram of patients included in the 2015 Multisite Dialysis Access audit

Table 12.3. Demographics and characteristics of patients in the 2015 Multisite Dialysis Access audit, stratified by first dialysis access type

	HD patients %				PD patients %						
Variable	*N*	AVF/ AVG	TL	NTL	*N*	Open surgery	Laparo-scopic	Peritoneo-scopic	Percuta-neous	Missing	Total *N*
Total patients											
Number	**4,032**	1,549	1,467	1,016	**1,075**	397	196	9	269	204	**5,107**
Percentage		38.4	36.4	25.2		36.9	18.2	0.8	25.0	19.0	
Age at first dialysis (years)											
Median (IQR)	**68 (55,76)**	68 (57,77)	66 (52,75)	69 (55,77)	**60 (48,73)**	60 (48,73)	57 (46,72)	69 (63,71)	61 (49,73)	61 (50,71)	**66 (53,76)**
<45	**473**	29.2	44.2	26.6	**214**	36.0	22.4	0.5	22.9	18.2	**687**
45–54	**550**	37.1	41.5	21.5	**211**	39.3	19.9		25.1	15.6	**761**
55–64	**757**	39.8	35.5	24.7	**221**	34.4	14.9	1.4	25.8	23.5	**978**
65–74	**1,092**	41.5	35.1	23.4	**224**	37.9	16.5	1.3	23.2	21.0	**1,316**
75+	**1,160**	39.1	32.6	28.4	**205**	37.1	17.6	1.0	28.3	16.1	**1,365**
BMI											
<20	**117**	17.1	50.4	32.5	**30**	50.0	16.7	3.3	26.7	3.3	**147**
20–24	**495**	40.8	35.8	23.4	**170**	42.4	25.3	2.4	19.4	10.6	**665**
25–29	**625**	43.2	33.8	23.0	**187**	49.2	19.8	1.1	19.3	10.7	**812**
30–34	**430**	45.1	37.7	17.2	**120**	48.3	28.3	1.7	15.0	6.7	**550**
35+	**361**	52.9	32.7	14.4	**57**	61.4	12.3		14.0	12.3	**418**
No data	**537**	28.3	36.1	35.6	**115**	27.8	20.9		37.4	13.9	**652**
PRD											
DM	**1,133**	41.1	39.6	19.2	**269**	32.7	14.1	0.7	27.9	24.5	**1,402**
GN	**428**	39.3	40.9	19.9	**189**	31.7	25.9		25.9	16.4	**617**
HTN	**258**	44.2	31.8	24.0	**88**	35.2	22.7	3.4	26.1	12.5	**346**
Other	**785**	19.7	35.0	45.2	**133**	39.8	16.5	2.3	21.1	20.3	**918**
PKD	**183**	70.5	21.9	7.7	**94**	45.7	20.2		19.1	14.9	**277**
Pyelo	**226**	49.1	30.5	20.4	**59**	44.1	16.9		22.0	16.9	**285**
RVD	**248**	44.0	31.9	24.2	**50**	48.0	18.0		20.0	14.0	**298**
Uncertain	**552**	39.1	41.1	19.7	**150**	33.3	14.0		31.3	21.3	**702**
No data	**219**	44.0	31.9	24.2	**43**	34.1	11.0		24.4	30.5	**262**
Referral time (days)											
<90	**653**	4.6	40.9	54.5	**82**	34.1	11.0		24.4	30.5	**735**
90–180	**215**	23.7	45.6	30.7	**46**	32.6	19.6		23.9	23.9	**261**
180–365	**337**	30.3	47.8	22.0	**87**	43.7	20.7		17.2	18.4	**424**
365+	**2,552**	52.1	31.4	16.5	**813**	36.9	18.7	1.1	26.2	17.1	**3,365**
No data	**275**	13.5	50.5	36.0	**47**	34.0	17.0		21.3	27.7	**322**
Assessed by surgeon											
Yes	**1,825**	70.4	22.6	7.0	**462**	35.7	25.5	1.5	22.5	14.7	**2,287**
No	**1,768**	7.4	49.7	42.9	**433**	45.5	13.2	0.5	35.6	5.3	**2,201**
No data	**73**	8.2	42.5	49.3	**68**	36.8	2.9		16.2	44.1	**141**
Gender											
Female	**1,480**	37.2	38.0	24.8	**404**	35.6	22.0	1.2	23.3	17.8	**1,884**
Male	**2,552**	39.1	35.4	25.4	**671**	37.7	15.9	0.6	26.1	19.7	**3,223**
Ethnicity											
Asian	**541**	39.4	40.1	20.5	**134**	24.6	14.9	0.7	23.9	35.8	**675**
Black	**317**	28.1	45.7	26.2	**77**	13.0	16.9		26.0	44.2	**394**
Other	**121**	37.2	38.0	24.8	**44**	9.1	25.0	2.3	15.9	47.7	**165**
White	**2,761**	40.3	33.5	26.3	**788**	43.1	19.0	0.9	24.9	12.1	**3,549**
No data	**186**	29.6	34.9	35.5	**20**	35.0	10.0		25.0	30.0	**206**
eGFR at start											
Median (IQR)	**8 (6,10)**	9 (7,10)	8 (6,10)	9 (6,11)	**8 (7,10)**	9 (7,11)	8 (7,10)	9 (7,10)	8 (6,10)	9 (7,11)	**8 (7,10)**
Diabetes											
Yes	**1,564**	40.5	38.2	21.3	**340**	37.4	16.2	0.9	25.0	20.6	**1,904**
No	**1,954**	37.7	36.1	26.2	**597**	40.9	20.9	1.0	24.1	13.1	**2,551**
No data	**188**	20.7	23.4	55.9	**56**	7.1				92.9	**244**

Centres with >50% missing data for a variable were excluded from summary data and analyses relating to that variable, hence the total number of patients does not always sum to the total

IQR – interquartile range; BMI – body mass index; PRD – primary renal diagnosis; DM – diabetes mellitus; GN – glomerulonephritis; HTN – hypertension; PKD – polycystic kidney disease; Pyelo – pyelonephritis; RVD – renal vascular disease; HD – haemodialysis; PD – peritoneal dialysis; eGFR – estimated glomerular filtration rate; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

data for centres submitting data were 3,968 HD and 1,076 PD patients. The slight over-reporting represents the inability to check all patients against the UKRR dataset, because some centres did not provide patient-level data. It is also possible that a small number of patients with AKI remained in the audit data on account of incomplete data at three months. Furthermore, it is possible that some patients who were excluded because they did not match to the UKRR database did not have AKI, but instead started dialysis towards the end of 2015 and the UKRR has not yet received data from renal centres.

Data completeness

Data completeness varied between 100% (date of birth, gender, dialysis start date, first dialysis access and first dialysis modality) and 27.3% (date of access failure). The data on diabetes were supplemented by triangulation with UKRR comorbidity and primary renal diagnosis (PRD), increasing completeness of diabetic status data from 78.2% to 89.9%. Of 51 centres that reported data on PD patients in 2014 ($N = 1{,}069$), 43 completed the one year follow-up, returning data on 834 (78.0%) patients. In these patients, 487 (58.4%) were still on PD at one year with 76.8% of these (374/487) still on their first catheter.

Variations in first dialysis access

The following observations can be made of incident dialysis access. These represent associations and do not imply causality. Data were unadjusted for patient factors.

- 51.4% of dialysis patients started therapy using an AVF/AVG or a PD catheter.
- 38.4% of HD patients started therapy using an AVF or AVG.
- AVF use increased with increasing referral time, with corresponding reductions in TL/NTL use: 45.2% of incident HD patients known to a nephrologist for over 90 days had an AVF/AVG which was below the Renal Association Audit standard of 60% (table 12.1).
- AVF use increased with increasing age and BMI, with corresponding reductions in TL/NTL use.
- AVG use was uncommon; used in only 0.9% of incident dialysis patients.
- Percutaneous PD catheter placement was less common with increasing BMI.
- Use of definitive access was high (80.5%) for patients with polycystic kidney disease listed as their PRD (AVF 45.9%; AVG 0.7%; PD 33.9%). There were corresponding low rates of TL/NTL use. For patients with 'other' listed as their PRD, AVF use was particularly low (16.9%).
- Incident HD patients who had been reviewed by a surgeon at least three months prior to starting dialysis had higher AVF/AVG (70.4% vs 7.4%) and lower TL/NTL use (29.6% vs 92.6%) than those who had not.
- Black patients starting HD had lower rates of AVF/AVG use (28.1%) than average (38.4%).

Figures 12.2–12.7 assist interpretation of table 12.3 by including annual transplant data. Transplant data were included to provide a more complete depiction of incident RRT patterns. Data remained otherwise unadjusted. For a more detailed analysis of transplantation, see chapters 3 and 11 of this Annual Report. Data were plotted and stratified by age (figure 12.2), BMI (figure 12.3), PRD (figure 12.4), referral time (figure 12.5), diabetic status (figure 12.6) and surgical referral (figure 12.7). Centres with >50% missing data for a variable were excluded, as detailed in the figure legend. BMI data on PTx recipients are not presented due to low data returns, although it is recognised that very few transplant recipients will have BMI >35. Transplant data were not presented against surgical referral data because all patients who received a PTx will have received surgical review. HD and PD data are displayed separately in figure 12.7 because the surgical pathways for vascular and PD access differ. Late presenting patients were excluded from this analysis. The following observations can be made:

- Rising use of AVF/AVG with increasing age was associated with falling rates of transplant and PD.
- Amongst incident RRT patients with BMI <20, PD use was low (20.4%) and TL/NTL use was high (66.0%). Otherwise the rising use of AVF/AVG with increasing BMI was associated with falling rates of PD.
- PRD had a variable association with use of definitive dialysis access and PTx. For example, for polycystic kidney disease both definitive dialysis access (60.4%) and PTx (24.3%) were common. Where PRD was listed as 'other', definitive dialysis access (29.7%)

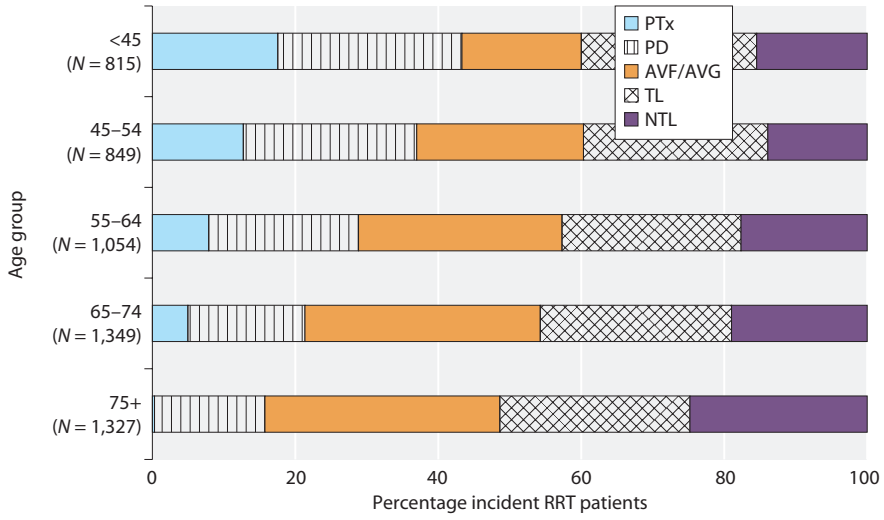

Fig. 12.2. Percentage of incident RRT patients by age group, 2015
Number of patients in each group in brackets.
PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

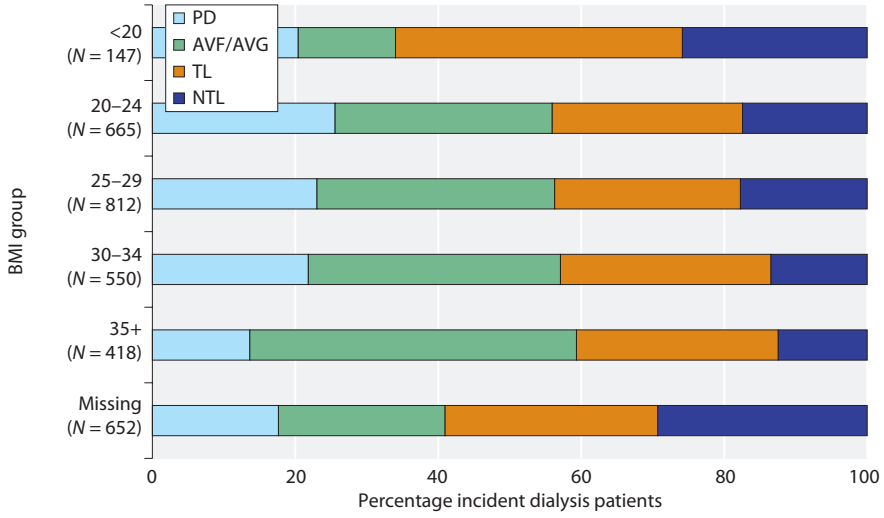

Fig. 12.3. Percentage of incident dialysis patients by BMI group, 2015
Number of patients in each group in brackets. 15 centres were excluded due to >50% missing BMI data.
PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line; BMI – body mass index

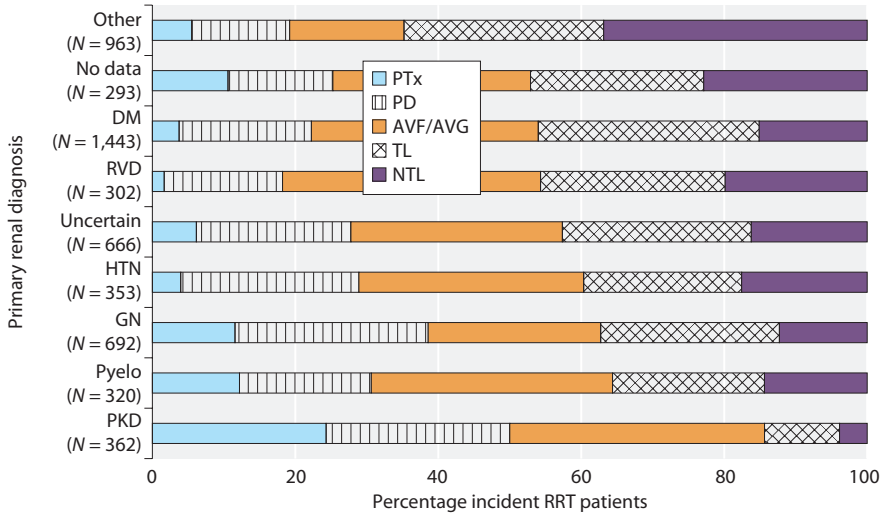

Fig. 12.4. Percentage of incident RRT patients by primary renal diagnosis, 2015
Number of patients in each group in brackets. PRD groups are sorted by decreasing proportion of patients initiating RRT with a HD catheter.
PRD – primary renal diagnosis; DM – diabetes mellitus; GN – glomerulonephritis; HTN – hypertension; PKD – polycystic kidney disease; Pyelo – pyelonephritis; RVD – renal vascular disease
PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

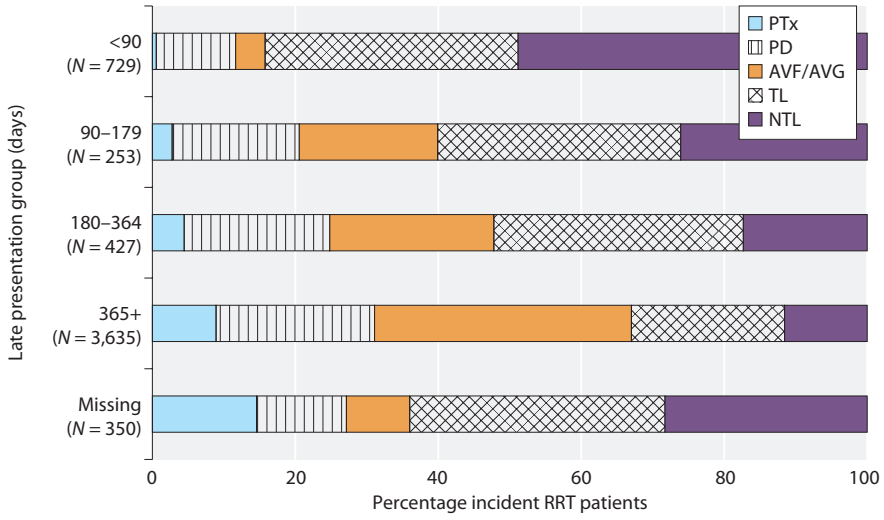

Fig. 12.5. Percentage of incident RRT patients by late presentation group, 2015
Number of patients in each group in brackets.
PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

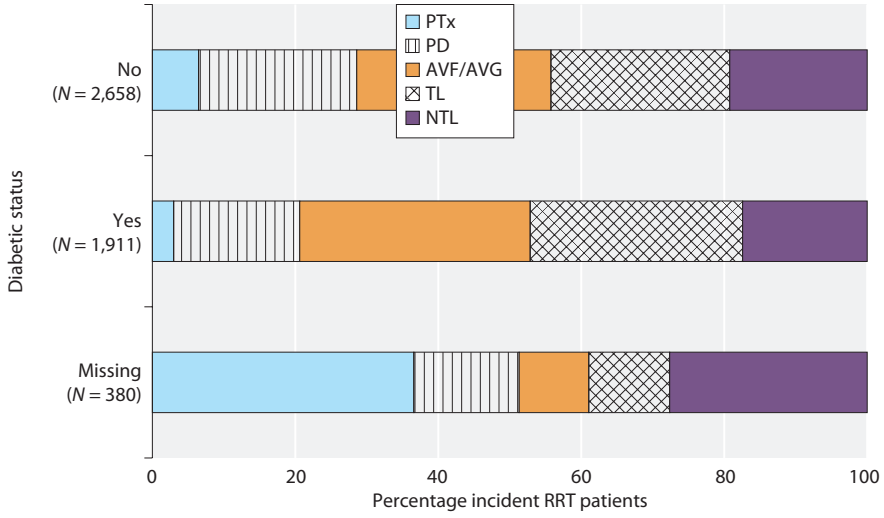

Fig. 12.6. Percentage of incident RRT patients by diabetic status, 2015
Number of patients in each group in brackets.
Two centres were excluded due to >50% missing diabetes data after triangulation with UKRR data
PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

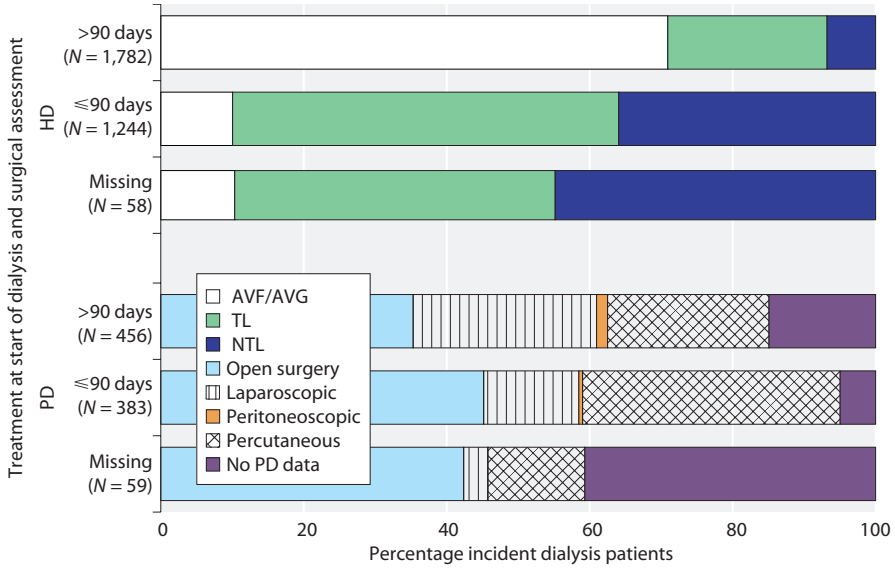

Fig. 12.7. Percentage of incident dialysis patients stratified by assessment by a surgeon within 3 months before starting RRT and access at start of dialysis, 2015
Number of patients in each group in brackets.
Late presenting patients were excluded from the analysis
AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line; PD – peritoneal dialysis

and PTx (5.5%) were both uncommon. In renovascular disease definitive dialysis access was established in 52.6% of incident patients, whilst PTx was very rare (1.7%).
- Increasing referral time was associated with a gradual increase in AVF/AVG, PD and PTx use, with corresponding reductions in use of TL/NTL. This pattern continued as referral time increased beyond 365 days.
- 63.5% of incident RRT patients known to a nephrologist for over 90 days had definitive access or a transplant. Whilst the Renal Association present this as an audit standard, no minimum standard is set (table 12.1).
- PD was initiated for only 11.1% of late presentations.
- Patients with diabetes were more likely to use an AVF/AVG and less likely to receive PTx or PD than patients without diabetes.
- AVF/AVG use was much higher amongst haemodialysis recipients referred to a surgeon >90 days before dialysis initiation (70.9%) than those who were not (10.0%).

Variations in first dialysis access by renal centre

Figure 12.8 plots incident RRT first access method stratified by centre. Practice variation was apparent. Initiating HD via an AVF/AVG ranged between <15% (London West, Carlisle) and >40% (Cardiff, Sheffield, Gloucester, York, Colchester). Initiating HD via a TL ranged between <5% (Belfast) and >40% (London West, Colchester, West NI). Initiating with a PD catheter ranged between 0% (Clwyd, Colchester, Plymouth) and >40% (Derby, Newry, Carlisle). There does not seem to be a relationship between the rate of definitive access use and whether a centre is a transplant or non-transplanting centre.

Table 12.4 provides centre-level data for incident dialysis access, grouping patients by time of presentation to nephrology (early ⩾90 or late <90 days before initiating dialysis). Late presentation was associated with low rates of definitive access placement (15.3%). Peritoneal catheter placement accounted for 73.2% of definitive access placed in late presenting patients. Sixteen centres had no late presenting patients dialysing with definitive access at initiation. Some centres were able to establish definitive vascular access for late presenting patients, although absolute numbers of patients were small. Surgical referral was made 90 days or more before dialysis initiation for 51.2% of incident patients, and ranged between >90% (London Barts, Middlesbrough) and <20% (Plymouth, Southend).

Table 12.5 provides centre-level data for dialysis access three months after initiation, grouping patients by time of initial presentation to nephrology (early ⩾90 or late <90 days before initiating dialysis). Late presentation remained associated with low rates of definitive access use at three months (15.2%) compared with early presentation (60.0%). TL was the mode of access for 62.4% of late presenting patients at three months. Definitive access was similar at initiation and three months later for late presenters and early presenters. Of early presenters, 1.8% were transplanted by three months with an overall fall in use of NTLs amongst this group. Of late presenting patients, 0.1% were transplanted by three months. Sixteen centres had no late presenting patients dialysing with definitive access at three months. A small number of centres were able to establish definitive access in at least 40% of late presenting patients by three months (Derby, London St George's, Cardiff).

Table 12.6 shows dialysis access three months after initiation, stratified by first access type. The shaded cells highlight proportions of patients who continued to use their initial dialysis access at three months. Of patients who initiated dialysis with definitive access, 86.2% continued with the same access at three months and 88.2% had definitive access or a transplant, whilst 5.9% converted to TL/NTL. Of patients who started dialysis without definitive access, 12.8% received a transplant or were dialysing with definitive access at three months. Of patients who initiated dialysis with a TL, 78.9% continued with a TL at three months and only 12.9% had converted to definitive access or a transplant. Death before three months was much more common in patients initiating dialysis with a NTL than with any other form of initial access (22.5%). Of those patients who initiated dialysis with a NTL and survived to three months, 78.3% converted to a TL.

Figure 12.9 provides a funnel plot of the percentage of patients starting HD with an AVF or AVG. Late presenting patients were excluded as a surrogate for 'unplanned dialysis initiation' as per the Renal Association guidelines (table 12.1). This analysis shows that the majority of UK renal centres fell below the Renal Association audit standard of ⩾60% AVF/AVG use at 'planned' HD initiation. Only ten centres achieved the target. All these centres had <65 incident HD patients, although

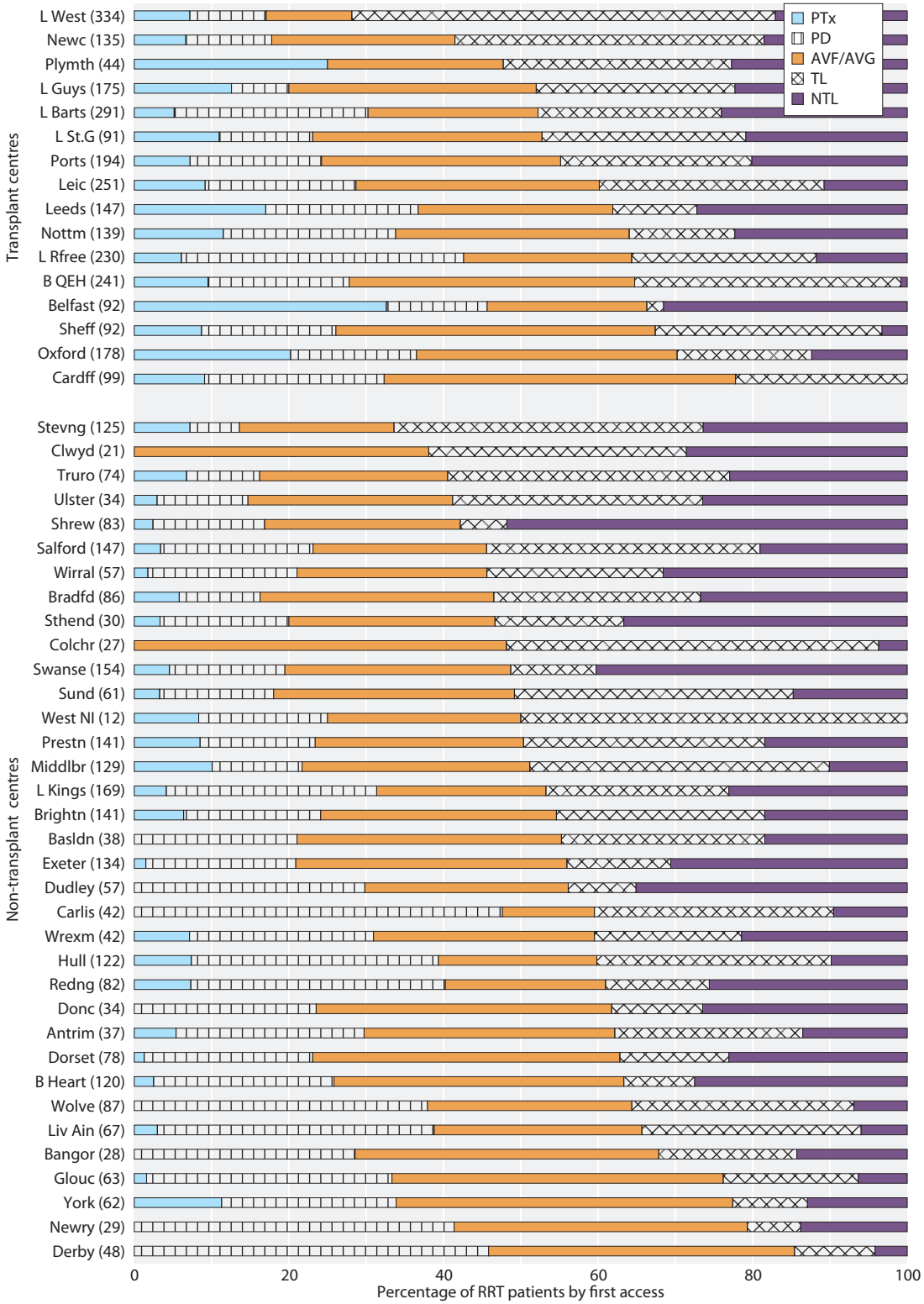

Fig. 12.8. Incident RRT first access method for patients in the 2015 Multisite Dialysis Access audit, stratified by renal centre
Centre size (patient numbers) in brackets. Centres are stratified by transplanting/non-transplanting centre and sorted by proportion of patients initiating RRT with a HD catheter (TL/NTL). PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line; RRT – renal replacement therapy

Table 12.4. Modality at start of dialysis and access in use for patients in the 2015 Multisite Dialysis Access audit, by early and late presentation at dialysis initiation, by centre, including surgical referral rates within three months before start of dialysis

	Early presenters (⩾90 days before start of dialysis) %					Late presenters (<90 days before start of dialysis) %					Surgical assessment %		Treatment modality at start (*N*)			
Centre	*N*	PD	AVF/ AVG	TL	NTL	*N*	PD	AVF/ AVG	TL	NTL	Yes	No	HD	PD	PTx	Total *N*
Antrim	29	31.0	41.4	20.7	6.9	4	0.0	0.0	75.0	25.0	80.0	20.0	26	9	2	37
B Heart	113	23.9	39.8	9.7	26.5	2	0.0	0.0	0.0	100.0	51.3	48.7	89	28	3	120
B QEH	172	22.1	45.9	30.8	1.2	30	10.0	20.0	70.0	0.0	72.0	28.0	174	44	23	241
Bangor	27	25.9	40.7	18.5	14.8	1	100.0	0.0	0.0	0.0	75.0	25.0	20	8	0	28
Basldn	30	26.7	43.3	26.7	3.3	7	0.0	0.0	14.3	85.7	68.4	31.6	30	8	0	38
Belfast	46	23.9	41.3	2.2	32.6	13	7.7	0.0	7.7	84.6	59.7	40.3	50	12	30	92
Bradfd	71	11.3	36.6	29.6	22.5	10	10.0	0.0	20.0	70.0	56.8	43.2	72	9	5	86
Brightn	112	20.5	38.4	28.6	12.5	15	13.3	0.0	26.7	60.0	46.2	53.8	107	25	9	141
Camb	85	9.4	34.1	55.3	1.2	10	10.0	0.0	90.0	0.0	46.6	53.4	0	0	0	0
Cardff	83	25.3	53.0	21.7	0.0	5	40.0	20.0	40.0	0.0	79.1	20.9	67	23	9	99
Carlis	36	55.6	13.9	27.8	2.8	5	0.0	0.0	40.0	60.0	69.0	31.0	22	20	0	42
Clwyd	19	0.0	42.1	31.6	26.3	1	0.0	0.0	100.0	0.0			21	0	0	21
Colchr	21	0.0	61.9	38.1	0.0	1	0.0	0.0	100.0	0.0	70.4	29.6	27	0	0	27
Derby	41	48.8	43.9	2.4	4.9	5	40.0	0.0	60.0	0.0	35.4	64.6	26	22	0	48
Donc	24	33.3	54.2	8.3	4.2	7	0.0	0.0	0.0	100.0	58.8	41.2	26	8	0	34
Dorset	58	25.9	53.4	10.3	10.3	16	12.5	0.0	31.3	56.3	39.0	61.0	60	17	1	78
Dudley	45	31.1	33.3	11.1	24.4	11	18.2	0.0	0.0	81.8	35.2	64.8	40	17	0	57
Exeter	106	21.7	40.6	15.1	22.6	20	5.0	15.0	5.0	75.0	49.2	50.8	106	26	2	134
Glouc	57	33.3	45.6	17.5	3.5	3	33.3	0.0	0.0	66.7	88.7	11.3	42	20	1	63
Hull	81	39.5	27.2	30.9	2.5	23	21.7	0.0	39.1	39.1	49.6	50.4	74	39	9	122
L Barts	197	27.4	30.5	21.8	20.3	58	24.1	5.2	32.8	37.9	100.0	0.0	203	73	15	291
L Guys	131	9.9	42.0	28.2	19.8	15	0.0	0.0	33.3	66.7	45.1	54.9	140	13	22	175
L Kings	134	31.3	26.9	22.4	19.4	20	10.0	0.0	35.0	55.0	35.2	64.8	116	46	7	169
L Rfree	171	40.9	28.1	21.6	9.4	28	32.1	0.0	39.3	28.6	50.5	49.5	132	84	14	230
L St.G	49	14.3	42.9	24.5	18.4	7	0.0	42.9	28.6	28.6	67.6	32.4	70	11	10	91
L West	250	12.8	14.0	61.6	11.6	31	0.0	3.2	45.2	51.6	46.4	53.6	277	33	24	334
Leeds	98	25.5	37.8	12.2	24.5	18	22.2	0.0	5.6	72.2	42.6	57.4	93	29	25	147
Leic	193	23.8	38.9	26.9	10.4	28	3.6	14.3	60.7	21.4	59.6	40.4	179	49	23	251
Liv Ain	48	43.8	35.4	16.7	4.2	12	8.3	0.0	83.3	8.3	31.3	68.8	41	24	2	67
Middlbr	91	14.3	40.7	35.2	9.9	17	11.8	5.9	58.8	23.5	100.0	0.0	101	15	13	129
Newc	96	15.6	33.3	36.5	14.6	29	0.0	0.0	62.1	37.9	45.2	54.8	111	15	9	135
Newry	26	42.3	38.5	7.7	11.5	0					65.5	34.5	17	12	0	29
Nottm	103	28.2	40.8	13.6	17.5	16	12.5	0.0	18.8	68.8	42.7	57.3	92	31	16	139
Oxford	124	18.5	48.4	19.4	13.7	12	25.0	0.0	50.0	25.0	59.2	40.8	113	29	36	178
Plymth	19	0.0	47.4	31.6	21.1	4	0.0	25.0	0.0	75.0	0.0	100.0	33	0	11	44
Ports	115	24.3	45.2	20.0	10.4	39	7.7	12.8	33.3	46.2	50.0	50.0	147	33	14	194
Prestn	103	18.4	36.9	32.0	12.6	24	4.2	0.0	45.8	50.0	53.1	46.9	108	21	12	141
Redng	61	41.0	27.9	11.5	19.7	15	13.3	0.0	26.7	60.0	23.7	76.3	49	27	6	82
Salford	104	26.0	29.8	33.7	10.6	24	0.0	4.2	50.0	45.8	34.8	65.2	113	29	5	147
Sheff	83	19.3	45.8	31.3	3.6	1	0.0	0.0	100.0	0.0	77.4	22.6	68	16	8	92
Shrew	49	20.4	42.9	4.1	32.7	29	0.0	0.0	10.3	89.7	55.6	44.4	69	12	2	83
Stevng	83	9.6	30.1	42.2	18.1	25	0.0	0.0	44.0	56.0	44.3	55.7	108	8	9	125
Sthend	21	23.8	33.3	19.0	23.8	5	0.0	0.0	20.0	80.0	17.2	82.8	24	5	1	30
Sund	50	16.0	36.0	38.0	10.0	8	12.5	0.0	37.5	50.0	74.6	25.4	50	9	2	61
Swanse	114	17.5	37.7	14.0	30.7	29	10.3	3.4	3.4	82.8	25.3	74.7	124	23	7	154
Truro	47	14.9	36.2	36.2	12.8	18	0.0	0.0	44.4	55.6	44.9	55.1	62	7	5	74
Ulster	25	8.0	36.0	32.0	24.0	5	0.0	0.0	60.0	40.0	60.6	39.4	29	4	1	34
West NI	10	20.0	30.0	50.0	0.0	0					63.6	36.4	9	2	1	12
Wirral	46	21.7	30.4	21.7	26.1	9	11.1	0.0	33.3	55.6	32.1	67.9	45	11	1	57
Wolve	74	35.1	31.1	29.7	4.1	11	63.6	0.0	18.2	18.2	57.5	42.5	54	33	0	87
Wrexm	33	30.3	33.3	18.2	18.2	3	0.0	0.0	66.7	33.3	64.1	35.9	29	10	3	42
York	46	23.9	56.5	8.7	10.9	6	33.3	0.0	16.7	50.0	52.7	47.3	41	14	7	62
Total	**4,050**	**23.4**	**36.6**	**26.2**	**13.9**	**735**	**11.2**	**4.1**	**36.3**	**48.4**	**51.2**	**48.8**	**3,926**	**1,063**	**405**	**5,394**

PTx – pre-emptive transplant; HD – haemodialysis; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

Table 12.5. Modality at three months after start of dialysis and access in use for patients in the 2015 Multisite Dialysis Access audit, by early and late presentation at dialysis initiation, by centre

	Early presenters (⩾90 days before start of dialysis) %								Late presenters (<90 days before start of dialysis) %								Treatment modality at 3 months (*N*)							
Centre	PTx	PD	AVF/ AVG	TL	NTL	Other	Miss	Total (*N*)	PTx	PD	AVF/ AVG	TL	NTL	Other	Miss	Total (*N*)	PTx	PD	AVF/ AVG	TL	NTL	Other	Miss	Total
Antrim	0.0	31.0	37.9	31.0	0.0	0.0	0.0	29	0.0	0.0	0.0	75.0	0.0	25.0	0.0	4	0	9	11	13	0	2	0	35
B Heart	0.9	23.9	38.9	28.3	0.0	8.0	0.0	113	0.0	0.0	0.0	100.0	0.0	0.0	0.0	2	1	28	44	35	0	9	0	117
B QEH	1.2	20.3	43.6	32.0	0.0	2.9	0.0	172	0.0	10.0	16.7	73.3	0.0	0.0	0.0	30	2	41	82	86	0	7	0	218
Bangor	3.7	18.5	33.3	40.7	3.7	0.0	0.0	27	0.0	0.0	0.0	0.0	0.0	100.0	0.0	1	1	5	9	11	1	1	0	28
Basldn	0.0	26.7	40.0	26.7	0.0	3.3	3.3	30	0.0	28.6	0.0	57.1	0.0	14.3	0.0	7	0	10	12	13	0	2	1	38
Belfast	6.5	21.7	41.3	21.7	2.2	6.5	0.0	46	0.0	23.1	0.0	23.1	0.0	53.8	0.0	13	3	14	20	14	1	10	0	62
Bradfd	2.8	11.3	40.8	40.8	1.4	2.8	0.0	71	0.0	10.0	0.0	80.0	0.0	10.0	0.0	10	2	9	29	37	1	3	0	81
Brightn	0.0	17.9	33.9	35.7	0.0	12.5	0.0	112	0.0	13.3	6.7	60.0	0.0	20.0	0.0	15	0	22	40	51	0	19	0	132
Camb	2.4	9.4	41.2	38.8	0.0	8.2	0.0	85	0.0	10.0	10.0	70.0	0.0	10.0	0.0	10	2	12	46	49	0	9	0	118
Cardff	0.0	2.4	59.0	9.6	0.0	3.6	25.3	83	0.0	0.0	40.0	20.0	0.0	0.0	40.0	5	0	2	53	9	0	3	23	90
Carlis	0.0	52.8	16.7	30.6	0.0	0.0	0.0	36	0.0	0.0	0.0	100.0	0.0	0.0	0.0	5	0	19	6	17	0	0	0	42
Clwyd	5.3	0.0	47.4	31.6	0.0	15.8	0.0	19	0.0	0.0	0.0	100.0	0.0	0.0	0.0	1	1	0	9	8	0	3	0	21
Colchr	4.8	0.0	57.1	23.8	0.0	14.3	0.0	21	0.0	0.0	0.0	100.0	0.0	0.0	0.0	1	1	0	12	11	0	3	0	27
Derby	2.4	46.3	46.3	4.9	0.0	0.0	0.0	41	0.0	40.0	40.0	20.0	0.0	0.0	0.0	5	1	21	21	4	0	1	0	48
Donc	4.2	25.0	54.2	16.7	0.0	0.0	0.0	24	0.0	0.0	0.0	85.7	0.0	14.3	0.0	7	1	6	13	13	0	1	0	34
Dorset	0.0	25.9	50.0	19.0	0.0	5.2	0.0	58	0.0	12.5	0.0	75.0	0.0	12.5	0.0	16	0	17	29	24	0	7	0	77
Dudley	0.0	35.6	26.7	24.4	2.2	11.1	0.0	45	0.0	18.2	0.0	36.4	0.0	45.5	0.0	11	0	19	12	15	1	10	0	57
Exeter	0.0	21.7	49.1	19.8	0.0	9.4	0.0	106	0.0	5.0	20.0	25.0	0.0	50.0	0.0	20	0	27	57	28	0	20	0	132
Glouc	0.0	31.6	45.6	19.3	0.0	3.5	0.0	57	0.0	0.0	0.0	100.0	0.0	0.0	0.0	3	0	18	27	15	0	2	0	62
Hull	2.5	38.3	28.4	28.4	0.0	2.5	0.0	81	4.3	26.1	4.3	56.5	0.0	8.7	0.0	23	3	38	26	42	0	4	0	113
L Barts	2.0	28.9	27.4	34.0	0.0	7.6	0.0	197	0.0	27.6	5.2	48.3	0.0	19.0	0.0	58	4	79	58	107	0	28	0	276
L Guys	6.1	9.9	37.4	42.0	0.0	4.6	0.0	131	0.0	0.0	0.0	80.0	0.0	20.0	0.0	15	8	13	50	73	0	9	0	153
L Kings	0.7	12.7	29.1	41.0	0.0	1.5	14.9	134	0.0	5.0	0.0	85.0	0.0	5.0	5.0	20	1	19	40	76	0	4	22	162
L Rfree	2.9	36.3	29.8	25.1	0.0	5.3	0.6	171	0.0	35.7	0.0	50.0	0.0	14.3	0.0	28	6	76	53	67	0	13	1	216
L St.G	0.0	16.3	42.9	28.6	8.2	4.1	0.0	49	0.0	0.0	42.9	42.9	14.3	0.0	0.0	7	0	10	26	31	7	7	0	81
L West	0.8	12.0	16.0	68.8	0.0	2.4	0.0	250	0.0	0.0	3.2	93.5	0.0	3.2	0.0	31	2	31	42	228	0	7	0	310
Leeds	3.1	24.5	41.8	22.4	0.0	8.2	0.0	98	0.0	16.7	0.0	61.1	5.6	16.7	0.0	18	3	28	42	36	1	12	0	122
Leic	2.6	16.6	37.8	35.8	0.0	7.3	0.0	193	0.0	3.6	14.3	78.6	0.0	3.6	0.0	28	5	35	78	93	0	17	0	228
Liv Ain	0.0	47.9	37.5	10.4	0.0	4.2	0.0	48	0.0	16.7	0.0	75.0	0.0	8.3	0.0	12	0	27	19	15	0	4	0	65
Middlbr	0.0	14.3	37.4	42.9	0.0	5.5	0.0	91	0.0	11.8	5.9	64.7	0.0	17.6	0.0	17	0	15	35	58	0	8	0	116
Newc	0.0	16.7	32.3	41.7	2.1	7.3	0.0	96	0.0	3.4	0.0	44.8	0.0	51.7	0.0	29	0	17	31	54	2	22	0	126
Newry	3.8	42.3	23.1	19.2	0.0	11.5	0.0	26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	1	12	7	5	0	4	0	29
Nottm	1.9	24.3	43.7	20.4	1.0	8.7	0.0	103	0.0	6.3	0.0	43.8	0.0	50.0	0.0	16	2	26	45	30	1	19	0	123
Oxford	4.0	18.5	44.4	25.0	0.0	8.1	0.0	124	0.0	25.0	0.0	58.3	0.0	16.7	0.0	12	5	29	55	41	0	12	0	142
Plymth	0.0	0.0	63.2	21.1	0.0	15.8	0.0	19	0.0	0.0	25.0	0.0	0.0	75.0	0.0	4	0	0	14	12	0	7	0	33
Ports	3.5	18.3	47.8	27.0	0.0	3.5	0.0	115	0.0	10.3	20.5	66.7	0.0	2.6	0.0	39	4	29	67	74	0	6	0	180
Prestn	1.9	16.5	35.0	38.8	1.0	6.8	0.0	103	0.0	12.5	0.0	70.8	0.0	12.5	4.2	24	2	21	36	58	1	10	1	129
Redng	0.0	37.7	29.5	21.3	0.0	11.5	0.0	61	0.0	13.3	0.0	73.3	0.0	13.3	0.0	15	0	25	18	24	0	9	0	76
Salford	3.8	23.1	28.8	31.7	1.9	9.6	1.0	104	0.0	4.2	0.0	45.8	0.0	50.0	0.0	24	4	28	31	48	2	28	1	142
Sheff	3.6	14.5	48.2	31.3	0.0	2.4	0.0	83	0.0	0.0	0.0	100.0	0.0	0.0	0.0	1	3	12	40	27	0	2	0	84
Shrew	2.0	22.4	40.8	16.3	2.0	16.3	0.0	49	0.0	3.4	10.3	17.2	10.3	58.6	0.0	29	1	14	23	14	4	25	0	81
Stevng	3.6	9.6	36.1	39.8	0.0	10.8	0.0	83	0.0	4.0	0.0	56.0	0.0	40.0	0.0	25	3	9	30	53	0	21	0	116
Sthend	0.0	19.0	38.1	38.1	0.0	4.8	0.0	21	0.0	0.0	0.0	80.0	0.0	20.0	0.0	5	0	4	11	12	0	2	0	29
Sund	4.0	12.0	34.0	46.0	0.0	4.0	0.0	50	0.0	12.5	0.0	75.0	0.0	12.5	0.0	8	2	7	18	29	0	3	0	59
Swanse	0.0	18.4	36.8	22.8	3.5	18.4	0.0	114	0.0	10.3	3.4	41.4	0.0	44.8	0.0	29	0	24	44	39	4	36	0	147
Truro	4.3	12.8	38.3	34.0	0.0	10.6	0.0	47	0.0	0.0	0.0	77.8	0.0	22.2	0.0	18	2	6	19	32	0	10	0	69
Ulster	0.0	8.0	32.0	56.0	0.0	4.0	0.0	25	0.0	0.0	0.0	60.0	0.0	40.0	0.0	5	0	4	8	18	0	3	0	33
West NI	0.0	10.0	30.0	60.0	0.0	0.0	0.0	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	1	3	7	0	0	0	11
Wirral	2.2	17.4	26.1	34.8	0.0	19.6	0.0	46	0.0	11.1	0.0	44.4	0.0	44.4	0.0	9	1	9	12	20	0	14	0	56
Wolve	0.0	32.4	33.8	25.7	0.0	8.1	0.0	74	0.0	27.3	0.0	63.6	0.0	9.1	0.0	11	0	27	25	27	0	8	0	87
Wrexm	0.0	30.3	36.4	24.2	3.0	6.1	0.0	33	0.0	0.0	0.0	100.0	0.0	0.0	0.0	3	0	10	13	12	1	3	0	39
York	2.2	23.9	67.4	6.5	0.0	0.0	0.0	46	0.0	33.3	0.0	66.7	0.0	0.0	0.0	6	1	14	32	8	0	0	0	55
Total	**1.8**	**21.3**	**38.7**	**29.9**	**0.6**	**6.7**	**0.9**	**4,050**	**0.1**	**9.8**	**5.4**	**62.4**	**0.6**	**20.7**	**1.0**	**735**	**78**	**978**	**1,583**	**1,923**	**27**	**469**	**49**	**5,107**

PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line; Miss – missing data

Table 12.6. Dialysis access at three months since dialysis start for patients in the 2015 Multisite Dialysis Access audit, stratified by first access used

Access in use at first dialysis (*N*)	Access in use at three months (%)							
	AVF/AVG	TL	NTL	PD catheter	Transplanted	Died	Stopped/LTFU	No data
AVF/AVG (1,549)	88.4	5.1	0.1	0.1	1.5	2.9	1.9	0.0
TL (1,467)	9.3	78.9	0.3	2.2	1.4	6.8	1.0	0.1
NTL (1,016)	7.0	60.6	1.9	5.2	0.5	22.5	1.8	0.5
PD catheter (1,075)	0.5	6.6	0.2	83.0	2.8	2.4	0.7	3.9

Shaded cells highlight the percentage of patients who remained on the same modality at three months
PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line; LTFU – lost to follow-up

the majority of centres of this size failed to meet the audit standard.

Figure 12.10 depicts the percentage of incident HD patients by first access used, stratified by time between date of first access formation attempt and HD initiation. Data from patients incident to dialysis in 2014 and 2015 are included. Date of first access was collected for the first time in 2014 and has not previously been presented in analyses in this chapter. Longer duration between first attempt at forming dialysis access and first HD session was associated with greater levels of AVF/AVG use at initiation. Amongst patients for whom the first attempt at forming dialysis access was made more than one year before starting HD, 89.0% initiated with AVF/AVG; whereas for those patients for whom the first attempt at forming dialysis access was made <90 days before starting dialysis, 15.6% commenced HD with an AVF/AVG. The biggest increment in definitive dialysis

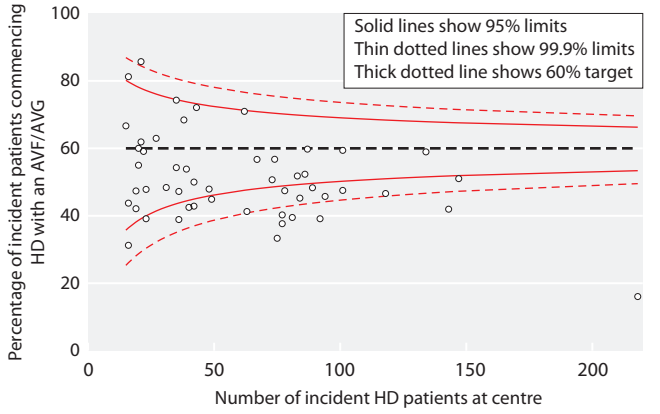

Fig. 12.9. Funnel plot of the percentage of HD patients in the 2015 Multisite Dialysis Access audit who commenced dialysis with an AVF/AVG

Patients who were first seen by a nephrologist <90 days from initiating dialysis were excluded. Centres with <10 patients receiving HD were excluded. HD – haemodialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft

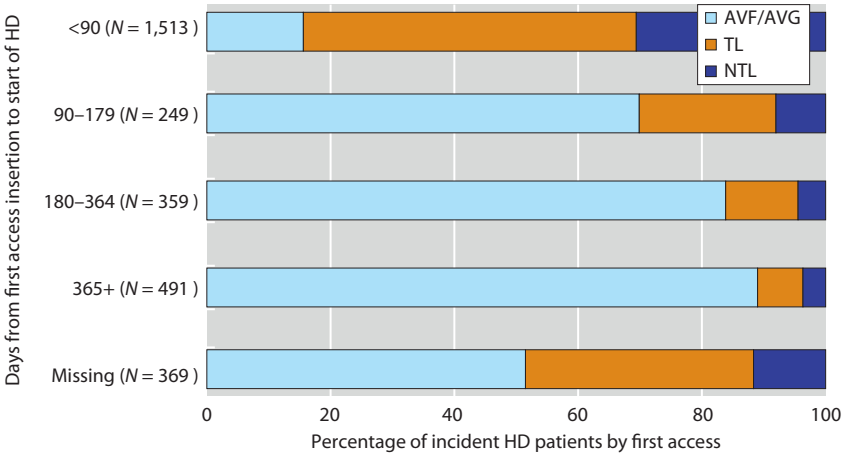

Fig. 12.10. Percentage of incident HD patients by first access used in the 2014 and 2015 Multisite Dialysis Access audits stratified categorically by days (<90; 90–179; 180–364; 365+) from first access attempt

Number of patients in each category in brackets. Late-presenting patients were excluded from this analysis. Three centres were excluded due to >50% missing data for date of first access attempt. HD – haemodialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line; Miss – missing data

access occurred between <90 and ⩾90 days. Three centres were excluded due to >50% missing data for date of first access attempt. Furthermore, the data field did not specify which access was attempted, so it cannot be assumed that first access attempt and access used on first session were the same. Missing data had a similar distribution of access use to those seen in patients for whom data were provided, suggesting no systematic tendency for early or late presenting patients to be more or less likely to have missing data.

Variations in prevalent dialysis access by renal centre

Figure 12.11 provides a funnel plot of the percentage of prevalent dialysis patients receiving PD or HD via an AVF/AVG. Seventeen centres met the Renal Association audit standard of ⩾80% for definitive access use (thick dotted line). Thirteen centre-level exclusions were made for this analysis due to non-completion of prevalent dialysis access data and >10% differences between centre-reported and UKRR numbers of patients receiving dialysis.

Figure 12.12 depicts dialysis access for prevalent patients by centre. Wide practice variation was apparent. Rates of definitive access ranged between >90% (Derby, Birmingham Heartlands, Dorset) and <50% (London West, Ulster). PD accounted for between >25% (Dudley, Carlisle) and <5% (London West, London Guys) of prevalent definitive access use. Thirteen centre-level exclusions were made for this analysis due to non-completion of prevalent dialysis access data and >10% differences between centre-reported and UKRR numbers of patients receiving dialysis.

