Comparing Methods to Identify Hip Fracture in a Nursing Home Population Using Medicare Claims

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Abstract

Objectives—to examine the impact of varied operational definitions for identifying hip fracture hospitalizations in administrative claims data.

Design—retrospective examination of Medicare inpatient and outpatient claims data.

Setting—nursing home population.

Participants—Medicaid- and Medicare-eligible nursing home residents in 1999 in CA, FL, MO, NJ, and PA (n=197,514).

Measurements—number of hip fractures identified in using inpatient (Medicare A) diagnoses codes, subjected to definitions varying according to whether or not hip fracture was required to be the principal diagnosis and whether or not confirmatory imaging and procedure codes were identified in other (Medicare B) claims files.

Results—Hip fractures were found in any inpatient diagnosis position in 4,680 subjects, with 4,479 of these found in the principal diagnosis position. With either approach to diagnosis position, confirmatory imaging and procedure codes were identified for 95% of persons hospitalized with hip fracture.

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Conclusion—The principal diagnosis alone will identify 96% of hip fracture diagnoses in hospitalized nursing home residents. Such diagnoses are confirmed at very high rates by other sources of claims data. Researchers may be confident using a simple approach to identifying hip fracture hospitalizations in this population, using inpatient claims alone and interrogating only the principal diagnosis position.

Keywords

health services research; hip fracture; Medicare claims; nursing home

INTRODUCTION

Hip fractures cause substantial mortality, morbidity, and functional decline in the older population.(1,2) The Centers for Disease Control and Prevention estimates that the total cost for treatment of hip fracture could climb to the range of $80 to $240 billion dollars per year by the year 2040.(2) A large body of research is based on use of Medicare claims to study hip fracture care patterns and outcomes, most often in pre-fracture community-dwellers. To our knowledge, no one has questioned whether current claims-based methods of hip fracture identification are equally applicable to nursing home populations. The annual incidence of fracture in nursing home residents is estimated at 6%, with hip fracture accounting for 40% of this total.(3) Age- and sex-adjusted rates of hip fracture are four-fold higher in nursing home residents than in community-dwellers.(4) Thus, a pressing need exists to ensure that current claims-based approaches to identifying hip fracture are sufficient for this growing population.

Ray et al presented a validated algorithm for identifying fractures using Medicare claims data in 1992. (5) This study evaluated diagnosis, hospital-based procedure, physician-base procedure, and radiology procedure codes, using chart-abstracted data as the reference standard. This classic paper has been cited often as the basis for fracture identification methods used subsequently by other investigators. Much of the known epidemiology of fractures in older adults is based upon such combined use of inpatient, outpatient, and physician-based claims.(5-12)

However, many recent claims-based publications have required only a diagnosis code for hip fracture in the inpatient claims files as the method of ascertainment, often relying on the principal diagnosis alone. (4,13-19) This approach is attractive because of its simplicity and requirement for only inpatient claims data. However, we are aware of only one study that has evaluated the extent to which hospital-derived hip fracture claims are confirmed by physician-derived claims. Baron et al reported high levels of agreement between hospital-derived claims and physician-derived procedure claims for the site of hip fracture and type of repair, using a 5% national Medicare claims sample from 1986-1989.(11) It is unknown whether these high rates of agreement between hospital-derived and outpatient- or physician-derived claims data can be expected in other types of samples, including those derived from nursing home residents. It is also not known whether the principal hospital diagnosis alone may be relied upon to identify hip fracture, or whether secondary diagnoses must also be examined. Fall-related fractures may result from unstable medical conditions (e.g., syncope) that might be coded as the principal reason for admission and hip fracture might be considered a secondary diagnosis. In nursing home populations where acute illness is particularly common, it is unclear whether reliance upon the principal hospital diagnosis alone is sufficient for capturing new hip fractures.

As part of a larger study of fractures in older adults receiving antipsychotic medications for dementia in nursing homes, we developed operational definitions for identifying hip fracture

using Medicare claims data. Here we describe the codes required for each operational definition and we report the comparative rates of fracture identification achieved when various data elements are considered. Our specific research questions were these: For persons admitted to the hospital with hip fracture, can a single diagnosis code from the Medicare Part A inpatient claims file (known as MedPAR) be used with confidence as a stand-alone identification method, or are Medicare Part B data also needed to provide confirmatory imaging, procedures, and/or physician service codes? Second, how often is hip fracture found in a position other than that of the principal admitting diagnosis? Put another way, can researchers wishing to identify hospitalization for treatment of new fractures in nursing home residents confidently rely upon inpatient claims data alone and, if so, is the principal admitting diagnosis sufficient for this purpose?

METHODS

This study was approved by the University of Kansas Medical Center Institutional Review Board.

