

## Commentary

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# Acute kidney injury on admission to the intensive care unit: where to go from here?

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## Abstract

Acute kidney injury (AKI) is a common problem, especially in critically ill patients. In *Critical Care*, Kolhe and colleagues report that 6.3% of 276,731 patients in 170 intensive care units (ICUs) in the UK had evidence of severe AKI within the first 24 hours of admission to ICU. ICU and hospital mortality as well as length of

stay in hospital were significantly increased. In light of this serious burden on individuals and the health system in general, the following commentary discusses the current state of knowledge of AKI in ICU and calls for more attention to preventive strategies.

Acute kidney injury (AKI) has been the focus of numerous publications and research projects in the past 5 years [1-4], including the study by Kolhe and colleagues [1] in *Critical Care*. Interestingly, as facts about AKI and its impact on prognosis emerged, areas of uncertainty and controversy became apparent [5,6]. It is now well known that AKI affects a large number of patients (although the exact incidence is variable), that AKI *per se* is associated with an increased risk of death, and that patients who need renal replacement therapy (RRT) have a higher risk of dying [2-4,7,8]. There is also evidence that AKI is a dynamic process, with many patients progressing through different stages of severity, and that early AKI appears to have a better prognosis than late AKI [7]. Numerous studies have identified factors that influence the prognosis of patients with AKI, including inherent patient characteristics as well as modifiable factors (ie, nephrotoxic drugs, fluid status, haemodynamics) and non-patient related aspects like size of ICU and type of hospital [2-4].

Despite this progress, several areas in the field of AKI remain uncertain, the issue of RRT being a particularly controversial one [5]. There is wide variation in clinical practice regarding mode, indication, timing, dose and provision of RRT [9]. Despite a widely held perception that a continuous mode may be better for critically ill patients with AKI, especially those with haemodynamic instability, clinical studies have failed to show

a consistent survival advantage for patients on continuous RRT compared to intermittent haemodialysis [10]. The Hemodiafe Study (randomized controlled trial comparing intermittent haemodialysis with continuous haemodiafiltration in 21 centres in France) not only showed similar mortality rates in both groups but also confirmed that nearly all patients with AKI as part of multiple-organ dysfunction syndrome could be treated with intermittent haemodialysis provided strict guidelines were used to achieve tolerance and metabolic control [11].

In a landmark study, Ronco and colleagues [12] made a strong case for dosing RRT (the more the better). However, when challenged in subsequent studies, this conclusion could not always be confirmed. Most recently, the Acute Renal Failure Trial Network study demonstrated in a randomized controlled multicenter fashion that intensive renal support in critically ill patients with AKI did not decrease mortality, improve recovery of kidney function or reduce the rate of non-renal organ failure compared to less intensive therapy [13].

In view of these uncertainties about 'best clinical practice' it is not surprising that the mortality associated with AKI in critically ill patients has not substantially changed during the past few decades despite increasing international efforts and advances in medical knowledge [14]. Lack of a uniform definition for AKI and lack of evidence-based guidelines have been blamed for

AKI: acute kidney injury; ICU: intensive care unit; RRT: renal replacement therapy.

some of the inconsistencies and poor progress. Formation of the international AKI network group, design of the RIFLE criteria and later the AKI classification and plans for streamlined focussed research are major steps in the right direction to tackle the problems associated with established AKI [6].

The study by Kolhe and colleagues in *Critical Care* illustrates that we may need to focus our attention also on the time before AKI has developed. Kolhe and colleagues show that 6.3% of 276,731 patients admitted to 170 ICUs in the UK during a 10 year period had evidence of severe AKI (serum creatinine  $\geq 300$   $\mu\text{mol/L}$  and/or urea  $\geq 40$   $\text{mmol/L}$ ) during the first 24 hours in ICU [1]. Their ICU and hospital mortality as well as stay in hospital were significantly increased. Moreover, among survivors, requirement for in-hospital care was even higher. The study also showed that a perfect mortality prediction model is still missing. As addressed by the authors, the study has some weaknesses (arbitrary definition of severe AKI, potential risk that some patients classified as AKI in fact had advanced chronic kidney disease, and no information on the number of patients treated with RRT). However, there are important messages: 6.3% of all ICU patients were admitted with severe derangement of renal function. The exact reasons for renal dysfunction are not given and may not be known but the question remains whether AKI could have been prevented prior to transfer to ICU. Chertow and colleagues [15] previously showed that even small changes in serum creatinine by  $\geq 0.3$   $\text{mg/dL}$  ( $\geq 26$   $\mu\text{mol/L}$ ) whilst in hospital were independently associated with an increased risk of dying. Given the serious implications of any degree of AKI on the individual and the health system, and the lack of curative therapies for AKI, it may be necessary to shift our attention more to the actual way we look after patients at risk of AKI, that is, how we recognise high-risk patients and prevent AKI. This call for 'attention to basics' includes general measures like education and training of nursing and medical staff, emphasis on the importance of the clinical examination, attention to drugs, drug dosing and nutrition, and early consultation with specialists in the field. The success of these simple non-technical steps depends on combined efforts by anybody looking after patients in hospital. The overall action plan to reduce the burden of AKI needs to incorporate these preventive strategies as well as regular review of clinical practice, in parallel with international collaboration and focussed research into drug therapies and technologies.

## Competing interests

The author declares that they have no competing interests.

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