Resident-to-Resident Violent Incidents in Nursing Homes

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Context Little is known about nursing home residents' injuries that are inflicted by other residents.

Objective To assess risk factors for violent injury to nursing home residents by other residents.

Design, Setting, and Subjects Case-control study using data from the Massachusetts Department of Public Health's Complaint and Incident Reporting System and from Minimum Data Set assessments for Massachusetts nursing home residents. Cases had an injury sustained from an incident with another nursing home resident between January 1, 2000, and December 31, 2000, which left visible evidence (ie, fracture, dislocation, bruise or hematoma, laceration, and reddened area) (median age, 81 years). Controls were randomly selected from all residents who had a Minimum Data Set assessment completed in 2000 (n=101 429) and no injury report (median age, 83 years). A total of 1994 controls were included in the analyses.

Main Outcome Measures Injury type and risk of being injured by resident-to-resident aggressive physical behaviors based on the specific characteristics of the injured resident.

Results During the first incident, 294 residents sustained fractures (n=39), dislocations (n=6), bruises or hematomas (n=105), lacerations (n=113), and reddened areas (n=31). Injured residents (cases) were more likely to be cognitively impaired, exhibit symptoms of wandering, be verbally abusive, and have socially inappropriate behavior than the controls. Residents who were classified as needing extensive assistance (adjusted odds ratio [AOR], 0.3; 95% confidence interval [CI], 0.2-0.6) and being severely dependent (AOR, 0.12; 95% CI, 0.05-0.27) had a significant reduction in being injured. Residents in an Alzheimer disease unit were almost 3 times as likely to be injured than those living in other units (AOR, 3.2; 95% CI, 1.4-7.5).

Conclusions Injured residents were more likely, perhaps unknowingly, to "put themselves in harm's way," be verbally aggressive, and be cognitively impaired. Interventions to prevent these incidents should focus on the behavior of the injured persons.

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NURSING HOME RESIDENTS COMprise one of the most vulnerable populations due to their physical disability and cognitive impairment. Despite long-term efforts, it has been difficult to ensure the quality of care for this vulnerable population.[1,2] Although the definition of quality of care varies among professionals,[1-5] safety is one of the most important aspects of quality of care in long-term care settings in which patients are often physically and/or cognitively dependent on others.[1]

Although efforts have been made to limit unintentional injury to this population,[6-8] nursing home residents are also vulnerable to intentional injury. Much concern has been expressed about the vulnerability of this population to abuse by staff,[9-14] but there is little attention regarding aggression by other residents. Prior studies have suggested that resident and facility characteristics associated with physically aggressive behavior by residents include male sex, dementia, psychosis, and pain; facility characteristics such as having a higher proportion of residents with dementia were also found to have a positive association.[15-22] According to data collected by the Centers for Medicare and Medicaid Services, approximately 88 000 nursing home residents in the United States have exhibited physically aggressive behavior in the week prior to their assessment with the Minimum Data Set (MDS).[23] However, there are currently no data, to our knowledge, that delineate the characteristics of those who are injured by other residents' aggressive behavior.

Therefore, we conducted a case-control study using data from the Massachusetts Department of Public Health's Complaint and Incident Reporting System and from MDS assessments to provide a broad examination of the types of injuries that result from resident-to-resident violent incidents; anatomical locations of injuries; location in nursing home facilities in which such injuries occurred; circumstances surrounding the incidents; and resident character-

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istics disproportionately associated with being injured.

METHODS

Data Sources

Nursing homes are required to report alleged abuse and other types of incidents (eg, neglect, mistreatment, misappropriation, serious incidents affecting the health and safety of patients) within 7 days in a written document (by fax) to the Massachusetts Department of Public Health's Complaint and Incident Reporting System, which is part of the Division of Health Care Quality, the state's licensing and certificating agency.[24]

We obtained resident-specific MDS assessments under a contract with Centers for Medicare and Medicaid Services to complement the data in Massachusetts' independent reporting system and to create a control group.[25] The MDS is a comprehensive assessment instrument that is completed by nurses at least every 3 months pursuant to the Omnibus Budget Reconciliation Act of 1987.[26] Facilities that receive federal payment must comply. A multistate investigation sponsored by the Centers for Medicare and Medicaid Services recently showed that the MDS has high interobserver reliability among nurse researchers.[27] The MDS has a quarterly assessment, which is performed at least every 3 months, and a full assessment, which is performed on admission, when there is a change in status, or at least every 12 months, and includes diagnoses and therapeutic plans, such as noting if the resident lives on an Alzheimer disease unit and is in a behavioral program. In the main analysis, we used only variables that were available in both the quarterly and full assessment forms.

