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Recurrent Fall-Related Hospitalizations Among Older Adults: The Burden In New York City

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Abstract

Background: Falls among older adults are a major public health concern, with recurrent falls being especially troubling. This analysis was conducted to better understand the burden of recurrent fall-related hospitalizations in New York City.

Methods: Administrative data from the Statewide Planning and Research Cooperative System were used to describe patient-level characteristics for New York City residents 65 years and older who were admitted to and discharged from New York City hospitals for a fall-related injury between 2004 and 2011.

Results: Of the 107,923 older adult residents hospitalized for a fall during the eight-year period, 16,574 (15%) were hospitalized at least one additional time for a fall-related injury during the same time period with a mean number of days between fall-related hospitalizations of about a year and a half (556 days). Females accounted for 72% of older adults hospitalized for more than one fall-related injury compared to 68% of older adults hospitalized for one fall-related injury. Adults aged 80-84 years and 85 years or older at the first fall accounted for 24% and 39%, respectively, of older adults hospitalized for more than one fall-related injury compared with 21% and 36%, respectively, of older adults hospitalized for one fall-related injury.

Conclusion: The burden of fall-related injuries is high among females and adults 80 years or older in New York City, underscoring the need for providers to evaluate their patient's individual risk, particularly to reduce the risk of recurrent falls. Future recurrent falls research should employ sufficient follow-up time, as recurrent falls may occur between one and two years after the first.

Keywords: Falls; Recurrent; Aging; Injury surveillance; Injury prevention; Hospitalizations

List of Abbreviations

DOHMH: Department of Health and Mental Hygiene; EUPIN: Encrypted Unique Personal Identifier; NYC: New York City; NYS: New York State; SPARCS: Statewide Planning and Research Cooperative System.

Introduction

Falls, the leading cause of fatal and non-fatal injuries among adults aged 65 and older, are a major public health concern [1,2]. Each year in the United States, one in three older adults experience a fall [3-5]. Injuries resulting from a fall among this vulnerable population can be serious, and can result in a variety of conditions and other negative outcomes including fractures, traumatic brain injuries, fear of falling, loss of independence, and mortality [6-9]. History of falling is a risk factor for future falls among older adults [10-12]. In addition, the consequences of falling may be more severe among recurrent fallers compared to one-time fallers, with multiple falls associated with increased functional disability [13].

In New York City (NYC), falls are the leading cause of injury-related deaths and hospitalizations among older adults, and the burden of falls is expected to increase between 2010 and 2030 as the older adult population continues to increase [14]. Total charges to treat fall-related hospitalizations amounted to more than $770 million in 2011 and accounted for nearly two-thirds of all injury-related charges among older adults [14]. However, the impact of recurrent falls among older NYC adults has not been previously reported.

The present analysis aims to document the burden of recurrent fall-related hospitalizations among individuals aged 65 and older in NYC to inform local practice, program, and policy efforts to reduce falls among older adults. The methodology used to assess the local experience may be applicable to other local and state jurisdictions.

Methods

Data source

Annual in-patient hospital discharge data for years 2004-2011 were obtained from the New York State (NYS) Statewide Planning and Research Cooperative System (SPARCS) through an agreement with the NYC department of health and mental hygiene (DOHMH). SPARCS datasets include information related to each hospitalization

including patient age, gender, residence, diagnosis codes, cause of injury codes, admission date, and discharge date. The datasets used for this analysis also included an encrypted unique personal identifier (EUPIN) that could be used to identify repeat hospitalizations for the same individual [15]. This project was submitted to the NYC DOHMH Institutional Review Board and the Columbia University Institutional Review Board and determined by both not to be human subject research.

Study population

The study population was defined as NYC residents aged 65-110 years with known gender who were discharged from a NYC hospital between 2004-2011 for an unintentional fall-related injury, defined by external cause of injury e-codes E880-E886, E888 of the ICD-9-CM classification system [16]. Fall-related hospitalizations were included only if the patient was discharged alive after the first fall-related hospitalization.

Recurrent fall-related hospitalizations were identified based on EUPIN frequency. Admission and discharge dates for each hospitalization by EUPIN were further examined to de-duplicate records for the same event. The final study population consisted of 107,923 NYC older adult residents with a combined total of 128,831 fall-related hospitalizations.

