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Epidemiology of hip fracture in nursing home residents with multiple sclerosis

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ABSTRACT

Background: Hip fracture risk is high in young people with multiple sclerosis (MS), but has not been examined in an institutionalized aging population with MS.
Objective: We aimed to compare the hip fracture risk in nursing home (NH) residents with and without MS; and (2) examine risk factors for hip fracture in those with MS.
Methods: We conducted a retrospective cohort study using national NH clinical assessment and Medicare claims data. Participants included age-, sex- and race-matched NH residents with/without MS (2007–2008). Multivariable competing risk regression was used to compare 2-year hip fracture risk, and to examine risk factors.
Results: A total of 5692 NH residents with MS were matched to 28,460 without MS. Approximately 80% of residents with MS vs. 50% of those without MS required extensive assistance in walking at NH admission. The adjusted incidence rate of hip fracture was 7.1 and 18.6 per 1000 person-years in those with or without MS, respectively. Wandering and anxiolytic exposure were the main hip fracture risk factors in transfer independent residents with MS; while pneumonia and antidepressant use were the main factors in dependent residents with MS.
Conclusions: In contrast to prior comparisons from non-NH populations, the incidence of hip fracture was lower in NH residents with MS as compared with matched controls. Residents with MS were much more functionally dependent, which likely explains these findings. Fracture prevention strategies should focus on fall prevention in independent residents; and possibly improvement of health status and facility quality of care in dependent residents.

Introduction

Hip fractures are common in nursing home (NH) residents (1) and associated with functional dependence and elevated mortality.(2) Multiple sclerosis (MS) is a chronic, immune-mediated and degenerative disease of the central nervous system, characterized by disability progression over time.(3) People with MS typically experience early occurrence of fall and/or fracture risk factors, such as physical inactivity, impaired gait or balance, and lower bone mineral density; (4) and 'accelerated aging' through earlier presence of physical dependence and multiple comorbidities.(5) For these reasons, prior studies have reported that community dwellers with MS (mean age: <40 years) have a three-fold increase in hip fracture rates as compared to age- and sex-matched population without MS.(6, 7).

However, information remains limited regarding hip fracture incidence and risk factors in aging populations with MS, particularly those who are institutionalized. To date, only one study that

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was based on Danish national data concluded the incidence of hip fracture was >10 per 1,000 person years in persons 70-year-olds or older with MS.(8) Risk factors for hip fracture have been described in the general NH population, but have not been studied in NH residents with MS. Given the high burden of potentially long-term disability among institutionalized persons with MS, it is likely that unique risk factors for fracture exist in this frail population. Functional impairment has been shown to modify risk factors for injurious falls in general NH populations, (1) but it is unclear whether this is also true in residents with MS.

Efforts to reduce fracture risk among institutionalized aging populations with MS require a detailed understanding of the incidence of fracture and a better understanding of risk factors for fracture in this unique group. Therefore, we conducted this study to (1) compare the incidence of hip fracture between NH residents with and without MS; and (2) identify clinical characteristics associated with 2-year hip fracture risk in long-term NH residents with MS. Risk factor analyses were stratified by ability to transfer.

Methodology

Study design and data sources

This was a retrospective cohort study, linking 100% national Medicare fee-for-service (FFS) enrollment, Part A and Part D claims to the Minimum Data Set (MDS) version 2.0 between May 2007 and March 2010. The Part A claims data contain hospital admission and discharge dates, and diagnosis codes using International Classification of Diseases (ICD) ninth revision (ICD-9). The Medicare Part D file contains prescriptions dispensed at outpatient pharmacies. The MDS is a federally mandated needs assessment performed on all NH admissions and captures detailed clinical assessments for each resident at NH admission and quarterly thereafter, for as long as a resident remains in the NH.(9) Routinely collected data include demographics, physical and cognitive function, comorbid medical conditions, and health behaviors (e.g., use of tobacco). The reliability and validity of the MDS data is generally considered to be high.(10–12) Although MDS 2.0 currently has been replaced by version 3.0 throughout the U.S., version 2.0 is still used in many countries (e.g., Finland, Canada). The MDS was used to identify the study cohort with MS and risk factors for hip fractures. Ethical approval for this study was granted by the Institutional Review Board at Hebrew SeniorLife.

