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Article

Online resources for chronic kidney disease (CKD) for primary care

Pushpa Kumarapeli BSc
Research Assistant

Simon de Lusignan MSc MD MRCGP
Senior Lecturer

Judas Robinson BA
Research Assistant

Primary Care Informatics, St George's – University of London, London, UK

Introduction

Chronic kidney disease (CKD) has joined a list of other financially-incentivised quality indicators for UK general practice contained within the Quality and Outcomes Framework (QOF).[1] The QOF CKD indicators expect practices to identify people with CKD and to control their blood pressure, ideally using angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers.

To help practices achieve the targets measured with the indicators, the Primary Care Informatics group at St George's have created online resources. These consist of an online calculator to allow glomerular filtration rate (GFR) to be estimated for individual patients and a spreadsheet to allow multiple simultaneous estimation of GFR. The calculator is also available in a downloadable format to allow it to be used on computers not connected to the internet or with slow connections. The calculator requires the patient's age, gender, serum creatinine and race (if black; Figure 1).

The pilot resources are available at: www.pcel.info/gfr/ for the online calculator and www.pcel.info/ckd/ for other CKD resources.

The CKD resources include access to the renal National Service Framework (NSF) guidelines, scientific papers and other resources. Each resource has an index card providing further information. The calculators have been designed to work with standard UK units and will not accept out-of-range values (types of data entry error are flagged up in the spreadsheet). This brief article provides further background to CKD describes the research we have carried out, discusses the challenge of managing CKD and sets out how we might like to see CKD indicators and targets extended in the future.

The resources include the following calculators described in more detail in Box 1:

1 an on-line calculator
2 a downloadable version of the on-line calculator
3 mobile phone calculators for the various types of mobile phone
4 a PDA (personal digital assistant) calculator
5 a spreadsheet for estimating GFR for populations.

Background to CKD

In overview, the management of CKD is about managing cardiovascular risk, with the best evidence being for controlling hypertension. Primary care colleagues need to approach cardiovascular risk in CKD just as they would in a patient with diabetes. Additionally, practitioners need to consider whether people with CKD might be on drugs that impair renal function and additionally, in men, whether they might have prostatic disease.

Although CKD is a major predictor for end-stage renal disease (ESRD), death in pre-ESRD patients with CKD is predominantly due to cardiovascular disease.[2] The prevalence and incidence of cardiovascular disease are both increased in patients with CKD.[3,4] Evidence

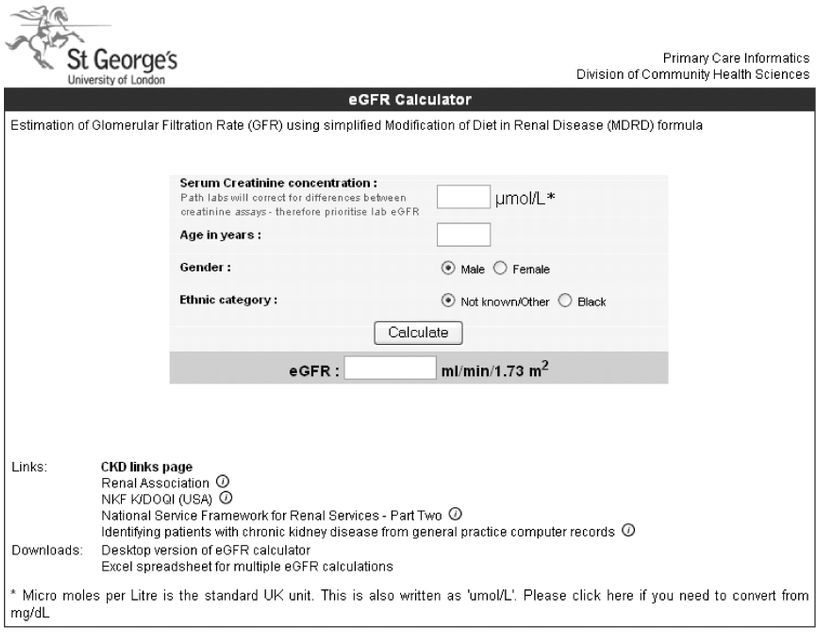

Figure 1 Online calculator to estimate GFR

Box 1 Types of on-line calculators to help with estimating eGFR

Calculator type	Resource required	Notes
On-line	Any browser connected to the internet	Just enter the data requested! N.B. UK units
Downloadable	Personal or laptop computer	Allows use of the calculator on a PC with no or limited internet connectivity
Mobile phone	Most types of mobile phone	Follow the instructions for the different types
PDA	PDA	Sorry, this won't work on a Palm!
Spreadsheet	PC with Microsoft Office or Excel	Enable Macros or it won't calculate! You may need to change security settings Help file is on the second sheet, see 'Help' tab at bottom of sheet.