Cohort Development

Administrative claims data were used to conduct a retrospective study of dually Medicaid- and Medicare-eligible persons aged 65 and older residing in nursing homes during the calendar year 1999 in California, Florida, Missouri, New Jersey and Pennsylvania. Nursing home utilization was identified using the Minimum Data Set (MDS) which is a federally-mandated reporting tool for nursing home residents. From this group, we retained only subjects with Medicaid coverage during 1999. This narrowing of the subject pool was necessary because Medicaid pharmacy claims data were needed for the primary larger study. The primary study also required that we exclude persons receiving antipsychotics for longstanding severe mental illness; this was achieved by dropping individuals with schizophrenia or bipolar disorder, history of psychiatric hospitalization or institutional treatment for developmental disability. Such persons tend to be younger, less physically impaired, and use higher doses of antipsychotics for longer durations than the older subjects of interest for this study.

We further reduced this cohort to only those persons aged 65 and older because all subjects had to have Medicare coverage. We then obtained Medicare claims for this group, including the denominator file which contains identifiers and eligibility information, the MedPAR file containing Part A (inpatient and skilled nursing facility) claims, the outpatient file, and the carrier file. Unique beneficiaries were identified using a combination of the SSN (social security number), date of birth, and gender in order to assure that data were accurately linked across the three data sets at the individual level. Once the correct population of subjects present in both the MDS and Medicaid data files were identified, and Medicare claims for this group were obtained, linking was achieved for >99% of beneficiaries.

Development of Hip Fracture Definitions

Publications using administrative claims to identify fractures were reviewed to determine what operational algorithms were used to define the presence of a hip fracture. A series of modifications were developed through consensus of three members of our research team (EE, SR, JW) to address changes over time in hip fracture-related codes.

Our purpose was to compare definitions of varying complexity which were designed to capture hospital admission for hip fracture. Hospitalizations of interest were typical short-stay admissions for acute medical/surgical care that would be received by most persons with an acute hip fracture. We used claims-based markers to exclude skilled nursing facility

stays, as well as stays in psychiatric units, rehabilitation units, alcohol-drug treatment units, and other special locations of care.

Four operational definitions for hip fracture were crafted, varying according to whether or not hip fracture was coded as the principal diagnosis and whether the inpatient diagnosis of hip fracture could be confirmed by additional imaging or procedure codes. The first two definitions required only an International Classification of Disease, 9th Clinical Modification (ICD-9-CM) code of 820.xx in a hospital claim, using only inpatient (MedPAR) data. One of these definitions required hip fracture to be coded as the principal hospital diagnosis while the other definition accepted hip fracture anywhere in the diagnoses entry fields. The next two definitions required that hip fracture-relevant imaging or procedure codes be found in addition to an inpatient diagnosis of hip fracture, with one definition requiring hip fracture as the principal diagnosis and the other definition accepting hip fracture anywhere in the diagnoses entry fields. The additional hip-fracture relevant imaging and procedure codes were extracted from the outpatient and carrier files, reflecting Medicare Part B services, and are hereafter termed "confirmatory codes." These codes would detect, for example, a plain radiograph of the hip obtained in the nursing home or in the emergency room after a fall, or the surgeon's charge for operative hip repair. Confirmatory imaging was confirmed by Current Procedural Terminology (CPT) codes 73500, 73510, 73520, 73550, 72170, 72180, 72190, 72192, 72193, 72194, 73700, 73701 and 73702. Confirmatory procedures were confirmed by ICD-9-CM codes 7855, 7905, 7915, 7925, and 7935 and CPT codes 27230, 27232, 27235, 27236, 27244, 27245, 27246, 27248 and 73530.

The study cohort was then subjected to these competing definitions, and each cohort member was flagged as having or not having a hip fracture, based on each competing definition. We restricted our examination of fractures to the time period of April 1 through December 31, excluding January through March of 1999. This was done because we were concerned that fractures occurring very late in 1998 or very early in 1999 might have generated a mixture of hip-fracture relevant claims that crossed both years, but we did not have 1998 data so we could not evaluate that possibility. All fractures of interest occurred during the period of observation in which the subject was already residing in a nursing home. We counted only the first event in which a beneficiary met the criteria for hip fracture during this 9 month period. If a second fracture occurred later in the year, it was not counted. This was done to assure that each study subject was represented only once in the statistical analysis.

Analysis

The number of hip fracture hospitalizations identified using each definition was calculated. We calculated the sample size lost by requiring that hip fracture be in the principal diagnosis position, as opposed to accepting a hip fracture diagnosis in any position in an inpatient claim. We determined the percentages of hip fractures in each position that were confirmed by outpatient imaging or procedure codes, and calculated the extent to which this confirmation was attributable to imaging, procedures, or both.

RESULTS

Overall Cohort

There were 224,763 individuals aged 65 years and older who were receiving nursing home care in 1999 in CA, FL, NJ, MO and PA, and were successfully linked across data sets. From this group, 15,014 persons were excluded because they did not have both Medicare A and B eligibility and/or because the timeframes of their Medicaid eligibility and nursing home residence did not overlap. In addition, 12,595 persons were excluded because of

schizophrenia, bipolar affective disorder, psychiatry institutionalization, or developmental disability, leaving a final cohort of 197,154 persons. The demographic characteristics of the overall study cohort and of those persons hospitalized for hip fracture are shown in Table 1.

