Geographic Variation in Fracture Incidence in US Patients Receiving Hemodialysis

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Introduction

• Fracture burden is high in patients on hemodialysis (HD), but whether fracture incidence varies geographically is unknown.

• Given the high morbidity and mortality associated with fracture in dialysis patients, we sought to determine whether fracture risk is associated with end-stage renal disease (ESRD) network, a proxy for regional variation in care.

Methods

• The United States Renal Data System ESRD database was used. Specific elements were:
  - ESRD Medical Evidence Report
  - ESRD Death Notification
  - Kidney transplant information
  - Medicare coverage information
  - Medicare Part A (inpatient, outpatient, skilled nursing facility, home health, and hospital) claims
  - Medicare Part B (physician/supplier) claims
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  - Medicare Part B (physician/supplier) claims
  - Four annual cohorts, 2007-2010, of prevalent dialysis patients were created.
  - Patients were required to be:
    - US patients receiving in-center HD
    - Aged 18 years or older
    - Covered by Medicare Parts A and B as primary payer for at least 1 year on January 1 of the year
    - Patients were followed from January 1 of the calendar year to the earliest date of death, kidney transplant, modality switch, or loss of Medicare coverage.

• Fractures were identified using ICD-9-CM diagnosis codes and HCPCS procedure codes from inpatient and physician claims. Fractures of pelvis/Hip, femur, lower leg, rib/sternum, shoulder/upper arm, and forearm/wrist were included.

• For each type of fracture, only the first event was counted in each cohort year.

• Geographic region was defined by ESRD network.

• Fracture rates were calculated as observed numbers of events divided by follow-up time per 100 patient-years.

• Poisson regression models were used to calculate rate ratios (RRs), unadjusted and adjusted, between each network and the national rate.

• Factors used for adjustment were age, race, sex, primary ESRD cause, body mass index, dialysis duration, and 9 cometid conditions.

• Variation in fracture rates among networks was illustrated by presenting the difference between observed fracture rates and the unadjusted and adjusted RRs.

Results

• In total, 333,718 patients were included in the study, most appeared in multiple years (Table 1).

• Numbers of patients increased each year, from 191,681 in 2007 to 218,105 in 2010.

• Mean age was 62.3 years; 56.2% were female, and 45.7% had diabetes as primary cause of ESRD. Mean dialysis duration was 3.9 years.

• Percentage of patients by network was stable over time.

• The observed national fracture rate within the four years was 6.1 per 100 patient-years.

• The observed fracture rate varied substantially by network (Figure 1), from a low of 4.6 per 100 patient-years to a high of 7.4 per 100 patient-years.

• Correspondingly, the unadjusted RRs (Figure 2, left panel) varied from a low of 0.78 to a high of 1.5.

• Overall variation in RRs across networks did not change materially after adjustment for patient characteristics (Figure 2, right panel), varying from 0.78 to 1.14, a nearly 1.5-fold difference.

Discussion

• Fracture rates among HD patients varied substantially, about 1-5-fold across ESRD networks.

• The significant geographic variation that appears to exist independent of patient case-mix suggests a role for the effects of differing treatment practices, in particular those relating to CKD-MBD.

• Detailed examination of regional treatment practices may help to explain some of these differences, and further strengthen the association between CKD-MBD and fracture risk in the dialysis population.

Limitations

• Fractures were derived from Medicare claims, meaning that the event times may not be precisely accurate.

• Not all types of fractures were included in this study, so the overall fracture burden might be underestimated. However, this should not confound the geographic comparison undertaken.

• We have not yet explored detailed factors that may be responsible for the geographic variation we observed.