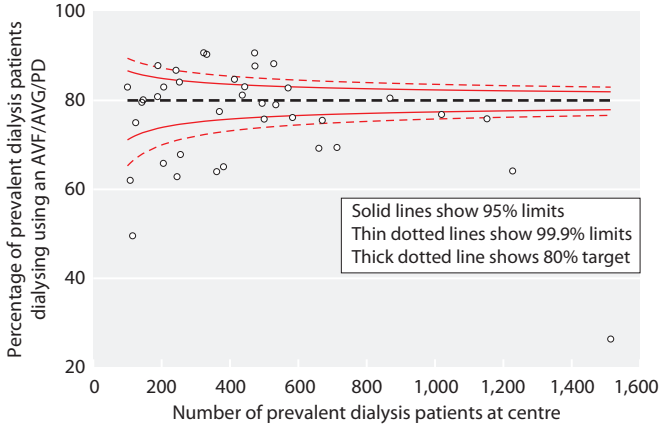

Fig. 12.11. Funnel plot of the percentage of prevalent patients in the 2015 Multisite Dialysis Access audit receiving PD or HD via AVF/AVG

A total of 13 centre-level exclusions were made for this analysis due to non-completion of prevalent dialysis access data and >10% differences between centre-reported and UKRR numbers of patients receiving dialysis. HD – haemodialysis; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft

Peritoneal dialysis audit one-year follow-up by renal centre

Figure 12.13 shows RRT modality one year after commencing PD by centre. Data for this analysis came from the 2015 one year follow-up for patients incident to dialysis in 2014. Centres with 100% missing data at one year, or fewer than five PD patients were excluded. The percentage of patients remaining on PD or who were transplanted one year after initiation ranges between 10% (Stevenage) and >85% (Cambridge, Doncaster, Wrexham, Plymouth, Leeds, Salford) with an overall mean of 72.8%. Of patients continuing dialysis (i.e. censoring for death, transplant and withdrawal), 76.6% of patients starting PD continued to use this modality one year later.

Figure 12.14 depicts PD catheter insertion technique stratified by centre. The five centres reporting fewer than five patients on PD were not considered for analysis. Surgical techniques include open and laparoscopic. Non-surgical techniques include percutaneous and peritoneoscopic insertion. There was considerable practice variation. Seventeen centres performed non-surgical PD catheter placement, accounting for 25.9% of all catheters placed and 13 of these centres placed >50% of their PD catheters this way. Six placed >90% of their PD catheters percutaneously (Southend, Gloucester, Derby, Birmingham Heartlands, Salford, Wolverhampton). At the 17 centres that place non-surgical PD catheters, 25.9% of incident RRT patients started PD, compared with 21.0% overall. Approximately 48% percent of incident RRT patients started PD at the six centres that placed >90% of their catheters percutaneously.

Figure 12.15 displays PD catheter insertion technique by referral time. There does not appear to be a strong relationship between referral time and technique for PD catheter insertion. This suggests that the PD access referral pathway was less dependent on timely referral than the vascular access pathway.

Figure 12.16 presents the percentage of incident PD patients by catheter insertion technique and BMI

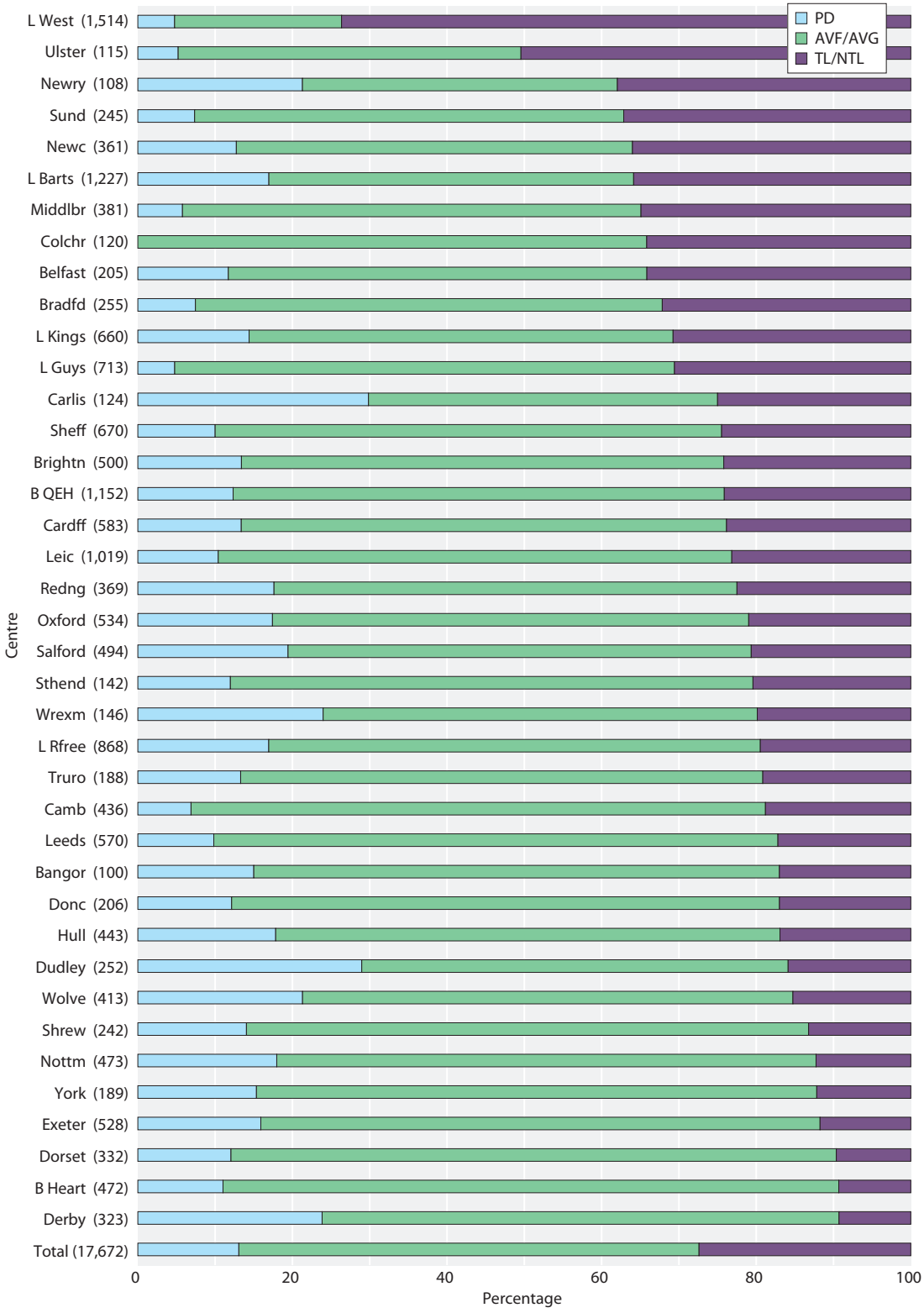

Fig. 12.12. Prevalent dialysis access by centre for patients in the 2015 Multisite Dialysis Access audit
Centre size (patient numbers) in brackets. Centres are sorted by proportion of patients initiating RRT with a HD catheter. HD – haemodialysis; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

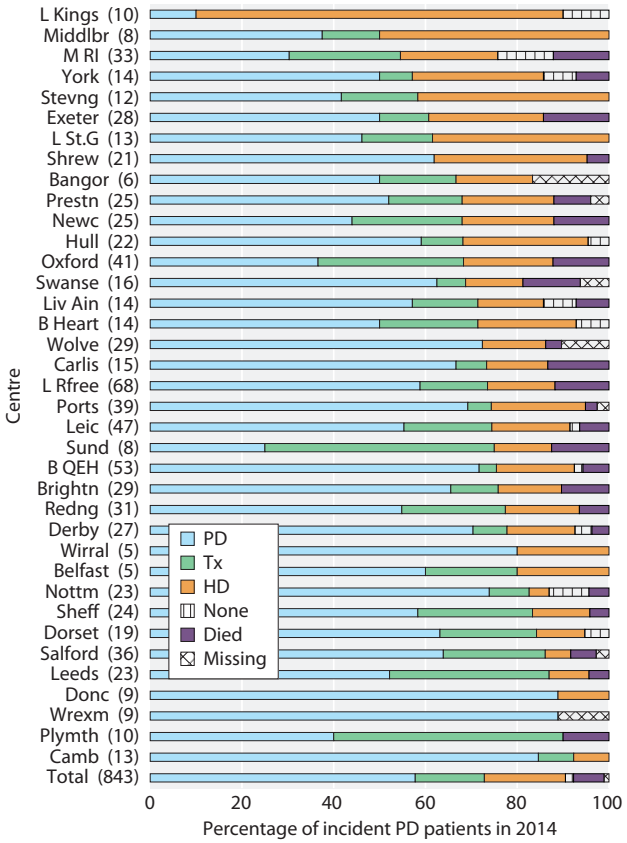

Fig. 12.13. Modality at one year after commencing PD in 2014, by centre

Number of patients receiving PD at each centre in brackets. Centres with 100% missing treatment data at one year or fewer than five PD patients were excluded. Centres are sorted by proportion of patients transplanted or remaining on PD. PD – peritoneal dialysis; HD – haemodialysis; Tx – transplanted

group. Associations between BMI and PD catheter insertion technique do not appear to be strong. An open surgical approach was used more frequently than any other technique (43.0%). Laparoscopic surgery was used less in patients with a BMI >35 (11.7%) and was compensated by an increase in the use of open surgery (61.7%). Rates of laparoscopic insertion were also low amongst individuals with BMI <20 (16.1%). This was compensated for by greater use of open (54.8%) and percutaneous approaches (25.8%).

Figure 12.17 shows a funnel plot of the percentage of PD catheter failures within one year of initiating dialysis. Data are from the one year PD follow-up audit of patients incident to PD in 2014. PD catheter failure was censored for transplantation, elective transfer to HD or death. Of the 30 centres for which data were available, none were above the 95% limit for PD catheter failure. However, four centres were below the lower 99.9% limit, none of which reported a failed PD catheter. The average one year catheter failure rate of 13.3% is an improvement on that which was reported in previous years (20.2% in 2014). Nine centres reported peritonitis within two weeks of PD catheter insertion, with rates ranging between 1.3% and 13.0% of inserted catheters. Twenty-nine centres reported no cases of peritonitis within two weeks. These results should be interpreted with caution due to missing data and small numbers of patients in some centres.

Figure 12.18 shows comparative access failure by access type within three months of initiating dialysis. Data were drawn from the 2014 and 2015 Multisite Dialysis Access audits. Access failure was defined as a documented date of failure/discontinuation recorded within three months of starting dialysis, unless a centre comment indicated that it was a planned discontinuation. Failure rates appeared higher for PD than for HD access. Numbers of AVGs and peritoneoscopically inserted PD tubes were very low, hence the wide confidence intervals (CIs) for these data. There was no signal from these data to suggest that sub-types of HD or PD access were more or less likely to fail at three months.

Figure 12.19 shows causes of PD catheter access failure within one year of initiating dialysis in 112 catheters reported from the one year PD follow-up audit of patients incident to dialysis in 2014. Infection was a more frequent cause of failure for percutaneously inserted than surgically placed PD catheters and for open compared with laparoscopic insertion. No leaks or hernias were reported for percutaneously inserted or failures reported in peritoneoscopically inserted PD catheters. The relatively small number in this analysis increases the likelihood that differences in causes of failure between subgroups are due to chance.

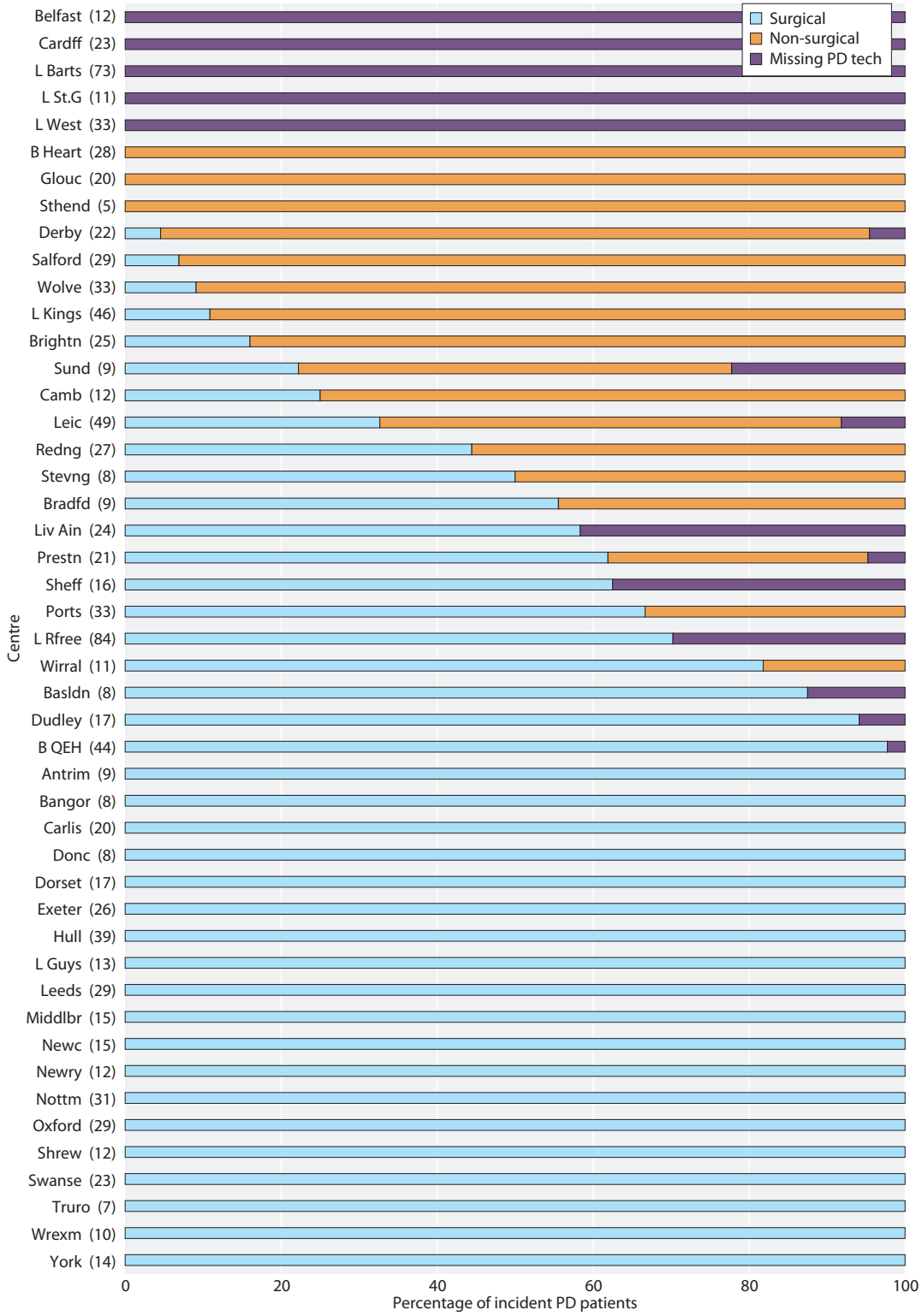

Fig. 12.14. PD catheter insertion technique (surgical vs non-surgical) stratified by centre for patients in the 2015 Multisite Dialysis Access audit

Number of patients receiving PD at each centre in brackets. Centres are sorted by proportion of catheters inserted by surgical technique. Centres reporting fewer than five patients on PD were excluded from this analysis. Due to small numbers in the subcategories of surgical insertion techniques, open and laparoscopic insertions are grouped as 'surgical'; peritoneoscopic and percutaneous as 'non-surgical'. PD – peritoneal dialysis

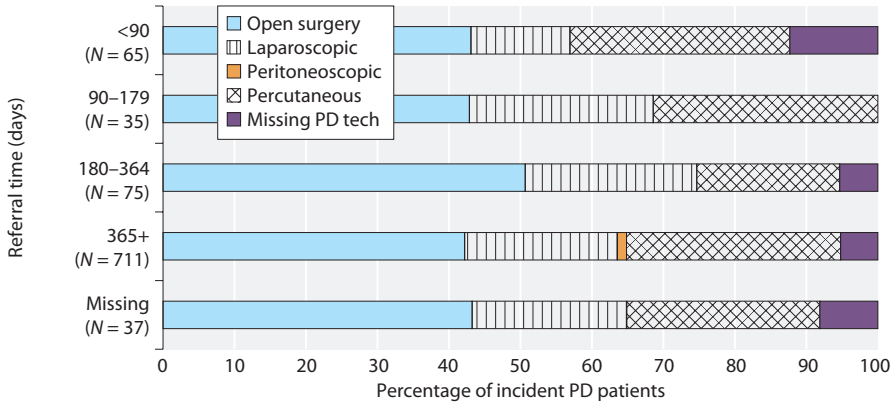

Fig. 12.15. PD catheter insertion technique by referral time (days) for patients in the 2015 Multisite Dialysis Access audit

Number of patients in each category in brackets. Referral time was measured between first nephrology input (inpatient/outpatient) and initiating dialysis. Five centres were excluded from this analysis due to >50% missing data for PD catheter insertion technique. PD – peritoneal dialysis

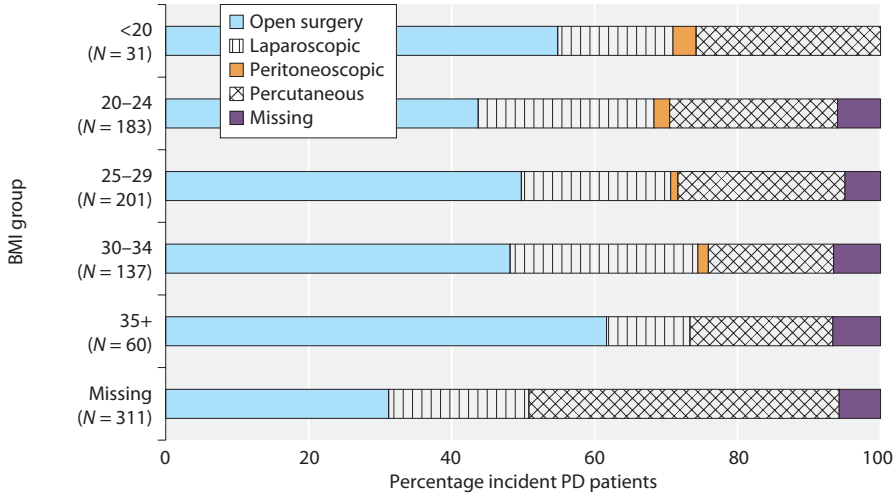

Fig. 12.16. Percentage of incident PD patients by catheter insertion technique and BMI group for patients in the 2015 Multisite Dialysis Access audit

Number of patients in each category in brackets. Five centres were excluded from this analysis due to >50% missing data for PD catheter insertion technique and 15 centres due to >50% of missing data for BMI. PD = peritoneal dialysis; BMI = body mass index

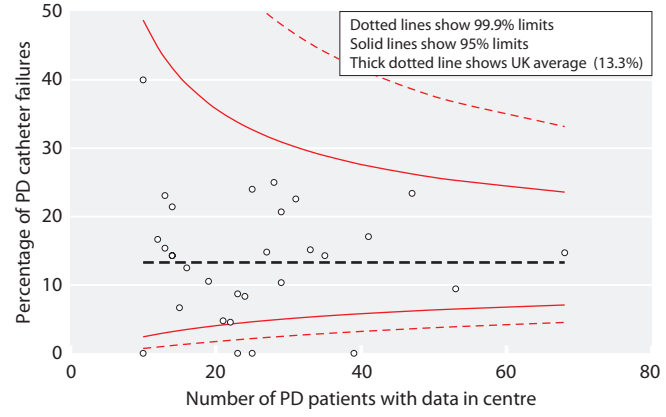

Fig. 12.17. Funnel plot of the percentage of PD catheter failures within one year of start date for patients incident to PD in 2014

Thirteen centres with <10 patients on PD were excluded from this analysis, along with eight centres that did not return data for the one year follow-up. PD – peritoneal dialysis

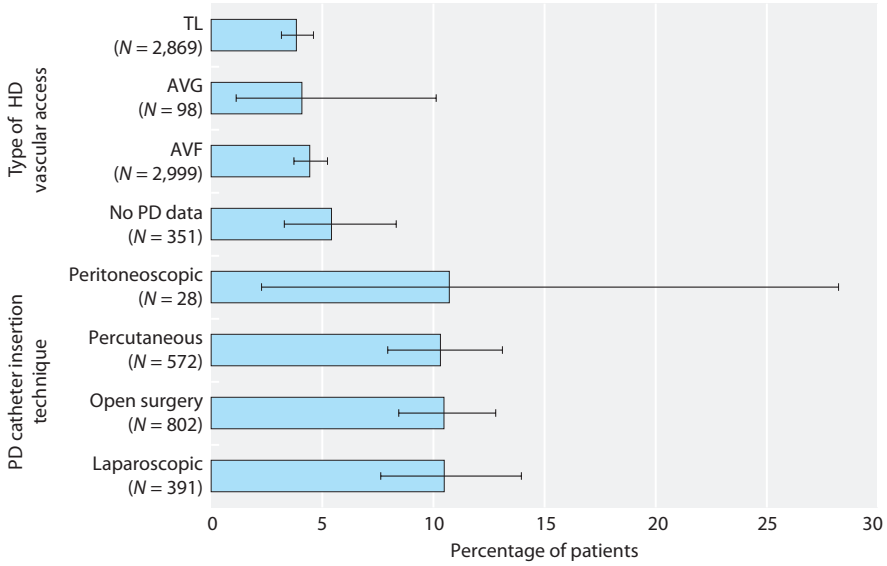

Fig. 12.18. Percentage of patients experiencing failure of first access within three months, by type of first access, for patients in the 2014 and 2015 Multisite Dialysis Access audits
PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line

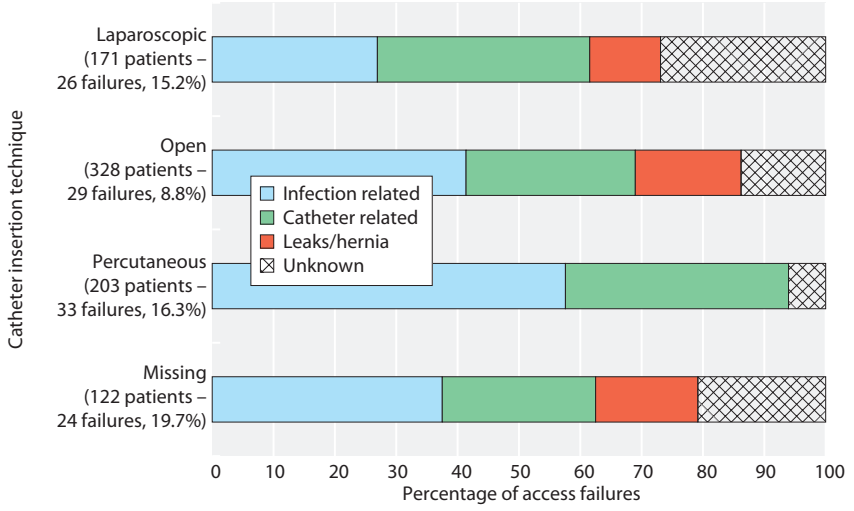

Fig. 12.19. Percentage of PD catheter access failures within one year of starting dialysis, from PD follow-up data, 2015
PD – peritoneal dialysis

Part 2 – Accumulated results from the 2011–2015 annual Multisite Dialysis Access audits

Data completeness

Over the five years since the multisite access audit was initiated, data on a total of 23,639 incident dialysis patients have been collected. The UKRR holds data for 33,034 incident dialysis patients over this period with patient-level data on dialysis access being available for 71.6% (table 12.7). The quality and completeness of data have improved over the time that the annual audit has been running (table 12.8), although the number of centres providing data peaked in 2013. Completeness for some fields remained lower than 75% with access complications having particularly low levels of completion, although there is improvement here too.

Table 12.9 provides centre-level data for incident dialysis access, grouping patients by time of presentation to nephrology services (early $\geqslant$90 or late $<$90 days before initiating dialysis). This table reproduces table 12.4 (which includes 2015 incident patients only) for incident dialysis patients between 2011 and 2015. Late presentation remains associated with low rates of definitive access placement compared with early presentation.

Table 12.10 provides an annual summary of rates of incident and prevalent definitive dialysis access and PTx. It shows that national performance from reporting centres has consistently fallen below Renal Association

Table 12.7. Data completeness of the 2011–2015 annual Multisite Dialysis Access audits

Centre and patient reporting	2011	2012	2013	2014	2015
Centres reporting (*N*)	47	51	57	53	52
Incident HD patients included					
N	3,412	3,522	3,696	3,945	4,032
%	80.3	77.7	78.0	78.7	79.0
Incident PD patients included					
N	839	1,008	1,041	1,069	1,075
%	19.7	22.3	22.0	21.3	21.0
Reported patients excluded due to centre level exclusion (*N*)	0	0	0	0	29
Reported patients excluded as they did not match the UKRR data (*N*)	210	481	1,025	840	744
Reported patients excluded due to missing RRT start date or 1st access (*N*)	99	30	24	7	60

HD – haemodialysis; PD – peritoneal dialysis; RRT – renal replacement therapy; UKRR – UK Renal Registry

Table 12.8. Percentage completeness of variables in the 2011–2015 annual Multisite Dialysis Access audits

Variable	2011	2012	2013	2014	2015
Age	100.0	100.0	100.0	100.0	100.0
Gender	100.0	100.0	100.0	100.0	100.0
BMI	23.4	44.0	52.4	56.7	54.9
Diabetes at time of access creation	80.8	91.3	98.4	97.1	89.9
PRD	79.3	85.2	82.5	96.1	94.9
First RRT treatment centre	100.0	100.0	100.0	100.0	100.0
Date first seen by renal physician	95.5	96.0	94.9	99.1	98.6
Assessed by surgeon for an AVF/AVG or PD catheter at least 3 months before dialysis	71.7	84.9	89.3	96.8	89.6
Was an AVF/AVG attempted before 1st dialysis?				75.9	78.3
Date first ever dialysis (HD/PD)	100.0	100.0	100.0	100.0	100.0
First ever modality (HD/PD)	100.0	100.0	100.0	100.0	100.0
Access in use at first ever dialysis	100.0	100.0	100.0	100.0	100.0
Access in use at 3 months	87.3	94.4	99.0	97.8	99.0
Date of first ever access insertion/construction	11.4	65.1	70.5	75.6	75.0
PD catheter insertion technique	87.8	80.2	82.7	86.3	81.0
Peritonitis	82.7	76.0	81.3	82.4	72.2
Access complication	3.5	12.9	10.7	22.9	29.4
Date of access failure/discontinuation	3.3	8.3	12.6	22.1	27.3

BMI – body mass index; PRD – primary renal diagnosis; HD – haemodialysis; PD – peritoneal dialysis; RRT – renal replacement therapy; AVF – arteriovenous fistula; AVG – arteriovenous graft

Table 12.9. Modality at start of dialysis and access, by referral time, by centre, including surgical referral rates, 2011–2015 data

	Early presenters (⩾90 days) %					Late presenters (<90 days) %					Surg referral %		Treatment modality *N*		
Centre	PD	AVF/AVG	TL	NTL	Total *N*	PD	AVF/AVG	TL	NTL	Total *N*	Yes	No	HD	PD	Total *N*
Antrim	20.2	47.7	12.8	19.3	109	5.3	0.0	31.6	63.2	19	68.0	32.0	111	24	135
B Heart	19.5	48.5	16.0	16.0	462	11.8	23.5	23.5	41.2	17	48.9	51.1	407	96	503
B QEH	24.0	42.9	32.7	0.4	741	9.1	8.6	82.3	0.0	186	65.0	35.0	797	207	1,004
Bangor	26.5	34.7	29.6	9.2	98	10.0	10.0	60.0	20.0	10	67.9	32.1	83	27	110
Basldn	26.7	44.3	19.1	9.9	131	10.5	5.3	10.5	73.7	19	65.4	34.6	121	38	159
Belfast	17.6	32.0	18.9	31.6	244	1.8	0.0	9.1	89.1	55	51.9	48.1	267	46	313
Bradfd	15.4	43.8	30.5	10.3	272	5.6	8.3	41.7	44.4	36	52.8	47.2	274	45	319
Brightn	27.8	35.8	22.6	13.8	486	12.4	4.4	22.1	61.1	113	39.9	60.1	479	153	632
Bristol	19.3	56.0	20.0	4.7	150	6.7	6.7	46.7	40.0	15	85.8	14.2	205	37	242

Table 12.9. Continued

	Early presenters (⩾90 days) %					Late presenters (<90 days) %					Surg referral %		Treatment modality *N*		
Centre	PD	AVF/ AVG	TL	NTL	Total *N*	PD	AVF/ AVG	TL	NTL	Total *N*	Yes	No	HD	PD	Total *N*
Camb	11.1	42.7	35.6	10.7	225	6.5	25.8	54.8	12.9	31	63.3	36.7	268	33	301
Cardff	21.4	42.5	34.4	1.6	616	9.1	15.9	75.0	0.0	44	77.1	22.9	563	138	701
Carlis	51.1	13.0	33.7	2.2	92	0.0	8.3	50.0	41.7	12	69.2	30.8	61	48	109
Carsh	0.0	41.8	38.8	19.4	98	0.0	2.9	25.7	71.4	35	0.0	100.0	140	0	140
Chelms	28.5	35.4	28.5	7.6	144	4.3	4.3	39.1	52.2	23	51.4	48.6	135	43	178
Clwyd	9.7	46.8	21.0	22.6	62	0.0	0.0	80.0	20.0	5	66.7	33.3	87	8	95
Colchr	0.0	49.6	50.4	0.0	117	0.0	13.3	73.3	13.3	15	63.9	36.1	162	0	162
Derby	44.9	44.9	8.4	1.8	274	39.5	11.6	37.2	11.6	43	46.7	53.3	186	144	330
Donc	24.2	56.0	9.3	10.4	182	3.4	0.0	20.7	75.9	29	62.9	37.1	176	48	224
Dorset	32.0	45.3	12.8	9.9	172	7.7	0.0	30.8	61.5	39	38.8	61.2	160	59	219
Dudley	30.6	32.9	18.8	17.6	85	13.3	0.0	13.3	73.3	15	56.1	43.9	74	30	104
Exeter	22.6	43.2	15.0	19.2	474	1.0	12.4	5.2	81.4	97	52.9	47.1	496	113	609
Glouc	29.5	43.3	19.5	7.6	210	5.0	0.0	50.0	45.0	20	74.2	25.8	174	63	237
Hull	40.0	27.9	29.6	2.5	365	11.2	3.4	41.6	43.8	89	45.3	54.7	314	163	477
Ipswi	23.1	23.1	53.8	0.0	26	0.0	0.0	100.0	0.0	3	69.6	30.4	26	9	35
Kent	15.3	41.2	43.5	0.0	85	0.0	7.7	84.6	7.7	13	34.8	65.2	92	13	105
L Barts	34.6	21.7	30.0	13.6	806	27.7	4.8	34.6	32.9	231	28.0	72.0	773	364	1,137
L Guys	11.0	42.5	28.0	18.5	200	0.0	4.0	40.0	56.0	25	61.1	38.9	218	22	240
L Kings	22.2	33.8	22.9	21.1	455	11.9	4.5	31.3	52.2	67	43.7	56.3	489	153	642
L Rfree	33.0	32.9	22.9	11.3	764	23.1	2.7	40.1	34.0	147	50.5	49.5	676	301	977
L St.G	19.5	38.4	18.9	23.2	164	0.0	17.9	35.7	46.4	28	58.0	42.0	236	48	284
L West	9.8	13.0	66.0	11.2	1,182	0.0	0.9	45.3	53.8	223	43.2	56.8	1,395	119	1,514
Leic	19.5	42.3	24.1	14.1	771	4.0	5.3	51.7	39.1	151	50.2	49.8	791	160	951
Liv Ain	29.7	49.2	10.3	10.8	195	10.3	3.4	58.6	27.6	29	51.8	48.2	227	74	301
Liv Roy	34.9	33.1	24.0	8.0	175	7.4	18.5	48.1	25.9	27	72.5	27.5	157	64	221
M RI	39.3	35.7	13.6	11.4	140	23.3	3.3	30.0	43.3	30	59.6	40.4	121	65	186
Middlbr	11.3	39.4	34.8	14.4	388	5.9	5.9	36.8	51.5	68	76.9	23.1	442	50	492
Newc	23.3	33.5	32.2	11.0	382	3.3	2.2	65.2	29.3	92	48.7	51.3	392	93	485
Newry	32.1	39.6	16.0	12.3	106	25.0	0.0	8.3	66.7	12	61.9	38.1	89	38	127
Norwch	19.5	42.9	27.3	10.4	77	4.5	13.6	40.9	40.9	22	100.0	0.0	111	25	136
Nottm	33.9	40.4	12.1	13.6	428	22.9	4.2	18.8	54.2	48	44.5	55.5	337	163	500
Oxford	27.5	41.2	19.4	11.9	614	13.0	6.5	45.5	35.1	77	53.5	46.5	546	187	733
Plymth	18.3	42.3	30.3	9.2	142	7.7	7.7	46.2	38.5	26	33.1	66.9	155	40	195
Ports	24.3	38.7	20.1	16.8	641	6.5	10.8	30.1	52.7	93	58.0	42.0	711	178	889
Prestn	19.8	47.3	24.4	8.6	491	5.6	1.9	48.1	44.4	108	52.2	47.8	511	111	622
Redng	39.4	35.5	9.3	15.8	259	11.3	4.2	21.1	63.4	71	31.5	68.5	230	112	342
Salford	25.0	45.0	24.8	5.2	484	12.3	4.6	55.4	27.7	65	42.1	57.9	449	140	589
Sheff	17.9	50.1	21.5	10.5	475	7.7	6.2	41.5	44.6	65	63.7	36.3	486	90	576
Shrew	23.6	35.5	9.1	31.8	110	14.9	14.9	13.5	56.8	74	61.0	39.0	153	42	195
StJms	19.7	47.0	16.2	17.1	538	5.0	3.0	26.7	65.3	101	53.4	46.6	565	113	678
Stevng	14.0	36.4	38.0	11.5	321	3.6	0.0	36.1	60.2	83	50.9	49.1	379	50	429
Sthend	28.8	34.2	27.0	9.9	111	0.0	9.5	28.6	61.9	21	26.8	73.2	110	35	145
Stoke	30.0	47.5	18.0	4.6	217	15.6	6.3	68.8	9.4	32	69.1	30.9	246	100	346
Sund	16.0	39.1	36.6	8.4	238	2.9	0.0	52.9	44.1	34	65.5	34.5	247	41	288
Swanse	23.1	44.6	9.5	22.8	451	9.6	8.7	8.7	73.1	104	39.5	60.5	461	116	577
Truro	19.7	37.5	31.6	11.2	152	0.0	0.0	45.7	54.3	46	48.4	51.6	184	36	220
Ulster	12.7	38.0	34.2	15.2	79	4.2	12.5	54.2	29.2	24	65.5	34.5	97	13	110
West NI	21.0	33.9	30.6	14.5	62	0.0	0.0	60.0	40.0	5	52.2	47.8	55	14	69
Wirral	23.8	39.7	15.2	21.2	151	9.1	3.0	24.2	63.6	33	43.4	56.6	157	42	199
Wolve	37.2	31.0	28.3	3.5	339	36.5	5.8	51.9	5.8	52	50.6	49.4	258	149	407
Wrexm	28.3	33.1	18.6	20.0	145	0.0	0.0	23.1	76.9	13	56.1	43.9	123	42	165
York	28.2	49.4	10.6	11.8	170	12.5	0.0	35.0	52.5	40	53.4	46.6	172	57	229
Total	**23.8**	**38.1**	**26.2**	**11.9**	**18,343**	**10.1**	**5.6**	**39.8**	**44.6**	**3,350**	**52.8**	**47.2**	**18,607**	**5,032**	**23,639**

Surg – surgical; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

Table 12.10. Annual rates of definitive access and pre-emptive transplantation and concordance with Renal Association audit standards

Modality in incident and prevalent patients	2011	2012	2013	2014	2015	Audit standard
Incident patients						
Definitive access (AVF/AVG/PD) or PTx in incident RRT patients (%)	56.5	57.6	58.7	56.5	55.3	None set
Definitive access (AVF/AVG/PD) or PTx in incident RRT patients excluding late presenters (%)	62.9	63.4	64.8	62.6	61.4	None set
AVF/AVG in incident HD patients (%)	41.4	40.9	41.8	39.2	38.6	None set
AVF/AVG in incident HD patients, excluding late presentation (%)	48.3	47.4	48.4	45.6	45.2	60%
AVF/AVG/PD in incident dialysis patients (%)	53.0	54.0	54.6	52.2	51.7	None set
AVF/AVG/PD in incident dialysis patients excluding late presentation (%)	59.5	59.9	60.8	58.3	57.8	None set
Prevalent patients						
Definitive access (AVF/AVG/PD) in prevalent dialysis patients (%)	*	82.3	79.0	73.6	72.6	80%
AVF/AVG in prevalent HD patients (%)	*	79.0	75.4	69.6	68.6	None set

In 2015, audit standards were updated for AVF/AVG in incident HD patients (minimum standard reduced from 65% to 60%); incident RRT recipients (to include PD and PTx; no minimum standard set) and prevalent dialysis patients (to include PD and HD via AVF/AVG – 'definitive access', minimum standard 80%). It is not entirely the same centres submitting access data each year and therefore direct year-to-year comparisons in performance are not valid.
HD – haemodialysis; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line; RRT – renal replacement therapy
*Prevalent data were not collected in the 2011 audit

minimum guideline standards. Direct year-to-year comparisons in performance are not valid due to annual changes in centres providing data and quality of data completion. A secondary analysis including only centres that have reported continuously from 2012 to 2015 (data not shown), shows that for these centres the trend was similar to the results in table 12.10.

Table 12.11 shows dialysis access three months after initiation, stratified by first access used for patients from the 2011–2015 audits. This reproduces table 12.6 (which includes 2015 patients only). As before, the majority (85.8%) of patients who initiated with definitive access continued with definitive access or had been transplanted at three months. Of patients who started dialysis without definitive access, 28.4% received a transplant or were dialysing with definitive access at three months. Death before three months was much more common in patients initiating dialysis with a NTL than with any other form of initial access (12.7%), which is lower than the 2015 data (22.4%).

Figures 12.20–12.25 replicate figures 12.2–12.7 (2015 incident patients only) to include all incident patients from 2011–2015. The trends described in figures 12.2–12.7 are largely reproduced. Data completeness for BMI and diabetic status remained low with multiple centre-level exclusions.

Figure 12.26 plots the incident RRT approach stratified by centre and reproduces figure 12.8 (2015 data only) for incident RRT patients from 2011–2015. The most notable feature is centre-to-centre variation in rates of PD as an incident modality. Use of PTx appears less strongly associated with centre size than for 2015 data.

Table 12.11. Type of dialysis access at 90 days stratified by initial modality in 2011–2015

Access in use at first dialysis (*N*)	Access in use at three months (%)								
	AVF/AVG	TL	NTL	PD catheter	Tx	Died	Stop/LTFU	Recovered	Missing
AVF/AVG (7,494)	85.3	4.5	0.1	0.3	1.0	3.2	0.3	0.6	4.8
TL (6,900)	10.7	75.8	0.3	2.7	1.0	5.8	0.5	0.0	3.3
NTL (4,213)	8.2	64.1	4.7	5.5	0.3	12.7	0.8	0.0	3.7
PD (5,032)	0.5	5.6	0.3	84.2	1.9	2.0	0.3	0.0	5.3

Shaded cells highlight the percentage of patients who remained on the same modality at three months
PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; Tx – transplant; TL – tunnelled line; NTL – non-tunnelled line; LTFU – lost to follow-up

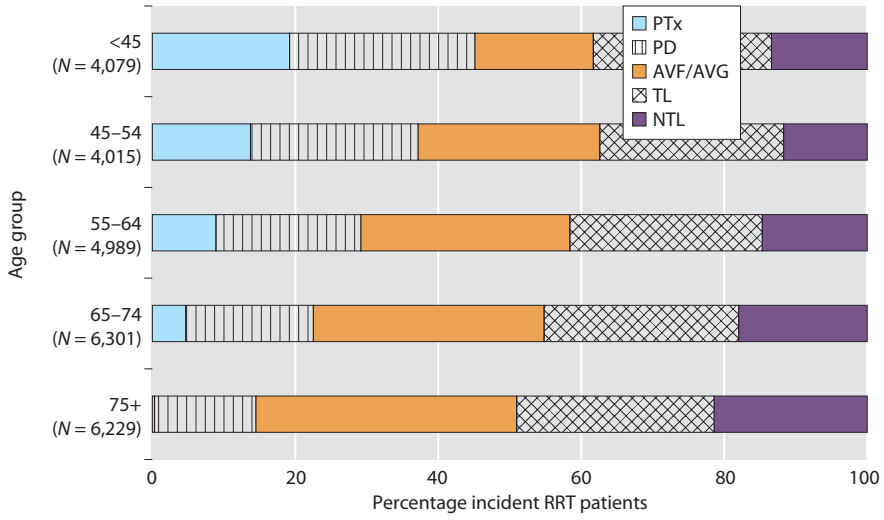

Fig. 12.20. Percentage of incident RRT patients stratified by age and access at start, 2011–2015
Number of patients in each group in brackets.
PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

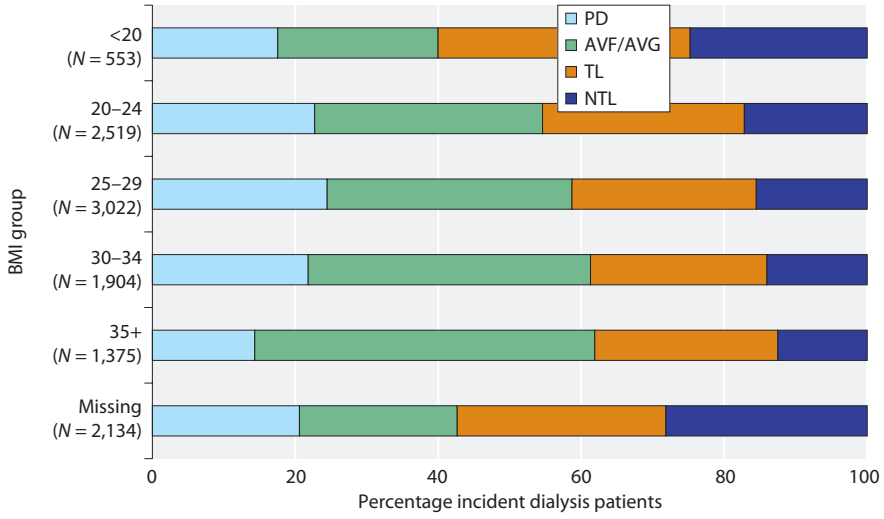

Fig. 12.21. Percentage of incident dialysis patients stratified by BMI and access at start, 2011–2015
Number of patients in each group in brackets.
PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line; BMI – body mass index

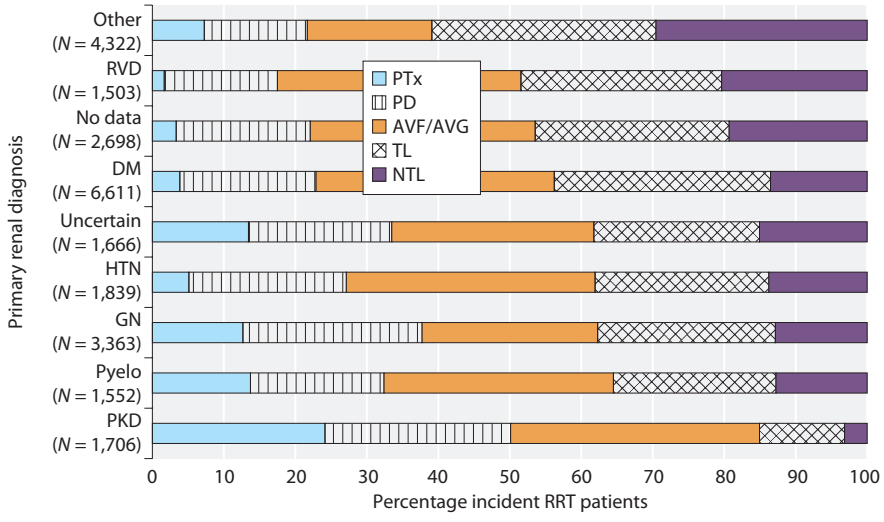

Fig. 12.22. Percentage of incident RRT patients stratified by PRD and access at start, 2011–2015
Number of patients in each group in brackets.
PRD groups are sorted by decreasing proportion of patients initiating RRT with a HD catheter.
PRD – primary renal diagnosis; DM – diabetes mellitus; GN – glomerulonephritis; HTN – hypertension; PKD – polycystic kidney disease; Pyelo – pyelonephritis; RVD – renal vascular disease
PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

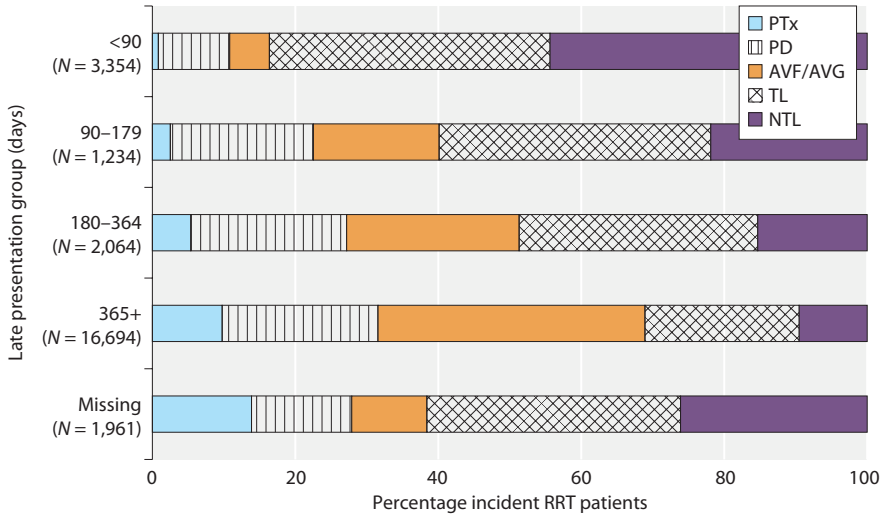

Fig. 12.23. Percentage of incident RRT patients stratified by length of time known to nephrology and access at start, 2011–2015
Number of patients in each group in brackets.
PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

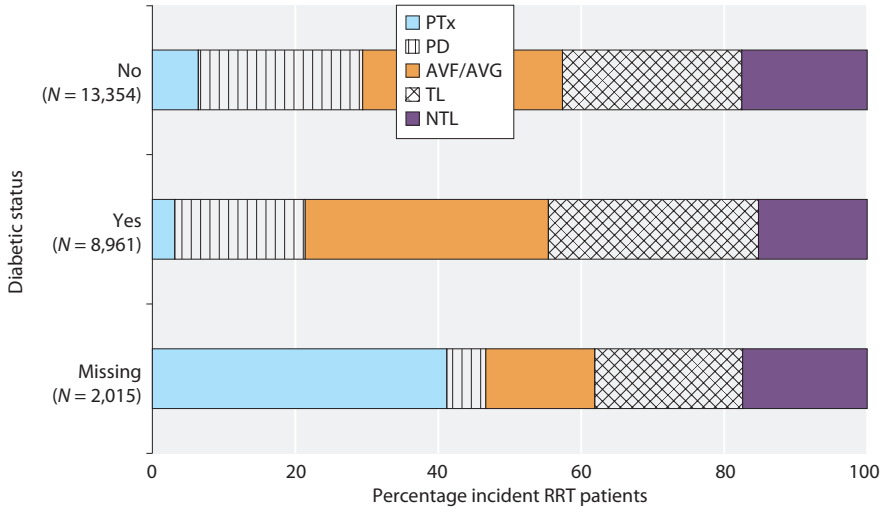

Fig. 12.24. Percentage of incident RRT patients by diabetic status and access at start, 2011–2015
Number of patients in each group in brackets.
PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line

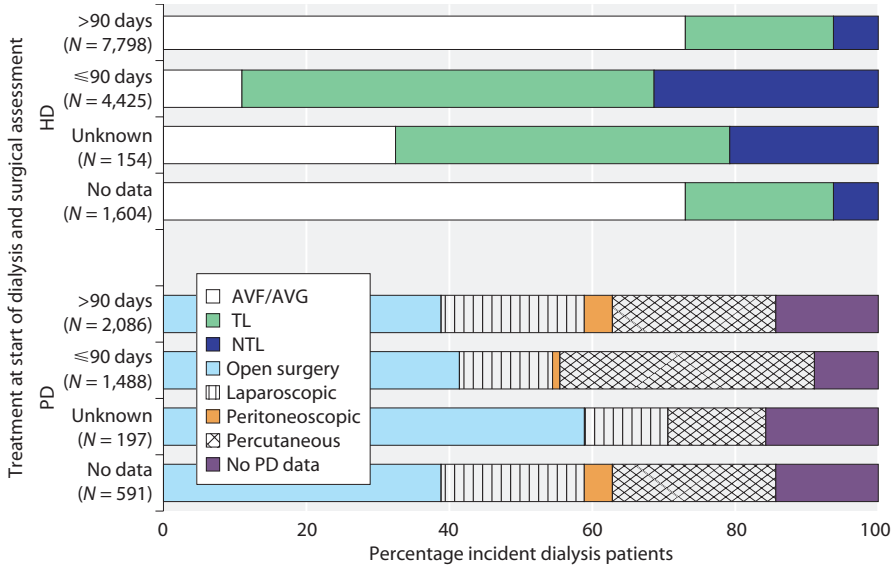

Fig. 12.25. Percentage of incident dialysis patients by assessment by a surgeon within 3 months before starting RRT and access at start of dialysis, 2011–2015
Number of patients in each group in brackets. Late presenting patients were excluded from the analysis.
AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line; PD – peritoneal dialysis

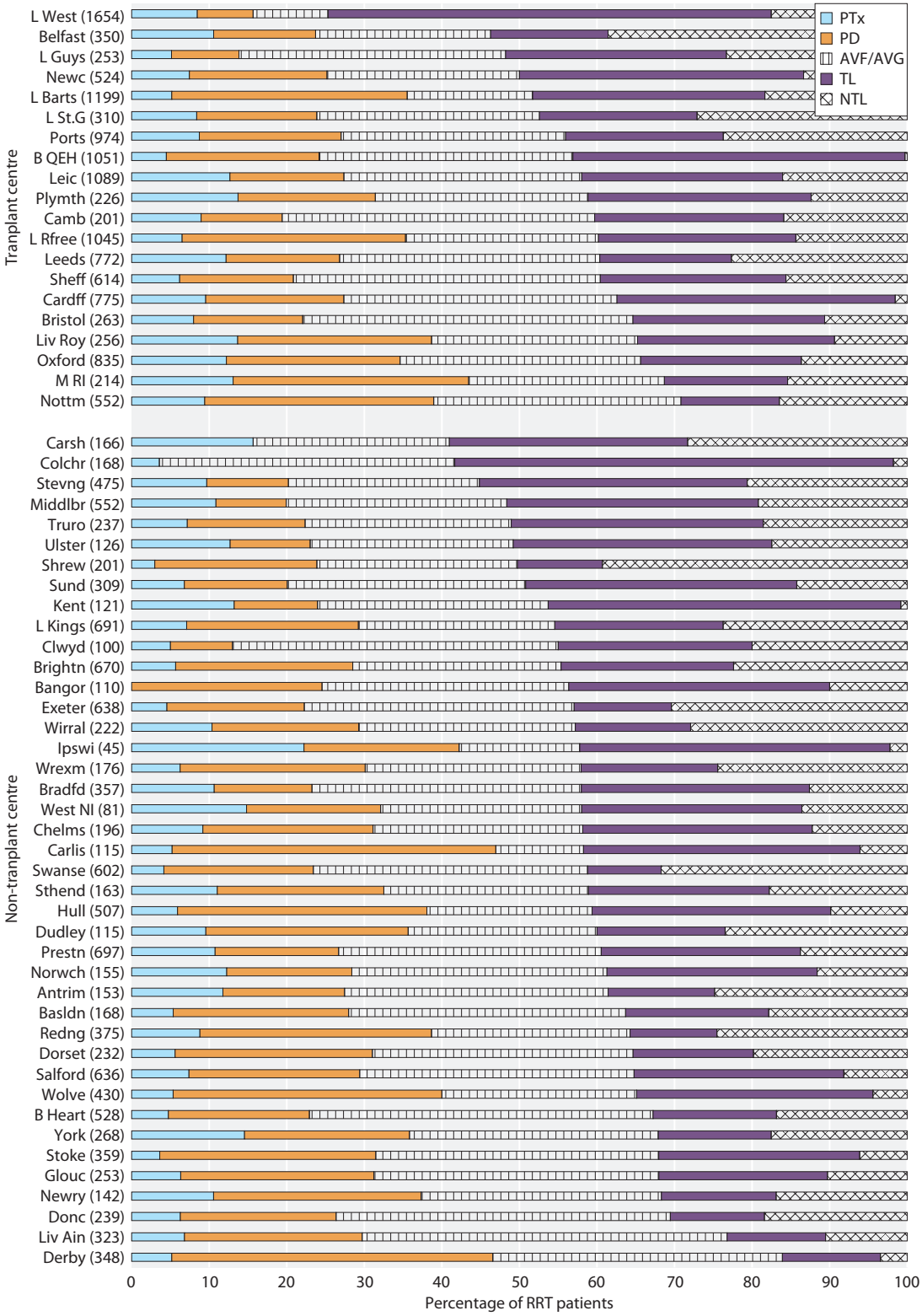

Fig. 12.26. Incident RRT approach for patients in the 2011–2015 Multisite Dialysis Access audits, stratified by renal centre
Centre size (patient numbers) in brackets. Centres are stratified by transplant/non-transplant centre and sorted by proportion of patients initiating HD with a TL/NTL. PTx – pre-emptive transplant; PD – peritoneal dialysis; AVF – arteriovenous fistula; AVG – arteriovenous graft; TL – tunnelled line; NTL – non-tunnelled line; RRT – renal replacement therapy

Discussion

In this fifth annual multisite dialysis access audit, information is presented on the nature, timeliness and durability of initial dialysis access for 23,639 incident RRT patients. This accounts for 71.6% of patients starting dialysis in England, Wales and Northern Ireland over this period. These data describe national and centre-level performance and identify patient and system factors that are associated with practice patterns. The centres contributing data to the audit have changed, so it is not appropriate to make direct year-to-year comparisons. However, definitive access amongst both incident and prevalent patients was below Renal Association audit standards for nearly every year of the data collection. There were a small number of centres achieving high rates of definitive dialysis access for incident and prevalent dialysis recipients, demonstrating that the audit standards are attainable. In addition, the Dialysis Outcomes and Practice Patterns Study (DOPPS) suggests that the UK is improving in overall performance [3]. A better understanding of the practice patterns at high performing centres has the potential to provide information to inform wider quality improvement.

