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THE RENAL ASSOCIATION
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UK Renal Registry

Acute kidney injury (AKI) in England

A report on the nationwide collection of AKI warning test scores from 2018

Submission of AKI data to the UKRR and preliminary analyses

AKI rate and mortality by clinical commissioning group

AKI rate and mortality by clinical setting

UK Renal Registry Acute kidney injury (AKI) in England

A report on the nationwide collection of AKI warning test scores from 2018

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Foreword



Dr Graham Lipkin, president of the Renal Association

I am delighted to write the foreword for the first national acute kidney injury (AKI) report for England, which reflects the hard work of a large number of people over the last seven years. AKI is common amongst patients, especially those admitted to hospitals as an emergency, and their outcomes, particularly in those with the two more severe levels of AKI are sobering, with one-in-four people dying within 30 days. Given the high number of patients involved, the complexity of care required and the protracted length of hospital stays, the cost to the NHS is substantial. Recent estimates put it at between £434 million and £620 million per year,[1] more than the costs associated with breast, lung and skin cancers combined.

The publication of the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) report, 'Acute Kidney Injury: Adding Insult to Injury'[2] sparked the imperative to improve detection and care for people with AKI. Clinical experts reviewing cases of AKI in hospital where the patient died, concluded that AKI could have been prevented 15% of the time and that only 50% of patients received a standard of care that was considered 'good'. Using clinical coding in hospital notes, it even proved difficult to accurately identify people who had AKI, with only 65% of the cases reviewed fulfilling the criteria.

I acknowledge the significant contributions and the hard work in this area under the umbrella of 'Think Kidneys' (thinkkidneys.nhs.uk) and all of its constituent workstreams. The leaders and members of the Think Kidneys programme are acknowledged at the end of this report, including the last National Clinical Director for Renal Disease for NHS England (NHSE), Dr Richard Fluck. Critically, Think Kidneys drove the development of the NHSE-funded AKI warning test score, now mandated by the NHSE patient safety directorate.

The data collection for the AKI warning test scores has always been with the UK Renal Registry (UKRR). This report is the product of the hard work of the laboratories that supply data and the UKRR that collects and analyses the data, as well as the continuing contribution from the wider renal community in their interpretation and impact. Initially, incomplete population coverage limited the scope to publish accurate comparative data on AKI, but improved coverage over the last couple of years has now made this possible.

This report describes the current position of AKI in England and provides a unique platform to guide improved service planning and delivery, leading to major patient and health economic benefits. There is still a lot of work to do to improve the care of people with AKI across the whole of UK healthcare to identify those at risk of AKI (to avoid it), those with early AKI (to limit the damage) and those with established AKI to give them the greatest chances of recovery. The Renal Association, including the UKRR, working with the wider health community, look forward to facilitating the major opportunities created by this important work.

Executive summary

AKI – impact, detection and reporting

Acute kidney injury (AKI) is a sudden deterioration of kidney function, caused by, for example, dehydration, sepsis or heart attack and is associated with about 100,000 deaths every year in hospital in the UK.[2] In 2014, NHS England mandated all blood testing laboratories in England to incorporate AKI warning test scores (AKI alerts) into their laboratory testing systems to improve early detection and outcomes of AKI. An AKI alert is triggered if there is a change in serum creatinine level over a short time. The alert ranges from the least severe AKI stage 1 to the most severe AKI stage 3. Hospital clinicians can see the AKI warnings alongside the creatinine results, alerting them to a potential AKI that needs further clinical assessment and action.

Laboratories were also mandated to submit their AKI alerts, with accompanying demographic information about each person (age, sex, postcode, etc.), to the UK Renal Registry (UKRR) to enable nationwide analyses of the data. This is the first national AKI report for England and is primarily about people who had an AKI episode in 2018. However, to differentiate the clinical setting in which an AKI episode occurred (community or hospital), it was necessary to link people who had an AKI in 2017 to Hospital Episode Statistics (HES).

Objectives

- To assess the number of laboratories that submit AKI alerts and demographic data to the UKRR, and the completeness of the data submitted
- To estimate the rate and outcome of AKI in England overall and by clinical commissioning group (CCG)
- To investigate factors associated with an increased likelihood of death following an AKI, in particular for people who are entirely cared for in the community, versus those who are admitted to hospital with their AKI, or develop an AKI during their stay.

Findings

- 166 (87%) laboratories submitted 2018 data that could be included in the analyses
- There were 1,524,398 AKI alerts for 488,856 people in England in 2018, which represented 564,738 AKI episodes (76% of people had one AKI episode, 17% had two episodes and 7% had more than two episodes during 2018)
- Only 2% of AKI episodes occurred in children, while 67% were in adults aged over 65 years
- The unadjusted rate of AKI episodes in England in 2018 was 12,300 per million population and this ranged between CCGs from 5,300 to 20,700 per million population
- The rate of AKI was particularly high in people admitted to hospital as an emergency – almost 70 AKI episodes per 1,000 admissions, compared to about five episodes per 1,000 elective admissions
- 71% of people with an AKI episode had a hospital stay – 39% following a community acquired AKI and 32% were already in hospital when the AKI occurred
- Most people had an AKI stage 1 – almost 80% of alerts at the start of an episode and 70% at the peak of an episode
- 18% of people with an AKI episode died within 30 days of the first alert
- Mortality within 30 days increased with peak AKI stage – 13% for AKI stage 1, 29% for AKI stage 2 and 33% for AKI stage 3
- Mortality in the first 30 days also increased with age, from 3% in children to 26% in adults aged over 75 years

- Mortality within 30 days was higher for people from deprived areas after accounting for their lower median age
- More deaths occurred in winter – 23% of people with an AKI episode between January and March died within 30 days, compared to 16% of those with an AKI between July and September
- Mortality within 30 days was higher in people whose AKI episode started in hospital – 24% mortality compared to 8% mortality for people with an AKI who were never hospitalised
- Median length of stay in hospital with an AKI episode was 12 days and was more than double in hospital acquired AKI than in community acquired, subsequently hospitalised AKI, for both elective and emergency admissions
- HES coding of AKI was better the higher the stage of the AKI episode and there was no clear difference between HES coding for renal and acute non-renal hospitals. Generally, HES coding for AKI was poor in paediatric hospitals.

Conclusions

This audit report describes the current picture related to AKI in England, with the aim to help service planning and improvements in people's outcomes following an AKI episode. It provides the detail to support the regular reports of AKI rates and mortality by CCG, which the UKRR has been producing for the last two years. In collaboration with the 'Getting It Right First Time' (GIRFT) programme, additional measures of hospital AKI rate and outcome are under development to highlight variation between hospitals and to stimulate improvement.

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Introduction

Acute kidney injury – definition and burden

Acute kidney injury (AKI) is a sudden drop in kidney function over a few hours to a few days. It commonly occurs with an episode of acute illness and is more likely if the illness is severe, or if an individual is at greater risk of an AKI. Examples of risk factors include older age and pre-existing conditions, such as chronic kidney disease (CKD), diabetes and heart failure.[1]

AKI represents a significant cause of mortality and morbidity, both in and out of hospital, and incurs significant healthcare costs.[3] Care between hospitals is known to vary[4] and there is evidence that AKI is not well treated in up to one third of cases.[2] Recently, it has been shown that relatively simple care bundles can improve outcomes, at least in hospitals.[5,6]

Algorithm to standardise detection of AKI in England

To improve the recognition and treatment of AKI, NHS England (NHSE) established a partnership with the Renal Association known as 'Think Kidneys' (thinkkidneys.nhs.uk).

Guided by Think Kidneys, NHSE issued a level 3 patient safety alert in June 2014 to standardise the early identification of AKI.[7] The alert mandated NHS trusts within England, from March 2015, to implement a standardised biochemical classification of AKI by installing an algorithm in their laboratory information management system.[8] The algorithm compares a person's serum creatinine to their historical blood tests (if there are any) to determine whether they may have an AKI and, if so, the severity of the AKI.

The AKI algorithm has five possible outputs, three of which constitute AKI warning test scores or alerts (from the least severe stage 1 through to the most severe stage 3 AKI). These outputs are in accordance with the Kidney Disease: Improving Global Outcomes (KDIGO) AKI staging system:[9]

1. Null (no evidence of AKI).
2. Stage 1 AKI.
3. Stage 2 AKI.
4. Stage 3 AKI.

   } AKI warning test scores or alerts

5. Not applicable (insufficient creatinine values, but flagged abnormal if outside reference range).

The patient safety alert also mandated laboratories to send AKI alerts and basic demographic information on all people detected by the AKI algorithm to the UK Renal Registry (UKRR), for comparison and audit. The algorithm has been externally validated with a high degree of sensitivity and specificity in different hospital settings.[10] However, the high level of sensitivity can result in false positives, whereby some patients with CKD are detected. In clinical practice, the addition of an AKI alert or abnormal flag to a creatinine result highlights the possibility of an AKI and can prompt a bundle of care. This has the potential to improve patient outcomes.[11]

AKI Master Patient Index

The UKRR collates the AKI alerts (stages 1, 2 and 3) into a single Master Patient Index (MPI), which records each adult or child in England who has had an AKI alert.

Laboratories are requested to provide separate creatinine timeline files for all patients with an AKI alert. These files should contain creatinine values for the 15 months both pre and post the AKI alert. These timelines will be used to help validate the algorithm and identify people with CKD, either before or after the AKI alert.

This report is based primarily on analyses of the 2018 MPI dataset and analyses included both adults and children, unless otherwise stated. Where Hospital Episode Statistics (HES) data were included in analyses, the 2017 MPI dataset was linked to 2017 HES data.

Importance of clinical setting

The demographics and outcomes of people who had an AKI episode (defined in chapter 2) are presented in different ways in this report to illustrate the impact of AKI on the whole population, or on selected groups. The three key groups of people are those with: a community acquired, never hospitalised (CA) AKI; a community acquired, subsequently hospitalised (CAH) AKI; and a hospital acquired (HA) AKI. For further information on these groups, see chapter 3.

The CA AKI group, who were never admitted to hospital, represent a significant proportion of patients in the whole population, especially those with the less severe AKI stage 1. This is discussed in more detail in chapter 3, but for readers accustomed to data only on hospitalised patients with AKI, it is important to bear this in mind when interpreting analyses that include the whole AKI population.

Objectives of the report

1. To illustrate the effectiveness of the implementation of the NHSE patient safety alert and highlight to laboratories and the NHS trusts that host them, the work still to be done. For example, a small number of laboratories still do not provide information to the UKRR and a few continue to struggle with data completeness.
2. To demonstrate the impact of AKI on the English population, through analysis of the laboratory files directly (with no correction for population) and through analysis at clinical commissioning group (CCG) geography to relate the rate and outcome of AKI to specific regions.
3. To show the different demographics and outcomes of various groups of people with AKI, but in particular, people who are entirely cared for in the community versus those who are admitted to hospital with their AKI, or develop it during their stay.

Please note, this is an audit report, the primary aim of which is to describe, benchmark and compare AKI alerts and episodes in England, without interpreting the results.

Structure of the report

Chapter 1 details which hospital laboratories in England send AKI data files to the UKRR and also the completeness of those files. The chapter contains analyses of variation in AKI alerts by laboratory.

Chapter 2 describes the demographics of people with AKI episodes. It also presents the population rates of AKI in England by CCG and patient outcomes.

Chapter 3 describes AKI in people admitted, or not admitted to English hospitals as part of their AKI episode. These data are presented by the provider trust of that hospital care. Some of these measures were co-produced by the UKRR and the 'Getting It Right First Time' (GIRFT) initiative.

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Chapter 1

Submission of AKI data to the UK Renal Registry and preliminary analyses

Introduction

This chapter describes the progress of laboratories in England to comply with the NHSE patient safety alert, both in terms of submitting a data file of AKI warning test scores (AKI alerts) and demographic data each month to the UKRR, and the completeness of the data contained in the file.

The chapter also includes basic analyses of all AKI alerts received for the 2018 calendar year. These analyses show variation between laboratories in the proportions of people with each AKI stage. This is important when interpreting variation in the rates of AKI episodes and their outcomes in the subsequent two chapters.

There is deliberately no comparison between laboratories in the rate of AKI alerts or outcomes, because this was not felt to be a useful geographical population for improvement. Instead, comparisons between CCGs and between hospitals are presented in chapters 2 and 3, respectively.

AKI data items submitted to the UKRR

The AKI data file sent to the UKRR for each patient detected by the AKI algorithm includes:

- NHS number
- date of birth
- sex
- postcode
- AKI stage
- care indicator
- serum creatinine.

The care indicator field details the source of the sample which generated the alert, for example, accident and emergency or outpatients.

Laboratories that have submitted AKI data

There are 190 laboratories in England that analyse serum creatinine blood tests for NHS clinical care. Thirty-nine of these laboratories do not submit data directly to the UKRR – instead, their data are submitted via another laboratory, but it is only possible to report by the submitting laboratory (see table 1.3).

The number of laboratories that submitted AKI alerts to the UKRR ranged from between 164 for May 2018 to 170 for June and September 2018 (figure 1.1).

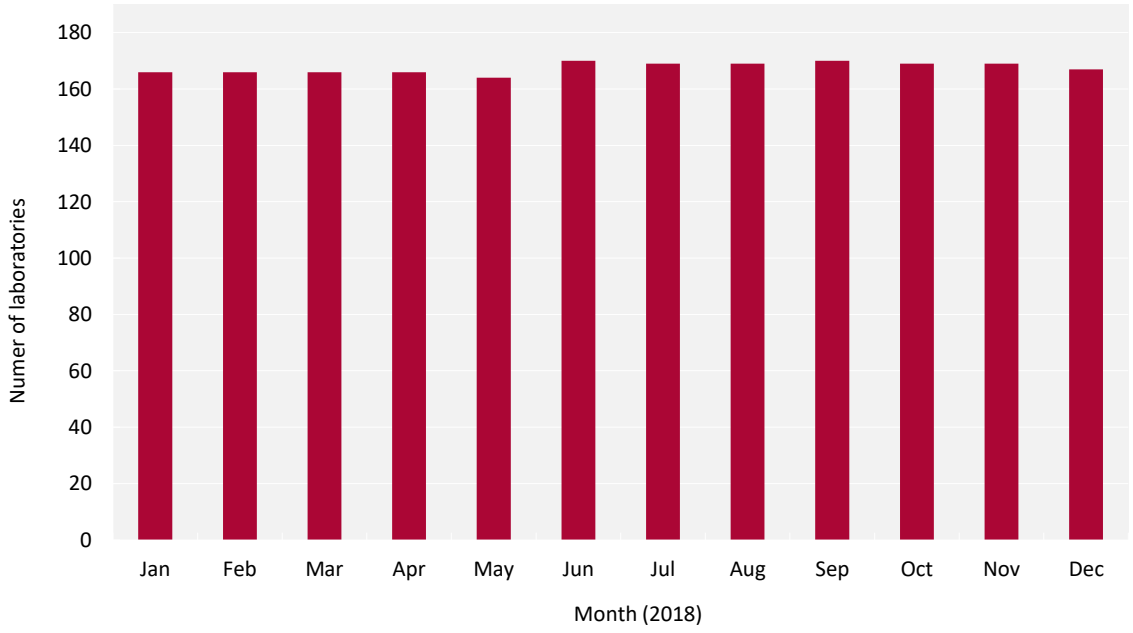


Figure 1.1 Number of laboratories that submitted AKI data to the UKRR for each month in 2018

Often when a laboratory first sends data, it is able to provide files that include the AKI alerts from the previous year, as well as the subsequent monthly files. Consequently, the number of laboratory files covering 2018 and now available for analysis, is greater than the number of files which were available for the quarterly reports of AKI episodes that the UKRR routinely produces two months after the end of each quarter.

In 2018, 46 laboratories agreed to send separate creatinine timeline files for all patients with an AKI alert and most now do this on a monthly basis. Data from these files will be used to further validate the AKI algorithm.

Completeness of AKI data

Overall completeness of laboratory AKI data files covering 2018 was good, as shown in table 1.1. However, this table does not take into account the laboratories that did not send any data at all for 2018.

Table 1.1 Overall completeness of AKI data files sent from laboratories to the UKRR for 2018

Data item	% completeness
NHS number	98.9
Date of birth	100.0
Sex	100.0
Postcode	98.2
AKI stage	100.0
Care indicator	98.2
Serum creatinine	99.5

Data files from each laboratory are scored automatically when they are received at the UKRR and given an initial red/amber/green (RAG) rating depending on the completeness of key data items. Four key data items were used for assessing the completeness of 2018 data (NHS number, sex, postcode and AKI stage). Data files have one row of data per AKI alert. If all the key data variables in a row are present, the row is rated green and if any of the variables are missing, the row is rated red. For a laboratory to be given a green rating for that month, more than 90% of the rows in the data file must be green. If 50–90% of rows are green, the laboratory is given an amber rating. If fewer than 50% of rows are green, the laboratory is given a red rating. Every three months each laboratory receives a report from the UKRR summarising the initial completeness of their data files and monthly laboratory RAG ratings are available on the Think Kidneys website (thinkkidneys.nhs.uk/aki/aki-data). Date of birth is included as a fifth key data item for these more recent assessments of data completeness.

Each laboratory is also given a RAG rating for the entire year after NHS numbers have been run through the NHS tracing service. Tracing validates sex, date of birth and postcode and leads to an overall improvement in data completeness compared to the initial RAG rating, because data items missing can be added. The post-tracing RAG rating for the 2018 data also included date of birth as a key variable. A RAG rating is first of all applied to each month of data, as described above, and then the number of red, amber and green months in the year is used to assign the yearly RAG rating for each laboratory. For example, if the UKRR received 12 months of data from a laboratory and 7 months had <50% completeness and 5 months had >90% completeness, the 7 red months would be removed, leaving only 5 green months – the yearly RAG rating for that laboratory would be red and the data would not be included in any analyses (see table 1.2).

Note, these RAG ratings are entirely separate from the RAG ratings of CCG population coverage in chapter 2.

Table 1.2 The criteria used to rate laboratories as red/amber/green (RAG) in 2018 based on the completeness of key data variables

RAG rating	Data completeness
R	<50% completeness - remove data
	<6 months with data - remove laboratory
A	12 months with 50-90% completeness
	6-9 months with >90% completeness - substitute the months with no data*
	≥9 months with 50-90% completeness - substitute the months with no data*
G	12 months with >90% completeness
	≥9 months with >90% completeness - substitute the months with no data*

*For a small number of amber and green rated laboratories where data were missing for a particular month(s), data were substituted up to a maximum of 6 months and 3 months, respectively. The substituted data were usually from the same month, but for 2017 for that laboratory, but in some instances, data were duplicated from the month before or after in 2018.

