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## Exciting Times in Research Regarding the Definition, Diagnosis, Complications, and Outcomes of Acute Kidney Injury

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This issue of *Advances in Chronic Kidney Disease* presents recent advances in the definition, classification, diagnosis, complications, therapy and long term outcomes in acute kidney injury (AKI) in both adults and children. There is a special emphasis on the development of chronic kidney disease (CKD) after AKI.

AKI is a complex syndrome with manifestations ranging from a minimal elevation in blood urea nitrogen (BUN) or serum creatinine to oliguria or anuria requiring renal replacement therapy (RRT). The multiple definitions of AKI have made comparisons across studies and populations very difficult. The international acute kidney injury network (AKIN) has proposed uniform definitions and staging criteria for AKI which should enhance the comparability of clinical data and clinical trials in AKI. These definitions and staging criteria are discussed in “AKI-definitions and new paradigms” by Endre.

Serum creatinine, which has typically been used to diagnose AKI, is dependent on non renal factors independent of kidney function. Alterations in serum creatinine may lag several days behind actual changes in GFR and serum creatinine is not sensitive to the loss of kidney reserve. A possible reason for the high mortality of AKI and the failure of interventional trials in AKI is the dependence on serum creatinine for diagnosis. Earlier detection of AKI with a kidney specific biomarker, that is released into the blood or urine by the injured kidney, may result in earlier nephrology consultation, more optimal dosing of antibiotics, avoidance of nephrotoxic agents, and initiation of earlier specific therapies to repair the damaged kidney and may predict the need for dialysis, mortality and long term kidney outcome. Novel biomarkers of AKI e.g. IL-18, NGAL and KIM-1 have been shown to rise before serum creatinine in certain patients with AKI. Novel biomarkers of AKI are discussed by Edelstein in this edition

The development of AKI in patients is an independent risk factor for mortality. The development of respiratory failure in patients with AKI increases mortality even more. Studies have demonstrated that the pulmonary complications of AKI are not simply from volume overload. In this edition, Faubel reviews the evidence that AKI contributes to pulmonary complications including the original descriptions of pathology and pathophysiology, recent epidemiologic data, and experimental studies in animals.

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Approximately 4% of all patients in the ICU will require RRT. Bouchard, Weidemann and Mehta review the numerous studies that have addressed the modality and dose of dialysis in AKI. There is no clear evidence that one modality of RRT is superior to another. However, several single center studies have demonstrated that doubling the dose of dialysis significantly improves mortality in AKI. Two large multi-center studies of the dose of dialysis in AKI have been concluded and the results are eagerly awaited. An expanding area of interest is the consequence of different modalities of RRT on the development of CKD.

According to the United States Renal Data System (USRDS) “acute tubular necrosis (ATN) without recovery” as a cause of end stage renal disease (ESRD) has risen from 1.2% of all ESRD patients 1994 to 1998 to 1.7% 1999 to 2003. The incidence of ESRD after AKI will likely continue to rise with an aging population, increase in comorbidities and better ICU care. In this edition, long term outcomes after AKI are reviewed in the following conditions: after AKI in the ICU (reviewed by Goldberg and Dennen), after kidney delayed graft function (reviewed by Yarlagadda and Jani), in children (reviewed by Goldstein and Devarajan) and after cardiac surgery (reviewed by Stafford-Smith, Patel, Phillips-Bute, Shaw and Swaminathan).

In summary, these articles have reviewed in depth some of the recent new information about the definition, classification, diagnosis, complications, therapy and long term outcomes in AKI. These are exciting times for nephrologists and AKI researchers as the definition of AKI becomes standardized, the diagnosis of AKI using biomarkers rather than serum creatinine is studied, the contribution of AKI to respiratory complications is studied, and the results of the largest treatment studies in AKI are awaited. The realization that AKI may lead to CKD emphasizes the need for novel therapies in AKI.