Foreword

Nephrology in Pediatric Critical Care

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Renal problems are frequently seen in critically ill pediatric patients admitted to the intensive care unit (ICU); however, these problems are often among those least recognized unless the patient was admitted with a primary diagnosis of renal disease. A pediatric nephrologist is often involved in the care of children and newborns admitted to the ICU in the management of acute renal failure with or without renal replacement therapy, fluid and electrolyte abnormalities, hypertensive emergencies, urosepsis, and procedure-related renal complications. These include cardiac surgery and cardiac catheterization in newborns and children. Diagnosis of acute renal failure (acute kidney injury [AKI]) and hypertensive crisis is challenging because the baseline parameters of measurements change with age and growth. Acute renal failure (AKI) is defined as an acute decrease in the glomerular filtration rate, which results in an increase in serum creatinine. However, an increase in serum creatinine can be delayed by as much as 48 hours after the damage to the kidney has occurred, therefore, resulting in a delayed diagnosis of acute renal failure. Despite its limitations, a change in serum creatinine remains the gold standard for the diagnosis of acute renal failure. To capture small changes in renal function, pediatric RIFLE (risk, injury, failure, loss, end-stage) was developed. This relies on changes in serum creatinine, estimated creatinine clearance, or urine output. In a preterm and term newborn, serum creatinine changes during the first few weeks of life due to postnatal physiological changes in renal function. It is therefore challenging to detect the onset of early renal failure in this group of patients in the ICU setting. Patients with acute renal failure who are unresponsive to medical management will require renal replacement therapy, which consists of three modalities (e.g., continuous renal replacement therapy, hemodialysis, and peritoneal dialysis).

Renal replacement therapy must be customized based on a patient's age, weight, and clinical condition.

The incidence of hypertension in the pediatric ICU can be as high as 25%, which contributes to the overall morbidity and mortality. A hypertensive crisis needs to be addressed immediately to avoid acute and chronic end-organ damage. Different pathophysiological mechanisms can be responsible for the hypertensive crisis, and management differs based on the underlying etiology. If a patient experiences above-target hypertension—with or without symptoms—it should be addressed via appropriate pain/anxiety control, deescalate the therapy of blood pressure enhancing medications, and by appropriate parenteral antihypertensive medications. Creating a fluid deficit is reserved for a patient with fluid overload.

Urinary tract infection is the third most common nosocomial infection in the ICU. It can progress to urosepsis in critically ill patients with or without renal anomalies. Early identification and treatment of urosepsis in infants and children is crucial. Urosepsis leads to profound disruption in the normal hemodynamic status of affected patients, with deleterious effects on renal, cardiac, respiratory, and hepatic functions. In urosepsis it is crucial to initiate treatment as early as possible, including fluid support, stabilization of the hemodynamic state with pressors if indicated, and empiric intravenous antimicrobial therapy. However, if possible, nephrotoxic antimicrobial therapy should be avoided.

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