Pre-NHS tracing data completeness of each data item and post-NHS tracing RAG rating are shown for each laboratory in table 1.3. Although all analyses in this report were based on the more complete post-tracing dataset, the UKRR felt it was important to show the completeness of the raw data submitted by laboratories. Of the 190 laboratories, 166 were rated green or amber, i.e. data from 87.4% of laboratories were included in the analyses.

The geographical distribution of RAG rated laboratories is shown in figure 1.2.

Table 1.3 Data completeness pre-NHS tracing and red/amber/green (RAG) rating post-tracing for each laboratory in 2018

Laboratory	Lab code	RAG rating	% completeness							No. months with data
			NHS no.	Date of birth	Sex	Post-code	AKI stage	Care indic-ator	Serum creat-inine	
Addenbrooke's Hospital	69010	G	99.5	100.0	100.0	99.2	100.0	100.0	100.0	12
Airedale Hospital	697C0	G	100.0	100.0	100.0	99.8	100.0	100.0	91.6	12
Alder Hey Children's	69480	G	99.7	100.0	100.0	99.6	100.0	100.0	100.0	12
Arrowe Park Hospital	69A60	R								0
Ashford & St Peter's Hospital	69050	A	85.7	100.0	100.0	44.6	100.0	100.0	100.0	12
Barnsley District General Hospital	69060	R								0
Basildon Hospital	69070	G	99.8	100.0	100.0	99.6	100.0	100.0	100.0	12
Basingstoke & North Hampshire	69350	G	99.2	99.9	100.0	99.4	100.0	100.0	100.0	12
Winchester & Eastleigh	69640	G								
Bedford Hospital	69680	R								0
Blackpool Teaching Hospitals	698Y0	G	96.5	100.0	100.0	99.4	100.0	100.0	99.2	12
Blackpool Victoria Hospital	690E0	G								
Bradford Royal Infirmary	690H0	G	99.4	100.0	100.0	99.7	100.0	100.0	100.0	12
Broomfield Hospital	692V0	G	98.3	99.9	100.0	94.2	100.0	100.0	98.3	9
Burton Hospitals	690M0	G	99.5	100.0	100.0	99.4	100.0	98.9	100.0	12
Charing Cross Hospital	69Z02	A	99.9	100.0	100.0	99.2	100.0	100.0	99.7	7
Chelsea & Westminster Hospital	690X0	A								
Hammersmith Hospital	691X0	A								
St Mary's Hospital	69550	A								
West Middlesex University Hospital	695Y0	A								
Cheltenham Hospital	691C0	G	99.8	100.0	100.0	99.7	100.0	100.0	100.0	12
Gloucestershire Royal Hospital	691R0	G								
Chesterfield & N Derbyshire Royal Hosp	690Y0	G	99.7	100.0	100.0	98.0	100.0	100.0	100.0	12
Christie Hospital	696F0	G	99.6	100.0	100.0	98.3	100.0	100.0	100.0	12
City Hospital Birmingham	69100	G	100.0	100.0	100.0	99.5	100.0	100.0	100.0	12
Colchester General Hospital	691K0	R								0
West Suffolk Hospital	695Z0	R								
Countess of Chester Hospital	69120	G	100.0	100.0	100.0	100.0	100.0	99.9	100.0	12
County Hospital Hereford	69240	G	99.5	100.0	100.0	99.5	100.0	99.9	99.9	12
Coventry & Warwickshire	695S0	G	100.0	100.0	100.0	99.6	100.0	100.0	99.8	12
George Eliot Hospital	695E0	G								
South Warwickshire Hospital	694W0	G								
Cumberland Infirmary	690Q0	G	99.3	100.0	100.0	99.8	100.0	100.0	100.0	12
West Cumberland Hospital	695V0	G								
Darent Valley Hospital	697K0	G	99.9	100.0	100.0	99.8	100.0	100.0	99.9	12
Derby Hospitals	69160	G	99.7	100.0	99.9	99.8	100.0	100.0	99.9	12
Derriford Hospital	693R0	G	99.8	100.0	100.0	99.9	100.0	100.0	100.0	12
Diana Princess of Wales Hospital Grimsby	696J0	G	99.8	100.0	100.0	98.4	100.0	100.0	100.0	12
Lincoln County Hospital	692P0	G								
Pilgrim Hospital	693P0	G								
Scunthorpe General Hospital	694M0	G								
Doncaster Royal Infirmary	69180	G	99.3	100.0	100.0	99.6	100.0	100.0	99.9	12
Bassetlaw Hospital	69080	G								
Dorset County Hospital	695W0	G	99.4	100.0	100.0	99.1	99.8	100.0	99.8	12
East Lancashire Hospitals	690D0	G	99.9	100.0	100.0	99.7	100.0	100.0	100.0	12
Burnley Hospital	690L0	G								
East Surrey Hospital	691F0	G	99.4	100.0	100.0	99.8	99.9	100.0	99.8	12
Crawley Hospital	69130	G								
Eastbourne District General Hospital	691G0	G	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12
Epsom Hospital	69760	G	100.0	100.0	100.0	99.8	100.0	100.0	100.0	12
Fazakerley Hospital	69020	G	98.5	100.0	100.0	99.4	99.9	100.0	99.9	12

Table 1.3 Continued

Laboratory	Lab code	RAG rating	% completeness							No. months with data
			NHS no.	Date of birth	Sex	Post-code	AKI stage	Care indic-ator	Serum creat-inine	
Freeman Hospital	695D0	G	94.3	100.0	100.0	99.1	100.0	100.0	100.0	12
Friarage Hospital	696M0	A	96.2	100.0	100.0	99.7	100.0	99.8	99.1	6
Frimley Park Hospital	691N0	G	99.7	100.0	100.0	99.8	99.7	99.8	100.0	12
Furness General Hospital	698Q0	G	99.7	100.0	100.0	99.5	100.0	100.0	100.0	12
Great Ormond Street Hospital	697L0	G	91.3	100.0	100.0	94.9	100.0	100.0	98.5	12
Great Western Hospital Swindon	69590	G	99.6	100.0	100.0	99.4	99.6	0.0	100.0	12
Guy's Hospital	696V0	R								0
Harefield Hospital	69840	A	79.0	100.0	100.0	97.2	100.0	100.0	100.0	12
Harrogate District Hospital	691Z0	A	99.9	100.0	100.0	0.0	100.0	99.9	0.0	12
Hastings & Rother Hospitals	69210	G	100.0	100.0	100.0	99.7	100.0	100.0	100.0	12
Heartlands Hospital	690A0	R								0
Hemel Hempstead Hospital	69950	G	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12
Hillingdon Hospital	697J0	G	100.0	100.0	100.0	99.8	100.0	100.0	99.9	12
Hinchingbrooke Hospital	696T0	G	99.7	100.0	100.0	99.6	100.0	100.0	100.0	12
Homerton Hospital	69270	G	99.2	100.0	100.0	79.3	100.0	100.0	100.0	12
Huddersfield Royal Infirmary	69290	G	99.9	100.0	100.0	99.9	100.0	100.0	100.0	11
Calderdale Royal Hospital	696A0	G								
Hull & East Yorkshire	69460	G	99.1	100.0	100.0	99.7	100.0	100.0	100.0	12
Ipswich Hospital	692A0	G	98.6	100.0	100.0	99.0	100.0	100.0	99.9	12
Isle of Wight Hospitals	69960	G	99.9	100.0	100.0	99.8	100.0	100.0	100.0	12
James Cook University Hospital	694U0	A	98.5	100.0	100.0	99.9	100.0	99.3	99.6	6
James Paget University Hospital	698N0	G	99.9	100.0	100.0	99.2	100.0	100.0	100.0	12
Kent & Canterbury Hospital	692D0	G	100.0	100.0	100.0	99.9	100.0	99.6	100.0	12
Kettering General Hospital	692F0	G	99.9	100.0	100.0	99.9	100.0	100.0	100.0	9
King George Hospital Ilford	693X0	G	96.2	100.0	100.0	98.9	100.0	100.0	99.9	11
King's College Hospital	692H0	G	95.8	100.0	100.0	98.0	100.0	99.9	99.8	12
King's Mill Hospital	696H0	G	100.0	100.0	100.0	99.6	100.0	100.0	100.0	12
Newark Hospital	696W0	G								
Kingston Hospital	692K0	G	99.1	100.0	100.0	98.3	100.0	100.0	92.1	12
Leeds General Infirmary	695N0	G	99.6	100.0	100.0	99.7	100.0	100.0	100.0	12
Leicester Royal Infirmary	692M0	G	99.1	100.0	100.0	98.6	100.0	99.5	100.0	11
Lister Hospital	69360	G	99.9	100.0	100.0	99.6	100.0	100.0	100.0	12
Luton & Dunstable Hospital	692Q0	G	99.3	100.0	100.0	99.2	100.0	100.0	100.0	12
Macclesfield District General Hospital	691B0	G	100.0	100.0	100.0	100.0	100.0	100.0	100.0	11
Maidstone & Tunbridge Wells	697P0	G	99.9	100.0	100.0	99.6	100.0	99.9	100.0	12
Maidstone Hospital	692E0	G								
Tunbridge Wells Hospital (Pembury)	698M0	G								
Manchester Royal Infirmary	690S0	G	95.4	100.0	100.0	99.4	100.0	100.0	100.0	12
Mayday University Hospital	692S0	G	99.0	100.0	100.0	99.5	100.0	100.0	99.9	12
Medway Maritime Hospital	692T0	G	99.6	100.0	100.0	90.7	100.0	100.0	99.2	11
Mid Cheshire Hospitals	696R0	G	99.7	100.0	100.0	99.9	100.0	100.0	100.0	11
Mid Yorkshire Hospitals	693Q0	G	100.0	100.0	100.0	99.9	100.0	100.0	100.0	12
Dewsbury & District Hospital	69170	G								
Milton Keynes General Hospital	692Z0	G	99.7	100.0	100.0	98.2	100.0	100.0	100.0	12
New Cross Hospital	694F0	G	99.7	100.0	100.0	99.8	100.0	100.0	100.0	12
Norfolk & Norwich Hospital	69330	G	99.5	100.0	100.0	97.0	100.0	100.0	100.0	12
North Bristol Hospitals	698V0	G	100.0	100.0	100.0	99.7	100.0	100.0	99.8	12
North Middlesex Hospital	69380	R								0
North Tyneside General Hospital	693B0	G	99.9	100.0	100.0	99.9	100.0	99.9	100.0	12
Hexham General Hospital	698H0	G								
Northumbria Specialist Care Hospital	698G0	G								
Wansbeck Hospital	690Z0	G								

Table 1.3 Continued

Laboratory	Lab code	RAG rating	% completeness							No. months with data
			NHS no.	Date of birth	Sex	Post-code	AKI stage	Care indic-ator	Serum creat-inine	
Northampton General Hospital	693C0	G	99.6	100.0	100.0	99.9	100.0	100.0	100.0	12
Northern Devon District Hospital	693D0	G	99.9	100.0	100.0	99.9	100.0	100.0	100.0	12
Northern General Hospital	693E0	G	100.0	100.0	100.0	99.6	100.0	100.0	100.0	12
Royal Hallamshire Hospital	690V0	G								
Northwick Park & St Mark's Hospital	697Q0	G	98.9	100.0	100.0	98.9	100.0	100.0	99.7	12
Ealing Hospital	691A0	G								
Nottingham University Hospitals	69790	G	100.0	100.0	100.0	99.4	100.0	100.0	100.0	12
Oxford University Hospitals	697D0	G	99.6	100.0	100.0	99.2	100.0	97.0	100.0	12
Papworth Hospital	696P0	G	99.9	100.0	100.0	98.8	99.8	100.0	100.0	12
Peterborough Hospital	693N0	G	99.7	100.0	100.0	99.7	100.0	100.0	100.0	12
Poole General Hospital	693S0	G	99.6	100.0	100.0	99.6	100.0	100.0	100.0	12
Portsmouth Hospitals	697E0	G	99.5	100.0	100.0	99.7	100.0	100.0	100.0	12
Queen Elizabeth Hospital Gateshead	691P0	G	100.0	100.0	100.0	99.7	100.0	100.0	100.0	12
Queen Elizabeth Hospital Lewisham	697W0	G	99.3	100.0	100.0	94.5	100.0	100.0	99.9	12
Lewisham Hospital	692N0	G								
Queen Elizabeth Hospital Norfolk	692J0	G	99.9	100.0	100.0	98.5	100.0	99.7	100.0	12
Queen's Hospital Romford	696X0	G	97.0	100.0	100.0	99.4	100.0	100.0	100.0	12
Rotherham General Hospital	693Z0	R								0
Royal & West Cornwall Hospital	69430	G	99.8	100.0	100.0	99.8	99.9	99.9	100.0	12
Royal Bath Hospital	698P0	G	99.9	100.0	100.0	99.8	100.0	100.0	99.9	12
Royal Berkshire Hospital	69400	R								0
Royal Brompton Hospital	69850	A	61.9	100.0	100.0	90.7	100.0	99.1	100.0	9
Royal Devon & Exeter Hospital	69440	A	99.9	100.0	100.0	70.6	100.0	100.0	99.9	12
Royal Free Hospital	697H0	R								0
Barnet Hospital	69Z03	R								
Chase Farm Hospitals (Enfield)	690W0	R								
Royal Liverpool University Hospital	69470	G	99.9	100.0	100.0	97.1	100.0	100.0	100.0	12
Royal National Orthopaedic Hospital	69KTV	G	94.4	100.0	100.0	96.2	100.0	100.0	100.0	12
Royal Oldham Hospital	698X0	G	99.5	100.0	100.0	99.4	100.0	99.7	100.0	12
Bury General Hospital	690N0	G								
North Manchester Hospital	696Y0	G								
Oldham Hospital	693L0	G								
Royal Preston Hospital	693U0	G	99.8	100.0	100.0	99.7	100.0	100.0	99.9	12
Royal Shrewsbury Hospital	694A0	G	100.0	100.0	100.0	99.7	100.0	100.0	92.5	12
Royal Surrey County Hospital	694B0	G	99.8	100.0	100.0	99.4	100.0	100.0	100.0	12
Royal Sussex County Hospital	690J0	G	99.6	100.0	100.0	99.6	100.0	0.0	100.0	12
Russells Hall Hospital	69190	G	100.0	100.0	100.0	99.5	100.0	100.0	100.0	12
Salford Royal Hospital	697T0	G	100.0	100.0	100.0	99.8	100.0	100.0	100.0	12
Salisbury District Hospital	694J0	R								0
Sandwell General Hospital	694K0	G	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12
Sheffield Children's Hospital	698E0	G	96.6	100.0	100.0	98.0	100.0	100.0	100.0	9
South Tyneside District General Hospital	694V0	G	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12
Southampton General Hospital	694X0	G	99.6	100.0	100.0	99.7	100.0	100.0	100.0	12
Southend Hospital	694Y0	G	99.8	100.0	100.0	99.8	100.0	100.0	99.4	12
Southport & Ormskirk Hospital	69500	G	99.9	100.0	100.0	99.8	100.0	100.0	100.0	12
SPS Musgrove Park Hospital	697M0	G	99.9	100.0	100.0	99.8	100.0	100.0	100.0	12
St. George's Hospital	697N0	G	98.9	100.0	100.0	98.8	100.0	100.0	99.9	12
St Helier Hospital	69750	G	99.9	100.0	100.0	99.6	100.0	96.4	100.0	12
St James's University Hospital	696B0	G	99.8	100.0	100.0	99.6	100.0	100.0	100.0	12
St Richard's Hospital	696Q0	G	100.0	100.0	100.0	99.8	100.0	100.0	100.0	12
St Thomas's Hospital	691W0	R								0

Table 1.3 Continued

Laboratory	Lab code	RAG rating	% completeness							No. months with data
			NHS no.	Date of birth	Sex	Post-code	AKI stage	Care indic-ator	Serum creat-inine	
Stepping Hill Hospital	69570	G	99.9	100.0	100.0	99.6	100.0	100.0	100.0	12
Stoke Mandeville Hospital	69580	G	99.9	100.0	100.0	99.7	100.0	99.9	100.0	12
South Buckinghamshire	694Q0	G								
Sunderland Royal Hospital	696D0	G	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12
Tameside General Hospital	695A0	G	99.8	100.0	100.0	99.8	100.0	99.9	100.0	12
Thanet District General Hospital	695C0	G	99.9	100.0	100.0	99.5	100.0	99.7	100.0	12
The Princess Alexandra Hospital	69780	R								0
The Princess Royal Hospital	697V0	G	99.1	100.0	100.0	99.6	100.0	99.6	100.0	12
The Royal Bolton Hospital	690F0	G	99.7	100.0	100.0	99.9	100.0	98.5	99.9	12
The Royal London Hospital	695H0	G	98.0	100.0	100.0	98.9	100.0	100.0	100.0	12
Newham Hospital	69320	G								
The Royal Marsden Hospital	696L0	R								0
The William Harvey Hospital	694S0	G	99.8	100.0	100.0	99.6	100.0	99.5	100.0	12
Torbay Hospital	694R0	G	100.0	100.0	100.0	99.8	100.0	100.0	99.5	10
Trafford General Hospital	695J0	G	94.3	100.0	100.0	99.8	100.0	100.0	100.0	12
UCLH	695P0	G	97.0	100.0	100.0	84.8	100.0	100.0	100.0	9
UHSM NHS Foundation Trust	694T0	G	99.4	100.0	100.0	99.5	100.0	100.0	100.0	12
University Hospital Birmingham	695Q0	G	99.5	100.0	100.0	99.6	100.0	100.0	100.0	12
University Hospital Bristol	69910	G	99.5	100.0	100.0	99.6	100.0	100.0	100.0	12
University Hospital Durham	69340	G	99.8	100.0	100.0	99.7	100.0	100.0	99.9	12
South Durham Hospital	69140	G								
University Hospital of North Midlands	69390	G	99.1	100.0	100.0	99.6	100.0	100.0	100.0	12
University Hospital of North Tees	693A0	R								0
University Hospital of Hartlepool	69200	R								
Walsall Hospitals NHS Trust	695R0	R	100.0	100.0	100.0	99.8	100.0	100.0	99.9	4
Warrington Hospital	695T0	R								0
West Hertfordshire Hospitals	69510	G	99.7	100.0	100.0	99.6	100.0	99.4	100.0	12
Weston General Hospital	698R0	R								0
Wexham Park Hospital	69230	R								0
Whiston Hospital	69530	G	99.8	100.0	100.0	99.8	100.0	100.0	100.0	12
Whittington Health	698W0	R								0
Worcester Royal Hospital	69650	G	99.9	100.0	100.0	99.6	100.0	100.0	100.0	11
The Alexandra Hospital	69040	G								
Worthing Hospital	69660	G	100.0	100.0	100.0	99.9	100.0	100.0	100.0	12
York District Hospital	69670	G	99.8	100.0	100.0	99.8	100.0	100.0	100.0	12
Scarborough General Hospital	694L0	G								

The RAG rating was based on the more complete post-NHS tracing data file that also included date of birth. There is therefore sometimes an apparent disparity between levels of data completeness for a laboratory and its RAG rating.

