

Acute Kidney Injury in Adults: An Underdiagnosed Condition

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ABSTRACT

Acute kidney injury (AKI) is a complex disease process that is increasingly common and has an increased rate of adverse outcomes and mortality. It is commonly underdiagnosed in inpatient and community settings by many providers. This article is a comprehensive review of AKI from risk factors to diagnosis to management and follow-up.

Keywords: acute kidney injury, Acute Kidney Injury Network, chronic kidney disease, Kidney Disease Improving Global Outcomes, Risk, Injury, Failure, Loss of Kidney Function, and End-Stage Kidney Disease classification

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Acute kidney injury (AKI) can cause acute loss of kidney function and can occur in multiple settings. It is often underdiagnosed and can range from a minor, temporary loss of kidney function to complete kidney failure. There is an increased rate of adverse outcomes and mortality with AKI. The United States Renal Data System reported that in-hospital mortality rates were 9% for Medicare patients ages 66 and older with their first AKI and 13.9% when patients who were discharged to hospice were included.¹ A single episode of AKI can lead to an elevated risk of recurrent AKI, progression of baseline chronic kidney disease (CKD), and progression to end-stage renal disease requiring renal replacement therapy (RRT).² The United States Renal Data System calculated that Medicare patients ages 66 and older with an AKI hospitalization had a 48% chance of a recurrent AKI hospitalization within 2 years.^{1,3} A review of Veterans Affairs patients noted that less than 50% of AKI cases were coded with the appropriate *Current Procedural Terminology* code (Figure).¹

DEFINITION AND STAGES

In 2012, the Kidney Disease Improving Global Outcomes (KDIGO) international committee created clinical practice guidelines for AKI because of the increase in incidence and complications of AKI. AKI is now replacing terms such as acute renal failure or acute renal insufficiency to help clarify and

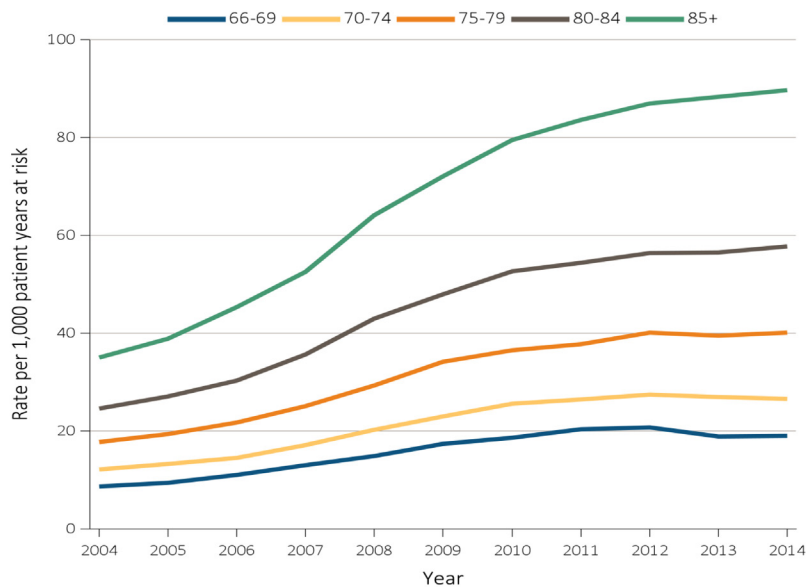
standardize the diagnosis.⁴ AKI results in the inability of the body to maintain acid-base, fluid, and electrolyte balance.

The KDIGO defines AKI as an increase in serum creatinine ≥ 0.3 mg/dL within 48 hours, an increase in serum creatinine ≥ 1.5 times a known baseline level or presumed to have occurred within the prior 7 days, or a urine volume < 0.5 mL/kg/h for 6 hours.⁵

The KDIGO AKI guideline is the current guideline on the staging of AKI (Table 1), and it builds on 2 previous guidelines: Risk, Injury, Failure, Loss of Kidney Function, and End-Stage Kidney Disease classification and the Acute Kidney Injury Network guideline.⁶ The full KDIGO AKI guideline can be found at <http://kdigo.org/home/guidelines/acute-kidney-injury>. The KDIGO AKI guideline is easy to use in a variety of settings but has limitations. These limitations include 1) the presumptive presence of a baseline creatinine value before the insult and 2) a decrease in urine output. These markers manifest relatively late after injury has occurred and do not consider the nature or site of the kidney injury.

TYPES

The types of AKI are divided into 3 categories: prerenal, intrarenal, and postrenal. Prerenal is caused by a sudden and severe drop in blood pressure, interruption of blood flow to the kidneys from severe

Figure. Unadjusted incidence rates of AKI by age and year, Medicare data.¹

2016 USRDS annual data report: Epidemiology of kidney disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2016.

injury or illness, and/or volume depletion. Prompt correction of the underlying cause will usually result in rapid correction of blood flow, which will prevent permanent kidney damage. Intrarenal is caused by direct damage to the kidneys by inflammation, toxins, drugs, sepsis, or reduced blood supply. The damage affects 1 of the compartments of the renal parenchyma (vasculature, glomerulus, tubules, or interstitium). The most common causes of intrarenal are acute tubular necrosis (ATN), contrast-induced nephropathy, and acute interstitial nephritis (often inflammatory). Postrenal is caused by an obstruction of urine flow or injury. The obstruction can be

partial, complete, unilateral, or bilateral and can affect the upper tract (renal pelvis and ureters) or the lower tract (bladder or urethra). A partial obstruction can cause polyuria or oliguria, whereas a complete obstruction causes anuria. The most common complication of an obstruction is a urinary tract infection, but permanent kidney damage can also occur from obstruction (Table 2).⁹

RISK ASSESSMENT

AKI typically occurs as a complication of another medical condition and can occur in a community or hospital setting. Patients who are hospitalized with an

Table 1. Kidney Disease Improving Global Outcomes (KDIGO) Definitions of Acute Kidney Injury

Guideline	SCr Criteria	Urine Output Criteria
KDIGO		
Stage 1	1.5-1.9 times baseline or ≥ 0.3 mg/dL increase	< 0.5 mL/kg/h for 6-12 hours
Stage 2	2.0-2.9 times baseline	< 0.5 mL/kg/h for ≥ 12 hours
Stage 3	3.0 times baseline or increase in SCr ≥ 4.0 mg/dL or RRT started (For pediatric patients ≤ 18 years, a decrease in eGFR to < 35 mL/min per 1.73 m ²)	< 0.3 mL/kg/h for greater than or equal to 24 hours or anuria for greater than or equal to 12 hours

eGFR = estimated glomerular filtration rate; RRT = renal replacement therapy; SCr = serum creatinine. Adapted with permission.⁵

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