This audit confirms that timely presentation to a nephrologist and referral to a dialysis access surgeon are associated with higher rates of definitive dialysis access use. Most patients who only meet a nephrologist for the first time within three months of starting dialysis commenced HD via a NTL/TL. However, a substantial proportion of patients known to a nephrologist for more than three months also commenced HD via this form of access, and indeed conversion from a NTL/TL to definitive access by three months was infrequent in most centres. The need to begin access planning early is confirmed by the observation that 86.3% of individuals who had access attempted more than a year before initiating HD, started with an AVF/AVG. A small number of centres were however, able to secure definitive access within three months, achieved in part by promoting the use of PD. Most commonly, responsive PD access pathways were achieved through the use of the percutaneous rather than surgical catheter insertion pathways. This is logical, since this approach is generally performed under local anaesthetic, avoiding the requirement for both scheduling a pre-operative assessment and operating theatre time. No evidence was found in this audit to suggest percutaneous placement of PD catheters was inferior to surgical placement, since catheter function at one year was similar for all insertion techniques. A number of centres were able to achieve rapid surgical pathways for vascular access. Again, efforts to better understand practice patterns that enhance the responsiveness of vascular and PD access services are needed. Results from the UK Peritoneal Dialysis Outcomes and Practice Patterns Study (PDOPPS) Catheter Study [4] and a national survey of HD access in the UK by the British Renal Society Vascular Access Special Interest Group will inform practice.

It has been argued that lower rates of definitive dialysis access in some centres may be a result of higher rates of PTx, because these patients may otherwise have started dialysis with definitive access. For this reason, PTx data are included alongside the dialysis access data in some places and allocated patients to centres according to the catchment area of the dialysis centre, rather than the transplant centre that they first appeared in. These data were therefore provided to explore the impact of preemptive and early transplant on dialysis access rates and were not intended as a study of variation in rates of transplantation. Importantly, there was no strong evidence to demonstrate that definitive dialysis access use was influenced by transplant/non-transplant centre status, or by the proportion of patients receiving PTx at centre level. Previous versions of this chapter have noted counterintuitive associations between increasing age and BMI with AVF/AVG use. The increased proportional use of AVF/AVG with increasing age and BMI reflect the lower use of PD and transplantation amongst older people and the obese. It is presumably for the same reason that the proportional use of TL/NTL amongst incident RRT recipients increased with age and BMI. Inclusion of PTx data has also highlighted the prominent differences in practice patterns between primary renal diagnoses. For example, rates of PTx and definitive access were particularly high for people with polycystic kidney disease. People with this primary diagnosis were likely to be known to nephrologists for several years prior to starting RRT and to have enhanced health literacy due to the familial nature of the condition – both factors that increase the opportunity for preparation for RRT. Understanding the factors that contribute to success in this group may allow effective components of the access pathway to be disseminated. Further unexplained patterns remain that require exploration, such as lower rates of AVF/AVG use amongst individuals whose ethnicity was listed as Black and the low use of definitive access in patients with BMI <20.

The UKRR has an important role in monitoring the quality of planned and unplanned RRT provision and

informing guidance and practice improvement. Centre-level data are provided as a surrogate of geographical variation in RRT provision. Wide variation in practice reflects the absence of a cohesive approach, despite national guidance. The insights gained from the inclusion of all information about all three RRT modalities in this chapter reflect the importance of a comprehensive approach in the exploration of trends in RRT access provision. Once again, this year's multisite dialysis access audit identifies the need for research and quality improvement initiatives to enhance dialysis access practice. The following approaches may help to generate the knowledge required to drive this process:

- Detailed practice pattern assessment of high and low-performing centres and those that have demonstrated marked improvement in their delivery of definitive access.
- Assessment of responsive pathways to PD access formation, with particular focus on the role of surgical and non-surgical insertion technique and treatment pathways that facilitate initiation of PD within 90 days.
- Use of UKRR data to analyse the associations between dialysis access at initiation and outcomes beyond one year, including dialysis catheter-related complications.
- Improvement in the completeness of data provision for the annual multisite dialysis access audit.

Acknowledgements

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Conflicts of interest: the authors declare no conflicts of interest

References

1 Fluck R, Pitcher D and Steenkamp R. Vascular Access Audit Report 2012 UK Renal Registry and NHS Kidney Care, 2012. Available from: https://www.renalreg.org/documents/vascular-access-audit-report/.
2 Judge, A., et al., Inequalities in rates of renal replacement therapy in England: does it matter who you are or where you live? Nephrol Dial Transplant, 2012. 27(4): p. 1598–1607.
3 The Dialysis Outcomes and Practice Patterns Study. Available from: http://www.dopps.org/OurStudies/HemodialysisDOPPS.aspx.
4 Briggs, V., et al., UK Catheter Study – Protocol Synopsis. Peritoneal Dialysis International. Accepted for publication.

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UK Renal Registry 19th Annual Report: Chapter 13 Home Therapies in 2015: National and Centre-specific Analyses

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Keywords

Comorbidity · Deprivation · Dialysis · End stage renal disease · Established renal failure · Ethnicity · Haemodialysis · Home haemodialysis · Home therapies · Incidence · Peritoneal dialysis · Prevalence · Renal replacement therapy · Technique failure · Transplantation · Treatment modality

Summary

- The use of peritoneal dialysis (PD) has continued to fall, down to 5.9% of all renal replacement therapy (RRT) patients in 2015 compared to 7.2% in 2011, whilst home haemodialysis (HHD) is slightly more common at 2.0% in 2015 compared to 1.7% in 2011.
- There was significant variability between centres in the use of home dialysis: the probability of starting PD within the first year ranged from 6.3% to 49.7%, whilst the probability of starting HHD in the first year ranged from 0.02% to 6.6%.
- The median age differed substantially between modalities, with prevalent HHD patients the youngest (55 years), PD intermediate (64 years) and in-centre haemodialysis (ICHD) the oldest (68 years).
- Home dialysis was used less by ethnic minorities, with non-Whites making up 28% of prevalent ICHD, 22% of PD and 13% of HHD.
- The proportion of prevalent patients on each dialysis modality differed by level of social deprivation, with 16.3% and 9.8% of the least and most deprived quintiles of deprivation using PD, respectively. The difference for HHD is less marked (5.6% and 4.6% for the same quintiles).
- Prevalent HHD patients had the lowest comorbidity burden (66% with no comorbidity), PD patients had an intermediate burden (61% with no comorbidity) and ICHD had the highest burden (52% with no comorbidity).
- HHD patients were more likely to have had a previous transplant (40.3% vs 7.2%). More than a third of HHD patients (36.8%) had previously received PD, whilst only a quarter of PD patients (24.3%) had previously received any form of haemodialysis (HD).
- Current absolute levels of both PD and HHD were negatively associated with transplantation levels, but only changes in PD were negatively associated with changes in transplantation levels.
- There was significant variability between centres in PD outcomes, with the probability of switching to HD within one year of starting PD ranging from 0.0% to 31.6%.

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Introduction

Previous UK Renal Registry (UKRR) annual reports have described country and centre-specific rates for home therapies (HTs), home haemodialysis (HHD) and peritoneal dialysis (PD), within the incidence and prevalence chapters. Although the use of HTs has changed significantly over time, until now they have not been the focus of a chapter. Furthermore, there has not been an assessment of whether the differences in prevalence of HT use are significant, and aside from mortality as an outcome, there has not been an assessment of differences in outcome by centre.

This chapter describes the home dialysis patient population compared with the in-centre haemodialysis (ICHD) population. It describes the variability in use of HTs and outcomes between countries and centres and begins to explore the factors that may drive some of this variability.

Methods

Prevalence of home therapies

Prevalent patients are defined as all patients over 18 years old, alive and receiving renal replacement therapy (RRT) on 31st December 2015 at a UK adult renal centre. Data from Scottish centres were obtained from the Scottish Renal Registry. Data from Welsh, Northern Irish and English centres were collected by the UKRR. Cambridge renal centre (Addenbrooke's) was unable to submit the 2015 data at patient level by the closing date of the 2015 database and was therefore excluded from all analyses on prevalent 2015 RRT patients.

Home therapies refer to PD, including continuous ambulatory PD (CAPD) and automated PD (APD), and HHD. Analyses are presented for all HT patients, or separately for PD and HHD patients, compared to ICHD patients. When looking at prevalence of HTs and changes over time, prevalence of transplantation is also presented for comparison, because changes in one modality may affect the use of another. Prevalent cohorts from 2011–2015 were analysed to compare changes in use of different treatments over time or correlation between initial prevalence of HT and its change with time (Pearson correlation coefficients are given).

The default method for allocating patients to centres was based on the centre sending quarterly data. Recognising the role of secondary care renal services in ensuring access to HHD and transplantation where these are not available locally, HHD and transplanted patients, and PD patients living in the area covered by Colchester (which does not offer a PD programme) were allocated to centres according to postcode of residence (see appendix E: Methodology for Estimating Catchment Populations of Renal Centres in the UK for Dialysis Patients). Where this was done, it has been specified in the relevant result.

Characteristics of patients on home therapies

Age, gender, primary renal disease (PRD), ethnic origin and level of social deprivation were examined for prevalent dialysis patients, by treatment modality (see appendix H: Coding www.renalreg.org). For the purpose of this analysis, patients were grouped into White, South Asian, Black, Other and Unknown. Social deprivation is expressed as quintiles of the index of multiple deprivation (IMD) for England (https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015), Northern Ireland (https://www.nisra.gov.uk/publications/nothern-ireland-multiple-deprivation-measure-2010-soa-results), Scotland (http://www.gov.scot/Topics/Statistics/SIMD) and Wales (http://gov.wales/statistics-and-research/welsh-index-multiple-deprivation/?lang=en). For both HHD and PD prevalent patients, time on a HT was defined as the time a patient had been consecutively on a HT up to 31st December 2015, ignoring changes to another dialysis modality lasting fewer than 30 days.

Differences in demographic characteristics between treatment groups in the UK dialysis population were tested using the Chi-squared and Kruskal-Wallis tests for categorical and continuous variables, respectively. Likelihood ratio tests were used to test for the presence of interactions between demographic factors such as age and gender in multivariable logistic regression models where the outcome was the use of HTs. For centre-level analyses, logistic regression models were used to estimate if the proportion of ethnic minority dialysis patients on HTs differed from the expected proportion (based on each centre's dialysis population). The percentages of PD (or HHD) patients from ethnic minorities versus the percentage of ICHD from ethnic minorities, at centre level, are presented in the form of scatterplots. Where there was evidence of significant differences, centres with a minimum of five ethnic minority patients on HHD or PD were highlighted in figures as outliers. These analyses were conducted using SAS 9.3.

Competing risk analyses

Cumulative incidence competing risk (CICR) methodology was used to analyse time to HT uptake and time to PD treatment failure rather than using Kaplan-Meier survival analysis. This approach was adopted because an important assumption of Kaplan–Meier analysis is that subjects experiencing censored observations should have, at any time, the same survival probability as those who continue to be followed until the event of interest or the end of study [1]. This means that, for example, censoring at death when looking at PD uptake would translate into assuming that patients who died had a similar chance to start PD as those still at risk (alive and on HD), which is usually not the case and therefore results from a Kaplan-Meier analysis would be biased. Therefore, the CICR methodology has been adopted and considered both transplantation and death as competing events in the survival analyses described below and from these analyses derived unbiased estimates of the cumulative incidence for the event of interest and competing events.

HT uptake To estimate the uptake of HTs in the UK, a cohort of incident patients starting RRT between 2011 and 2014 was identified. Adult patients were followed from their first day of RRT until 31st December 2015, with the event of interest being start of PD or start of HHD. The competing risks in these analyses were transplantation and death on ICHD. Patients were censored when they recovered renal function, stopped treatment without

recovery, were lost to follow-up or ended follow-up without having had the event. Separate analyses were conducted with censoring at transplantation to allow comparisons with international data from the ANZDATA report [2]. As the UKRR did not receive patient level data from Cambridge, patients starting RRT in this centre were followed-up until 31st December 2014 and those starting RRT during 2014 were excluded from analyses to allow a minimum potential follow-up of one year. Results from these analyses are presented as unadjusted cumulative incidence curves for the uptake of HHD and PD up to two years from RRT start and are shown by country, whilst the unadjusted one-year cumulative incidence of PD and HHD uptake, with confidence intervals (CIs), are shown by centre.

PD technique failure The 2007–2014 incident PD cohort was analysed to investigate PD technique failure. The cohort included only patients starting RRT on PD at day zero and remaining on PD for a minimum of 90 days. PD technique survival from day 90 until 31st December 2015 onwards was then analysed using CICR methodology. Cambridge patients were followed-up only to 31st December 2014 and those starting PD in 2014 were excluded from analyses. The event of interest was PD technique failure, defined as a change to haemodialysis (HD) lasting more than 30 days. Transplantation and death on PD were considered as competing risks and censoring was applied at recovery of function, end of treatment without recovery, loss to follow-up or end of follow-up. Results were presented as unadjusted cumulative incidence curves for PD technique failure up to five years from 90 days after PD start. The cumulative incidence curves of the two competing events (transplantation and death on PD) are shown by country, whilst the unadjusted one-year cumulative incidence of PD technique failure, with CIs, are shown by centre.

All competing risks analyses were performed using Stata 12.

Results

Prevalence of home therapies in the UK

UK- and country-level home therapy use and changes over time

At the end of 2015, there were 59,567 adults receiving RRT in the UK. Of these, 27,912 (46.9%) were on some form of dialysis. The prevalence rates for RRT overall and the individual dialysis modalities in 2015 are shown in table 13.1.

Expressed as a percentage of the prevalent UK dialysis population, 16.9% of patients were on a HT, with 4.2% on HHD and 12.7% on PD (5.4% on CAPD and 7.3% on APD).

HHD was used less frequently than PD and this pattern was consistent across the individual countries. Patients using HHD constituted 6.7% of all dialysis patients in Wales (30.2% of all HT), compared with 4.2%, 2.6% and 2.9% of all dialysis in England, Scotland and Northern Ireland, respectively (25.0%, 20.1% and 19.2% of all HT, respectively).

The coding for sub-types of PD modality has not been extensively validated, so some caution is warranted in interpreting these data. This is likely to be a particular issue for assisted PD. That accepted, APD appeared to be more commonly used than CAPD, and the difference was particularly marked in Northern Ireland.

In an analysis stratified according to country and age group (figure 13.1), HT use followed a similar pattern

Table 13.1. Prevalence of dialysis in the UK, by country[a], on 31st December 2015

	England[c]	N Ireland	Scotland	Wales	UK[c]
Number of prevalent patients on RRT	49,972	1,679	4,828	3,088	59,567
Number of prevalent patients on dialysis	23,695	696	2,138	1,383	27,912
Total estimated population, mid-2015 (millions)[b]	54.8	1.9	5.4	3.1	65.1
Prevalence rate dialysis (pmp) (HT + in-centre)	432	376	398	446	429
Prevalence rate HHD (pmp)	18	11	10	30	18
Prevalence rate PD (pmp)	55	45	41	69	54
Prevalence rate CAPD (pmp)	24	3	14	34	23
Prevalence rate APD (pmp)	31	43	27	36	31
Prevalence rate HT (pmp)	74	56	51	99	72
95% CI of the prevalence rate HT (pmp)	71–76	45–67	45–57	88–110	70–75

RRT – renal replacement therapy; pmp – per million population; HT – home therapy; HHD – home haemodialysis; PD – peritoneal dialysis; CAPD – continuous ambulatory PD; APD – automated PD; CI – confidence interval

[a]Based on postcode of residency

[b]Data from the Office of National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census

[c]Prevalent numbers do not include Cambridge patients

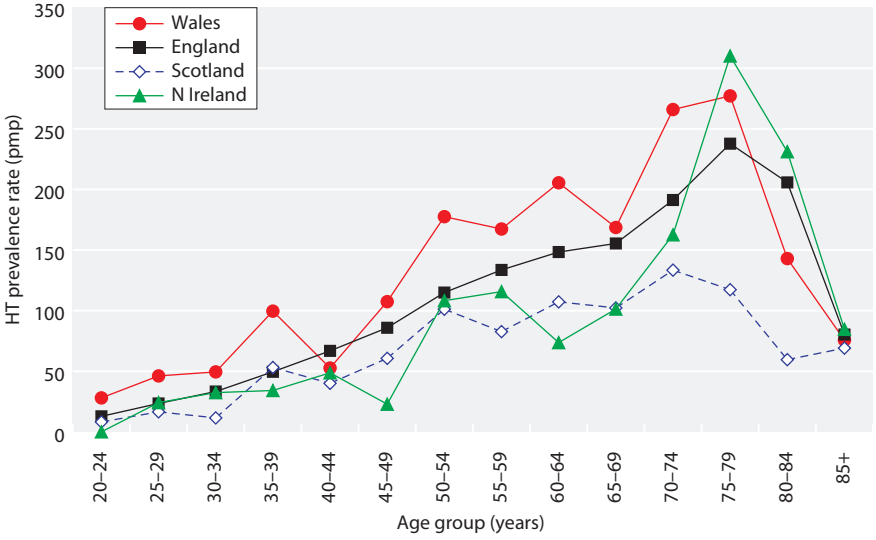

Fig. 13.1. Prevalence rate of HTs, per million population by age group and country*, on 31st December 2015
*Based on postcode of residency

to that seen for the dialysis population as a whole, with prevalence increasing with age (data not shown).

The overall use of HTs in the total UK RRT population fell by 1.0% between 2011–2015 (appendix 1, table 13.7). This fall was driven by the change in PD use (−1.2%) over this time, with HHD growing by 0.3%. Roughly the same pattern was evident throughout the countries, although Scotland and Northern Ireland both experienced a small fall in HHD use (−0.2% and −0.8% respectively). As changes in one modality may affect the use of another (e.g. transplantation rates may affect PD use), data on all the modalities are presented. Transplantation grew significantly over this time period, but the UK change of 3.6% masks differences between the countries: numbers of transplants in Wales grew by 2.9%, in England by 3.3%, in Scotland by 4.9% and in Northern Ireland by 11.5%.

Centre-level home therapy use and changes over time

The breakdown of modality use in prevalent dialysis patients between centres is shown in table 13.2. Data from this table are also displayed, ordered by increasing

Table 13.2. Proportion of prevalent RRT patients using HTs, ICHD and transplantation, by country and centre*, on 31st December 2015

Centre	RRT patients *N*	% of prevalent RRT patients				Ratio HT/dialysis
		HT	ICHD	Tx	HT + Tx	
England						
B Heart	822	7.8	49.5	42.7	50.5	0.14
B QEH	1,917	9.6	49.9	40.5	50.1	0.16
Basldn	358	10.3	45.3	44.4	54.7	0.19
Bradfd	628	4.3	36.0	59.7	64.0	0.11
Brightn	1,077	10.7	36.1	53.2	63.9	0.23
Bristol	1,341	5.5	37.5	57.0	62.5	0.13
Carlis	280	13.6	28.9	57.5	71.1	0.32
Carsh	1,788	8.2	44.0	47.9	56.0	0.16
Chelms	348	7.8	41.4	50.9	58.6	0.16
Colchr	226	4.4	53.1	42.5	46.9	0.08
Covnt	899	11.2	37.6	51.2	62.4	0.23
Derby	627	17.9	33.2	49.0	66.8	0.35
Donc	396	9.6	43.2	47.2	56.8	0.18
Dorset	738	7.3	38.1	54.6	61.9	0.16
Dudley	379	19.8	42.0	38.3	58.0	0.32
Exeter	1,049	8.2	41.0	50.8	59.0	0.17

Table 13.2. Continued

Centre	RRT patients *N*	% of prevalent RRT patients				Ratio HT/dialysis
		HT	ICHD	Tx	HT + Tx	
Glouc	524	8.6	42.6	48.9	57.4	0.17
Hull	931	9.3	37.6	53.1	62.4	0.20
Ipswi	345	8.7	41.4	49.9	58.6	0.17
Kent	1,135	7.0	35.9	57.1	64.1	0.16
L Barts	2,190	10.4	44.9	44.7	55.1	0.19
L Guys	1,318	4.2	47.6	48.2	52.4	0.08
L Kings	1,321	8.3	41.9	49.7	58.1	0.17
L Rfree	1,837	9.6	37.7	52.7	62.3	0.20
L St.G	808	6.9	41.3	51.7	58.7	0.14
L West	3,114	2.9	45.8	51.3	54.2	0.06
Leeds	1,453	5.4	33.7	61.0	66.3	0.14
Leic	2,251	7.4	37.7	54.9	62.3	0.16
Liv Ain	390	13.8	42.3	43.8	57.7	0.25
Liv Roy	956	10.1	36.3	53.6	63.7	0.22
M RI	1,337	8.2	35.6	56.2	64.4	0.19
Middlbr	911	4.2	37.1	58.7	62.9	0.10
Newc	952	7.1	30.6	62.3	69.4	0.19
Norwch	740	8.4	42.3	49.3	57.7	0.17
Nottm	1,012	11.4	35.5	53.2	64.5	0.24
Oxford	1,485	7.3	28.3	64.4	71.7	0.21
Plymth	474	8.9	27.4	63.7	72.6	0.24
Ports	1,691	7.4	36.1	56.5	63.9	0.17
Prestn	1,354	6.9	39.4	53.7	60.6	0.15
Redng	937	8.1	31.7	60.2	68.3	0.20
Salford	1,278	8.2	30.0	61.8	70.0	0.22
Sheff	1,235	7.9	40.3	51.7	59.7	0.16
Shrew	442	13.6	40.7	45.7	59.3	0.25
Stevng	1,026	3.8	47.4	48.8	52.6	0.07
Sthend	303	6.6	40.9	52.5	59.1	0.14
Stoke	831	12.4	36.2	51.4	63.8	0.25
Sund	507	4.1	43.2	52.7	56.8	0.09
Truro	411	7.8	36.7	55.5	63.3	0.17
Wirral	436	7.3	40.1	52.5	59.9	0.15
Wolve	691	15.5	42.7	41.8	57.3	0.27
York	475	8.2	31.4	60.4	68.6	0.21
Northern Ireland						
Antrim	276	8.7	43.1	48.2	56.9	0.17
Belfast	589	5.1	29.5	65.4	70.5	0.15
Newry	245	10.2	32.7	57.1	67.3	0.24
Ulster	247	3.6	42.5	53.8	57.5	0.08
West NI	324	4.9	35.5	59.6	64.5	0.12
Scotland						
Abrdn	525	5.9	40.6	53.5	59.4	0.13
Airdrie	511	3.7	38.2	58.1	61.8	0.09
D & Gall	137	10.2	37.2	52.6	62.8	0.22
Dundee	426	4.5	43.4	52.1	56.6	0.09
Edinb	740	4.6	37.6	57.8	62.4	0.11
Glasgw	1,580	4.9	36.6	58.5	63.4	0.12
Inverns	254	6.7	35.4	57.9	64.6	0.16
Klmarnk	355	13.0	35.5	51.5	64.5	0.27
Krkcldy	306	6.5	49.0	44.4	51.0	0.12

Table 13.2. Continued

Centre	RRT patients *N*	% of prevalent RRT patients				Ratio HT/dialysis
		HT	ICHD	Tx	HT + Tx	
Wales						
Bangor	189	17.5	36.5	46.0	63.5	0.32
Cardff	1,481	7.2	31.7	61.2	68.3	0.18
Clwyd	185	13.0	41.6	45.4	58.4	0.24
Swanse	888	11.0	37.0	51.9	63.0	0.23
Wrexm	289	14.2	37.0	48.8	63.0	0.28
England	**49,974**	**8.1**	**39.4**	**52.5**	**60.6**	**0.17**
N Ireland	**1,681**	**6.2**	**35.3**	**58.5**	**64.7**	**0.15**
Scotland	**4,834**	**5.7**	**38.6**	**55.6**	**61.4**	**0.13**
Wales	**3,032**	**10.0**	**34.7**	**55.4**	**65.3**	**0.22**
UK	**59,521**	**7.9**	**39.0**	**53.1**	**61.0**	**0.17**

RRT – renal replacement therapy; HT – home therapy; ICHD – in-centre haemodialysis; Tx – transplant
*Based on postcode of residency

rate of combined transplant/HT use (figure 13.2). Across the whole of the UK, 7.9% of the RRT population were using a HT, but rates between centres varied widely from 2.9% to 19.8%. Rates for combined transplant/HT use also varied widely between centres, from 46.9% to 72.7%. Due to this variability, incidence rates for HTs between centres, and their relationship with transplant rates, are explored later in this chapter.

As numerous centres have specifically sought to increase HHD and/or PD, the change in use of these modalities over the last five years is displayed in appendix 1, table 13.7. There is an association between the level of PD use and the change in that level over time, with higher baseline (2011) levels of PD use being more likely to be associated with a fall in PD use over time – there is a correlation of −0.53 between the proportion of RRT patients on PD in 2011 and the change in the proportion of RRT patients on PD from 2011–2015. Despite the overall fall, some centres have managed to increase PD use (e.g. Clwyd, Wrexham, Liverpool Aintree and Carlisle). However, these centres started with low to medium levels of PD use in 2011.

The changes in HHD use range from a fall of 2.1% to an increase of 3.3% from 2011–2015. There is no

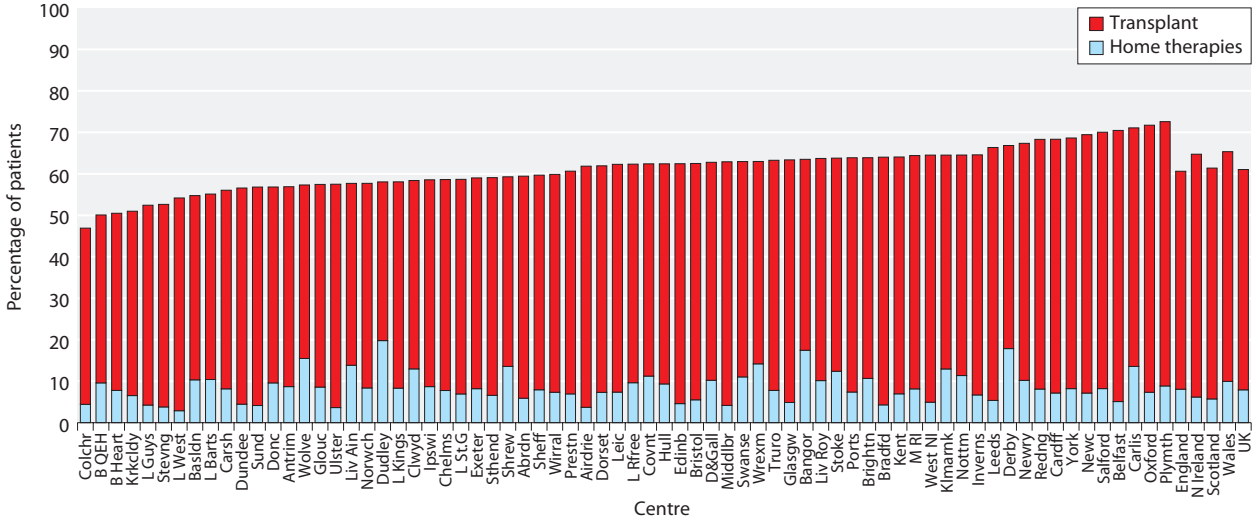

Fig. 13.2. Centre specific proportion of prevalent RRT patients* using a HT or transplantation on 31st December 2015
*Based on postcode of residency

apparent association between the 2011 HHD use and the subsequent change, but the overall HHD use rate was much lower than for PD.

It has also been suggested that levels of transplantation may affect rates of HTs and this is borne out in simple correlations. Levels of PD use in 2011 correlate negatively with levels of transplantation in 2011 ($r = -0.35$) and five-year changes in PD use correlate negatively with five-year changes in transplantation ($r = -0.44$). Levels of HHD use in 2011 also correlate negatively with levels of transplantation in 2011 ($r = -0.42$), but there was no significant association between changes in HHD and transplantation during the five-year follow up ($r = -0.02$). It is not clear to what extent these correlations with transplantation reflect a lower probability of starting home dialysis, or a higher probability of stopping home dialysis due to transplantation.

There was some evidence that quality improvement initiatives can affect HT use. Between 2010 and 2012, the West Midlands introduced a commissioning target to increase HT uptake, with evidence that this led to an increase in HT rates [3]. This can also be seen in the UKRR data. The average rates of HHD and PD in the Midlands grew from 1.6% and 10.2% in 2010, respectively, to 3.3% and 11.4% in 2012, respectively. However, this growth appears not to have continued, with the average HHD and PD rates stable or slightly reduced in 2015 at 3.4% and 9.4%, respectively.

Home therapies patient demographics: UK, country and centre-level

Age

The median age of prevalent UK HT patients was 61 years (table 13.3), considerably younger than the ICHD median age of 68 years. As has been noted previously, the HHD population was younger than the PD population, with a median age of 55 and 64 years respectively. Practice patterns such as the use of assisted PD may influence the age of patients using different modalities between centres, so the median age for patients using

Table 13.3. Median age and gender of prevalent dialysis patients, by country and centre, on 31st December 2015

Centre	HT patients *N*	Median age (years)				% male	
		HHD	PD	HT	ICHD	HT	ICHD
England							
B Heart	64	53	67	64	68	62.5	60.4
B QEH	192	49	60	58	66	61.5	57.7
Basldn	36		58	57	68	58.3	64.2
Bradfd	25	49	53	52	63	40.0	58.0
Brightn	112	58	66	64	69	67.9	66.6
Bristol	79	58	68	63	70	58.2	64.4
Carlis	38	n/a	70	70	70	63.2	69.1
Carsh	142	57	66	63	69	54.9	63.8
Chelms	27	n/a	70	70	69	63.0	71.5
Colchr	0				73	n/a	68.3
Covnt	102	57	65	63	68	65.7	59.2
Derby	116	63	63	63	68	61.2	59.1
Donc	33	64	69	66	69	72.7	58.5
Dorset	50	64	73	70	72	62.0	63.1
Dudley	70	56	61	59	68	51.4	67.9
Exeter	86	42	68	67	72	61.6	65.1
Glouc	42	69	67	68	72	52.4	65.5
Hull	84	58	65	62	69	60.7	68.6
Ipswi	38	n/a	69	69	70	65.8	70.6
Kent	76	54	64	63	70	63.2	64.0
L Barts	230	50	61	60	62	65.7	59.5
L Guys	82	52	62	54	62	46.3	60.3
L Kings	102	54	59	57	64	61.8	62.1
L Rfree	175	58	64	63	69	52.0	62.0
L St.G	53	53	71	70	66	60.4	55.5
L West	89	58	65	62	66	53.9	60.6
Leeds	81	49	53	52	65	56.8	59.9
Leic	168	59	66	61	68	63.1	61.8

Table 13.3. Continued

Centre	HT patients *N*	Median age (years)				% male	
		HHD	PD	HT	ICHD	HT	ICHD
Liv Ain	48	54	60	58	70	64.6	63.0
Liv Roy	104	53	61	59	62	56.7	60.8
M RI	115	51	66	57	67	60.0	57.6
Middlbr	37	50	54	51	68	56.8	62.1
Newc	70	49	69	59	65	67.1	61.9
Norwch	63	67	64	65	71	63.5	55.6
Nottm	111	51	65	61	72	55.9	56.8
Oxford	113	57	66	62	68	64.6	60.2
Plymth	42	58	64	63	71	71.4	63.1
Ports	128	52	65	59	69	66.4	64.2
Prestn	93	59	68	63	67	69.9	59.3
Redng	71	45	68	66	70	64.8	62.3
Salford	100	58	62	61	64	62.0	62.4
Sheff	102	56	65	61	68	63.7	60.1
Shrew	55	58	58	58	70	67.3	60.6
Stevng	39	57	68	59	69	69.2	62.1
Sthend	19		70	69	69	63.2	63.7
Stoke	108	55	69	65	69	63.0	57.5
Sund	20		65	63	66	50.0	60.3
Truro	32	54	64	64	70	50.0	64.2
Wirral	31	51	66	59	69	58.1	56.0
Wolve	102	52	63	63	66	63.7	69.8
York	40	50	65	60	68	75.0	61.1
Northern Ireland							
Antrim	22		61	61	74	63.6	70.0
Belfast	33	54	67	61	70	48.5	60.9
Newry	25	55	75	74	66	72.0	52.9
Ulster	8		69	66	74	62.5	54.3
West NI	16	56	62	58	72	56.3	58.0
Scotland							
Abrdn	31	47	53	53	66	48.4	61.5
Airdrie	16	n/a	60	60	65	37.5	54.4
D & Gall	14	49	69	52	68	64.3	62.8
Dundee	19		64	64	68	57.9	57.8
Edinb	33	51	63	59	60	48.5	62.2
Glasgw	81	57	62	60	66	60.5	57.5
Inverns	16	51	59	55	67	68.8	54.4
Klmarnk	47	67	61	62	64	68.1	61.9
Krkcldy	20	n/a	63	63	69	40.0	52.0
Wales							
Bangor	30	55	69	65	69	73.3	65.2
Cardff	107	58	66	63	69	64.5	63.8
Clwyd	27	55	65	65	68	66.7	59.7
Swanse	98	57	62	61	73	59.2	65.1
Wrexm	42	45	58	53	73	61.9	60.8
England	**4,035**	**55**	**64**	**61**	**68**	**61.2**	**61.5**
N Ireland	**104**	**55**	**69**	**64**	**72**	**59.6**	**59.9**
Scotland	**277**	**56**	**61**	**60**	**66**	**56.7**	**58.2**
Wales	**304**	**55**	**64**	**62**	**70**	**63.5**	**63.7**
UK	**4,720**	**55**	**64**	**61**	**68**	**61.1**	**61.3**

HT – home therapy; HHD – home haemodialysis; PD – peritoneal dialysis; ICHD – in-centre haemodialysis
n/a – no patients on this treatment; Blank cells – data for only one to two patients

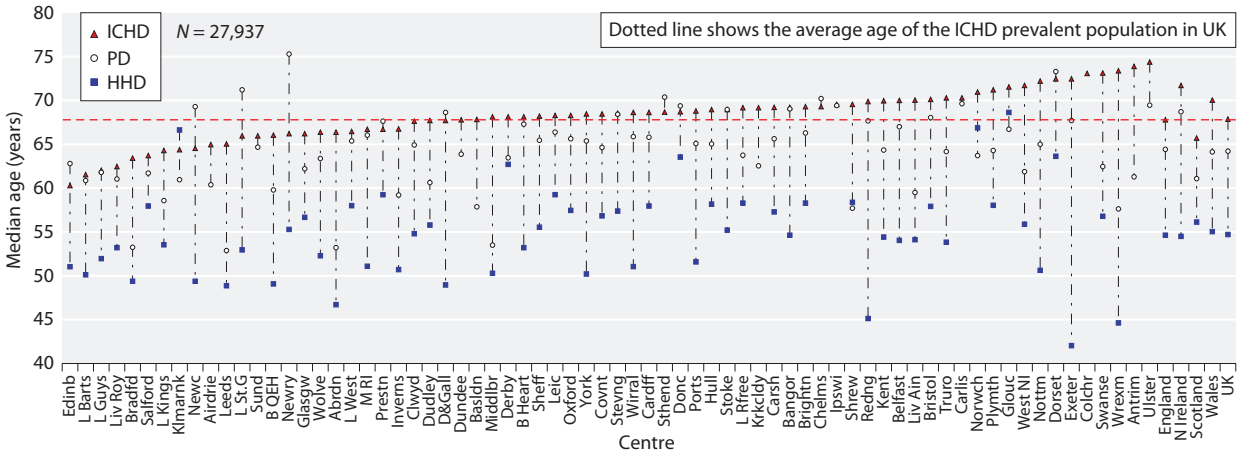

Fig. 13.3. Median age in prevalent dialysis population, by dialysis modality and centre, on 31st December 2015

each modality is shown by centre in figure 13.3. The same general pattern is evident, with HHD having the youngest population and ICHD having the oldest, but there do appear to be exceptions.

Caution is necessary when interpreting differences in ages between centres, particularly where centres have low numbers of patients on HTs. However, there does appear to be some difference in the median age of PD patients, ranging from 52.9 in Leeds to 75.3 years in Newry. Looking only at centres with larger patient numbers on HTs, Wrexham, Shrewsbury, Leeds and Swansea had PD populations that were markedly younger than their ICHD populations (difference >10 years). Conversely, London St. George's and Newcastle were unusual in having PD populations with a median age 5.3 and 4.8 years older than their ICHD populations, respectively.

Differences in the HHD population were less clear due to the smaller patient numbers. Despite this, there do appear to be differences in patient ages between centres, with median ages ranging from 42.0 in Exeter to 68.6 in Gloucester. Looking just at the larger HHD populations, Derby had a median age for HHD of 62.7 years (compared with ICHD 68.1 years), whilst Portsmouth had a median of 51.6 years (compared with ICHD 68.8 years). Together, these differences do raise the possibility that non-patient factors may be having an impact on the age of patients who use HTs.

Gender

Across the UK, the gender of patients on ICHD and HT modalities was similar, with 61.3% and 61.1% of these groups being male respectively (table 13.3). The distribution of HT use according to gender at the individual country level was largely similar, but some large variation was observed by centre with for example, Dudley using HT less than expected in males and Preston using HT more than expected in males (table 13.3).

As shown in figure 13.4, there is a suggestion of an interaction between age and gender in the use of different dialysis modalities. In prevalent dialysis patients, younger

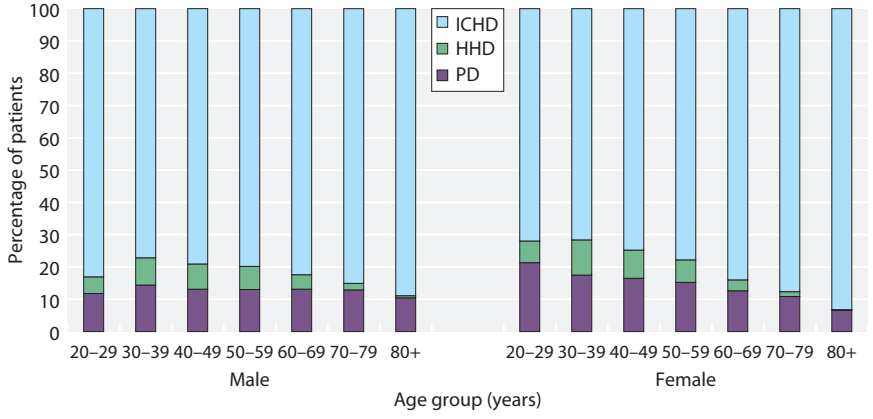

Fig. 13.4. Percentage of prevalent dialysis patients, by age and gender, on 31st December 2015

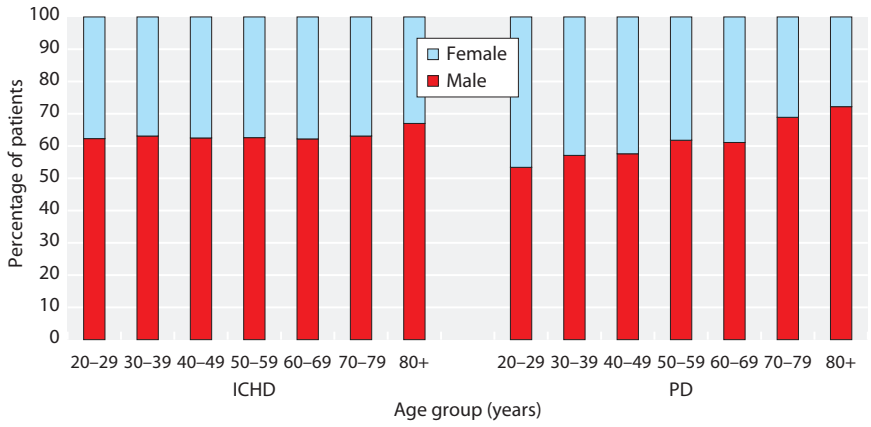

Fig. 13.5. Dialysis modality at start, by age and gender, in the incident ICHD and PD dialysis* cohort, 2011–2015
*Patients starting on HHD are excluded because they comprise <1% of the cohort ($N = 69$)

females appear slightly more likely to use a HT than males, whilst a similar or lower proportion of older females used a HT compared to older males (age-gender interaction p-value <0.001). Most of this difference appears to be through differences in PD use. This difference has been further explored in incident patients, using the percentage of patients starting dialysis on either PD or ICHD who are male/female by age (figure 13.5). The same pattern emerged, with females over-represented in the younger age group on PD compared to ICHD, and under-represented in the older PD patients (age-gender interaction p-value <0.0001).

Ethnicity

A summary of patient ethnicity by centre on 31st December 2015 is presented in table 13.4. There appears to be a systematic difference in the proportion of patients using HTs by ethnicity. For the England, Wales and Northern Ireland ICHD population, 28% of the patients are from a non-White background, compared to only 13% of patients using HHD. PD appears to be intermediate between HHD and ICHD with 22% of patients described as non-White.

This also appears to vary between centres, but at the centre level the proportion of dialysis patients from

Table 13.4. Ethnicity of prevalent dialysis patients, by dialysis modality, country* and centre, on 31st December 2015

Centre	HHD patients *N*	HHD % ethnicity		PD patients *N*	PD % ethnicity		ICHD % ethnicity	
		non-White	White		non-White	White	non-White	White
England								
B Heart	13	31	69	51	22	78	45	55
B QEH	50	28	72	142	32	68	48	52
Basldn				35	14	86	16	84
Bradfd	7	0	100	18	39	61	51	49
Brightn	45	2	98	64	11	89	9	91
Bristol	22	5	95	54	4	96	13	87
Carlis	0	n/a	n/a	38	0	100	0	100
Carsh	29	14	86	110	24	76	36	64
Chelms	0	n/a	n/a	23	13	87	9	91
Covnt	16	13	88	86	29	71	25	75
Derby	38	18	82	78	14	86	19	81
Donc	10	10	90	23	9	91	5	95
Dorset	7	0	100	43	9	91	3	97
Dudley	13	8	92	57	19	81	13	87
Exeter	5	0	100	80	3	98	1	99
Glouc	5	0	100	37	11	89	4	96
Hull	8	0	100	76	3	97	4	96
Ipswi	0	n/a	n/a	35	26	74	13	87
Kent	16	6	94	60	7	93	5	95

Table 13.4. Continued

Centre	HHD patients *N*	HHD % ethnicity non-White	HHD % ethnicity White	PD patients *N*	PD % ethnicity non-White	PD % ethnicity White	ICHD % ethnicity non-White	ICHD % ethnicity White
L Barts	23	48	52	207	71	29	73	27
L Guys	49	29	71	33	30	70	54	46
L Kings	12	33	67	90	50	50	57	43
L Rfree	20	50	50	151	56	44	59	41
L St.G	4	25	75	46	41	59	69	31
L West	18	39	61	71	54	46	69	31
Leeds	23	4	96	58	12	88	24	76
Leic	60	10	90	102	18	82	32	68
Liv Ain	9	22	78	38	0	100	3	97
Liv Roy	37	3	97	63	8	92	10	90
M RI	48	35	65	65	26	74	37	63
Middlbr	15	7	93	22	0	100	9	91
Newc	24	4	96	46	7	93	11	89
Norwch	25	0	100	38	3	97	3	97
Nottm	29	14	86	82	10	90	19	81
Oxford	18	6	94	92	16	84	23	77
Plymth	7	0	100	35	6	94	3	97
Ports	53	6	94	65	5	95	9	91
Prestn	40	3	98	53	8	92	19	81
Redng	5	0	100	64	30	70	26	74
Salford	15	7	93	85	22	78	25	75
Sheff	43	9	91	59	7	93	14	86
Shrew	23	4	96	32	13	88	7	93
Stevng	23	26	74	16	13	88	26	74
Sthend				17	18	82	13	87
Stoke	33	3	97	73	3	97	9	91
Sund				18	6	94	5	95
Truro	10	0	100	22	5	95	1	99
Wirral	12	8	92	19	0	100	5	95
Wolve	23	13	87	78	36	64	35	65
York	11	0	100	28	4	96	5	95
Northern Ireland								
Antrim				20	10	90	0	100
Belfast	9	0	100	18	0	100	4	96
Newry	3	0	100	22	0	100	0	100
Ulster				6	17	83	5	95
West NI	4	0	100	12	0	100	0	100
Wales		1	99	211	8	92	5	95
Bangor	15	0	100	15	0	100	3	97
Cardff	28	0	100	77	12	88	9	91
Clwyd	7	0	100	20	5	95	4	96
Swanse	36	3	97	62	5	95	3	97
Wrexm	5	0	100	37	8	92	0	100
England	**1,001**	**14**	**86**	**2,978**	**23**	**77**	**30**	**70**
N Ireland	**20**	**0**	**100**	**78**	**4**	**96**	**2**	**98**
Wales	**91**	**1**	**99**	**211**	**8**	**92**	**5**	**95**
E, W & NI*	**1,112**	**13**	**87**	**3,267**	**22**	**78**	**28**	**72**

HHD – home haemodialysis; PD – peritoneal dialysis; ICHD – in-centre haemodialysis
n/a – no patients on this treatment; Blank cells – data for only one to two patients
*Scotland not included because of low completeness of ethnicity data

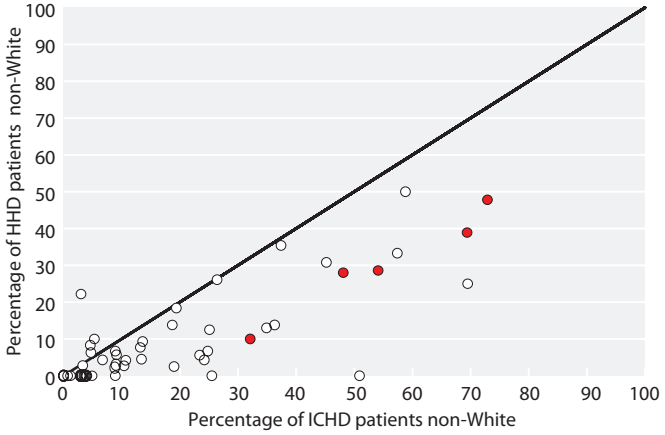

Fig. 13.6A. Percentage of non-White prevalent HHD patients relative to non-White ICHD patients on 31st December 2015
Centres with a lower than expected percentage of ethnic minorities on HHD are highlighted (shown as bold dots) only if they had a minimum of five non-White patients on HHD

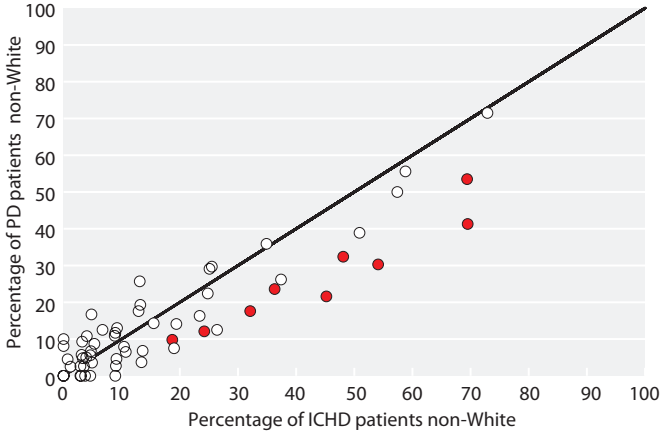

Fig. 13.6B. Percentage of non-White prevalent PD patients relative to non-White ICHD patients on 31st December 2015
Centres with a lower than expected percentage of ethnic minorities on PD are highlighted (shown as bold dots) only if they had a minimum of five non-White patients on PD

ethnic minorities varied widely. The data are therefore presented again in figures 13.6A and B for the HHD and PD groups respectively, highlighting centres where there were sufficient patients to have reasonable confidence that the differences were not due to chance. This suggests that there may be real differences in access to HTs for patients from non-White ethnic groups, though this is still confounded by other factors such as social deprivation.

Primary renal disease

The distribution of primary renal disease (PRD) by dialysis modality in prevalent dialysis patients is shown in table 13.5. There is missing PRD data in only 4.6% of patients. There are statistically significant differences in PRD by modality, particularly for diabetic nephropathy in HHD patients, where only 12.3% of patients have this PRD, compared to 22.5% in PD patients and 25.4% in ICHD patients. The distribution of PRD causes in ICHD patients more closely reflects PD patients than HHD patients.

Table 13.5. PRD in prevalent dialysis patients, by dialysis modality, on 31st December 2015

PRD	% HHD	% PD	% ICHD	% overall dialysis
Aetiology uncertain	13.7	17.0	17.0	16.8
Diabetes	12.3	22.5	25.4	24.5
Glomerulonephritis	26.1	16.5	14.6	15.3
Hypertension	4.5	8.7	7.7	7.7
Other	19.8	14.7	15.7	15.7
Polycystic kidney	9.2	7.3	6.0	6.3
Pyelonephritis	12.0	7.7	8.3	8.4
Renal vascular disease	2.4	5.5	5.4	5.3
Missing	1.8	4.7	3.9	3.9

PRD – primary renal disease; HHD – home haemodialysis; PD – peritoneal dialysis; ICHD – in-centre haemodialysis
Excluded centre with ⩾40% PRD 'aetiology uncertain' (Colchester)

Social deprivation

Previous work has demonstrated that patients who are less socioeconomically deprived are more likely to be on HHD [4], so this finding was retested. Increasing deprivation was still associated with a decreasing proportion of the dialysis population using HTs (figure 13.7, chi-squared test p-value <0.001 for deprivation effect). On 31st December 2015, PD was used by 16.3% and 9.8% of prevalent dialysis patients from deprivation quintiles one and five respectively. The difference was less striking for HHD, with 5.0% and 3.4% of patients using HHD from quintiles one and five respectively. To look at the effect of social deprivation independent of ethnicity, the same analysis was done within the White population (data not shown). This revealed the same pattern of decreased HT use with increasing deprivation and the same dose-response pattern.

To control for the possibility that informative censoring was affecting the prevalence data, the association between deprivation and HT use was explored in an incident UK dialysis cohort (January 2014–September 2015). The cohort was curtailed in September 2015 to allow modality at day 90 to be determined. At day 90, the proportion of incident RRT patients on PD was 22.7% and 16.7% in the least and most deprived quintiles

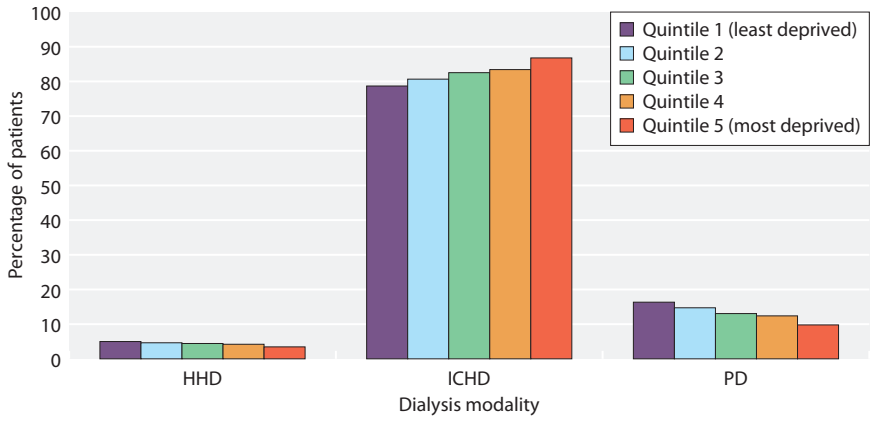

Fig. 13.7. Level of social deprivation in the prevalent dialysis population, by dialysis modality, on 31st December 2015

respectively. This pattern was also seen for transplantation by day 90, with 12.9% and 7.0% of patients from the least and most deprived quintiles respectively. Both of these trends have a clear dose-response pattern. A sensitivity analysis excluding late referrals gives consistent results. It therefore seems reasonable to conclude that increasing deprivation was associated with decreasing HT use, and that this is consistent when accounting for ethnicity, early referrals and early changes in modality.