The 39 laboratories that submit through another laboratory are indented and italicised underneath the submitting laboratory.

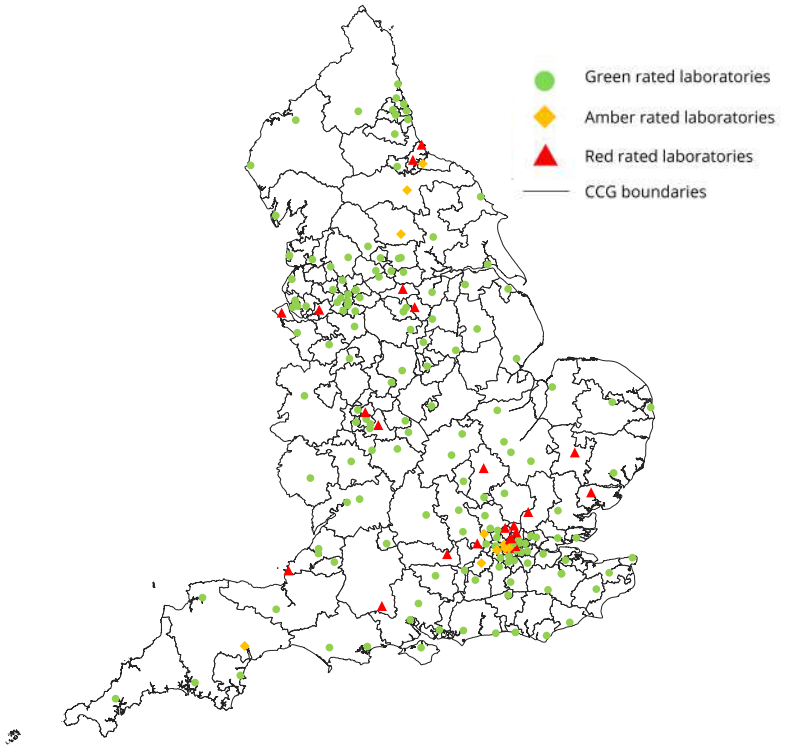


Figure 1.2 The distribution of laboratories in England, including their red/amber/green (RAG) rating for 2018

Variation in AKI alerts by laboratory

The UKRR received 1,524,398 AKI alerts from laboratories for 2018. Variation between laboratories in the proportions of people with each AKI stage is shown for adults (table 1.4) and children (table 1.5). It was not possible to analyse these data by clinical setting, because the care indicator proved challenging to interpret systematically – there was little consistency between laboratories and cross-checking with HES also showed limited correlation between whether a patient was an inpatient or an outpatient.

These data represent the pattern of the individual alerts, rather than episodes, and should therefore be interpreted with caution – laboratories may differ in their implementation of the algorithm and/or primary and secondary care services may differ in their testing behaviour. Consequently, further analyes in the report are based on AKI episodes as defined in chapter two.

Table 1.4 Variation in the proportions of adults (≥18 years) with each AKI stage for green and amber rated laboratories

			% AKI stage		
Laboratory	Lab code	Number of AKI alerts	1	2	3
Addenbrooke's Hospital	69010	17,949	62.2	17.4	20.4
Airedale Hospital	697C0	4,643	67.4	19.3	13.3
Ashford & St Peter's Hospital	69050	7,126	61.1	21.1	17.8
Basildon Hospital	69070	12,264	64.4	18.7	16.8
Basingstoke & North Hampshire	69350	11,810	63.2	19.5	17.3
Blackpool Teaching Hospitals	698Y0	14,162	63.5	19.5	16.9
Bradford Royal Infirmary	690H0	8,572	59.1	16.9	24.1

Table 1.4 Continued

Laboratory	Lab code	Number of AKI alerts	% AKI stage		
			1	2	3
Burton Hospitals	690M0	6,331	66.0	17.9	16.1
Charing Cross Hospital	69Z02	23,306	58.4	12.8	28.8
Cheltenham Hospital	691C0	17,767	63.2	18.6	18.2
Chesterfield & N Derbyshire Royal Hosp	690Y0	1,753	68.2	16.2	15.6
Christie Hospital	696F0	5,762	77.0	17.2	5.9
City Hospital Birmingham	69100	1,199	56.5	20.3	23.3
Countess of Chester Hospital	69120	3,047	61.6	17.1	21.3
County Hospital Hereford	69240	6,688	65.8	17.0	17.2
Coventry & Warwickshire	695S0	27,474	62.7	19.1	18.1
Cumberland Infirmary	690Q0	9,091	66.2	18.7	15.1
Darent Valley Hospital	697K0	6,432	65.8	18.2	16.0
Derby Hospitals	69160	15,154	68.6	18.4	13.0
Derriford Hospital	693R0	15,155	58.0	20.0	22.0
Diana Princess of Wales Hospital Grimsby	696J0	36,207	63.5	19.3	17.2
Doncaster Royal Infirmary	69180	9,563	68.7	15.0	16.3
Dorset County Hospital	695W0	5,120	54.5	19.0	26.5
East Lancashire Hospitals	690D0	15,696	61.3	18.8	19.9
East Surrey Hospital	691F0	10,455	64.9	18.4	16.7
Eastbourne District General Hospital	691G0	6,912	65.8	17.3	16.9
Epsom Hospital	69760	4,151	67.0	18.4	14.6
Fazakerley Hospital	69020	12,577	62.9	18.0	19.1
Freeman Hospital	695D0	24,881	61.1	18.7	20.2
Friarage Hospital	696M0	995	68.2	18.3	13.5
Frimley Park Hospital	691N0	10,713	63.2	18.2	18.5
Furness General Hospital	698Q0	9,396	58.6	17.9	23.4
Great Western Hospital Swindon	69590	9,441	63.0	17.5	19.5
Harefield Hospital	69840	6,193	61.2	23.0	15.7
Harrogate District Hospital	691Z0	2,797	69.5	20.0	10.5
Hastings & Rother Hospitals	69210	4,924	63.0	21.1	15.9
Hemel Hempstead Hospital	69950	129	75.2	17.8	7.0
Hillingdon Hospital	697J0	6,017	60.8	16.7	22.5
Hinchingbrooke Hospital	696T0	2,998	63.0	18.9	18.1
Homerton Hospital	69270	4,834	65.7	18.1	16.1
Huddersfield Royal Infirmary	69290	9,737	63.8	18.6	17.6
Hull & East Yorkshire	69460	14,510	64.7	19.1	16.2
Ipswich Hospital	692A0	12,385	62.0	17.6	20.4
Isle of Wight Hospitals	69960	4,765	62.9	19.9	17.2
James Cook University Hospital	694U0	7,829	59.2	18.3	22.5
James Paget University Hospital	698N0	6,848	64.7	19.0	16.3
Kent & Canterbury Hospital	692D0	2,438	60.8	17.1	22.1
Kettering General Hospital	692F0	9,742	66.4	18.3	15.3
King George Hospital Ilford	693X0	4,917	64.8	15.7	19.6
King's College Hospital	692H0	22,620	61.6	17.9	20.5
King's Mill Hospital	696H0	9,675	65.4	19.2	15.5
Kingston Hospital	692K0	7,261	65.3	20.9	13.8
Leeds General Infirmary	695N0	8,185	68.6	16.7	14.8
Leicester Royal Infirmary	692M0	29,584	62.5	18.7	18.7
Lister Hospital	69360	12,510	60.3	17.0	22.7
Luton & Dunstable Hospital	692Q0	9,639	69.0	15.8	15.2
Macclesfield District General Hospital	691B0	4,719	67.2	18.5	14.3
Maidstone & Tunbridge Wells	697P0	14,503	63.0	19.0	18.0
Manchester Royal Infirmary	690S0	18,886	57.2	13.5	29.3
Mayday University Hospital	692S0	7,176	62.0	20.6	17.3

Table 1.4 Continued

Laboratory	Lab code	Number of AKI alerts	% AKI stage		
			1	2	3
Medway Maritime Hospital	692T0	8,822	62.9	19.3	17.8
Mid Cheshire Hospitals	696R0	7,257	64.5	19.9	15.5
Mid Yorkshire Hospitals	693Q0	13,979	64.0	18.2	17.8
Milton Keynes General Hospital	692Z0	7,316	63.2	17.5	19.3
New Cross Hospital	694F0	16,143	59.3	18.6	22.1
Norfolk & Norwich Hospital	69330	14,354	64.1	17.6	18.4
North Bristol Hospitals	698V0	16,371	66.3	16.7	17.0
North Tyneside General Hospital	693B0	11,371	65.0	18.4	16.7
Northampton General Hospital	693C0	3,368	60.8	16.8	22.4
Northern Devon District Hospital	693D0	4,770	65.6	18.7	15.7
Northern General Hospital	693E0	24,920	70.9	17.2	11.9
Northwick Park & St Mark's Hospital	697Q0	22,685	66.2	15.9	17.8
Nottingham University Hospitals	69790	29,566	61.1	18.6	20.4
Oxford University Hospitals	697D0	8,742	71.4	15.9	12.7
Papworth Hospital	696P0	5,233	67.6	21.7	10.7
Peterborough Hospital	693N0	10,892	58.6	17.5	23.9
Poole General Hospital	693S0	18,595	67.1	17.4	15.4
Portsmouth Hospitals	697E0	24,116	62.5	15.9	21.6
Queen Elizabeth Hospital Gateshead	691P0	9,877	70.3	16.4	13.3
Queen Elizabeth Hospital Lewisham	697W0	20,919	67.0	17.6	15.4
Queen Elizabeth Hospital Norfolk	692J0	6,546	58.2	20.2	21.6
Queen's Hospital Romford	696X0	10,741	63.0	19.6	17.4
Royal & West Cornwall Hospital	69430	14,125	62.6	17.8	19.6
Royal Bath Hospital	698P0	11,324	64.5	19.3	16.2
Royal Brompton Hospital	69850	2,560	65.6	20.1	14.3
Royal Devon & Exeter Hospital	69440	11,214	69.7	16.4	13.9
Royal Liverpool University Hospital	69470	13,183	63.0	16.5	20.5
Royal National Orthopaedic Hospital	69KTV	540	67.8	22.2	10.0
Royal Oldham Hospital	698X0	20,176	58.5	21.1	20.4
Royal Preston Hospital	693U0	14,602	60.7	17.4	21.9
Royal Shrewsbury Hospital	694A0	15,531	62.0	17.5	20.5
Royal Surrey County Hospital	694B0	6,094	63.1	20.2	16.6
Royal Sussex County Hospital	690J0	17,399	65.6	15.5	18.9
Russells Hall Hospital	69190	13,575	62.8	17.2	20.0
Salford Royal Hospital	697T0	19,251	62.1	19.7	18.2
Sandwell General Hospital	694K0	1,608	61.6	19.8	18.6
South Tyneside District General Hospital	694V0	5,175	65.6	19.0	15.4
Southampton General Hospital	694X0	23,104	67.7	18.9	13.4
Southend Hospital	694Y0	11,005	59.8	19.4	20.8
Southport & Ormskirk Hospital	69500	7,510	64.1	19.4	16.5
SPS Musgrove Park Hospital	697M0	17,266	63.2	19.6	17.2
St George's Hospital	697N0	14,640	65.4	15.8	18.8
St Helier Hospital	69750	7,578	62.3	17.9	19.8
St James's University Hospital	696B0	19,287	59.9	21.8	18.3
St Richard's Hospital	696Q0	1,861	68.2	15.5	16.3
Stepping Hill Hospital	69570	11,031	65.2	20.2	14.6
Stoke Mandeville Hospital	69580	15,845	78.7	11.6	9.6
Sunderland Royal Hospital	696D0	11,522	57.1	18.2	24.7
Tameside General Hospital	695A0	8,069	62.1	19.5	18.4
Thanet District General Hospital	695C0	7,405	59.1	22.1	18.7
The Princess Royal Hospital	697V0	9,867	65.4	19.2	15.4
The Royal Bolton Hospital	690F0	7,802	60.1	19.0	20.9
The Royal London Hospital	695H0	34,935	57.9	15.0	27.2

Table 1.4 Continued

Laboratory	Lab code	Number of AKI alerts	% AKI stage		
			1	2	3
The William Harvey Hospital	694S0	9,885	64.0	21.0	15.0
Torbay Hospital	694R0	7,028	64.1	20.1	15.8
Trafford General Hospital	695J0	1,108	68.2	16.8	15.0
UCLH	695P0	11,679	72.2	16.5	11.3
UHSM NHS Foundation Trust	694T0	11,062	66.3	19.8	13.9
University Hospital Birmingham	695Q0	24,182	69.9	18.7	11.5
University Hospital Bristol	69910	12,653	69.8	18.1	12.1
University Hospital Durham	69340	20,211	63.8	19.4	16.8
University Hospital of North Midlands	69390	28,000	62.2	18.5	19.3
West Hertfordshire Hospitals	69510	12,036	65.3	17.7	17.0
Whiston Hospital	69530	14,487	64.4	19.5	16.1
Worcester Royal Hospital	69650	14,382	65.5	18.7	15.8
Worthing Hospital	69660	2,234	72.0	13.8	14.1
York District Hospital	69670	22,870	71.3	14.9	13.8

Broomfield Hospital was excluded because it submitted only AKI stage 3 alerts for most of 2018.
All laboratories that predominantly reported paedatric data (N=3) were also excluded.

Table 1.5 Variation in the proportions of children (<18 years) with each AKI stage for green and amber rated laboratories

Laboratory	Lab code	Number of AKI alerts	% AKI stage		
			1	2	3
Alder Hey Children's	69480	3,405	71.1	20.1	8.7
Ashford & St Peter's Hospital	69050	245	71.8	20.0	8.2
Basildon Hospital	69070	157	72.6	17.8	9.6
Basingstoke & North Hampshire	69350	81	69.1	16.0	14.8
Blackpool Teaching Hospitals	698Y0	54	83.3	11.1	5.6
Bradford Royal Infirmary	690H0	135	8.9	63.0	28.1
Burton Hospitals	690M0	59	40.7	8.5	50.8
Charing Cross Hospital	69Z02	641	65.1	16.5	18.4
Cheltenham Hospital	691C0	248	67.7	17.7	14.5
Christie Hospital	696F0	74	82.4	14.9	2.7
County Hospital Hereford	69240	64	48.4	12.5	39.1
Coventry & Warwickshire	695S0	274	66.8	15.3	17.9
Cumberland Infirmary	690Q0	61	62.3	18.0	19.7
Darent Valley Hospital	697K0	81	81.5	13.6	4.9
Derby Hospitals	69160	111	70.3	20.7	9.0
Derriford Hospital	693R0	175	49.1	24.6	26.3
Diana Princess of Wales Hospital Grimsby	696J0	248	70.2	10.5	19.4
Doncaster Royal Infirmary	69180	162	63.0	16.0	21.0
East Lancashire Hospitals	690D0	142	70.4	12.0	17.6
East Surrey Hospital	691F0	132	73.5	13.6	12.9
Epsom Hospital	69760	38	89.5	7.9	2.6
Freeman Hospital	695D0	1,078	52.9	22.3	24.9
Frimley Park Hospital	691N0	124	64.5	8.1	27.4
Furness General Hospital	698Q0	66	69.7	12.1	18.2
Great Ormond Street Hospital	697L0	4,673	58.3	18.7	23.0
Great Western Hospital Swindon	69590	114	64.9	14.0	21.1
Harefield Hospital	69840	114	41.2	36.8	21.9
Hastings & Rother Hospitals	69210	82	59.8	17.1	23.2
Hull & East Yorkshire	69460	133	81.2	11.3	7.5
Ipswich Hospital	692A0	167	78.4	11.4	10.2

Table 1.5 Continued

Laboratory	Lab code	Number of AKI alerts	% AKI stage		
			1	2	3
Isle of Wight Hospitals	69960	30	70.0	10.0	20.0
James Paget University Hospital	698N0	46	54.3	21.7	23.9
Kettering General Hospital	692F0	237	80.6	16.5	3.0
King George Hospital Ilford	693X0	57	61.4	33.3	5.3
King's College Hospital	692H0	3,752	53.5	27.5	19.0
King's Mill Hospital	696H0	46	67.4	21.7	10.9
Leeds General Infirmary	695N0	3,393	55.7	23.5	20.8
Leicester Royal Infirmary	692M0	478	60.3	22.8	16.9
Lister Hospital	69360	139	75.5	10.8	13.7
Maidstone & Tunbridge Wells	697P0	195	83.1	13.3	3.6
Manchester Royal Infirmary	690S0	1,466	58.0	14.5	27.4
Medway Maritime Hospital	692T0	367	61.6	28.9	9.5
Mid Cheshire Hospitals	696R0	88	50.0	28.4	21.6
Mid Yorkshire Hospitals	693Q0	92	65.2	10.9	23.9
Milton Keynes General Hospital	692Z0	158	79.1	19.0	1.9
New Cross Hospital	694F0	439	63.1	22.8	14.1
Norfolk & Norwich Hospital	69330	153	76.5	20.3	3.3
Northern Devon District Hospital	693D0	37	89.2	10.8	0.0
Northwick Park & St Mark's Hospital	697Q0	308	85.4	12.7	1.9
Nottingham University Hospitals	69790	317	57.7	14.8	27.4
Poole General Hospital	693S0	110	80.9	11.8	7.3
Portsmouth Hospitals	697E0	993	70.4	22.8	6.8
Queen Elizabeth Hospital Lewisham	697W0	618	76.2	18.1	5.7
Queen's Hospital Romford	696X0	176	75.0	17.6	7.4
Royal & West Cornwall Hospital	69430	232	79.3	13.8	6.9
Royal Bath Hospital	698P0	139	83.5	12.9	3.6
Royal Brompton Hospital	69850	663	58.2	29.6	12.2
Royal Devon & Exeter Hospital	69440	199	81.4	11.6	7.0
Royal Oldham Hospital	698X0	290	70.0	16.2	13.8
Royal Preston Hospital	693U0	281	56.2	11.4	32.4
Royal Shrewsbury Hospital	694A0	161	74.5	14.9	10.6
Royal Surrey County Hospital	694B0	67	64.2	19.4	16.4
Royal Sussex County Hospital	690J0	235	82.1	10.2	7.7
Russells Hall Hospital	69190	72	83.3	6.9	9.7
Salford Royal Hospital	697T0	49	91.8	6.1	2.0
Sheffield Children's Hospital	698E0	842	67.6	19.7	12.7
Southampton General Hospital	694X0	2,982	63.1	22.4	14.5
Southend Hospital	694Y0	86	74.4	15.1	10.5
Southport & Ormskirk Hospital	69500	40	82.5	7.5	10.0
SPS Musgrove Park Hospital	697M0	266	77.4	12.4	10.2
St George's Hospital	697N0	46	67.4	8.7	23.9
St Helier Hospital	69750	59	76.3	22.0	1.7
St James's University Hospital	696B0	34	67.6	14.7	17.6
Stepping Hill Hospital	69570	48	54.2	31.3	14.6
Sunderland Royal Hospital	696D0	57	54.4	1.8	43.9
Tameside General Hospital	695A0	106	65.1	34.0	0.9
The Princess Royal Hospital	697V0	98	78.6	15.3	6.1
The Royal Bolton Hospital	690F0	215	75.3	15.8	8.8
The Royal London Hospital	695H0	754	70.6	13.8	15.6
The William Harvey Hospital	694S0	79	68.4	17.7	13.9
Torbay Hospital	694R0	44	84.1	11.4	4.5
UCLH	695P0	474	83.3	13.3	3.4
UHSM NHS Foundation Trust	694T0	54	66.7	18.5	14.8

Table 1.5 Continued

Laboratory	Lab code	Number of AKI alerts	% AKI stage		
			1	2	3
University Hospital Birmingham	695Q0	210	72.9	18.1	9.0
University Hospital Bristol	69910	2,896	63.4	18.0	18.6
University Hospital of North Midlands	69390	268	75.0	10.8	14.2
Whiston Hospital	69530	431	62.4	29.7	7.9
Worcester Royal Hospital	69650	90	88.9	7.8	3.3
York District Hospital	69670	129	88.4	7.8	3.9

Laboratories were excluded if the total number of AKI alerts was <30.

