UNDERSTANDING CHRONIC KIDNEY DISEASE 1: DIAGNOSIS

AUTHORS
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ABSTRACT

This is the first part of a two-part unit on chronic kidney disease. It discusses the causes, risk factors, identification and prevalence of the disease.

Chronic kidney disease (CKD) affects around 10% of the general population (Corey et al, 2003). Diabetes is the most common cause, and the predicted doubling in incidence of type 2 diabetes over the next 25 years will in turn lead to increased incidence of diabetic nephropathy, with approximately 30% progressing to stage 5 CKD (see classification table below) (Atkins, 2005).

Risk factors for CKD include diabetes, cardiovascular disease, obesity, sedentary lifestyle and low socioeconomic status (Jenkins, 2007). Prevalence also increases with age – every year over the age of 40, 1% of kidney function is lost, while men with CKD have a more rapid decline in renal function and disease progression than women (Buck and Feehally, 1999).

Management of CKD has changed radically in the past two years due to:
- The National Service Framework for renal services (DH, 2005: 2004);
- The introduction of estimated glomerular filtration rate (eGFR) reporting – a more accurate measurement of kidney function;
- National guidance for the identification, management and referral of CKD.

IDENTIFICATION OF CKD
Traditionally kidney function was assessed by serum creatinine. This is determined by the rate of creatinine production, which is dependent on muscle mass, as well as the rate at which the kidney excretes it. It is now recommended that kidney function is assessed by eGFR using a specific formula.

The NSF recommends the four-variable Modification of Diet in Renal Disease (MDRD) formula to estimate GFR, which is measured in ml per minute (Levey et al, 2003). The formula requires gender, age, serum creatinine and ethnicity. If a person is of African or Caribbean ethnicity (not mixed race) the eGFR value should be multiplied by 1.21 when reviewing the result.

Caucasion ethnicity can be assumed if ethnicity is unknown.

It has been recommended since April 2006 that hospital laboratories in England report eGFR alongside serum creatinine. This means that blood samples sent for serum creatinine measurement will be returned with a value for eGFR as well. The eGFR can be related to percentage of kidney function. For example, 20ml/min/1.73m² = 20% kidney function. A normal eGFR is considered to be more than 90ml/min/1.73m².

DEFINITION OF CKD
CKD is defined as kidney damage due to pathological abnormalities, abnormal blood/urine tests or imaging studies or eGFR <60ml/min/1.73m² for ≥3 months. Other markers of kidney damage include:
- Persistent microalbuminuria – measured by albumin: creatinine ratio (ACR) – >2.5 in men and >3.5 in women is considered abnormal;
- Persistent proteinuria (after exclusion of other causes, for example, urological);
- Persistent haematuria;
- Structural abnormalities of the kidney;
- Biopsy-proven chronic glomerulonephritis.

Patients with eGFR 60–89ml/min/1.73m² without one of these markers should not be considered to have CKD or given further investigation. Rate of change is important when considering disease progression and need for referral. An eGFR is considered stable if there is <2ml/min/1.73m² change or fluctuation over six months or more.

It is important to note that eGFR is not appropriate for a patient with acute renal failure, as it relies on a stable serum creatinine for its predictive accuracy. In addition, eGFR cannot be used for children.

QUALITY AND OUTCOMES FRAMEWORK
Implementation of the new general medical services contract and the QoF in April 2004 coincided with the drive to implement measures in primary and secondary care for early detection and prevention of progression

CLASSIFICATION OF CKD

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>eGFR (ml/min/1.73m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>Kidney damage with normal or elevated eGFR</td>
<td>≥90</td>
</tr>
<tr>
<td>2*</td>
<td>Kidney damage with mild reduced eGFR</td>
<td>60–89</td>
</tr>
<tr>
<td>3</td>
<td>Moderate reduced eGFR</td>
<td>30–59</td>
</tr>
<tr>
<td>4</td>
<td>Severe reduced eGFR</td>
<td>15–29</td>
</tr>
<tr>
<td>5</td>
<td>Kidney failure</td>
<td>&lt;15 (or dialysis)</td>
</tr>
</tbody>
</table>

*Only considered to be CKD in the presence of urinary abnormality on imaging or urinalysis, otherwise considered as normal function.

of CKD. GP practices can gain up to 27 clinical points for CKD identification/monitoring. This will aid earlier recognition in primary care, and offers the chance to prevent progression and associated complications. It is important to note that renal QOF points overlap with other disease areas. It is expected that nurses in primary care will play a key role in setting up CKD registers. Data suggests a UK prevalence of about 5%, with only 0.4% going on to require renal replacement therapy (dialysis).

