INVITED COMMENTARY

Community-Acquired Acute Kidney Injury in Hospitalized Children: Do Not Miss the Diagnosis!

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Acute kidney injury (AKI) is an abrupt decline in glomerular filtration rate that could lead to health consequences in children in both the short- and -long term [1]. In fact, in the short-term, AKI may increase the length of the hospitalization, and the morbidity and mortality of patients; while, in the long-term, it exposes to an increased risk of chronic kidney disease (CKD). Even a mild AKI, indeed, doubles the risk of CKD during the follow-up [2].

AKI is a common condition in hospitalized children. Reports have shown that AKI can worsen several common pediatric disorders with an AKI prevalence of about 25% in acute gastroenteritis [3], 20% in community-acquired pneumonia [4], 45% during type 1 diabetes mellitus onset [5], and around 7% in acute appendicitis [6]. In this issue of *Indian Pediatrics*, Ashish, et al. [7] evaluated frequency, etiology, outcomes and risk factors for mortality in Indian children with community-acquired AKI (AKI already present at the time of hospitalization). Interestingly, the authors found that 7.7% of the hospitalized children presented with AKI. Diarrheal diseases with dehydration and sepsis were the most common causes of community acquired AKI. Among the 215 patients presenting with AKI, 11.2% died, 78.1% had complete kidney recovery while 10.7% had partial or absent kidney recovery at discharge [7]. For the 23 patients with partial or absent kidney recovery, a 3-month follow-up was also available and the authors found that 10 of them developed CKD (3 becoming dialysis-dependent) [7].

This study gives a picture of the prevalence of the community-acquired AKI in an urban pediatric tertiary care hospital in India providing relevant information for the daily clinical practice. It underscores, indeed, that the overall prevalence of AKI as a complication of common pediatric illnesses is not negligible [7]. The awareness of pediatricians about this topic is relevant in our opinion because AKI, especially in its milder forms, is often undiagnosed [3-6]. In fact, in our research experience, we frequently noticed that the AKI diagnosis was made only retrospectively when analyzing the data for research purpose [3,4,6]. Moreover, the data provided by the authors [7] further support the need of a post-discharge follow-up for children who presented with an AKI episode, in order to accurately detect clinical signs suggesting the evolution toward CKD.

In the AKI pathophysiology, the early stage occurs when the renal blood flow decreases (functional prerenal AKI) causing ischemia and adenosine triphosphate depletion in the renal tubular cells leading to an acute renal tubule cell injury and dysfunction. The acute tubular injury determines an adaptive fall in glomerular filtration rate due to renal vasoconstriction in order to compensate for failure to reabsorb filtered solute. If ischemia persists, the renal tubular damage evolves to overt acute tubular necrosis shifting the AKI from functional to intrinsic [5]. Therefore, being aware of the AKI pathophysiology in the most common pediatric conditions (i.e., dehydration in children with acute gastroenteritis [3] and type 1 diabetes mellitus onset [5] or systemic inflammation in children with community-acquired pneumonia [4] or acute appendicitis [6]) is important to avoid the onset of this complication and to prevent the progression of AKI from functional to intrinsic.

The Kidney Disease/Improving Global Outcomes provides specific criteria to diagnose AKI [1]. The diagnosis can be made on the basis of serum creatinine and urinary output criteria. AKI is defined as either an increase in serum creatinine by ≥0.3 mg/dL within 48 hours or increase in serum creatinine to ≥1.5 times baseline, which is known or presumed to be occurred within the 7 prior days, or urine volume <0.5mL/kg/h for 6 hours [1]. While these data are easily available in adulthood, in children they could not be easily obtained unless using an invasive approach, not always achievable or justifiable in pediatrics. In fact, especially in case of mild clinical pictures who apparently do not require seriate blood sample collections for biochemical analyses or vesical bladder catheterization for urine output quantifica-

tion (in non-toilet trained patients), a mild AKI diagnosis could be missed. Moreover, the real increase of the serum creatinine value compared with measured baseline serum creatinine seems to be challenging, considering that healthy children rarely undergo to creatinine measurements. To overcome these issues, both for research and clinical purpose, height- and age-based methods to estimate the basal serum creatinine on the basis of glomerular filtration rate normative values have been proposed and validated in children [8-11]. To avoid daily bedside calculations, we have designed a table with the back-calculation of basal serum creatinine for children both on the basis of height- and age-based methods [12,13] (**Table I**).

Table I Estimated Basal Serum Creatinine on the Basis of Normative eGFR Values

On the basis of height[1]		Age (y)	*On the basis of age*[2]	
Height (cm)	Cr (mg/dL)		Cr (mg/dL)	
			Male	Female
70,00	0.34	0.5	0.36	0.37
90,00	0.35	1	0.30	0.30
105,00	0.36	2	0.26	0.26
110,00	0.38	3	0.29	0.28
115,00	0.39	4	0.31	0.31
120,00	0.41	5	0,33	0.33
125,00	0.43	6	0.35	0.35
130,00	0.45	7	0.37	0.38
135,00	0.46	8	0.40	0.40
140,00	0.48	9	0.42	0.42
145,00	0.50	10	0.45	0.45
150,00	0.52	11	0.48	0.48
155,00	0.53	12	0.52	0.50
160,00	0.55	13	0.56	0.53
165,00	0.57	14	0.60	0.55
170,00	0.58	15	0.65	0.58
175,00	0.60	16	0.69	0.60
180,00	0.62	17	0.73	0.62
185,00	0.64	18	0.76	0.63
190,00	0.65	19	0.79	0.65

[1]Calculated on the basis of CKiD equation [12]; [2]Calculated on the basis of age equation [13].

In conclusion, AKI is common in hospitalized children. Being aware that AKI could complicate several common pediatric conditions could improve the children's care by making an early diagnosis, in order to prevent AKI progression and, through a specific post-discharge follow-up, to early detect the progression to CKD. The paper appearing in this issue of the journal [7] further emphasizes these considerations, making pediatricians aware of the importance of early diagnosis of AKI in children.

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