Study variables

Recurrent fall-related hospitalizations were defined as the number of additional hospital admissions for a fall-related injury that occurred after being discharged from the first fall-related hospitalization. NYC residents were defined as residents within one of the five NYC boroughs (Bronx, Brooklyn, Manhattan, Queens, and Staten Island).

Length of stay was defined as the number of days from the admission date to the discharge date for the first fall-related hospitalization. Age at first fall-related hospitalization was operationalized as a categorical variable with five levels: 65-69, 70-74, 75-79, 80-84, and 85 or older.

Statistical analysis

Descriptive analyses were based on the univariates of people hospitalized for a fall-related injury. Bivariable associations between dichotomized fall-related hospitalization status (single or recurrent) and categorical variables were analyzed using the Chi-squared test. Continuous variables were analyzed using the Student's t-test.

Results

Among the final population of 107,923 older adults, there were a total of 128,831 fall-related hospitalizations between 2004-2011, with a mean of 1.2 fall-related hospitalizations per individual (Table 1). The vast majority of patients (n=91,349, 85%) had only one fall-related hospitalization, followed by smaller percentages of patients with two (n=13,322, 12%), three (n=2,491, 2%), and four or more (n=761, 1%) fall-related hospitalizations. Adults aged 80-84 years and 85 years or older at the first fall accounted for 24% and 39%, respectively, of older adults hospitalized for more than one fall-related injury compared with 21% and 36%, respectively, of older adults hospitalized for one fall-related injury.

Number of fall-related hospitalizations	Single fall (N=91,349)		Two or more falls (N=16,574)		Overall (N=107,923)			
	Number	%	Number	%	Number	%	Test statistic	p-value
1	91,349	100			91,349	85		
2			13,322	80	13,322	12		
3			2,491	15	2,491	2		
4-10			761	5	761	1		
Average number of fall-related hospitalizations (SD)	1.0	(0.0)	2.3	(0.6)	1.2	(0.5)		
Age at first fall-related hospitalization							209.5	<0.001
65-69	10,647	12	1,416	9	12,063	11		
70-74	12,084	13	1,916	12	14,000	13		
75-79	15,847	17	2,878	17	18,725	17		
80-84	19,593	21	3,946	24	23,539	22		
85+	33,178	36	6,418	39	39,596	37		
Mean (SD)	80.9	(8.4)	81.7	(7.9)	81.1	(8.4)	-11.3	<0.001
Gender							85.2	<0.001
Male	28,901	32	4,646	28	33,547	31		

Female	62,448	68	11,928	72	74,376	69		
Borough of residence at first hospitalization							114.3	<0.001
Bronx	14,235	16	2,664	16	16,899	16		
Brooklyn	25,696	28	4,480	27	30,176	28		
Manhattan	21,020	23	4,340	26	25,360	23		
Queens	24,039	26	3,888	23	27,927	26		
Staten Island	6,359	7	1,202	7	7,561	7		
Length of stay (days) for first fall-related hospitalization								
Mean (SD)	7.6	(10.3)	6.9	(6.7)			5.4	<0.001
Median	5		5					
Days between fall-related hospitalizations								
Mean (SD)			556	(572)				
Median			359					
Min			1					
Max			2,840					
Interquartile Range			97-844					

Table 1: Characteristics of older adults with one or more fall-related hospitalizations, New York City, 2004-2011.

The majority of patients hospitalized for a fall-related injury were female (n=74,376, 69%). Females accounted for 72% of older adults hospitalized for more than one fall-related injury, compared with 68% of older adults hospitalized for one fall-related injury (p<0.001). Length of hospital stay for the first fall-related hospitalization was slightly higher among those with one fall-related hospitalization compared with those hospitalized for a recurrent fall (7.6 days vs. 6.9 days, p<0.001). There was a wide range of days between the discharge date of the first fall-related hospitalization and the admission date of the second among those hospitalized for more than one fall-related injury (IQR: 97-844) with a mean of 556 days and a median of 359 days.