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Chapter 2

AKI rate and mortality by clinical commissioning group

Introduction

This chapter describes the demographics of the entire population of people in England who had an episode of AKI in 2018, as determined from their laboratory AKI warning test scores (alerts). As noted in the introduction to the report, it is important to remember that this includes patients with AKI in all clinical settings (community and hospital) and that if considered separately, these groups have different demographics and outcomes. Analysis by clinical setting is presented in chapter 3. Variation in mortality in the 30 days after the beginning of an AKI episode is also reported.

The chapter also includes rates of laboratory derived AKI episodes by CCG in England. Rates by CCG pose significant challenges for a number of reasons. First, the 190 laboratories are unevenly distributed amongst the 195 CCGs, with 46 CCGs not having a laboratory within their boundaries and some with up to four (West London CCG). Second, laboratories and CCGs have very few shared boundaries. Third, laboratory coverage is still incomplete. AKI rates by CCG are only reported where the UKRR is confident they are valid, meaning the UKRR received files covering the majority of the CCG population. Up to date CCG rates are available on the Think Kidneys website (thinkkidneys.nhs.uk/aki/aki-data/aki-data-ccg).

Definition of an AKI episode

The date of a first AKI episode is defined as the date of the first AKI alert received by the UKRR from any laboratory. It is possible that a person had an earlier episode prior to the laboratory sending files, but the significance of this decreases with time as more files are received.

Subsequent alerts are only considered to be a further episode of AKI if at least 30 days have passed since the last alert (figure 2.1). If an episode appears to last more than 90 days, duration of the episode is truncated to day 90 to align with the KDIGO definition of chronicity after 90 days of an AKI episode.[9] There is now evidence that duration of an AKI episode influences long term outcome,[12] but this is not considered in this report.

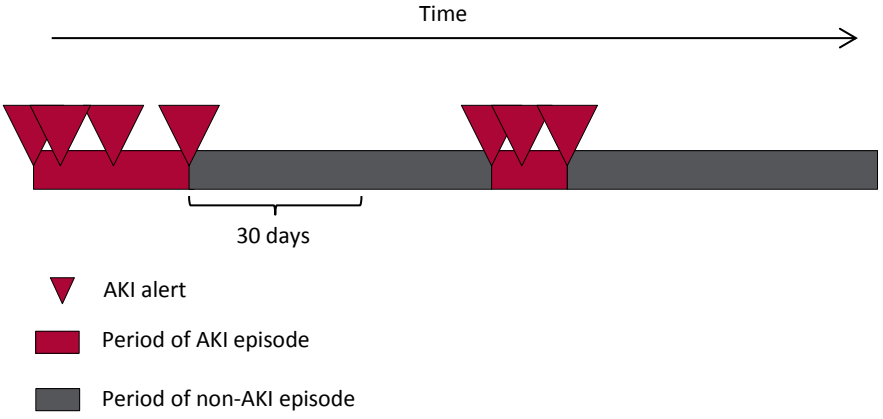


Figure 2.1 Definition of an AKI episode – an example of a person with seven AKI alerts, which equate to two episodes

The 2018 MPI included 564,738 AKI episodes from 488,856 patients (76% of patients had one AKI episode, 17% had two episodes and 7% had more than two episodes during 2018).

Demographics of people with AKI episodes

Figure 2.2 illustrates the distribution of the AKI stage at the start of the AKI episode, split by adults and children, while figures 2.3 and 2.4 show the median ages by first AKI stage for adults and children, respectively.

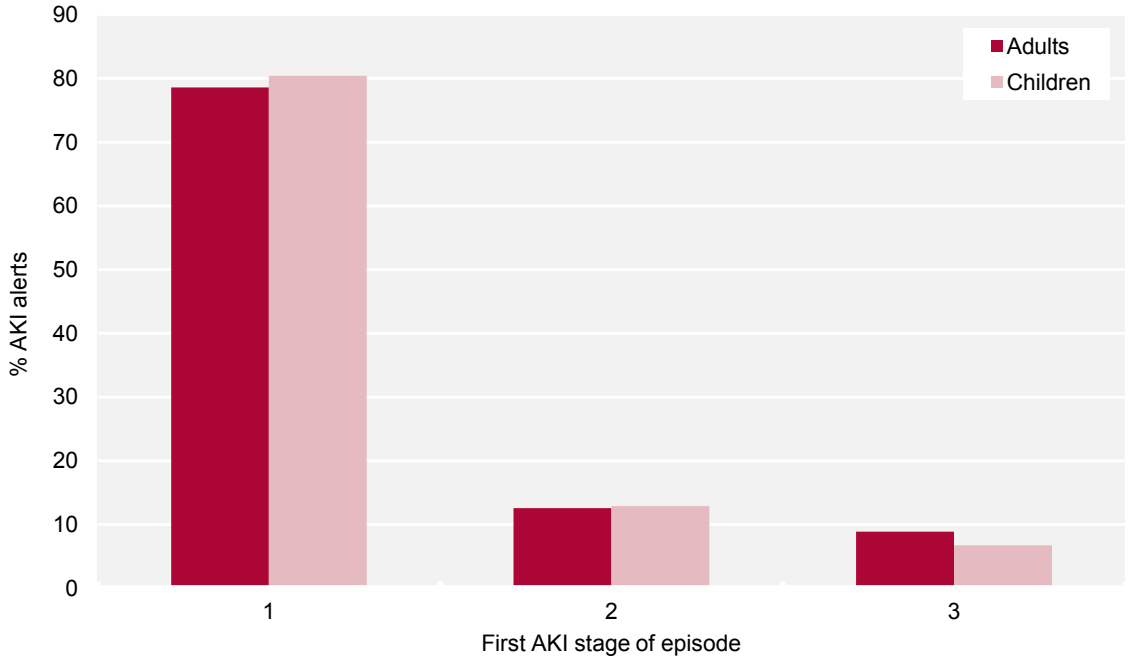


Figure 2.2 The proportion of adults (≥18 years) and children (<18 years) by first stage of AKI episode in 2018

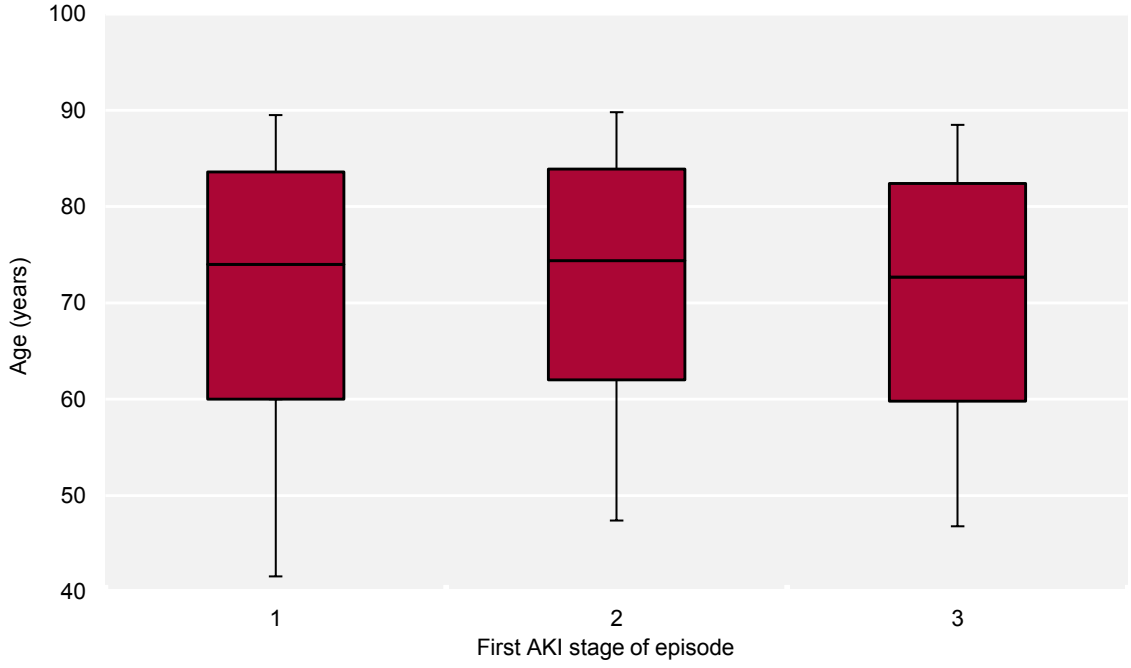


Figure 2.3 Boxplot for age distribution of adults (≥18 years) by first stage of AKI episode in 2018
The box shows the median and interquartile range (IQR) and the whiskers are the 10th and 90th percentiles.

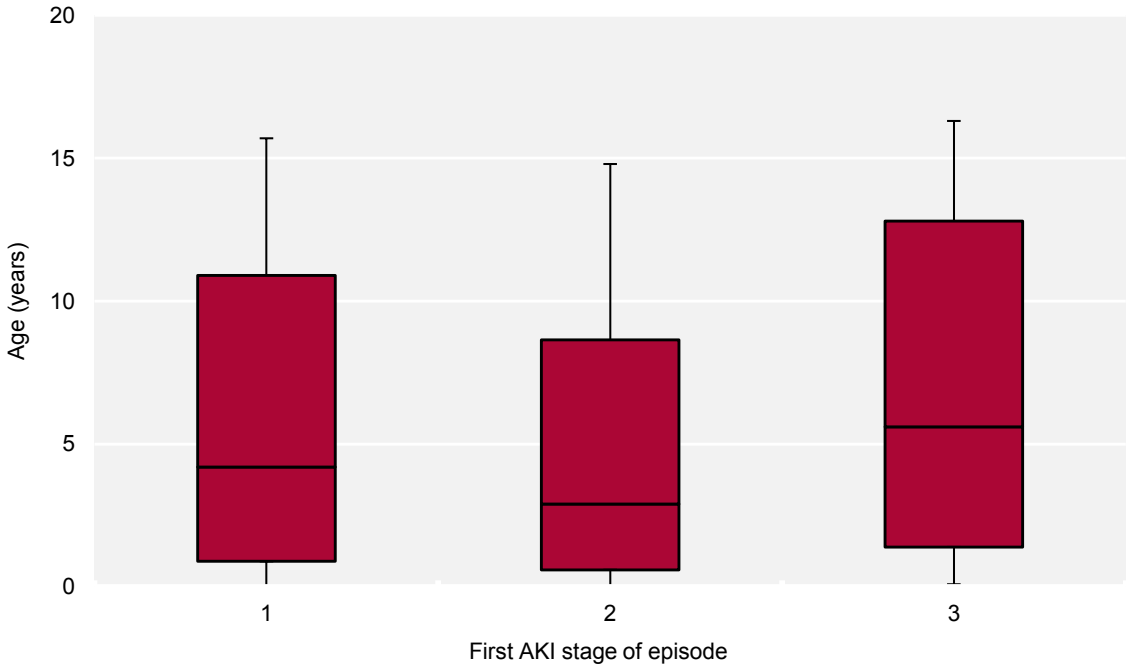


Figure 2.4 Boxplot for age distribution of children (<18 years) by first stage of AKI episode in 2018
The box shows the median and interquartile range (IQR) and the whiskers show the 10th and 90th percentiles.

Mortality following an AKI episode

These analyses include the outcomes of all patients with laboratory derived AKI episodes. Note that in patients not admitted to hospital, AKI stage 1 is more common and overall mortality for this group is lower (see chapter 3).

Data were stratified by age, sex, quintile of Index of Multiple Deprivation (IMD), month of AKI alert and AKI stage. The IMD is a composite measure of how deprived a small geographic (neighbourhood) area is in relation to other areas and is based on income, employment, education, health, crime, housing and living environment.[13]

Table 2.1 shows 30 day unadjusted and age-sex adjusted mortality from start of episode by peak and first stage of AKI. Table 2.2 shows 30 day unadjusted mortality stratified by age, sex, deprivation and quarter of the year. Mortality from AKI in 2018 was highest with AKI stage 3, in older ages and in the quarter January–March.

Table 2.1 30 day mortality by peak and first stage of AKI for patients with an AKI episode in 2018, unadjusted and adjusted to males aged 65–74 years

		Mortality (%)	
AKI stage	Number of AKI episodes	Unadjusted	Adjusted
Peak			
1	342,382	13.4	12.6
2	82,769	28.6	26.4
3	63,705	32.7	30.5
First			
1	387,348	16.1	15.5
2	62,258	27.6	26.3
3	39,250	27.7	26.2

Table 2.2 30 day mortality by peak stage of AKI and demographics for patients with an AKI episode in 2018

	All AKI episodes		Peak stage of AKI					
			1		2		3	
Variable	N	Unadj. mortality (%)	N	Unadj. mortality (%)	N	Unadj. mortality (%)	N	Unadj. mortality (%)
All	488,856	18.5	342,382	13.4	82,769	28.6	63,705	32.7
Age group (years)								
<18	11,204	3.0	8,072	1.8	2,001	4.7	1,131	9.1
18-39	42,374	2.7	34,143	1.4	4,970	5.7	3,261	11.4
40-64	106,491	10.9	73,208	6.7	17,395	17.8	15,888	23.1
65-74	97,928	16.9	65,924	11.7	17,644	25.8	14,360	29.9
≥75	230,859	26.2	161,035	20.2	40,759	38.3	29,065	42.6
Sex								
Male	233,457	20.0	157,562	15.0	38,995	29.0	36,900	31.8
Female	255,399	17.0	184,820	11.9	43,774	28.2	26,805	34.1
Deprivation quintile								
1 - least deprived	82,698	19.2	58,546	14.1	13,904	29.6	10,248	33.9
2	93,807	19.2	66,098	13.8	15,850	30.2	11,859	34.3
3	99,469	18.6	69,778	13.6	16,908	28.5	12,783	32.9
4	102,600	17.9	71,762	12.9	17,169	27.3	13,669	31.8
5 - most deprived	109,598	17.5	75,779	12.4	18,782	27.3	15,037	31.1
Month of AKI alert								
Jan-Mar	128,252	22.6	87,753	16.7	22,751	33.4	17,748	38.0
Apr-Jun	118,485	17.6	83,565	12.7	19,897	27.5	15,023	31.7
Jul-Sep	116,762	16.3	82,371	11.7	19,396	26.1	14,995	29.4
Oct-Dec	125,357	17.0	88,693	12.2	20,725	26.6	15,939	31.0

Patients from more deprived areas were of lower average age – the reduction in mortality with increasing deprivation was not seen when stratified by age group (table 2.3).

Table 2.3 30 day mortality by age and deprivation quintile for patients with an AKI episode in 2018

		Age group (years)									
		<18		18-39		40-64		65-74		≥75	
Deprivation quintile*	Median age (years)	N	Unadj. mortality (%)	N	Unadj. mortality (%)	N	Unadj. mortality (%)	N	Unadj. mortality (%)	N	Unadj. mortality (%)
1	77.3	1,390	2.6	4,976	2.5	13,608	10.7	16,476	15.4	46,248	25.3
2	76.1	1,776	3.1	6,356	2.5	16,996	10.8	19,111	16.2	49,568	25.9
3	74.8	2,093	3.3	7,763	2.4	20,091	10.5	20,081	16.5	49,441	26.0
4	72.1	2,621	2.7	10,197	2.5	24,408	10.8	20,535	17.1	44,839	26.4
5	68.7	3,289	3.2	13,064	3.0	31,275	11.4	21,615	18.8	40,355	27.4

*1 – least deprived, 5 – most deprived.

Method used to calculate CCG AKI rate

In brief, each CCG is given a red/amber/green (RAG) rating based on the confidence that there is complete coverage of the CCG population from the laboratory files received. This is entirely separate from the earlier RAG rating of data completeness of laboratory files described in chapter 1. See table 2.4 for more details – the full methodology will be published separately.

