

## Standardisation of the U&E Profile

### Comments to :

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### Background

There are very few strict definitions of the U&E profile. The recent Acute Hospital Portfolio Reviews made the following attempt:

*Urea and electrolyte test in biochemistry. The measurement of urea in the blood is an indicator of renal or kidney function. An automated test involving measurement of urea, creatinine and the electrolytes; chlorine, sodium, calcium, potassium and bicarbonate in the blood plasma.*

It is most unlikely that very many laboratories comply with this definition as intended (and no laboratories measure chlorine).

In a review of the clinical need for plasma urea and electrolytes in 1984 the late Professor D B Morgan made the following definition:

*The plasma sodium, potassium and urea, sometimes with chloride, bicarbonate and creatinine, form a set of measurements generally known as the urea and electrolytes, the 'U&E'.*

The D B Morgan definition emphasized the flexibility of approach, with a minimum data set of sodium, potassium and urea, and with optional inclusions dependent on whim, cost, availability or perceived clinical need. Potentially the U&E profile could take on eight different strict definitions using this basic premise:

1. [Na]+[K]+[Urea]
2. [Na]+[K]+[Urea]+[Creat]
3. [Na]+[K]+[Urea]+[HCO<sub>3</sub>]
4. [Na]+[K]+[Urea]+[Cl]
5. [Na]+[K]+[Urea]+[Creat] ]+[HCO<sub>3</sub>]
6. [Na]+[K]+[Urea]+[Creat]
7. [Na]+[K]+[Urea]+[HCO<sub>3</sub>]+[Cl]
8. [Na]+[K]+[Urea]+[HCO<sub>3</sub>]+[Cl]+[Creat]

However, further information obtained from recent audits within the UK indicate that the profile is absolutely invariable only in the provision of sodium and potassium concentration, together with one indicator of renal function which could be either urea or creatinine concentration. Thus further potential definitions could include:

9. [Na]+[K]+[Creat]
10. [Na]+[K]+[Creat]+[HCO<sub>3</sub>]
11. [Na]+[K]+[Creat]+[Cl]
12. [Na]+[K]+[Creat]+[HCO<sub>3</sub>]+[Cl]

Whatever profile laboratories choose to provide currently, the tests within NHS clinical laboratories are invariably measured on a high capacity automated analyser.

As a collective term, “electrolytes” in the context of the U&E profile thus can include the measurement of sodium, potassium, with an option on chloride and/or bicarbonate in serum or plasma. However, analytical expediency, either because of cost or non-availability within the automated equipment repertoire, has reduced the collective in some laboratories through the removal of bicarbonate, chloride or both.

Under these circumstances experience has shown that such removals are generally not met with large scale persistent clinical protest, **providing that the missing measurements remain available as additional tests** for specific clinical circumstances e.g. assessment of anion gap or assessment of a metabolic acid/base disturbance. However, for the vast majority of current automated analytical platforms sodium, potassium and chloride are measured within a single block of ion-selective electrodes. Thus the removal of chloride from the collective would require suppression of an available result for most laboratories.

The term “urea” within U&E profile would originally have only indicated the measurement of serum or plasma urea alone. However, the widespread practice since the introduction of automated equipment has been to provide both urea and creatinine measurements within the U&E profile. The creatinine concentration in serum is predominantly dependent on the glomerular filtration rate (GFR), and is now widely used to estimate this – the eGFR. There is pressure from primary care to incorporate the eGFR within the U&E profile as a matter of course. The eGFR, however, should never form part of the U&E profile as this would result in a large proportion of inappropriate estimates,

particularly in the acutely ill, together with the potential for a large amount of generated angst, particularly in the elderly without other objective evidence of renal disease.

The serum urea concentration is also dependent on the GFR but is significantly influenced by endogenous urea production and the tubular reabsorption of urea. Both of these influences may provide clinical insights into the causes of perturbations of serum or plasma urea and thus it is appropriate that this analyte should be retained within the collective.

There are suggestions from some quarters that the U&E profile should vary in its composition based upon the origin of the request e.g. a specific profile for primary care, and also different profile composition for acute medical/surgical needs, and yet a further comprehensive profile for renal medicine. This would complicate the issue considerably, could have a resource implication for many laboratories and would inevitably lead to errors in provision. As previously stated, however, it is important that analyte(s) not included within the basic definition is/are available as additional tests.

### **Recommendation: U&E profile**

It is recommended that the definition of the serum or plasma U&E profile should be the measurement of

Sodium	mmol/l
Potassium	mmol/l
Chloride	mmol/l
Urea	mmol/l
Creatinine	µmol/l

### **Periodicity of Testing**

Defining the time interval that should elapse before test (profile) is repeated is a useful tool for demand management. However, the U&E profile includes specific tests that can, within certain clinical scenarios, change extremely rapidly. Moreover monitoring such changes may have significant prognostic or therapeutic importance. Thus without associated clinical information (which is rarely available to the clinical laboratory in sufficient detail) it would be practically impossible to place a minimum periodicity on the repeat requesting of the U&E profile.

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12<sup>th</sup> March 2007.

### **References**

Acute hospital portfolio reviews 2005/2006: Guide to Diagnostic Services  
Healthcare Commission, Version 1: 13 February 2006.

Morgan DB. Plasma urea and electrolytes: the clinical need.  
Clinics in Endocrinology and Metabolism 1984; **13**: 399-412.