UK Kidney Association

Kidney Failure Risk Equation (KFRE) quick reference

KFRE at a glance	
What it predicts	Risk of end-stage kidney disease (ESKD) over the next 2 or 5 years
Who	Adults with CKD stages 3a-5
Inputs	Age, sex, eGFR and urine ACR
When to calculate	Whenever eGFR and ACR are measured – at least annually. eGFR and ACR within 6 months of each other, ideally within a month
Referral threshold	5-year risk >5% (NICE NG203)
Calculator	UK-calibrated KFRE: kidneyfailurerisk.co.uk

What is the KFRE?

The Kidney Failure Risk Equation (KFRE) is a well-validated risk prediction tool for the development of end-stage kidney disease (ESKD) in the next two or five years in individuals with chronic kidney disease (CKD) stages 3a-5. To estimate the risk of ESKD, the four-variable KFRE uses:

1. Age
2. Sex
3. Estimated glomerular filtration rate (eGFR)
4. Urine albumin:creatinine ratio (ACR)

Validation

The KFRE was developed and underwent validation in 31 CKD cohorts from 30 countries including over 700,000 individuals and 23,000 ESKD cases. The statistical performance to predict ESKD cases was found to be good to excellent in all cohorts. The KFRE has subsequently been validated in other independent CKD cohorts including in primary care in the East Midlands. This study led to re-calibration of the KFRE for the UK, a common finding when risk prediction tools are studied in new settings.

Publicly available websites may use the non-UK calibrated KFRE, so caution should be used with these. A calculator for the UK-calibrated KFRE, the version NICE recommends, is available at kidneyfailurerisk.co.uk.

When to calculate

The KFRE should be calculated when an individual with CKD Stage 3a-5 has an eGFR and ACR measured. This should be at least on an annual basis, but more frequently with more advanced disease. Table 2 of the NICE CKD guidelines describes frequency of testing for CKD. We would recommend that both eGFR and ACR should be within six months of each other, and ideally within a month.

Using and discussing the result

The KFRE will give a risk of ESKD over the next two or five years. Five-year predictions may be used in primary care to counsel patients regarding referral to secondary care. Two-year predictions may be

more applicable to secondary care when discussing the risk of requiring kidney replacement therapy over a shorter timeframe. Discussing ESKD risk should follow NICE's guidelines for 'shared decision making' and should include:

- Discussing ESKD risk in the context of a patient's life – such as comorbidities and what matters most to the patient
- Describing ESKD risk over the appropriate timeframe using 'natural frequencies' such as '10 in 100', instead of percentages such as '10%'
- Using a mixture of numbers and pictures

Limitations

As KFRE uses eGFR and urine ACR to make a prediction, the same limitations for eGFR and urine ACR are also applicable to KFRE. Examples include assessment of patients at extremes of weight or muscle mass, or where a patient is being assessed in the context of acute kidney injury, or for ACR where a patient has a urinary tract infection. Please see the sections on eGFR and albuminuria for further explanation. In addition, KFRE should always be viewed in the context of the individual, their comorbidities, and their risk of dying from other causes over a period of the next two/five years.

There has been limited specific validation of the KFRE in primary renal pathologies such as glomerulonephritis, cystic kidney disease and vasculitis. Therefore, in these groups caution should be used when making predictions based on KFRE.

Referral

The UK re-calibrated KFRE has been recommended by NICE (2021) to guide personalised care for people with CKD stages 3a-5 including referral to secondary care. If the risk of ESKD is >5% in the next 5 years, NICE recommends referral for specialist assessment, taking into account the patient's wishes and comorbidities. This threshold has replaced the previous recommendation for considering referral if eGFR is less than 30 ml/min/1.73m^2. This is because it is likely to be more sensitive and specific for detecting ESKD cases and may reduce the number of people referred unnecessarily.

Further information

- UK-calibrated KFRE calculator – https://kidneyfailurerisk.co.uk/
- NICE Guidance: Chronic Kidney Disease: Assessment and Management, Sections 1.5.1 and 1.5.5 (2021) – https://www.nice.org.uk/guidance/ng203
- NICE Guidance: Shared Decision Making (2021) – https://www.nice.org.uk/guidance/ng197
- Tangri N et al., JAMA. 2011 Apr 20;305(15):1553-9.
- Tangri N et al., JAMA 2016;315(2):164-74.
- Major RW et al. PLoS Medicine 2019;16(11):e1002955.

More on this topic and other CKD information

Explore The UK CKD Guide for further resources on this and other areas of chronic kidney disease: The UK CKD Guide – UK Kidney Association

Scan the QR code to open it on your phone.