Potentially Avoidable Readmissions in United States Hemodialysis Patients

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Introduction: Patients with end-stage kidney disease have a high risk of 30-day readmission to hospital. These readmissions are financially costly to health care systems and are associated with poor health-related quality of life. The objective of this study was to describe and analyze the frequency, causes, and predictors of 30-day potentially avoidable readmission to hospital in patients on hemodialysis.

Methods: We conducted a retrospective cohort study using the US Renal Data System data from January 1, 2008, to December 31, 2008. A total of 107,940 prevalent United States hemodialysis patients with 248,680 index hospital discharges were assessed for the main outcome of 30-day potentially avoidable readmission, as identified by a computerized algorithm.

Results: Of 83,209 30-day readmissions, 59,045 (70.1%) resulted in a 30-day potentially avoidable readmission. The geographic distribution of 30-day potentially avoidable readmission in the United States varied by state. Characteristics associated with 30-day potentially avoidable readmission included the following: younger age, shorter time on hemodialysis, at least 3 or more hospitalizations in preceding 12 months, black race, unemployed status, treatment at a for-profit facility, longer length of index hospital stay, and index hospitalizations that involved a surgical procedure. The 5-, 15-, and 30-day potentially avoidable readmission cumulative incidences were 6.0%, 15.1%, and 25.8%, respectively.

Conclusion: Patients with end-stage kidney disease on maintenance hemodialysis are at high risk for 30-day readmission to hospital, with nearly three-quarters (70.1%) of all 30-day readmissions being potentially avoidable. Research is warranted to develop cost-effective and transferrable interventions that improve care transitions from hospital to outpatient hemodialysis facility and reduce readmission risk for this vulnerable population.

Hospital readmission is associated with poor quality of life and health outcomes,[1,2] as well as high costs. In the United States, an estimated $17 billion spent on return trips to the hospital can be saved annually with appropriate management.[3] Given the high societal, emotional, and financial costs, research has focused on identifying patient populations at high risk for readmission, as well as developing and testing interventions to reduce this risk. For example, more than 40 randomized controlled trials have tested interventions to reduce readmission risk in patients with congestive heart failure.[4]

Patients with end-stage kidney disease (ESKD) on maintenance hemodialysis (HD) face particularly high rates of readmission to hospital. In 2013, 34.9% of HD patients were readmitted within 30 days of an index hospitalization.[5] In comparison, 19% of the general Medicare population[6] and approximately 25% of patients with congestive heart failure[7] are readmitted to hospital within 30 days of an index hospital discharge. Hospitalizations in ESKD are exceptionally costly, and 38% of the nearly $30 billion in annual Medicare expenditures for ESKD is spent on acute inpatient care.[5]

After an index hospital discharge, a patient with ESKD will experience 1 of 3 outcomes: remain out of hospital, be readmitted to hospital, or die. Perhaps

related to definitions levied by pay-for-performance programs,[8] readmissions are often defined as within 30 days of an index hospitalization, and are categorized as planned or unplanned. Planned readmissions are scheduled during or shortly after the index hospitalization, and are often for a procedure, chemotherapy, transplant, or rehabilitation. Approximately 10% of all readmissions are planned in the United States.[6,9] An example scenario would be a patient admitted for a urologic procedure, with a planned readmission within 10 days for stent removal.

Of the remaining unplanned readmissions, some are unavoidable, whereas others might be avoidable with appropriate transitional and/or ambulatory care after index hospital discharge. For example, if a patient is discharged from hospital after an episode of atrial fibrillation, then readmitted within 30 days with acute cholecystitis, this readmission would be considered unplanned and also unavoidable. Conversely, if the same patient discharged from hospital after an episode of atrial fibrillation is then readmitted within 30 days with an episode of congestive heart failure, this would be considered an unplanned, but potentially avoidable readmission to hospital. The literature shows much variation regarding the proportion of potentially avoidable readmissions to hospital. In a recent systematic review, 27.1% of readmissions were deemed potentially avoidable in general medicine patients, ranging from 5% to 79%.[10] Similarly, conditions in HD patients who are ambulatory-sensitive (e.g., volume overload, electrolyte imbalance) can result in readmission but may have been avoided with the appropriate transitional care on discharge.

Vest et al.[11] recently published a systematic review of readmissions, and defined a potentially avoidable readmission as: "an unintended and undesired subsequent post-discharge hospitalization, where the probability is subject to the influence of multiple factors." However, the methodology to identify an avoidable readmission varies widely in the literature, often based on subjective criteria,[12–15] or predefined lists of discharge categories or diagnoses.[16,17] These methodologies lack generalizability and are inadequate for use with large datasets or more sophisticated analyses. 3M Health Information Systems has developed a proprietary potentially preventable readmissions classification system,[18] but its use for research purposes is limited. Halfon et al.[19] derived an algorithm using administrative data (International Classification of Diseases, Ninth Revision codes and diagnosis-related group [DRG] codes) in a general medical inpatient population in Switzerland. The algorithm had 96% sensitivity and 95.7% specificity against the gold standard of chart review and has been used for research

purposes to aid in the identification of predictive factors for potentially avoidable readmission in the United States.[20]

Despite the high risks, negative impact on patient outcomes, and financial consequences, there is a paucity of literature on the frequency and predictors of potentially avoidable readmission in ESKD,[21] and lack of a standardized metric to define potentially avoidable readmission. Although some studies and reports have described all-cause,[22–25] or cause-specific[5,26–29] readmissions in ESKD, potentially avoidable readmissions have not been previously studied. Given these gaps in the literature, we conducted an observational study using the US Renal Data System (USRDS) database to describe and analyze the frequency, causes, and predictors associated with potentially avoidable readmission.

METHODS

This study was conducted and reported in accordance with Strengthening the Reporting of Observational Studies in Epidemiology guidelines.[30]

Data Source, Setting, and Participants

We conducted an observational cohort study of the USRDS database using data from the core and hospitalized datasets. Patients with Medicare as their primary insurance type, 18 to 95 years of age at day ≥91 after first ESKD service, with acute hospital discharges from January 1, 2008, to November 30, 2008, were included in the study population. All 30-day readmissions were assessed until December 31, 2008. Data were obtained on patient characteristics and comorbidities at baseline from the 2728 medical evidence form. Data on comorbid conditions were also collected from claims over a 3- to 6-month entry period (dependent on date of first ESKD service). Hospitalization claims with discharge status of "left against medical advice," or DRG of 998, 999, or 000 (invalid or ungroupable) were excluded. Hospital discharges with primary reason for admission being rehabilitation (DRG 945, 946), psychiatric diagnosis (DRG 876 – 887), cancer (International Classification of Diseases, Ninth Revision principal discharge code of 140.xx-172.xx, 174.xx-208.xx, 230.xx-231.xx, 233.xx-234.xx), or renal transplant (DRG 652) were similarly excluded. An index hospital discharge was eligible only if it occurred during an HD treatment period, thus excluding patients on peritoneal dialysis. Patients listed as "recovered function," with an unknown ESKD start date, who died during the index hospitalization, or with conflicting information on 1995 and 2005 medical evidence forms were also excluded. The study protocol was approved for Exempt Status by the Institutional