Acute Kidney Injury
The Ugly Truth

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KEYWORDS

• Acute kidney injury • KDIGO • Continuous renal replacement therapy • AKIN • RIFLE

KEY POINTS

- Acute kidney injury (AKI) is a common cause of morbidity and mortality in hospitalized patients.
- The Kidney Disease Improving Global Outcomes (KDIGO) guidelines are the most recent guidelines for the definition and staging of AKI. These were preceded by the risk, injury, failure, loss, and end-stage renal disease (RIFLE) and Acute Kidney Injury Network (AKIN) criteria.
- Acute tubular necrosis is the most common cause of AKI in hospitalized patients, accounting for 45% of all in-hospital AKI.
- The mainstay of treatment of AKI is the prompt identification of the underlying cause and aggressive hemodynamic support.

ACUTE KIDNEY INJURY: THE UGLY TRUTH

Acute kidney injury (AKI) is a common and complex problem. The incidence of AKI severe enough to warrant renal replacement therapy (RRT) has an occurance of 2 to 300 per million population per year; while AKI without the need for RRT occurs in 2 to 3000 per million population per year.[1] Close to two-thirds of all patients in the critical care setting will develop AKI and approximately 5% of intensive care unit (ICU) patients will develop AKI severe enough to warrant RRT.[1] AKI is typically caused by renal ischemia and is characterized by the abrupt decline in urine production and rise in serum creatinine.

AKI was without a consensus definition until 2002 when the Acute Dialysis Quality Initiative (ADQI), an expert panel, developed the risk, injury, failure, loss, and end-stage renal disease (RIFLE) criteria classification of acute renal failure. It includes 3 classes of increasing severity of renal failure (risk, injury, and failure) and 2 outcome

Disclosure Statement: The author has nothing to disclose.
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Physician Assist Clin 1 (2016) 149–159
http://dx.doi.org/10.1016/j.cpha.2015.09.006 **physicianassistant.theclinics.com**
2405-7991/16/$ – see front matter © 2016 Elsevier Inc. All rights reserved.

variables (loss, and end-stage renal disease [ESRD]). The classes of severity of kidney failure are based on increase in serum creatinine, decrease in glomerular filtration rate (GFR) and reduction in urine output (UOP). The outcome variables establish time frames for determination of prolonged loss of function (>4 weeks) and the development of ESRD.[2]

Following the development of the RIFLE criteria, the Acute Kidney Injury Network (AKIN), which recommended the term AKI be used to represent the entire spectrum of acute renal failure, was formed in 2004. It also set forth a staging system for AKI reflecting quantitative changes in serum creatinine and UOP. AKIN varies from RIFLE by defining AKI as reduced function over a 48-hour period versus the 7 days suggested by RIFLE. AKIN also includes less severe injury in its diagnostic criteria and removes GFR, which is unpredictable during AKI. The AKIN criteria are predicated on 2 factors: that volume status has been optimized and the presence of urinary tract obstructions has been excluded. The need for RRT was not included in the AKIN criteria because this was thought to be an outcome of AKI.[2,3] To further complicate the picture, a third criteria was proposed in 2012 when the Kidney Disease Improving Global Outcomes (KDIGO) released Clinical Practice Guidelines for AKI. These guidelines, developed by the world's kidney experts and agreed to by all participating countries, sought to provide comprehensive evidenced-based recommendations and improve patient care in the setting of AKI. The KDIGO guidelines simplified the definition of AKI down to any 1 of the following 3 criteria:

1. An increase in serum creatinine by 0.3 mg/dL or more within 48 hours
2. An increase in serum creatinine to 1.5 times the baseline or more within the last 7 days
3. A UOP of less than 0.5 mL/kg/h for 6 hours.

AKI can then be further staged for severity according to additional severity criteria[4] (**Table 1**).

Table 1
The 3 acute kidney injury classification systems

Stage	UOP	RIFLE	AKIN	KDIGO
1	<0.5 mL/kg/h for 6 h	*Risk:* Increase in SCr of 1.5× or decrease in GFR >25%	Increase in SCr 1.5× baseline or ≥3.0 mg/dL	Increase in SCr of 1.5–1.9× baseline or ≥0.3 mg/dL increase in SCr
2	<0.5 mL/kg/h for 12 h	*Injury:* Increase in SCr 2× or decrease in GFR >50%	Increase in SCr 2× baseline	Increase in SCr of 2–2.9× baseline
3	<0.3 mL/kg/h for 24 h or anuria for 12 h	*Failure:* Increase in SCr 3× or decrease in GFR >75%	Increase in SCr 3× baseline or ≥4 mg/dL (with acute rise of >0.5 mg/dl)	Increase in SCr of >3× baseline or increase in SCr ≥4.0 mg/dL or initiation of RRT

Loss and ESRD of the RIFLE criteria are not included in this staging chart because they are considered outcome variables.

Abbreviation: SCr, serum creatinine.

Adapted from Kristensen SD, Knuuti J, Saraste A, et al. 2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management: The Joint Task Force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA). Eur Heart J 2014;35:2383–431; with permission.

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