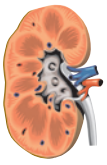
Detecting and managing early kidney failure



by Mark Thomas, Dept of Nephrology, RPH & Kirkman House, 10 Murray St, Perth.

Currently, about 12,000 Australians are receiving renal replacement therapy (i.e. dialysis or transplantation), but many more have milder degrees of asymptomatic chronic renal failure (CRF) – see Fig 1. Key factors increasing risk of kidney disease are either unmodifiable (age, family history, Aboriginal or Torres Strait Islander) or modifiable (smoking, diabetic control, hypertension, obesity). Combined risks can escalate the prevalence ten-fold.

Detection of kidney disease

Although vascular or cystic chronic kidney disease (in particular) may show no abnormalities in the urine sediment, proteinuria or albuminuria should be checked annually in high-risk patients. Proteinuria not only points to most forms of unsuspected renal disease, it is also useful in monitoring response to therapy.

A spot urine protein:creatinine ratio (or the more-sensitive albumin:creatinine ratio) is much more convenient and gives comparable accuracy to a 24-hour urine collection.

Calculating Glomerular Filtration Rate (GFR)

The calculated GFR most easily estimates the degree of renal impairment. This uses the patient's age, lean weight and stable creatinine in a simplified version of the standard Cockcroft & Gault formula (Fig. 2), and is available for computers.

Arbitrary divisions of severity have been revised following the American Kidney Disease Outcome Quality Initiative, so that:

- normal 100-140 mls/min,
- mild CRF < 90 mls/min,
- moderate CRF < 60mls/min,
- severe CRF < 30 mls/min, and
- endstage RF (ESRF) where life is unsustainable without dialysis or transplantation (approx 7-15 mls/min).

GFR falls by 0.5-1ml/min as a part of normal ageing (Fig. 3), even with a stable normal-range serum creatinine, so that a healthy 60-70 year-old will have a GFR of 60-70 mls/min i.e. half their young adult normal. Similarly, a 50 Kg, 80 year-old with a serum creatinine of 100 umol/L has a calculated GFR of only 30 mls/min.

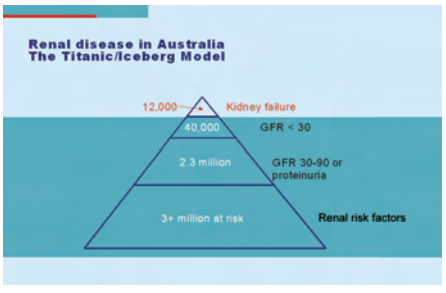


Fig 1. Number of Australians with renal risk factors, mild-severe CRF or ESRF (ie. receiving dialysis or transplantation)

Principles of renal failure therapy

Control blood pressure to the lowest tolerable level. This is the key element of management. Reducing below 140/90 approximately halves the rate of GFR loss, compared to leaving the BP uncontrolled. BP targets below 125/70 are particularly important in the presence of proteinuria, which acts as an independent predictor of accelerated GFR loss. On average, three combined antihypertensives are required to achieve this target.

Suppression of the renin:angiotensin axis. 'Renoprotection' with either ACE inhibitors or Angiotensin receptor blockers (ARBs), alone or together, retards GFR loss beyond the benefit of BP reduction alone. The expected outcome is a 30% increase in serum creatinine, 0.5mmol/L rise in serum K+ and a 50-70% fall in proteinuria (by lowering intra-glomerular pressure). As with all renally-excreted drugs. initial doses are reduced according the GFR, including the active metabolite of all ACE inhibitors, as well as eprosartan and telmisartan among the ARBs.

Avoidance of nephrotoxic insults. This is critical at any stage of CRF. It includes avoiding volume depletion (eg. give i.v. saline when fasting for procedures), unnecessary or large-volume radiocontrast media, aminoglycosides, and NSAID's (including COX-2 inhibitors), as well as addressing all the usual vascular risk factors.

Timely referral for dialysis

Delayed referral increases morbidity, mortality and hospitalisation – yet nearly 50% of patients currently commencing dialysis saw a nephrologist for the first time less than six months earlier.

Management programs involve creation of vascular access, education on dialysis options and managing complications, including anaemia – all preferably delivered using a multidisciplinary team approach.

$$\frac{[140 - \text{age (years)}] \times \text{Lean Weight* (kg)}}{\text{s. creatinine (umol/L)}} \times 1.23 \text{ (males only)}$$

* Lean weight (equivalent to BMI of 25) approximately
= Height (cm) - 100, AND
= Expected serum creatinine for female with normal renal function

Fig 2. Calculated GFR based on Cockcroft & Gault formula, with "rules of thumb"

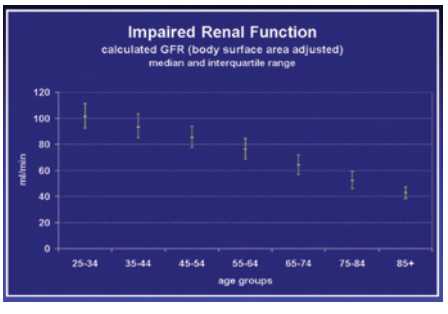


Fig 3. Linear fall in GFR with normal ageing

Take-home messages

- Check creatinine, calculated GFR, and proteinuria annually in high-risk patients (i.e. age, family history, Aboriginal or Torres Strait Islander, smoking, diabetes mellitus, hypertension, obesity).
- If calculated GFR is <90 mls/min in young adult or < 60 in the elderly, consider introducing ACE inhibitors or ARBs (then both). Aim for lowest tolerable BP and monitor the effect on electrolytes and proteinuria.
- Refer patients with progressive CRF to a nephrologist before the GFR is < 30mls/min, whether or not dialysis may be appropriate.

Footnote. The Australian Kidney Foundation has initiated a nation-wide education project, Kidney Check Australia Taskforce (KCAT), to reduce endstage renal disease through earlier detection and management of mild chronic renal failure. The key elements are investigation of high risk groups, initiation of appropriate therapy and timely referral.