Table 2.4 The criteria used to rate CCG population coverage in 2018 as red/amber/green (RAG)

RAG rating	CCG population coverage
R	There was little or no data from the laboratories covering the CCG population for the 12 month period. At least one of the laboratories within the CCG did not provide data. This means that the score is likely to be a significant underestimation of the real rate of AKI alerts in the CCG population during the 12 month period.
A	Some of the laboratories serving this CCG population provided data for the 12 month period. The laboratories within the CCG provided data, but not all the laboratories in the neighbouring CCG(s). Data for people living towards the boundaries of the CCG may be missing. This means that the score is likely to be an underestimation of the real rate of AKI alerts in the CCG population during the 12 month period.
G	Confident that all the laboratories serving this CCG population provided data for the 12 month period. This means that all laboratories in the CCG, and all laboratories in neighbouring CCGs, provided data. This is likely to be the real rate of AKI alerts in the CCG population during the 12 month period.

The number of CCGs with a green population coverage rating has increased over time – see figure 2.5 for the RAG rating of CCGs at the end of 2018.

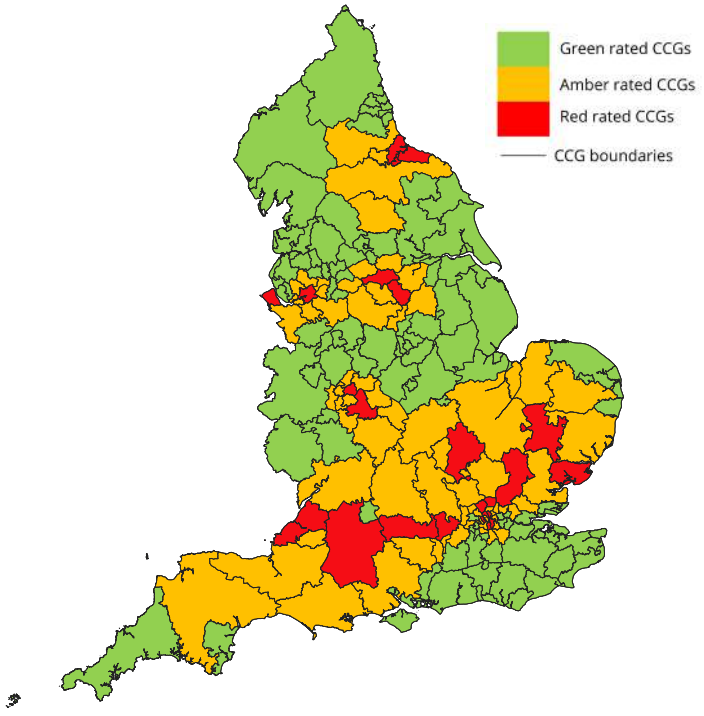


Figure 2.5 Red/amber/green (RAG) rating of clinical commissioning group (CCG) population coverage in 2018

AKI rates by CCG

The rate of AKI episodes per million population (pmp) for each amber or green rated CCG in 2018 is shown in table 2.5. The overall 2018 population rate of AKI in England in the green rated CCGs was 12,300 pmp.

Table 2.5 Red/amber/green (RAG) rating of clinical commissioning group (CCG) population coverage and unadjusted and adjusted (directly standardised to the population age-sex distribution) AKI rates per million population (pmp) for green and amber rated CCGs in 2018

CCG	RAG rating	Unadjusted AKI rate* (pmp)	Adjusted AKI rate* (pmp)
NHS Airedale, Wharfedale & Craven	G	11,400	10,000
NHS Ashford	G	11,200	10,900
NHS Barking & Dagenham	G	9,900	14,800
NHS Barnet	R		
NHS Barnsley	R		
NHS Basildon & Brentwood	A	11,300	11,100
NHS Bassetlaw	A	12,100	10,900
NHS Bath & North East Somerset	A	9,500	9,200
NHS Bedfordshire	R		
NHS Berkshire West	R		
NHS Bexley	G	13,400	13,800
NHS Birmingham & Solihull	R		
NHS Blackburn with Darwen	G	12,900	15,500
NHS Blackpool	G	17,600	16,100
NHS Bolton	G	11,500	12,300
NHS Bradford City	G	9,100	17,600
NHS Bradford Districts	G	9,700	11,100
NHS Brent	A	11,800	15,600
NHS Brighton & Hove	G	10,300	12,400
NHS Bristol, North Somerset & South Gloucestershire	R		
NHS Bromley	A	12,500	12,400
NHS Buckinghamshire	A	10,500	10,100
NHS Bury	G	11,800	12,000
NHS Calderdale	G	11,200	11,200
NHS Cambridgeshire & Peterborough	A	9,500	9,600
NHS Camden	R		
NHS Cannock Chase	A	11,700	11,200
NHS Canterbury & Coastal	G	10,700	9,700
NHS Castle Point & Rochford	G	11,900	9,800
NHS Central London (Westminster)	A	6,600	8,100
NHS Chorley & South Ribble	G	11,500	11,400
NHS City & Hackney	A	8,200	14,400
NHS Coastal West Sussex	G	9,300	6,900
NHS Corby	G	16,900	20,600
NHS Coventry & Rugby	A	11,000	12,600
NHS Crawley	G	10,800	12,800
NHS Croydon	A	8,500	10,400
NHS Darlington	A	17,300	16,200
NHS Dartford, Gravesham & Swanley	G	10,300	10,500
NHS Doncaster	A	12,500	12,300
NHS Dorset	A	11,900	9,300
NHS Dudley	A	14,100	13,100
NHS Durham Dales, Easington & Sedgefield	A	14,900	13,800
NHS Ealing	G	10,700	13,900
NHS East & North Hertfordshire	A	7,900	8,000
NHS East Berkshire	R		

Table 2.5 Continued

CCG	RAG rating	Unadjusted AKI rate* (pmp)	Adjusted AKI rate* (pmp)
NHS East Lancashire	G	13,100	13,000
NHS East Leicestershire & Rutland	G	13,200	11,700
NHS East Riding of Yorkshire	G	15,200	12,000
NHS East Staffordshire	G	12,700	12,300
NHS East Surrey	G	11,000	10,700
NHS Eastbourne, Hailsham & Seaford	G	13,700	10,100
NHS Eastern Cheshire	A	13,000	10,500
NHS Enfield	R		
NHS Erewash	G	10,700	10,200
NHS Fareham & Gosport	G	14,400	12,600
NHS Fylde & Wyre	G	15,600	11,500
NHS Gloucestershire	A	11,000	9,900
NHS Great Yarmouth & Waveney	G	14,500	11,500
NHS Greater Huddersfield	A	9,800	10,000
NHS Greater Preston	G	11,200	11,600
NHS Greenwich	G	11,900	16,400
NHS Guildford & Waverley	G	7,300	6,900
NHS Halton	A	9,000	9,400
NHS Hambleton, Richmondshire & Whitby	A	12,200	10,000
NHS Hammersmith & Fulham	A	11,000	16,400
NHS Hardwick	A	6,500	5,900
NHS Haringey	A	2,200	2,900
NHS Harrogate & Rural District	A	7,800	6,700
NHS Harrow	A	12,900	14,000
NHS Hartlepool & Stockton-on-Tees	R		
NHS Hastings & Rother	G	13,200	10,500
NHS Havering	A	11,200	10,900
NHS Herefordshire	G	13,300	10,900
NHS Herts Valleys	A	10,100	10,400
NHS Heywood, Middleton & Rochdale	G	11,700	12,800
NHS High Weald Lewes Havens	G	11,800	9,800
NHS Hillingdon	A	9,000	10,900
NHS Horsham & Mid Sussex	G	10,600	9,800
NHS Hounslow	A	4,300	5,700
NHS Hull	G	13,100	15,100
NHS Ipswich & East Suffolk	A	11,500	9,700
NHS Isle of Wight	G	15,500	11,700
NHS Islington	R		
NHS Kernow	G	13,300	11,000
NHS Kingston	G	7,600	9,400
NHS Knowsley	G	16,700	16,900
NHS Lambeth	R		
NHS Leeds	G	11,300	12,700
NHS Leicester City	G	13,100	17,500
NHS Lewisham	A	12,000	17,500
NHS Lincolnshire East	G	17,300	13,300
NHS Lincolnshire West	G	13,200	12,400
NHS Liverpool	G	10,700	12,500
NHS Luton	A	11,100	14,300
NHS Manchester	G	10,200	16,900
NHS Mansfield & Ashfield	G	14,100	13,800
NHS Medway	G	10,800	12,000
NHS Merton	A	8,300	10,700
NHS Mid Essex	A	2,800	2,600

Table 2.5 Continued

CCG	RAG rating	Unadjusted AKI rate* (pmp)	Adjusted AKI rate* (pmp)
NHS Milton Keynes	A	10,400	12,900
NHS Morecambe Bay	G	13,500	11,600
NHS Nene	A	9,300	9,600
NHS Newark & Sherwood	G	12,500	11,100
NHS Newcastle Gateshead	G	14,200	15,200
NHS Newham	G	7,700	13,700
NHS North Cumbria	G	13,800	11,600
NHS North Derbyshire	A	6,100	5,200
NHS North Durham	G	15,200	14,600
NHS North East Essex	R		
NHS North East Hampshire & Farnham	A	9,000	9,200
NHS North East Lincolnshire	G	15,000	14,000
NHS North Hampshire	A	9,600	9,800
NHS North Kirklees	G	11,400	12,400
NHS North Lincolnshire	G	14,600	13,400
NHS North Norfolk	G	12,800	8,800
NHS North Staffordshire	G	13,200	11,600
NHS North Tyneside	G	11,600	10,800
NHS North West Surrey	A	8,700	8,500
NHS Northern, Eastern & Western Devon	A	11,200	9,500
NHS Northumberland	G	11,500	9,400
NHS Norwich	G	10,600	10,500
NHS Nottingham City	G	10,200	13,900
NHS Nottingham North & East	G	11,800	11,100
NHS Nottingham West	G	12,000	10,900
NHS Oldham	G	11,800	13,300
NHS Oxfordshire	A	10,000	9,900
NHS Portsmouth	G	12,300	14,600
NHS Redbridge	A	9,100	11,700
NHS Redditch & Bromsgrove	A	12,200	11,300
NHS Richmond	G	5,300	6,000
NHS Rotherham	R		
NHS Rushcliffe	G	10,300	9,100
NHS Salford	A	12,400	14,600
NHS Sandwell & West Birmingham	A	5,000	6,300
NHS Scarborough & Ryedale	G	20,600	16,500
NHS Sheffield	A	13,600	14,700
NHS Shropshire	G	11,800	9,600
NHS Somerset	A	13,700	11,400
NHS South Cheshire	G	12,700	11,500
NHS South Devon & Torbay	G	13,200	10,200
NHS South East Staffordshire & Seisdon Peninsula	A	6,900	6,100
NHS South Eastern Hampshire	G	14,400	12,000
NHS South Kent Coast	G	13,100	10,900
NHS South Lincolnshire	G	11,700	9,600
NHS South Norfolk	A	10,100	8,300
NHS South Sefton	G	13,600	12,300
NHS South Tees	R		
NHS South Tyneside	G	18,000	16,700
NHS South Warwickshire	A	10,900	9,400
NHS South West Lincolnshire	G	13,900	12,300
NHS South Worcestershire	G	12,400	10,500
NHS Southampton	G	13,100	16,400
NHS Southend	G	12,100	11,400

Table 2.5 Continued

CCG	RAG rating	Unadjusted AKI rate* (pmp)	Adjusted AKI rate* (pmp)
NHS Southern Derbyshire	G	11,300	11,100
NHS Southport & Formby	G	17,100	12,800
NHS Southwark	R		
NHS St Helens	A	16,100	15,300
NHS Stafford & Surrounds	G	12,800	11,000
NHS Stockport	G	14,200	13,100
NHS Stoke on Trent	G	14,400	15,200
NHS Sunderland	G	14,900	14,500
NHS Surrey Downs	G	10,300	9,000
NHS Surrey Heath	A	9,900	9,400
NHS Sutton	G	11,100	12,300
NHS Swale	G	11,100	11,400
NHS Swindon	G	10,600	11,600
NHS Tameside & Glossop	A	15,500	16,100
NHS Telford & Wrekin	G	12,200	13,300
NHS Thanet	G	14,200	12,100
NHS Thurrock	G	10,600	13,100
NHS Tower Hamlets	A	6,800	13,800
NHS Trafford	A	11,100	11,200
NHS Vale of York	G	14,300	13,300
NHS Vale Royal	A	12,500	11,800
NHS Wakefield	A	12,100	11,900
NHS Walsall	R		
NHS Waltham Forest	A	9,000	13,000
NHS Wandsworth	A	5,800	9,600
NHS Warrington	R		
NHS Warwickshire North	A	12,400	11,800
NHS West Cheshire	A	8,700	7,500
NHS West Essex	R		
NHS West Hampshire	A	12,200	10,100
NHS West Kent	G	11,500	11,000
NHS West Lancashire	G	13,700	12,200
NHS West Leicestershire	G	12,300	12,000
NHS West London	R		
NHS West Norfolk	A	12,000	9,300
NHS West Suffolk	R		
NHS Wigan Borough	A	12,100	12,300
NHS Wiltshire	R		
NHS Wirral	R		
NHS Wolverhampton	A	14,600	15,200
NHS Wyre Forest	G	13,500	11,100

*Rates are rounded to the closest 100

The unadjusted and adjusted rates of AKI in green rated CCGs are shown in figures 2.6 and 2.7, respectively.

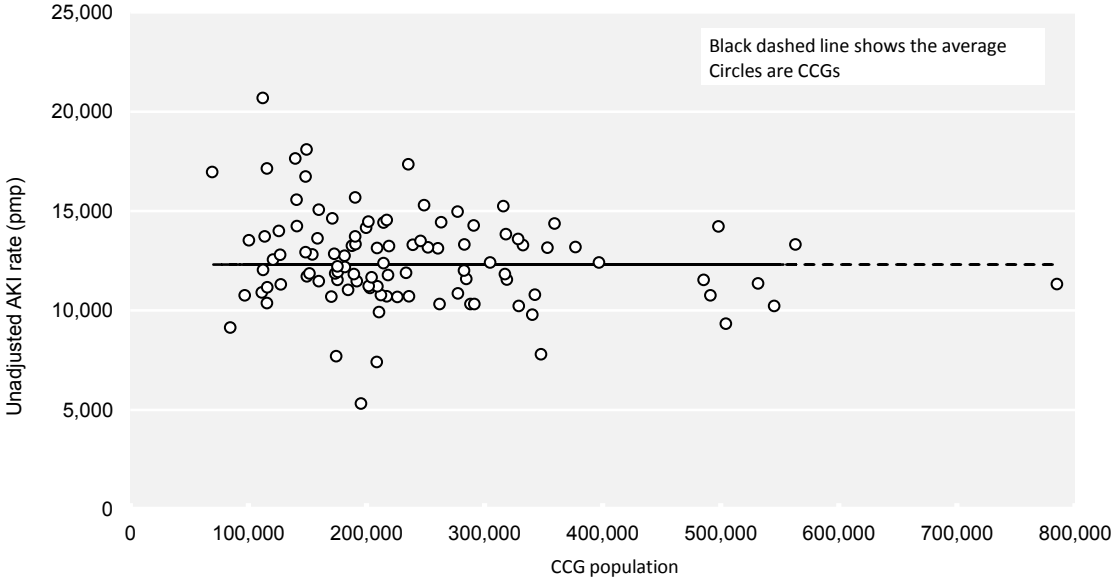


Figure 2.6 Scatterplot of unadjusted AKI rate per million population (pmp) for green rated clinical commissioning groups (CCGs) in 2018

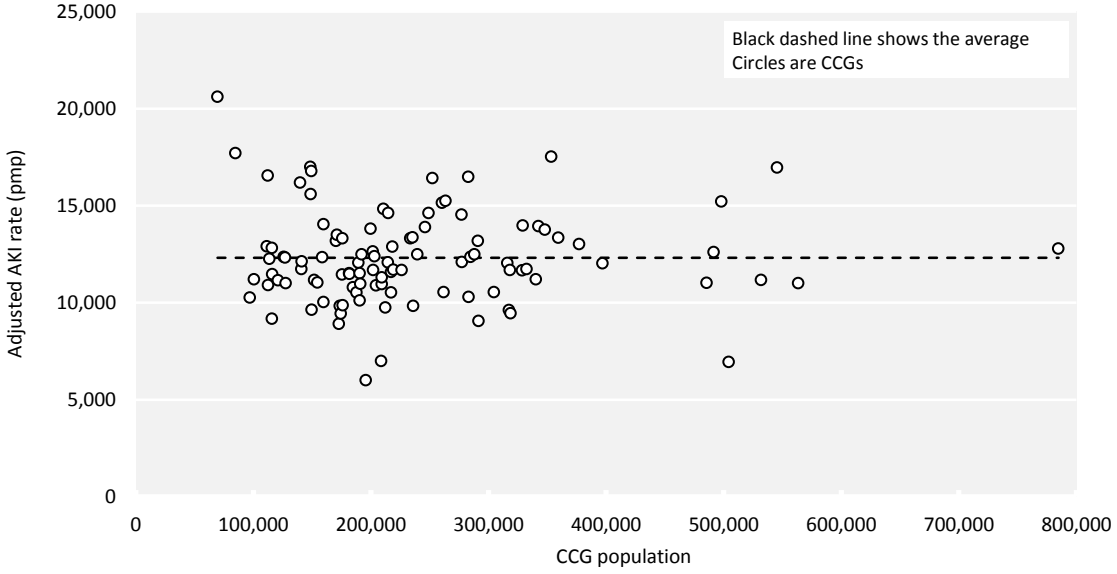


Figure 2.7 Scatterplot of adjusted (directly standardised to the population age-sex distribution) AKI rate per million population (pmp) for green rated clinical commissioning groups (CCGs) in 2018

Figure 2.8 shows the deprivation quintile of the adjusted AKI rate for each of the green rated CCGs, as determined by each CCG's median IMD score.

