# What's the hoo-haa about eGFR?

**N.B. > 60 mls/min ≠ normal!**

**By Mark Thomas, Renal Physician, RPH**

Following a nation-wide initiative spearheaded by Kidney Health Australia, many pathology laboratories are now reporting an **estimated glomerular filtration rate** (eGFR), calculated from the patient's age, sex, serum creatinine and race. This is based on a formula derived from the landmark American Modification of Diet in Renal Disease (MDRD) study (NEJM, 1996).

## Why the eGFR?

As the MDRD formula does not require any body measurements, it is very convenient for automatic laboratory calculation, but may therefore produce a falsely high GFR for very low body muscle mass, or falsely low GFR for large muscular builds.

The "race" factor in the MDRD formula involves increasing the GFR in African-Americans, in recognition of their greater average muscle mass than Caucasians. No similar correction factors have been derived for ATSI, Maori or Asian populations to date.

No normal range for GFR is provided, but the simplest estimate is given as (140-age) mls/min. The MDRD formula loses accuracy in the near-normal GFR range, so is reported as just >60mls/min.

There are other "guesstimate" formulae that do use body measurements, eg Cockcroft & Gault, or its simplified Australianised version that I use*. None of these formulae (including MDRD) give perfect correlation with formal isotopic GFR measurement, especially at extremes of age, body size, protein intake, fluid status, malnutrition or liver disease. Height actually gives a closer correction to true GFR than body surface area or body weight. The Thomas GFR and MDRD GFR have a correlation of 0.72, with greatest differences in the very small or very large patients.

## Rules of Thumb

- Thomas GFR = (140 – age) x lean weight* x 1.23 (males)/ s. creatinine (umol/L)
- Lean weight = [Height (cm) – 100] or actual weight (whichever is less)
- Normal GFR for age = (140 – age) mls/min
- If GFR normal for age, then serum creatinine = lean weight (female)
- If GFR normal for age, then serum creatinine = lean weight x 1.23 (male)

## CASE REPORT: eGFR Success!

Dorothy is a delightful 50kg 80-year-old with T2DM for 15 years. Her BP of 160/90 is your best juggle between her calcified arteries (?spurious high BP) and her decalcified bones (fracture risk if overtreated). She has lost a little of her sparkle and appetite over the last year and has a tendency to diarrhoea and anaemia (but negative stool cultures and colonoscopy).

Routine electrolytes show a stable normal-range s. creatinine of 85, but a new MDRD eGFR result of 59 mls/min. Alerted, you recalculate her Thomas eGFR, corrected for her tiny frame, obtaining a results of 35mls/min (age-normal = 60mls/min). Either way, she has at least moderate severity renal impairment. Certainly, her creatinine is a lot more than her lean weight.


■ *eGFR calculator can be downloaded from or used at the Kidney Health Australia website*

The penny drops! You reduce her metformin from 1g b.d. to 0.5g b.d. with resolution of her GI symptoms in 3 days, and no loss of diabetic control. Her BP and exertional dyspnoea improve after converting her ACEI to an ACEI/diuretic combination, with no change in renal function. An iron infusion raises her ferritin towards 500 umol/L with a 10g/L rise in Hb. Her daughter cancels plans for a nursing home and drops off two bottles of your favourite red wine.

## If eGFR is < 60mls/min, what do I do?

eGFR < 60mls/min is a signal to:

- Look for a recent insult: illness, diuretics, NSAIDs, X-ray dye
- Investigate: electrolytes, MSU, spot urine ACR (or spot PCR if heavy proteinuria), consider renal ultrasound
- Check complications: overload, ↓Hb, ↑K+, ↓HCO3, ↑PTH (with ↓Ca & ↑PO4)
- Address all cardiovascular risk factors, esp. BP and smoking
- Dose-adjust renally-excreted drugs
- Start ACEI +/- ARBs (esp. if proteinuria), and monitor K+.

If eGFR is <u>< 30mls/min</u> or changing rapidly:

- As above, plus
- Refer to nephrologist
- Consider later need for dialysis or transplantation (eGFR 15 mls/min)

## CASE REPORT: eGFR Disaster!

Simon is a tall, successful 32-year-old stockbroker who works long hours. He remains fatigued after viral bronchitis a month ago, unable to complete his usual gym class. One empiric course of roxithromycin made no difference. His BP is 150/95 at a lean weight of 80kg with occasional creps at both bases. His Hb is a little low (125 g/L), but blood count, LFTs, serum creatinine (125 umol/L) and eGFR (> 60mls/min) are otherwise unremarkable; *Mycoplasma* serology is negative. You suggest he rest until recovered and return in month if not improved.

Six weeks later, your mail includes Simon's discharge summary. He had been admitted to hospital with rapidly progressive glomerulonephritis, requiring dialysis, aggressive immunosuppression and plasmapheresis. He is unlikely to regain renal function and cannot be transplanted until free from anti-GBM antibodies.

The medical registrar mentions your "failure to check a urinalysis". Before reaching for the phone to explain some of the realities of real-world medicine to this registrar, you go back to the results and calculate his GFR as 85mls/min vs age-normal of 110 mls/min. It is hard to concentrate on your next three patients.

## If eGFR is >60mls/min, don't assume kidney function is adequate

- If there is high BP or abnormal urine sediment, then calculate the GFR
- If serum creatinine is > or < than expected, then calculate the GFR
- Compare calculated GFR to the normal GFR for age
- If >30mls/min below expected, refer to nephrologist

## Further reading:

Kidney Health Australia: www.kidney.primed.com.au, and www.kidney.org.au, with online and downloadable MDRD eGFR calculator

Johnson DW, Usherwood T. Automated reporting of GFR. Australian Family Physician 2005;34(11):925-931.

*Footnote. Kidney Health Australia (formerly 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. The opinions in this article are not necessarily endorsed by KCAT.*

This clinical update is supported by an independent educational grant to Medical Forum from Amgen Australia.