Discussion

In NYC, nearly one out of six (15%) older adults hospitalized for a fall-related injury had more than one fall-related hospitalization. Similar to national patterns, overall rates of fall-related hospitalizations are highest among adults aged 80 years and older and among females [17]. The finding that recurrent fall-related hospitalizations were more common among the oldest adults and females underscores the need for assessing falls risk and employing multifactorial approaches to falls prevention [4,11,18]. Furthermore, the modest differences in age and gender distributions observed between those with one fall-related hospitalization and those with recurrent fall-related hospitalizations suggests that interventions to prevent the first fall in this population may have additional impacts by lowering the chances of a recurrent fall.

This descriptive analysis is the first to document the local NYC burden of recurrent fall-related hospitalizations among older adults. This analysis highlights the utility of an administrative dataset containing information on all hospital discharge events and an encrypted identifier to quantify the number of individuals hospitalized multiple times over an eight-year period and to document and describe the burden of recurrent fall-related hospitalizations.

One of the main strengths of this analysis was the ability to examine recurrent fall-related hospitalizations over an eight-year time period. As expected, among those with recurrent fall-related hospitalizations, the highest percentage were admitted to the hospital for the first fall-related injury at the start of the period, in 2004. For those with more than one fall-related hospitalization, the mean number of days between fall-related hospitalizations was 556 days. To our knowledge, there is no comparable national average of time between recurrent fall-related hospitalizations. Much of the literature on the topic of recurrent falls only takes into account a 6-month or 1-year follow-up period, and we suggest that lengthening this time frame would be beneficial for future research so that all recurrent falls can be accounted for [19,20].

Several possible predictors of recurrent fall-related hospitalizations, such as race and ethnicity and comorbidities, unfortunately could not be incorporated into this study because they were coded unreliably, incompletely collected, or missing for a substantial number of patients. The analysis was limited by a lack of complete follow-up time at risk for all individuals. Individuals could only be identified if they experienced another fall-related hospitalization in a NYC hospital. We expect, therefore, that the estimated percent of older adults who had more than one fall-related hospitalization may be underestimated. In addition, the lack of complete follow-up limits the ability to fully understand potential risk and protective factors for recurrent fall-related hospitalizations. For example, the finding that length of stay for the first fall-related hospitalization was shorter among those with recurrent fall-related hospitalizations compared with those with only

one fall-related hospitalization should be further examined. If length of stay is a marker for injury severity it is possible that some older adults with more severe injuries were discharged alive, but later succumbed to conditions that were caused by or exacerbated by the fall. Relatedly, discharge status is also a marker of severity, indicating further medical care is necessary after release. More than one-half of older adults hospitalized for a fall are discharged to a skilled nursing facility or rehabilitation center, but lack of follow-up information prohibited complete assessment of discharge status as a contributing factor to recurrent falls-related hospitalizations [14]. Future analysis that can utilize hospitalization records linked with vital statistics death certificates may be able to more completely evaluate this relationship in other global urban cities.

Conclusions

Local administrative surveillance data can be used to document the burden of recurrent fall-related hospitalizations. In NYC, 15% of older adults hospitalized for fall-related injuries had more than one fall-related hospitalization. As other studies have found, fall recurrence in NYC appears to be associated with older age and female gender, which may be useful for providers evaluating their patients' individual risk, particularly to reduce the risk of recurrent falls among patients who already experienced a fall. The finding that the average number of days between fall-related hospitalizations is 556 days should be of note for future research when considering a sufficient timeframe to use as a follow-up period for potential repeat falls.

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Competing interests

Dr. Thelma Mielenz serves on the editorial board of *Injury Epidemiology*. She was not involved in the review or handling of this manuscript. The authors have no other competing interests to disclose.

Authors' contributions

DT conducted the analysis, interpreted the results, and wrote the first draft of the manuscript. JMN helped to procure the dataset, supervised the analysis, oversaw the development of the manuscript, and provided critical revisions to the manuscript. TJM oversaw the development of the manuscript, contributed to the interpretation of the results, and provided critical revisions to the manuscript. LLD and RJK contributed to the interpretation of the results and to critical revisions of the manuscript. All authors read and approved the final manuscript.

Authors' information

DT presented a final draft of the results in the form of a Master's student thesis for Columbia University's Mailman School of Public Health. TJM acted as his first reader at the Mailman School and JMN acted as his second reader at the New York City Department of Health and Mental Hygiene.

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