USRDS
UNITED STATES RENAL DATA SYSTEM

Chapter 5: Acute Kidney Injury

- In 2015, 4.3% of Medicare fee-for-service beneficiaries experienced a hospitalization complicated by Acute Kidney Injury (AKI); this appears to have plateaued since 2011 (Figure 5.1). The 2015 Optum Clinformatics™ population showed a similar trend—0.3% had an AKI hospitalization (Figure 5.2).
- Among hospitalized veterans who did not have a prior diagnosis of AKI, 15% met KDIGO guidelines for AKI as defined using serum creatinine-based criteria (Table A). This included 13.4%, 0.5%, and 1.2% of patients with Stage 1, Stage 2, and Stage 3 AKI (Table 5.2).
- In 2013, Medicare patients aged 66 years and older who were hospitalized for AKI had a 35% cumulative probability of a recurrent AKI hospitalization within one year (Figure 5.6.a). For Optum Clinformatics™ patients aged 22 years and older, the probability of recurrent AKI hospitalization was 23% (Figure 5.7.a).
- Among these older Medicare patients, 28% were given an initial diagnosis of CKD in the year following an AKI hospitalization (Figure 5.10.a). In the Optum Clinformatics™ population, 19% of patients with an AKI hospitalization were newly classified as having CKD in the subsequent year (Figure 5.10.b).
- Among Medicare patients aged 66 years and older with a first AKI hospitalization in 2015, the in-hospital mortality rate was 8.7%, or 13.7% when including discharge to hospice. Comparable mortality rates for non-AKI hospitalizations were 2.1% and 4.2%. Less than half of all patients returned to their home on discharge, as compared to two-thirds of non-AKI patients, while 30.6% were discharged to an institution such as a rehabilitation or skilled nursing facility. About one-quarter of non-AKI patients are discharged to rehabilitation or skilled nursing facilities (Figure 5.11).

Introduction

Acute kidney injury (AKI) is now recognized as a major risk factor for the development of chronic kidney disease (CKD). This is obvious in cases of severe, dialysis-requiring AKI where patients fail to recover kidney 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 kidney disease burden resulting from AKI.

Studies have demonstrated significantly increased long-term risk of CKD and ESRD following AKI, even after initial recovery of function (Heung, 2012). Furthermore, this relationship is bidirectional—CKD patients are at substantially higher risk of suffering an episode of AKI. As a result, AKI is frequently superimposed on CKD, and plays a key role in CKD progression.

This year we again present data from three sources: the Medicare 5% sample, the Optum Clinformatics™ Data Mart dataset (from OptumInsight, representing claims from a large U.S. national health insurance company), and national data from the U.S. Department of Veterans Affairs (VA) health system. Medicare and Optum Clinformatics™ administrative data do not contain clinical or biochemical data with which to identify an AKI episode using the consensus criteria based on changes in serum creatinine or urinary output. In these data sources, episodes of AKI were identified using ICD-9-CM and ICD-10-CM (International Classification of Diseases, Ninth/Tenth Revision, Clinical Modification) diagnosis codes from 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 particular, 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 and recognition of AKI increase the likelihood of administrative coding for AKI. Thus, a rising incidence of AKI may represent a true increase in cases, an increased likelihood to code for AKI, or a combination of both factors. In addition, a lower threshold for coding would lead to identification of less severe episodes and an apparent decrease in the rate of associated adverse outcomes.

In contrast to Medicare and Optum Clinformatics™, VA data contain clinical information to identify episodes of AKI through serum creatinine-based criteria. We present some data from the VA population to illustrate the potential gap between AKI episodes identified by administrative coding versus clinical data.

We begin this chapter by exploring trends in hospitalizations that became complicated by AKI, and describing the characteristics of those patients. We refer to "AKI hospitalizations" as any hospitalization during which there was a diagnosis of AKI; the AKI diagnosis was not necessarily the primary or admitting diagnosis. We focus on hospitalizations because the occurrence of AKI exclusively in the community is uncommon and often unrecognized. Next, we explore the risk of re-hospitalization with recurrent AKI, and describe follow-up care after an episode. We end by examining the impact of AKI on outcomes, including subsequent CKD status and patient disposition after an AKI hospitalization.

Methods

Starting with the 2013 claim year, the USRDS Coordinating Center has received the Medicare 5% sample from the Medicare Chronic Conditions Warehouse, a different data source than in previous years. This has coincided with a subsequent decrease in AKI hospitalizations, and we cannot rule out that this is an artifact of the differing source of the Medicare 5% data files. Conclusions regarding trends should be made in this context.

For the Medicare data, we often present results for those aged 66 and older. This allows a full year of Medicare eligibility (ages 65-66) for us to assess the patient's CKD and diabetes mellitus (DM) status prior to the hospitalization within which AKI occurred.

In contrast to the Medicare data, we also present figures and tables from the commercial insurance plans of a large national U.S. health insurance company, as included in the Optum Clinformatics™ Data Mart from OptumInsight. These data represent mainly working-age people and their minor dependents.

We present results only for patients aged 22 and older. In Volume 1, Chapter 2, *Identification and Care of Patients with CKD* see Table 2.1 for demographic characteristics of the Optum Clinformatics™ population (all ages) and Table 2.2 (ages 22-64) and Table 2.3 (all ages) for the prevalence of CKD and related conditions. Additionally, Table 5.2 of this chapter uses data from all patients hospitalized at a VA hospital during fiscal year 2015, to show AKI as defined by serum creatinine measurements and staged as outlined in the KDIGO clinical practice guideline for AKI (KDIGO, 2012). Note that urine output data was not available, so identification of AKI episodes did not include the KDIGO criteria related to urine output.

Age is a major risk factor for AKI. Each of the included datasets had interactions between sex and age that are important to keep in mind when comparing differences in AKI by sex. Within both Optum Clinformatics™ and the VA, women were younger on average than men. In Optum Clinformatics™, 56% of women were between the ages of 22 and 39, compared to only 19.4% of men. Among VA patients with at least one outpatient visit, 82% of men were aged 60 and older compared to only 46.6% of women. Conversely, women in the Medicare 5% sample were older, on average. Women had a mean age of 77.2 years while for men it was 75.5 years, and a higher proportion of women (20.4%) than men (13.2%) were aged 85 and older.

Note that the analyses for all figures except Figure 5.11 were based on all beneficiaries meeting the specified inclusion criteria. In Figure 5.11, we excluded those beneficiaries who were admitted from a long-term care facility to the inpatient setting where the AKI hospitalization occurred. Therefore, the category of institution in this figure includes only those newly admitted following a hospitalization.

Details of this data are described in the *Data Sources* section of the *CKD Analytical Methods*