Comorbidities

Using centres with >70% completeness for comorbidity data, the distribution of comorbidities within the prevalent dialysis population is shown in table 13.6 and figure 13.8. The highest comorbidity was found in the

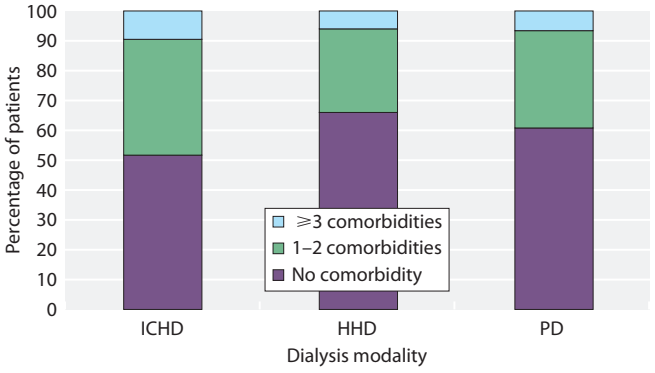

Fig. 13.8. Comorbidity of prevalent dialysis patients*, stratified by dialysis modality, on 31st December 2015

* Only data from centres with ⩾70% completeness for comorbidity data are included

Table 13.6. Comorbidity burden in the prevalent dialysis population, by dialysis modality and centre*, on 31st December 2015

Centre	Dialysis *N*	HT *N*	% no comorbidity			% 1–2 comorbidities			% ⩾3 comorbidities		
			HHD	PD	ICHD	HHD	PD	ICHD	HHD	PD	ICHD
B Heart	471	64	55.6	64.7	54.1	44.4	31.4	41.0	0.0	3.9	4.9
B QEH	1,149	192	86.0	76.1	67.8	14.0	23.9	28.2	0.0	0.0	4.0
Bangor	99	30	40.0	40.0	32.4	26.7	53.3	63.2	33.3	6.7	4.4
Basldn	198	36	n/a	55.2	47.1	n/a	37.9	46.4	n/a	6.9	6.4
Bradfd	251	25	85.7	77.8	47.7	0.0	11.1	40.5	14.3	11.1	11.7
Bristol	582	79	66.7	63.6	51.5	26.7	34.1	37.5	6.7	2.3	11.0
Cardff	576	107	55.6	53.9	42.9	33.3	39.5	44.4	11.1	6.6	12.7
Clwyd	104	27	57.1	56.3	35.3	42.9	25.0	48.5	0.0	18.8	16.2
Derby	324	116	43.2	47.5	47.5	54.1	44.1	43.8	2.7	8.5	8.6
Donc	204	33	77.8	56.3	59.7	11.1	37.5	34.9	11.1	6.3	5.4
Dorset	332	50	71.4	48.8	53.1	28.6	44.2	38.2	0.0	7.0	8.7
Exeter	516	86	60.0	66.7	47.5	20.0	26.4	38.7	20.0	6.9	13.8
Hull	434	84		57.5	53.6		39.7	41.0		2.7	5.4
Kent	484	76	62.5	80.0	61.5	31.3	20.0	35.3	6.3	0.0	3.2
L Barts	1,214	230	84.2	70.4	60.1	15.8	25.4	32.6	0.0	4.2	7.4
L Guys	709	82	61.2	63.6	54.5	32.7	33.3	38.8	6.1	3.0	6.7
L Kings	656	102	58.3	61.1	53.6	41.7	32.2	38.1	0.0	6.7	8.3

Table 13.6. Continued

Centre	Dialysis *N*	HT *N*	% no comorbidity			% 1–2 comorbidities			% ⩾3 comorbidities		
			HHD	PD	ICHD	HHD	PD	ICHD	HHD	PD	ICHD
Leeds	570	81	70.0	60.8	51.0	25.0	35.3	36.1	5.0	3.9	12.9
Middlbr	375	37	72.7	77.3	39.8	27.3	18.2	45.1	0.0	4.5	15.0
Newc	361	70	54.2	41.2	37.6	37.5	41.2	42.7	8.3	17.6	19.7
Newry	110	25	33.3	63.6	33.8	33.3	27.3	52.7	33.3	9.1	13.5
Nottm	470	111	85.7	55.2	60.3	10.7	39.7	35.1	3.6	5.2	4.6
Oxford	533	113	75.0	58.7	40.5	25.0	32.0	46.2	0.0	9.3	13.3
Plymth	172	42	20.0	56.5	42.3	60.0	34.8	41.2	20.0	8.7	16.5
Redng	368	71	80.0	42.9	33.6	20.0	39.7	47.4	0.0	17.5	19.0
Sheff	601	102	59.1	58.0	50.4	40.9	40.0	42.6	0.0	2.0	7.0
Sthend	143	19		73.3	67.4		6.7	22.8		20.0	9.8
Sund	239	20		77.8	53.3		22.2	34.3		0.0	12.4
Swanse	427	98	58.3	40.3	35.3	33.3	35.5	51.2	8.3	24.2	13.5
Ulster	112	8		50.0	34.0		50.0	49.0		0.0	17.0
West NI	135	16	33.3	66.7	51.0	33.3	25.0	41.2	33.3	8.3	7.8
Wolve	397	102	80.0	60.3	58.1	10.0	38.4	30.5	10.0	1.4	11.4
Wrexm	149	42	100.0	66.7	56.6	0.0	22.2	35.8	0.0	11.1	7.5
York	189	40	81.8	69.0	43.7	9.1	24.1	43.0	9.1	6.9	13.4
Total	**13,654**	**2,416**	**66.0**	**60.8**	**51.7**	**28.0**	**32.6**	**38.8**	**6.0**	**6.6**	**9.5**

HT – home therapy; HHD – home haemodialysis; PD – peritoneal dialysis; ICHD – in-centre haemodialysis
n/a – no patients on this treatment; Blank cells – data for only one to two patients
*Only data from centres with ⩾70% completeness for comorbidity data are included in this analysis

ICHD group, with HHD having the lowest comorbidity and the PD group an intermediate burden of comorbidity. At centre level, comorbidity burden varied considerably (table 13.6). Despite this, the same pattern of decreasing comorbidity with HT use was evident, although this was clearest in centres with large numbers of HT patients.

Home therapy patient treatment history

On 31st December 2015 there were 3,537 patients on PD in the UK. Ignoring temporary changes to HD of fewer than 90 days, these patients had been on PD for a median duration of 1.29 years (interquartile range [IQR] 0.50–2.65 years). Due to previous concerns about technique survival by PD programme size [5], the association between centre median PD duration and centre programme size was analysed and considerable variation and only a weak association was found (figure 13.9). Modality preceding PD in those patients is shown in figure 13.10 (panel B). The majority of patients (76.4%) had only ever been on PD, with a median duration on PD of 1.33 years (IQR 0.52–2.73 years), while a minority had received HD prior to PD (17.8%, median duration on PD 1.17 years [IQR 0.42–2.51 years]) or had had a prior functioning transplant (5.6%, median duration on PD 1.06 years [IQR 0.47–2.22 years]).

The prior modality history for HHD patients was markedly different from PD patients (figure 13.10A), with the great majority having moved onto HHD directly from ICHD (89.5%). The longer term RRT history was also quite different, with 40.3% of patients having had a previous transplant, compared with 7.2% for PD patients. This is at least in part related to the longer time spent on total RRT of the HHD prevalent patients compared to the prevalent PD patients (median time on RRT 7.3 and 1.6 years respectively). Of patients on HHD, 36.8% had previously been on PD, whilst only 24.3% of PD patients had previously been on any form of HD.

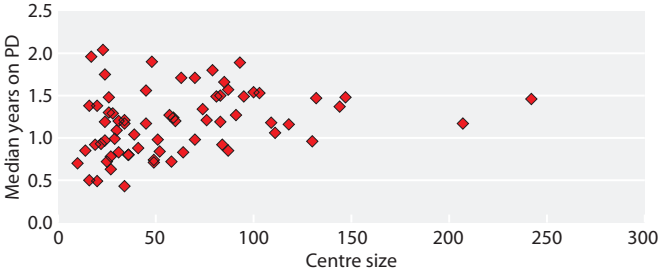

Fig. 13.9. Median duration of PD by centre size*, in PD prevalent patients, on 31st December 2015
*Number of incident patients starting RRT on PD during 2013–2015

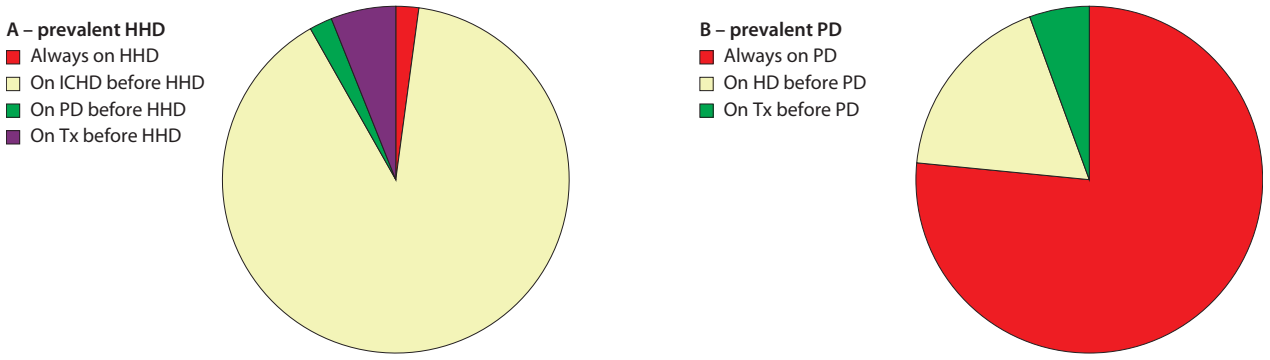

Fig. 13.10. RRT modality immediately prior to HHD in prevalent HHD patients (A) and prior to PD in prevalent PD patients (B)

There were insufficient data to calculate the duration of HHD by centre, but the 1,175 patients on HHD nationally had a median duration of 2.4 years (IQR 0.7–13.2 years).

Home therapy patient time to starting a home therapy

The ideal pathway for a HT would minimise the time to starting the HT, reducing time spent on ICHD, but without sacrificing training or support. Time to HT can be seen in figures 13.11 and 13.12, which show the probability of commencing PD or HHD by time since RRT commencement respectively (the cumulative incidence function (CIF) has been used to avoid bias in the presence of competing risks such as death, kidney transplantation or other HT). To aid international comparisons, specifically with ANZDATA, an alternative plot where transplants are censored (appendix 1, figures 13.18 and 13.19) are included. Within the total 2011–2014 incident RRT cohort, after two years follow-up, 18.0% of patients had died on ICHD, 1.9% had been lost to follow-up/had stopped dialysis or had recovered renal function, 13.7% had received a transplant, 40.3% remained on ICHD, 2.2% were on HHD and 23.9% were on PD.

Consistent with the data shown in figure 13.10B, the CIF plots show that the majority of patients who were ever going to receive PD started RRT on PD, with some further increase in patients starting PD over the first year of RRT, but little growth after this. The same pattern was evident across all countries, with the differences in HT use between countries described earlier reflected in the height of the CIF curves. HHD has a quite different pattern with almost no patients starting RRT with HHD. With the possible exception of Scotland, there was no evidence of a 'plateau' in the probability of starting HHD by two years after RRT commencement. There was also no evidence of a difference when transplantation was treated as censored or a competing risk.

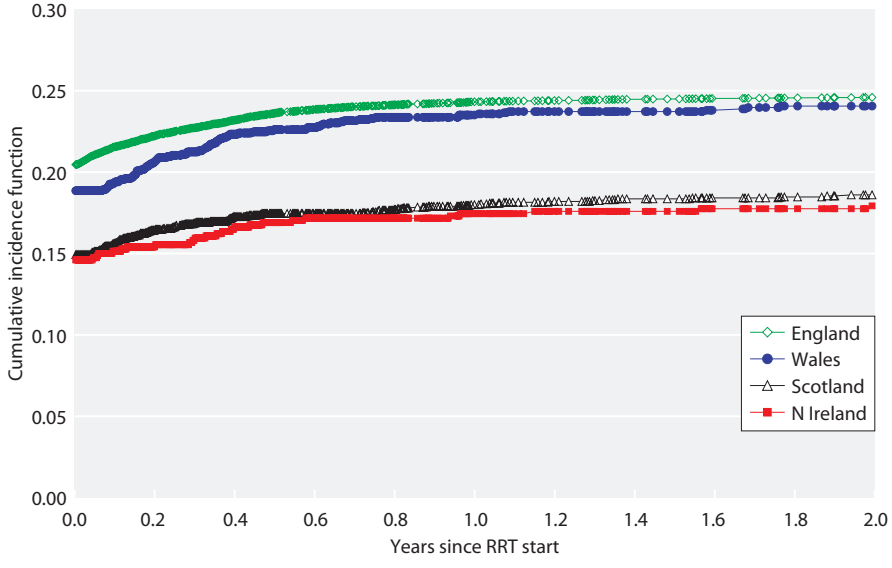

Fig. 13.11. Cumulative probability of starting PD since commencing RRT, by country, in the incident cohort 2011–2014

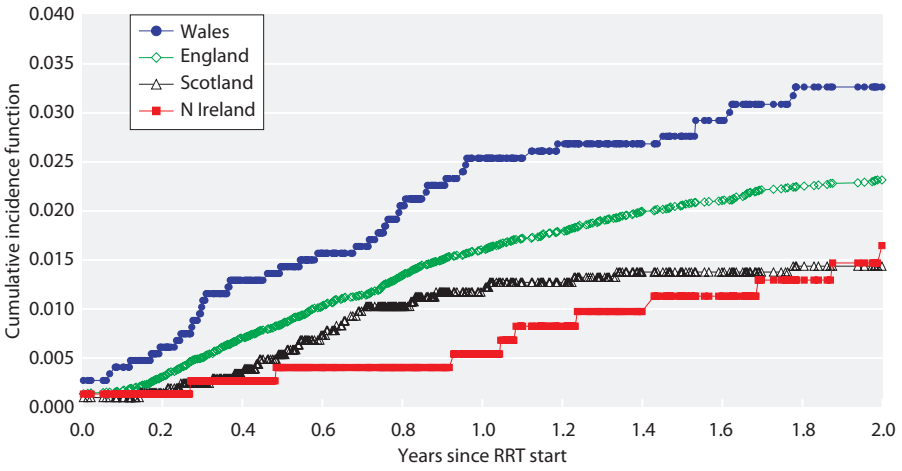

Fig. 13.12. Cumulative probability of starting HHD since commencing RRT, by country, in the incident cohort 2011–2014

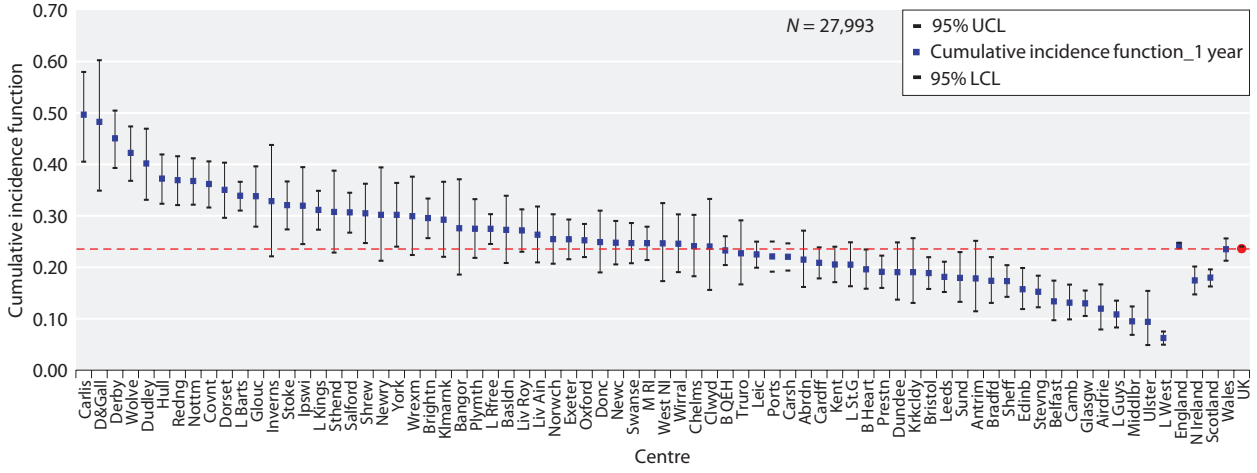

Fig. 13.13A. Cumulative probability of starting PD by one year after RRT start, by centre, in the incident cohort 2011–2014

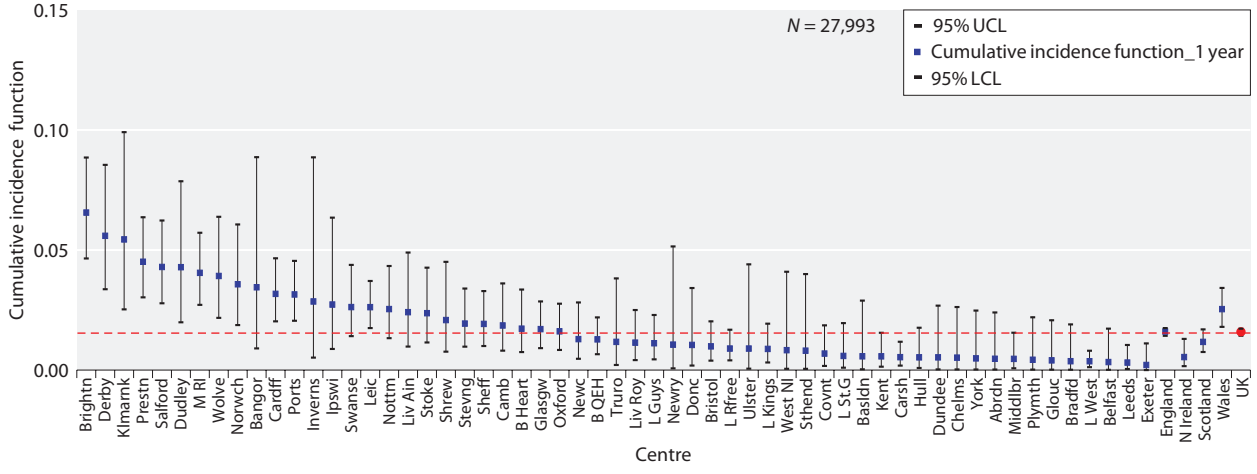

Fig. 13.13B. Cumulative probability of starting HHD by one year after RRT start, by centre, in the incident cohort 2011–2014

Compared with ANZDATA, which censors these analyses for transplantation, the increase in PD was mostly seen over the first year of RRT, whereas the rise in HHD was more gradual. The absolute values in the UK were lower but the rise in incidence appears to occur over the same time period [2].

For comparison, the time to death and time to transplantation CIFs have been derived for each country. No large differences in time to transplant could be seen between countries, but when assessing time to death, following adjustment for age of start and gender, Wales showed significantly higher incidence compared to England.

Analyses of PD and HHD uptake by centre are shown in figures 13.13A and 13.13B. The extent of variability between centres in PD use is unusual when compared with other UKRR analyses, with the 95% CI for only 34 centres crossing the national average. The magnitude of the difference between centres is also striking, with the percentage of patients starting PD by one year of RRT start ranging between 6% and 50% (CIF 0.06–0.50), an eight-fold difference. There was clear between centre variability in HHD use as well, with the percentage of patients starting HHD by one year of RRT start ranging between 0.2% and 6.6% (CIF 0.002–0.066).

Home therapy patient outcomes

The analysis of outcomes for HTs is more complex due to multiple possible outcomes, which may be either desired (transplantation and rarely recovery) or undesired (death and technique failure). Changes in the probability of any one of these events may change the probability of the other events, so data is provided on all the outcomes to aid interpretation. The numbers on HHD were too small to analyse, with only 1,212 patients starting HHD within two years of RRT start in the UK incident RRT cohort between 2007 and 2014. Of these, 91% had had ICHD prior to HHD, 1% had had a transplant prior to HHD and 11% had had PD prior to HHD.

PD technique outcomes in 9,337 incident PD patients are shown in figure 13.14. This figure describes the cumulative incidence probability for the three possible events of interest in incident PD patients: PD technique-failure (switch to HD), transplantation and death on PD. This analysis was done on a cohort of incident RRT patients from 2007–2014, starting RRT on PD at day zero and still on PD at day 90.

As suggested by work from ANZDATA, the definition used for transfer to ICHD was a switch that lasted for more than 30 days [6]. As shown in figure 13.14, whilst England, Scotland and Northern Ireland had broadly

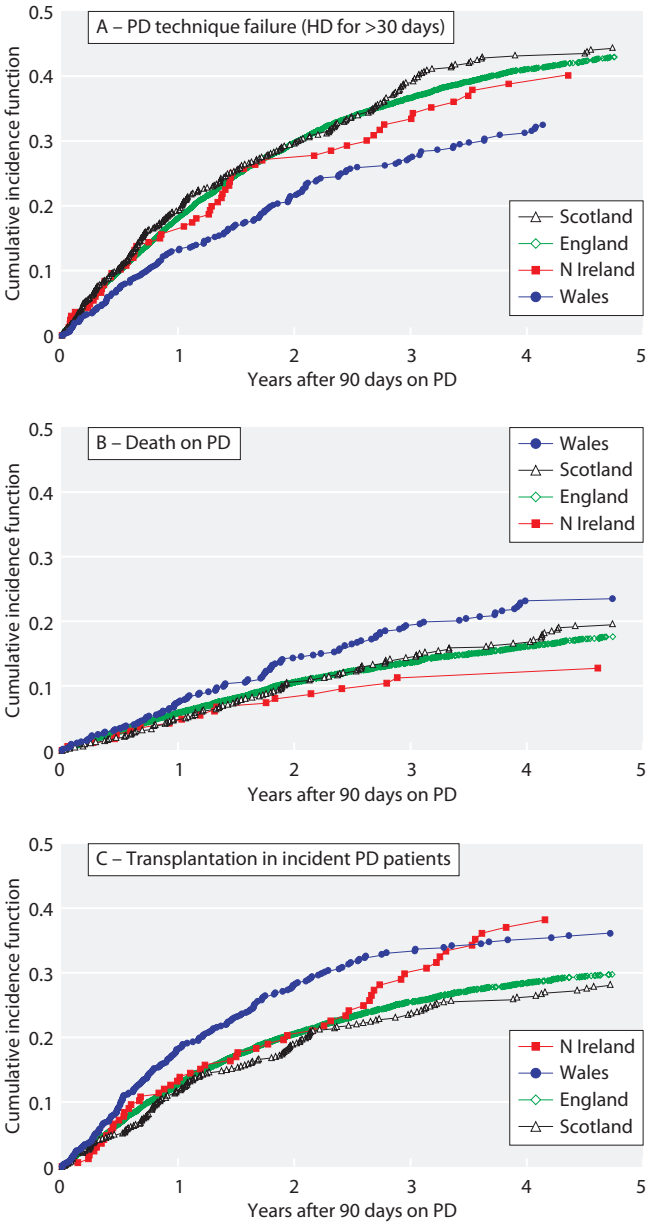

Fig. 13.14. Cumulative probability of technique failure (switch to HD, panel A), mortality on PD (panel B) and transplantation (panel C), in incident PD* patients 2007–2014, by country

*Patients starting RRT on PD at day zero and consecutively on PD for the first 90 days of RRT

comparable event rates for mortality, transplantation and technique failure, there is a suggestion that Wales had slightly higher transplant and mortality rates with possibly as a consequence, a slightly lower technique failure rate. This analysis is not adjusted for patient-level confounders such as age.

There was also significant between centre variability in technique failure rates, as shown in figure 13.15, with six

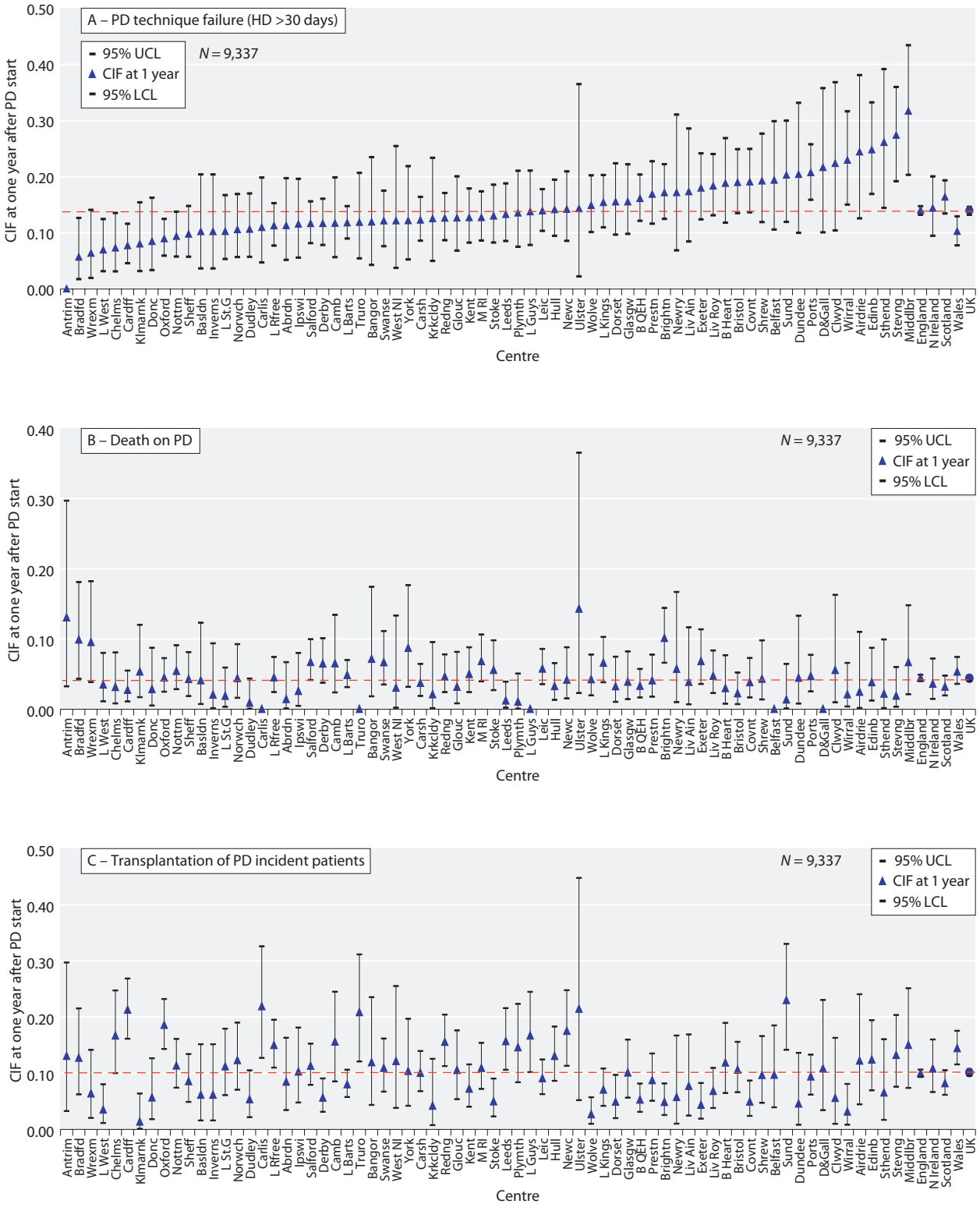

Fig. 13.15. One-year probability of technique failure (switch to HD, panel A), mortality on PD (panel B) and transplantation (panel C), in incident PD* patients 2007–2014, by centre

CIF = cumulative incidence function

*Patients starting RRT on PD at day zero and consecutively on PD for the first 90 days of RRT

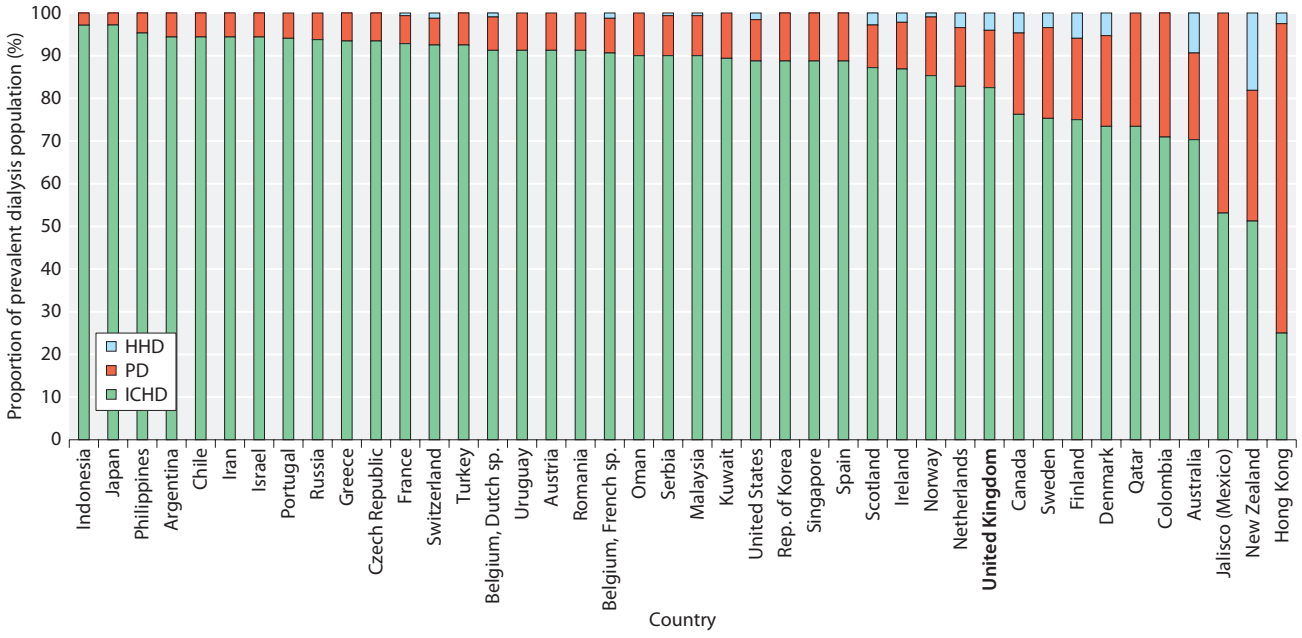

Fig. 13.16. Dialysis modality use by nation, 2014

centres having lower confidence limits that do not cross the national average, and five having upper confidence limits that do not cross the national average. The centre estimates range from a probability of 0.00 to 0.32. The plots for mortality and transplantation are shown ordered by technique failure rates to visually test whether centre variability in technique failure rates may be partially explained by the other outcomes. There was no apparent pattern. It should be borne in mind that none of these probabilities have been adjusted for potential patient-level confounders such as age.

Home therapies international comparison

HT prevalence rates internationally vary widely. As seen in figure 13.16, which shows the proportion of prevalent dialysis patients on each modality in 2014 as reported to the United States Renal Data System (USRDS) by registries around the world [7]. HT prevalence was particularly high in countries such as Hong Kong, where a PD first policy was used, whereas in countries like Japan, HT prevalence was less than 5%. Furthermore, as can be seen in figure 13.17, which looks at the serial change in the proportion of dialysis

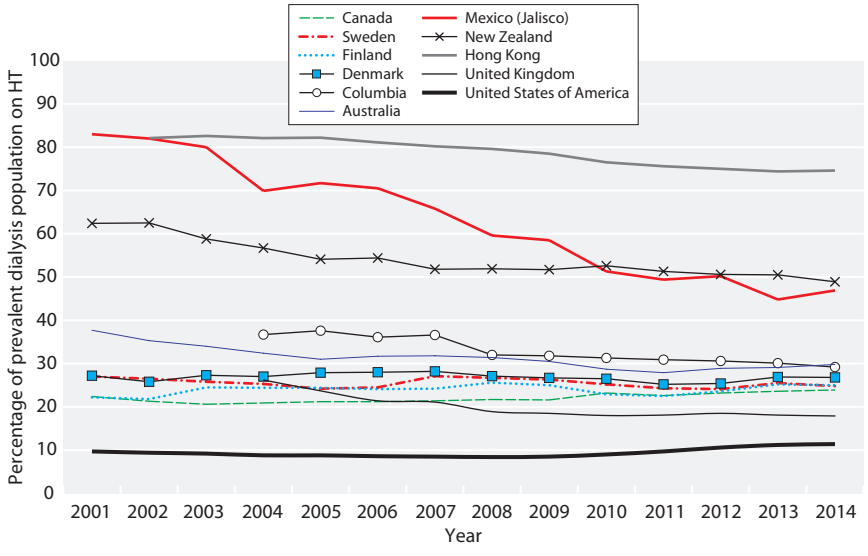

Fig. 13.17. Serial changes in proportion of prevalent dialysis patients using HTs (2001–2014, USRDS)

patients using a HT in the prevalent dialysis population between 2001–2014 in the top 15 providers of HT internationally, most countries were seeing gradual declines in HT prevalence. Such international differences in dialysis practices may be explained by multiple factors, including geography and climatic factors, healthcare structure, ethical approaches to conservative care and resourcing differences.

Discussion

This chapter has provided a clear description of the characteristics of the home dialysis population. Whilst many of the characteristics were expected (e.g. lower levels of deprivation, younger age, fewer comorbidities), or unsurprising (fewer ethnic minority patients), the interaction between gender and age was not expected and represents a novel finding. However, these findings are all purely descriptive and the mechanism for these differences remains unclear, making recommendations for changes in practice not possible.

There has also been a preliminary analysis to explore the determinants of the changes in prevalence of HHD and PD over time, with a suggestion that increasing transplantation is the primary driver of the falling PD prevalence and less of an impact on HHD. This requires a more robust exploration, examining the relative impact on starting versus stopping PD and HHD, including adjustments for patient mix. This work should also explore the extent to which HHD and PD compete for the same patient population. The results here suggest that the impact will be minimal, with the younger, less comorbid HHD patients usually having a far longer history of RRT (including previous PD), implying that HHD is being used for a particular sub-group of patients at a different point in their RRT pathway.

From the point of view of both patient outcomes and treatment costs, it is tempting to explore other areas, such as differences in HHD outcomes and the impact of different practice patterns, including assisted PD. This would require further work on data accuracy and coding and is therefore contingent on the prioritisation of home dialysis data.

Whilst the routine description of patient characteristics is an important feature of this chapter, one of the key strengths of the UKRR is the ability to compare outcomes in different centres. This analysis has robustly demonstrated significant differences between centres in both uptake of PD/HHD and outcomes for PD. These differences are large so, although it is possible that variability in patient mix (e.g. ethnicity, deprivation, comorbidity and age) could explain them, it seems unlikely that the differences will disappear after adjustment. This will be tested in subsequent analyses.

Acknowledgement

The (non-UK) data reported in the section on International comparisons have been supplied by the United States Renal Data System (USRDS). The interpretation and reporting of these data are the responsibility of the author(s) and in no way should be seen as an official policy or interpretation of the U.S. government.

Conflicts of interest: the authors declare no conflicts of interest

References

1 Verduijn M, Grootendorst C, Dekkeri FW, Jager K and Le-Cassie S. The analysis of competing events like cause-specific mortality – beware of the Kaplan-Meier method. Nephrol Dial Transplant 2011, 26:56–61.
2 http://www.anzdata.org.au/v1/report_2016.html
3 Combes G, Allen K, Sein K, Girling A, Lilford R. Taking hospital treatments home: a mixed methods case study looking at the barriers and success factors for home dialysis treatment and the influence of a target on uptake rates. Implement Sci 2015, 10:148.
4 Nitsch D, Steenkamp R, Tomson CRV, Roderick P, Ansell D, MacGregor MS. Outcomes in patients on home haemodialysis in England and Wales, 1997–2005: a comparative cohort analysis. Nephrol Dial Transplant 2011, 26:1670–7.
5 Huisman RM, Nieuwenhuizen MGM, Th de Charro F. Patient-related and centre-related factors influencing technique survival of peritoneal dialysis in The Netherlands. Nephrol Dial Transplant 2002, 17:1655–60.
6 Lan PG, Clayton PA, Johnson DW, McDonald SP, Borlace M, Badve SV, et al. Duration of Hemodialysis Following Peritoneal Dialysis Cessation in Australia and New Zealand: Proposal for a Standardized Definition of Technique Failure. Perit Dial Int 2016, 11–12;36:623–30.
7 https://www.usrds.org/2016/download/v2_c13_IntComp_16.pdf

Appendix 1

Table 13.7. Prevalence (as a proportion of the total RRT population) of treatment modalities between 2011 and 2015, by centre[a]

Centre	Modality	2011	2012	2013	2014	2015	% change 5 years
	HHD	0.85	1	1.38	1.22	0.95	0.1
	PD	4.7	5	4.91	5.51	4.95	0.3
Abrdn	HT	5.56	6	6.29	6.73	5.9	0.3
	Tx	49.36	48.6	51.28	53.06	53.52	4.2
	HT + Tx	54.91	54.6	57.56	59.8	59.43	4.5
	HHD	1.17	1.27	0.63	0.62	0.59	−0.6
	PD	2.34	2.34	2.92	1.86	3.13	0.8
Airdrie	HT	3.51	3.61	3.55	2.47	3.72	0.2
	Tx	55.74	55.2	56.58	60.21	58.12	2.4
	HT + Tx	59.25	58.81	60.13	62.68	61.84	2.6
	HHD	1.96	2.77	1.55	1.13	1.45	−0.5
	PD	5.49	5.14	5.81	4.89	7.25	1.8
Antrim	HT	7.45	7.91	7.36	6.02	8.7	1.3
	Tx	41.96	42.29	44.57	48.12	48.19	6.2
	HT + Tx	49.41	50.2	51.94	54.14	56.88	7.5
	HHD	2.88	2.08	2.57	2.17	1.58	−1.3
	PD	6.02	6.11	5.13	4.34	6.2	0.2
B Heart	HT	8.9	8.19	7.7	6.51	7.79	−1.1
	Tx	35.86	37.58	39.54	42.98	42.7	6.8
	HT + Tx	44.76	45.77	47.24	49.49	50.49	5.7
	HHD	2.1	2.44	2.65	2.45	2.19	0.1
	PD	10.01	9.23	7.72	7.79	7.41	−2.6
B QEH	HT	12.11	11.67	10.37	10.25	9.6	−2.5
	Tx	37.05	37.63	40.19	40.71	40.48	3.4
	HT + Tx	49.16	49.3	50.56	50.95	50.08	0.9
	HHD	8.67	9.93	11.29	10.32	9.52	0.9
	PD	14	10.64	10.48	12.7	7.94	−6.1
Bangor	HT	22.67	20.57	21.77	23.02	17.46	−5.2
	Tx	27.33	25.53	20.16	21.43	46.03	18.7
	HT + Tx	50	46.1	41.94	44.44	63.49	13.5
	HHD	0.32	0.3	0.28	0.28	0.56	0.2
	PD	8.2	9.61	8.4	7.73	9.78	1.6
Basldn	HT	8.52	9.91	8.68	8.01	10.34	1.8
	Tx	44.48	42.34	46.5	44.48	44.41	−0.1
	HT + Tx	53	52.25	55.18	52.49	54.75	1.8
	HHD	2.84	3.33	2.54	1.41	1.02	−1.8
	PD	5.3	4.81	4.89	2.64	4.07	−1.2
Belfast	HT	8.14	8.13	7.43	4.05	5.09	−3.1
	Tx	52.27	54.16	56.88	62.15	65.37	13.1
	HT + Tx	60.42	62.29	64.31	66.2	70.46	10.0
	HHD	0.2	0.73	1.22	1.68	1.43	1.2
	PD	6.26	5.26	5.21	3.52	2.87	−3.4
Bradfd	HT	6.46	5.99	6.42	5.2	4.3	−2.2
	Tx	55.97	56.99	59.2	58.56	59.71	3.7
	HT + Tx	62.43	62.98	65.63	63.76	64.01	1.6
	HHD	3.34	4.13	4.95	5.18	4.46	1.1
	PD	8.91	8.89	7.98	6.14	6.22	−2.7
Brightn	HT	12.25	13.02	12.93	11.31	10.68	−1.6
	Tx	52.78	51.53	51.41	52.44	53.2	0.4
	HT + Tx	65.03	64.55	64.34	63.76	63.88	−1.2

Table 13.7. Continued

Centre	Modality	2011	2012	2013	2014	2015	% change 5 years
	HHD	2.12	2.04	1.63	1.36	1.27	−0.9
	PD	5.5	5.38	5.21	5.05	4.25	−1.3
Bristol	HT	7.62	7.42	6.84	6.4	5.52	−2.1
	Tx	55.04	54.81	55.48	55.5	56.97	1.9
	HT + Tx	62.66	62.23	62.32	61.9	62.49	−0.2
	HHD	0.84	1.3	1.82	2.23		
	PD	4.9	4.14	2.73	3.46		
Camb[b]	HT	5.73	5.44	4.55	5.69		
	Tx	51.85	54.73	54.66	55.8		
	HT + Tx	57.59	60.17	59.2	61.5		
	HHD	2.3	2.12	2.71	2.4	1.82	−0.5
	PD	7.32	5.51	5.07	5.43	5.33	−2.0
Cardff	HT	9.62	7.63	7.78	7.83	7.16	−2.5
	Tx	57.36	60.59	61.15	60.71	61.17	3.8
	HT + Tx	66.98	68.22	68.94	68.54	68.33	1.3
	HHD	0.47	0.46	0.43	0.4	0	−0.5
	PD	9.81	12.04	11.54	10.32	13.57	3.8
Carlis	HT	10.28	12.5	11.97	10.71	13.57	3.3
	Tx	59.81	59.26	59.4	59.92	57.5	−2.3
	HT + Tx	70.09	71.76	71.37	70.63	71.07	1.0
	HHD	1.1	1.24	1.55	1.61	1.85	0.8
	PD	6.63	6.87	7.17	7.84	6.32	−0.3
Carsh	HT	7.73	8.11	8.73	9.45	8.17	0.4
	Tx	46.65	46.78	47.34	47.03	47.87	1.2
	HT + Tx	54.39	54.89	56.07	56.48	56.04	1.7
	HHD	0.29	0.28	1.1	0.77	0.29	0.0
	PD	6.4	6.8	5.25	6.19	7.47	1.1
Chelms	HT	6.69	7.08	6.35	6.96	7.76	1.1
	Tx	58.43	56.09	60.22	58.51	50.86	−7.6
	HT + Tx	65.12	63.17	66.57	65.46	58.62	−6.5
	HHD	2.07	1.14	1.22	2.22	2.16	0.1
	PD	5.52	10.23	7.93	6.11	10.81	5.3
Clwyd	HT	7.59	11.36	9.15	8.33	12.97	5.4
	Tx	51.72	42.61	46.34	43.89	45.41	−6.3
	HT + Tx	59.31	53.98	55.49	52.22	58.38	−0.9
	HHD	0.39	0.38	0	0	0	−0.4
	PD	3.52	3.8	2.97	3.08	4.42	0.9
Colchr	HT	3.91	4.18	2.97	3.08	4.42	0.5
	Tx	49.61	51.33	54.28	56.16	42.48	−7.1
	HT + Tx	53.52	55.51	57.25	59.25	46.9	−6.6
	HHD	1.47	2.11	2.08	1.23	1.67	0.2
	PD	10.93	11.61	9.69	10.59	9.57	−1.4
Covnt	HT	12.41	13.72	11.76	11.82	11.23	−1.2
	Tx	45.21	46.19	47.06	48.61	51.17	6.0
	HT + Tx	57.62	59.91	58.82	60.42	62.4	4.8
	HHD	0.8	0.79	1.63	1.54	2.19	1.4
	PD	11.2	12.6	12.2	11.54	8.03	−3.2
D & Gall	HT	12	13.39	13.82	13.08	10.22	−1.8
	Tx	48.8	48.03	49.59	51.54	52.55	3.8
	HT + Tx	60.8	61.42	63.41	64.62	62.77	2.0

Table 13.7. Continued

Centre	Modality	2011	2012	2013	2014	2015	% change 5 years
	HHD	3.06	4.5	4.71	5.27	5.42	2.4
	PD	20	15.83	14.31	14	12.44	−7.6
Derby	HT	23.06	20.32	19.02	19.28	17.86	−5.2
	Tx	42.88	44.6	48.69	47.45	48.96	6.1
	HT + Tx	65.95	64.93	67.71	66.72	66.83	0.9
	HHD	2.35	1.95	2.79	4.09	3.79	1.4
	PD	7.65	8.08	9.75	6.91	5.81	−1.8
Donc	HT	10	10.03	12.53	11	9.6	−0.4
	Tx	42.65	42.06	42.34	44.25	47.22	4.6
	HT + Tx	52.65	52.09	54.87	55.24	56.82	4.2
	HHD	0.76	0.6	1.01	1.39	1.49	0.7
	PD	7.9	7	6.81	7.08	5.83	−2.1
Dorset	HT	8.66	7.6	7.83	8.47	7.32	−1.3
	Tx	54.86	53.65	53.91	53.89	54.61	−0.3
	HT + Tx	63.53	61.25	61.74	62.36	61.92	−1.6
	HHD	3.58	5.06	4.7	5.41	4.75	1.2
	PD	15.82	17.42	15.47	14.59	15.04	−0.8
Dudley	HT	19.4	22.47	20.17	20	19.79	0.4
	Tx	37.91	33.15	35.08	36.76	38.26	0.4
	HT + Tx	57.31	55.62	55.25	56.76	58.05	0.7
	HHD	0.25	0.25	1	0.99	0.47	0.2
	PD	4.75	4.81	5	5.69	3.99	−0.8
Dundee	HT	5	5.06	6	6.68	4.46	−0.5
	Tx	49.25	49.87	52.25	52.72	52.11	2.9
	HT + Tx	54.25	54.94	58.25	59.41	56.57	2.3
	HHD	0.9	0.87	0.72	0.85	0.95	0.0
	PD	5.99	5.52	4.32	2.98	3.65	−2.3
Edinb	HT	6.89	6.39	5.04	3.84	4.59	−2.3
	Tx	55.39	56.17	56.55	58.95	57.84	2.5
	HT + Tx	62.28	62.55	61.58	62.78	62.43	0.1
	HHD	0.44	0.43	0.41	0.39	0.48	0.0
	PD	8.46	8.12	7.47	9.06	7.72	−0.7
Exeter	HT	8.9	8.55	7.88	9.45	8.2	−0.7
	Tx	50	49.68	51.28	50.92	50.81	0.8
	HT + Tx	58.9	58.23	59.16	60.37	59.01	0.1
	HHD	2.04	2.03	1.7	1.68	1.39	−0.7
	PD	3.57	3.29	3	2.62	3.48	−0.1
Glasgw	HT	5.6	5.33	4.7	4.3	4.87	−0.7
	Tx	51.46	53.82	56.34	59.54	58.48	7.0
	HT + Tx	57.06	59.15	61.04	63.84	63.35	6.3
	HHD	1.5	1.46	1.21	1.98	1.53	0.0
	PD	8.33	7.48	6.68	8.53	7.06	−1.3
Glouc	HT	9.83	8.94	7.89	10.52	8.59	−1.2
	Tx	48.93	46.15	49.6	48.02	48.85	−0.1
	HT + Tx	58.76	55.09	57.49	58.53	57.44	−1.3
	HHD	1.12	1.32	1.05	1.15	1.18	0.1
	PD	11.07	10.94	9.3	8.82	8.16	−2.9
Hull	HT	12.19	12.26	10.35	9.97	9.34	−2.9
	Tx	49.63	50	52.67	53.49	53.06	3.4
	HT + Tx	61.82	62.26	63.02	63.46	62.41	0.6

Table 13.7. Continued

Centre	Modality	2011	2012	2013	2014	2015	% change 5 years
	HHD	2.18	3.18	0.91	1.32	1.57	−0.6
	PD	7.42	7.27	5.94	6.58	5.12	−2.3
Inverns	HT	9.61	10.45	6.85	7.89	6.69	−2.9
	Tx	55.9	58.64	62.1	63.16	57.87	2.0
	HT + Tx	65.5	69.09	68.95	71.05	64.57	−0.9
	HHD	1.34	1	0.63	0.91	0	−1.3
	PD	8.7	8.33	7.84	8.18	8.7	0.0
Ipswi	HT	10.03	9.33	8.46	9.09	8.7	−1.3
	Tx	49.83	49.33	53.92	53.64	49.86	0.0
	HT + Tx	59.87	58.67	62.38	62.73	58.55	−1.3
	HHD	2.39	2.17	2.18	1.89	1.67	−0.7
	PD	7.05	6.21	6.07	5.95	5.29	−1.8
Kent	HT	9.44	8.37	8.25	7.84	6.96	−2.5
	Tx	53.73	55.76	56.68	57.08	57.09	3.4
	HT + Tx	63.17	64.14	64.93	64.92	64.05	0.9
	HHD	2.08	2.59	2.03	3.17	2.54	0.5
	PD	13.35	11.82	12.46	10.37	10.42	−2.9
Klmarnk	HT	15.43	14.41	14.49	13.54	12.96	−2.5
	Tx	43.03	44.67	47.83	50.72	51.55	8.5
	HT + Tx	58.46	59.08	62.32	64.27	64.51	6.1
	HHD	0	0	0	0	0	0.0
	PD	9.79	6.99	6.53	5.21	6.54	−3.3
Krkcldy	HT	9.79	6.99	6.53	5.21	6.54	−3.3
	Tx	39.16	41.61	42.96	45.14	44.44	5.3
	HT + Tx	48.95	48.6	49.48	50.35	50.98	2.0
	HHD	0.46	0.71	0.46	0.62	0.96	0.5
	PD	9.57	10.43	9.8	10.63	9.45	−0.1
L Barts	HT	10.03	11.14	10.26	11.25	10.41	0.4
	Tx	40.08	41.1	42.19	43.85	44.7	4.6
	HT + Tx	50.12	52.24	52.45	55.1	55.11	5.0
	HHD	1.63	1.92	2.1	2.48	1.75	0.1
	PD	2.99	2.7	2.43	2.32	2.5	−0.5
L Guys	HT	4.62	4.62	4.53	4.8	4.25	−0.4
	Tx	43.66	44.43	46.44	47.24	48.18	4.5
	HT + Tx	48.28	49.04	50.96	52.04	52.43	4.2
	HHD	1.14	1.54	1.18	1.59	1.51	0.4
	PD	8.48	7.77	8.79	7.23	6.81	−1.7
L Kings	HT	9.62	9.3	9.97	8.82	8.33	−1.3
	Tx	46.29	47.06	48.27	49.05	49.74	3.5
	HT + Tx	55.9	56.37	58.24	57.87	58.06	2.2
	HHD	1.05	1.16	1.17	1.02	1.31	0.3
	PD	6.09	7.34	7.74	8.05	8.33	2.2
L Rfree	HT	7.13	8.51	8.91	9.08	9.64	2.5
	Tx	48.89	49.88	50.26	51.56	52.69	3.8
	HT + Tx	56.02	58.38	59.18	60.64	62.33	6.3
	HHD	0.9	0.59	0.7	0.92	0.87	0.0
	PD	8.13	7.51	6.76	6.28	6.06	−2.1
L St.G	HT	9.04	8.1	7.46	7.2	6.93	−2.1
	Tx	48.8	51.69	53.66	52.75	51.73	2.9
	HT + Tx	57.83	59.79	61.13	59.95	58.66	0.8

Table 13.7. Continued

Centre	Modality	2011	2012	2013	2014	2015	% change 5 years
	HHD	0.4	0.6	0.55	0.6	0.61	0.2
	PD	1.28	1.83	2.11	2.13	2.28	1.0
L West	HT	1.68	2.43	2.67	2.73	2.89	1.2
	Tx	47.34	47.78	49.39	50.83	51.28	3.9
	HT + Tx	49.01	50.21	52.06	53.56	54.17	5.2
	HHD	0.76	0.68	1.09	1.05	1.38	0.6
	PD	6.98	6.41	5.09	4.42	3.99	−3.0
Leeds	HT	7.74	7.09	6.18	5.47	5.37	−2.4
	Tx	54.17	56.41	58.28	59.3	60.98	6.8
	HT + Tx	61.91	63.5	64.46	64.77	66.35	4.4
	HHD	2.06	3.08	3.27	2.99	2.58	0.5
	PD	7.82	7.6	6.92	5.44	4.8	−3.0
Leic	HT	9.88	10.68	10.19	8.42	7.37	−2.5
	Tx	50.54	50.77	51.78	54.37	54.91	4.4
	HT + Tx	60.42	61.45	61.96	62.79	62.28	1.9
	HHD	2.91	3.12	2.82	3.78	4.1	1.2
	PD	4.36	5.67	8.45	10.27	9.74	5.4
Liv Ain	HT	7.27	8.78	11.27	14.05	13.85	6.6
	Tx	42.73	43.34	47.61	45.14	43.85	1.1
	HT + Tx	50	52.12	58.87	59.19	57.69	7.7
	HHD	2.53	3.23	3.7	3.09	3.14	0.6
	PD	7.7	7.26	6.51	6.4	7.01	−0.7
Liv Roy	HT	10.23	10.48	10.21	9.5	10.15	−0.1
	Tx	49.2	51.84	53.76	54.43	53.56	4.4
	HT + Tx	59.43	62.33	63.97	63.93	63.7	4.3
	HHD	5.36	5.25	4.62	3.5	3.29	−2.1
	PD	7.87	6.83	6.45	5.6	4.86	−3.0
M RI	HT	13.24	12.07	11.07	9.11	8.15	−5.1
	Tx	50.95	51.54	52.55	54.55	56.25	5.3
	HT + Tx	64.19	63.61	63.61	63.66	64.4	0.2
	HHD	1.82	1.74	1.77	1.6	1.76	−0.1
	PD	2.21	1.25	1.53	1.26	2.41	0.2
Middlbr	HT	4.04	2.99	3.31	2.86	4.17	0.1
	Tx	57.42	57.04	57.38	60.02	58.73	1.3
	HT + Tx	61.46	60.02	60.68	62.89	62.9	1.4
	HHD	2.11	2.83	2.35	2.16	2.31	0.2
	PD	5.5	5.32	4.7	5.62	4.83	−0.7
Newc	HT	7.61	8.14	7.05	7.78	7.14	−0.5
	Tx	63.47	62.44	64.88	63.57	62.29	−1.2
	HT + Tx	71.08	70.59	71.92	71.35	69.43	−1.6
	HHD	0.96	0.97	0.92	1.35	1.22	0.3
	PD	5.77	7.73	8.29	7.21	8.98	3.2
Newry	HT	6.73	8.7	9.22	8.56	10.2	3.5
	Tx	44.23	51.69	51.61	53.6	57.14	12.9
	HT + Tx	50.96	60.39	60.83	62.16	67.35	16.4
	HHD	2.81	3.23	3.7	3.95	3.24	0.4
	PD	8.89	8.14	5.35	4.76	5.14	−3.8
Norwch	HT	11.7	11.37	9.05	8.71	8.38	−3.3
	Tx	43.37	43.16	49.66	51.16	49.32	6.0
	HT + Tx	55.07	54.53	58.71	59.86	57.7	2.6