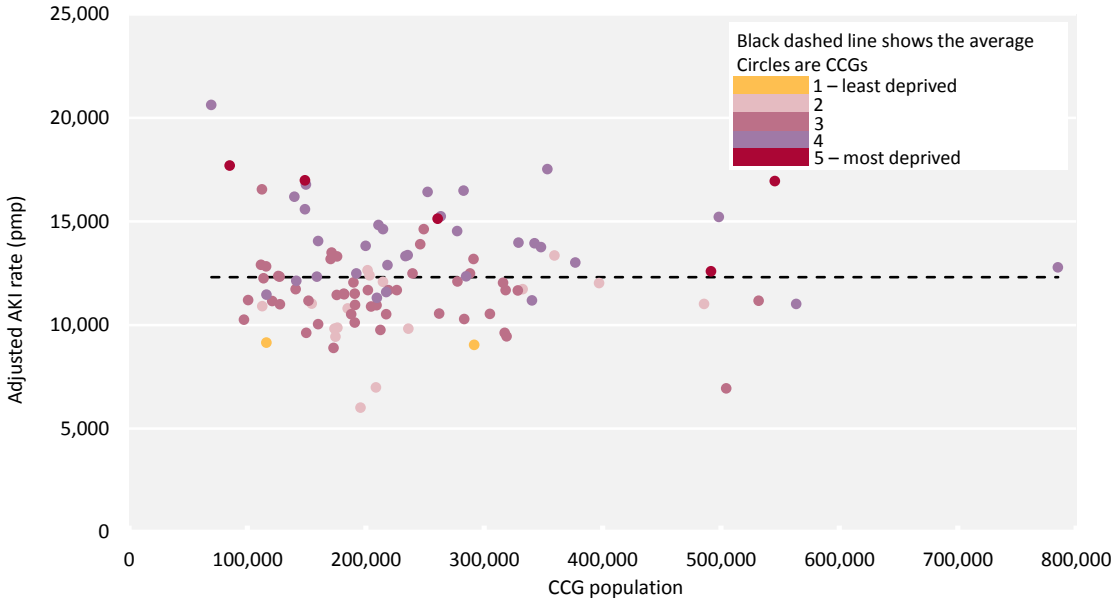


Figure 2.8 Scatterplot of adjusted (directly standardised to the population age-sex distribution) AKI rate per million population (pmp) and deprivation quintile for green rated clinical commissioning groups (CCGs) in 2018

Mortality following an AKI episode by CCG

Figures 2.9 and 2.10 show unadjusted and adjusted (age-sex) 30 day AKI survival, respectively, for green rated CCGs. Although there is variation across CCGs in survival following an episode of AKI, the range is small (unadjusted median 80.8%, IQR 79.5–82.4%; adjusted median 81.3%, IQR 80.1–82.6%).

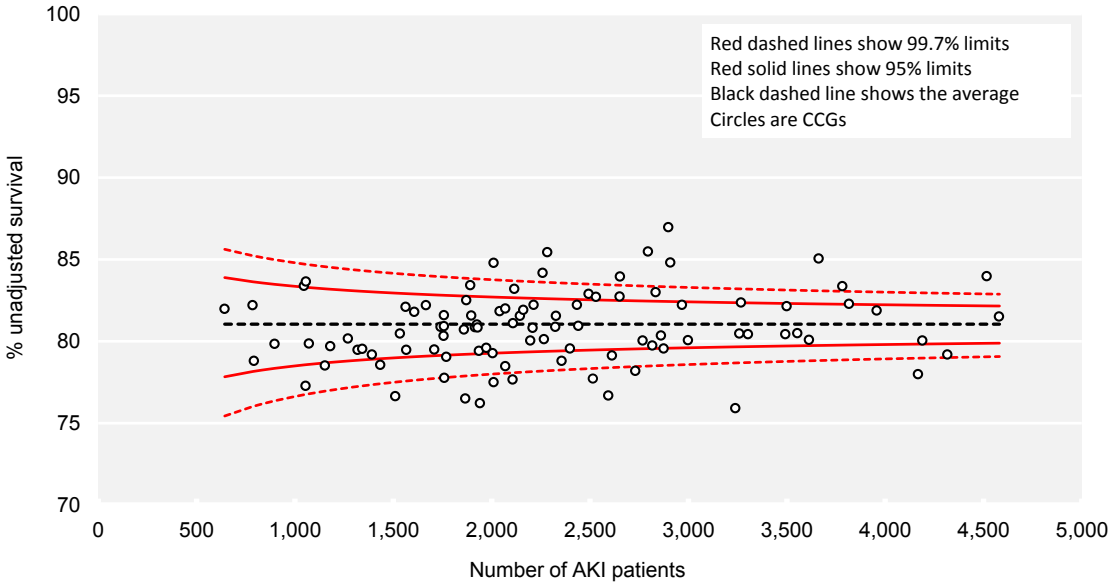


Figure 2.9 Unadjusted 30 day survival of patients with an AKI episode for green rated clinical commissioning groups (CCGs) in 2018

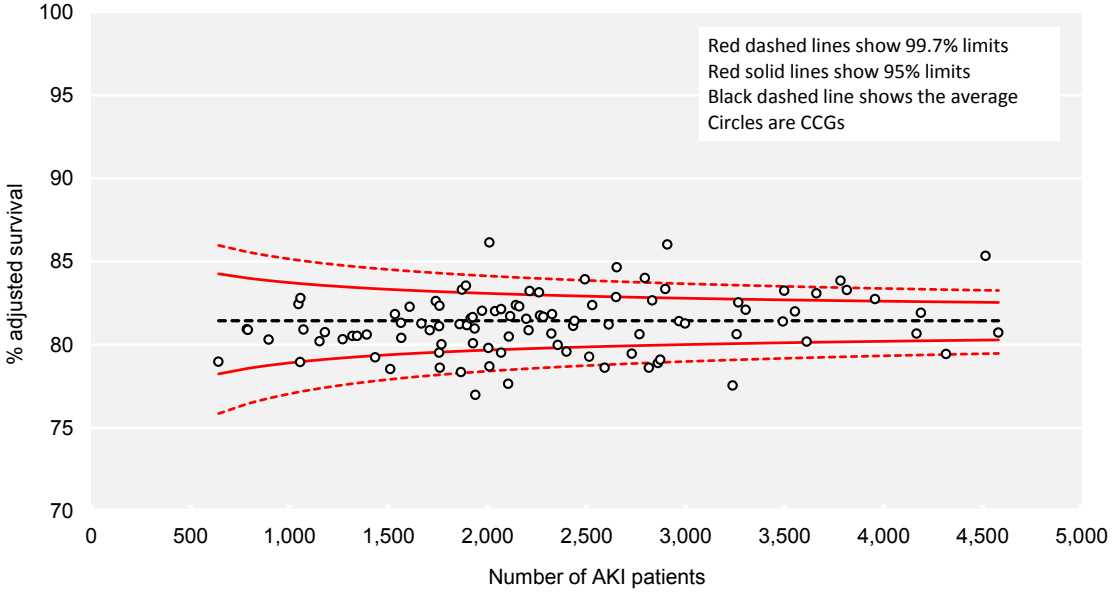


Figure 2.10 Adjusted (males aged 65–74 years) 30 day survival of patients with an AKI episode for green rated clinical commissioning groups (CCGs) in 2018

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Chapter 3

AKI rate and mortality by clinical setting

Introduction

This chapter differentiates the clinical setting in which a patient's AKI episode(s) was identified and was made possible by linking the UKRR MPI with HES. The most recent HES data available to the UKRR at the time of preparing this report were from 2017 and so the analyses were performed by linking these HES data with the MPI of AKI episodes in 2017. Where possible the chapter presents conformance to the Renal Association's AKI guideline audit measures.[14]

Some of the measures of AKI outcomes in hospital have been developed with the assistance of the GIRFT team of NHS Improvement. In 2019 the GIRFT team visited all renal centres in England and discussed with them, individually, their conformance to a wide range of measures, including some of admitted AKI patient care. An ongoing collaboration between the UKRR and GIRFT will explore whether adjusted measures of AKI outcome, including mortality, can be produced to allow comparison between hospitals.

Of the original cohort of 460,741 AKI episodes available for 2017 from 153 laboratories, 441,699 episodes (95.9%) from 134 laboratories were included in the analyses. These were the laboratories that had submitted data in a timely fashion to allow matching with HES data, and for which there was a clear relationship between the laboratory submitting the data and the acute hospital trust. AKI episodes associated with IP admissions that had started before October 2016 were excluded as possibly unreliable. These comprised fewer than 0.1% of all AKI episodes and were uniformly distributed across all hospitals. The demographics of the cohort remained very similar after deletions and were consistent with the 2018 cohort analysed in the previous two chapters.

When determining if a person was hospitalised during their AKI episode, some patient categories (mother and baby using delivery facilities only, day case and regular attendances) and some methods of admission (pre/post-partum, births, transfer of any admitted patient from another hospital provider other than in an emergency, unknown) were excluded to narrow the focus to patients receiving conventional admitted patient care and with a higher risk of AKI. People in the aforementioned categories were instead included in the CA group (see below).

Most people included in the cohort for these analyses had only one episode of AKI during 2017 – just 10% had two or more AKI episodes during 2017.

Definition of clinical settings

Patients with laboratory derived AKI episodes in 2017 were divided into three groups:

- Community acquired, never hospitalised (CA) AKI – there was no inpatient (IP) admission during the AKI episode (this group included the patient and IP admission categories listed above)
- Community acquired, subsequently hospitalised (CAH) AKI – if the AKI episode had started before an IP admission or in the first two days of an IP admission
- Hospital acquired (HA) AKI – if the AKI episode had started from the third day of an IP admission onwards.

Note that while most of the AKI episodes were associated only to one IP hospitalisation, in about 6% of AKI episodes with an IP stay, multiple hospitalisations occurred during the episode. In those cases, the type of AKI (CAH or HA) was defined by the timing of the first IP hospitalisation associated with the AKI episode. The third day of hospitalisation was used to define the AKI as HA because, while date and time were available for the start of an AKI episode, only a date was recorded for an IP admission. Therefore, the conservative definition of third day rather than 48 hours was preferred.

The Renal Association AKI guideline audit measures

The Renal Association's 'Clinical Practice Guideline – Acute Kidney Injury (AKI)'[14] contains a range of audit measures. The analyses here cover the incidence of AKI by setting and AKI outcomes.

Demographics of patients by clinical setting

The characteristics of patients in the three clinical setting groups are shown in table 3.1. The CA group in 2017 was younger, with lower peak AKI and included more females than expected. The CAH group was associated with higher AKI stage at start.

Table 3.1 Demographics of patients with community acquired, never hospitalised (CA), community acquired, subsequently hospitalised (CAH) and hospital acquired (HA) AKI in 2017

		Clinical setting of AKI episode		
Variable	All AKI episodes	CA	CAH	HA
Number	441,699	127,767	171,266	142,666
%		28.9	38.8	32.3
Age group (years)				
Median	74.1	68.5	74.7	77.6
% <18	2.2	3.4	1.8	1.7
% 18-39	8.0	15.7	5.7	3.7
% 40-64	21.5	25.0	21.8	18.1
% 65-74	20.4	19.7	21.3	19.9
% ≥75	47.9	36.2	49.5	56.6
Sex (%)				
Male	47.9	41.5	51.5	49.4
First AKI stage (%)				
1	78.9	84.6	68.4	86.5
2	12.9	9.4	18.1	9.8
3	8.2	6.0	13.6	3.6
Peak AKI stage (%)				
1	69.5	81.4	57.4	73.6
2	17.3	11.3	22.5	16.5
3	13.2	7.4	20.2	10.0
Deprivation quintile (%)				
1 - least deprived	16.4	16.0	16.0	17.2
2	19.1	19.1	18.8	19.4
3	20.6	20.8	20.4	20.6
4	21.2	21.5	21.4	20.7
5 - most deprived	22.8	22.6	23.4	22.1

AKI rates by clinical setting

The following analyses include AKI rates by hospital for both separate and combined hospitalised groups (CAH and HA) for elective and emergency admissions.

Each AKI episode was assigned to the hospital where the first IP admission during the AKI episode occurred. Most people had only one admission during the AKI episode and most of those with multiple hospitalisations were always admitted to the same hospital.

Of the initial cohort of 313,932 AKI episodes linked with IP admissions, 7,064 (2.3%) were excluded if the IP admission occurred in a non-acute trust hospital (community, independent sector, other), or in special care acute trusts (for example, orthopaedic and cancer trusts, but not paediatric), or in acute trusts that were served by laboratories not submitting sufficient data during 2017. This resulted in a cohort of 306,868 AKI episodes from 134 laboratories, associated with hospitalisations from 103 hospitals (41 with renal centres, 59 without renal centres and three paediatric).

In most cases there was a one-to-one relationship between hospital and laboratory, but in some instances two or three laboratories served one hospital, and one of the laboratories served more than one hospital.

Rates were calculated as the number of AKI episodes related to IP admissions (numerator) per 1,000 total admissions (denominator) in each hospital.

The denominator for the following analyses was the annual numbers (April 2017–March 2018) of elective and emergency hospitalisations by hospital that were available online (digital.nhs.uk/data-and-information/publications/statistical/hospital-admitted-patient-care-activity/2017-18), because HES publishes data by financial year rather than calendar year. The data combined all three categories of patient admission (ordinary, day case and maternity), because these were the only HES data in the public domain, whilst the numerator only included ordinary admissions. This likely resulted in a systematic underestimation of the AKI rate, which is recognised. In addition, for those cases when more than one admission occurred during a single AKI episode, the number of hospitalisations was also slightly underestimated.

For these reasons, the results are shown as scatterplots rather than funnel plots, with no attempt to identify outliers.

No adjustment for age was made, because although HES summary data provide total hospitalisations by age group for each hospital, the data were not categorised by type of admission (elective and emergency).

Hospitals were RAG rated depending on the completeness of the data from the laboratories serving them, using the same rules as those shown for the CCG analyses (table 2.4). For hospitals that had fewer than 12 months of data available (due to incomplete laboratory submission), the numerator (number of AKI episodes) was upscaled proportionally.

Of the 103 hospitals included in the analyses, 86 were rated green, 12 amber and five red (table 3.2).

The rates of AKI associated with elective and emergency hospitalisations in green rated hospitals are shown in figures 3.1 and 3.2, respectively.

Table 3.2 Rates of AKI per 1,000 hospitalisations by admission type and clinical setting in 2017

Hospital	RAG rating	Rate of AKI per 1,000 hospitalisations					
		Elective	Emergency	Elective HA	Emergency HA	Elective CAH	Emergency CAH
Aintree University Hospital	G	5.1	55.8	2.8	26.3	2.3	29.5
Airedale	G	2.5	64.8	1.3	26.5	1.2	38.2
Ashford & St Peter's Hospitals	A	3.9	78.6	2.1	30.7	1.8	48.0
Barking, Havering & Redbridge University Hosps	A	2.8	49.1	1.6	21.1	1.2	28.0
Barts Health	A	4.3	34.1	3.4	16.4	0.9	17.7
Basildon & Thurrock University Hospitals	G	7.9	65.1	5.8	28.8	2.1	36.3
Blackpool Teaching Hospitals	A	7.4	79.3	5.0	37.3	2.4	42.0
Bolton	G	3.4	51.9	1.9	21.4	1.5	30.6
Bradford Teaching Hospitals	G	5.1	38.9	2.5	13.7	2.5	25.1
Burton Hospitals	G	2.9	63.2	1.6	26.8	1.3	36.3
Calderdale & Huddersfield	G	2.7	49.4	1.6	19.8	1.0	29.6
Cambridge University Hospitals	G	6.8	55.2	3.5	31.3	3.3	24.0
City Hospitals Sunderland	G	4.6	77.2	2.4	29.6	2.2	47.6
Countess of Chester Hospital	A	1.3	52.0	0.9	24.9	0.4	27.1
County Durham & Darlington	G	3.5	76.7	2.4	28.9	1.1	47.8
Croydon Health Services	A	1.6	69.1	1.2	46.8	0.4	22.4
Dartford & Gravesham	G	3.5	47.3	1.9	24.8	1.6	22.5
Derby Teaching Hospitals	G	4.4	72.0	1.9	26.2	2.4	45.8
Doncaster & Bassetlaw Teaching Hospitals	G	4.8	61.5	2.5	25.7	2.3	35.8
Dorset County Hospital	G	4.2	65.5	2.0	23.2	2.3	42.2
East Cheshire	R						
East Kent Hospitals University	G	4.1	69.6	2.1	26.5	2.1	43.1
East Lancashire Hospitals	A	4.9	70.1	2.8	29.4	2.1	40.7
East Sussex Healthcare	G	3.5	71.6	1.6	28.2	1.9	43.3
Epsom & St Helier University Hospitals	G	3.1	57.2	1.8	26.7	1.3	30.5
Frimley Health	G	2.2	33.4	1.2	15.3	1.0	18.0
Gateshead Health	G	4.8	91.3	3.2	41.4	1.7	49.9
George Eliot Hospital	G	3.9	94.0	1.8	37.9	2.1	56.0
Gloucestershire Hospitals	G	4.2	73.4	2.3	31.1	1.9	42.3
Great Western Hospitals	G	6.1	62.0	3.4	25.2	2.7	36.8
Hampshire Hospitals	G	5.4	74.7	3.5	34.1	1.9	40.6
Homerton University Hospital	G	2.9	44.1	1.9	21.5	1.0	22.7
Hull & East Yorkshire Hospitals	G	5.8	68.8	4.1	28.5	1.7	40.3
Ipswich Hospital	G	4.4	79.0	2.2	34.6	2.1	44.3
Isle of Wight	G	5.4	105.1	3.5	46.9	1.9	58.2
James Paget University Hospitals	G	4.7	85.6	2.7	41.1	2.0	44.5
Kettering General Hospital	G	3.1	88.9	1.6	39.1	1.5	49.8
King's College Hospital	G	3.5	55.2	2.1	27.9	1.3	27.3
Kingston Hospital	A	3.4	59.3	1.9	38.5	1.5	20.8
Lancashire Teaching Hospitals	G	4.8	71.2	2.7	33.6	2.1	37.6
Leeds Teaching Hospitals	G	10.2	78.7	5.8	33.0	4.4	45.7
London North West University Healthcare	G	5.7	71.7	3.7	35.3	1.9	36.4
Manchester University	G	6.7	46.4	4.6	23.1	2.1	23.3
Medway	G	5.6	66.4	2.2	26.7	3.4	39.8
Mid Cheshire Hospitals	R						
Mid Yorkshire Hospitals	G	2.9	56.3	1.8	22.7	1.1	33.6
Milton Keynes University Hospital	G	2.3	60.0	1.4	25.0	0.9	34.9
Norfolk and Norwich University Hospitals	G	4.4	74.3	2.3	31.5	2.0	42.8
North Bristol	G	6.0	75.1	3.0	38.1	3.0	37.0
North Cumbria University Hospitals	G	3.3	74.9	1.8	31.7	1.5	43.1
North Middlesex University Hospital	A	2.6	44.7	1.6	20.6	1.0	24.1
Northern Devon Healthcare	G	3.3	72.8	1.4	27.9	2.0	44.9
Northern Lincolnshire & Goole	G	2.8	85.5	1.8	32.4	1.0	53.1

