

Trends and Epidemiology of Spine Fractures in the Super-Elderly Population in the United States from 2011 to 2020

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INTRODUCTION: Spine fractures are a major public health issue for the elderly and are associated with significant morbidity, mortality, and economic burden.¹ As the United States (US) elderly population continues expanding, the impact of spine fractures in this demographic will likely increase accordingly. Super-elderly individuals, defined as 80 years of age or greater, represent a significantly expansive segment of the US population. This cohort is known to be particularly prone to fragility fractures due to a variety of age-related risk factors that increase their susceptibility.² Despite this concern, few population-based epidemiological studies elucidating the incidence of spine fractures in US 80+ year-olds have been published to date. Thus, this study aims to investigate the incidence of spine fractures, including stratifications by fracture site, sex, and age, in 80+ year-old US patients between 2011-2020.

METHODS: This descriptive epidemiology study retrospectively analyzed the National Electronic Injury Surveillance System (NEISS) to identify cases of spine fractures in the super-elderly. NEISS data are obtained from a national sample of hospitals which have been selected as a stratified probability sample of all hospitals in the US, from which nationwide injury estimates can be made. All patients aged 80+ years who were diagnosed with a neck, upper trunk, or lower trunk injury between 2011 to 2020 were identified using the NEISS dataset and further reviewed for inclusion of only those with a clear diagnosis of an acute spine fracture. Outcome measures included annual, overall, and age-adjusted fracture incidence rates (IRs), temporal trends in IRs from 2011 to 2020, patient demographics (age, sex), and injury characteristics (disposition, associated injuries). IRs are expressed as the number of fractures per 10,000 person-years at-risk (PYR). Person-years at-risk were calculated using population estimates from the US Census Bureau. Patients were stratified by ages for additional comparisons (octogenarians, nonagenarians, centenarians). Acute spine fracture IRs from 2011 to 2020 were analyzed using linear regression. The magnitude and direction of trends in acute spinal injury rates are indicated by average annual percent change (AAPC) estimates. The NEISS dataset is de-identified and publicly available and thus this study was deemed exempt from institutional review board approval.

RESULTS: An estimated 385,375 super-elderly patients sustained spinal fractures over the 10-year study period for an overall IR of 31.5 PYR. Lumbar spine fractures were the most common spinal fracture, representing about 50% of all cases. Female patients accounted for 70% of all cases, and overall injury rate was significantly higher in females than males for spinal fractures. Octogenarians accounted for the majority of spinal fractures, suffering nearly 70% of all spinal fractures in the super elderly population. However, the spinal fracture IRs among nonagenarians and centenarians were significantly higher than that of octogenarians. Patients with cervical spine fractures were more likely to suffer from concomitant closed head injuries, face/skull fractures, and upper extremity fractures, while patients with thoracic spine fractures were more at risk for simultaneous chest/internal organ injuries, rib/sternum fractures, and multilevel spinal fractures. Overall, annual spine fracture IRs increased from 20.8 PYR in 2011 to 40.3 PYR in 2020 (AAPC=8, $p=0.00002$). When looking at specific types of spine fractures, the incidence of cervical spine fractures (AAPC=6.9, 95%, $p=0.00079$), thoracic spine fractures (AAPC=9.5, $p=0.00027$), and lumbar spine fractures (AAPC=8, $p=0.00004$) all increased significantly from 2011 to 2020. The annual incidence of cervical, thoracic, and lumbar spine fractures increased at similar rates over the study period ($p>0.2$ for all pairwise comparisons). Annual fracture IRs increased significantly and at similar rates in both males and females for spinal fractures. Stratified by age, injury rates increased among octogenarians and nonagenarians for spinal fractures and remained stable among centenarians during the same period (Figure 1).

DISCUSSION: Despite continuing advancements in the detection and management of degenerative diseases commonly associated with fractures, the present study has revealed a significant increase in annual incidence of spine fractures in US patients 80+ years of age from 2011 to 2020.² Further analysis by skeletal type demonstrated that the incidences of cervical, thoracic, and lumbar spine fractures all significantly increased, despite lumbar spine fractures being the dominant subtype in this population. Although females accounted for greater than two-thirds of cases, both male and female fracture incidences increased significantly across the study period. Interestingly, when stratified by age group, significant increases in fracture incidence were seen in octogenarians and nonagenarians but not in centenarians. As advancements in all areas of medicine contribute to increased life expectancy, this data can help uncover potential causes of the aforementioned increased fracture incidence and highlight areas for further improvement in the prevention and care of these financially burdensome and potentially fatal injuries that inevitably come with age.

SIGNIFICANCE/CLINICAL RELEVANCE: Identification of recent trends in the epidemiology of spine fractures in the oldest cohort of US patients can be used to study the outcomes of past preventative efforts and offer insight to more effective ways to improve future prevention and management strategies.

REFERENCES:

1. Braithwaite RS, Col NF, Wong JB. Estimating hip fracture morbidity, mortality and costs. *J Am Geriatr Soc.* 2003;51(3):364-370. doi:10.1046/j.1532-5415.2003.51110.x
2. LeBoff MS, Greenspan SL, Insogna KL, et al. The clinician's guide to prevention and treatment of osteoporosis [published correction appears in *Osteoporos Int.* 2022 Jul 28;]. *Osteoporos Int.* 2022;33(10):2049-2102. doi:10.1007/s00198-021-05900-y

IMAGES AND TABLES:

Figure 1