Table 13.7. Continued

Centre	Modality	2011	2012	2013	2014	2015	% change 5 years
	HHD	3.46	3.99	3.22	3.6	3.26	−0.2
	PD	10.27	9.38	8.63	8.63	8.1	−2.2
Nottm	HT	13.73	13.36	11.85	12.23	11.36	−2.4
	Tx	46.16	49.89	52.6	53.65	53.16	7.0
	HT + Tx	59.89	63.25	64.45	65.88	64.53	4.6
	HHD	1.02	1.13	1.53	0.97	1.01	0.0
	PD	7.22	6.27	7.2	5.68	6.33	−0.9
Oxford	HT	8.24	7.41	8.73	6.65	7.34	−0.9
	Tx	60.36	62.06	61.67	62.6	64.38	4.0
	HT + Tx	68.6	69.46	70.4	69.25	71.72	3.1
	HHD	1.19	1.65	1.3	1.71	1.48	0.3
	PD	10.71	8.25	7.78	7.26	7.38	−3.3
Plymth	HT	11.9	9.91	9.07	8.97	8.86	−3.0
	Tx	58.1	61.32	63.07	62.39	63.71	5.6
	HT + Tx	70	71.23	72.14	71.37	72.57	2.6
	HHD	0.21	0.54	1.54	2.55	3.13	2.9
	PD	6.66	5.63	5.44	4.91	4.26	−2.4
Ports	HT	6.87	6.18	6.97	7.46	7.39	0.5
	Tx	56.76	57.03	56.62	56.99	56.48	−0.3
	HT + Tx	63.63	63.2	63.6	64.45	63.87	0.2
	HHD	3.05	3.31	2.87	2.92	3.03	0.0
	PD	5.67	5.72	4.46	4.46	3.91	−1.8
Prestn	HT	8.72	9.03	7.33	7.38	6.94	−1.8
	Tx	49	49.88	51.79	52.34	53.69	4.7
	HT + Tx	57.72	58.91	59.12	59.72	60.64	2.9
	HHD	0.86	1.45	1.37	1.42	1.07	0.2
	PD	10.62	8.97	8.65	7.87	7.04	−3.6
Redng	HT	11.48	10.42	10.01	9.29	8.11	−3.4
	Tx	54.94	57.45	58.7	59.67	60.19	5.3
	HT + Tx	66.42	67.88	68.71	68.96	68.3	1.9
	HHD	1.91	2.07	2.43	1.84	1.56	−0.4
	PD	10.16	8.96	7.04	7.52	6.65	−3.5
Salford	HT	12.07	11.02	9.46	9.36	8.22	−3.9
	Tx	57.17	58.31	60.13	59.04	61.82	4.7
	HT + Tx	69.24	69.34	69.6	68.4	70.03	0.8
	HHD	2.82	2.58	2.75	2.95	3.16	0.3
	PD	5.3	5.66	5.66	4.94	4.78	−0.5
Sheff	HT	8.12	8.24	8.41	7.89	7.94	−0.2
	Tx	45.47	46.38	47.41	49.24	51.74	6.3
	HT + Tx	53.59	54.62	55.83	57.13	59.68	6.1
	HHD	3.02	4.41	5.04	4.39	6.33	3.3
	PD	8.79	10.05	8.06	7.8	7.24	−1.6
Shrew	HT	11.81	14.46	13.1	12.2	13.57	1.8
	Tx	43.72	41.67	44.08	44.39	45.7	2.0
	HT + Tx	55.53	56.13	57.18	56.59	59.28	3.8
	HHD	2.86	3.36	3.02	2.78	2.24	−0.6
	PD	3.3	3.36	4.24	2.42	1.56	−1.7
Stevng	HT	6.17	6.72	7.26	5.2	3.8	−2.4
	Tx	50.77	53.89	52.12	53.63	48.83	−1.9
	HT + Tx	56.94	60.61	59.38	58.83	52.63	−4.3

Table 13.7. Continued

Centre	Modality	2011	2012	2013	2014	2015	% change 5 years
	HHD	1.15	1.14	0.7	0.33	0.99	−0.2
	PD	6.92	5.32	6.27	6.62	5.61	−1.3
Sthend	HT	8.08	6.46	6.97	6.95	6.6	−1.5
	Tx	46.92	49.81	51.92	54.97	52.48	5.6
	HT + Tx	55	56.27	58.89	61.92	59.08	4.1
	HHD	2.32	3.76	2.96	3.79	3.49	1.2
	PD	11.17	11.28	11.2	10.13	8.9	−2.3
Stoke	HT	13.49	15.03	14.16	13.92	12.39	−1.1
	Tx	45.37	47.65	49.16	49.08	51.38	6.0
	HT + Tx	58.86	62.68	63.32	63	63.78	4.9
	HHD	0.91	0.85	0.42	0.4	0.59	−0.3
	PD	4.08	4.65	2.54	3.63	3.55	−0.5
Sund	HT	4.99	5.5	2.96	4.03	4.14	−0.9
	Tx	55.56	53.28	55.81	54.03	52.66	−2.9
	HT + Tx	60.54	58.77	58.77	58.06	56.8	−3.7
	HHD	3.32	3.36	2.38	4.61	4.05	0.7
	PD	7.13	8.46	6.89	6.26	6.98	−0.1
Swanse	HT	10.44	11.82	9.26	10.87	11.04	0.6
	Tx	48.77	50.5	54.04	54.37	51.91	3.1
	HT + Tx	59.21	62.31	63.3	65.25	62.95	3.7
	HHD	0.29	1.36	1.92	2.42	2.43	2.1
	PD	7.47	6.23	6.59	5.65	5.35	−2.1
Truro	HT	7.76	7.59	8.52	8.06	7.79	0.0
	Tx	49.14	52.03	52.47	54.57	55.47	6.3
	HT + Tx	56.9	59.62	60.99	62.63	63.26	6.4
	HHD	1.91	2.28	2.22	2.2	1.21	−0.7
	PD	1.44	3.2	2.67	1.76	2.43	1.0
Ulster	HT	3.35	5.48	4.89	3.96	3.64	0.3
	Tx	48.8	47.95	50.67	54.63	53.85	5.1
	HT + Tx	52.15	53.42	55.56	58.59	57.49	5.3
	HHD	1.39	2.2	2.17	1.31	1.23	−0.2
	PD	6.62	6.96	5.42	4.59	3.7	−2.9
West NI	HT	8.01	9.16	7.58	5.9	4.94	−3.1
	Tx	42.51	45.05	54.15	58.03	59.57	17.1
	HT + Tx	50.52	54.21	61.73	63.93	64.51	14.0
	HHD	0.23	0.93	2.38	1.76	2.98	2.8
	PD	9.51	7.42	7.58	4.85	4.36	−5.2
Wirral	HT	9.74	8.35	9.96	6.61	7.34	−2.4
	Tx	46.4	47.8	47.19	50	52.52	6.1
	HT + Tx	56.15	56.15	57.14	56.61	59.86	3.7
	HHD	2.58	3.21	3.12	3.62	4.05	1.5
	PD	11.43	14.1	12.46	11.43	11.43	0.0
Wolve	HT	14.01	17.31	15.58	15.05	15.48	1.5
	Tx	38.49	39.1	41.84	42.4	41.82	3.3
	HT + Tx	52.5	56.41	57.42	57.45	57.31	4.8
	HHD	0.43	0.41	0.79	0.36	1.38	1.0
	PD	8.7	9.13	8.66	10.71	12.8	4.1
Wrexm	HT	9.13	9.54	9.45	11.07	14.19	5.1
	Tx	53.04	51.04	51.57	48.93	48.79	−4.3
	HT + Tx	62.17	60.58	61.02	60	62.98	0.8

Table 13.7. Continued

Centre	Modality	2011	2012	2013	2014	2015	% change 5 years
	HHD	1.34	2.65	2.81	2.46	2.11	0.8
	PD	6.99	7.47	6.32	6.49	6.11	−0.9
York	HT	8.33	10.12	9.13	8.95	8.21	−0.1
	Tx	56.99	60.24	60.89	61.52	60.42	3.4
	HT + Tx	65.32	70.36	70.02	70.47	68.63	3.3
	HHD	1.68	1.98	2.05	2.05	2.02	0.3
	PD	7.35	7.11	6.62	6.35	6.05	−1.3
England	HT	9.03	9.09	8.67	8.4	8.07	−1.0
	Tx	49.28	50.08	51.5	52.28	52.54	3.3
	HT + Tx	58.31	59.17	60.17	60.68	60.62	2.3
	HHD	2.02	2.55	2.03	1.45	1.19	−0.8
	PD	5.11	5.43	5.3	3.9	5	−0.1
N Ireland	HT	7.13	7.97	7.33	5.35	6.19	−0.9
	Tx	47.01	49.23	52.65	56.74	58.54	11.5
	HT + Tx	54.14	57.2	59.97	62.09	64.72	10.6
	HHD	1.32	1.43	1.21	1.31	1.14	−0.2
	PD	5.66	5.22	4.92	4.38	4.59	−1.1
Scotland	HT	6.98	6.66	6.14	5.7	5.73	−1.3
	Tx	50.74	51.97	54.05	56.6	55.65	4.9
	HT + Tx	57.72	58.63	60.19	62.29	61.38	3.7
	HHD	2.78	2.66	2.73	3.19	2.94	0.2
	PD	7.65	7.24	6.34	6.54	7.03	−0.6
Wales	HT	10.43	9.9	9.07	9.73	9.96	−0.5
	Tx	52.49	53.92	55.51	54.95	55.38	2.9
	HT + Tx	62.92	63.82	64.58	64.68	65.34	2.4
	HHD	**1.72**	**1.98**	**2.01**	**2.04**	**1.97**	**0.3**
	PD	**7.17**	**6.92**	**6.44**	**6.14**	**5.95**	**−1.2**
UK	**HT**	**8.88**	**8.9**	**8.45**	**8.17**	**7.93**	**−1.0**
	Tx	**49.5**	**50.41**	**51.93**	**52.87**	**53.11**	**3.6**
	HT + Tx	**58.38**	**59.31**	**60.38**	**61.04**	**61.03**	**2.7**

HHD – home haemodialysis; PD – peritoneal dialysis; HT – home therapy; Tx – transplant
[a]Based on postcode of residency
[b]Cambridge was unable to submit patient level data for 2015 in time

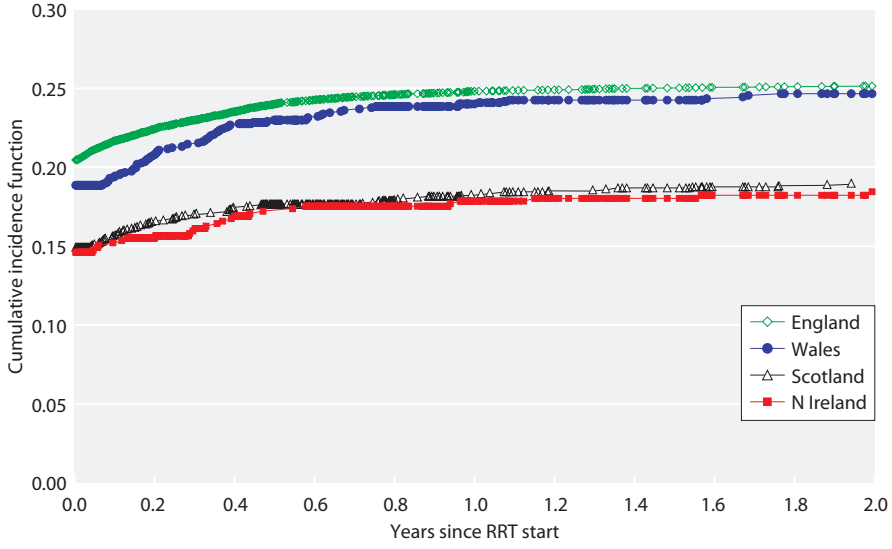

Fig. 13.18. Cumulative probability of starting PD since commencing RRT, by country, in the incident cohort 2011–2014, censoring at transplantation

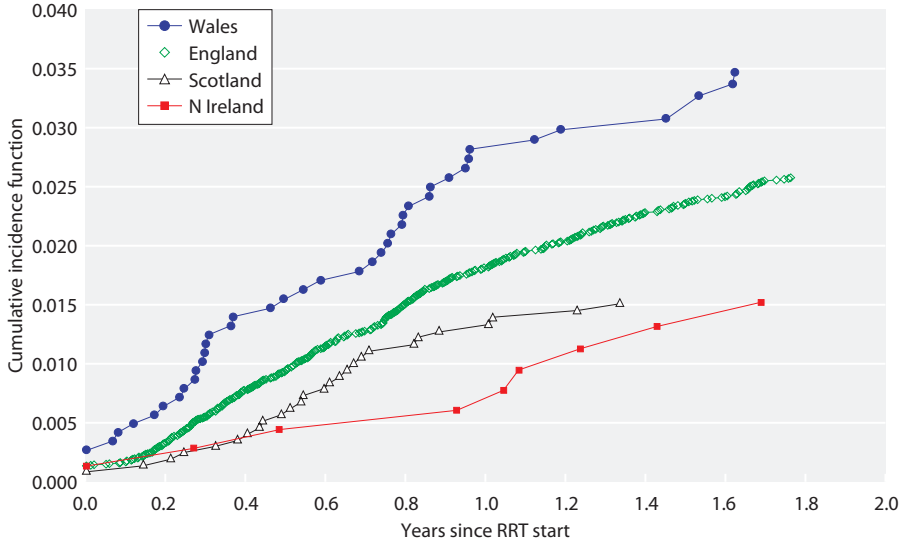

Fig. 13.19. Cumulative probability of starting HHD since commencing RRT, by country, in the incident cohort 2011–2014, censoring at transplantation

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UK Renal Registry 19th Annual Report: Appendix A The UK Renal Registry Statement of Purpose

A:1 Executive summary

1.1 The UK Renal Registry (UKRR) was established by the Renal Association to act as a resource in the development of patient care in renal disease.

1.2 The UKRR acts as a source of comparative data for audit, benchmarking, planning, quality improvement, policy and research. The collection and analysis of sequential biochemical and haematological data is a unique feature of the UKRR.

1.3 The UK Renal Registry Database System Specification (UKRR DSS) defines the data items that are required to be sent from participating renal centres for analysis by the UKRR.

1.4 Data is collected quarterly to maintain centre-level quality assurance, with the results being published in an annual report.

1.5 Core activity is funded from commissioning agencies by a capitation fee per renal patient.

1.6 As part of its core activities, the UKRR provides data to hospital trusts, commissioning authorities and the European Renal Association – European Dialysis and Transplant Association (ERA–EDTA) Registry.

1.7 The development of the UKRR is open to influence from all interested parties, including clinicians, hospital trusts, commissioning authorities, patient groups, researchers and academics.

1.8 The UKRR is non-profit making and has a registered charitable status through the Renal Association.

A:2 Introduction

2.1 Registry-based national specialty comparative audit is one of the cornerstones of NHS development. The Renal National Service Framework (NSF), published in two sections in 2004 and 2005, recommended the participation of all renal centres in comparative audit through the UKRR.

2.2 The chief executives of hospital trusts are responsible for clinical governance and audit is an essential part of that agenda [1].

2.3 Demographic information on patients receiving renal replacement therapy (RRT) throughout Europe was collected from 1965 in the registry of the ERA-EDTA. This voluntary exercise was conducted on paper and by post, demanded considerable effort and time from participating centres and eventually proved impossible to sustain. Latterly, the incompleteness of UK data returns to

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the ERA-EDTA made it impossible to build a picture of the activity of RRT in the UK for planning and policy purposes. Subsequently, national data collections from England and Wales were solicited from renal centres in 1992, 1996, 1999, 2002 and 2004 to fill this gap. The UKRR published its first report in 1998 and through its quarterly returns has established a system to place routine data collection and analysis on a permanent basis. The next stage is in progress incorporating data from the earlier stages of chronic kidney disease and acute kidney injury.

2.4 Together with the need to know demographic and structural elements, the NHS has developed a need to underpin clinical activity more rigorously through the scientific evidence base (for example, the Cochrane Initiative) and by quality assurance activity through audit. These initiatives require comprehensive information about the structures, processes and outcomes of RRT, which go well beyond the detail previously compiled by the ERA-EDTA.

2.5 The UKRR is recognised as one of the very few high quality clinical databases available for general use [2]. The collection of data by download of electronic records from routine clinical databases, has been highly successful and is being imitated worldwide.

2.6 The Renal Association publishes guidelines in renal Clinical Standards documents. It was apparent during the development of the standards that many of the desirable criteria of clinical performance were uncertain or unknown and that only the accumulated data of practicing renal centres could provide the evidence for advice on best practice and what might be achievable. A common data registration provides the simplest device for such an exercise. The data currently gathered audits a proportion of the Renal Association standards, partly due to some data items required not being available in the dataset and partly due to data not being either completed in or extracted from renal systems. The dataset is subject to regular review and a drive is required for more complete data returns by renal centres.

2.7 It can be seen that the need for a RRT registry developed for a variety of reasons: international comparisons, national planning, local trust and health authority management, standard setting, audit and research. The opportunity for data gathering arises partly from improvements in information technology. Although it was possible to see the need for a national renal database over 25 years ago, the circumstances have become ideal for the maintenance of a data repository, supported by the clinical users and resourced for national benchmarking as a routine part of RRT management.

2.8 The provisional expectations of the earlier UKRR Annual Reports can now be replaced by confident assertions, built on the experience of eighteen years of publication, about the role and potential of the UKRR. The integration of the various elements of Renal Association strategy is being pursued through the Clinical Affairs Board (CAB) and Academic Affairs Board (AAB).

A:3 Statement of intent

The UKRR provides a focus for the collection and analysis of standardised data relating to the incidence, clinical management and outcome of renal disease. Data will be accepted quarterly by automatic downloading from renal centre databases. There will be a core dataset, with optional elements of special interest that may be entered by agreement for defined periods. A report will be published annually to allow a comparative audit of facilities, patient demographics, quality of care and outcome measures. Participation is mandated in England through the recommendation in the Renal National Service Framework and the NHS Commissioning document A06 Renal Dialysis. During the earlier years of the UKRR there was a focus on RRT, including transplantation, this now extends to other areas of nephrology. The UKRR provides an independent source of data and analysis on national activity in renal disease.

A:4 Relationships of the UK Renal Registry

4.1 The UKRR is a registered charity through the Renal Association (No. 2229663). It was established by a committee of the Renal Association, with additional representation from the British Transplantation Society, the British Association for Paediatric Nephrology, the Scottish Renal Registry, Wales and Northern Ireland. The UKRR maintains links

with the Department of Health, the National Kidney Federation (NKF), Kidney Care UK (formerly the British Kidney Patient Association (BKPA)), the Royal Colleges, the Association for Clinical Biochemistry and Health and Social Care Commissioners.

4.2 A number of sub-committees were instituted as the database and renal centre participation developed, in particular for data analysis and interpretation for inclusion in the annual reports. Further specialised panels may be developed for publications and the dissemination of UKRR analyses.

4.3 The Scottish Renal Registry sends data to the UKRR for joint reporting and comparison.

4.4 The return of English, Welsh and Northern Irish data to the EDTA-ERA Registry will be through the UKRR. The Scottish Renal Registry already sends data directly to the EDTA-ERA Registry.

4.5 A paediatric database has been developed in collaboration with the UKRR. The two databases are in the process of being integrated, which will allow long-term studies of renal cohorts over a wide age range.

4.6 Close collaboration with NHS Blood and Transplant gives joint benefits. Data aggregation and integration has led to joint presentations and publications. The description of the entire patient pathway in RRT by this means is a source of continuing insight and usefulness.

4.7 The retention of patient identifiable information, necessary in particular for the adequate tracing of patients, has been approved by the Health Research Authority's Confidentiality Advisory Group (CAG). This is renewed on an annual basis along with audit of the information governance arrangements within the UKRR through completion of NHS Digital's Information Governance Toolkit.

A:5 The role of the UK Renal Registry for patients

5.1 The goal of the UKRR is to improve care for patients with renal disease. The appropriate use of UKRR information should improve equity of access to care, adequacy of facilities, availability of important but high cost therapies and the efficient use of resources. The continuing comparative audit of the quality of care should facilitate the improvement of care and treatment outcomes.

5.2 A patient leaflet and poster produced in collaboration with the NKF and Kidney Care UK are available on the UKRR website (www.renalreg.org), explaining how patients may opt out of the collection of identifiable data by the UKRR if they wish. This was renewed in 2016 as part of the UKRR's CAG submission. Patient opt out remains low.

5.3 Information from the UKRR complements the records available on 'PatientView' www.patientview.org.

5.4 A patient council has been convened. The role of the Patient Council is to:

- Act as representatives for kidney patients and their carers.
- Guide and influence methods of delivery of care.
- Advise on opportunities for new work ideas and initiatives for the UKRR.
- Contribute to the development of new audit, research and survey proposals.
- Provide an arena that will encourage discussions between patients and clinical teams to promote patient involvement at renal centre, regional and national levels.
- Monitor and review patient facing initiatives recommended by the Department of Health.
- Review applications and contribute towards the production of patient leaflets, posters, reports and other patient information products developed by the Renal Association.
- Support the UKRR in issues relating to information governance and patient consent.
- Use personal networks to spread awareness of the UKRR and its work with the council.
- Represent the Patient Council and the UKRR at other external meetings.

A:6 The role of the UK Renal Registry for nephrologists

6.1 The clinical community have become increasingly aware of the need to define and understand their activities, particularly in relation to national standards and in comparison with other renal centres.

6.2 In 2013, the UKRR Committee was disbanded and the UKRR is now governed by the Renal Information Governance Board of the Renal Association.

6.3 The Renal Standards documents are designed to give a basis for centre structure and performance, as well as patient-based elements such as case mix

and outcomes. It is anticipated that Standards will become increasingly based on research evidence.

6.4 The UKRR data are available to allow the comparative review of many elements of renal centre practice. Centre data are presented to allow a contrast of individual centre activity and results against national aggregated data. Sophisticated analyses of patient survival for example, are a unique resource to exclude any anomalies of performance and standardise for centre caseload.

6.5 Reports of demographic and treatment variables are available to the participating centres for distribution to hospital trusts, strategic health authorities and commissioners, as well as renal networks, as required and agreed with the centre. Reports should facilitate discussion between clinicians, Trust officers and commissioners.

6.6 The UKRR welcomes suggestions for topics of national audit or research that colleagues feel are of sufficiently widespread interest for the UKRR to undertake.

6.7 The database has been designed to provide research facilities and for future participation in national and international trials. Members of the Renal Association and other interested parties are welcome to apply to the UKRR to conduct local or national audit and research using the database, further information is available at www.renalreg.org/about-us/working-with-us/. All such projects will need the agreement of the UKRR study group concerned and any costs involved may need to be met by the applicants.

6.8 These facilities will be sustainable only through cooperation between nephrologists and the UKRR. There is a need for high-quality and comprehensive data entry at source.

6.9 Centres will need to develop an 'annual informatics plan', to review the maintenance and improvement of data collection, organisation and returns to the UKRR. This will help maintain the accuracy, timeliness and completeness of clinical data and also in parallel, support the career development of informatics staff.

A:7 The role of the UK Renal Registry for trust managers

7.1 As the basis of the clinical governance initiative, the gathering and presentation of clinical data are regarded as essential parts of routine patient management in the health service.

7.2 One of the principles of health service informatics is that the best data are acquired from clinical information recorded at the point of health care delivery.

7.3 Renal services data entered on local systems by staff directly engaged with patients are likely to be of the highest quality and it is these that the UKRR intends to capture.

7.4 The UKRR provides a cost-effective source of detailed information on renal services.

7.5 The regular reports of the UKRR supply details of patient demographics, treatment numbers, treatment quality and outcomes. Data are compared with both national standards and national performance, for benchmarking and quality assurance. The assessment of contract activity and service delivery is possible through these data returns, without the need for further costly hospital trust or commissioner administrative activity. These data should be particularly valuable to contracts managers and those responsible for clinical governance.

7.6 Data are available on centre case mix, infrastructure and facilities.

7.7 Work is progressing on the data capture and analysis from patients with renal disease other than those requiring RRT and will become available in time (e.g. chronic kidney disease and acute kidney injury).

A:8 The role of the UK Renal Registry for commissioners of health care

8.1 Commissioners have confirmed the powerful role accurate data plays in their decisions.

8.2 Schedule 2 of the Renal Dialysis Service Specification states '***The provider will ensure that the required patient, activity and outcomes data are provided in accordance with the requirements of the UKRR***'.

8.3 The UKRR provides validated, comparative reports of renal centre activity on a regular basis to participating centres. These allow assessment of centre performance across a wide range of variables relating to structure, process and outcome measures.

8.4 There are economies of scale in the performance of audit through the UKRR, since multiple local audits are not required.

8.5 The incidence of RRT treated locally, mortality and renal transplant rates should also be of interest. The assessment of referral and treatment patterns of patients with established (end stage) renal failure by postcode analysis indicates the geographical origin. This information also allows the expression of differences relating to geography, ethnicity and social deprivation. These data may also identify potential unmet need in the population and permit assessment on the equity of service provision. In the future, the UKRR database should also provide information on nephrology and pre-dialysis patients (CKD). This will allow a prediction of the need for RRT facilities, as well as indicating the opportunities for beneficial intervention.

8.6 UKRR data are used to track patient incidence and prevalence rates over time, which allows the modelling of future demand and the validation of these predictions.

8.7 Information on the clinical diagnosis of new and existing RRT patients may help identify areas where possible preventive measures may have maximal effect.

8.8 The higher acceptance rates in the elderly, and the increasing demand from ethnic groups due to a high prevalence of renal, circulatory and diabetic disease, are measurable.

8.9 Comparative data are available in all categories for national and regional benchmarking.

8.10 The UKRR offers independent expertise in the analysis of renal services data and their interpretation, a resource that is widely required but difficult to otherwise obtain.

8.11 In 2017 the cost of supporting the UKRR core work on RRT, AKI, CKD audit and PatientView will be £30 per registered RRT patient per annum, which is less than 0.08% of the typical cost of a dialysis patient per annum. It is expected that this cost will need to be made explicit within the renal services contract.

A:9 The role of the UK Renal Registry for national quality assurance agencies

9.1 The UKRR audit is listed as an audit of the Healthcare Quality Improvement Partnership national clinical audit programme.

9.2 The demographic, diagnostic and outcomes data can support the investigation of clinical effectiveness.

9.3 The case mix information and comorbidity data that would allow better assessment of survival statistics remains incomplete. There is also some clinical scepticism whether 'correction' of outcome data would reflect the realities of clinical practice.

A:10 References

1 Black N. Clinical governance: fine words or action? *Br Med J* 1998;316:297–8

2 Black N. High-quality clinical databases: breaking down barriers [Editorial]. *Lancet* 1999;353:1205–6

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UK Renal Registry 19th Annual Report: Appendix B Definitions and Analysis Criteria

B:1 Definition of the incident population

The incident population is defined as all patients over 18 who started renal replacement therapy (RRT) at UK renal centres and did not have a recovery lasting more than 90 days within 90 days of starting RRT.

The treatment timeline is used to define incident patients as follows.

If a patient has timeline entries from more than one centre then these are all combined and sorted by date. Then, the first treatment entry from any centre gives the first date when they received RRT. This is defined as a 'start date'. However, in the following situations there is evidence that the patient was already receiving RRT before this 'start date' and these people are not classed as incident patients:

- patients with an initial entry on the timeline of transferred in (modality codes 39 to 69)
- those with an initial entry of transferred out (modality code 38)
- those with an initial treatment of lost to follow up (modality code 95)
- those who had graft acute rejection (modality code 31) and did not have a transplant on the same day
- those with an initial entry of transfer to adult nephrology (modality code 37)
- those with an initial entry of graft functioning (modality code 72)
- those with an initial entry of nephrectomy transplant (modality code 76)

Where none of the above apply, the patient is defined as an incident patient (providing there is no recovery of more than 90 days within 90 days of the start date).

If there is a recovery lasting more than 90 days which begins **more** than 90 days after starting RRT then the program looks at the modality codes after this date to see if the patient restarted RRT. If they did, then this second (or third etc.) starting point is defined as their take-on date. This definition is different to that used up to the 17th Annual Report. In those previous reports a person could be counted as an incident patient two (or more) times. For example, a patient may start RRT in 2010, recover and then restart RRT in 2011. Providing that they do not have a recovery lasting more than 90 days within 90 days of start on either occasion, such patients would have been counted twice in previous years but since the 18th Annual Report they are only counted as an incident patient in 2011 in the example given.

See section B:4 'Start of established renal failure' below for information on 'acute' codes such as 81 'acute haemodialysis'.

Provided the UK Renal Registry (UKRR) received a modality code 36 from the work-up centre, pre-emptive transplants are allocated as incident patients of the work-up centre and not of the centre where the transplant took place.

Note: patients restarting dialysis after a failed transplant are not counted as incident patients.

B:2 Definition of the prevalent population for each year

The adult prevalent population for a year is defined as all RRT patients over 18, being treated at centres returning data to the UKRR for that year and who were alive on

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31 December of that year. It includes both incident patients for that year and patients who had been on treatment for longer. Note that any patients over 18 still being treated at paediatric centres are excluded.

Patients who had transferred out, recovered function, stopped treatment without recovery of function or been lost to follow up before the end of the quarter are excluded.

When quarterly data are received from more than one centre (often when there is joint care of renal transplant recipients between the referring centre and the transplant centre) the patient is only included under one of these. The centre to be used is defined by the steps below (as many steps as necessary are followed in this order until data is only left from one centre):

a) the treatment timeline is used to eliminate any centre(s) which the patient was not still at, at the end of the quarter.
b) a centre with biochemistry data (at least 1 of the 6 fields: creatinine, haemoglobin, albumin, aluminium, serum potassium, urea) is favoured over one without.
c) a centre with quarterly modality of transplant is favoured over one without.
d) non-transplanting centres are favoured over transplanting centres.
e) the centre with the most of the six biochemistry fields (listed above) populated is favoured.
f) if the above steps do not decide between centres (unusual) then the choice is made based on the sort order of the centre codes.

In some situations (generally where timeline data is seen to be inaccurate/incomplete) then the centre used is set manually on an ad hoc basis.

Further exclusions when analysing quarterly biochemistry or blood pressure data

For these analyses, further restrictions are made to the prevalent cohort for each quarter.

Patients who had 'transferred in' to the centre in that particular quarter are excluded.

Patients who had changed treatment modality in that particular quarter are excluded.

Patients who had been on RRT for less than 90 days are excluded.

Note: the length of time on RRT is calculated from the most recent start date (i.e. the point at which they are defined as an incident patient using the new (from 18th Annual Report) definition – see above). So if a patient starts, then recovers and then starts again, this second start date is used. Also, for patients who are not defined as incident patients because their start date is unknown (for example, if their first timeline entry is a transfer in code) it is assumed that they have been on RRT for longer than 90 days and they are included for every quarter.

B:3 Statistical definitions

Death rate calculation

A death rate per 100 patient years is calculated by counting the number of deaths and dividing by the person years exposed. This includes all patients, including those who died within the first three months of therapy. The person years at risk are calculated by adding, for each patient, the number of days at risk (until they died or transferred out) and dividing by 365.

Odds ratio

This is the odds of an event in one group divided by the odds in a reference group. For example, if the event is death (within a certain time) and phosphate groups are being compared, then for phosphate group 1.8 to 2.1 mmol/L the odds of the event are:

$$\frac{\text{(probability of dying for someone with a phosphate of 1.8–2.1 mmol/L)}}{\text{(probability of surviving for someone with a phosphate of 1.8–2.1 mmol/L)}}$$

The odds ratio is then:

$$\frac{\text{(odds of dying if phosphate 1.8–2.1 mmol/L)}}{\text{(odds of dying for reference group)}}$$

Note that when the event being analysed is death, often the odds ratio would not be used but a 'survival analysis' used instead. This takes into account the time when the event occurs and also allows for censoring (for example if people are lost to follow up). Such an analysis gives hazard ratios (see below) rather than odds ratios.

Hazard function

The hazard function is the probability of dying in a short time interval, conditional on survival up to that point.

Hazard ratio

For the same example as above, the hazard ratio is the:

$$\frac{\text{(probability of dying in the next interval for a phosphate of 1.8–2.1 mmol/L)}}{\text{(probability of dying in the next interval for a phosphate in the reference range)}}$$

Funnel plots

Percentages achieving Renal Association and other standards are displayed in several ways in the annual report. Caterpillar plots show the percentage meeting the targets along with 95% confidence intervals (CIs) for each centre and overall. Funnel plots show the percentage meeting the target plotted against the size of the centre (the number of people with a measurement). 'Funnels' are plotted around the average percentage meeting the target. Any centres which fall outside the funnels are significantly different from the average. The funnel shape of the limits reflects the fact that for smaller centres, for which the percentage meeting the target is less reliably estimated, a greater observed difference from the average is required for it to be statistically significantly different.

In survival analysis the funnel plot methodology is similar except that the funnel plots show the percentage survival plotted against the size of the centre (the number of patients in the cohort) and 'funnels' are plotted around the average survival. Survival for any centres falling outside the 95% confidence intervals is therefore significantly different from the average survival.

B:4 General and modality definitions

Definitions of analysis quarters

Quarter	Dates
1	1 January–31 March
2	1 April–30 June
3	1 July–30 September
4	1 October–31 December

The quarterly biochemistry data are extracted from renal centre systems as the last data item stored for that quarter. If the patient treatment modality was haemodialysis, the software should try to select a pre-dialysis value (unless otherwise specified in the data specification).

Home haemodialysis

Home haemodialysis patients cease to be classed as such if they need longer than two weeks of hospital dialysis when not an inpatient.

Satellite dialysis unit

A renal satellite unit is defined as a haemodialysis facility that is linked to a main renal centre, is not autonomous for medical decisions and provides chronic outpatient maintenance haemodialysis but with no acute or inpatient nephrology beds on site.

Start of established renal failure

Established renal failure (also known as end stage renal failure or end stage renal disease) was defined as the date of the first dialysis (or of pre-emptive transplant).

A patient starting RRT on 'chronic' haemodialysis should be entered on the UKRR timeline on the date of the first HD episode.

If a patient started RRT with an episode of acute (or acute-on-chronic) kidney injury in which it was felt that kidney function had potential to recover, then acute haemodialysis (or acute haemofiltration or acute peritoneal dialysis where appropriate) should be entered on the UKRR timeline. If subsequently it is felt that kidney function is no longer likely to recover, a timeline modality should be added of 'chronic dialysis' at the time when this becomes apparent (accepting that the timing of this change will vary between clinicians). The UKRR will interrogate the timeline of patients starting 'chronic' RRT and if there is evidence of recent 'acute' RRT, will backdate the date of start of RRT to the first episode of 'acute' RRT provided there has been less than 90 days recovery of kidney function between acute and chronic episodes.

If a patient was started on dialysis and dialysis was temporarily stopped for less than 90 days for any reason (including access failure and awaiting the formation of further access), the date of start of RRT in UKRR analyses remained the date of first dialysis.

The date of start of peritoneal dialysis is defined as the date of first PD fluid exchange given with the intention of causing solute or fluid clearance. This is in contrast with a flush solely for confirming or maintaining PD catheter patency. In general, exchanges which are part of PD training should be considered as the start of PD (unless earlier exchanges have already been given). However, if it is not planned that the patient starts therapy until a later date, exchanges as part of PD training need not necessarily be considered the start of RRT.

Change of modality from PD to HD

Sites are requested to log in their timeline changes from PD to HD if the modality switch is for longer than 30 days.

Date first seen by a nephrologist

This is the date the patient first attended clinic or was an inpatient under the care of a dialysing nephrologist (whichever is the earlier). If a patient transfers into a renal centre from another renal centre then this date should be left blank by the new renal centre.

Date of CKD5

When a patient has two eGFRs recorded as <15 ml/min/1.73 m^2 over a time period of greater than three months apart without an intervening eGFR >15, then the earlier of these two dates is defined as the date the patient reached CKD5.

If the patient dies or goes onto RRT within the three month period of eGFR reaching <15, then the date of eGFR <15 is still the date of CKD5.

B:5 Comorbidity definitions

Angina

History of chest pain on exercise with or without ECG changes, ETT, radionucleotide imaging or angiography.

Previous MI within last three months

Detection of rise and/or fall of a biomarker (CK, CK-MB or Troponin) with at least one value above the 99th percentile together with evidence of myocardial ischaemia with at least one of either:

(a) ischaemic symptoms,
(b) ECG changes indicative of new ischaemia (new ST-T changes or new left bundle branch block),
(c) development of pathological Q waves,
(d) imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

This definition is from the European Society of Cardiology and American College of Cardiology.

Previous MI >3 months ago

Any previous MI at least three months prior to start of renal replacement therapy.

Previous CABG or coronary angioplasty

Previous episode of heart failure

Whether or not due to fluid overload.

Cerebrovascular disease

Any history of strokes (whatever cause) and including transient ischaemic attacks caused by carotid disease.

Diabetes (not causing established renal failure)

This includes diet controlled diabetics.

Chronic obstructive pulmonary disease

Chronic obstructive pulmonary disease (COPD) is characterised by airflow obstruction. The airflow obstruction is usually progressive, not fully reversible and does not change markedly over several months.

- Airflow obstruction is defined as a reduced FEV1 (forced expiratory volume in 1 second) and a reduced FEV1/FVC ratio (where FVC is forced vital capacity), such that FEV1 is less than 80% predicted and FEV1/FVC is less than 0.7.
- The airflow obstruction is due to a combination of airway and parenchymal damage.
- The damage is the result of chronic inflammation that differs from that seen in asthma and which is usually the result of tobacco smoke.

There is no single diagnostic test for COPD. Making a diagnosis relies on clinical judgement based on a combination of history, (exertional breathlessness, chronic cough, regular sputum production, frequent winter 'bronchitis', wheeze) physical examination and confirmation of the presence of airflow obstruction using spirometry, (source: British Thoracic Society guidelines).

Liver Disease

Persistent enzyme evidence of hepatic dysfunction or biospy evidence or HbeAg or hepatitis C antigen (polymerase chain reaction) positive serology.

Malignancy

Defined as any history of malignancy (even if curative) e.g. removal of melanoma, excludes basal cell carcinoma.

Claudication

Current claudication based on a history, with or without Doppler or angiographic evidence.

Ischaemic / neuropathic ulcers

Current presence of these ulcers.

Angioplasty, stenting, vascular graft (all non coronary)

This category now includes vascular grafts (e.g. aortic bifurcation graft) and renal artery stents.

Amputation for peripheral vascular disease

Smoking

Current smoker or history of smoking within the last year.

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UK Renal Registry 19th Annual Report: Appendix C Renal Services Described for Non-physicians

This appendix provides information on the issues discussed in this report, background information on renal failure and discusses the services available for its treatment.

The role of the kidneys

1.1 The kidneys are paired organs located behind the abdominal cavity. Their primary function is to produce urine, which allows the removal of metabolism-related waste products from the blood. The kidneys also have a role in controlling fluid balance, blood pressure, red blood cell production and the maintenance of healthy bones.

Kidney diseases

1.2 At least 13,000 people die from kidney (renal) disease in the UK each year, although this is an underestimation as many deaths of patients with renal failure are not recorded as such in mortality statistics. Kidney diseases can occur suddenly ('acute') or over months and years ('chronic'). Chronic kidney disease is relatively common, with the majority of patients being elderly and having mild impairment of their renal function.

Acute kidney injury

1.3 Acute kidney injury (AKI) has replaced the previous term 'acute renal failure'. AKI, which is often a reversible process, occurs when there is a rapid loss of renal function due to kidney damage. The causes of AKI can be divided into three categories: pre-renal (interference with the renal blood supply), intrinsic (damage to the kidney itself) and post-renal (obstructive causes in the urinary tract). Some patients with AKI require dialysis for a few days or weeks until their renal function improves, although a small proportion of individuals never recover kidney function. AKI normally occurs in the context of other illness and patients are often unwell; approximately 50% of patients with AKI who receive dialysis do not survive.

Chronic kidney disease (CKD) and established renal failure (ERF)

1.4 Chronic kidney disease affects approximately three million people in theUK and occurs because of slow damage to the kidneys over a number of months or years. The incidence increases with age and is higher in certain ethnic groups, such as people of South Asian and African descent. In the initial stages of CKD, patients are usually well and there is little to find on clinical examination. Early abnormal findings may include blood (haematuria) and protein (proteinuria) in the urine or elevated blood pressure (hypertension). However, the lack of symptoms means many patients present to medical services with advanced disease. In the latter stages of CKD, patients may complain of tiredness, a loss of appetite, feeling sick (nausea) and itching

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(pruritus). Other symptoms, such as ankle swelling (oedema), may be present depending on the underlying condition causing CKD.

1.5 Other terms used for chronic kidney disease include chronic renal impairment, chronic renal insufficiency and chronic renal failure. Established renal failure (ERF) refers to kidney function that has deteriorated to a level where treatment is required to sustain life. Treatment options include dialysis and renal transplantation but some patients decide not to receive dialysis and opt for conservative management. Conservative care involves input from specialist nurses and palliative care services, and focuses on treating the complications of kidney disease and managing symptoms.

Causes of CKD

1.6 Most renal diseases that cause renal failure fall into one of five categories

1. Generalised (systemic) disease. Diabetes mellitus is by far the most common systemic disease that affects the kidneys (around 20% of all renal disease). Diabetic patients often develop progressive kidney damage over many years, particularly if blood glucose levels and blood pressure are poorly controlled. Careful lifelong supervision of diabetes has a major impact in preventing kidney damage. Other systemic diseases that can cause kidney damage include auto-immune conditions (e.g. systemic lupus erythematous and vasculitis), amyloidosis and multiple myeloma.
2. Glomerulonephritis. This term describes conditions that damage the glomeruli (the filtering units of the kidneys that start the process of urine formation). There are many different causes of glomerulonephritis and treatment depends on the form of the disease. Some types of glomerulonephritis are relatively benign and unlikely to progress to established renal failure. Other forms are more aggressive with treatment making only a small impact on disease progression and the development of established renal failure.
3. High blood pressure (hypertension). Severe ('accelerated') hypertension causes chronic kidney disease, but early recognition and treatment of high blood pressure can halt (and to some extent reverse) the associated kidney damage. Hypertension is a common cause of renal failure in patients of African origin.
4. Obstruction. CKD can be a consequence of any pathology that obstructs the free flow of urine through the urinary system. Most often obstruction is secondary to enlargement of the prostate gland in elderly men, but other causes include kidney stones, bladder tumours, and congenital abnormalities of the renal tract.
5. Genetic disease. The commonest genetic disease causing CKD is polycystic kidney disease. This condition, along with many rare inherited diseases affecting the kidneys, accounts for about 8% of all kidney failure in the UK.

Prevention and management

1.7 Within theUK, risk factors for CKD, such as diabetes, obesity and hypertension are becoming more common. Consequently, the NHS is increasingly focusing on the prevention, early detection and treatment of CKD. Although many of the diseases causing CKD are not preventable, their recognition is important to allow appropriate treatment of any complications and preparation for renal replacement therapy. Some diseases, such as urinary obstruction, may be reversible to some extent and intervention is appropriate. Good diabetic control and blood pressure management may halt the rate of future renal function decline.

1.8 Clear guidelines are in place for the management of CKD by both general practitioners and hospital kidney specialists (nephrologists) [1]. Currently there is no general population screening for renal disease; instead, targeted screening of patients groups 'at-risk' of renal disease, such as diabetic or hypertensive patients, occurs. This normally involves testing the urine for the presence of blood or protein, plus blood tests for the level of substances normally excreted by the kidney such as creatinine and urea.

Complications and comorbidity

1.9 Patients with chronic kidney disease often have accompanying illnesses (comorbidities). Some are

due to the primary disease, e.g. diabetes may cause blindness and diseases of the nerves and blood vessels. Others, such as anaemia, bone disease and heart failure, are consequences of the renal failure. In addition, many patients with established renal failure, have diseases affecting the heart and blood vessels (vascular) particularly ischaemic heart disease and peripheral vascular disease. Comorbidity can influence the choice of treatment for renal failure and may reduce its benefits. Early and aggressive management of CKD-related complications, such as bone mineral abnormalities (hyperparathyroidism), may reduce the incidence of vascular disease.

Renal replacement therapy

1.10 The term renal replacement therapy (RRT) encompasses the three treatments used in established renal failure: haemodialysis, peritoneal dialysis and kidney transplantation. Both forms of dialysis remove waste products from the blood, but the other complications of established renal failure, such as anaemia and abnormal bone metabolism (hyperparathyroidism), require treatment with medications. Patients, usually (but not always) under 70 years of age, may undergo kidney transplantation as a form of treatment. If successful, a kidney transplant returns an individual to good health and removes the need for dialysis.

Renal dialysis

1.11 Dialysis involves the removal of waste products from the blood by allowing these products to diffuse across a thin membrane into dialysis fluid, which is then discarded along with the toxic waste products. The fluid is chemically composed to draw or 'attract' excess salts and water from the blood to cross the membrane, without the blood itself being in contact with the fluid.

Haemodialysis

1.12 The method first used to achieve dialysis was the artificial kidney, or haemodialysis. This involves the attachment of the patient's circulation to a machine through which fluid is passed and exchange can take place. A disadvantage of this method is that some form of permanent access to the circulation must be produced to be used at every treatment. The majority of patients on haemodialysis receive three four-hour sessions a week, at either a hospital-based dialysis centre or a community-based unit (satellite unit) away from the main renal centre. A small number of patients perform their own dialysis at home (home haemodialysis) and the number and duration of treatments will vary.

Peritoneal dialysis

1.13 An alternative form of dialysis is peritoneal dialysis, most commonly in the form of continuous ambulatory peritoneal dialysis (CAPD). In this technique, dialysis fluid is inserted, via a plastic tube (catheter), into the peritoneal cavity (which lies around the bowel) for approximately six hours before being removed and replaced. The fluid must be sterile in order to avoid infection and inflammation of the peritoneum (peritonitis), which is the main complication of the treatment. Each fluid exchange takes 30 to 40 minutes to perform and is repeated three or four times daily.

Renal transplantation

1.14 Renal transplantation replaces all the kidneys' functions, so erythropoietin and vitamin D supplementation are unnecessary. Transplantation involves the placement of a single kidney in the pelvis, close to the bladder, to which the ureter is connected. The immediate problem is the body's immune system recognising the new organ as foreign tissue – a process known as rejection. Consequently, all patients receiving a kidney transplant require anti-rejection drugs, such as tacrolimus, cyclosporine and mycophenolate mofetil, for the lifetime of the transplant. These drugs, known as immunosuppressants, have many undesirable side effects, including the acceleration of vascular disease, increased risk of infection and higher rates of cancer (malignancy). This often means

that myocardial infarctions and strokes are commoner in transplant patients than in healthy individuals of the same age. As transplants get older, there is a progressive loss of function due to chronic rejection (chronic allograft nephropathy). The average lifespan of a kidney transplant is between 10 and 15 years, which means some younger patients, will receive more than one transplant during their lifetime, often with periods of dialysis in-between.

1.15 For many patients, renal transplantation, from both live and deceased donors, is the best treatment in terms of survival and quality of life. Unfortunately, despite changes in policy and legislation there remains a shortage of kidneys for transplant; it appears likely that whatever social and medical structures are present, there will inevitably be a shortage of kidneys from humans.

Nature of renal services

1.16 The work of a nephrologist includes the early detection and diagnosis of renal disease and the long-term management of its complications such as high blood pressure, anaemia and bone disease. The nephrologist may share the management with the general practitioner or local hospital physician; relying on them to refer patients early for initial diagnosis and specific treatment. At any one time, perhaps only 5% of patients under their care are inpatients in wards with a further 20% attending the renal centre regularly for haemodialysis. However, inpatient nephrology and the care of patients receiving centre-based dialysis are specialised, complex and require experienced medical advice to be available on a 24 hour basis. Other renal work is sustained on an outpatient basis; this includes renal replacement therapy by dialysis and the care of transplant patients.

1.17 There are six major components to renal medicine.

1. Renal replacement therapy. The most significant element of work relates to the preparation of patients with advanced CKD for RRT and their medical supervision for the remainder of their lives. The patient population will present increasing challenges for renal staffing as more elderly and diabetic patients are accepted for treatment.
2. Emergency work. The emergency work associated with the specialty consists of:
   i. Treatment of acute renal failure, often involving multiple organ failure and acute-on-chronic renal failure. Close co-operation with other medical specialties, including critical care, is therefore a vital component of this aspect of the service.
   ii. Management of medical emergencies arising from an established renal failure programme. This workload is expanding as the number, age and comorbidity of patients on renal replacement therapy increases.
3. Routine nephrology. A substantial workload is associated with the immunological and metabolic nature of renal disease which requires investigative procedures in an inpatient setting. It is estimated that ten inpatient beds per million of the population are required for this work.
4. Investigation and management of fluid and electrolyte disorders. This makes up a variable proportion of the nephrologists work, depending on the other expertise available in the hospital.
5. Outpatient work. The outpatient work in renal medicine consists of the majority of general nephrology together with clinics for dialysis and renal transplant patients.
6. Research activities. Many nephrologists have clinical or laboratory-based research interests.

References

1 National Collaborating Centre for Chronic Conditions. Chronic kidney disease: national clinical guideline for early identification and management in adults in primary and secondary care. London: Royal College of Physicians, September 2008

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UK Renal Registry 19th Annual Report: Appendix D Methodology for Analyses of CCG/HB Incidence and Prevalence Rates and of Standardised Ratios

This appendix describes the methods used for calculating the standardised incidence ratios for the incident UK RRT cohort, the standardised prevalence ratios for the total UK RRT cohort and the standardised ratios for prevalent transplant patients.

Patients

For the incidence rate analyses, all new cases recorded by the UK Renal Registry (UKRR) as starting RRT in each year were included. For the prevalence rate analyses, prevalent patients at the end of the year were included.

Years used

Analyses have been completed for each of the last six years. Combined analyses over the six years have also been done for the incidence rates and rate ratio analyses as there can be small numbers of incident patients particularly in the smaller areas.

Geography

The areas used were the 209 English Clinical Commissioning Groups (CCGs), the seven Welsh Local Health Boards, the 14 Scottish Health Boards and the five Health and Social Care Trusts in Northern Ireland; these different types of area are collectively called CCG/HBs here. Patients were allocated to CCG/HBs using the patient's postcode (rather than the GP postcode). For the incidence rate analyses the patients' postcodes at start of RRT were used. For the prevalence rate analyses the postcodes at the end of the relevant year were used. Each postcode was linked to the ONS postcode directory (ONSPD) to give the CCG/HB code. The ONSPD contains National Statistics data © Crown copyright and database right 2015 and also Ordnance Survey data © Crown copyright and database right 2015.

Areas included in the UK Renal Registry 'covered' population

One renal centre (Cambridge) was unable to submit 2015 data to the UKRR by the closing of the database. As a consequence, coverage of the UK was complete for only five of the six years used in these analyses (2010 to 2014 complete, 2015 not complete). As an approximation, for these analyses, it was decided to use the 2014 incident and prevalent patients from Cambridge twice (for 2014 and as an approximation to the unavailable data for 2015). This was done as individual patient level data was needed for the age-gender standardisation. As the actual 2015 numbers for Cambridge were thought to be higher than for 2014, using 2014 data as an approximation to 2015 data has likely caused an underestimation of the true rates (or perhaps an over-estimation for some CCGs), and CCGs that are affected by this 'fix' have been highlighted in the relevant tables.

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Population data

Mid-2015 population estimates by CCG/HB, gender and age group were obtained from the Office for National Statistics (ONS) website (www.statistics.gov.uk), the Northern Ireland Statistics and Research Agency (NISRA) website (www.nisra.gov.uk) and the National Records of Scotland website (www.nrscotland.gov.uk). These mid-2015 population estimates are projections based on the 2011 Census data. The CCG/HB populations range from 21,700 (Orkney) to 1.15 million (Greater Glasgow and Clyde).

The analysis for each year uses this mid-2015 population data. As the analyses only cover six years this was a reasonable approximation.