N.B. The calculators use the four item MDRD equation. This is not validated for children
Lab derived eGFR should always be given priority as the lab calculation takes account of variation in creatinine measures.

from community based studies demonstrates an inverse relationship between renal function and adverse cardiovascular outcome.[5]

Managing cardiovascular risk is important in CKD. Most experts consider a blood pressure of 130/80 mmHg to be an aspirational target for people with CKD.[6,7] However, studies have shown that in people over 65 years and in diabetic patients, this is hard to achieve.[8–11] Some patients have taken four different anti-hypertensive therapies to achieve this target.[12] Angiotensin-converting enzyme inhibitors (ACEI) and angiotensin receptor blockers (ARB) are known to reduce the rate of deterioration in renal function.[13–15] Tighter blood pressure targets remain a goal for future years of the QOF for CKD.

Reviews suggest that there are growing numbers of studies that report beneficial effects of statins on slowing the decline in renal function and on proteinuria.[16,17] Cigarette smoking is associated with an adverse outcome in CKD; a community-based,

observational study indicated that 31% of attributable risk in CKD was due to smoking.[18] Consequently, earlier identification of CKD in primary care, better management of cardiovascular risk, avoiding medicines that impair renal function, considering prostate disease in men and specialist referral where appropriate, might improve long-term outcomes.

UK general practice research into undiagnosed CKD

Our investigation of the quality of care in CKD revealed that this condition was largely undiagnosed, and that there was scope to improve the management of cardiovascular co-morbidity and risk with interventions readily available in primary care.[19] CKD is diagnosed by measuring renal function; one of the simplest ways of doing this is to estimate GFR from serum creatinine, age, gender and ethnicity. A GFR of less than 60 ml/min/1.73 m^2 is diagnostic of CKD, though the diagnosis can still be made with a higher (and nearer to normal) GFR if there is evidence of renal damage.

One-quarter of the population (25.7%; 28 862/112 215) in our 2003 study population had a serum creatinine recorded in their computer record; this enabled us to calculate their GFR. One in five (18.9%) had a GFR <60 ml/min/1.73 m^2, which is diagnostic of CKD. This represents 4.9% of the population. Three-quarters (74.7 %; 4075/5449) of those with CKD had one or more circulatory diseases and risk factors amenable to intervention in primary care. For example: the mean systolic blood pressure in those with a normal GFR was 130 mmHg, while for those with a GFR <60 ml/min/1.73 m^2 the mean systolic blood pressure (BP) was 142 mmHg. One-way analysis of variance shows that the differences were significant at the $P<0.001$ level. Evidence-based guidance recommends lowering BP in CKD to 130 mmHg.[20] There is considerable scope for intervention and improvement of risk factors. Only 3.6% of these people were recorded as having renal disease within the GP computer record. A subsequent hand-search of 500 records in one practice suggested the computer results were reliable, with only four more cases having an indication that they had CKD only in their written records but not in the computer record.[21]

The challenge of improving the management of CKD

Primary care professionals involved in the CKD improvement programme had four challenges: GP colleagues were often unaware that the prevalence of CKD was so high (5%); they were not familiar with the evidence base; the stratification of risk took place outside the computerised medical record using a method with which they were unfamiliar (i.e. the estimation of GFR); and they were found lacking in implementing best practice. Part of the reason we undertook the hand-search of 500 records was to generate evidence to overcome the cognitive dissonance of GPs that such a large number of people might have undiagnosed CKD.

Next steps

The starting point for improving quality in CKD is the identification of people with stage 3–5 disease and improving their BP control. As better evidence becomes available we might wish to add measurement of proteinuria, cholesterol, smoking and anaemia management to the targets for CKD management. The National Institute for Health and Clinical Excellence is due to report on anaemia management in due course.

The estimate of glomerular filtration rate (eGFR) used in this calculator is the four item MDRD (modified diet in renal disease – www.kdoqi....) formula. This formula which requires age, gender, ethnicity, and creatinine is validated for adults, but should not be used in children. Where available laboratory estimated GFR should be given priority over that calculated using these tools as the laboratory will correct its creatinine assay to national standards. The MDRD formula is recommended by the National Service Framework for Renal Disease.[22] In the longer term it is likely that better formulae will be developed. For the moment this formula is the best pragmatic choice and gives clinicians much more information that creatinine alone.

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CONFLICTS OF INTEREST

None.

ADDRESS FOR CORRESPONDENCE

Simon de Lusignan
Primary Care Informatics
Division of Community Health Sciences
St George's – University of London
London SW17 0RE
UK
Tel: +44 (0)20 8725 5661
Fax: +44 (0)20 8767 7697
Email: slusigna@sgul.ac.uk

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