Table 3.2 Continued

Hospital	RAG rating	Rate of AKI per 1,000 hospitalisations					
		Elective	Emergency	Elective HA	Emergency HA	Elective CAH	Emergency CAH
Northumbria Healthcare	G	2.0	60.2	1.2	27.6	0.8	32.5
Nottingham University Hospitals	R						
Plymouth Hospitals	G	8.4	62.1	5.9	26.2	2.5	35.9
Poole Hospital	G	2.4	57.6	1.6	26.5	0.8	31.1
Portsmouth Hospitals	G	7.3	92.4	3.6	38.5	3.7	53.8
Royal Cornwall Hospitals	G	3.9	73.3	2.1	28.4	1.7	44.9
Royal Devon & Exeter	A	5.0	72.5	2.7	31.6	2.2	40.9
Royal Liverpool & Broadgreen University Hosps	G	7.3	57.2	5.0	31.1	2.2	26.1
Royal Surrey County Hospital	G	6.3	52.5	3.2	22.8	3.1	29.8
Royal United Hospitals Bath	G	4.0	67.8	2.1	30.9	1.9	36.9
Salford Royal	G	5.7	73.4	3.8	33.6	2.0	39.8
Sandwell & West Birmingham	G	1.4	16.9	1.0	7.7	0.4	9.1
Sheffield Teaching Hospitals	G	7.2	86.2	4.9	38.6	2.3	47.6
Sherwood Forest Hospitals	G	2.4	74.1	1.6	25.4	0.8	48.7
Shrewsbury & Telford Hospital	G	3.8	68.4	1.9	29.7	1.9	38.7
South Tees Hospitals	G	7.0	74.7	4.5	29.3	2.5	45.4
South Tyneside	G	2.9	85.1	1.7	36.4	1.2	48.7
South Warwickshire	G	2.7	64.2	1.9	31.2	0.8	33.0
Southend University Hospital	G	4.9	68.9	2.1	27.5	2.8	41.4
Southport & Ormskirk Hospital	G	2.2	81.1	1.1	35.0	1.0	46.0
St George's University Hospitals	A	11.8	56.3	8.8	36.1	2.9	20.2
St Helens & Knowsley Teaching Hospitals	R						
Stockport	G	6.1	70.3	3.6	32.3	2.6	38.0
Surrey & Sussex Healthcare	G	3.6	85.9	2.4	39.7	1.1	46.1
Tameside & Glossop Integrated Care	G	2.9	80.0	1.8	30.7	1.1	49.3
Taunton & Somerset	G	4.6	64.7	2.4	27.3	2.2	37.4
The Dudley Group	G	6.0	79.0	3.5	31.8	2.5	47.2
The Newcastle Upon Tyne Hospitals	G	8.0	68.1	4.7	31.6	3.2	36.4
The Queen Elizabeth Hospital, King's Lynn	G	2.6	52.9	1.1	21.6	1.5	31.3
The Royal Bournemouth & Christchurch Hosps	G	4.3	74.2	2.4	33.1	2.0	41.1
The Royal Wolverhampton	G	6.5	76.4	4.8	34.7	1.6	41.7
Torbay & South Devon	G	4.2	57.5	2.1	19.8	2.0	37.7
United Lincolnshire Hospitals	G	4.0	83.8	2.4	34.3	1.6	49.5
University College London Hospitals	A	8.8	57.7	6.5	29.8	2.3	27.8
University Hospital Southampton	G	13.6	73.4	9.1	33.6	4.5	39.8
University Hospitals Birmingham	G	16.4	74.0	11.9	40.6	4.5	33.3
University Hospitals Bristol	G	8.3	45.7	6.1	23.1	2.3	22.5
University Hospitals Coventry & Warwickshire	G	6.0	60.9	4.0	26.6	2.0	34.3
University Hospitals of Leicester	G	7.1	69.4	4.8	24.6	2.4	44.8
University Hospitals of Morecambe Bay	G	2.1	63.7	1.4	20.4	0.7	43.3
University Hospitals of North Midlands	G	6.3	72.0	4.0	31.1	2.3	40.9
West Hertfordshire Hospitals	G	3.6	76.9	1.6	35.9	2.0	41.0
Worcestershire Acute Hospitals	G	3.3	77.4	2.0	29.4	1.2	48.0
Wrightington, Wigan and Leigh	G	2.6	75.7	1.8	24.7	0.9	50.9
Wye Valley	G	3.3	67.4	1.8	23.9	1.5	43.5
Yeovil District Hospital	G	4.0	74.8	2.4	33.1	1.6	41.7
York Teaching Hospital	G	4.1	85.6	2.1	32.6	2.0	53.1
PAEDIATRIC HOSPITALS							
Alder Hey Children's	G	7.3	28.3	4.8	18.5	2.6	9.8
Great Ormond Street Hospital for Children	R						
Sheffield Children's	G	3.2	31.2	1.6	14.1	1.6	17.1

CAH – community acquired, subsequently hospitalised; HA – hospital acquired; RAG – red/amber/green

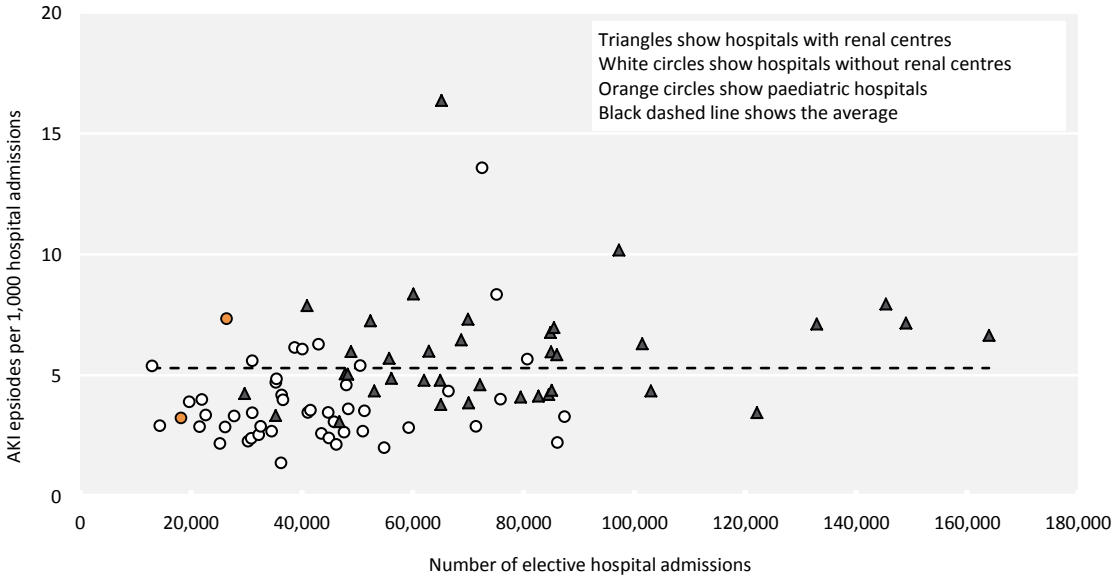


Figure 3.1 Rate of AKI (community acquired, subsequently hospitalised and hospital acquired) per 1,000 elective hospital admissions in 2017 by hospital

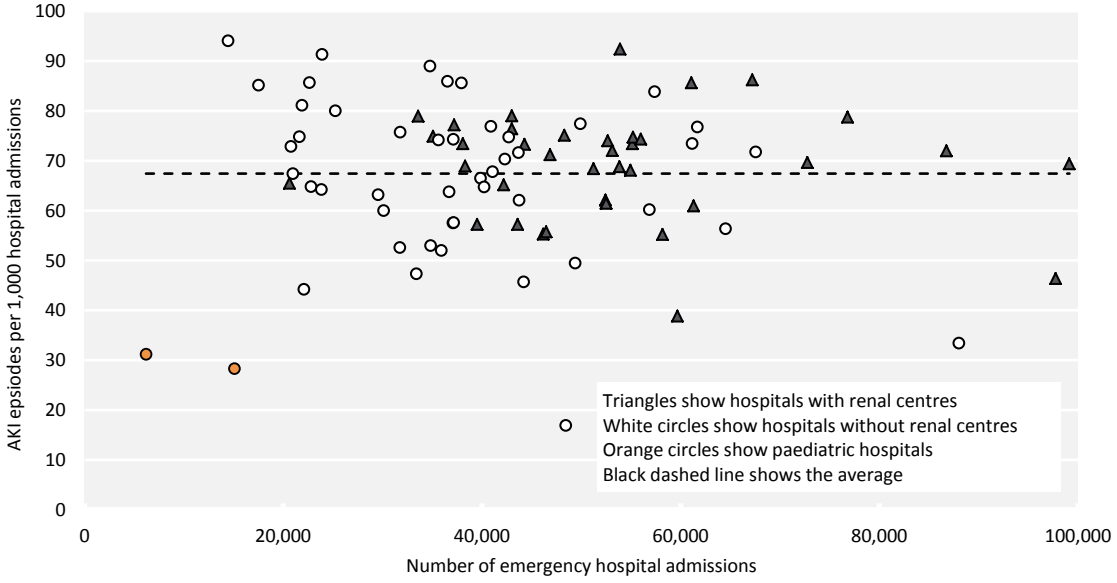


Figure 3.2 Rate of AKI (community acquired, subsequently hospitalised and hospital acquired) per 1,000 emergency hospital admissions in 2017 by hospital

Length of hospital stay associated with an AKI episode

For each AKI episode with associated hospitalisations (CAH and HA), a length of stay (LOS) in hospital was calculated. If a person had more than one hospital stay during a single AKI episode, the sum of the time spent in hospital during the multiple spells was used, rather than using the time for each hospital stay separately. In these cases, LOS was attributed to the first hospital to which the patient was admitted. Also, the LOS was determined to be elective or emergency based on the first hospital admission during the AKI episode being elective or emergency, respectively.

Note that most patients had only one hospital stay during a single AKI episode, with only 18,889 (6.2%) of AKI episodes associated with more than one hospital stay. Of these, the repeated hospitalisations were in different hospitals in 19.0% of cases (corresponding to only 1.2% of the total AKI episodes being associated to multiple hospitalisations in different hospitals).

Median LOS across all 86 green rated hospitals by elective and emergency admissions is presented in table 3.3. This includes a sub-analysis, that excluded patients who died during the admission, to investigate whether those with an early poor outcome of AKI artificially improved the overall LOS. The data suggest that this was not the case.

Table 3.4 shows the LOS for each admission type by hospital. The UKRR does not have access to any data on patients who had a hospital admission without an AKI and hence it was not possible to include a comparator group. Figure 3.3 shows the overall median LOS for the subset of green rated hospitals by admission type.

Table 3.3 Length of stay in hospital associated with AKI by elective versus emergency admissions and community acquired, subsequently hospitalised (CAH) versus hospital acquired (HA) AKI for green rated hospitals in 2017

	Time in hospital (days)		
Type of admission	Total	Median	IQR
ALL ADMISSIONS			
All	275,830	12	6-23
Elective	25,725	10	6-20
Elective CAH	10,131	6	4-12
Elective HA	15,594	14	8-26
Emergency	250,105	12	6-24
Emergency CAH	142,897	8	4-16
Emergency HA	107,208	18	10-34
ADMISSIONS ALIVE AT DISCHARGE			
All	221,894	12	6-24
Elective	24,246	10	6-20
Elective CAH	9,689	6	4-11
Elective HA	14,557	13	8-25
Emergency	197,648	12	6-24
Emergency CAH	115,804	8	4-17
Emergency HA	81,844	19	11-35

IQR – interquartile range

Table 3.4 Length of stay by hospital for elective and emergency admissions associated with hospitalised AKI (community acquired, subsequently hospitalised and hospital acquired) in 2017

Hospital	RAG rating	Length of hospital stay (days)			
		Elective		Emergency	
		Number	Median	Number	Median
Aintree University Hospital	G	242	13	2,591	13
Airedale	G	82	7	1,479	11
Ashford & St Peter's Hospitals	A	159	9	2,123	10
Barking, Havering & Redbridge University Hosps	A	166	11	2,933	11
Barts Health	A	420	13	3,490	13
Basildon & Thurrock University Hospitals	G	323	10	2,748	12
Blackpool Teaching Hospitals	A	181	10	1,345	13
Bolton	G	107	8	1,867	12
Bradford Teaching Hospitals	G	244	10	2,319	9
Burton Hospitals	G	94	8	1,868	11
Calderdale & Huddersfield	G	103	9	1,833	11
Cambridge University Hospitals	G	575	9	2,551	15
City Hospitals Sunderland	G	332	7	2,874	10
Countess of Chester Hospital	A	51	12	1,484	13
County Durham & Darlington	G	155	14	4,734	10
Croydon Health Services	A	20	9	1,073	14
Dartford & Gravesham	G	142	9	1,581	15
Derby Teaching Hospitals	G	373	8	3,827	10
Doncaster & Bassetlaw Teaching Hospitals	G	298	7	3,229	11
Dorset County Hospital	G	126	7	1,352	11
East Cheshire	R				
East Kent Hospitals University	G	342	8	5,065	10
East Lancashire Hospitals	A	204	10	2,580	12
East Sussex Healthcare	G	181	9	3,127	13
Epsom & St Helier University Hospitals	G	144	7	2,496	14
Frimley Health	G	191	8	2,939	13
Gateshead Health	G	172	13	2,185	12
George Eliot Hospital	G	77	6	1,360	11
Gloucestershire Hospitals	G	356	9	4,050	11
Great Western Hospitals	G	244	9	2,715	11
Hampshire Hospitals	G	273	9	3,194	13
Homerton University Hospital	G	75	11	977	11
Hull & East Yorkshire Hospitals	G	503	10	3,705	11
Ipswich Hospital	G	231	8	2,652	11
Isle of Wight	G	70	9	1,309	12
James Paget University Hospitals	G	166	9	1,940	12
Kettering General Hospital	G	141	8	3,096	12
King's College Hospital	G	422	10	3,213	14
Kingston Hospital	A	41	12	888	15
Lancashire Teaching Hospitals	G	312	10	3,338	12
Leeds Teaching Hospitals	G	990	12	6,048	14
London North West University Healthcare	G	343	15	3,635	14
Manchester University	G	1,045	12	4,345	15
Medway	G	174	6	2,650	11
Mid Cheshire Hospitals	R				
Mid Yorkshire Hospitals	G	206	11	3,636	11
Milton Keynes University Hospital	G	69	10	1,808	12
Norfolk & Norwich University Hospitals	G	448	8	4,163	10
North Bristol	G	377	8	3,628	14
North Cumbria University Hospitals	G	118	7	2,628	11
North Middlesex University Hospital	A	84	10	1,487	12
Northern Devon Healthcare	G	76	8	1,516	10

Table 3.4 Continued

Hospital	RAG rating	Length of hospital stay (days)			
		Elective		Emergency	
		Number	Median	Number	Median
Northern Lincolnshire & Goole	G	168	10	3,247	12
Northumbria Healthcare	G	110	7	3,424	11
Nottingham University Hospitals	R				
Plymouth Hospitals	G	503	10	3,258	12
Poole Hospital	G	74	12	2,141	12
Portsmouth Hospitals	G	512	7	4,980	12
Royal Cornwall Hospitals	G	271	10	3,245	10
Royal Devon & Exeter	A	372	9	2,892	11
Royal Liverpool & Broadgreen University Hosps	G	380	15	2,261	15
Royal Surrey County Hospital	G	270	9	1,669	12
Royal United Hospitals Bath	G	146	10	2,785	12
Salford Royal	G	318	13	2,796	13
Sandwell & West Birmingham	G	50	13	817	12
Sheffield Teaching Hospitals	G	1,068	14	5,797	14
Sherwood Forest Hospitals	G	108	9	2,642	10
Shrewsbury & Telford Hospital	G	247	8	3,506	11
South Tees Hospitals	G	596	10	4,128	11
South Tyneside	G	42	16	1,494	12
South Warwickshire	G	93	8	1,533	13
Southend University Hospital	G	274	8	2,642	10
Southport & Ormskirk Hospital	G	55	9	1,777	12
St George's University Hospitals	A	348	10	1,542	14
St Helens & Knowsley Teaching Hospitals	R				
Stockport	G	238	8	2,976	12
Surrey & Sussex Healthcare	G	148	11	3,141	12
Tameside & Glossop Integrated Care	G	62	11	2,022	12
Taunton & Somerset	G	221	8	2,605	11
The Dudley Group	G	293	8	3,400	11
The Newcastle Upon Tyne Hospitals	G	1,060	10	3,431	13
The Queen Elizabeth Hospital, King's Lynn	G	113	8	1,846	11
The Royal Bournemouth & Christchurch Hosps	G	289	8	2,758	10
The Royal Wolverhampton	G	444	9	3,288	12
Torbay & South Devon	G	127	8	1,778	8
United Lincolnshire Hospitals	G	304	8	4,812	12
University College London Hospitals	A	1,061	18	1,818	14
University Hospital Southampton	G	985	13	4,492	14
University Hospitals Birmingham	G	1,067	13	3,898	16
University Hospitals Bristol	G	627	13	2,019	13
University Hospitals Coventry & Warwickshire	G	507	10	3,735	12
University Hospitals of Leicester	G	947	11	6,878	10
University Hospitals of Morecambe Bay	G	99	14	2,340	10
University Hospitals of North Midlands	G	640	11	6,247	12
West Hertfordshire Hospitals	G	160	8	2,885	13
Worcestershire Acute Hospitals	G	287	9	3,864	11
Wrightington, Wigan & Leigh	G	126	9	2,407	9
Wye Valley	G	92	10	1,415	10
Yeovil District Hospital	G	88	7	1,619	12
York Teaching Hospital	G	326	7	5,232	10
PAEDIATRIC HOSPITALS					
Alder Hey Children's	G	194	14	427	11
Great Ormond Street Hospital for Children	R				
Sheffield Children's	G	54	9	177	8

RAG – red/amber/green

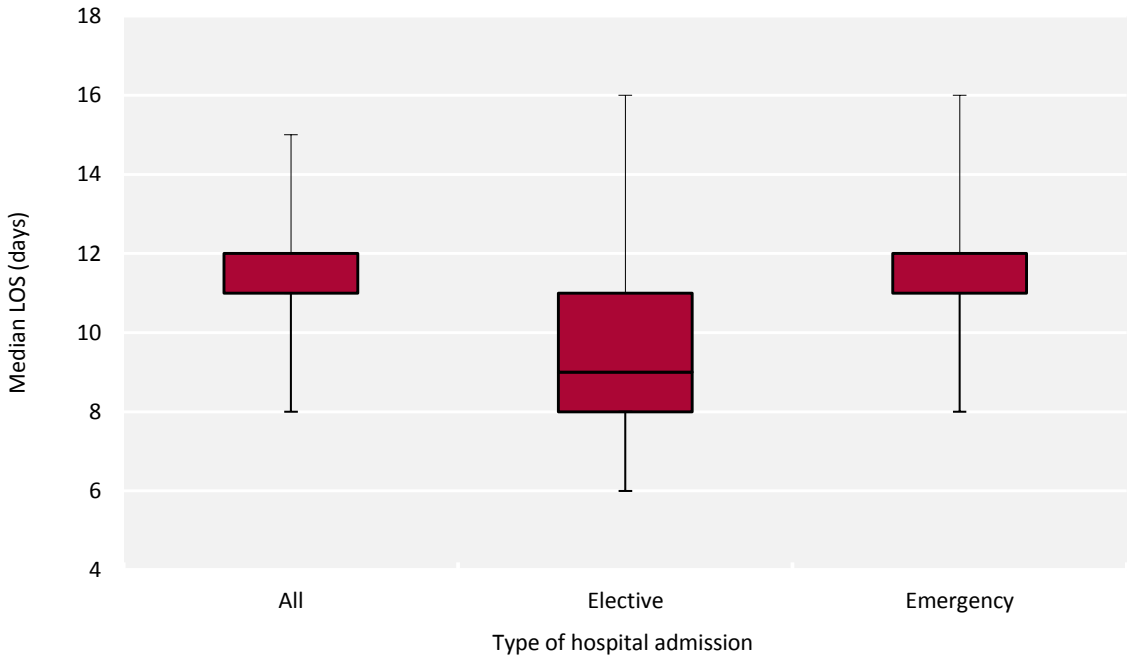


Figure 3.3 Boxplot of the median hospital length of stay (LOS) for elective and emergency admissions associated with hospitalised AKI (community acquired, subsequently hospitalised and hospital acquired) for green rated hospitals in 2017

The box shows the median and interquartile range (IQR) and the whiskers are the minimum and maximum values. The median and 3rd quartiles for the 'All' and 'Emergency' admissions boxplots coincide.