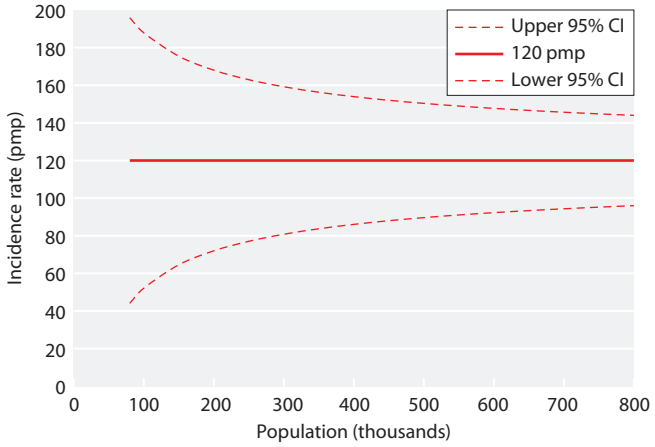

Fig. D.1. 95% confidence limits for incidence rate of 120 pmp for population size 80,000–800,000

Calculation of rates and rate ratios

Crude rates

The crude rates, per million population (pmp), were calculated for each CCG/HB for each year:

$$1{,}000{,}000 \times (\text{observed number})/(\text{population size})$$

For the combined years analyses the observed cases are summed over the available years and the population is multiplied by the number of years that the area has been covered. This is a rate per million population **per year**. It is an average over the available years.

Confidence intervals have not been calculated for these (single or combined years) rates but, if required, an assessment can be made of whether the rate for a given area is consistent with the rate in the whole covered population. This can be done by using the figures provided here showing the confidence intervals around the overall average rates for a range of CCG/HB population sizes. These are figures D.1 and D.2 for incidence rates, and D.3 and D.4 for prevalence rates.

Note that when using the confidence interval figures to assess how different an area's combined years crude incidence rate is from the overall average, the population looked up on the x-axis should be the area's population multiplied by the number of years of data that has been used (i.e. six). In doing this, the confidence intervals obtained become narrower, consistent with the analysis now being based on more than one year of data.

These confidence intervals have been obtained using the Normal approximation to the Poisson distribution. For the incident analyses, confidence intervals have

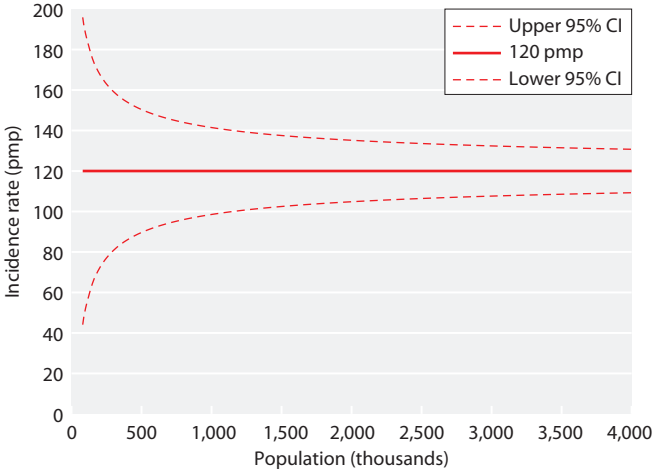

Fig. D.2. 95% confidence limits for incidence rate of 120 pmp for population size 80,000–4 million

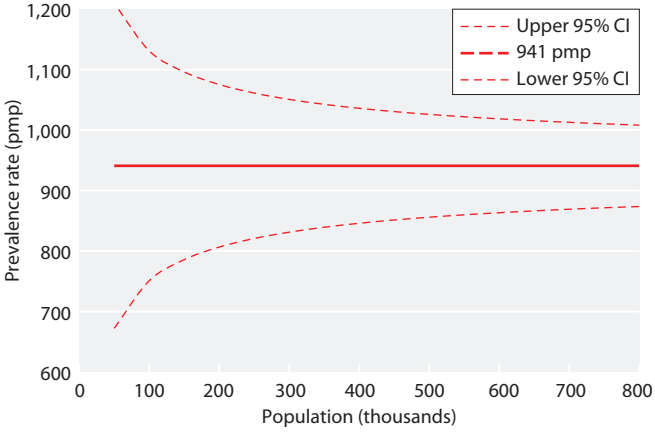

Fig. D.3. 95% confidence limits for prevalence rate of 941 pmp for catchment population size 50,000–800,000

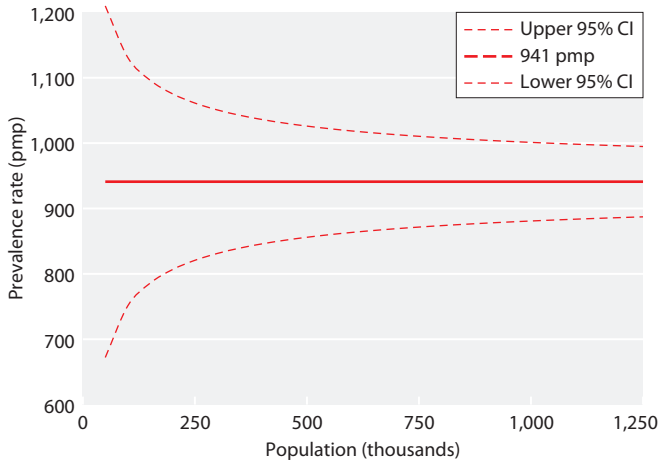

Fig. D.4. 95% confidence limits for prevalence rate of 941 pmp for catchment population size 50,000–1.25 million

only been calculated around the overall average for populations of over 80,000. This is because below this level the number of cases you would expect per area is low – with low expected numbers the Poisson distribution is skewed and the Normal approximation to it is not appropriate. Due to prevalence rates being higher, confidence intervals can be obtained using this method for lower population sizes.

Standardised incidence/prevalence ratios (SIR/SPR or SR)

There are large differences in incidence and prevalence rates for RRT between age and gender groups. As there are also differences in the age/gender breakdowns of the different areas it is useful to produce estimates standardised for age and gender. The method used is *indirect* standardisation.

Observed cases (O*i*) were calculated by summing all cases in all age and gender bands for each CCG/HB. Expected cases (E*i*) for each CCG/HB were calculated as follows:

Overall crude rates (for each year) were calculated for the whole covered population (the *standard population*) by summing the observed numbers, over the CCG/HBs, for each age/gender band and dividing this by the total covered population in that age/gender band. These crude rates (by age/gender band) were then multiplied by the population each CCG/HB has in each band to give the number of cases expected in that band if that CCG/HB had the same rates as the standard population.

These expected numbers were then summed over the age/gender bands to give an expected total number of cases in each CCG/HB. The age/gender standardised ratio (SR) for CCG/HB i is then O_i/E_i.

The expected number of cases is the number you would see if the rates seen in the standard population applied to that individual CCG/HB's age/gender breakdown. 95% confidence intervals were calculated for each area using an error factor (EF) as follows:

$$LCL = SR/EF$$

$$UCL = SR \times EF$$

Where $EF = \exp(1.96/\sqrt{(O_i)})$.

A standardised ratio (SR) of 1 indicates that the area's rate was as expected if the age/gender rates found in the total covered population applied to the CCG/HB area's population structure; a value above 1 indicates that the observed rate was greater than expected given the area's population structure, if the lower confidence limit was above one this was statistically significant at the 5% level. The converse applies to standardised ratios below one.

The combined years analyses are similar to the above except that the observed and expected numbers are summed over the years.

Remaining variability between rates

Even after standardisation there remains a large amount of variability between CCG/HBs – as can be seen by the large numbers of significantly low or high standardised ratios. This is partly because these ratios have only been adjusted for age and gender and not for ethnicity or any other factors. Higher rates are expected in populations with a high percentage of patients from South Asian or Black backgrounds and so it is hoped that in the future the UKRR will also do analyses further standardised for ethnicity.

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UK Renal Registry 19th Annual Report: Appendix E Methodology for Estimating Catchment Populations of Renal Centres in the UK for Dialysis Patients

Introduction

Providing accurate centre-level incidence and prevalence rates for patients receiving renal replacement therapy (RRT) in the UK was limited until the 13th Annual Report by the difficulty in estimating the catchment population from which the RRT population was derived. One reason for this was that the geographical boundaries separating renal centres are relatively arbitrary and dependent upon a number of factors including referral practice, patient choice and patient movement. Previously, incidence and prevalence rates had been calculated at Local Authority/Primary Care Trust/Health Board level for which denominator data were available, but not at renal centre level.

UK Renal Registry (UKRR) annual reports prior to the 13th suggested an estimate of the size of the catchment populations. These were extrapolated figures originally derived from data in the 1992 National Renal Survey undertaken by Professor Paul Roderick.

The purpose of this appendix is to present an estimate of the dialysis catchment population for all renal centres in the UK. It also contains a methodological description and discussion of the limitations of these methods. Previous UKRR annual reports contained estimates for English renal centres using 2001 Census data and a similar methodology as outlined here [1]. For the 16th Annual Report the methodology was repeated using data from the 2011 Census in order to obtain more up to date estimates and also to include renal centres in Wales. For the 17th Annual Report, estimates for renal centres in Scotland and Northern Ireland were calculated thus completing full coverage of the UK.

Methods

The UKRR database of the incident dialysis population between 1st January 2008 and 31st December 2012 was used to estimate the size of each renal centre's catchment population. This used the postcode and centre for each individual at the time of starting RRT on dialysis.

Polygons were constructed to define an area around the geographical location of each dialysis patient. The lines of the polygons, representing the boundaries between areas, were drawn such that they were equidistant between adjacent patients, creating a map of non-overlapping polygons covering the entire area of England, Northern Ireland, Scotland and Wales (the process was done separately for each country). This method produces Thiessen polygons which have the property that all locations within each polygon share the same nearest dialysis patient [2].

The polygons of all patients starting at the same renal centre were combined to create the catchment area for that centre. The catchment area for one centre might comprise multiple unconnected polygons as a result of adjacent patients attending different renal centres. The Office for National Statistics (ONS) map of 2011 Census merged wards contains population estimates for England and Wales divided into 8,546 wards. The Northern Ireland Statistics and Research Agency (NISRA) published population estimates based on the 2011 Census for 4,537 geographical regions referred to as Small Areas. The General Register Office for Scotland published 2011 population estimates at 6,505 data zone level areas. Wards, Small Areas and data zones will collectively be referred to as wards in the following paragraph.

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The wards were overlaid on the map of renal centre catchment areas, enabling the proportion of each ward's area covered by each of the renal centre catchment areas to be calculated. Each ward's population was then allocated to the renal centres in proportions equal to the proportions of the overlaid areas. Summing these proportions of populations across all of the wards for each renal centre produced the estimates of the total catchment population for each centre.

Results

The estimated dialysis catchment populations for renal centres in England, Wales, Northern Ireland and Scotland are shown in Tables E.1, E.2, E.3 and E.4 respectively.

Table E.1. Estimated dialysis catchment populations of English renal centres based upon 2011 Census ONS Census ward population estimates (rounded to nearest 1,000)

Centre	Estimate	Centre	Estimate
B Heart	738,000	Leeds	1,670,000
B QEH	1,699,000	Leic	2,436,000
Basldn	415,000	Liv Ain	484,000
Bradfd	652,000	Liv RI	1,000,000
Brightn	1,297,000	M RI	1,531,000
Bristol	1,439,000	Middlbr	1,004,000
Camb	1,158,000	Newc	1,121,000
Carlis	321,000	Norwch	787,000
Carsh	1,913,000	Nottm	1,088,000
Chelms	510,000	Oxford	1,690,000
Colchr	299,000	Plymth	470,000
Covnt	892,000	Ports	2,024,000
Derby	703,000	Prestn	1,493,000
Donc	410,000	Redng	910,000
Dorset	862,000	Salford	1,490,000
Dudley	442,000	Sheff	1,372,000
Exeter	1,089,000	Shrew	501,000
Glouc	587,000	Stevng	1,204,000
Hull	1,020,000	Sthend	317,000
Ipswi	399,000	Stoke	890,000
Kent	1,224,000	Sund	618,000
L Barts	1,830,000	Truro	413,000
L Guys	1,082,000	Wirral	572,000
L Kings	1,171,000	Wolve	669,000
L Rfree	1,518,000	York	492,000
L St G	797,800	**England**	**53,399,000**
L West	2,399,000		

Table E.2. Estimated dialysis catchment populations of Welsh renal centres based upon 2011 Census ONS Census Ward population estimates (rounded to nearest 1,000)

Centre	Estimate	Centre	Estimate
Bangor	218,000	Swanse	885,000
Cardff	1,420,000	Wrexm	240,000
Clwyd	190,000	**Wales**	**2,953,000**

Table E.3. Estimated dialysis catchment populations of renal centres in Northern Ireland based upon 2011 Census NISRA Small Area population estimates (rounded to nearest 1,000)

Centre	Estimate	Centre	Estimate
Antrim	295,000	Ulster	266,000
Belfast	637,000	West NI	352,000
Newry	261,000	**N Ireland**	**1,811,000**

Source: NISRA: Website: www.nisra.gov.uk

Table E.4. Estimated dialysis catchment populations of renal centres in Scotland based upon 2011 Census NRS data zone area population estimates (rounded to nearest 1,000)

Centre	Estimate	Centre	Estimate
Abrdn	600,000	Glasgw	1,624,000
Airdrie	552,000	Inverns	270,000
D & Gall	148,000	Klmarnk	361,000
Dundee	463,000	Krkcldy	317,000
Edinb	964,000	**Scotland**	**5,300,000**

Discussion

These results show estimates for the size of the catchment areas for each of the renal centres in the UK.

There are some limitations to these results. The main one is that the ward/small area/data zone allocated to each renal centre was based upon dialysis patients only. Therefore it is possible that non-dialysis patients may come from a different catchment population. This is more likely where a renal centre provides specialist services and especially likely for patients undergoing renal transplantation. The catchment population for renal transplant patients will depend largely upon the distribution of workload between the referral centre and

the transplanting centre for pre-transplant work-up, donor nephrectomy work-up and post-transplant care (including if and when care is returned to the referring centre).

Despite the limitations, this is the most valid methodology to date to estimate the size of the catchment populations for renal centres in the UK. The results of this analysis allows the UKRR to calculate estimates of the incidence and prevalence rates of RRT at renal centre level, rather than only at CCG/HB level.

These results also provide other opportunities for the study of the catchment populations. The ONS provides data on gender, age and ethnicity of the population at ward level. It should be possible to use this information to consider centre differences in the demographics of patients commencing or receiving RRT with adjustment for the catchment population characteristics.

Acknowledgements

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References

1 Judge A, Caskey FJ, Welton NJ, Ansell D, Tomson CR, Roderick PJ, Ben-Shlomo Y: Inequalities in rates of renal replacement therapy in England: does it matter who you are or where you live? Nephrol Dial Transplant. 2012 Apr;27(4):1598-607 Nephron Dial Transplant. 2012 Apr:27(4):1598-607. doi: 10.1093/ndt/gfr466. Epub 2011 Aug 30

2 Boots BN: Voronoi (Thiessen) Polygons (Concepts and Techniques in Modern Geography); Norwich: Geo Books, 1986

nephron Clinical Practice

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UK Renal Registry 19th Annual Report (December 2016): Appendix F Additional Data Tables for 2015 new and existing patients

F:1 Patients starting renal replacement therapy

Table F1.1. Number of patients on dialysis at 90 days (incident cohort 1/10/2014 to 30/09/2015)

	Aged <65		Aged ⩾65	
	HD *N*	PD *N*	HD *N*	PD *N*
England	1,952	731	2,337	482
N Ireland	54	16	80	18
Scotland	233	58	173	23
Wales	102	48	171	23
UK	**2,341**	**853**	**2,761**	**546**

Table F1.2. Number of patients per treatment modality at 90 days (incident cohort 1/10/2014 to 30/09/2015)

	HD	PD	Transplant	Recovered/ discontinued	Died
England	4,289	1,213	552	27	350
N Ireland	134	34	35	6	5
Scotland	406	81	44	3	19
Wales	273	71	22	*	*
UK	**5,102**	**1,399**	**653**	*	*

*Values suppressed due to small numbers (primary or secondary suppression)

Table F1.3. First treatment modality (incident cohort 2011 to 2015)

Centre	% HD	% PD	% transplant
England			
B Heart	80	17	3
B QEH	74	18	8
Basldn	*	23	*
Bradfd	79	12	9
Brightn	72	24	4
Bristol	73	18	10
Camb	67	11	22
Carlis	53	41	7
Carsh	76	19	6
Chelms	*	22	*
Colchr	100		
Covnt	65	27	8
Derby	55	44	1
Donc	79	21	
Dorset	68	28	5
Dudley	*	35	*
Exeter	76	21	3
Glouc	70	27	2
Hull	63	32	5
Ipswi	68	29	4
Kent	74	16	9
L Barts	68	27	5
Prestn	75	15	9
Redng	61	34	6
Salford	69	26	5
Sheff	77	16	7
Shrew	72	26	2
Stevng	81	12	7
Sthend	73	23	4
Stoke	74	24	2
Sund	81	14	5
Truro	76	17	7
Wirral	76	21	3
Wolve	61	37	2
York	68	20	12
N Ireland			
Antrim	80	16	4
Belfast	66	11	23
Newry	*	31	*
Ulster	*	10	*
West NI	*	18	*
Scotland			
Abrdn	84	16	
Airdrie	89	11	
D&Gall	59	41	

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Table F1.3. Continued

Centre	% HD	% PD	% transplant	Centre	% HD	% PD	% transplant
L Guys	75	9	16	Dundee	84	16	
L Kings	73	24	3	Edinb	71	12	16
L Rfree	65	27	9	Glasgw	78	11	11
L St.G	76	14	10	Inverns	73	27	
L West	84	7	9	Klmarnk	78	22	
Leeds	72	14	14	Krkcldy	83	17	
Leic	71	18	10	**Wales**			
Liv Ain	74	24	3	Bangor	77	23	
Liv Roy	59	24	17	Cardff	74	17	10
M RI	62	20	18	Clwyd	78	20	3
Middlbr	81	9	11	Swanse	77	20	3
Newc	73	18	9	Wrexm	70	24	6
Norwch	80	19	1	**England**	**72**	**20**	**8**
Nottm	60	29	11	**N Ireland**	**75**	**15**	**10**
Oxford	62	23	15	**Scotland**	**79**	**15**	**6**
Plymth	65	22	13	**Wales**	**75**	**19**	**6**
Ports	73	19	8	**UK**	**72**	**20**	**8**

*Values suppressed due to small numbers (primary or secondary suppression)

Table F1.4. First treatment modality, patient numbers (2015 incident cohort)

	HD	PD	Transplant
England	4,610	1,250	483
N Ireland	148	39	34
Scotland	482	94	47
Wales	296	74	19
UK	**5,536**	**1,457**	**583**

Table F1.5. Gender breakdown by treatment modality at 90 days (incident cohort 1/10/2010 to 30/09/2015)

	HD			PD		
Centre	% male	% female	M : F Ratio	% male	% female	M : F Ratio
England						
B Heart	62	38	1.7	64	36	1.8
B QEH	62	38	1.6	63	37	1.7
Basldn	67	33	2.0	65	35	1.8
Bradfd	62	38	1.6	54	46	1.2
Brightn	64	36	1.8	68	32	2.1
Bristol	64	36	1.8	70	30	2.3
Camb	71	29	2.5	72	28	2.5
Carlis	73	27	2.7	67	33	2.0
Carsh	66	35	1.9	61	39	1.5
Chelms	69	31	2.2	65	35	1.8
Colchr	62	39	1.6			
Covnt	65	35	1.8	68	32	2.1
Derby	60	40	1.5	63	37	1.7
Donc	59	41	1.4	71	30	2.4
Dorset	64	36	1.8	65	35	1.8
Dudley	64	36	1.8	59	41	1.4
Exeter	66	34	1.9	68	33	2.1
Glouc	65	35	1.8	65	35	1.9
Hull	66	34	1.9	64	36	1.8
Ipswi	73	27	2.7	64	36	1.8
Kent	65	35	1.8	68	32	2.1
L Barts	61	39	1.5	67	33	2.0

Table F1.5. Continued

	HD			PD		
Centre	% male	% female	M : F Ratio	% male	% female	M : F Ratio
L Guys	63	37	1.7	52	48	1.1
L Kings	65	35	1.8	66	34	2.0
L Rfree	64	36	1.8	60	40	1.5
L St.G	60	40	1.5	55	45	1.2
L West	64	36	1.8	57	43	1.3
Leeds	64	36	1.8	69	31	2.3
Leic	63	37	1.7	57	43	1.3
Liv Ain	60	40	1.5	70	30	2.3
Liv Roy	61	39	1.6	60	40	1.5
M RI	60	40	1.5	59	41	1.4
Middlbr	65	35	1.8	66	34	1.9
Newc	62	38	1.6	72	28	2.6
Norwch	58	42	1.4	51	49	1.1
Nottm	58	42	1.4	56	44	1.3
Oxford	63	37	1.7	64	36	1.8
Plymth	71	29	2.4	57	43	1.3
Ports	64	36	1.8	69	31	2.3
Prestn	61	40	1.5	61	39	1.6
Redng	66	34	1.9	69	31	2.2
Salford	65	35	1.8	58	42	1.4
Sheff	65	35	1.9	65	35	1.9
Shrew	64	36	1.8	56	44	1.3
Stevng	65	35	1.8	59	41	1.5
Sthend	69	31	2.2	68	32	2.2
Stoke	62	38	1.6	65	35	1.8
Sund	64	36	1.8	54	46	1.2
Truro	66	34	1.9	60	41	1.5
Wirral	55	45	1.2	63	37	1.7
Wolve	66	34	1.9	68	32	2.2
York	60	40	1.5	64	37	1.7
N Ireland						
Antrim	72	28	2.6	67	33	2.0
Belfast	63	37	1.7	61	39	1.6
Newry	45	55	0.8	70	30	2.4
Ulster	57	43	1.3	43	57	0.8
West NI	58	42	1.4	61	39	1.5
Scotland						
Abrdn	67	33	2.0	59	41	1.4
Airdrie	58	42	1.4	65	36	1.8
D&Gall	65	35	1.8	48	52	0.9
Dundee	56	44	1.3	49	51	0.9
Edinb	60	40	1.5	55	45	1.2
Glasgw	58	42	1.4	56	44	1.3
Inverns	55	45	1.2	58	42	1.4
Klmarnk	64	37	1.7	57	43	1.3
Krkcldy	58	42	1.4	52	48	1.1
Wales						
Bangor	69	31	2.2	64	36	1.7
Cardff	62	38	1.6	65	36	1.8
Clwyd	69	31	2.3	68	32	2.1
Swanse	65	35	1.8	59	42	1.4
Wrexm	63	37	1.7	62	38	1.6
England	**63**	**37**	**1.7**	**63**	**37**	**1.7**
N Ireland	**60**	**40**	**1.5**	**62**	**38**	**1.7**
Scotland	**59**	**41**	**1.5**	**56**	**44**	**1.3**
Wales	**64**	**36**	**1.8**	**62**	**38**	**1.7**
UK	**63**	**37**	**1.7**	**63**	**37**	**1.7**

F:2 Prevalent patients on 31/12/2015

Table F2.1. Treatment modalities for 2015 prevalent patients aged under and over 65

	Patients aged <65				Patients aged ⩾65			
Centre	% HD	% PD	% transplant	HD : PD ratio	% HD	% PD	% transplant	HD : PD ratio
England								
B Heart	52	7	41	7.5	77	9	15	8.9
B QEH	34	6	60	5.8	65	7	27	9.1
Basldn	47	14	39	3.4	75	11	14	6.5
Bradfd	31	3	66	11.7	62	4	34	14.9
Brightn	34	5	61	6.5	62	10	28	6.5
Bristol	23	3	74	7.9	57	5	38	10.4
Carlis	17	8	75	2.1	46	21	32	2.2
Carsh	38	6	56	5.9	69	8	23	8.5
Chelms	38	8	54	4.8	64	11	24	5.8
Colchr	100	0	0	0.0	100	0	0	0.0
Covnt	25	7	68	3.5	58	12	30	4.8
Derby	35	13	52	2.6	63	16	21	3.8
Donc	48	6	46	8.3	74	10	17	7.6
Dorset	27	5	68	5.1	58	7	35	7.9
Dudley	46	19	35	2.4	65	17	17	3.8
Exeter	26	7	67	3.8	67	10	23	6.6
Glouc	31	8	61	3.8	72	9	19	8.4
Hull	29	7	64	4.0	63	12	25	5.4
Ipswi	24	5	71	5.0	50	15	35	3.3
Kent	27	5	68	5.3	61	7	32	9.0
L Barts	36	7	57	4.7	67	13	20	5.0
L Guys	27	1	72	20.6	53	3	44	20.3
L Kings	44	8	49	5.7	67	9	24	7.1
L Rfree	23	6	72	3.9	56	10	34	5.3
L St.G	30	4	66	7.9	56	9	35	6.3
L West	32	2	66	19.5	63	3	34	21.2
Leeds	25	4	71	6.4	52	3	44	15.3
Leic	31	4	65	7.9	60	7	34	9.0
Liv Ain	67	20	12	3.3	84	14	2	6.1
Liv Roy	24	5	72	5.1	46	7	47	6.9
M RI	20	2	78	8.4	47	6	47	7.8
Middlbr	27	3	70	9.7	61	2	37	33.0
Newc	25	3	72	8.5	44	8	48	5.6
Norwch	30	5	66	6.3	67	6	27	11.8
Nottm	21	6	74	3.5	59	10	31	6.0
Oxford	16	4	80	4.0	47	9	44	5.4
Plymth	16	6	78	2.6	45	8	47	5.5
Ports	29	3	67	8.7	58	6	37	9.8
Prestn	37	3	60	11.7	63	6	30	10.1
Redng	27	6	66	4.4	54	11	35	4.7
Salford	34	7	59	4.7	56	12	32	4.7
Sheff	29	3	68	8.9	64	7	30	9.5
Shrew	39	11	50	3.6	73	6	21	11.5
Stevng	47	1	51	31.9	81	3	17	31.8
Sthend	42	4	54	9.3	63	10	28	6.4
Stoke	28	7	65	4.4	63	14	23	4.5
Sund	38	3	59	12.0	65	5	30	12.6
Truro	24	6	70	4.4	57	5	39	11.6
Wirral	78	8	14	9.7	86	9	5	10.0
Wolve	42	13	45	3.3	74	15	11	5.0
York	22	5	73	4.9	51	8	41	6.1

Table F2.1. Continued

Centre	Patients aged <65				Patients aged ⩾65			
	% HD	% PD	% transplant	HD : PD ratio	% HD	% PD	% transplant	HD : PD ratio
N Ireland								
Antrim	26	9	65	2.8	81	7	12	11.1
Belfast	13	2	85	5.9	50	5	45	9.3
Newry	30	4	66	7.0	54	19	27	2.9
Ulster	44	3	54	17.0	79	4	16	18.2
West NI	27	3	70	7.7	64	5	31	12.8
Scotland								
Abrdn	27	6	67	4.5	72	2	25	29.8
Airdrie	35	3	62	11.0	68	5	27	13.7
D&Gall	32	7	61	4.8	54	11	36	5.0
Dundee	32	4	64	9.0	62	5	33	13.3
Edinb	34	6	60	5.3	74	7	19	10.2
Glasgw	31	3	66	10.2	53	5	42	11.0
Inverns	25	3	73	9.3	60	4	35	13.4
Klmarnk	23	5	72	4.4	65	5	30	13.3
Krkcldy	35	10	55	3.6	62	16	22	3.8
Wales								
Bangor	37	5	58	7.2	56	12	32	4.8
Cardff	21	4	76	5.8	50	7	43	6.8
Clwyd	37	10	53	3.8	56	12	32	4.6
Swanse	33	9	58	3.8	65	8	27	8.6
Wrexm	23	14	63	1.7	61	11	28	5.8
England	**30**	**5**	**65**	**6.1**	**61**	**8**	**31**	**7.7**
N Ireland	**21**	**4**	**75**	**5.9**	**63**	**7**	**30**	**8.6**
Scotland	**29**	**4**	**67**	**7.0**	**63**	**6**	**31**	**11.1**
Wales	**26**	**6**	**68**	**4.1**	**56**	**8**	**36**	**6.7**
UK	**29**	**5**	**66**	**6.0**	**61**	**8**	**31**	**7.8**

Table F2.2. Number of 2015 prevalent patients under and over 65 per treatment modality

	Patients aged <65			Patients aged ⩾65		
	HD	PD	Transplant	HD	PD	Transplant
England	9,413	1,553	20,575	11,292	1,473	5,740
N Ireland	226	38	804	397	46	190
Scotland	943	134	2,216	979	88	493
Wales	468	113	1,253	674	100	421
UK	**11,050**	**1,838**	**24,848**	**13,342**	**1,707**	**6,844**

Table F2.3. Dialysis modalities for 2015 prevalent patients aged under 65

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	4	79	4	6	0	6
B QEH	7	14	63	5	0	10
Basldn	1	63	13	8	0	15
Bradfd	4	79	9	4	0	4
Brightn	14	37	35	10	0	4
Bristol	7	26	56	7	0	5
Carlis	0	47	21	9	0	23
Carsh	5	26	54	3	0	12
Chelms	0	83	0	9	0	9
Colchr	0	100	0	0	0	0
Covnt	6	72	0	22	0	1
Derby	14	58	0	18	0	10
Donc	7	50	32	1	0	10
Dorset	4	22	58	5	1	11
Dudley	10	41	20	18	1	10
Exeter	2	13	64	9	0	12
Glouc	2	60	16	5	0	16
Hull	3	41	36	13	0	7
Ipswi	0	77	6	5	0	12
Kent	7	26	51	15	0	1
L Barts	3	39	41	1	0	17
L Guys	10	9	76	1	0	3
L Kings	3	20	62	5	0	10
L Rfree	3	3	73	5	0	15
L St.G	2	43	44	2	1	8
L West	2	21	72	3	0	2
Leeds	7	19	60	2	0	11
Leic	9	19	61	3	0	9
Liv Ain	10	10	56	2	0	21
Liv Roy	12	38	35	7	0	10
M RI	15	31	44	4	0	6
Middlbr	7	30	54	9	0	0
Newc	11	73	6	2	0	9
Norwch	8	52	26	14	0	0
Nottm	14	41	23	7	0	15
Oxford	6	31	43	3	0	17
Plymth	6	60	6	15	0	13
Ports	14	19	56	10	0	0
Prestn	9	19	64	1	0	7
Redng	3	36	42	13	0	5
Salford	5	26	52	6	0	12
Sheff	14	32	44	10	0	0
Shrew	13	39	26	8	0	13
Stevng	7	27	63	3	0	0
Sthend	3	87	0	10	0	0
Stoke	15	45	22	4	3	11
Sund	2	67	24	4	0	3
Truro	9	37	36	6	0	13
Wirral	9	36	45	1	0	8
Wolve	8	47	22	7	2	15
York	13	41	29	6	0	11
N Ireland						
Antrim	2	71	0	0	0	27
Belfast	10	76	0	1	0	13
Newry	4	83	0	0	0	13

Table F2.3. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
Ulster	6	89	0	0	0	6
West NI	6	83	0	0	2	10
Scotland*						
Abrdn	2	79	0	11	0	7
Airdrie	0	92	0	4	0	5
D&Gall	10	72	0	14	0	3
Dundee	2	88	0	8	0	2
Edinb	3	88	0	4	0	5
Glasgw	6	84	0	2	0	8
Inverns	4	78	0	12	0	6
Klmarnk	4	74	0	1	0	21
Krkcldy	0	84	0	0	0	16
Wales						
Bangor	27	56	5	5	0	7
Cardff	8	13	64	9	0	5
Clwyd	10	69	0	4	0	17
Swanse	15	39	25	10	0	11
Wrexm	7	48	7	1	0	36
England	**7**	**33**	**46**	**6**	**0**	**8**
N Ireland	**6**	**80**	**0**	**0**	**0**	**14**
Scotland*	**4**	**84**	**0**	**4**	**0**	**8**
Wales	**12**	**32**	**37**	**8**	**0**	**12**
UK	**7**	**38**	**41**	**6**	**0**	**9**

*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.4. Dialysis modalities for 2015 prevalent patients aged over 65

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	1	81	7	4	0	6
B QEH	1	10	79	3	0	7
Basldn	0	66	21	8	0	6
Bradfd	1	69	23	2	0	5
Brightn	5	34	48	10	0	4
Bristol	2	12	77	4	0	5
Carlis	0	49	20	14	3	14
Carsh	2	14	74	3	0	8
Chelms	0	85	0	9	0	6
Colchr	0	100	0	0	0	0
Covnt	2	81	0	17	0	0
Derby	9	70	0	15	0	6
Donc	3	41	44	1	0	11
Dorset	1	18	70	3	0	8
Dudley	2	46	31	14	0	7
Exeter	0	9	77	4	0	9
Glouc	2	66	21	3	0	8
Hull	1	42	42	9	0	7
Ipswi	0	63	13	11	0	12
Kent	1	25	64	7	0	3
L Barts	1	30	52	3	0	13
L Guys	2	15	78	3	0	2
L Kings	0	13	74	7	0	6
L Rfree	2	1	81	8	0	8

Table F2.4. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
L St.G	0	31	55	6	2	6
L West	0	20	75	3	0	2
Leeds	0	11	82	1	0	5
Leic	3	17	70	4	0	6
Liv Ain	1	10	75	2	0	13
Liv Roy	3	30	54	7	0	5
M RI	2	24	62	4	0	7
Middlbr	1	23	73	3	0	0
Newc	2	77	5	2	0	13
Norwch	6	50	36	7	0	0
Nottm	1	36	48	7	0	7
Oxford	2	30	53	5	0	11
Plymth	3	70	12	4	0	12
Ports	2	19	70	9	0	0
Prestn	4	21	65	2	0	7
Redng	0	41	42	13	0	4
Salford	1	22	59	7	0	11
Sheff	2	40	49	10	0	0
Shrew	7	44	41	4	0	4
Stevng	3	25	69	3	0	0
Sthend	0	86	0	14	0	0
Stoke	3	52	27	1	8	9
Sund	0	70	23	4	0	3
Truro	4	42	47	5	0	3
Wirral	3	39	49	2	0	7
Wolve	4	41	38	7	1	8
York	0	26	59	4	0	10
N Ireland						
Antrim	1	91	0	1	0	7
Belfast	1	90	0	1	0	9
Newry	2	73	0	2	0	24
Ulster	0	95	0	0	0	5
West NI	1	92	0	0	0	7
Scotland*						
Abrdn	2	95	0	2	0	1
Airdrie	0	93	0	1	0	6
D&Gall	0	83	0	14	0	3
Dundee	0	93	0	4	0	3
Edinb	0	92	0	1	0	8
Glasgw	2	92	0	2	0	5
Inverns	2	91	0	2	0	5
Klmarnk	7	72	0	1	0	20
Krkcldy	0	91	0	2	0	7
Wales						
Bangor	7	48	28	9	0	9
Cardff	3	12	72	10	0	3
Clwyd	4	79	0	5	0	13
Swanse	4	48	38	6	0	4
Wrexm	0	67	18	0	0	15
England	**2**	**32**	**55**	**5**	**0**	**6**
N Ireland	**1**	**89**	**0**	**1**	**0**	**10**
Scotland*	**1**	**90**	**0**	**2**	**0**	**6**
Wales	**3**	**37**	**47**	**7**	**0**	**6**
UK	**2**	**38**	**49**	**5**	**0**	**6**

*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.5. Prevalent patients 2015, age ranges by centre (%)

Centre	18–24	25–34	35–44	45–54	55–64	65–74	75–84	85+
England								
B Heart	1	5	9	19	19	23	22	3
B QEH	3	7	11	22	23	19	13	3
Basldn	1	5	9	18	21	21	19	4
Bradfd	4	11	13	20	23	16	12	1
Brightn	2	6	10	21	20	22	16	3
Bristol	3	7	11	20	22	21	14	3
Carlis	4	6	8	19	23	20	19	1
Carsh	1	5	10	20	20	23	16	5
Chelms	2	4	7	18	22	25	17	6
Colchr	.	3	3	8	13	28	35	12
Covnt	2	7	12	22	21	19	15	3
Derby	1	7	10	21	22	24	14	2
Donc	3	4	8	15	22	24	20	4
Dorset	2	5	7	17	19	26	20	4
Dudley	1	6	7	19	19	24	18	6
Exeter	2	6	7	17	20	24	17	6
Glouc	1	4	8	18	18	25	19	6
Hull	3	6	12	20	21	21	14	3
Ipswi	1	4	10	20	21	24	14	5
Kent	2	5	11	19	22	24	15	3
L Barts	2	7	14	23	26	17	9	1
L Guys	4	9	14	23	24	16	8	2
L Kings	1	4	12	23	24	19	15	4
L Rfree	2	8	12	21	22	18	13	4
L St.G	1	5	13	20	23	23	12	3
L West	1	5	12	21	26	22	12	2
Leeds	3	8	13	23	22	19	10	1
Leic	2	6	12	21	21	23	13	2
Liv Ain	0	3	9	13	17	25	28	4
Liv Roy	2	8	13	25	26	17	8	1
M RI	4	7	13	24	23	18	9	1
Middlbr	2	8	10	22	22	21	12	3
Newc	3	6	12	22	24	20	11	2
Norwch	1	6	8	19	23	23	15	5
Nottm	3	7	11	21	21	20	14	4
Oxford	2	7	14	24	22	19	10	2
Plymth	2	6	10	18	26	23	13	3
Ports	1	6	11	21	22	21	14	2
Prestn	1	6	11	20	22	25	12	2
Redng	0	4	12	20	21	24	16	3
Salford	2	6	14	23	22	21	12	1
Sheff	2	7	11	21	24	19	13	3
Shrew	1	5	9	17	20	25	19	3
Stevng	2	5	10	20	21	20	20	3
Sthend	3	4	12	18	17	20	21	5
Stoke	1	7	12	19	22	20	15	4
Sund	1	6	12	22	22	22	14	2
Truro	2	6	10	18	20	24	18	3
Wirral	1	2	8	20	18	21	24	6
Wolve	1	6	11	18	25	20	17	3
York	3	8	12	19	21	21	13	3
N Ireland								
Antrim	1	5	9	20	20	22	19	5
Belfast	4	8	14	24	21	17	10	2
Newry	2	5	13	17	26	17	19	1
Ulster	2	4	12	11	17	23	22	9
West NI	1	8	14	20	15	22	18	2

Table F2.5. Continued

Centre	18–24	25–34	35–44	45–54	55–64	65–74	75–84	85+
Scotland								
Abrdn	3	9	14	20	24	20	9	2
Airdrie	1	8	12	25	22	19	14	1
D&Gall	2	6	10	23	15	25	15	3
Dundee	1	4	12	24	19	21	15	4
Edinb	2	7	13	26	26	18	8	1
Glasgw	2	8	12	22	26	19	10	1
Inverns	2	5	15	25	22	20	11	1
Klmarnk	1	3	11	26	25	23	8	3
Krkcldy	2	3	14	16	24	24	16	2
Wales								
Bangor	2	5	10	17	19	25	19	2
Cardff	2	7	13	23	21	21	12	2
Clwyd	2	8	6	19	20	24	17	3
Swanse	3	4	9	17	20	23	20	4
Wrexm	3	7	12	19	20	16	18	5
England	**2**	**6**	**11**	**21**	**22**	**21**	**13**	**3**
N Ireland	**2**	**7**	**13**	**21**	**20**	**19**	**15**	**3**
Scotland	**2**	**7**	**12**	**23**	**24**	**20**	**11**	**2**
Wales	**2**	**6**	**11**	**21**	**21**	**21**	**15**	**3**
UK	**2**	**6**	**12**	**21**	**22**	**21**	**13**	**3**

Table F2.6. Dialysis modalities for 2015 prevalent patients without diabetes (all ages)

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	2	80	7	4	0	7
B QEH	5	11	70	5	0	9
Basldn	1	66	17	8	0	9
Bradfd	4	71	17	4	0	5
Brightn	10	34	42	10	0	4
Bristol	5	16	67	6	0	6
Carlis	0	46	20	16	2	16
Carsh	5	17	69	1	0	8
Chelms	0	85	0	9	0	5
Covnt	4	78	0	18	0	0
Derby	14	63	0	16	0	7
Donc	6	45	38	1	0	10
Dorset	2	19	66	4	1	8
Dudley	5	42	26	18	0	8
Exeter	1	10	72	7	0	10
Glouc	2	65	18	4	0	11
Hull	2	40	42	10	0	7
Ipswi	0	76	10	6	0	9
Kent	4	26	58	10	0	2
L Barts	3	35	46	2	0	14
L Guys	9	11	76	2	0	3
L Kings	2	14	69	7	0	7
L Rfree	3	2	76	8	0	11
L St.G	1	36	48	5	1	9
L West	1	21	72	3	0	2
Leeds	5	15	69	2	0	10
Leic	7	18	65	3	0	7
Liv Ain	5	9	71	2	0	13

Table F2.6. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
Liv Roy	11	31	44	7	0	7
M RI	11	24	53	4	0	8
Middlbr	5	24	64	6	0	0
Newc	8	73	7	2	0	10
Norwch	7	52	31	9	0	0
Nottm	7	36	39	8	0	10
Oxford	4	30	47	4	0	14
Plymth	4	65	9	9	0	12
Ports	9	17	64	10	0	0
Prestn	7	18	66	1	0	7
Redng	2	40	43	11	0	4
Salford	3	28	50	7	0	12
Sheff	9	36	45	10	0	0
Shrew	12	42	34	4	0	9
Stevng	5	27	65	3	0	0
Sthend	2	85	0	13	0	0
Stoke	9	47	26	3	4	10
Sund	1	69	23	4	0	3
Truro	5	35	46	6	0	7
Wirral	5	39	45	1	0	9
Wolve	6	43	31	7	1	11
York	7	30	49	5	0	9
N Ireland						
Antrim	2	83	0	1	0	14
Belfast	5	84	0	1	0	10
Newry	4	74	0	1	0	21
Ulster	2	91	0	0	0	7
West NI	4	88	0	0	1	8
Scotland*						
Abrdn	3	87	0	7	0	4
Airdrie	0	91	0	3	0	6
D&Gall	5	85	0	10	0	0
Dundee	1	89	0	7	0	3
Edinb	3	88	0	3	0	6
Glasgw	4	88	0	2	0	5
Inverns	3	84	0	7	0	6
Klmarnk	7	72	0	2	0	20
Krkcldy	0	87	0	1	0	11
Wales						
Bangor	16	48	18	8	0	10
Cardff	5	13	67	11	0	4
Clwyd	9	71	0	6	0	14
Swanse	10	44	33	8	0	5
Wrexm	3	57	13	1	0	27
England	**5**	**32**	**50**	**6**	**0**	**7**
N Ireland	**4**	**84**	**0**	**1**	**0**	**11**
Scotland*	**3**	**87**	**0**	**3**	**0**	**7**
Wales	**7**	**34**	**42**	**8**	**0**	**8**
UK	**5**	**38**	**44**	**6**	**0**	**7**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table
*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.7. Number of 2015 prevalent patients without diabetes by treatment modality

	HD	PD	Transplant
England	14,767	2,216	23,069
N Ireland	460	64	900
Scotland	1,466	166	2,435
Wales	873	172	1,466
UK	**17,566**	**2,618**	**27,870**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table

Table F2.8. Dialysis modalities for 2015 prevalent patients without diabetes aged under 65

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	4	80	5	5	0	6
B QEH	8	14	61	6	0	11
Basldn	2	62	11	8	0	16
Bradfd	6	77	8	5	0	5
Brightn	17	37	34	9	0	3
Bristol	9	24	53	9	0	5
Carlis	0	48	19	13	0	19
Carsh	8	28	53	2	0	9
Chelms	0	82	0	10	0	8
Covnt	7	72	0	20	0	1
Derby	17	58	0	18	0	7
Donc	9	49	31	2	0	9
Dorset	5	21	58	6	1	8
Dudley	8	40	19	23	0	10
Exeter	3	12	62	10	0	12
Glouc	3	60	12	6	0	18
Hull	3	41	39	10	0	6
Ipswi	0	84	7	0	0	9
Kent	9	26	48	16	0	1
L Barts	4	40	41	1	0	15
L Guys	13	8	74	1	0	3
L Kings	4	19	63	7	0	9
L Rfree	4	4	73	5	0	14
L St.G	3	44	40	3	2	9
L West	2	22	70	3	0	2
Leeds	8	18	59	2	0	12
Leic	11	19	59	2	0	9
Liv Ain	12	8	63	3	0	14
Liv Roy	14	36	35	6	0	8
M RI	17	29	42	4	0	8
Middlbr	9	27	53	10	0	0
Newc	13	71	6	2	0	8
Norwch	10	51	26	13	0	0
Nottm	15	40	23	8	0	14
Oxford	7	31	41	4	0	17
Plymth	7	56	7	16	0	13

Table F2.8. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
Ports	17	16	56	11	0	0
Prestn	10	18	64	0	0	7
Redng	4	33	43	14	0	6
Salford	4	31	50	4	0	11
Sheff	16	33	40	10	0	0
Shrew	17	38	25	5	0	14
Stevng	8	31	58	3	0	0
Sthend	4	84	0	12	0	0
Stoke	19	39	23	5	0	14
Sund	1	65	26	4	0	3
Truro	8	31	38	8	0	15
Wirral	9	37	44	0	0	10
Wolve	10	46	25	6	1	13
York	17	38	28	7	0	10
N Ireland						
Antrim	4	68	0	0	0	28
Belfast	12	75	0	1	0	12
Newry	6	81	0	0	0	14
Ulster	10	81	0	0	0	10
West NI	8	82	0	0	3	8
Scotland*						
Abrdn	3	79	0	11	0	7
Airdrie	0	90	0	5	0	5
D&Gall	13	80	0	7	0	0
Dundee	3	84	0	9	0	3
Edinb	4	86	0	4	0	5
Glasgw	7	85	0	1	0	7
Inverns	6	74	0	15	0	6
Klmarnk	5	72	0	2	0	21
Krkcldy	0	83	0	0	0	17
Wales						
Bangor	33	43	7	7	0	10
Cardff	8	14	63	11	0	5
Clwyd	14	64	0	6	0	17
Swanse	18	39	26	11	0	6
Wrexm	5	50	9	2	0	34
England	**9**	**33**	**45**	**6**	**0**	**8**
N Ireland	**8**	**77**	**0**	**1**	**1**	**13**
Scotland*	**4**	**83**	**0**	**5**	**0**	**8**
Wales	**12**	**31**	**38**	**9**	**0**	**10**
UK	**8**	**38**	**40**	**6**	**0**	**8**

Excluded one centre with $\geqslant$40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table
*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.9. Number of 2015 prevalent patients without diabetes aged under 65 by treatment modality

	HD	PD	Transplant
England	6,807	1,120	17,897
N Ireland	163	27	719
Scotland	682	97	1,966
Wales	364	86	1,083
UK	**8,016**	**1,330**	**21,665**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table

Table F2.10. Dialysis modalities for 2015 prevalent patients without diabetes aged over 65

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	1	80	9	3	0	7
B QEH	1	7	81	4	0	7
Basldn	0	69	21	7	0	3
Bradfd	1	62	29	3	0	5
Brightn	5	32	48	11	0	4
Bristol	2	11	76	4	0	6
Carlis	0	44	21	17	3	14
Carsh	2	10	79	1	0	8
Chelms	0	87	0	9	0	4
Covnt	1	83	0	16	1	0
Derby	12	69	0	13	0	7
Donc	4	42	43	1	0	10
Dorset	1	18	70	3	1	8
Dudley	2	45	32	15	0	7
Exeter	0	9	76	5	0	10
Glouc	1	67	20	3	0	7
Hull	1	39	44	9	0	7
Ipswi	0	71	11	9	0	9
Kent	0	26	64	6	0	3
L Barts	1	27	56	4	0	12
L Guys	3	15	78	3	0	2
L Kings	1	8	77	8	0	6
L Rfree	3	1	78	9	0	8
L St.G	0	28	56	8	1	8
L West	1	19	75	3	0	2
Leeds	0	10	82	1	0	7
Leic	4	17	70	3	0	6
Liv Ain	1	9	75	2	0	13
Liv Roy	5	23	59	9	0	5
M RI	3	17	67	5	0	8
Middlbr	2	21	74	3	0	0
Newc	3	75	7	2	0	13
Norwch	5	53	34	7	0	1

Table F2.10. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
Nottm	2	33	49	9	0	7
Oxford	2	29	52	5	0	12
Plymth	2	70	11	5	0	12
Ports	2	18	70	10	0	0
Prestn	4	18	67	2	0	8
Redng	0	45	43	10	1	3
Salford	2	25	50	10	0	13
Sheff	2	38	50	10	0	0
Shrew	8	44	40	3	0	5
Stevng	3	24	70	3	0	0
Sthend	0	87	0	13	0	0
Stoke	3	53	28	2	7	7
Sund	0	73	20	4	0	3
Truro	3	38	51	5	0	3
Wirral	2	41	46	2	0	9
Wolve	4	41	37	8	2	9
York	0	24	63	4	0	9
N Ireland						
Antrim	1	89	0	1	0	8
Belfast	0	91	0	1	0	8
Newry	2	69	0	2	0	27
Ulster	0	94	0	0	0	6
West NI	1	91	0	0	0	7
Scotland*						
Abrdn	2	95	0	2	0	1
Airdrie	0	93	0	1	0	6
D&Gall	0	88	0	12	0	0
Dundee	0	91	0	5	0	3
Edinb	0	92	0	1	0	7
Glasgw	2	92	0	2	0	4
Inverns	2	91	0	2	0	5
Klmarnk	8	72	0	1	0	18
Krkcldy	0	90	0	2	0	7
Wales						
Bangor	4	51	26	9	0	11
Cardff	3	13	70	11	0	3
Clwyd	5	77	0	7	0	12
Swanse	5	47	38	6	0	5
Wrexm	0	63	17	0	0	20
England	**2**	**31**	**55**	**6**	**0**	**6**
N Ireland	**1**	**88**	**0**	**1**	**0**	**10**
Scotland*	**2**	**90**	**0**	**2**	**0**	**6**
Wales	**3**	**37**	**45**	**8**	**0**	**7**
UK	**2**	**38**	**48**	**6**	**0**	**6**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table
*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.11. Number of 2015 prevalent patients without diabetes aged over 65 by treatment modality

	HD	PD	Transplant
England	7,960	1,096	5,172
N Ireland	297	37	181
Scotland	784	69	469
Wales	509	86	383
UK	**9,550**	**1,288**	**6,205**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table

Table F2.12. Dialysis modalities for 2015 prevalent patients with diabetes

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	5	81	4	6	0	5
B QEH	3	16	74	2	0	6
Basldn	0	62	21	4	0	13
Bradfd	0	85	11	0	0	3
Brightn	7	37	44	7	0	4
Bristol	1	23	74	2	0	1
Carlis	0	58	17	0	0	25
Carsh	2	14	72	2	0	10
Chelms	0	83	0	5	0	12
Covnt	4	73	0	23	0	0
Derby	5	66	0	18	0	10
Donc	0	44	44	0	0	12
Dorset	2	21	64	2	0	11
Dudley	9	49	23	5	2	12
Exeter	0	12	77	3	0	8
Glouc	2	62	26	0	0	9
Hull	1	48	29	14	0	7
Ipswi	0	62	14	5	0	19
Kent	2	24	62	11	0	1
L Barts	0	34	46	1	0	18
L Guys	2	16	78	2	0	2
L Kings	1	22	65	3	0	9
L Rfree	0	2	82	4	0	12
L St.G	1	32	56	4	1	6
L West	1	20	75	2	0	2
Leeds	2	20	73	1	0	5
Leic	2	25	64	4	0	5
Liv Ain	5	17	51	0	0	27
Liv Roy	4	38	45	5	0	9
M RI	2	36	53	5	0	3
Middlbr	0	32	63	5	0	0
Newc	0	83	3	1	0	13
Norwch	6	46	35	13	0	0

Table F2.12. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
Nottm	4	45	37	3	0	12
Oxford	1	31	53	3	0	12
Plymth	0	72	12	4	0	12
Ports	5	18	72	5	0	0
Prestn	4	28	61	2	0	5
Redng	1	36	39	17	0	6
Salford	5	19	63	4	0	9
Sheff	2	40	50	8	0	0
Shrew	2	44	37	12	0	6
Stevng	4	22	72	1	1	0
Sthend	0	92	0	8	0	0
Stoke	7	55	17	1	9	11
Sund	2	63	26	5	0	5
Truro	7	55	31	2	0	5
Wirral	7	36	50	2	0	5
Wolve	3	45	27	10	3	12
York	3	46	32	3	0	16
N Ireland						
Antrim	0	87	0	0	0	13
Belfast	3	92	0	0	0	5
Newry	0	86	0	0	0	14
Ulster	0	100	0	0	0	0
West NI	0	90	0	0	0	10
Scotland*						
Abrdn	0	89	0	6	0	5
Airdrie	0	96	0	0	0	4
D&Gall	4	68	0	20	0	8
Dundee	0	98	0	2	0	0
Edinb	0	92	0	1	0	6
Glasgw	2	86	0	2	0	10
Inverns	0	88	0	6	0	6
Klmarnk	3	75	0	0	0	23
Krkcldy	0	93	0	0	0	7
Wales						
Bangor	14	64	18	5	0	0
Cardff	4	11	76	4	0	4
Clwyd	0	83	0	0	0	17
Swanse	5	44	32	7	0	12
Wrexm	6	68	10	0	0	16
England	**2**	**33**	**53**	**4**	**0**	**7**
N Ireland	**1**	**91**	**0**	**0**	**0**	**9**
Scotland*	**1**	**88**	**0**	**3**	**0**	**8**
Wales	**5**	**38**	**43**	**5**	**0**	**9**
UK	**2**	**39**	**47**	**4**	**0**	**7**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Only patients with diabetes as their primary renal disease included in this table
*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.13. Number of 2015 prevalent patients with diabetes by treatment modality