Study Population

The cases included in this study were Massachusetts nursing home residents who were injured by another resident during incidents that occurred between January 1, 2000, and December 31, 2000. Among 1132 incident reports classified as physical harm inflicted by other residents (unpublished data, Massachusetts Department of Public Health, Division of Health Care Quality, 2000), we eliminated reports that were duplicates and restricted our study to those residents who had physical harm with visible evidence of injuries (ie, fracture, dislocation, bruise or hematoma, laceration, or reddened area) to maximize objectivity and thereby reduce the chances of reporting bias. For the descriptive component, we examined the frequency of injury types among those injured by other residents' physical aggression; the anatomical location in which the injury occurred; and the location within the facility in which the injury occurred. Additionally, for the descriptive component only, we included all incidents that occurred during the study period (even if a resident was involved in >1 violent incident). We also included all body parts when several parts were listed as injury sites.

The injured residents identified in the incident reporting system were linked to their MDS assessments by using their names, sex, age, and facility names. For those individuals who were included in more than 1 incident report, we chose the earliest incident chronologically, and later grouped those with multiple incidents as a distinct set for separate analysis. The information on the injured residents comes from MDS assessments that were closest to but before the incident date. In the analyses that used MDS data, we excluded 22 cases whose earliest MDS assessment in 2000 was performed after the incident date.

We randomly selected 1994 controls from all Massachusetts nursing home residents who had an MDS completed in 2000 (n=101 429) and were not reported as injured residents. Within that year, we randomly chose 1 evaluation by randomly sampling residents from the resident level file (a record of all Massachusetts nursing home residents, in which each individual resident is listed only once), and then by randomly choosing 1 MDS assessment among all those performed during the sampling frame for each control resident. We randomly chose 1 MDS assessment to ensure dates of the controls' assessments spanned the entire calendar year thus matching that of the cases. If we had chosen the first evaluation for each control, all of the assessments would have been concentrated in the first 3 months of the calendar year. The study was approved by the human subjects committee of the Harvard School of Public Health.

Resident Characteristics

Because there is a lack of literature regarding the characteristics of residents that are at risk for being injured, we relied on our clinical observations and those of state nursing home surveyors with whom we spoke. We chose the following characteristics for further study and restricted both our data acquisition and analysis to these variables. The MDS items used for this study were age, sex, level of activities of daily living (ADLs), cognitive level, behavior symptom types and frequency (ie, wandering, verbally abusive behavior, physically abusive behavior, socially inappropriate behavior, or resists care), presence of bed rails (ie, whether any type of bed rails were used), the reason for assessment, whether patients were in an Alzheimer disease or dementia special care unit (Alzheimer unit), and whether they were in a special behavior symptom evaluation program (behavioral program).

The ADLs were evaluated with the ADL Hierarchy Scale, which includes both early and late loss such that the 4 components (personal hygiene, using the toilet, locomotion on unit, and eating) create a summary score that can reflect substantial variability in physical dependence.[28] Cognitive level was evaluated with the Cognitive Performance Scale (CPS), a measure that has been validated against commonly used instruments such as the Mini-Mental State Examination.[29]

The verbatim definition of behavioral symptoms measured by the MDS are wandering (moved with no rational purpose, seemingly oblivious to needs or safety); verbally abusive behavior symptoms (others were threatened, screamed at, cursed at); physically abusive behavior symptoms

(others were hit, shoved, scratched, sexually abused); socially inappropriate or disruptive behavior symptoms (made disruptive sounds, noisiness, screaming, self-abusive acts, sexual behavior or disrobing in public, smeared or threw food or feces, hoarding, rummaged through others' belongings); and resists care (resisted taking medications or injections, ADL assistance or eating). We defined *postacute care* as whether the reason for assessment in the MDS had any code related to the Medicare Prospective Payment System to distinguish residents who temporarily stay in nursing homes for postacute care from those who stayed in nursing homes for long-term chronic care, and used this variable as a proxy for length of stay.

According to a study[27] that investigated MDS's reliability, the κ scores for those items used in our final model (directly or indirectly via one of the composite scores) were 0.63 for short-term memory; 0.89, cognitive skills used for daily decision making; 0.82, making self understood; 0.85, frequency of wandering; 1.0, frequency of being verbally abusive; 0.74, frequency of being physically abusive; 0.87, frequency of having socially inappropriate behavior; 0.88, ability to feed oneself; 0.91, ability to use the toilet; 0.89, ability to attend to personal hygiene; and 0.85, locomotion on the nursing unit. This large study did not publish data about items related to resisting care, the use of bed rails, or if patients had been in a coma. However, in another study,[29] $\kappa = 1.0$ for coma.

Statistical Analysis

Bivariate associations were analyzed using χ^2 tests. We used the χ^2 test of linear trend to screen for injury risk by other residents across gradients of age, ADL, and CPS strata. When injured residents were involved in more than 1 incident, we used the first incident for the analysis. For modeling purposes, categorical variables with many levels (eg, behavioral symptoms) were dichotomized. Continuous and composite variables (ie, age, ADL Hierarchy Scale score, and CPS score) were plotted against the probability of being an injured resident (the logit). Because the relationship with the logit was not linear, these continuous variables were categorized. The reference group for the ADL Hierarchy Scale was independence and the reference group for CPS was intact cognition. The reference group for age was the one with the largest sample size. The overall linear trend for significance was evaluated for age, ADL Hierarchy Scale score, and CPS score. All variables collected were included in the final model.