Study population

The study population included all newly admitted long-stay NH residents between May 2007 and April 2008. An individual qualified as a long-stay NH resident on day 100 (i.e., index date) after staying in the same nursing facility with no more than 10 consecutive days outside the facility. The 100-day period before the index date was referred as the baseline period. We required residents to have continuous enrollment in Medicare FFS Parts A and D, and at least one MDS assessment during the baseline period in order to permit assessment of risk factors for hip fractures. Approximately 3% of residents reported a hip fracture during the one year before the index date. We only counted the first hip fracture between the index date and the end of follow-up without a hospitalization for hip fracture in the previous 100 days, in order to be sure that we were excluding encounters for the follow-up care of a hip fracture (Fig. 1).(13).

Residents with MS were identified using the medical condition checkbox of all available MDS assessments on or before the index date since 2000. The validity of using MDS to identify individuals with MS was well established, with a positive predictive value (PPV) of 0.65 and a negative predictive value of 1.(14) To account for differences in the demographics between NH residents with and without MS,(15) each resident with MS was matched to 5 residents without MS according to age, sex, and race on the index date.

The study population was followed from the index date, until the end of follow-up, defined as the first event of incident hip fracture, death, or March 31st, 2010 (end of the study period). All participants had the opportunity for 2-years of follow-up, but were censored on day 61 following a NH discharge.

Assessment of risk factors

Over 50 potential risk factors were selected based on prior literature and substantive clinical knowledge (4, 13) and categorized into 8 domains: demographic, cognitive/function, neuropsychiatric, falls, pain, nutrition, co-morbidities and prescription drugs. Potential risk factors under each domain are summarized in Table S1. This included, but was not limited to, the Cognitive Performance Scale (CPS), wandering, the Katz Activities of Daily Living (ADL) scale, walking in the room and self-transfer performance. Information from all domains except prescription drug use was obtained using the Medicare Enrollment File, Medicare Part A claims, or the MDS assessment closest to and preceding the index date. We considered prescription drugs that have been associated with an increased risk of falls or decreased bone mineral density (Table S1).(16) Drugs use was ascertained from Medicare Part D claims and defined as any dispensing during the baseline period.

Study outcomes

The outcome was presence of the first hospitalized hip fracture from the index date until the end of follow-up. A hospitalization for hip fracture was identified using a ICD-9 diagnosis code of 820.xx or 733.14 with or without an accompanying procedural code in the primary or secondary position on the Medicare Part A inpatient claims. The estimated PPV using a similar definition (without ICD-9 code 733.14) is 98%, with sensitivity of 97%.(17).

Statistical analysis

The incidence rates (IR) of hip fracture were calculated as the number of hip fractures divided by person-years of follow-up. We firstly calculated IR for hip fracture in our age-, sex- and race-matched cohort without adjusting for other covariates; then we calculated adjusted IR taking into account inverse probability weights estimated based on the presence of each of the characteristics described in the Risk Factors section above.(18) As physical function correlates with the disability of MS and may modify the relationships between other risk factors and hip fracture in MS, (19) we calculated the IR overall, as well as stratified by physical function indicated by self-transfer performance. The 95% confidence intervals (CI) were calculated based on the Gamma distribution.(20) Self-transfer performance is categorized in MDS version 2.0 as 5 categories according to performance in the past 7 days: no assistance required, requires setup help only, requires one person to physically assist, requires two or more persons to physically assist, and the activity did not occur (21). The first three categories were collapsed into the group of independent or mild assistance; while dependent was used to indicate the latter two categories.

Due to the high mortality following hip fracture events in NH, (22) we used the competing risk proportional hazards regression based on the Fine and Gray method (23) to compare the IR of hip fracture by MS status in the age-, sex- and race-matched cohort while accounting for the competing risk of death. We similarly used a Fine and Gray model to determine risk factors for hip fracture in

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