

Risky Business

Lessons from Medication Misadventures in Chronic Kidney Disease



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KEYWORDS

- Chronic kidney disease (CKD) • Medication errors • Elderly
- Community-acquired acute kidney injury(CA-AKI) • Acute kidney injury (AKI)

KEY POINTS

- Improvement in dosing for patients with chronic kidney disease (CKD) and age-related kidney decline accompanied by comorbid conditions requires recognition of the populations at risk and adherence to kidney dosing guidelines.
- Clinical outcomes associated with medication errors include increased emergency department visits, hospitalizations, and lengths of stays as well as considerable morbidity and mortality.
- As kidney function declines, renal and nonrenal absorption, metabolism, distribution, and elimination of medications are affected, causing drugs and their metabolites to accumulate and cause toxic effects.
- Concurrent medication use increases the risk of drug interactions leading to electrolyte disorders, hyperglycemia and hypoglycemia, mental status changes, and acute kidney injury.
- Educating patients and providers on the multifactorial issues related to drug management in CKD may reduce medication errors.

INTRODUCTION

Chronic kidney disease (CKD) affects up to 13% of the people in the United States and is widely underdiagnosed despite improvements in measuring and reporting the estimated glomerular filtration rate (eGFR).^{1,2} Dosing errors occur at a greater rate in CKD

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and undiagnosed CKD than in a patient with a normal glomerular filtration rate (GFR).³⁻⁶ Patients who are not readily diagnosed with CKD are primarily the elderly with age-related kidney decline and comorbid conditions. Dosing errors are reported to range from 19% to 69% depending on the health care setting.²

Farang and colleagues⁴ reported that technological capabilities to report GFR and trigger drug dosing alerts have done little to reduce the number of dosing errors in CKD. Two experts who participated in an international conference attempting to reduce renal dosing deficits editorialized that the group failed to identify prescribers' nonadherence to CKD dosing guidelines as a barrier.⁷ Although many studies have focused on the patient populations, the improper use of drugs, and the health care institutions associated with medication errors in CKD, few have focused on the clinical course and adverse patient outcomes that occur due to improper dosing.³⁻⁶

The purpose of this article is to describe iatrogenic errors in drugs commonly dosed or prescribed incorrectly in CKD, including age-related kidney dysfunction. A focus is placed on describing patient outcomes, delineating pertinent pharmacodynamics and pharmacokinetic changes, and discussing strategies to improve drug dosing. The case studies that follow have been reported either in the literature or by clinicians. They include the most common medication dosing errors seen by clinicians and described by studies: antimicrobials, hypoglycemic agents, analgesics, anticoagulants, nonsteroidal anti-inflammatory drugs (NSAIDs), and antihypertensive agents.⁸

CONTENT

Antimicrobials and Antivirals

Case 1: Valacyclovir

A 52-year-old man with a history of hypertension (HTN), congestive heart failure, and CKD stage 5 receiving hemodialysis (HD) 3 times a week was diagnosed with herpes zoster virus (HSV) in the emergency department (ED) and given a prescription for valacyclovir (VAL) 1 g orally (PO) 3 times a day for 7 days.⁹ After taking 2 doses, the patient was brought back to the ED by his wife who stated the patient had become increasingly irritable and was experiencing visual and auditory hallucinations. The differential diagnosis was narrowed down to varicella zoster virus versus HSV meningoencephalitis. He was admitted for further workup.

Table 1 describes his hospital course.⁹

Table 1 Case 1: Valacyclovir, clinical course	
Hospital Day	Clinical Course
1	<ul style="list-style-type: none"> ● ACY 10 mg/kg IV q12h 600 mg/d
6	<ul style="list-style-type: none"> ● Mental status declines ● Electroencephalogram^a
7	<ul style="list-style-type: none"> ● Seizure witnessed ● ACY discontinued ● Daily HD started
10	<ul style="list-style-type: none"> ● Marked resolution neurologic symptoms
15	<ul style="list-style-type: none"> ● Mental status returns to baseline ● Discharged to home

^a Electroencephalogram (EEG) was nonconclusive. Causes consistent with EEG results included seizure vs metabolic encephalopathy.

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