

Survival Analysis of Nursing Home Residents with a Fracture in 2012

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INTRODUCTION

Fractures among the elderly are serious health problems that occur frequently, are expensive to treat, and may result in significant disability and increased risk of mortality. Overall mortality rates among the elderly with hip fractures has been estimated, but less is known about the risk of mortality following fractures of varying severity.

Hip fractures are an especially common, severe and expensive fracture type among the elderly. Every year, approximately 300,000 hip fractures occur in elderly persons, causing considerable mortality and loss of independence (Neuman, 2014; Brauer, 2009; Magaziner, 1997; Magaziner, 1990). Particularly concerning is that residents of long-term nursing homes are twice as likely as community-dwellers to have a hip fracture (Norton, 1999; Butler, 1996). Further, studies have observed poorer outcomes after hip fracture among the nursing home population compared to community-dwellers (Eastwood, 2002; Baupre, 2007).

While it is important to study hip fracture because of the high associated mortality, there is also a need to examine other types of fractures common among the elderly. Skeletal fractures in the elderly population have been associated with multiple negative health outcomes such as disability (Braithwaite, 2003), mental deterioration (Dolan, 2000; Lenze, 2007) and mortality (Neuman, 2015; Biluc, 2009).

The main objectives of this study were to quantify mortality rates and determine factors impacting mortality following a fracture among nursing home residents.

METHODS

Study Design and Population: A retrospective cohort design was used to examine mortality outcomes in Medicare fee-for-service (FFS) beneficiaries aged 65+ years residing in nursing homes with a fracture in 2012. A group of comparison group of age-, sex- and race-matched beneficiaries was randomly selected from all nursing home residents without a fracture.

Classification Exposure and Outcomes: Primary International Classification of Diseases, Ninth Revision (ICD-9), diagnosis codes from Medicare inpatient and emergency room claims were used to categorize fractures. Exposure classifications included: 1) hip/pelvic fracture, 2) lower limb fracture, 3) upper limb fracture, 4) neck and trunk fracture and 5) fracture-free (control) beneficiaries. Death from all causes was the main outcome. Baseline covariates of interest were beneficiary age, sex, race, Medicare-Medicaid dual enrollment status and Hierarchical Condition Category (HCC) score in the month of the fracture (or study date for fracture-free group). Antipsychotic drug use, fall history, delirium, activities of daily living (ADL) score and body mass index (BMI) were extracted from the Minimum Data Set (MDS) v3.0 assessment data. The Charlson Comorbidity Index (CCI) was used to estimate the burden of comorbidity based on the ICD-9 diagnosis codes in the Medicare claims data.

Statistical Analysis: Kaplan-Meier survival functions were estimated to examine differences in mortality on the basis of fracture type and categorical covariates. Cox proportional hazards model was used to produce adjusted estimates of the effect of fracture type on survival while controlling for covariates.

RESULTS

A total of 9,863 beneficiaries were included in the study with the unexposed group totaling 5,406 beneficiaries and hip fracture being the most common fracture with 2,262 beneficiaries.

The median age of beneficiaries across groups ranged from 84-86 years old with the hip fracture patients slightly older than the other groups. Overall, 78% of beneficiaries were female with larger percentages of women in the lower and upper limb fracture groups. Over 90% of beneficiaries in the hip fracture group were of non-Hispanic white race compared to the unexposed control group that was comprised of 81.2% non-Hispanic whites.

The study population was predominately dually eligible for both the Medicare and Medicaid programs and 84.6% of beneficiaries were originally entitled to Medicare on the basis of age. CCI scores ranged from 0-21, about half of beneficiaries scored in the 2-5 range and the median CCI score was 4 for all groups (Table 1).

