Chapter 5: Acute Kidney Injury

- In 2013, the percent of Medicare fee-for-service beneficiaries experiencing an AKI hospitalization was 3.9%, slightly lower than the 4.1% in 2012. This decrease in rates was also observed across all age and race groups.
- For Medicare patients aged 66 years and older with an AKI hospitalization in 2011, the cumulative probability of a recurrent AKI hospitalization within two years was 48%.
- Overall, less than 20% of patients had a nephrology visit within one year of live discharge from an AKI hospitalization. Among patients without pre-existing CKD or diabetes, less than 5% had nephrology follow-up within one year.
- Among Medicare patients aged 66 years and older with a first AKI hospitalization, the in-hospital mortality rate in 2013 was 9.5% (or 14.4% when including discharge to hospice) and less than half of all patients were discharged to their home.

Introduction

Acute kidney injury (AKI) has gained increasing recognition as a major risk factor for the development of chronic kidney disease (CKD). The clearest example of this relationship is seen in cases of severe dialysis-requiring AKI where patients fail to recover renal function. Indeed, acute tubular necrosis without recovery is the primary diagnosis for 2 to 3% of incident end-stage renal disease (ESRD) cases annually. Yet this represents a small fraction of the renal disease burden resulting from AKI, as studies have demonstrated significantly increased long-term risk of CKD and ESRD following AKI, even after initial recovery of renal function. Furthermore, this relationship is bi-directional and CKD patients are at substantially greater risk of suffering an episode of AKI. As a result, AKI is frequently superimposed on CKD and therefore plays a key role in CKD progression.

In this chapter, we examine antecedents and outcomes associated with AKI using the Medicare 5 percent sample. Medicare administrative data do not contain clinical or biochemical data with which to identify an AKI episode using consensus criteria based on changes in serum creatinine or urinary output. Instead, episodes of AKI, including those requiring dialysis, are identified using ICD-9-CM (International Classification of Diseases, 9th revision, clinical modification) diagnosis codes from billing claims. While this approach carries a high degree of specificity, an important limitation of this indirect method is poor sensitivity, generally <30%, and even lower for less severe cases of AKI. In addition, time trends in AKI incidence must be interpreted with caution due to the possibility of "code creep," whereby non-clinical factors (such as changing billing thresholds or increased awareness/recognition of AKI) increase the likelihood of administrative coding for AKI. Thus, a rising incidence of AKI may represent a true increase in AKI cases, an increased likelihood to code for AKI, or a combination of both factors. In addition, a lower threshold for coding for AKI would lead to identification of less severe episodes and an apparent decrease in the rate of associated adverse outcomes. For this chapter, we identified and included all hospitalizations during which a diagnosis of AKI was coded, referring to these as AKI hospitalizations, even if AKI was not the primary diagnosis.

We begin this chapter by exploring trends in AKI hospitalizations and characteristics of these patients, including age, sex, race, and comorbidity status. We focused on hospitalizations because AKI occurring exclusively in the community is uncommon and often unrecognized. In general, AKI has increased over time while the percent of AKI hospitalizations that required dialysis has decreased, although that may have started

to level off in 2013. Rates of AKI per 1,000 patient years at risk increase with increasing age. Patients with diabetes and/or CKD also have higher rates, while patients with CKD alone are associated with higher risk than those with diabetes alone.

Next we explore outcomes and follow-up after an AKI hospitalization. Among Medicare patients aged 66 years and older, 35% have a recurrent AKI hospitalization by one year, and 48% have a recurrent AKI hospitalization within two years. These findings highlight the at-risk nature of this population, and support published recommendations for post-AKI follow-up care. However, only 12.7% and 16.1% of patients are seen by a nephrologist at 3 and 6 months post-discharge respectively. The proportion of patients seen for follow-up care is higher among those with pre-existing CKD, but even among this group with recognized kidney disease fewer than 25% are seen within 6 months.

As noted above, AKI plays an important role in CKD development and progression. Among patients without pre-existing CKD who experienced an AKI hospitalization, nearly 30% were reclassified as having some degree of CKD in the subsequent year.

Lastly, we explore patient disposition following an AKI hospitalization. Among patients not admitted from a nursing facility, 48% of Medicare patients suffering an AKI hospitalization return directly to their homes, while 30% are institutionalized in a skilled nursing facility. These outcomes highlight the significant morbidity associated with AKI.

Analytical Methods

In 2013, the Medicare 5 percent sample was received by the Coordinating Center from the Medicare Chronic Conditions Warehouse, a different source than in previous years. When this data was tabulated, rates per patient year at risk for AKI were lower for 2013 than in 2012. We cannot rule out that this is an artifact of the differing source for the Medicare 5 percent data files, so caution should be used in drawing conclusions regarding trends.

Note that all the figures except Figure 5.14 include all beneficiaries meeting the specified inclusion criteria. In Figure 5.14, those beneficiaries who were admitted to the inpatient setting where the AKI hospitalization occurred from a long-term care facility ('point of origin for admission,' previously named 'source of admission,' is 5) are excluded. Therefore, the category of institution in this figure includes only those newly admitted following their hospitalization. See the CKD Analytical Methods chapter for a more detailed explanation of the analytical methods used to generate the figures and table in this chapter.

Characteristics of Patients With Acute Kidney Injury

As shown in Figure 5.1, the percentage of patients with an AKI hospitalization in the Medicare fee-for-service population has risen over the past decade, reaching 3.9% in 2013, compared to 1.5% in 2003 (n=51,909 for 2013). Notably, the percentage in 2013 showed a decline from 4.1% in 2012. The proportion of AKI patients requiring dialysis has continued to decline, falling from 9.1% in 2003 to 3.6% in 2013 (n= 1,854 in 2013). These findings suggest that code creep for AKI is indeed occurring: while the threshold for defining (and thus coding for) AKI has decreased over the last 10 years, the threshold for dialysis initiation has likely remained fairly stable.

vol 1 **Figure 5.1 Percent of Medicare patients aged 66+ (a) with at least one AKI hospitalization, and (b) with an AKI hospitalization that included dialysis, by year, 2003-2013**

(a) Percent with an AKI hospitalization