Management of chronic kidney disease

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Abstract

Management of chronic kidney disease (CKD) requires a systematic approach that includes all components of the chronic disease model. NICE guidance now combines eGFR and albumin:creatinine ratio in CKD staging to improve prediction of the risk of adverse outcomes and to recommend frequency of monitoring. Some causes of CKD require specific management directed at the underlying cause. For many patients, control of cardiovascular risk factors is the most important intervention, as these risk factors also promote progressive loss of kidney function. More intensive reduction of blood pressure and the use of inhibitors of the renin–angiotensin axis are recommended for patients with diabetes and/or significant proteinuria, but excessive blood pressure reduction can be harmful. Reducing the level of proteinuria is a further therapeutic goal. Dietary salt restriction is an important adjunct to drug therapy. Smoking cessation, obesity correction, lipid-lowering treatment and (among patients with diabetes mellitus) glycaemic control are also important. The dosage of drugs that are cleared by the kidney should be adjusted; care must be taken to avoid nephrotoxic drugs. Hypovolaemia and hypotension can further damage kidney function and should be avoided, or treated promptly. Symptoms are common only in advanced CKD. Patients likely to progress to established renal failure should be referred early enough to allow adequate preparation for renal replacement therapy.

Keywords Antihypertensive therapy; chronic disease management; chronic kidney disease; glomerulonephritis; progression

What's new?

- The staging of chronic kidney disease (CKD) according to NICE guidance has changed in line with international recommendations (Table 1)
- Staging now includes level of proteinuria; suggested frequency of follow-up is also defined by these categories (Table 2)

Principles of chronic disease management

Chronic kidney disease (CKD) is a prime example of a chronic disease requiring life-long management, involving the patient, the primary care team and specialists. Most people with CKD also have other long-term conditions (hypertension, cardiovascular disease, diabetes mellitus, atherosclerosis). Current disease-based clinical services (e.g. nephrology clinics, hypertension clinics, diabetes clinics, heart failure clinics) seldom provide optimal care, with poor communication occurring between these 'silos' of care, and between hospital-based clinics, the primary care team, and the patient. This lack of integration is harmful and can contribute to patients' loss of control, and to conflicting messages about what drug treatment the patient should be taking. The system is also wasteful, with much duplication of effort, tests and wasted travel time. Research into systematic attempts to achieve improvement in the delivery of care for patients with chronic diseases has resulted in development of a framework, the 'chronic care model'. Improvement is more likely if each component of the organization of care (self-management; decision support; delivery system design; clinical information systems) is addressed, and unlikely if, for instance, improvement efforts are confined to a hospital-based clinic.[1,2] Many of the components of the model, including national guidelines on identification, management and referral, are already in place for CKD.[3]

Early CKD is largely asymptomatic, so a balance has to be struck between 'labelling' patients as having 'chronic kidney disease' and ensuring that patients who are at increased risk of cardiovascular disease or progressive loss of kidney function are identified and offered the options of treatment that will reduce these risks.

Diagnosis and classification of chronic kidney disease

The Kidney Disease: Improving Global Outcomes (KDIGO) guideline 2012[4] and subsequently the National Institute for Health and Care Excellence (NICE) guideline 2014[5] now recommend the use of a new classification of CKD, wherein the diagnosis and monitoring of CKD involves measuring estimated glomerular filtration rate (eGFR) and proteinuria by albumin:creatinine ratio (Figure 1). This will replace the old five- or six-stage classification. We expect that full adoption of this classification will take time.

The KDIGO classification endorses the use of the Chronic Kidney Disease Epidemiology collaboration (CKD-EPI) equation to calculate $eGFR_{creatinine}$ in place of the Modification of Diet in Renal Disease (MDRD) formula; both formulae use age, gender, and ethnicity to predict creatinine generation and to derive an estimate of GFR normalized to body surface area, but CKD-EPI is more accurate. It will probably take several years for all laboratories to make this change.

In cases where the $eGFR_{creatinine}$ is between 45 and 50 ml/min/1.73 m^2 for more than 90 days, in the absence of proteinuria (by albumin:creatinine ratio <3 mg/mmol), KDIGO recommends using $eGFR_{cystatin\ C}$ (where available), which is a more accurate predictor of outcomes in this group (and takes into account age, gender and serum cystatin C). If $eGFR_{cystatin\ C}$ is >60 ml/min/1.73 m^2, the diagnosis of CKD should not be made. However, the cystatin C assay currently costs considerably more than the

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Glomerular filtration rate and albumin:creatinine ratio categories and level of increased risk of adverse outcomes			Albumin:creatinine ratio(ACR) categories (mg/mmol), description and range		
			<3 Normal to mildly increased ACR	3–30 Moderately increased ACR	>30 Severely increased ACR
			A1	A2	A3
Glomerular filtration rate (GFR) categories (ml/min/1.73m^2), description and range	>90 Normal and high GFR	G1	No chronic kidney disease in the absence of markers of kidney damage	Moderate	High
	60–89 Mild reduction in GFR related to normal range for a young adult	G2		Moderate	High
	45–59 Mild-moderate reduction in GFR	G3a	Moderate	High	Very high
	30–44 Moderate-severe reduction in GFR	G3b	High	Very high	Very high
	15–29 Severe reduction in GFR	G4	Very high	Very high	Very high
	<15 Kidney failure	G5	Very high	Very high	Very high

Adapted from KDIGO guideline 2012[4]

Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int Suppl. 2013; 3: 1-150.

Table 1

creatinine assay, and it will probably take some time before this recommendation is widely adopted.

Identification of proteinuria should be by albumin:creatinine ratio (as it is more sensitive for low levels of proteinuria). Protein:creatinine ratio can be used to quantify or monitor patients with larger amounts of proteinuria. Urinary albumin:creatinine ratio (UACR) remains the recommended measure of proteinuria in patients with diabetes. The term 'microalbuminuria' is now discouraged, in favour of 'moderately increased albuminuria' (UACR range 3–30 mg/mmol).

We anticipate that standard notation for CKD stage will follow the format 'CKD G3a A2', for instance, indicating a lab eGFR of 45–59 ml/min/1.73 m^2 and a UACR of 3–30 mg/mmol. The cause should be stated when known. The eGFR provided by the laboratory should be used wherever possible, as this should include correction factors for the type of creatinine assay used (see Assessment of kidney function in adults in *Medicine* 2015; **43(7):** 368–373).[5]

Some patients not defined as having CKD by this classification will have other evidence of chronic kidney damage, such as:

- persistent haematuria (after exclusion of other causes, such as urological disease)
- structural abnormalities of the kidneys demonstrated on ultrasound scanning or other radiological tests (e.g. polycystic kidney disease, reflux nephropathy) or
- biopsy-proven chronic glomerulonephritis (though most of these patients will have proteinuria and/or haematuria).

Limitations of eGFR formulae

The CKD-EPI formula is a further modification of the MDRD formula, and was developed to account for inaccuracies of the MDRD formula in estimating GFR, especially at GFR >60 ml/min/1.73 m^2. However, many limitations remain. Specifically, its use has not been fully validated in the elderly, children or pregnant women, acute kidney injury (AKI), extremes of body size, or in ethnic groups other than Caucasians and African Americans.