Table 1: Characteristics of Beneficiaries by Fracture Group

Age Group	FRACTURE-FREE		HIP		LOWER LIMB		NECK/TRUNK		UPPER LIMB		TOTAL	
	n	%	n	%	n	%	n	%	n	%	n	%
65-74	722	13.3	260	11.5	150	18.1	86	15.1	121	15.2	1339	13.6
75-84	1507	27.9	597	26.4	243	29.3	167	29.3	236	29.6	2750	27.9
85-94	2266	41.9	1001	44.3	325	39.2	236	41.4	314	39.5	4142	42.0
95+	911	16.9	404	17.9	111	13.4	81	14.2	125	15.7	1632	16.5
Sex												
Male	1193	22.1	578	25.6	92	11.1	164	28.8	145	18.2	2172	22.0
Female	4213	77.9	1684	74.4	737	88.9	406	71.2	651	81.8	7691	78.0
Race												
Non-Hispanic White	4390	81.2	2042	90.3	699	84.3	510	89.5	693	87.1	8334	84.5
Black or African-American	613	11.3	117	5.2	81	9.8	28	4.9	55	6.9	894	9.1
Hispanic	264	4.9	66	2.9	41	5.0	18	3.2	30	3.8	419	4.2
Other	139	2.6	37	1.6	8	1.0	14	2.5	18	2.3	216	2.2
Medicare-Medicaid Dual Status												
No Medicaid Eligibility	1290	23.9	533	23.6	125	15.1	129	22.6	144	18.1	2221	22.5
Full, Partial or QMB Eligibility	4116	76.1	1729	76.4	704	84.9	441	77.4	652	81.9	7642	77.5
Original Entitlement												
Elderly	4596	85.0	1982	87.6	653	78.8	478	83.9	633	79.5	8342	84.6
Disability, ESRD or Both	810	15.0	280	12.4	176	21.2	92	16.2	163	20.5	1521	15.4
Charlson Score												
0-1	665	12.3	312	13.8	122	14.7	77	13.5	95	11.9	1271	12.9
2-3	1431	26.5	663	29.3	215	25.9	139	24.4	212	26.6	2660	27.0
4-5	1432	26.5	601	26.6	202	24.4	141	24.7	183	23.0	2559	25.9
6-7	952	17.6	334	14.8	136	16.3	103	18.1	155	19.5	1679	17.0
8+	926	17.1	352	15.6	155	18.7	110	19.3	151	19.0	1694	17.2
ADL Category												
0-7	1019	18.9	644	28.5	174	21.0	161	28.3	194	24.4	2192	22.2
8-11	752	13.9	393	17.4	77	9.3	106	18.6	142	17.8	1470	14.9
12-15	1913	35.4	771	34.1	273	32.9	197	34.6	282	35.4	3436	34.8
16-18	1722	31.9	454	20.1	305	36.8	106	18.6	178	22.4	2765	28.0
Antipsychotic Use												
Yes	458	8.5	163	7.2	53	6.4	42	7.4	77	9.7	793	8.0
Tobacco Use												
Yes	655	12.1	350	15.5	98	11.8	95	16.7	121	15.2	1319	13.4
Falls in Previous 30 days												
Yes	41	0.8	51	2.3	29	3.5	15	2.6	20	2.5	156	1.6
Other												
Median Age	85		86		84		85		84		85	
Median HCC	1.80		1.68		1.79		1.80		1.76		1.77	
Median BMI	25		23		27		24		25		25	
Median Activities of Daily Living	13		12		14		12		13		13	
Median Charlson Comorbidity Index	4		4		4		4		4		4	
Survival												
Alive after 2 years	2844	52.6	1008	44.6	413	49.8	273	47.9	418	52.5	4956	50.2
Died within 2 years	2562	47.4	1254	55.4	416	50.2	297	52.1	378	47.5	4907	49.8
Mortality												
30 days	516	9.5	356	15.7	80	9.7	52	9.1	40	5.0	1044	10.6
60 days	819	15.1	510	22.5	122	14.7	91	16.0	80	10.1	1622	16.4
90 days	1053	19.5	622	27.5	162	19.5	114	20.0	110	13.8	2061	20.9
180 days	1523	28.2	812	35.9	237	28.6	157	27.5	184	23.1	2913	29.5
1 year	2167	40.1	1070	47.3	345	41.6	236	41.4	311	39.1	4129	41.9
2 years	2562	47.4	1254	55.4	416	50.2	297	52.1	378	47.5	4907	49.8
Total	5406	54.9	2262	22.9	829	8.4	570	5.7	796	8.1	9863	100

Activities of daily living scores in the 12-15 point range were most common for beneficiaries across all groups except lower limb fractures. The median ADL score across all groups was 13.

