

# Should we still be measuring urea?

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### Key point:

In most situations choose eGFR or serum creatinine for assessing renal function

Over recent years the role of urea as a renal function test, has been mostly superseded by creatinine and more recently by the estimated glomerular filtration rate (eGFR). Despite urea being well recognised as less useful for routine investigation of renal function, there continues to be significant variation in the patterns of testing of urea throughout New Zealand.

### Urea is a less reliable test of renal function

In the past “U&Es” (urea and electrolytes) was frequently requested for assessing renal function. Creatinine is now used in preference to urea as it has become recognised as a more constant measure of renal function (because it is an end-product of creatine metabolism in muscles). In contrast, urea is an end product of protein metabolism, therefore levels can vary for a number of reasons, see sidebar. For example, a high protein diet, tissue breakdown, major GI haemorrhage and corticosteroid therapy can lead to an increase in urea whereas a low protein diet and liver disease can lead to a reduction. Also, because 40–50% of urea filtered by the glomerulus may be reabsorbed by the tubules,<sup>1</sup> urea is a less useful indicator of either glomerular or tubular function

Urea is not longer indicated in most situations. Although there are some limitations with creatinine, it is considered a better measure of renal function. Furthermore, the eGFR (calculated by the laboratory) reflects renal function more accurately even when the creatinine levels are normal.

### In most situations choose eGFR or serum creatinine for assessing renal function

Although creatinine is widely used as a test of renal function and is raised in chronic renal failure, it is an insensitive marker of early renal loss. In many patients with early renal dysfunction, serum levels do not increase until at least 50% of the filtration capacity is lost.

### Causes of a raised urea

#### Pre-renal:

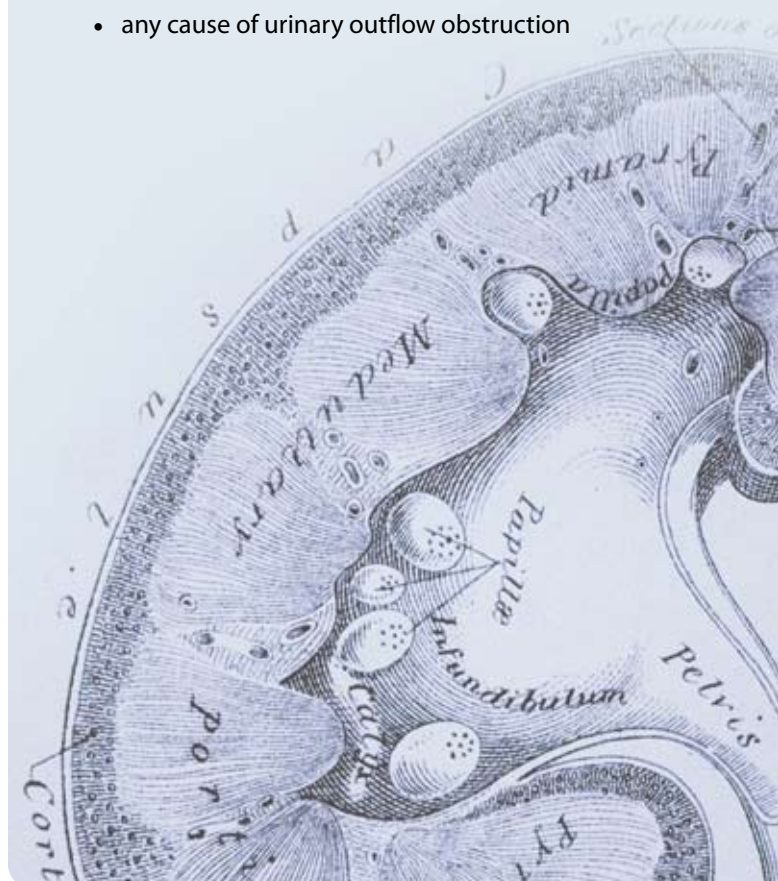
- increased hepatic production of urea:
  - high protein diet
  - gastrointestinal haemorrhage
  - increased protein catabolism – trauma, major surgery, extreme starvation with muscle breakdown
- increased renal reabsorption of urea – any cause of reduced renal perfusion, for example, congestive cardiac failure, shock, severe diarrhoea
- iatrogenic e.g. drug therapy leading to an increased production of urea – corticosteroids

#### Renal:

- any cause of acute or chronic renal failure

#### Post-renal:

- any cause of urinary outflow obstruction



eGFR has superseded creatinine measurement alone as the preferred measure of chronic renal disease because it reflects renal function more accurately even when the creatinine levels are normal. Creatinine and eGFR are recommended for screening and monitoring of patients with early loss of glomerular function.

The eGFR formula assumes a number of factors including normal diet, average weight and stable renal function, therefore it does not work in a number of situations, including:

- children under age 18
- patients with acute changes in renal function, including dialysis
- vegetarians or patients taking supplements such as creatine
- those with unusual muscle bulk, either very low (wasting diseases, amputees) or high (very obese patients or body builders)

The formula was derived in Caucasians and, while it is used for other ethnic groups, it may underestimate renal function in Māori and Pacific Island patients who have relatively higher weight and muscle bulk.

#### **For patients on diuretics or ACE-inhibitors monitor changes in renal function with with eGFR**

Any changes in renal function associated with diuretics<sup>2</sup> or ACE-inhibitors<sup>3</sup> are best monitored with eGFR (as well as electrolytes).

#### **Confirm acute renal failure with falling eGFR or rising creatinine**

If the eGFR is found to be unexpectedly low, best practice is to exclude acute renal failure by a repeat eGFR and serum creatinine. Discuss urgently with the nephrology team if acute renal failure is confirmed and there is evidence of rising blood pressure, oedema, proteinuria or haematuria.

Both urea and creatinine are increased in acute renal failure. Previously the urea:creatinine ratio was used to distinguish between pre-renal and renal causes, but this is now considered unreliable. Instead, a serum creatinine greater than 250 µmol/L is suggestive of a renal cause with 90% probability.<sup>4</sup>

## **Does urea testing have a role in Primary Care**

**The role of urea is limited to the following:**

### **Urea is used for managing dialysis in end stage renal failure**

Both serum urea and creatinine may be required by nephrologists for dialysis patients.

In end stage renal failure (equivalent to CKD 5), urea levels are used as a proxy measure for all the metabolites that accumulate with poor renal excretion causing the symptoms of 'uraemia'. When the decision to use peritoneal or haemo-dialysis, the prescription is adjusted on the urea levels in order to remove about two thirds of the total-body urea content during each treatment.<sup>5</sup>

### **Urea is rarely used for the assessment of hydration status**

Initial assessment of dehydration is best made with clinical, rather than biochemical parameters.<sup>6</sup> Occasionally urea may be helpful for the assessment of dehydration in the frail elderly, when clinical indicators are less reliable.

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#### **References:**

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