Mortality following an AKI episode by clinical setting

Table 3.5 shows the mortality by 30 days from AKI episode start, adjusted for age and sex, by clinical setting (CA/CAH/HA). All stages of AKI were included. At present the UKKR is not able to determine whether the difference in outcome between hospitals is all unwarranted and not partially explained by case-mix and comorbidity differences between patients. We will work in collaboration with GIRFT on a case-mix adjusted measure.

Table 3.5 Adjusted (males aged 65–74 years) 30 day mortality for patients with an AKI episode by clinical setting in 2017

		Setting of AKI episode		
	All AKI episodes	CA	CAH	HA
Number	441,699	127,767	171,266	142,666
%		28.9	38.8	32.3
% died by 30 days from AKI start	18.0	8.3	20.6	23.6
ADJUSTED MORTALITY (%) BY PEAK AKI STAGE				
1	12.2	6.2	13.5	15.5
2	26.0	20.5	24.5	31.1
3	28.3	21.8	26.4	36.6

CA – community acquired; CAH – community acquired, subsequently hospitalised; HA – hospital acquired

Accuracy of coding of hospital AKI episodes

For all 2017 AKI episodes in the MPI that were associated with hospitalisations (both CAH and HA, in emergency or elective admissions), the percentage of those that were coded in HES using the International Classification of Diseases diagnostic code for AKI (N17) was calculated for each hospital. Coding of peak AKI stages 1, 2 and 3 are presented in figures 3.4, 3.5 and 3.6, respectively.

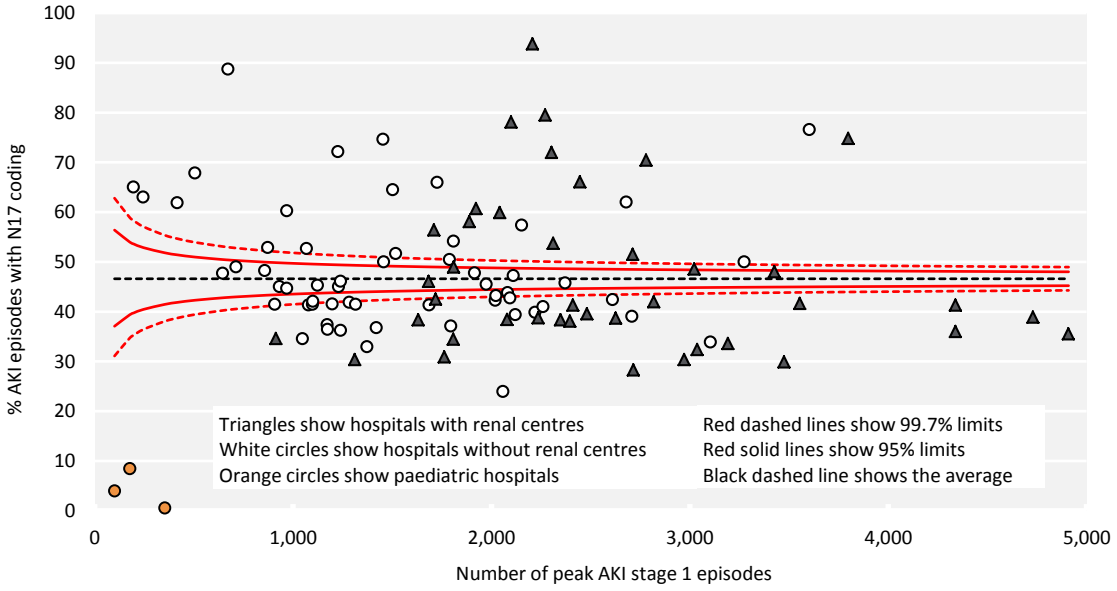


Figure 3.4 Percentage of peak AKI stage 1 episodes in the Master Patient Index that were coded in Hospital Episode Statistics using N17 by hospital in 2017

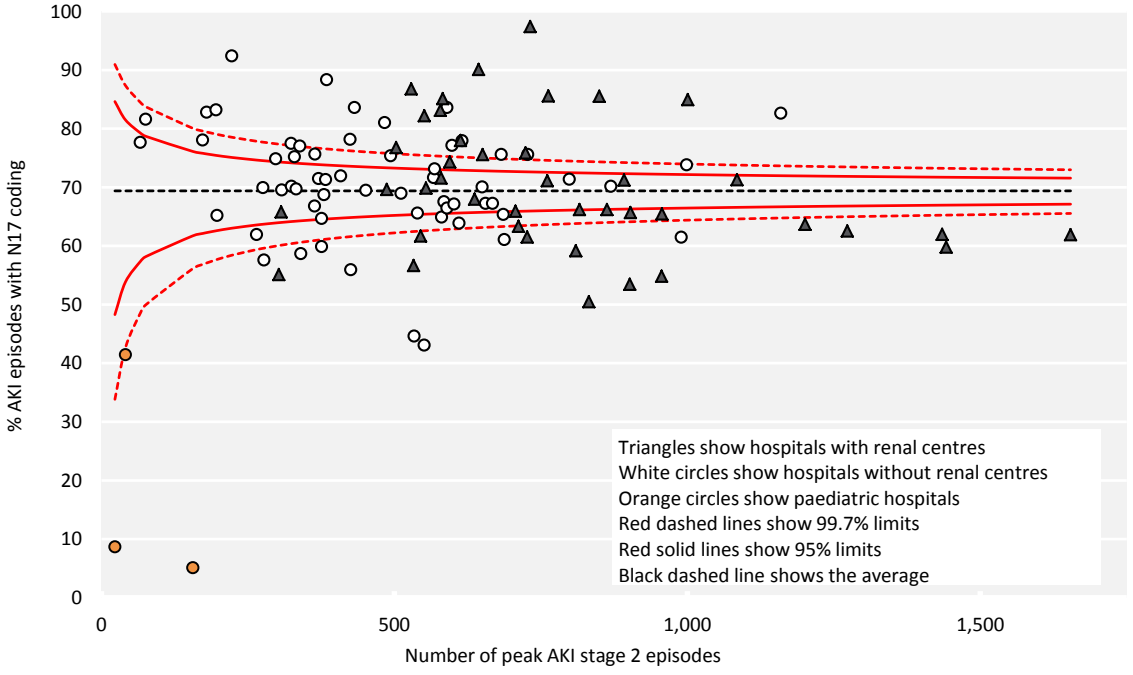


Figure 3.5 Percentage of peak AKI stage 2 episodes in the Master Patient Index that were coded in Hospital Episode Statistics using N17 by hospital in 2017

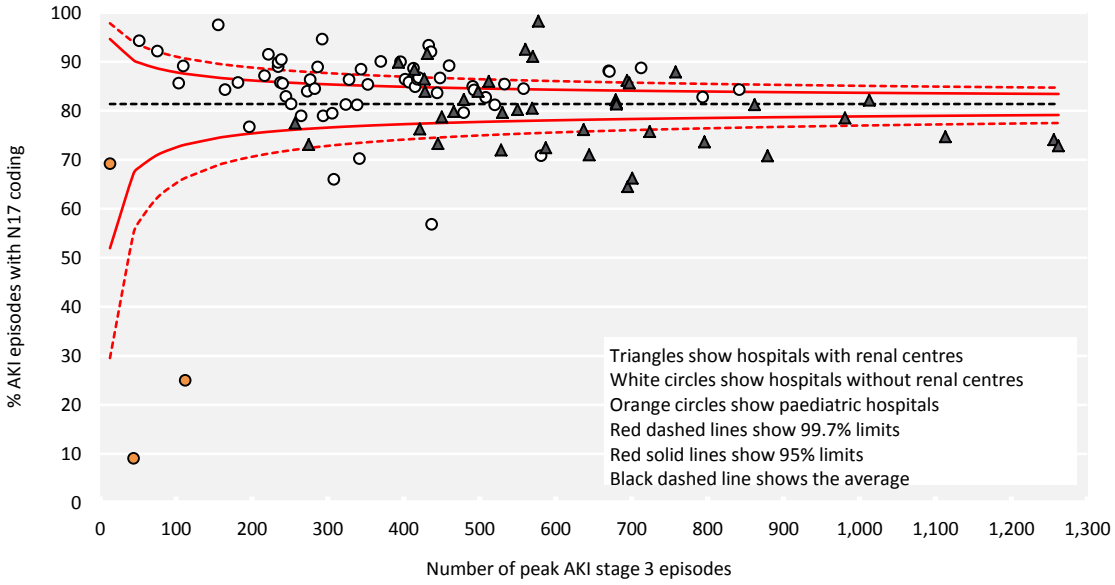


Figure 3.6 Percentage of peak AKI stage 3 episodes in the Master Patient Index that were coded in Hospital Episode Statistics using N17 by hospital in 2017

HES coding was better the higher the stage of AKI and there was no clear difference between HES coding for renal and acute non-renal hospitals. Generally, HES coding for AKI was poor in paediatric hospitals. More information about coding accuracy by hospital is presented in table 3.6.

Table 3.6 Correlation of AKI coding between UKRR and Hospital Episode Statistics (HES) – the percentage of peak AKI stage 1, 2 and 3 episodes in the Master Patient Index that were coded in HES using N17 by hospital in 2017

Hospital	% peak AKI 1 coded	% peak AKI 2 coded	% peak AKI 3 coded
Aintree University Hospital	58.1	82.2	89.8
Airedale	41.4	61.9	76.6
Ashford & St Peter's Hospitals	74.6	83.6	89.9
Barking, Havering & Redbridge University Hospitals	43.2	67.5	84.9
Barts Health	39.5	61.5	66.2
Basildon & Thurrock University Hospitals	60.7	75.6	83.9
Blackpool Teaching Hospitals	41.4	58.7	86.3
Bolton	46.1	68.7	85.3
Bradford Teaching Hospitals	38.3	69.6	73.3
Burton Hospitals	41.9	71.3	78.9
Calderdale & Huddersfield	41.5	71.9	86.3
Cambridge University Hospitals	38.4	71.6	79.8
City Hospitals Sunderland	59.9	78.0	80.2
Countess of Chester Hospital	60.2	75.2	88.9
County Durham & Darlington	33.8	61.4	82.7
Croydon Health Services	48.9	65.2	85.7
Dartford & Gravesham	45.2	69.7	78.9
Derby Teaching Hospitals	70.4	85.5	91.1
Doncaster & Bassetlaw Teaching Hospitals	41.3	68.0	82.3
Dorset County Hospital	34.6	65.8	77.4
East Cheshire	65.0	81.6	94.2
East Kent Hospitals University	33.6	63.7	82.1
East Lancashire Hospitals	41.3	66.4	82.7
East Sussex Healthcare	43.8	67.2	84.4
Epsom & St Helier University Hospitals	56.4	76.7	86.4
Frimley Health	39.4	67.1	85.7
Gateshead Health	51.6	75.3	88.4
George Eliot Hospital	52.9	77.5	90.4
Gloucestershire Hospitals	42.0	66.2	75.7
Great Western Hospitals	45.5	73.1	84.8
Hampshire Hospitals	41.0	65.3	81.2
Homerton University Hospital	88.7	92.4	97.4
Hull & East Yorkshire Hospitals	38.7	65.7	82.2
Ipswich Hospital	34.5	61.7	79.6
Isle of Wight	48.2	74.8	91.4
James Paget University Hospitals	32.9	55.9	79.4
Kettering General Hospital	42.7	70.0	84.2
King's College Hospital	38.1	63.3	72.0
Kingston Hospital	47.7	78.0	89.1
Lancashire Teaching Hospitals	66.1	90.1	92.5
Leeds Teaching Hospitals	36.0	59.8	74.0
London North West University Healthcare	39.0	61.0	70.7
Manchester University	41.6	65.4	70.8
Medway	50.4	77.1	92.0
Mid Cheshire Hospitals	63.0	77.6	92.1
Mid Yorkshire Hospitals	45.7	71.3	87.9
Milton Keynes University Hospital	36.4	66.8	81.1
Norfolk & Norwich University Hospitals	48.5	71.2	85.7
North Bristol	51.5	75.8	80.5
North Cumbria University Hospitals	30.9	56.7	78.7
North Middlesex University Hospital	34.5	57.6	82.9
Northern Devon Healthcare	41.3	69.9	85.7
Northern Lincolnshire & Goole	57.3	75.5	85.4

Table 3.6 Continued

Hospital	% peak AKI 1 coded	% peak AKI 2 coded	% peak AKI 3 coded
Northumbria Healthcare	61.9	81.0	90.0
Nottingham University Hospitals	42.5	69.9	76.2
Plymouth Hospitals	72.0	85.6	86.2
Poole Hospital	64.5	78.1	88.9
Portsmouth Hospitals	48.0	71.2	78.5
Royal Cornwall Hospitals	93.8	97.4	98.3
Royal Devon & Exeter	79.5	83.1	88.4
Royal Liverpool & Broadgreen University Hospitals	46.1	86.8	83.9
Royal Surrey County Hospital	41.4	71.4	81.3
Royal United Hospitals Bath	47.8	71.6	86.6
Salford Royal	78.1	85.1	91.6
Sandwell & West Birmingham	67.8	83.2	84.2
Sheffield Teaching Hospitals	38.9	62.5	81.2
Sherwood Forest Hospitals	66.0	83.6	93.3
Shrewsbury & Telford Hospital	53.7	71.1	81.3
South Tees Hospitals	30.3	54.8	73.6
South Tyneside	44.6	70.2	85.5
South Warwickshire	42.1	69.5	87.1
Southend University Hospital	49.0	74.3	85.9
Southport & Ormskirk Hospital	37.3	64.6	84.5
St George's University Hospitals	30.3	55.1	73.1
St Helens & Knowsley Teaching Hospitals	61.9	82.8	85.6
Stockport	47.2	75.5	86.7
Surrey & Sussex Healthcare	39.8	67.2	88.6
Tameside & Glossop Integrated Care	45.0	69.5	86.3
Taunton & Somerset	37.1	63.8	86.4
The Dudley Group	38.4	65.9	76.1
The Newcastle Upon Tyne Hospitals	32.4	59.1	71.0
The Queen Elizabeth Hospital, King's Lynn	36.2	59.8	70.2
The Royal Bournemouth & Christchurch Hospitals	23.9	43.0	56.8
The Royal Wolverhampton	38.8	66.2	81.6
Torbay & South Devon	72.1	88.3	94.5
United Lincolnshire Hospitals	50.0	73.8	84.2
University College London Hospitals	18.8	44.6	65.9
University Hospital Southampton	76.5	82.6	88.6
University Hospitals Birmingham	29.9	53.4	72.4
University Hospitals Bristol	54.1	68.9	81.2
University Hospitals Coventry & Warwickshire	28.3	50.5	64.5
University Hospitals of Leicester	35.5	61.9	72.8
University Hospitals of Morecambe Bay	36.8	65.6	79.5
University Hospitals of North Midlands	41.3	62.0	74.7
West Hertfordshire Hospitals	42.2	64.9	83.6
Worcestershire Acute Hospitals	42.4	70.1	88.1
Wrightington, Wigan & Leigh	50.0	77.9	89.1
Wye Valley	45.0	77.0	89.8
Yeovil District Hospital	52.7	75.6	83.9
York Teaching Hospital	74.8	84.9	87.9
PAEDIATRIC HOSPITALS			
Alder Hey Children's	0.6	5.1	25.0
Great Ormond Street Hospital for Children	4.0	8.7	9.1
Sheffield Children's	8.5	41.5	69.2

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Abbreviations

AKI	acute kidney injury
CA	community-acquired, never hospitalised
CAH	community-acquired, subsequently hospitalised
CCG	clinical commissioning group
CKD	chronic kidney disease
GIRFT	Getting It Right First Time
HA	hospital-acquired
HES	Hospital Episode Statistics
IMD	Index of Multiple Deprivation
IP	inpatient
IQR	interquartile range
KDIGO	Kidney Disease: Improving Global Outcomes
LOS	length of stay
MPI	Master Patient Index
NCEPOD	National Confidential Enquiry into Patient Outcome and Death
NHSE	NHS England
pmp	per million population
RAG	red/amber/green
UKRR	UK Renal Registry

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