Median HCC scores, a measure of risk for high medical spending (note: a value of 1.0 indicates average risk for Medicare spending), ranged from 1.68 for beneficiaries with a hip fracture to 1.80 among those with neck/trunk fractures and the unexposed control beneficiaries. (Table 1)

Figure 1: Kaplan-Meier Survival Curve by Fracture Group

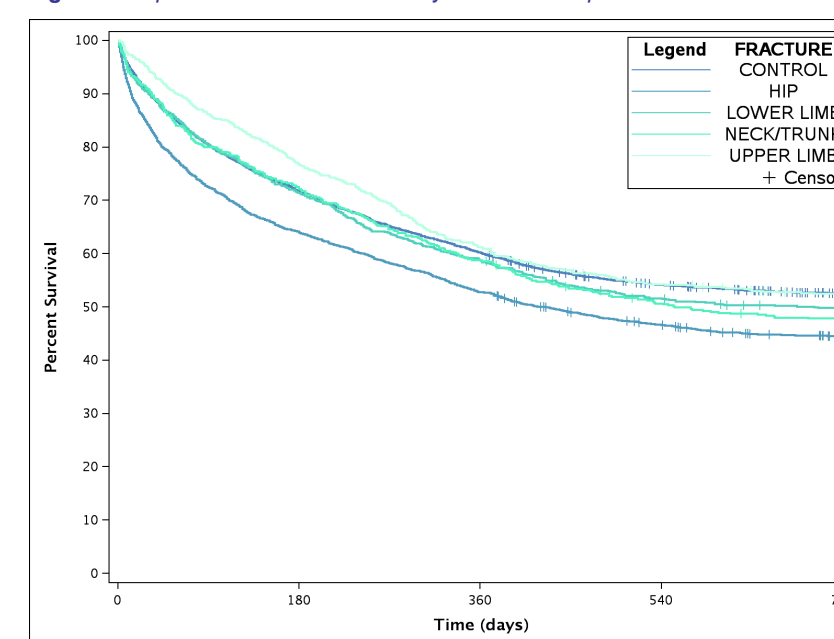
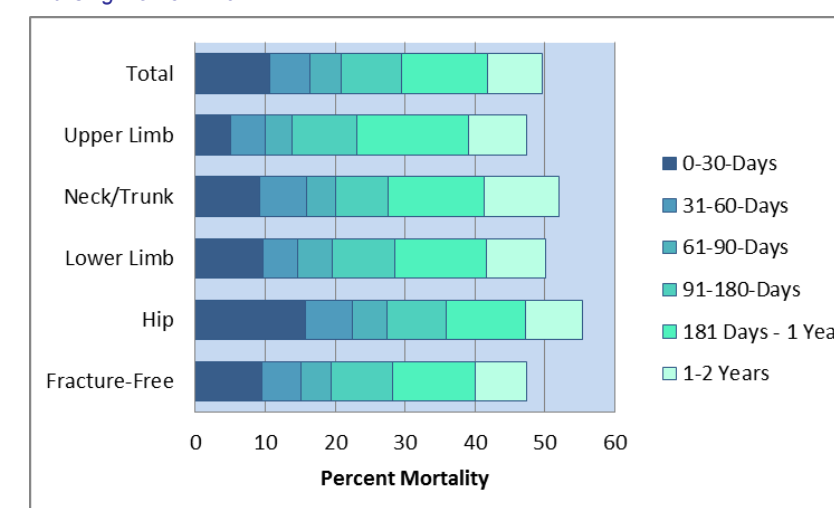


Figure 2: Percent Mortality by Time Period in Medicare Beneficiaries Residing in a Nursing Home in 2012



CONCLUSIONS

In addition to hip fractures, beneficiaries residing in nursing homes who experience a neck/trunk or lower limb fracture are also at significant risk of death when compared to fracture-free nursing home residents. Risk of death in beneficiaries with upper limb fractures was not significantly different from those in the fracture-free group. Taken together these results indicate that the fractures impacting mobility have the most significantly detrimental effect on survival.

IMPLICATIONS

Implementing programs to reduce all fractures in nursing home residents, such as fall prevention and mobility improvement, along with well-defined treatment protocols focused on increasing mobility following fractures of the lower limb and neck/trunk may reduce risk of death in nursing home residents.

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