Sample Sizes and Confirmation Rates by Hip Fracture Definition

Using inpatient claims only, we identified 4,680 hip fractures in any diagnosis position. When hip fracture was required to be the principal diagnosis, 201 cases were excluded. Pneumonia, stroke, acute myocardial infarction, congestive heart failure, and 'general symptoms' (including seizure and syncope/collapse) were the most common principal diagnoses in these excluded cases. The remaining 4, 479 persons had a principal diagnosis of hip fracture, representing 95.7% (CI: 95.1-96.3%) of hip fractures.

In the 4,680 persons with hip fracture in any diagnosis position, confirmatory codes were found in 95% (CI: 94.0-95.3%) of cases. Among these confirmed cases, 99% had confirmatory imaging while 86% had both confirmatory imaging and procedure codes. In the 4,479 persons with a principal diagnosis of hip fracture, confirmatory codes were found in 95% (CI: 94.2-95.5%) of cases. Among these confirmed cases, 99% had confirmatory imaging while 87% had both confirmatory imaging and procedure codes.

DISCUSSION

Our first goal was to determine how often hip fracture diagnosis codes in inpatient (MedPAR) claims data alone were confirmed by additional imaging and/or procedure codes from outpatient claims in a sample of hospitalized nursing home residents. We found confirmation rates of 95%. Imaging codes provided 99% of these confirmations, with or without procedure codes. We conclude that researchers can confidently rely upon inpatient (MedPAR) claims-based diagnoses to identify hip fracture in nursing home residents who have been hospitalized, without resorting to complicated and costly analyses of the outpatient and carrier files to confirm this diagnosis.

We also found that only 4% of inpatient hip fracture cases had some other principal diagnosis. Whether to require hip fracture to be the principal diagnosis, or instead to accept it anywhere in the inpatient diagnoses code field, should depend upon the study purpose. Researchers who wish to exclude persons who may have been acutely ill with conditions such as pneumonia or seizure when they suffered a fall-related fracture may wish to opt for hip fracture to be only in the principal diagnosis. Conversely, those who are more broadly interested in all nursing home residents admitted to the hospital with hip fracture, regardless of their health status at the time of the fall, may choose to allow the diagnosis in any position. Either way, the sample size will not be substantially altered.

We found no other similar study in the literature with which to directly compare our results. However, our finding that hip-fracture related procedure codes were found in only 86-87% of hospital stays is not unexpected for a nursing home sample in which some individuals may have been deemed poor surgical candidates or surgery may not have been desired due to severe dementia or other end-stage conditions. We found one study that showed variation in patterns of hip fracture care according to pre-fracture institutional versus home residence. Lu-Yao et al conducted population-based study of treatment patterns and survival in hip fracture patients, using both inpatient and outpatient claims data for a 5% national Medicare sample. Pre-fracture nursing home residence was associated with higher rates of hip fracture care that did not include either internal fixation or arthroplasty, although the majority of persons still received these procedures.(20)

Limitations

As with any claims-based study, it must be noted that administrative claims are created for non-research purposes and are limited in their ability to capture clinical status. Of note, we did not validate our definitions directly against chart-abstracted data. This would be impractical for a cohort of this large size, and would require retrospective access to hospital and nursing home records from 1999. However, internal consistency between different 'data streams' is an acceptable approach when true validation is not an option in very large data sets, and this approach has been used for study of hip fracture.(11) Our results also are consistent with other reported data. The finding of hip fracture in any diagnosis position in 4,680 persons during 9 calendar months can be annualized to an estimated 6,240 hip fractures in one year's time. Within our cohort of 197,154 persons, this represents a fracture rate of 3% per year which is consistent with publicly reported national nursing home data wherein 1.5 to 2.0% of residents have experienced a hip fracture in the past 180 days.(21)

Another limitation is that these data are not able to identify which hip fractures in secondary diagnosis positions might have occurred *during* the hospital stay. Although newer emphasis has been placed on in-hospital fractures as a troubling quality indicator, no indicator for 'present at admission' was available in the claims during this study time period. Finally, the underlying study cohort presents limits to generalizability. This project was derived from study of older nursing home residents who had dual Medicaid & Medicare eligibility in one of 5 states at some time during 1999. These results may not necessarily apply to non-Medicaid eligible nursing home residents. Finally, this approach will not capture hip fracture in anyone not hospitalized but this is generally thought to be an uncommon event.(18) Results should not be applied to fractures other than hip fractures for which outpatient care is more common.

CONCLUSION

Health services researchers can confidently use inpatient diagnosis data alone, without additional outpatient/physician claims files, to identify nursing home residents admitted to the hospital with a hip fracture. Use of the principal diagnosis field alone will capture 96% of hip fracture diagnoses recorded in the inpatient claims.

Acknowledgments

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