How often should eGFR be measured?

Patients’ eGFR should be measured at initial assessment and at least annually in all adults with:

- Previously diagnosed CKD, including identified renal pathology (such as polycystic kidney, biopsy-proven glomerular nephritis, reflex nephropathy), persistent proteinuria or urologically unexplained haematuria;
- Conditions associated with a high risk of silent development of obstructive kidney disease – bladder voiding dysfunction (outflow obstruction, neurogenic bladder), urinary diversion surgery or urinary stone disease (more than one episode/year);
- Conditions associated with a high risk of silent development of parenchymal kidney disease – hypertension, diabetes, heart failure, atherosclerotic coronary, cerebral or peripheral vascular disease;

- Conditions requiring long-term treatment with potentially nephrotoxic drugs, such as ACE inhibitors, angiotensin receptor blockers (ARBs), NSAIDs, lithium, mesalazine, ciclosporin or tacrolimus;
- Multi-system diseases that may involve the kidney, such as rheumatoid arthritis, systemic lupus erythematosus, vasculitis, myeloma.

PREVALENCE

Both US and UK studies of prevalence, progression and referral rates of CKD have found older age to be strongly associated with moderate or severely decreased kidney function. The prevalence of stage 3 CKD and higher (GFR of 30–60ml/min/1.73 m²) in the unselected US adult population was 4.7% (Coresh et al, 2003). A survey of 112,215 people in the UK found prevalence to be 4.9% (de Lusignan et al, 2005). Among people with co-morbidities, such as diabetes, hypertension and heart disease, the rate will be considerably higher.

OTHER CHANGES IN PRACTICE

Protein in the urine is one of the cardinal signs of kidney disease. Confirmation has traditionally relied on the submission of a 24-hour urine sample for quantification of daily protein excretion. However, urine protein:creatinine ratio (PCR) testing has replaced this and requires only a small urine sample (preferably early morning).

The daily total protein excretion can be estimated simply by multiplying the protein:creatinine ratio (PCR) by a factor of 10. For example, a PCR of 100mg/mmol = 100 x 10 = 1,000mg = 1g/day. Some laboratories are unable to perform a PCR but can measure ACR, which can also be used to diagnose proteinuria. Positive tests for proteinuria are:

- ACR >45mg/mmol or ACR >30mg/mmol.

Further advice on interpreting proteinuria can be found in the UK CKD Guidelines (Joint Specialty Committee on Renal Medicine, 2006).

MICROALBUMINURIA

The ACR reading of >2.5mg/mmol (male) or >3.5mg/mmol (female) on 2–3 occasions is consistent with microalbuminuria.

Measurements can vary from day to day, so it is advisable to diagnose microalbuminuria only if two out of three samples in a six-month period are abnormal. To reduce the risk of false positives do not test for microalbuminuria if urinary infection or acute illness is present. It is also advisable to avoid taking a sample for ACR during menstruation as laboratories often reject blood-stained samples.

- Microalbuminuria with eGFR >60ml/min/1.73m² is stage 1 or 2 CKD;
- In patients with diabetes, microalbuminuria is an indication for treatment with ACE inhibitors (or ARBs), with titration to full dose to achieve appropriate blood pressure target, and good glycaemic control (HbA1c 6.5–7.5%).

ACR and serum creatinine should be measured annually in people with diabetes.

CONCLUSION

It is essential that eGFR is used to measure kidney function but CKD should not be diagnosed on a single measurement. The widespread use of eGFR will greatly improve recognition and appropriate care of CKD.

- Part 2 of this unit, discussing referral guidelines, education and management of CKD, will be published in next week’s issue.

KEY REFERENCES


The full reference list for this part of the unit is available in Portfolio Pages on nursingtimes.net

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