	HD	PD	Transplant
England	4,900	649	2,811
N Ireland	156	15	86
Scotland	456	56	274
Wales	265	41	204
UK	**5,777**	**761**	**3,375**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Only patients with diabetes as their primary renal disease included in this table

Table F2.14. Demography of 2015 prevalent patients with diabetes

Centre	M : F ratio	Median age on 31/12/2015	Median age at start of treatment	Median time on RRT in days	Median time on RRT in years
England					
B Heart	1.5	66	62	979	2.7
B QEH	1.6	63	57	1,515	4.1
Basldn	2.0	64	59	1,340	3.7
Bradfd	1.6	63	60	1,111	3.0
Brightn	1.7	60	55	1,063	2.9
Bristol	1.9	62	54	1,498	4.1
Carlis	2.5	60	58	770	2.1
Carsh	1.8	63	56	1,934	5.3
Chelms	2.9	64	60	898	2.5
Covnt	1.5	61	56	1,655	4.5
Derby	1.5	64	59	1,092	3.0
Donc	1.7	61	57	1,259	3.4
Dorset	1.8	62	55	1,331	3.6
Dudley	2.4	61	56	1,318	3.6
Exeter	1.7	64	60	1,170	3.2
Glouc	1.8	63	57	1,150	3.1
Hull	1.8	64	57	1,276	3.5
Ipswi	1.5	62	51	1,804	4.9
Kent	1.9	60	54	1,147	3.1
L Barts	1.6	63	59	1,141	3.1
L Guys	1.4	57	48	2,364	6.5
L Kings	1.4	64	61	1,061	2.9
L Rfree	1.5	65	60	1,312	3.6
L St.G	1.2	67	62	1,696	4.6
L West	1.7	64	59	1,464	4.0
Leeds	1.7	61	55	1,173	3.2
Leic	1.7	62	57	1,308	3.6
Liv Ain	1.4	58	56	636	1.7
Liv Roy	1.0	56	48	1,697	4.6
M RI	1.7	59	54	1,292	3.5
Middlbr	1.6	58	55	1,191	3.3
Newc	1.5	57	50	1,417	3.9
Norwch	1.6	61	56	1,563	4.3
Nottm	1.4	59	54	1,869	5.1
Oxford	1.9	56	52	1,304	3.6
Plymth	1.6	59	54	2,064	5.7
Ports	1.8	61	56	1,220	3.3

Table F2.14. Continued

Centre	M : F ratio	Median age on 31/12/2015	Median age at start of treatment	Median time on RRT in days	Median time on RRT in years
Prestn	1.6	63	58	1,121	3.1
Redng	1.9	63	59	1,476	4.0
Salford	2.3	63	57	716	2.0
Sheff	2.0	63	58	1,391	3.8
Shrew	1.5	65	62	1,055	2.9
Stevng	2.2	64	60	1,107	3.0
Sthend	2.5	63	57	1,648	4.5
Stoke	1.2	63	57	1,045	2.9
Sund	2.0	59	56	1,098	3.0
Truro	1.2	57	55	1,135	3.1
Wirral	1.2	62	58	1,129	3.1
Wolve	1.6	59	53	1,656	4.5
York	1.3	58	53	1,504	4.1
N Ireland					
Antrim	1.1	63	62	1,171	3.2
Belfast	1.6	60	55	1,420	3.9
Newry	1.1	64	60	1,297	3.6
Ulster	1.6	61	57	1,223	3.3
West NI	1.4	60	56	1,012	2.8
Scotland					
Abrdn	1.3	60	55	913	2.5
Airdrie	1.7	57	54	1,036	2.8
D&Gall	2.0	59	54	1,048	2.9
Dundee	1.1	56	51	1,821	5.0
Edinb	1.3	55	49	1,246	3.4
Glasgw	1.4	58	54	990	2.7
Inverns	1.8	52	42	2,659	7.3
Klmarnk	1.5	55	51	1,289	3.5
Krkcldy	1.3	63	61	1,269	3.5
Wales					
Bangor	1.6	61	60	964	2.6
Cardff	2.0	59	53	1,492	4.1
Clwyd	1.2	57	52	912	2.5
Swanse	2.1	64	60	1,010	2.8
Wrexm	2.6	60	53	1,601	4.4
England	**1.6**	**62**	**57**	**1,345**	**3.7**
N Ireland	**1.4**	**62**	**57**	**1,236**	**3.4**
Scotland	**1.4**	**57**	**52**	**1,159**	**3.2**
Wales	**2.0**	**61**	**55**	**1,323**	**3.6**
UK	**1.6**	**62**	**56**	**1,323**	**3.6**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Only patients with diabetes as their primary renal disease included in this table

Table F2.15. Transplant gender ratios in 2015 prevalent patients

	% male	% female	male *N*	female *N*	M : F ratio
England	60.4	39.6	15,897	10,418	1.5
N Ireland	61.1	38.9	607	387	1.6
Scotland	59.3	40.7	1,606	1,103	1.5
Wales	63.6	36.4	1,064	610	1.7
UK	**60.5**	**39.5**	**19,174**	**12,518**	**1.5**

F:3 Trends by CCG/HB between 2010 and 2015

Table F3.1. Number of incident patients by year of RRT start and CCG/HB

UK area	CCG/HB name	Code	Incident numbers					
			2010	2011	2012	2013	2014	2015
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	E38000056	20	18	17	16	19	23
	NHS South Cheshire	E38000151	14	15	12	24	24	19
	NHS Vale Royal	E38000189	9	10	9	15		5
	NHS Warrington	E38000194	13	10	19	16	24	19
	NHS West Cheshire	E38000196	30	28	23	27	24	24
	NHS Wirral	E38000208	32	33	23	37	27	45
Durham, Darlington and Tees	NHS Darlington	E38000042	11	10	15	10	7	15
	NHS Durham Dales, Easington and Sedgefield	E38000047	32	35	27	33	32	36
	NHS Hartlepool and Stockton-on-Tees	E38000075	24	28	32	28	32	24
	NHS North Durham	E38000116	13	15	34	18	15	22
	NHS South Tees	E38000162	31	28	29	37	26	54
Greater Manchester	NHS Bolton	E38000016	39	27	26	27	21	35
	NHS Bury	E38000024	13	14	27	16	25	22
	NHS Central Manchester	E38000032	25	14	21	29	30	31
	NHS Heywood, Middleton & Rochdale	E38000080	16	26	27	27	31	23
	NHS North Manchester	E38000123	12	20	20	20	21	30
	NHS Oldham	E38000135	18	23	16	22	31	28
	NHS Salford	E38000143	30	17	20	26	22	20
	NHS South Manchester	E38000158	13	16	16	17	13	21
	NHS Stockport	E38000174	29	28	21	18	31	28
	NHS Tameside and Glossop	E38000182	24	26	16	30	24	30
	NHS Trafford	E38000187	30	12	28	28	22	23
	NHS Wigan Borough	E38000205	25	35	27	26	35	32
Lancashire	NHS Blackburn with Darwen	E38000014	12	19	17	13	12	25
	NHS Blackpool	E38000015	10	14	24	19	20	16
	NHS Chorley and South Ribble	E38000034	10	18	14	25	18	24
	NHS East Lancashire	E38000050	29	37	22	36	47	30
	NHS Fylde & Wyre	E38000060	15	12	17	18	23	21
	NHS Greater Preston	E38000065	11	11	21	18	21	24
	NHS Lancashire North	E38000093	10	18	12	11	12	13
	NHS West Lancashire	E38000200	7	11	10	9	9	19
Merseyside	NHS Halton	E38000068	11	20	13	13	15	21
	NHS Knowsley	E38000091	13	17	20	11	28	15
	NHS Liverpool	E38000101	38	50	55	47	59	66
	NHS South Sefton	E38000161	23	25	19	24	25	21
	NHS Southport and Formby	E38000170	9	14	11	21	13	11
	NHS St Helens	E38000172	18	15	18	13	21	22
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	E38000041	45	36	39	59	54	58
	NHS Newcastle Gateshead	E38000212	37	40	41	31	45	58
	NHS North Tyneside	E38000127	20	15	20	22	16	19
	NHS Northumberland	E38000130	23	32	30	25	40	28
	NHS South Tyneside	E38000163	12	18	9	13	11	18
	NHS Sunderland	E38000176	31	23	27	19	30	34

Table F3.1. Continued

UK area	CCG/HB name	Code	Incident numbers					
			2010	2011	2012	2013	2014	2015
North Yorkshire and Humber	NHS East Riding of Yorkshire	E38000052	27	29	28	19	32	38
	NHS Hambleton, Richmondshire and Whitby	E38000069	14	13	23	17	17	13
	NHS Harrogate and Rural District	E38000073	12	18	18	10	22	23
	NHS Hull	E38000085	23	19	19	24	27	38
	NHS North East Lincolnshire	E38000119	12	23	12	15	19	20
	NHS North Lincolnshire	E38000122	13	29	22	20	10	22
	NHS Scarborough and Ryedale	E38000145	8	8	13	10	12	11
	NHS Vale of York	E38000188	27	42	36	31	35	28
South Yorkshire and Bassetlaw	NHS Barnsley	E38000006	30	21	27	28	37	*
	NHS Bassetlaw	E38000008	12	11	14	17	13	8*
	NHS Doncaster	E38000044	30	35	27	39	48	28
	NHS Rotherham	E38000141	31	20	24	22	26	*
	NHS Sheffield	E38000146	56	55	68	54	57	*
West Yorkshire	NHS Airedale, Wharfedale and Craven	E38000001	10	9	12	16	23	18
	NHS Bradford City	E38000018	17	10	14	14	18	14
	NHS Bradford Districts	E38000019	37	34	44	34	39	53
	NHS Calderdale	E38000025	11	13	17	24	15	17
	NHS Greater Huddersfield	E38000064	20	23	28	24	28	22
	NHS Leeds North	E38000094	14	18	17	19	21	16
	NHS Leeds South and East	E38000095	16	21	17	22	24	17
	NHS Leeds West	E38000096	17	17	21	34	22	29
	NHS North Kirklees	E38000121	19	23	9	28	17	17
	NHS Wakefield	E38000190	31	33	39	32	40	25
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	E38000038	54	61	74	56	51	50
	NHS Herefordshire	E38000078	16	19	21	19	23	34
	NHS Redditch and Bromsgrove	E38000139	19	16	25	15	18	17
	NHS South Warwickshire	E38000164	22	30	20	18	28	27
	NHS South Worcestershire	E38000166	23	25	29	28	37	30
	NHS Warwickshire North	E38000195	33	23	17	16	36	26
	NHS Wyre Forest	E38000211	11	13	10	8	18	6
Birmingham and the Black Country	NHS Birmingham CrossCity	E38000012	87	106	98	98	108	120
	NHS Birmingham South and Central	E38000013	25	32	26	29	33	27
	NHS Dudley	E38000046	28	30	43	44	36	33
	NHS Sandwell and West Birmingham	E38000144	76	72	63	68	79	88
	NHS Solihull	E38000149	23	16	24	22	23	29
	NHS Walsall	E38000191	54	35	39	47	31	42
	NHS Wolverhampton	E38000210	37	30	39	28	42	36
Derbyshire and Nottinghamshire	NHS Erewash	E38000058	9	12	14	14	8	11
	NHS Hardwick	E38000071	5	9	11	10	11	*
	NHS Mansfield & Ashfield	E38000103	19	16	18	18	24	19
	NHS Newark & Sherwood	E38000109	13	18	13	7	11	10
	NHS North Derbyshire	E38000115	22	31	26	26	22	*
	NHS Nottingham City	E38000132	40	29	32	34	37	51
	NHS Nottingham North & East	E38000133	14	13	12	12	10	16
	NHS Nottingham West	E38000134	12	7	14	16	12	13
	NHS Rushcliffe	E38000142	12	15	5	14	6	3
	NHS Southern Derbyshire	E38000169	52	57	63	50	58	51

Table F3.1. Continued

UK area	CCG/HB name	Code	Incident numbers					
			2010	2011	2012	2013	2014	2015
East Anglia	NHS Cambridgeshire and Peterborough	E38000026	67	81	60	98	77	*
	NHS Great Yarmouth & Waveney	E38000063	28	31	26	26	23	35
	NHS Ipswich and East Suffolk	E38000086	30	29	42	44	37	60
	NHS North Norfolk	E38000124	18	12	18	20	22	28
	NHS Norwich	E38000131	23	23	18	17	18	22*
	NHS South Norfolk	E38000159	19	28	24	30	21	33*
	NHS West Norfolk	E38000203	18	14	15	14	21	*
	NHS West Suffolk	E38000204	21	18	23	22	17	*
Essex	NHS Basildon and Brentwood	E38000007	23	28	34	26	29	33
	NHS Castle Point, Rayleigh and Rochford	E38000030	18	16	15	26	17	21
	NHS Mid Essex	E38000106	35	42	35	32	41	37*
	NHS North East Essex	E38000117	36	47	36	33	46	37
	NHS Southend	E38000168	12	16	18	21	15	22
	NHS Thurrock	E38000185	17	18	12	15	18	18
	NHS West Essex	E38000197	20	23	38	34	38	35*
Hertfordshire and the South Midlands	NHS Bedfordshire	E38000010	38	33	44	47	47	48
	NHS Corby	E38000037	8	7	5	4	7	12
	NHS East and North Hertfordshire	E38000049	48	59	40	64	64	71
	NHS Herts Valleys	E38000079	48	46	52	55	71	56
	NHS Luton	E38000102	19	25	22	37	30	27
	NHS Milton Keynes	E38000107	24	22	27	22	31	35
	NHS Nene	E38000108	48	59	72	67	66	64
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	E38000051	26	27	37	35	32	39
	NHS Leicester City	E38000097	47	51	46	49	37	48
	NHS Lincolnshire East	E38000099	23	27	23	34	19	26
	NHS Lincolnshire West	E38000100	16	19	11	21	17	19
	NHS South Lincolnshire	E38000157	20	17	16	12	13	19
	NHS South West Lincolnshire	E38000165	13	14	10	13	8	9
	NHS West Leicestershire	E38000201	45	38	22	35	46	30
Shropshire and Staffordshire	NHS Cannock Chase	E38000028	16	17	12	18	13	13
	NHS East Staffordshire	E38000053	20	12	10	16	13	11
	NHS North Staffordshire	E38000126	17	28	15	25	27	30
	NHS Shropshire	E38000147	34	37	29	40	37	40
	NHS South East Staffs and Seisdon and Peninsular	E38000153	18	26	19	17	22	21
	NHS Stafford and Surrounds	E38000173	20	15	17	17	17	25
	NHS Stoke on Trent	E38000175	36	28	23	30	42	31
	NHS Telford & Wrekin	E38000183	23	19	21	22	24	28
London	NHS Barking & Dagenham	E38000004	20	25	31	25	33	33
	NHS Barnet	E38000005	58	49	52	44	49	55
	NHS Camden	E38000027	32	23	23	28	26	30
	NHS City and Hackney	E38000035	30	34	41	38	46	26
	NHS Enfield	E38000057	38	57	47	47	48	50
	NHS Haringey	E38000072	30	37	50	50	39	38
	NHS Havering	E38000077	9	31	27	22	26	32
	NHS Islington	E38000088	25	27	36	27	21	31
	NHS Newham	E38000113	50	50	45	52	57	62
	NHS Redbridge	E38000138	38	35	55	52	40	42
	NHS Tower Hamlets	E38000186	26	32	36	41	48	53
	NHS Waltham Forest	E38000192	26	40	28	38	50	44

Table F3.1. Continued

UK area	CCG/HB name	Code	Incident numbers					
			2010	2011	2012	2013	2014	2015
London (cont.)	NHS Brent	E38000020	71	58	68	56	76	72
	NHS Central London (Westminster)	E38000031	20	21	19	23	19	18
	NHS Ealing	E38000048	58	57	68	52	58	78
	NHS Hammersmith and Fulham	E38000070	22	21	22	15	23	20
	NHS Harrow	E38000074	49	53	38	26	40	39
	NHS Hillingdon	E38000082	38	39	40	39	29	33
	NHS Hounslow	E38000084	40	42	40	48	32	34
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	E38000202	25	25	19	21	34	16
	NHS Bexley	E38000011	32	29	21	25	29	33
	NHS Bromley	E38000023	37	23	24	29	36	57
	NHS Croydon	E38000040	47	43	69	69	67	73
	NHS Greenwich	E38000066	44	23	26	55	30	43
	NHS Kingston	E38000090	13	15	17	18	19	14
	NHS Lambeth	E38000092	32	43	41	35	49	54
	NHS Lewisham	E38000098	33	42	44	36	39	40
	NHS Merton	E38000105	21	28	32	23	27	35
	NHS Richmond	E38000140	16	13	15	19	16	13
	NHS Southwark	E38000171	41	46	41	54	47	49
	NHS Sutton	E38000179	27	25	30	16	35	32
	NHS Wandsworth	E38000193	35	30	34	24	41	48
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	E38000009	12	11	18	19	14	13
	NHS Gloucestershire	E38000062	61	62	83	51	60	63
	NHS Swindon	E38000181	22	25	27	21	28	32
	NHS Wiltshire	E38000206	43	35	26	44	49	42
Bristol, North Somerset, Somerset and South Gloucestershire	NHS Bristol	E38000022	57	56	49	55	49	52
	NHS North Somerset	E38000125	24	22	26	27	29	23
	NHS Somerset	E38000150	69	56	45	38	64	50
	NHS South Gloucestershire	E38000155	31	18	24	35	22	25
Devon, Cornwall and Isles of Scilly	NHS Kernow	E38000089	59	55	65	60	59	89
	NHS North, East, West Devon	E38000129	101	96	104	89	105	98
	NHS South Devon and Torbay	E38000152	44	32	39	37	34	34
Kent and Medway	NHS Ashford	E38000002	12	11	17	15	14	13
	NHS Canterbury and Coastal	E38000029	21	19	13	22	29	23
	NHS Dartford, Gravesham and Swanley	E38000043	25	23	26	40	27	28
	NHS Medway	E38000104	19	24	22	30	27	35
	NHS South Kent Coast	E38000156	22	25	14	19	27	26
	NHS Swale	E38000180	12	7	16	10	15	12
	NHS Thanet	E38000184	23	14	17	26	18	12
	NHS West Kent	E38000199	36	42	32	37	52	47
Surrey and Sussex	NHS Brighton & Hove	E38000021	21	24	30	21	30	31
	NHS Coastal West Sussex	E38000213	30	40	50	50	70	63
	NHS Crawley	E38000039	19	5	8	11	14	8
	NHS East Surrey	E38000054	24	14	24	18	17	30
	NHS Eastbourne, Hailsham and Seaford	E38000055	14	20	25	29	19	29
	NHS Guildford and Waverley	E38000214	15	16	25	12	18	21
	NHS Hastings & Rother	E38000076	17	22	17	29	16	25
	NHS High Weald Lewes Havens	E38000081	13	14	19	13	22	20
	NHS Horsham and Mid Sussex	E38000083	18	20	13	20	23	16

Table F3.1. Continued

UK area	CCG/HB name	Code	Incident numbers					
			2010	2011	2012	2013	2014	2015
Surrey and Sussex (cont.)	NHS North West Surrey	E38000128	40	47	33	35	48	36
	NHS Surrey Downs	E38000177	30	31	29	34	33	29
	NHS Surrey Heath	E38000178	8	8	8	5	5	11
Thames Valley	NHS Aylesbury Vale	E38000003	20	22	16	15	19	18
	NHS Bracknell and Ascot	E38000017	13	10	5	17	14	11
	NHS Chiltern	E38000033	23	24	26	36	30	32
	NHS Newbury and District	E38000110	7	7	7	12	11	9
	NHS North & West Reading	E38000114	3	10	10	7	11	11
	NHS Oxfordshire	E38000136	59	69	67	62	62	62
	NHS Slough	E38000148	22	25	20	21	21	25
	NHS South Reading	E38000160	11	10	10	21	14	7
	NHS Windsor, Ascot and Maidenhead	E38000207	13	18	9	20	19	10
	NHS Wokingham	E38000209	13	22	8	14	14	12
Wessex	NHS Dorset	E38000045	56	68	67	70	73	63
	NHS Fareham and Gosport	E38000059	25	18	18	24	27	23
	NHS Isle of Wight	E38000087	11	14	16	23	17	14
	NHS North East Hampshire and Farnham	E38000118	18	18	25	26	20	23
	NHS North Hampshire	E38000120	16	16	11	17	26	20
	NHS Portsmouth	E38000137	10	25	21	22	20	22
	NHS South Eastern Hampshire	E38000154	26	19	16	25	30	20
	NHS Southampton	E38000167	26	25	19	14	23	23
	NHS West Hampshire	E38000198	30	44	41	45	55	44
Wales	Betsi Cadwaladr University	W11000023	78	68	83	76	96	100
	Powys Teaching	W11000024	12	22	22	13	11	19
	Hywel Dda	W11000025	51	58	43	52	60	54
	Abertawe Bro Morgannwg University	W11000026	85	68	84	62	60	73
	Cwm Taf	W11000027	31	46	29	37	39	34
	Aneurin Bevan	W11000028	80	77	76	69	81	71
	Cardiff and Vale University	W11000029	59	47	47	53	47	48
Scotland	Ayrshire and Arran	S08000015	48	36	42	45	38	45
	Borders	S08000016	15	8	8	7	9	12
	Dumfries and Galloway	S08000017	11	11	20	8	25	13
	Fife	S08000018	50	48	36	43	41	49
	Forth Valley	S08000019	33	27	29	34	33	38
	Grampian	S08000020	51	51	53	58	51	62
	Greater Glasgow and Clyde	S08000021	103	129	133	112	115	153
	Highland	S08000022	25	20	24	27	21	41
	Lanarkshire	S08000023	64	58	76	67	68	75
	Lothian	S08000024	52	62	65	54	71	69
	Orkney	S08000025		0	5		0	5
	Shetland	S08000026			0		3	3
	Tayside	S08000027	47	56	32	42	49	50
	Western Isles	S08000028	5	0	0	3	6	6
Northern Ireland	Belfast	ZC010	43	36	57	40	31	45
	Northern	ZC020	50	59	54	51	53	48
	Southern	ZC030	34	44	30	30	29	35
	South Eastern	ZC040	26	34	29	35	31	53
	Western	ZC050	25	28	17	29	33	36

Values of 1 or 2 have been suppressed – these cells are blank

*Incident numbers in CCGs where at least 10% of the incident RRT population were incident patients of Cambridge/Sheffield renal centres. In these CCGs the numbers are approximated/underestimated. In the CCGs which were >70% covered by Cambridge/Sheffield, the numbers for 2015 have been blanked (see methods section of the Incidence chapter of this report for further details)

Table F3.2. Number of prevalent patients on HD in-centre by year and CCG/HB

UK area	CCG/HB name	Code	Prevalent numbers on HD in-centre					
			2010	2011	2012	2013	2014	2015
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	E38000056	45	43	51	49	49	55
	NHS South Cheshire	E38000151	58	59	53	52	56	59
	NHS Vale Royal	E38000189	23	26	23	29	28	25
	NHS Warrington	E38000194	52	47	50	49	61	60
	NHS West Cheshire	E38000196	84	89	84	84	87	78
	NHS Wirral	E38000208	98	96	106	113	103	96
Durham, Darlington and Tees	NHS Darlington	E38000042	33	24	32	29	27	32
	NHS Durham Dales, Easington and Sedgefield	E38000047	91	101	98	105	100	116
	NHS Hartlepool and Stockton—on—Tees	E38000075	65	83	91	89	94	80
	NHS North Durham	E38000116	43	48	63	66	67	71
	NHS South Tees	E38000162	85	91	91	99	95	107
Greater Manchester	NHS Bolton	E38000016	75	80	75	75	70	75
	NHS Bury	E38000024	42	44	42	47	50	53
	NHS Central Manchester	E38000032	78	73	81	88	92	87
	NHS Heywood, Middleton & Rochdale	E38000080	52	51	56	65	73	74
	NHS North Manchester	E38000123	53	57	60	52	56	64
	NHS Oldham	E38000135	52	52	56	61	67	66
	NHS Salford	E38000143	53	51	51	54	52	43
	NHS South Manchester	E38000158	44	41	41	46	47	52
	NHS Stockport	E38000174	58	66	69	57	71	69
	NHS Tameside and Glossop	E38000182	60	52	60	60	58	61
	NHS Trafford	E38000187	61	56	57	65	68	58
	NHS Wigan Borough	E38000205	68	74	79	84	94	89
Lancashire	NHS Blackburn with Darwen	E38000014	71	71	73	79	75	80
	NHS Blackpool	E38000015	39	41	51	55	64	63
	NHS Chorley and South Ribble	E38000034	38	41	54	63	59	55
	NHS East Lancashire	E38000050	123	117	113	120	125	123
	NHS Fylde & Wyre	E38000060	59	64	65	62	66	67
	NHS Greater Preston	E38000065	66	63	62	63	58	61
	NHS Lancashire North	E38000093	32	37	33	27	35	39
	NHS West Lancashire	E38000200	39	36	34	30	30	33
Merseyside	NHS Halton	E38000068	38	46	39	40	41	42
	NHS Knowsley	E38000091	44	51	51	46	49	48
	NHS Liverpool	E38000101	176	177	169	159	161	167
	NHS South Sefton	E38000161	43	58	51	52	58	60
	NHS Southport and Formby	E38000170	38	43	43	41	46	42
	NHS St Helens	E38000172	61	61	58	50	48	52
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	E38000041	104	102	104	109	115	122
	NHS Newcastle Gateshead	E38000212	124	111	118	110	112	127
	NHS North Tyneside	E38000127	37	33	38	51	51	49
	NHS Northumberland	E38000130	68	70	69	63	76	88
	NHS South Tyneside	E38000163	41	49	46	44	40	47
	NHS Sunderland	E38000176	94	90	96	85	97	98

Table F3.2. Continued

UK area	CCG/HB name	Code	Prevalent numbers on HD in-centre					
			2010	2011	2012	2013	2014	2015
North Yorkshire and Humber	NHS East Riding of Yorkshire	E38000052	88	85	86	79	80	83
	NHS Hambleton, Richmondshire and Whitby	E38000069	28	29	40	44	41	39
	NHS Harrogate and Rural District	E38000073	36	34	35	35	39	47
	NHS Hull	E38000085	77	75	67	70	81	92
	NHS North East Lincolnshire	E38000119	56	61	54	59	60	62
	NHS North Lincolnshire	E38000122	49	56	64	73	65	72
	NHS Scarborough and Ryedale	E38000145	29	27	32	33	34	32
	NHS Vale of York	E38000188	96	92	88	92	90	94
South Yorkshire and Bassetlaw	NHS Barnsley	E38000006	109	113	107	99	100	92
	NHS Bassetlaw	E38000008	34	34	45	40	40	40
	NHS Doncaster	E38000044	105	116	111	107	112	109
	NHS Rotherham	E38000141	115	106	103	105	100	92
	NHS Sheffield	E38000146	233	224	236	236	243	229
West Yorkshire	NHS Airedale, Wharfedale and Craven	E38000001	31	36	36	36	46	46
	NHS Bradford City	E38000018	44	45	45	47	56	51
	NHS Bradford Districts	E38000019	100	112	120	108	111	122
	NHS Calderdale	E38000025	66	60	46	43	45	48
	NHS Greater Huddersfield	E38000064	66	59	74	73	79	76
	NHS Leeds North	E38000094	68	71	69	68	61	63
	NHS Leeds South and East	E38000095	65	71	73	69	82	78
	NHS Leeds West	E38000096	69	65	57	66	69	78
	NHS North Kirklees	E38000121	65	69	70	75	69	60
	NHS Wakefield	E38000190	93	103	102	105	104	101
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	E38000038	183	182	188	196	186	168
	NHS Herefordshire	E38000078	59	60	63	62	61	73
	NHS Redditch and Bromsgrove	E38000139	56	54	57	53	57	65
	NHS South Warwickshire	E38000164	76	85	76	78	74	84
	NHS South Worcestershire	E38000166	80	87	98	99	98	108
	NHS Warwickshire North	E38000195	82	70	60	67	79	76
	NHS Wyre Forest	E38000211	30	30	29	30	38	38
Birmingham and the Black Country	NHS Birmingham CrossCity	E38000012	397	417	422	422	433	448
	NHS Birmingham South and Central	E38000013	121	133	145	143	143	145
	NHS Dudley	E38000046	104	96	113	116	109	110
	NHS Sandwell and West Birmingham	E38000144	365	359	350	353	350	367
	NHS Solihull	E38000149	87	84	85	85	78	80
	NHS Walsall	E38000191	145	134	132	135	143	143
	NHS Wolverhampton	E38000210	128	118	108	108	113	116
Derbyshire and Nottinghamshire	NHS Erewash	E38000058	45	43	40	34	30	38
	NHS Hardwick	E38000071	39	39	41	43	38	36
	NHS Mansfield & Ashfield	E38000103	60	59	53	58	55	59
	NHS Newark & Sherwood	E38000109	37	39	31	29	26	27
	NHS North Derbyshire	E38000115	78	83	78	78	77	77
	NHS Nottingham City	E38000132	130	115	105	104	110	122
	NHS Nottingham North & East	E38000133	46	41	43	42	42	41
	NHS Nottingham West	E38000134	41	39	40	40	40	41
	NHS Rushcliffe	E38000142	31	31	28	31	29	30
	NHS Southern Derbyshire	E38000169	167	151	146	144	155	164

Table F3.2. Continued

UK area	CCG/HB name	Code	Prevalent numbers on HD in-centre					
			2010	2011	2012	2013	2014	2015
East Anglia	NHS Cambridgeshire and Peterborough	E38000026	255	274	262	290	277	277*
	NHS Great Yarmouth & Waveney	E38000063	107	106	103	96	88	97
	NHS Ipswich and East Suffolk	E38000086	118	120	125	129	127	147
	NHS North Norfolk	E38000124	74	70	69	76	84	81
	NHS Norwich	E38000131	67	59	64	61	56	60
	NHS South Norfolk	E38000159	64	64	71	71	71	80
	NHS West Norfolk	E38000203	60	55	54	55	51	*
	NHS West Suffolk	E38000204	61	65	52	59	58	*
Essex	NHS Basildon and Brentwood	E38000007	83	91	91	98	106	97
	NHS Castle Point, Rayleigh and Rochford	E38000030	56	52	54	57	58	61
	NHS Mid Essex	E38000106	97	95	97	102	111	125*
	NHS North East Essex	E38000117	114	121	118	112	117	119*
	NHS Southend	E38000168	64	67	68	68	65	69
	NHS Thurrock	E38000185	54	54	57	56	60	64
	NHS West Essex	E38000197	61	68	82	102	110	106*
Hertfordshire and the South Midlands	NHS Bedfordshire	E38000010	113	107	102	113	122	133*
	NHS Corby	E38000037	18	17	21	18	20	18
	NHS East and North Hertfordshire	E38000049	147	165	156	155	170	185*
	NHS Herts Valleys	E38000079	202	200	191	181	188	191
	NHS Luton	E38000102	90	96	95	95	95	103*
	NHS Milton Keynes	E38000107	55	58	55	63	77	74
	NHS Nene	E38000108	172	173	170	178	187	187
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	E38000051	80	78	79	77	78	79
	NHS Leicester City	E38000097	173	187	188	198	186	190
	NHS Lincolnshire East	E38000099	72	82	86	85	83	87
	NHS Lincolnshire West	E38000100	61	70	63	71	68	75
	NHS South Lincolnshire	E38000157	41	45	48	44	42	42*
	NHS South West Lincolnshire	E38000165	32	30	31	29	27	29
	NHS West Leicestershire	E38000201	97	100	100	101	108	107
Shropshire and Staffordshire	NHS Cannock Chase	E38000028	44	47	38	46	43	52
	NHS East Staffordshire	E38000053	33	26	34	31	35	28
	NHS North Staffordshire	E38000126	64	68	60	65	61	65
	NHS Shropshire	E38000147	109	98	106	99	102	103
	NHS South East Staffs and Seisdon and Peninsular	E38000153	78	82	76	74	73	72
	NHS Stafford and Surrounds	E38000173	43	51	45	39	47	55
	NHS Stoke on Trent	E38000175	96	103	99	99	113	104
	NHS Telford & Wrekin	E38000183	79	79	70	72	78	76
London	NHS Barking & Dagenham	E38000004	66	81	85	88	90	91
	NHS Barnet	E38000005	177	167	167	167	174	181
	NHS Camden	E38000027	90	85	83	88	94	98
	NHS City and Hackney	E38000035	131	140	147	139	141	132
	NHS Enfield	E38000057	143	152	146	152	146	135
	NHS Haringey	E38000072	121	136	141	147	151	146
	NHS Havering	E38000077	69	80	77	67	73	77
	NHS Islington	E38000088	69	74	83	87	83	87
	NHS Newham	E38000113	169	191	190	209	212	223
	NHS Redbridge	E38000138	112	123	123	137	124	133
	NHS Tower Hamlets	E38000186	105	114	122	136	143	165
	NHS Waltham Forest	E38000192	111	134	126	136	134	139
	NHS Brent	E38000020	267	276	281	270	286	297

Table F3.2. Continued

UK area	CCG/HB name	Code	Prevalent numbers on HD in-centre					
			2010	2011	2012	2013	2014	2015
London (cont.)	NHS Central London (Westminster)	E38000031	54	64	63	70	65	62
	NHS Ealing	E38000048	236	246	261	258	257	278
	NHS Hammersmith and Fulham	E38000070	76	82	83	77	84	87
	NHS Harrow	E38000074	153	177	175	168	164	167
	NHS Hillingdon	E38000082	122	134	140	153	146	146
	NHS Hounslow	E38000084	124	138	143	148	149	151
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	E38000202	87	99	100	103	110	110
	NHS Bexley	E38000011	89	95	98	99	109	107
	NHS Bromley	E38000023	85	92	83	82	85	110
	NHS Croydon	E38000040	200	214	235	247	256	260
	NHS Greenwich	E38000066	102	110	107	121	118	116
	NHS Kingston	E38000090	59	64	63	58	57	57
	NHS Lambeth	E38000092	185	199	203	203	228	238
	NHS Lewisham	E38000098	169	183	190	185	176	181
	NHS Merton	E38000105	89	87	89	87	96	113
	NHS Richmond	E38000140	46	44	41	45	43	43
	NHS Southwark	E38000171	168	184	186	189	199	220
	NHS Sutton	E38000179	83	89	91	84	91	95
	NHS Wandsworth	E38000193	146	135	125	117	132	141
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	E38000009	59	62	64	59	56	62
	NHS Gloucestershire	E38000062	191	188	220	209	213	221
	NHS Swindon	E38000181	37	45	54	56	61	57
	NHS Wiltshire	E38000206	105	109	101	108	106	111
Bristol, North Somerset, Somerset and South Gloucestershire	NHS Bristol	E38000022	143	150	164	177	183	180
	NHS North Somerset	E38000125	55	61	69	69	79	76
	NHS Somerset	E38000150	157	164	166	164	171	175
	NHS South Gloucestershire	E38000155	76	73	73	85	88	87
Devon, Cornwall and Isles of Scilly	NHS Kernow	E38000089	184	180	173	176	180	186
	NHS North, East, West Devon	E38000129	264	275	288	285	295	299
	NHS South Devon and Torbay	E38000152	110	107	114	122	119	124
Kent and Medway	NHS Ashford	E38000002	37	38	37	37	39	40
	NHS Canterbury and Coastal	E38000029	55	53	49	59	72	78
	NHS Dartford, Gravesham and Swanley	E38000043	66	72	79	83	88	87
	NHS Medway	E38000104	56	67	73	78	79	85
	NHS South Kent Coast	E38000156	63	64	69	59	60	66
	NHS Swale	E38000180	37	32	36	32	28	30
	NHS Thanet	E38000184	49	44	44	53	52	47
	NHS West Kent	E38000199	113	123	138	129	145	141
Surrey and Sussex	NHS Brighton & Hove	E38000021	62	61	65	65	76	77
	NHS Coastal West Sussex	E38000213	131	126	141	140	142	161
	NHS Crawley	E38000039	54	46	43	41	41	40
	NHS East Surrey	E38000054	46	42	51	57	56	58
	NHS Eastbourne, Hailsham and Seaford	E38000055	57	49	58	59	69	69
	NHS Guildford and Waverley	E38000214	39	40	46	43	46	49
	NHS Hastings & Rother	E38000076	51	50	50	57	56	58
	NHS High Weald Lewes Havens	E38000081	30	32	37	39	46	52
	NHS Horsham and Mid Sussex	E38000083	43	52	51	53	44	45
	NHS North West Surrey	E38000128	109	109	106	105	113	117
	NHS Surrey Downs	E38000177	83	86	84	88	84	82
	NHS Surrey Heath	E38000178	26	25	23	21	21	25

Table F3.2. Continued

UK area	CCG/HB name	Code	Prevalent numbers on HD in-centre					
			2010	2011	2012	2013	2014	2015
Thames Valley	NHS Aylesbury Vale	E38000003	51	42	47	44	50	48
	NHS Bracknell and Ascot	E38000017	24	24	25	32	38	39
	NHS Chiltern	E38000033	66	77	72	79	85	73
	NHS Newbury and District	E38000110	20	20	14	23	30	30
	NHS North & West Reading	E38000114	20	20	21	20	21	26
	NHS Oxfordshire	E38000136	141	163	160	158	157	140
	NHS Slough	E38000148	61	75	72	66	72	76
	NHS South Reading	E38000160	36	32	31	38	39	39
	NHS Windsor, Ascot and Maidenhead	E38000207	40	35	36	35	35	41
	NHS Wokingham	E38000209	40	48	45	47	44	45
Wessex	NHS Dorset	E38000045	203	205	226	227	235	242
	NHS Fareham and Gosport	E38000059	46	48	48	56	57	66
	NHS Isle of Wight	E38000087	21	30	39	57	57	47
	NHS North East Hampshire and Farnham	E38000118	52	59	62	68	63	75
	NHS North Hampshire	E38000120	44	41	40	36	46	48
	NHS Portsmouth	E38000137	47	56	60	63	64	75
	NHS South Eastern Hampshire	E38000154	66	70	61	69	74	75
	NHS Southampton	E38000167	65	69	74	67	59	67
	NHS West Hampshire	E38000198	108	125	136	140	144	141
Wales	Betsi Cadwaladr University	W11000023	218	218	244	232	257	236
	Powys Teaching	W11000024	49	44	54	55	48	56
	Hywel Dda	W11000025	134	131	123	128	133	141
	Abertawe Bro Morgannwg University	W11000026	234	221	206	201	179	205
	Cwm Taf	W11000027	89	102	97	92	94	101
	Aneurin Bevan	W11000028	184	192	176	179	202	201
	Cardiff and Vale University	W11000029	139	131	131	136	130	135
Scotland	Ayrshire and Arran	S08000015	156	147	146	135	128	130
	Borders	S08000016	51	47	38	37	37	40
	Dumfries and Galloway	S08000017	60	53	53	47	46	51
	Fife	S08000018	139	154	159	157	150	158
	Forth Valley	S08000019	119	110	100	103	94	98
	Grampian	S08000020	186	202	220	209	189	203
	Greater Glasgow and Clyde	S08000021	408	418	417	405	384	424
	Highland	S08000022	87	81	74	74	68	87
	Lanarkshire	S08000023	223	214	236	228	218	228
	Lothian	S08000024	216	201	217	230	227	236
	Orkney	S08000025	9	7	6	8	6	8
	Shetland	S08000026	4	4	3	3	4	7
	Tayside	S08000027	172	179	168	162	159	180
	Western Isles	S08000028	11	8	6	6	9	14
Northern Ireland	Belfast	ZC010	149	146	141	139	138	128
	Northern	ZC020	170	184	185	183	183	165
	Southern	ZC030	124	130	103	103	103	96
	South Eastern	ZC040	99	99	102	97	89	104
	Western	ZC050	131	119	105	88	92	99

*Prevalent numbers in CCGs where at least 10% of the RRT population was seen in Cambridge renal centre. In these CCGs the 2015 numbers are estimated using 2014 data from Cambridge, as this centre was unable to submit 2015 patient-level data on time. In the CCGs with >70% RRT population covered by Cambridge, the numbers for 2015 have been blanked

Table F3.3. Number of prevalent patients on home-therapies by year and CCG/HB

UK Area	CCG/HB Name	Code	Prevalent numbers on home-therapies					
			2010	2011	2012	2013	2014	2015
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	E38000056	18	21	21	19	20	13
	NHS South Cheshire	E38000151	12	12	17	18	17	16
	NHS Vale Royal	E38000189	12	12	10	8	6	8
	NHS Warrington	E38000194	16	17	15	13	16	18
	NHS West Cheshire	E38000196	20	19	20	22	17	11
	NHS Wirral	E38000208	14	21	14	18	10	17
Durham, Darlington and Tees	NHS Darlington	E38000042	3	4		3	3	4
	NHS Durham Dales, Easington and Sedgefield	E38000047	14	13	11	10	9	6
	NHS Hartlepool and Stockton-on-Tees	E38000075	7	8	8	7	9	13
	NHS North Durham	E38000116	14	13	17	8	12	10
	NHS South Tees	E38000162	4	3	6	7	5	12
Greater Manchester	NHS Bolton	E38000016	27	25	26	25	23	18
	NHS Bury	E38000024	17	20	21	19	18	15
	NHS Central Manchester	E38000032	20	17	14	15	16	18
	NHS Heywood, Middleton & Rochdale	E38000080	15	22	19	16	23	18
	NHS North Manchester	E38000123	15	9	10	12	12	8
	NHS Oldham	E38000135	19	21	18	13	13	18
	NHS Salford	E38000143	12	13	12	17	13	13
	NHS South Manchester	E38000158	12	10	12	10	10	9
	NHS Stockport	E38000174	34	36	34	29	22	26
	NHS Tameside and Glossop	E38000182	23	28	24	25	20	19
	NHS Trafford	E38000187	24	23	21	16	11	12
	NHS Wigan Borough	E38000205	27	26	29	25	25	20
Lancashire	NHS Blackburn with Darwen	E38000014	11	14	10	3	3	
	NHS Blackpool	E38000015	7	7	5	5	8	10
	NHS Chorley and South Ribble	E38000034	11	12	12	10	11	11
	NHS East Lancashire	E38000050	26	32	30	26	27	20
	NHS Fylde & Wyre	E38000060	12	11	11	15	14	14
	NHS Greater Preston	E38000065	6	5	12	11	17	17
	NHS Lancashire North	E38000093	8	10	17	17	11	12
	NHS West Lancashire	E38000200	6	7	5	7	6	7
Merseyside	NHS Halton	E38000068	8	11	13	13	11	14
	NHS Knowsley	E38000091	11	7	13	12	17	23
	NHS Liverpool	E38000101	29	30	32	33	37	38
	NHS South Sefton	E38000161	16	12	18	19	21	22
	NHS Southport and Formby	E38000170	8	10	8	10	10	13
	NHS St Helens	E38000172	15	14	22	21	18	15
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	E38000041	25	34	36	35	37	50
	NHS Newcastle Gateshead	E38000212	20	23	26	24	27	26
	NHS North Tyneside	E38000127	14	11	13	11	11	12
	NHS Northumberland	E38000130	23	15	21	21	25	22
	NHS South Tyneside	E38000163	12	9	8		6	5
	NHS Sunderland	E38000176	16	8	7	8	6	12

Table F3.3. Continued

UK Area	CCG/HB Name	Code	Prevalent numbers on home-therapies					
			2010	2011	2012	2013	2014	2015
North Yorkshire and Humber	NHS East Riding of Yorkshire	E38000052	28	36	30	20	23	27
	NHS Hambleton, Richmondshire and Whitby	E38000069	10	11	6	7	3	5
	NHS Harrogate and Rural District	E38000073	6	8	10	11	14	16
	NHS Hull	E38000085	18	17	16	15	17	16
	NHS North East Lincolnshire	E38000119	14	19	22	15	13	15
	NHS North Lincolnshire	E38000122	12	19	23	26	24	19
	NHS Scarborough and Ryedale	E38000145	9	7	8	10	7	7
	NHS Vale of York	E38000188	17	25	34	28	24	19
South Yorkshire and Bassetlaw	NHS Barnsley	E38000006	16	14	14	22	19	16
	NHS Bassetlaw	E38000008	10	13	12	13	11	9
	NHS Doncaster	E38000044	22	20	22	25	26	26
	NHS Rotherham	E38000141	21	18	22	16	16	18
	NHS Sheffield	E38000146	38	37	40	40	33	33
West Yorkshire	NHS Airedale, Wharfedale and Craven	E38000001	8	5	6	7	6	8
	NHS Bradford City	E38000018	7	4	3		3	
	NHS Bradford Districts	E38000019	20	19	24	27	21	19
	NHS Calderdale	E38000025	21	14	15	15	14	14
	NHS Greater Huddersfield	E38000064	20	20	15	14	12	14
	NHS Leeds North	E38000094	14	7	8	5	4	
	NHS Leeds South and East	E38000095	12	10	5	6	5	8
	NHS Leeds West	E38000096	19	16	9	7	8	6
	NHS North Kirklees	E38000121	10	12	11	12	10	10
	NHS Wakefield	E38000190	18	19	25	23	24	19
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	E38000038	44	57	71	62	52	49
	NHS Herefordshire	E38000078	15	18	18	19	20	23
	NHS Redditch and Bromsgrove	E38000139	19	23	25	25	19	16
	NHS South Warwickshire	E38000164	21	22	18	16	26	20
	NHS South Worcestershire	E38000166	30	31	31	21	26	22
	NHS Warwickshire North	E38000195	21	26	29	26	27	29
	NHS Wyre Forest	E38000211	14	19	18	16	23	19
Birmingham and the Black Country	NHS Birmingham CrossCity	E38000012	64	63	65	66	55	62
	NHS Birmingham South and Central	E38000013	19	20	24	22	19	15
	NHS Dudley	E38000046	49	47	60	59	62	59
	NHS Sandwell and West Birmingham	E38000144	58	66	70	57	68	71
	NHS Solihull	E38000149	17	16	10	11	11	17
	NHS Walsall	E38000191	37	46	48	48	41	49
	NHS Wolverhampton	E38000210	29	31	44	37	38	39
Derbyshire and Nottinghamshire	NHS Erewash	E38000058	6	12	15	8	9	11
	NHS Hardwick	E38000071	9	7	8	8	11	10
	NHS Mansfield & Ashfield	E38000103	23	19	13	13	20	23
	NHS Newark & Sherwood	E38000109	17	26	27	23	21	15
	NHS North Derbyshire	E38000115	24	24	21	27	29	22
	NHS Nottingham City	E38000132	25	27	32	32	27	31
	NHS Nottingham North & East	E38000133	13	18	16	13	16	14
	NHS Nottingham West	E38000134	11	9	14	16	16	15
	NHS Rushcliffe	E38000142	13	13	7	5	6	6
	NHS Southern Derbyshire	E38000169	79	91	81	80	83	76

Table F3.3. Continued

UK Area	CCG/HB Name	Code	Prevalent numbers on home-therapies					
			2010	2011	2012	2013	2014	2015
East Anglia	NHS Cambridgeshire and Peterborough	E38000026	35	44	41	41	41	37*
	NHS Great Yarmouth & Waveney	E38000063	15	18	15	13	13	14
	NHS Ipswich and East Suffolk	E38000086	30	25	24	25	29	31
	NHS North Norfolk	E38000124	20	16	21	15	14	15
	NHS Norwich	E38000131	12	11	10	13	17	17
	NHS South Norfolk	E38000159	15	28	26	24	19	16
	NHS West Norfolk	E38000203	13	14	8	6	8	*
	NHS West Suffolk	E38000204	11	9	17	14	13	*
Essex	NHS Basildon and Brentwood	E38000007	18	20	20	19	19	28
	NHS Castle Point, Rayleigh and Rochford	E38000030	11	12	11	11	13	11
	NHS Mid Essex	E38000106	24	21	21	20	21	16*
	NHS North East Essex	E38000117	18	16	15	12	13	12*
	NHS Southend	E38000168	10	11	9	12	10	11
	NHS Thurrock	E38000185	10	11	11	16	12	9
	NHS West Essex	E38000197	12	7	16	13	16	20*
Hertfordshire and the South Midlands	NHS Bedfordshire	E38000010	24	27	27	28	21	20*
	NHS Corby	E38000037		4	5	6	8	7
	NHS East and North Hertfordshire	E38000049	20	22	21	29	29	28*
	NHS Herts Valleys	E38000079	13	10	17	23	23	19
	NHS Luton	E38000102	8	9	10	20	15	7*
	NHS Milton Keynes	E38000107	19	17	16	20	15	14
	NHS Nene	E38000108	42	49	64	61	44	38
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	E38000051	23	26	25	28	22	27
	NHS Leicester City	E38000097	31	25	32	23	27	22
	NHS Lincolnshire East	E38000099	21	20	26	31	24	22
	NHS Lincolnshire West	E38000100	21	22	22	19	25	25
	NHS South Lincolnshire	E38000157	10	12	12	14	13	14*
	NHS South West Lincolnshire	E38000165	14	14	10	10	10	8
	NHS West Leicestershire	E38000201	28	29	26	29	29	28
Shropshire and Staffordshire	NHS Cannock Chase	E38000028	13	18	19	22	27	23
	NHS East Staffordshire	E38000053	18	21	18	16	17	20
	NHS North Staffordshire	E38000126	26	33	34	33	36	30
	NHS Shropshire	E38000147	20	35	35	31	35	37
	NHS South East Staffs and Seisdon and Peninsular	E38000153	19	27	26	23	19	21
	NHS Stafford and Surrounds	E38000173	21	18	24	24	24	21
	NHS Stoke on Trent	E38000175	24	27	23	27	28	24
	NHS Telford & Wrekin	E38000183	8	11	21	20	16	25
London	NHS Barking & Dagenham	E38000004	26	21	27	24	30	31
	NHS Barnet	E38000005	32	38	37	38	40	40
	NHS Camden	E38000027	7	9	11	11	12	14
	NHS City and Hackney	E38000035	12	14	18	24	19	19
	NHS Enfield	E38000057	17	22	28	29	35	43
	NHS Haringey	E38000072	5	14	23	27	26	28
	NHS Havering	E38000077	16	17	27	22	22	23
	NHS Islington	E38000088	8	11	16	19	21	21
	NHS Newham	E38000113	36	42	43	33	40	49
	NHS Redbridge	E38000138	40	27	31	35	42	41
	NHS Tower Hamlets	E38000186	22	20	24	26	28	23
	NHS Waltham Forest	E38000192	29	24	27	25	40	34
	NHS Brent	E38000020	5	6	9	13	16	17

Table F3.3. Continued

UK Area	CCG/HB Name	Code	Prevalent numbers on home-therapies					
			2010	2011	2012	2013	2014	2015
London (cont.)	NHS Central London (Westminster)	E38000031		4	4	6	10	9
	NHS Ealing	E38000048	11	6	11	16	14	18
	NHS Hammersmith and Fulham	E38000070	3	5	6	5	4	4
	NHS Harrow	E38000074	8	5	9	9	8	8
	NHS Hillingdon	E38000082	7	8	10	9	11	13
	NHS Hounslow	E38000084	7	9	13	15	13	14
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	E38000202	4	4	6	5	7	8
	NHS Bexley	E38000011	24	22	22	18	21	22
	NHS Bromley	E38000023	23	23	23	26	28	27
	NHS Croydon	E38000040	29	27	29	31	37	36
	NHS Greenwich	E38000066	20	15	14	29	24	29
	NHS Kingston	E38000090	12	13	11	10	12	7
	NHS Lambeth	E38000092	26	23	27	31	23	27
	NHS Lewisham	E38000098	17	17	20	19	23	15
	NHS Merton	E38000105	11	13	13	12	16	13
	NHS Richmond	E38000140	6	5	5	4	5	8
	NHS Southwark	E38000171	15	14	17	18	15	11
	NHS Sutton	E38000179	9	8	9	11	11	15
	NHS Wandsworth	E38000193	18	17	15	16	17	18
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	E38000009	9	6	8	9	8	10
	NHS Gloucestershire	E38000062	46	48	44	40	49	40
	NHS Swindon	E38000181	27	24	22	21	17	20
	NHS Wiltshire	E38000206	24	25	23	27	29	29
Bristol, North Somerset, Somerset and South Gloucestershire	NHS Bristol	E38000022	22	28	26	27	25	22
	NHS North Somerset	E38000125	16	16	13	12	12	13
	NHS Somerset	E38000150	48	44	42	35	43	35
	NHS South Gloucestershire	E38000155	16	15	17	19	20	12
Devon, Cornwall and Isles of Scilly	NHS Kernow	E38000089	53	47	45	48	47	46
	NHS North, East, West Devon	E38000129	62	65	59	55	59	59
	NHS South Devon and Torbay	E38000152	26	30	25	27	30	29
Kent and Medway	NHS Ashford	E38000002	12	9	9	9	7	6
	NHS Canterbury and Coastal	E38000029	25	23	19	19	17	18
	NHS Dartford, Gravesham and Swanley	E38000043	25	27	25	29	28	23
	NHS Medway	E38000104	14	9	10	12	16	17
	NHS South Kent Coast	E38000156	11	17	11	11	14	12
	NHS Swale	E38000180	6	6	10	12	13	11
	NHS Thanet	E38000184	12	17	16	14	11	8
	NHS West Kent	E38000199	26	23	16	18	19	17
Surrey and Sussex	NHS Brighton & Hove	E38000021	12	14	22	18	19	13
	NHS Coastal West Sussex	E38000213	41	29	37	36	43	42
	NHS Crawley	E38000039	9	10	8	7	9	10
	NHS East Surrey	E38000054	16	13	17	20	18	17
	NHS Eastbourne, Hailsham and Seaford	E38000055	19	23	27	30	22	22
	NHS Guildford and Waverley	E38000214	15	15	14	12	11	10
	NHS Hastings & Rother	E38000076	17	14	17	23	22	26
	NHS High Weald Lewes Havens	E38000081	12	13	13	10	7	14
	NHS Horsham and Mid Sussex	E38000083	18	23	16	15	17	12
	NHS North West Surrey	E38000128	11	19	24	25	31	32
	NHS Surrey Downs	E38000177	23	28	31	26	24	20
	NHS Surrey Heath	E38000178	5	4	6	6	9	7

