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Hip Fracture Rates in Nursing Home Residents With and Without HIV

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Persons with HIV have near-normal life expectancy with antiretroviral treatment,[1] and so more individuals will develop chronic conditions and require nursing home (NH) care. The number of NH residents with HIV increased by 71% from 2000 to 2010.[2] Persons with HIV may develop low bone mineral density (BMD) as a result of the infection and its treatment, thereby increasing fracture risk.[3,4] However, little information exists about hip fractures in NH residents with HIV.

We examined differences in hip fracture rates in a national cohort of HIV-positive (HIV+) and HIV-negative (HIV−) residents who stayed at least 100 days in an NH during 2013-2016. This analysis used Medicare Parts A and D claims linked to the Minimum Data Set (MDS) version 3.0, the Chronic Condition Warehouse (CCW), and Certification and Survey Provider Enhanced Reports (CASPER). The Advarra institutional review board approved the study.

We identified HIV+ NH residents using the CCW HIV/AIDS indicator and the MDS diagnosis. HIV+ NH residents reside in a relatively small number of NHs, which tend to be located in states with the highest prevalence of HIV.[5] We therefore restricted our primary analysis to residents living in an NH with both HIV+ and HIV− residents during the study period. Other exclusion criteria were as follows: residents without continuous enrollment in Medicare Parts A and D, or without a valid MDS assessment during baseline. We followed residents from their 101st day in the facility until hip fracture, death, Medicare disenrollment, or 12/31/2016. Baseline characteristics were measured during the initial 100 days in the facility including resident characteristics (eg, age, physical[6] and cognitive function[7] from the MDS), facility characteristics (eg, deficiency scores[8] from CASPER) and prescription drug use identified from Part D.

We identified hospitalization events for hip fracture using the *International Classification of Diseases, Ninth* and *Tenth Revisions* (*ICD-9* codes 820 and 733.14, *ICD-10* codes S72.0, S72.1, M80.05, M84.45, M80.85, and M84.65), in the primary or secondary diagnostic fields of the MedPAR data. We calculated the incidence rates of hip fracture by HIV status using propensity scores with inverse probability weights to balance baseline characteristics. Fine and Gray competing risk models were used to compare hip fracture events by HIV status. Results were stratified by age groups. In a stability analysis, we examined hip fracture rates in all long-stay residents, regardless of whether HIV+ residents lived in the facility.

Among 1,064,002 long-stay NH residents, 5235 residents with HIV and 251,698 residents without HIV resided in 2908 unique NHs. The number of HIV+ residents in each facility ranged from 1 to 56. For residents aged 65 years or older, HIV+ residents were younger [mean (SD): 75.9 (7.9) vs 81.8 (8.6) years], less likely to be female (HIV+ vs HIV−: 41.9% vs 64.9%), and more likely to be black (44.5% vs 21.6%) than HIV− residents. Older HIV+

residents had a higher burden of major psychiatric illness (eg, schizophrenia: 8.5% vs 4.8%) than HIV− residents. For residents aged <65 years, HIV+ and HIV− residents were similar in most characteristics (findings are available from the author upon request).

Among residents aged 65 years or older, the adjusted incidence rates of hip fracture was 1.06 (95% CI 0.71-1.67) for HIV+ residents; and 1.20 (95% CI 1.17-1.24) for HIV− residents (Table 1). In those aged <65 years, the adjusted incidence rate of hip fracture was 0.47 (0.30-0.79) for HIV+ residents, and 0.41 (0.36-0.46) for HIV− residents. HIV status was not associated with hip fracture (age ≥65 years: HR 1.02, 95% CI 0.78-1.34; age <65 years: HR 1.31, 95% CI 0.90-1.89).

Our stability analysis based on 1,064,002 long-stay NH residents (5235 HIV+ residents and 1,058,766 HIV− residents residing in 15,804 facilities) yielded consistent findings (available from the author on request).

Despite having fewer traditional risk factors for hip fracture, older NH residents with HIV had similar rates of hip fracture to HIV− residents, a group known to have high hip fracture risk. Our findings differ from previous US and international studies that reported an increased fracture risk in people with HIV.[9] Differences may relate to patient characteristics of these community-based studies (eg, mostly male aged 60 years or younger) and study methodology.

Previous studies suggest that low BMD may not fully explain hip fracture risk among HIV+ individuals,[10] emphasizing the importance of identifying and addressing traditional risk factors for osteoporosis and falls in this population. Until future research defines the unique factors that contribute to increased fracture risk among persons living with HIV, clinicians should use strategies known to prevent hip fractures in the general population.

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Table 1

Crude and Standardized Incidence Rates (per 100 Person-Years) for Hip Fracture by Age Group and HIV Status

	Age <65 y (n = 35,369)		Age ≥65 y (n = 221,564)	
	HIV+ (n = 2734)	**HIV− (n = 32,635)**	**HIV+ (n = 2501)**	**HIV− (n = 219,063)**
Hip fracture events, n (%)	31 (1.13)	282 (0.86)	51 (2.04)	4395 (2.01)
Mean follow-up years (SD)	2.01 (1.20)	2.10 (1.16)	1.70 (1.14)	1.66 (1.14)
Death, n (%)	963 (35.2)	9884 (30.3)	1206 (48.2)	112,410 (51.3)
Crude IRs per 100 person-years (95% CI) *	0.56 (0.40-0.80)	0.41 (0.36-0.46)	1.20 (0.91-1.58)	1.21 (1.17-1.24)
IPW standardized IRs per 100 person-years (95% CI)	0.47 (0.30-0.79)	0.41 (0.36-0.46)	1.06 (0.71-1.67)	1.20 (1.17-1.24)
Regular Cox proportional regression, HR (95% CI)	1.12 (0.70-1.81)	1	0.90 (0.59-1.35)	1
Fine and Gray competing risk model, HR (95% CI) †	1.31 (0.90-1.89)	1	1.02 (0.78-1.34)	1

IPW, inverse probability weight; IR, incidence rate; SD, standard deviation.

*95% CIs for the IRs of each group were calculated using the nonparametric bootstrap with 1000 replicates.

†Hazard ratios were obtained using the Fine and Gray competing risk model in an IPW cohort. Final models were further adjusted for BMI category, which was not adequately balanced through the IPW approach.

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