Table F3.3. Continued

UK Area	CCG/HB Name	Code	Prevalent numbers on home-therapies					
			2010	2011	2012	2013	2014	2015
Thames Valley	NHS Aylesbury Vale	E38000003	9	12	6	10	5	7
	NHS Bracknell and Ascot	E38000017	8	4	3	8	10	10
	NHS Chiltern	E38000033	29	16	12	17	17	23
	NHS Newbury and District	E38000110	7	7	11	8	8	13
	NHS North & West Reading	E38000114	9	11	9	8	7	7
	NHS Oxfordshire	E38000136	36	38	40	48	40	37
	NHS Slough	E38000148	19	20	23	19	13	12
	NHS South Reading	E38000160	15	13	12	14	17	11
	NHS Windsor, Ascot and Maidenhead	E38000207	8	15	8	8	14	10
	NHS Wokingham	E38000209	6	11	10	13	9	8
Wessex	NHS Dorset	E38000045	52	43	45	51	54	47
	NHS Fareham and Gosport	E38000059	20	20	23	18	22	23
	NHS Isle of Wight	E38000087	4	4		6	9	12
	NHS North East Hampshire and Farnham	E38000118	12	9	9	11	16	9
	NHS North Hampshire	E38000120	9	6	7	17	18	15
	NHS Portsmouth	E38000137	4	7	9	12	8	8
	NHS South Eastern Hampshire	E38000154	10	13	11	13	8	7
	NHS Southampton	E38000167	12	10	8	7	11	15
	NHS West Hampshire	E38000198	39	31	25	27	29	30
Wales	Betsi Cadwaladr University	W11000023	73	69	74	71	75	99
	Powys Teaching	W11000024	9	15	14	12	14	12
	Hywel Dda	W11000025	27	34	35	33	41	51
	Abertawe Bro Morgannwg University	W11000026	55	55	63	50	55	50
	Cwm Taf	W11000027	34	36	26	24	25	17
	Aneurin Bevan	W11000028	57	51	49	48	49	54
	Cardiff and Vale University	W11000029	26	30	19	25	27	25
Scotland	Ayrshire and Arran	S08000015	49	54	51	52	48	50
	Borders	S08000016	9	6	6	7	4	4
	Dumfries and Galloway	S08000017	8	14	17	18	17	13
	Fife	S08000018	30	32	22	24	18	20
	Forth Valley	S08000019	17	12	14	11	13	12
	Grampian	S08000020	34	26	28	32	33	28
	Greater Glasgow and Clyde	S08000021	50	54	53	43	40	44
	Highland	S08000022	30	27	31	22	22	23
	Lanarkshire	S08000023	18	18	18	21	15	25
	Lothian	S08000024	50	42	41	29	23	29
	Orkney	S08000025						
	Shetland	S08000026						
	Tayside	S08000027	18	15	19	19	23	18
	Western Isles	S08000028					3	4
Northern Ireland	Belfast	ZC010	9	11	19	18	12	20
	Northern	ZC020	24	28	30	27	21	29
	Southern	ZC030	23	21	27	28	22	26
	South Eastern	ZC040	22	24	21	19	13	14
	Western	ZC050	14	22	21	19	16	15

Blank cells are values of 1 or 2 – these have been suppressed

*Prevalent numbers in CCGs where at least 10% of the RRT population was seen in Cambridge renal centre. In these CCGs the 2015 numbers are estimated using 2014 data from Cambridge, as this centre was unable to submit 2015 patient-level data on time. In the CCGs with >70% RRT population covered by Cambridge, the numbers for 2015 have been blanked

Table F3.4. Number of prevalent patients on transplant by year and CCG/HB

UK area	CCG/HB name	Code	Prevalent numbers on transplant					
			2010	2011	2012	2013	2014	2015
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	E38000056	68	74	79	85	89	94
	NHS South Cheshire	E38000151	67	67	69	77	87	93
	NHS Vale Royal	E38000189	29	30	33	37	38	42
	NHS Warrington	E38000194	71	75	81	94	96	96
	NHS West Cheshire	E38000196	86	92	96	103	109	105
	NHS Wirral	E38000208	112	114	113	117	119	123
Durham, Darlington and Tees	NHS Darlington	E38000042	35	41	42	47	51	52
	NHS Durham Dales, Easington and Sedgefield	E38000047	112	122	125	137	152	152
	NHS Hartlepool and Stockton-on-Tees	E38000075	123	119	126	132	141	146
	NHS North Durham	E38000116	96	96	99	102	102	104
	NHS South Tees	E38000162	141	151	155	157	163	167
Greater Manchester	NHS Bolton	E38000016	125	140	150	154	159	175
	NHS Bury	E38000024	75	76	81	82	90	99
	NHS Central Manchester	E38000032	58	64	67	74	81	92
	NHS Heywood, Middleton & Rochdale	E38000080	85	92	97	103	95	105
	NHS North Manchester	E38000123	47	53	59	65	68	74
	NHS Oldham	E38000135	86	92	94	106	106	117
	NHS Salford	E38000143	84	89	101	102	110	117
	NHS South Manchester	E38000158	41	48	53	56	61	65
	NHS Stockport	E38000174	112	115	119	126	130	140
	NHS Tameside and Glossop	E38000182	106	115	117	122	132	136
	NHS Trafford	E38000187	74	80	87	95	104	112
	NHS Wigan Borough	E38000205	119	141	152	167	170	172
Lancashire	NHS Blackburn with Darwen	E38000014	47	54	58	63	70	74
	NHS Blackpool	E38000015	48	48	57	68	73	75
	NHS Chorley and South Ribble	E38000034	60	69	69	77	82	88
	NHS East Lancashire	E38000050	153	165	167	180	187	199
	NHS Fylde & Wyre	E38000060	57	59	65	69	70	80
	NHS Greater Preston	E38000065	63	65	74	76	81	86
	NHS Lancashire North	E38000093	53	54	54	56	59	62
	NHS West Lancashire	E38000200	38	40	43	44	45	49
Merseyside	NHS Halton	E38000068	49	52	57	58	63	65
	NHS Knowsley	E38000091	58	57	60	64	64	65
	NHS Liverpool	E38000101	159	173	182	200	210	212
	NHS South Sefton	E38000161	57	60	66	68	70	72
	NHS Southport and Formby	E38000170	34	35	32	40	40	43
	NHS St Helens	E38000172	59	63	64	71	81	83
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	E38000041	200	205	213	230	240	256
	NHS Newcastle Gateshead	E38000212	183	197	199	203	210	213
	NHS North Tyneside	E38000127	117	120	121	121	115	119
	NHS Northumberland	E38000130	119	133	136	146	152	150
	NHS South Tyneside	E38000163	71	74	75	82	76	74
	NHS Sunderland	E38000176	120	131	138	145	146	144

Table F3.4. Continued

UK area	CCG/HB name	Code	Prevalent numbers on transplant					
			2010	2011	2012	2013	2014	2015
North Yorkshire and Humber	NHS East Riding of Yorkshire	E38000052	124	128	136	156	159	163
	NHS Hambleton, Richmondshire and Whitby	E38000069	45	49	51	58	72	73
	NHS Harrogate and Rural District	E38000073	74	75	85	86	90	95
	NHS Hull	E38000085	98	102	109	117	121	134
	NHS North East Lincolnshire	E38000119	57	64	68	72	71	76
	NHS North Lincolnshire	E38000122	45	48	49	52	59	62
	NHS Scarborough and Ryedale	E38000145	49	52	52	50	53	57
	NHS Vale of York	E38000188	138	145	164	175	185	193
South Yorkshire and Bassetlaw	NHS Barnsley	E38000006	94	95	98	103	114	120
	NHS Bassetlaw	E38000008	36	36	36	37	42	49
	NHS Doncaster	E38000044	102	113	120	122	134	144
	NHS Rotherham	E38000141	103	112	117	126	138	140
	NHS Sheffield	E38000146	202	215	221	234	243	248
West Yorkshire	NHS Airedale, Wharfedale and Craven	E38000001	71	68	71	75	77	85
	NHS Bradford City	E38000018	34	34	41	46	47	56
	NHS Bradford Districts	E38000019	152	158	173	188	194	205
	NHS Calderdale	E38000025	96	103	110	109	106	109
	NHS Greater Huddersfield	E38000064	95	104	111	115	124	132
	NHS Leeds North	E38000094	79	86	88	89	97	104
	NHS Leeds South and East	E38000095	88	93	97	108	106	112
	NHS Leeds West	E38000096	102	109	125	139	153	156
	NHS North Kirklees	E38000121	87	91	92	107	120	126
	NHS Wakefield	E38000190	114	118	124	131	137	142
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	E38000038	165	173	183	189	209	222
	NHS Herefordshire	E38000078	53	56	60	62	66	74
	NHS Redditch and Bromsgrove	E38000139	59	60	66	67	73	74
	NHS South Warwickshire	E38000164	103	104	117	123	127	135
	NHS South Worcestershire	E38000166	99	102	105	112	117	117
	NHS Warwickshire North	E38000195	76	85	84	88	87	90
	NHS Wyre Forest	E38000211	34	34	36	40	38	37
Birmingham and the Black Country	NHS Birmingham CrossCity	E38000012	260	272	289	307	331	350
	NHS Birmingham South and Central	E38000013	75	74	72	83	92	95
	NHS Dudley	E38000046	94	95	89	100	106	116
	NHS Sandwell and West Birmingham	E38000144	168	173	184	212	214	223
	NHS Solihull	E38000149	61	65	70	72	78	81
	NHS Walsall	E38000191	106	114	119	132	142	142
	NHS Wolverhampton	E38000210	76	74	80	97	102	102
Derbyshire and Nottinghamshire	NHS Erewash	E38000058	26	26	27	36	40	40
	NHS Hardwick	E38000071	32	31	31	29	34	38
	NHS Mansfield & Ashfield	E38000103	72	80	90	96	101	100
	NHS Newark & Sherwood	E38000109	54	55	61	66	70	70
	NHS North Derbyshire	E38000115	86	93	105	105	106	112
	NHS Nottingham City	E38000132	96	102	110	120	123	133
	NHS Nottingham North & East	E38000133	49	56	60	64	60	63
	NHS Nottingham West	E38000134	47	49	50	55	59	64
	NHS Rushcliffe	E38000142	37	42	44	51	49	47
	NHS Southern Derbyshire	E38000169	181	198	210	229	240	255

Table F3.4. Continued

UK area	CCG/HB name	Code	Prevalent numbers on transplant					
			2010	2011	2012	2013	2014	2015
East Anglia	NHS Cambridgeshire and Peterborough	E38000026	317	340	350	371	389	392*
	NHS Great Yarmouth & Waveney	E38000063	66	69	75	94	105	114
	NHS Ipswich and East Suffolk	E38000086	132	146	148	169	175	191
	NHS North Norfolk	E38000124	64	70	65	87	83	89
	NHS Norwich	E38000131	53	59	58	76	81	88
	NHS South Norfolk	E38000159	91	87	91	113	116	126
	NHS West Norfolk	E38000203	59	60	67	69	75	*
	NHS West Suffolk	E38000204	83	85	93	95	96	*
Essex	NHS Basildon and Brentwood	E38000007	93	98	100	120	112	114
	NHS Castle Point, Rayleigh and Rochford	E38000030	62	63	64	74	87	84
	NHS Mid Essex	E38000106	148	161	157	178	181	187*
	NHS North East Essex	E38000117	111	124	128	140	156	157*
	NHS Southend	E38000168	57	60	68	78	83	83
	NHS Thurrock	E38000185	50	55	56	58	61	63
	NHS West Essex	E38000197	102	105	114	117	128	132*
Hertfordshire and the South Midlands	NHS Bedfordshire	E38000010	177	181	205	210	226	226*
	NHS Corby	E38000037	21	23	22	22	21	29
	NHS East and North Hertfordshire	E38000049	201	210	228	244	261	267*
	NHS Herts Valleys	E38000079	223	234	242	260	279	299
	NHS Luton	E38000102	78	88	98	106	119	133*
	NHS Milton Keynes	E38000107	97	107	115	115	131	143
	NHS Nene	E38000108	243	255	252	267	297	309
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	E38000051	118	124	129	136	150	155
	NHS Leicester City	E38000097	170	181	189	208	229	242
	NHS Lincolnshire East	E38000099	83	85	89	97	103	108
	NHS Lincolnshire West	E38000100	75	79	81	89	94	90
	NHS South Lincolnshire	E38000157	40	40	44	44	52	54*
	NHS South West Lincolnshire	E38000165	32	39	41	43	45	46
	NHS West Leicestershire	E38000201	158	168	174	185	191	201
Shropshire and Staffordshire	NHS Cannock Chase	E38000028	45	43	43	47	47	46
	NHS East Staffordshire	E38000053	28	31	31	39	38	43
	NHS North Staffordshire	E38000126	77	83	89	98	97	104
	NHS Shropshire	E38000147	107	111	107	110	114	127
	NHS South East Staffs and Seisdon and Peninsular	E38000153	87	85	83	92	100	104
	NHS Stafford and Surrounds	E38000173	53	57	61	67	72	77
	NHS Stoke on Trent	E38000175	105	103	110	111	117	119
	NHS Telford & Wrekin	E38000183	49	49	48	56	57	66
London	NHS Barking & Dagenham	E38000004	64	74	75	86	92	98
	NHS Barnet	E38000005	170	186	213	224	229	242
	NHS Camden	E38000027	88	100	105	107	107	112
	NHS City and Hackney	E38000035	81	80	86	95	109	120
	NHS Enfield	E38000057	150	168	186	191	208	225
	NHS Haringey	E38000072	111	120	129	139	152	169
	NHS Havering	E38000077	74	78	80	93	91	101
	NHS Islington	E38000088	93	100	107	112	120	127
	NHS Newham	E38000113	92	98	114	133	153	162
	NHS Redbridge	E38000138	118	124	138	144	163	169
	NHS Tower Hamlets	E38000186	75	77	86	90	103	107
	NHS Waltham Forest	E38000192	106	112	116	129	148	165
	NHS Brent	E38000020	186	190	204	222	232	250

Table F3.4. Continued

UK area	CCG/HB name	Code	Prevalent numbers on transplant					
			2010	2011	2012	2013	2014	2015
London (cont.)	NHS Central London (Westminster)	E38000031	74	74	78	81	90	98
	NHS Ealing	E38000048	198	204	214	222	244	256
	NHS Hammersmith and Fulham	E38000070	77	78	82	86	90	92
	NHS Harrow	E38000074	165	165	171	173	187	196
	NHS Hillingdon	E38000082	151	165	174	176	193	193
	NHS Hounslow	E38000084	123	126	129	147	160	173
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	E38000202	103	103	102	106	113	112
	NHS Bexley	E38000011	117	120	124	134	136	151
	NHS Bromley	E38000023	150	149	158	165	170	179
	NHS Croydon	E38000040	122	132	136	152	159	173
	NHS Greenwich	E38000066	97	104	114	126	149	160
	NHS Kingston	E38000090	66	68	74	76	80	85
	NHS Lambeth	E38000092	101	114	128	142	154	166
	NHS Lewisham	E38000098	98	102	105	127	137	154
	NHS Merton	E38000105	81	86	95	103	110	115
	NHS Richmond	E38000140	58	63	70	76	80	80
	NHS Southwark	E38000171	136	147	163	177	191	196
	NHS Sutton	E38000179	84	87	94	97	96	100
	NHS Wandsworth	E38000193	99	111	119	129	142	150
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	E38000009	49	49	50	61	68	69
	NHS Gloucestershire	E38000062	215	237	235	262	261	275
	NHS Swindon	E38000181	86	92	94	102	110	123
	NHS Wiltshire	E38000206	167	181	190	193	207	219
Bristol, North Somerset, Somerset and South Gloucestershire	NHS Bristol	E38000022	203	206	216	228	236	244
	NHS North Somerset	E38000125	92	94	101	107	107	111
	NHS Somerset	E38000150	203	219	221	232	238	243
	NHS South Gloucestershire	E38000155	121	126	128	136	139	145
Devon, Cornwall and Isles of Scilly	NHS Kernow	E38000089	253	266	287	300	307	322
	NHS North, East, West Devon	E38000129	374	378	400	429	439	457
	NHS South Devon and Torbay	E38000152	133	138	141	156	163	164
Kent and Medway	NHS Ashford	E38000002	54	58	64	64	69	70
	NHS Canterbury and Coastal	E38000029	83	89	101	103	113	112
	NHS Dartford, Gravesham and Swanley	E38000043	124	121	125	133	144	154
	NHS Medway	E38000104	106	106	110	120	121	123
	NHS South Kent Coast	E38000156	70	73	78	85	96	99
	NHS Swale	E38000180	49	60	64	71	72	74
	NHS Thanet	E38000184	54	60	71	77	80	86
	NHS West Kent	E38000199	162	171	183	194	201	209
Surrey and Sussex	NHS Brighton & Hove	E38000021	97	100	102	104	108	118
	NHS Coastal West Sussex	E38000213	194	209	209	226	235	245
	NHS Crawley	E38000039	29	32	34	34	35	34
	NHS East Surrey	E38000054	60	62	63	67	65	69
	NHS Eastbourne, Hailsham and Seaford	E38000055	57	59	61	66	68	71
	NHS Guildford and Waverley	E38000214	56	53	61	64	68	71
	NHS Hastings & Rother	E38000076	60	65	64	68	74	75
	NHS High Weald Lewes Havens	E38000081	56	56	66	66	70	68
	NHS Horsham and Mid Sussex	E38000083	71	71	73	79	91	98

Table F3.4. Continued

UK area	CCG/HB name	Code	Prevalent numbers on transplant					
			2010	2011	2012	2013	2014	2015
Surrey and Sussex (cont.)	NHS North West Surrey	E38000128	141	143	151	158	163	168
	NHS Surrey Downs	E38000177	112	114	114	123	130	136
	NHS Surrey Heath	E38000178	45	48	51	48	44	45
Thames Valley	NHS Aylesbury Vale	E38000003	97	104	109	111	114	116
	NHS Bracknell and Ascot	E38000017	56	60	62	65	65	65
	NHS Chiltern	E38000033	132	132	147	155	155	163
	NHS Newbury and District	E38000110	52	59	60	61	60	57
	NHS North & West Reading	E38000114	41	41	44	49	49	49
	NHS Oxfordshire	E38000136	271	278	298	310	336	352
	NHS Slough	E38000148	85	86	90	107	113	123
	NHS South Reading	E38000160	54	55	53	57	62	69
	NHS Windsor, Ascot and Maidenhead	E38000207	56	61	72	79	86	88
	NHS Wokingham	E38000209	64	66	70	72	77	80
Wessex	NHS Dorset	E38000045	300	306	303	312	328	341
	NHS Fareham and Gosport	E38000059	79	82	82	96	100	103
	NHS Isle of Wight	E38000087	46	46	47	44	46	53
	NHS North East Hampshire and Farnham	E38000118	72	72	76	82	89	94
	NHS North Hampshire	E38000120	73	79	83	86	89	97
	NHS Portsmouth	E38000137	79	79	81	86	85	84
	NHS South Eastern Hampshire	E38000154	89	87	93	96	108	112
	NHS Southampton	E38000167	81	92	100	108	116	121
	NHS West Hampshire	E38000198	222	230	234	243	250	255
Wales	Betsi Cadwaladr University	W11000023	255	254	250	240	251	310
	Powys Teaching	W11000024	55	55	49	51	53	54
	Hywel Dda	W11000025	161	172	169	193	193	193
	Abertawe Bro Morgannwg University	W11000026	254	283	299	313	320	322
	Cwm Taf	W11000027	185	194	201	216	214	214
	Aneurin Bevan	W11000028	290	303	338	346	349	354
	Cardiff and Vale University	W11000029	211	224	239	245	244	258
Scotland	Ayrshire and Arran	S08000015	151	151	161	172	185	193
	Borders	S08000016	52	52	59	60	61	61
	Dumfries and Galloway	S08000017	57	61	61	61	67	72
	Fife	S08000018	124	134	141	152	156	163
	Forth Valley	S08000019	101	109	117	125	139	148
	Grampian	S08000020	214	222	233	252	254	275
	Greater Glasgow and Clyde	S08000021	491	509	563	606	642	662
	Highland	S08000022	159	156	156	164	172	181
	Lanarkshire	S08000023	269	285	307	321	349	358
	Lothian	S08000024	299	315	322	329	352	364
	Orkney	S08000025	8	8	8	8	6	6
	Shetland	S08000026	6	5	6	6	6	6
	Tayside	S08000027	167	172	174	182	185	193
	Western Isles	S08000028	8	9	9	9	9	9
Northern Ireland	Belfast	ZC010	144	148	160	170	186	197
	Northern	ZC020	171	178	183	198	220	236
	Southern	ZC030	113	127	143	154	172	197
	South Eastern	ZC040	127	137	139	148	163	179
	Western	ZC050	105	108	110	134	159	174

*Prevalent numbers in CCGs where at least 10% of the RRT population was seen in Cambridge renal centre. In these CCGs the 2015 numbers are estimated using 2014 data from Cambridge, as this centre was unable to submit 2015 patient-level data on time. In the CCGs with >70% RRT population covered by Cambridge, the numbers for 2015 have been blanked

F:4 Data completeness for haemodialysis session variables

Table F4.1a. Data completeness for haemodialysis session variables for sessions defined as acute, by centre from July to December 2015

Centre	Patients with data *N*	Acute sessions *N*	Data completeness (%)					
			Weight		Blood pressure		Diastolic BP	
			Pre-HD	Post-HD	Pre-HD systolic	Post-HD systolic	Pre-HD	Post-HD
Antrim	4	13	77	54	100	77	100	77
B Heart	7	80	48	44	99	95	99	95
B QEH	32	217	64	55	100	100	100	100
Basldn	11	65	97	99	100	100	100	100
Belfast	18	142	37	28	99	92	99	92
Bradfd	22	124	11	6	100	99	99	99
Bristol	39	158	20	11	99	98	99	98
Carlis	2	2	100	100	100	100	100	100
Carsh	82	1,020	0	0	0	0	0	0
Chelms	11	166	97	91	98	96	98	96
Colchr	1	32	100	100	100	100	100	100
Covnt	29	298	60	46	100	98	99	98
Derby	32	98	0	0	3	3	3	3
Donc	4	23	48	26	100	91	100	91
Dorset	22	389	92	88	100	100	99	100
Dudley	26	240	60	55	100	100	99	100
Exeter	38	358	75	51	100	83	99	82
Glouc	11	53	25	26	98	98	98	98
Hull	36	215	23	20	84	81	84	81
Ipswi	4	23	0	0	0	0	0	0
Kent	2	4	0	0	100	100	100	100
L Kings	18	120	0	0	0	0	0	0
L Rfree	28	158	60	38	99	98	99	98
L West	6	19	68	58	100	95	100	95
Leeds	23	140	21	6	99	96	97	96
Leic	62	302	23	5	81	76	81	76
Middlbr	28	191	14	6	100	100	100	100
Newc	39	171	0	0	0	0	0	0
Newry	2	8	50	25	100	88	100	88
Nottm	28	143	24	18	90	87	90	87
Oxford	3	4	100	100	100	100	100	100
Plymth	6	25	48	44	100	96	100	96
Ports	40	257	65	42	99	99	98	99
Redng	16	123	0	0	0	0	0	0
Salford	44	315	20	5	99	97	99	97
Shrew	38	254	0	0	0	0	0	0
Stevng	33	223	47	48	100	97	99	97
Sthend	4	16	31	6	100	100	100	100
Swanse	86	522	44	33	99	94	99	94
Truro	4	13	46	31	100	100	100	100
Ulster	6	43	79	51	100	86	100	86
West NI	2	38	29	29	100	95	100	95
Wolve	38	248	19	17	98	96	96	96
York	11	56	14	14	98	95	98	93
Total	**998**	**7,109**	**36**	**28**	**73**	**70**	**72**	**70**

Table F4.1b. Data completeness for haemodialysis session variables for sessions defined as acute, by centre from July to December 2015

Centre	Data completeness (%)						% submitted in	
	Dialysate sodium conc	Access two sites	Symptomatic hypotension	Vascular access	Blood flow rate	Time dialysed	July–Sept	Oct–Dec
Antrim	0	0	100	31	54	85	62	39
B Heart	0	0	0	100	99	100	16	84
B QEH	0	0	0	100	97	100	50	50
Basldn	0	0	100	28	100	100	49	51
Belfast	0	0	100	71	18	20	84	16
Bradfd	0	0	0	100	0	0	47	53
Bristol	0	100	100	100	0	0	49	51
Carlis	0	0	0	0	100	50	0	100
Carsh	0	0	0	0	0	99	46	54
Chelms	0	0	100	95	99	98	65	35
Colchr	0	0	0	0	0	0	100	0
Covnt	0	0	0	0	100	97	64	36
Derby	0	0	0	98	0	0	37	63
Donc	0	0	100	44	91	83	26	74
Dorset	0	0	100	97	99	94	44	56
Dudley	0	0	99	74	98	99	35	65
Exeter	0	100	100	100	0	0	36	65
Glouc	0	6	6	100	0	0	96	4
Hull	0	0	0	100	0	0	36	64
Ipswi	0	0	0	100	0	65	44	57
Kent	0	0	100	0	0	0	0	100
L Kings	0	0	0	68	0	18	33	67
L Rfree	0	0	0	0	0	0	77	23
L West	0	0	0	0	90	100	5	95
Leeds	0	0	0	100	0	0	78	22
Leic	0	0	0	100	0	85	45	55
Middlbr	0	0	0	100	97	98	18	82
Newc	0	0	0	0	0	100	56	44
Newry	0	0	100	25	63	88	0	100
Nottm	0	0	100	48	79	63	44	56
Oxford	0	0	0	75	0	0	25	75
Plymth	0	0	0	0	0	0	48	52
Ports	0	0	0	100	92	99	72	28
Redng	0	0	0	100	0	76	60	40
Salford	0	0	0	76	0	0	62	38
Shrew	0	0	0	0	0	93	62	38
Stevng	0	100	100	75	100	95	67	33
Sthend	0	0	0	0	56	100	50	50
Swanse	39	51	87	99	98	100	56	44
Truro	0	0	100	100	0	0	100	0
Ulster	0	0	100	79	5	12	37	63
West NI	0	0	100	0	42	45	79	21
Wolve	0	0	100	0	4	2	42	58
York	0	0	0	100	0	0	13	88
Total	**3**	**14**	**38**	**61**	**40**	**65**	**51**	**49**

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UK Renal Registry 19th Annual Report: Appendix G UK Renal Registry dataset specification

This appendix is available on the UK Renal Registry website only. The current version of this document can be found under the downloads menu at www.renalreg.org/datasets/the-uk-renal-registry-dataset/.

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UK Renal Registry 19th Annual Report: Appendix H Coding: Ethnicity, EDTA Primary Renal Diagnoses, EDTA Causes of Death

H1: Ethnicity coding

In some renal centres ethnicity data is recorded in the clinical information systems in the individual renal centres in the format of 9S. . . read codes. In other centres it is extracted from local PAS systems in a different format and should be recoded to the 9S. . . format by the centre, before being sent to the UK Renal Registry (UKRR). For report analyses, ethnic categories are condensed into five groups (White, South Asian, Black, Chinese and Other). For some analyses Chinese are grouped into Other.

Read code	Ethnic category	Assigned group	Old PAS	New PAS
9S1. . .	White	White	0	A1
9S1..	Irish (NMO)	White		B1
9SAA.	Greek Cypriot (NMO)	White		CG
9SAB.	Turkish Cypriot (NMO)	White		CJ
9SAC.	Other European (NMO)	White		C1
9S6..	Indian	S Asian	4	H1
9S7..	Pakistani	S Asian	5	J1
9S8..	Bangladeshi	S Asian	6	K1
9SA6.	East African Asian	S Asian		
9SA7.	Indian Subcontinent	S Asian		
9SA8.	Other Asian	S Asian		L1
9S2..	Black Caribbean	Black	1	M1
9S3..	Black African	Black	2	N1
9S4..	Black/Other/non-mixed origin	Black	3	P1
9S41.	Black British	Black		PD
9S42.	Black Caribbean	Black		
9S43.	Black North African	Black		
9S44.	Black other African country	Black		
9S45.	Black East African Asian	Black		
9S46.	Black Indian subcontinent	Black		
9S47.	Black Other Asian	Black		
9S48.	Black Black Other	Black		PE
9S5..	Black other/mixed	Black		
9S51.	Other Black – Black/White origin	Black		GC
9S52.	Other Black – Black/Asian origin	Black		GA
9S9..	Chinese	Chinese	7	R1
9T1C.	Chinese	Chinese		
9SA..	Other ethnic non-mixed (NMO)	Other		

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Read code	Ethnic category	Assigned group	Old PAS	New PAS
9SA1.	British ethnic minority specified (NMO)	Other		
9SA2.	British ethnic minority unspecified (NMO)	Other		
9SA3.	CaribbeanIsland (NMO)	Other		
9SA4.	North African Arab (NMO)	Other		
9SA5.	Other African countries (NMO)	Other		
9SAD.	Other ethnic NEC (NMO)	Other		S1
9SB..	Other ethnic/mixed origin	Other	8	
9SB1.	Other ethnic/Black/White origin	Other		E1
9SB2.	Other ethnic/Asian/White origin	Other		F1
9SB3.	Other ethnic/mixed White origin	Other		
9SB4.	Other ethnic/Other mixed origin	Other		G1

NMO denotes non-mixed origin

H2: EDTA primary renal diagnoses

New primary renal diagnosis codes were produced in 2012 [1]. The data used for this report included a mixture of old and new ERA-EDTA codes. New codes were received for about 70% of the 2015 incident patients. The old codes were used where available, and for those people without an old code, new codes (where available) were mapped back to old codes using the mapping available on the ERA-EDTA website. As recommended in the notes for users in the ERA-EDTA's PRD code list document, the mapping of new to old codes is provided for guidance only and has not been validated; therefore care must be taken not to over interpret data from this mapping.

The old codes (both those received from centres and those mapped back from new codes) were then grouped into the same eight categories as in previous reports as shown in the table below.

EDTA code	Title	Group
0	Chronic renal failure; aetiology uncertain unknown/unavailable	Uncertain
10	Glomerulonephritis; histologically NOT examined	Glomerulonephritis*
11	Focal segmental glomerulosclerosis with nephrotic syndrome in children	Glomerulonephritis
12	IgA nephropathy (proven by immunofluorescence, not code 76 and not 85)	Glomerulonephritis
13	Dense deposit disease; membrano-proliferative GN; type II (proven by immunofluorescence and/or electron microscopy)	Glomerulonephritis
14	Membranous nephropathy	Glomerulonephritis
15	Membrano-proliferative GN; type I (proven by immunofluorescence and/or electron microscopy – not code 84 or 89)	Glomerulonephritis
16	Crescentic (extracapillary) glomerulonephritis (type I, II, III)	Glomerulonephritis
17	Focal segmental glomerulosclerosis with nephrotic syndrome in adults	Glomerulonephritis
19	Glomerulonephritis; histologically examined, not given above	Glomerulonephritis
20	Pyelonephritis – cause not specified	Pyelonephritis
21	Pyelonephritis associated with neurogenic bladder	Pyelonephritis
22	Pyelonephritis due to congenital obstructive uropathy with/without vesico-ureteric reflux	Pyelonephritis
23	Pyelonephritis due to acquired obstructive uropathy	Pyelonephritis
24	Pyelonephritis due to vesico-ureteric reflux without obstruction	Pyelonephritis
25	Pyelonephritis due to urolithiasis	Pyelonephritis
29	Pyelonephritis due to other cause	Pyelonephritis
30	Interstitial nephritis (not pyelonephritis) due to other cause, or unspecified (not mentioned above)	Other
31	Nephropathy (interstitial) due to analgesic drugs	Other
32	Nephropathy (interstitial) due to cis-platinum	Other
33	Nephropathy (interstitial) due to cyclosporin A	Other
34	Lead induced nephropathy (interstitial)	Other
39	Drug induced nephropathy (interstitial) not mentioned above	Other
40	Cystic kidney disease – type unspecified	Polycystic
41	Polycystic kidneys; adult type (dominant)	Polycystic

EDTA code	Title	Group
42	Polycystic kidneys; infantile (recessive)	Polycystic
43	Medullary cystic disease; including nephronophtisis	Other
49	Cystic kidney disease – other specified type	Other
50	Hereditary/Familial nephropathy – type unspecified	Other
51	Hereditary nephritis with nerve deafness (Alport's Syndrome)	Other
52	Cystinosis	Other
53	Primary oxalosis	Other
54	Fabry's disease	Other
59	Hereditary nephropathy – other specified type	Other
60	Renal hypoplasia (congenital) – type unspecified	Other
61	Oligomeganephronic hypoplasia	Other
63	Congenital renal dysplasia with or without urinary tract malformation	Other
66	Syndrome of agenesis of abdominal muscles (Prune Belly)	Other
70	Renal vascular disease – type unspecified	Renal vascular disease
71	Renal vascular disease due to malignant hypertension	Hypertension
72	Renal vascular disease due to hypertension	Hypertension
73	Renal vascular disease due to polyarteritis	Renal vascular disease
74	Wegener's granulomatosis	Other
75	Ischaemic renal disease/cholesterol embolism	Renal vascular disease
76	Glomerulonephritis related to liver cirrhosis	Other
78	Cryoglobulinemic glomerulonephritis	Other
79	Renal vascular disease – due to other cause (not given above and not code 84–88)	Renal vascular disease
80	Type 1 diabetes with diabetic nephropathy	Diabetes
81	Type 2 diabetes with diabetic nephropathy	Diabetes
82	Myelomatosis/light chain deposit disease	Other
83	Amyloid	Other
84	Lupus erythematosus	Other
85	Henoch–Schoenlein purpura	Other
86	Goodpasture's syndrome	Other
87	Systemic sclerosis (scleroderma)	Other
88	Haemolytic Ureaemic Syndrome (including Moschcowitz syndrome)	Other
89	Multi-system disease – other (not mentioned above)	Other
90	Tubular necrosis (irreversible) or cortical necrosis (different from 88)	Other
91	Tuberculosis	Other
92	Gout nephropathy (urate)	Other
93	Nephrocalcinosis and hypercalcaemic nephropathy	Other
94	Balkan nephropathy	Other
95	Kidney tumour	Other
96	Traumatic or surgical loss of kidney	Other
98	Not known	Missing
99	Other identified renal disorders	Other
199	Code not sent	Missing

*Prior to the 15th Annual Report categorised as 'uncertain'

H3: EDTA cause of death

EDTA code	Cause	UKRR category
0	Cause of death uncertain/not determined	Uncert
11	Myocardial ischaemia and infarction	Heart
12	Hyperkalaemia	Other
13	Haemorrhagic pericarditis	Other
14	Other causes of cardiac failure	Heart
15	Cardiac arrest/sudden death; other cause or unknown	Heart
16	Hypertensive cardiac failure	Heart
17	Hypokalaemia	Other

EDTA code	Cause	UKRR category
18	Fluid overload/pulmonary oedema	Heart
21	Pulmonary embolus	Other
22	Cerebro-vascular accident, other cause or unspecified	CVA
23	Gastro-intestinal haemorrhage (digestive)	Other
24	Haemorrhage from graft site	Other
25	Haemorrhage from vascular access or dialysis circuit	Other
26	Haemorrhage from ruptured vascular aneurysm (not code 22 or 23)	Other
27	Haemorrhage from surgery (not codes 23,24,26)	Other
28	Other haemorrhage, (not codes 23–27)	Other
29	Mesenteric infarction	Other
31	Pulmonary infection bacterial (not code 73)	Infect
32	Pulmonary infection (viral)	Infect
33	Pulmonary infection (fungal or protozoal; parasitic)	Infect
34	Infections elsewhere except viral hepatitis	Infect
35	Septicaemia	Infect
36	Tuberculosis (lung)	Infect
37	Tuberculosis (elsewhere)	Infect
38	Generalized viral infection	Infect
39	Peritonitis (all causes except for peritoneal dialysis)	Infect
41	Liver disease due to hepatitis B virus	Other
42	Liver disease due to other viral hepatitis	Other
43	Liver disease due to drug toxicity	Other
44	Cirrhosis – not viral (alcoholic or other cause)	Other
45	Cystic liver disease	Other
46	Liver failure – cause unknown	Other
47	Patient refused further treatment for end stage renal failure (ESRF)	Trt_stop
51	Patient refused further treatment for end stage renal failure (ESRF)	Trt_stop
52	Suicide	Other
53	ESRF treatment ceased for any other reason	Trt_stop
54	ESRF treatment withdrawn for medical reasons	Trt_stop
61	Uraemia caused by graft failure	Trt_stop
62	Pancreatitis	Other
63	Bone marrow depression (Aplasia)	Other
64	Cachexia	Other
66	Malignant disease in patient treated by immunosuppressive therapy	Malignant
67	Malignant disease: solid tumours except those of 66	Malignant
68	Malignant disease: lymphoproliferative disorders (Except 66)	Malignant
69	Dementia	Other
70	Peritonitis (sclerosing, with peritoneal dialysis)	Other
71	Perforation of peptic ulcer	Other
72	Perforation of colon	Other
73	Chronic obstructive pulmonary disease	Other
81	Accident related to ESRF treatment (not 25)	Other
82	Accident unrelated to ESRF treatment	Other
90	Uraemia caused by graft failure	Trt_stop
99	Other identified cause of death	Other*
100	Peritonitis (bacterial, with peritoneal dialysis)	Infect
101	Peritonitis (fungal, with peritoneal dialysis)	Infect
102	Peritonitis (due to other cause, with peritoneal dialysis)	Infect

*Prior to the 15th Annual Report categorised as 'uncertain'

References

1 Venkat-Raman G. et al. New Primary diagnosis codes for the ERA-EDTA. Nephrol Dial Transplant 2012;27(12):4414–9

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UK Renal Registry 19th Annual Report: Appendix I Acronyms and Abbreviations used in the Annual Report

AAB	Academic Affairs Board (Renal Association)
ACE (inhibitor)	Angiotensin converting enzyme (inhibitor)
AKI	Acute kidney injury
ANZDATA	Australia and New Zealand Dialysis and Transplant Registry
APD	Automated peritoneal dialysis
ADPKD	Autosomal dominant polycystic kidney disease
APKD	Adult polycystic kidney disease
ATTOM	Access to transplant and transplant outcome measures
ATTOMic	Access to transplant and transplant outcome measures in children
AV	Arteriovenous
AVF	Arteriovenous fistula
AVG	Arteriovenous graft
BAPN	British Association of Paediatric Nephrology
BCG	Bromocresol green
BCP	Bromocresol purple
Bicarb	Bicarbonate
BMD	Bone mineral disease
BMI	Body mass index
BP	Blood pressure
BSI	Blood stream infection
BTS	British Transplant Society
Ca	Calcium
CAB	Clinical Affairs Board (Renal Association)
CABG	Coronary artery bypass grafting
CAPD	Continuous ambulatory peritoneal dialysis
CCG	Clinical Commissioning Group
CCL	Clinical Computing Limited
CCPD	Cycling peritoneal dialysis
CDI	Clostridium difficile infection
Chol	Cholesterol
CHr	Target reticulocyte Hb content
CI	Confidence interval
CICR	Cumulative incidence competing risk
CIF	Cumulative incidence function
CK	Creatine kinase
CKD	Chronic kidney disease
CKD-EPI	Chronic kidney disease epidemiology collaboration
CK-MB	Creatine kinase isoenzyme MB
CKD-MBD	Chronic kidney disease- mineral bone disorder
COPD	Chronic obstructive pulmonary disease

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Creat	Creatinine
cRF	Calculated HLA antibody reaction frequency
CRF	Chronic renal failure
CRP	C-reactive protein
CRVF	Cardiovascular risk factor
CVVH	Continuous veno-venous haemofiltration
CXR	Chest x-ray
DBP	Diastolic blood pressure
DCCT	Diabetes Control and Complications Trial
DCD	Donor after circulatory death
DH	Department of Health
DM	Diabetes mellitus
DOB	Date of birth
DOPPS	Dialysis Outcomes and Practice Patterns Study
Ei	Expected cases in area i
E Coli	Escherichia coli
E&W	England and Wales
E, W & NI	England, Wales and Northern Ireland
EBPG	European Best Practice Guidelines
ECG	Electrocardiogram
EDTA	European Dialysis and Transplant Association
EF	Error factor
eGFR	Estimated glomerular filtration rate
ECD	Extended Criteria Donor
EDTA	European Dialysis and Transplant Association
eKt/V	Equilibrated Kt/V
EPO	Erythropoietin
ERA	European Renal Association
ERA-EDTA	European Renal Association – European Dialysis and Transplant Association
ERF	Established renal failure
ESA	Erythropoiesis stimulating agent
ESRD	End stage renal disease
ESRF	End stage renal failure
EWNI	England, Wales and Northern Ireland
Ferr	Ferritin
FEV1	Forced expiratory volume in 1 second
FVC	Forced vital capacity
GFR	Glomerular filtration rate
GH	Growth hormone
GN	Glomerulonephritis
HA	Health Authority
HB	Health board
Hb	Haemoglobin
HbA1c	Glycated Haemoglobin
HBeAg	Hepatitis B e antigen
HCAI-DCS	Healthcare-associated infection data collection system
HD	Haemodialysis
HDF	Haemodialysis filtration
HDL	High-density lipoprotein
HES	Hospital Episodes Statistics
HHD	Home haemodialysis
HLA	Human leucocyte antigen
HPA	Health Protection Agency
HQIP	Health Quality Improvement Partnership
HR	Hazard ratio
HRC	Hypochromic red blood cells
Ht	Height
HT	Home therapy
HTN	Hypertension
ICHD	In centre haemodialysis

ICU	Intensive care unit
IDMS	Isotope dilution mass spectrometry
IDOPPS	International Dialysis Outcomes and Practice Patterns Study
IFCC	International Federation of Clinical Chemistry & Laboratory Medicine
IHD	Ischaemic heart disease
IMD	Index of Multiple Deprivation
IOTF	International Obesity Taskforce
IPD	Intermittent peritoneal dialysis
IQR	Inter-quartile range
ISPD	International Society for Peritoneal Dialysis
IT	Information technology
IU	International units
IV	Intra venous
KDIGO	Kidney Disease: Improving Global Outcomes
KDOQI	Kidney Disease Outcomes Quality Initiative
KM	Kaplan Meier
Kt/V	Ratio between the product of urea clearance (K, in ml/min) and dialysis session duration (t, in minutes) divided by the volume of distribution of urea in the body (V, in ml)
LA	Local Authority
LCL	Lower confidence limit
LDL	Low-density lipoprotein
LSOA	Lower super output area
LTFU	Lost to follow-up
M:F	Male:Female
MAP	Mean arterial blood pressure
MDRD	Modification of diet in renal disease
MI	Myocardial infarction
MMF	Mycophenolate mofetil
MRSA	Methicillin resistant Staphylococcal aureus
MSSA	Methicillin sensitive Staphylococcal aureus
N	Number
N Ireland	Northern Ireland
NCDS	National Co-operative Dialysis Study
NE	North East
NEQAS	UK National External Quality Assessment Scheme
NHBPEP	National high blood pressure education programme
NHS	National Health Service
NHS BT	National Health Service Blood and Transplant
NI	Northern Ireland
NICE	National Institute for Health and Care Excellence
NISRA	Northern Ireland Statistic and Research Agency
NMO	Non-mixed origin
NRS	National Records of Scotland
NSF	National service framework
NTC	Non-tunnelled dialysis catheter
NTL	Non-tunnelled line
NW	North West
O/E	Observed/expected
Oi	Observed cases in area i
ODT	Organ Donation and Transplantation (a Directorate of NHS Blood and transplant)
ONS	Office for National Statistics
ONSPD	ONS postcode directory
OR	Odds ratio
PAS	Patient Administration System
PCT	Primary Care Trust
PD	Peritoneal dialysis
PDOPPS	UK Peritoneal Dialysis Outcomes and Practice Patterns Study
PEx	Plasma exchange
PHE	Public Health England
Phos	Phosphate

PIAG	Patient Information Advisory Group
PKD	Polycystic kidney disease
PMARP	Per million age related population
PMCP	Per million child population
PMP	Per million population
PP	Pulse pressure
PRD	Primary renal disease
PTH	Parathyroid hormone
PTx	Pre-emptive transplant
PUV	Posterior urethral valves
PVD	Peripheral vascular disease
QOF	Quality and Outcomes Framework
QUEST	Quality European Studies
RA	Renal Association
rhGH	Recombinant human growth hormone
RI	Royal Infirmary
RNSF	Renal National Service Framework (or NSF)
RR	Relative risk
RRDSS	RenalRegistry data set specification
RRT	Renal replacement therapy
RVD	Renovascular disease
SAR	Standardised acceptance ratio (= O/E)
SAS	Statistical Analysis System
SBP	Systolic blood pressure
SD	Standard deviation
SES	Socio-economic status
SHA	Strategic health authority
SHARP	Study of Heart and Renal Protection
SI	System International (units)
SMR	Standardised mortality ratios
spKt/V	Single pool Kt/V
SPC	Statistical process control
SPR	Standardised prevalence ratio (= O/E)
SR	Standardised ratio (used to cover either SAR or SPR)
SRR	Scottish Renal Registry
SUS	Secondary uses service
SW	South West
TC	Tunnelled dialysis catheter
TL	Tunnelled line
TSAT	Transferrin saturation
TWL	Transplant waiting list
Tx	Transplant
UCL	Upper confidence limit
UK	United Kingdom
UKRR	UK Renal Registry
UKT	UK Transplant (now ODT)
URR	Urea reduction ratio
US	United States
USA	United States of America
USRDS	United States Renal Data System
WHO	World health organization
Wt	Weight

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UK Renal Registry 19th Annual Report: Appendix J Laboratory Conversion Factors

Laboratory measure	Conversion factors from SI units
Albumin	g/dl = g/L × 0.1
Aluminium	μg/L = μmol/L × 27.0
Bicarbonate	mg/dl = mmol/L × 6.1
Calcium	mg/dl = mmol/L × 4
Calcium × phosphate	$mg^2/dl^2 = mmol^2/L^2 \times 12.4$
Cholesterol	mg/dl = mmol/L × 38.6
Creatinine	mg/dl = μmol/L × 0.011
Glucose	mg/dl = mmol/L × 18.02
Phosphate	mg/dl = mmol/L × 3.1
PTH	ng/L = pmol/L × 9.4
Urea	mg/dl = mmol/L × 6.0
Urea nitrogen	mg/dl = mmol/L × 2.8

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UK Renal Registry 19th Annual Report: Appendix K Renal Centre Names and Abbreviations used in the Figures and Data Tables

Adult Centres

City	Hospital	Abbreviation
England		
Basildon	Basildon University Hospital	Basldn
Birmingham	Heartlands Hospital	B Heart
Birmingham	Queen Elizabeth Hospital	B QEH
Bradford	St Luke's Hospital	Bradfd
Brighton	Royal Sussex County Hospital	Brightn
Bristol	Southmead Hospital	Bristol
Cambridge	Addenbrooke's Hospital	Camb
Carlisle	Cumberland Infirmary	Carlis
Carshalton	St Helier Hospital	Carsh
Chelmsford	Broomfield Hospital	Chelms
Colchester	Colchester General Hospital	Colchr
Coventry	University Hospital Coventry and Warwickshire	Covnt
Derby	Royal Derby Hospital	Derby
Doncaster	Doncaster Royal Infirmary	Donc
Dorset	Dorset County Hospital	Dorset
Dudley	Russells Hall Hospital	Dudley
Exeter	Royal Devon and Exeter Hospital	Exeter
Gloucester	Gloucestershire Royal Hospital	Glouc
Hull	Hull Royal Infirmary	Hull
Ipswich	Ipswich Hospital	Ipswi
Kent	Kent and Canterbury Hospital	Kent
Leeds	St James's University Hospital and Leeds General Infirmary	Leeds
Leicester	Leicester General Hospital	Leic
Liverpool	Aintree University Hospital	Liv Ain
Liverpool	Royal Liverpool University Hospital	Liv Roy
London	St. Bartholomew's Hospital and The Royal London Hospital	L Barts
London	St George's Hospital and Queen Mary's Hospital	L St. G
London	Guy's Hospital and St Thomas' Hospital	L Guys
London	Hammersmith, Charing Cross, St Mary's	L West
London	King's College Hospital	L Kings
London	Royal Free, Middlesex and UCL Hospitals	L Rfree
Manchester	Manchester Royal Infirmary	M RI
Middlesbrough	The James Cook University Hospital	Middlbr
Newcastle	Freeman Hospital and Royal Victoria Infirmary	Newc
Norwich	Norfolk and Norwich University Hospital	Norwch
Nottingham	Nottingham City Hospital	Nottm
Oxford	John Radcliffe Hospital and Churchill Hospital	Oxford

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City	Hospital	Abbreviation
Plymouth	Derriford Hospital	Plymth
Portsmouth	Queen Alexandra Hospital	Ports
Preston	Royal Preston Hospital	Prestn
Reading	Royal Berkshire Hospital	Redng
Salford	Salford Royal Hospital	Salford
Sheffield	Northern General Hospital	Sheff
Shrewsbury	Royal Shrewsbury Hospital	Shrew
Southend	Southend University Hospital	Sthend
Stevenage	Lister Hospital	Stevng
Stoke	Royal Stoke University Hospital	Stoke
Sunderland	Sunderland Royal Hospital	Sund
Truro	Royal Cornwall Hospital	Truro
Wirral	Arrowe Park Hospital	Wirral
Wolverhampton	New Cross Hospital	Wolve
York	The York Hospital	York
Wales		
Bangor	Ysbyty Gwynedd	Bangor
Cardiff	University Hospital of Wales	Cardff
Clwyd	Glan Clwyd Hospital	Clwyd
Swansea	Morriston Hospital	Swanse
Wrexham	Wrexham Maelor Hospital	Wrexm
Scotland		
Aberdeen	Aberdeen Royal Infirmary	Abrdn
Airdrie	Monklands Hospital	Airdrie
Dumfries	Dumfries & Galloway Royal Infirmary	D & Gall
Dundee	Ninewells Hospital	Dundee
Edinburgh	Royal Infirmary of Edinburgh	Edinb
Glasgow	Queen Elizabeth University Hospital, Glasgow Royal Infirmary and Stobhill Hospitals	Glasgw
Inverness	Raigmore Hospital	Inverns
Kilmarnock	University Hospital Crosshouse	Klmarnk
Kirkcaldy	Victoria Hospital	Krkcldy
Northern Ireland		
Antrim	Antrim Area Hospital	Antrim
Belfast	Belfast City Hospital	Belfast
Londonderry & Omagh	Altnagelvin Area and Tyrone County Hospitals	West NI
Newry	Daisy Hill Hospital	Newry
Ulster	Ulster Hospital	Ulster

Paediatric Centres

City	Hospital	Abbreviation	Country
Belfast	Royal Belfast Hospital for Sick Children	Blfst_P	N Ireland
Birmingham	Birmingham Children's Hospital	Bham_P	England
Bristol	Bristol Royal Hospital for Children	Brstl_P	England
Cardiff	KRUF Children's Hospital for Wales	Cardf_P	Wales
Glasgow	Royal Hospital for Children	Glasg_P	Scotland
Leeds	Leeds Children's Hospital	Leeds_P	England
Liverpool	Alder Hey Children's Hospital	Livpl_P	England
London	Guy's Hospital – Paediatric	L Eve_P	England
London	Great Ormond Street Hospital for Children	LGOSH_P	England
Manchester	Royal Manchester Children's Hospital	Manch_P	England
Newcastle	Great North Children's Hospital	Newc_P	England
Nottingham	Nottingham Children's Hospital	Nottm_P	England
Southampton	Southampton Children's Hospital	Soton_P	England