To control for possible confounding, we performed unconditional, logistic regression with cluster analysis based on the residents' facility (for the potential underestimation of the SEs of the odds ratios [ORs] derived from dependent observations within a nursing home[30]) in which the outcome was resident-induced injury and the independent variables were all of those listed in the prior paragraph. We conducted 1 main analysis and 2 subgroup analyses as follows. The main analysis included all 272 injured residents who had an MDS completed during 2000 and all 1994 controls. The first subgroup analysis included only injured residents and controls drawn from facilities that reported at least 1 injured resident and at least 1 control; the second subgroup analysis, which investigated the effect of residence on an Alzheimer unit and participation in a behavioral program, included only injured residents and controls who had a full MDS assessment performed (because such data are only recorded in the full MDS assessment rather than the quarterly assessment). In the subanalysis that focused on the variable of Alzheimer unit and behavioral program, we used only variables that were found to

Table 1. Frequency of Injury Types Among Residents Injured During Resident-to-Resident Violent Incidents

Injury Type	No. (%) of Residents With Violent Incident		
	First Incident	Second Incident	Third-Fifth Incident
Fracture	39 (13)	1 (4)	1 (33)
Dislocation	6 (2)	0	0
Bruise or hematoma	105 (36)	11 (44)	0
Laceration	113 (38)	10 (40)	2 (67)
Reddened area	31 (11)	3 (12)	0
Total	**294** (100)	**25** (100)	**3** (100)

Table 2. Body Location of Injury Among Residents Injured During Resident-to-Resident Violence*

Body Location	No. (%) of Residents With Violent Incident		
	Total	Women	Men
Head, face, nose, or neck	**147** (56)	70 (48)	77 (52)
Torso, spine, back, or rib	**18** (7)	12 (67)	6 (33)
Extremity			
Upper	**68** (26)	42 (62)	26 (38)
Lower (hip)	**28** (11)	19 (68)	9 (32)
Total	**261** (100)	**143** (55)	**118** (45)

*Body location was mentioned in 78% of incidents (230/294). One person may have injuries to several parts of the body. This is for all incidents, even if they occurred more than once in a given resident.

Table 3. Facility Location in Which Resident Was Injured*

Facility Location	No. (%) of Residents Injured
Injured residents' room	43 (29)
Other residents' room	13 (9)
Dining room	26 (17)
Day room	20 (13)
Hallway	38 (26)
Other	9 (6)
Total	**149** (100)

*Facility location was mentioned in 49% of incidents (143/294). Residents who had several incidents have locations listed more than once.

be significant in the main analysis. The Hosmer-Lemeshow test was performed to evaluate the goodness of fit of the model.[31]

All reported *P* values are 2-sided with significance defined as $P<.05$. All analyses were performed with STATA statistical software (Version 7.0, STATA Corp, College Station, Tex).

RESULTS

The total number of residents who met the inclusion criteria in the Massachusetts reporting system was 323, of which 294 had confirmation identification in the MDS assessments. The injury types for the 294 residents are indicated in TABLE 1. Injury types for the first incidence included fractures (n=39), dislocations (n=6), bruises or hematomas (n=105), lacerations (n=113), and reddened areas (n=31). Severe injuries such as fracture and dislocation accounted for 15% of the total injuries reported. Twenty-five residents were involved in more than 1 incident involving lasting physical harm. Among those who were involved in more than 1 incident of lasting physical harm, the second event occurred within 60 days of the first in 60% of the cases. Among the cases in which body locations were mentioned, more than half of the injuries occurred around the head and face region, with another large proportion involving the extremities (TABLE 2). Facility location in which the injury occurred was available for only half of the cases. Among these cases, injuries frequently occurred in the injured residents' rooms, although public spaces such as hallways and dining rooms were also common (TABLE 3).

Through the narratives in the Massachusetts Department of Public Health's incident reporting system, we found that although many incidents appeared to have been unprovoked, some of the residents allegedly injured by other residents may have provoked the aggressive physical contact—whether unintentionally, unknowingly, or otherwise. For example, walking into the wrong bedroom or eating from another resident's plate may have precipitated an assault. We were unable to characterize or quantify the circumstances of the incidents due to insufficient reporting details that were almost always devoid of information about the alleged aggressors.

Characteristics of study residents and *P* values from χ^2 tests are shown in TABLE 4. For all first incidents among residents who sustained physical harm, the median age was 81 years (range, 18-101 years) for cases and 83 years (range, 16-109 years) for controls. Compared with controls, there were quite a few injuries among younger residents. Men accounted for 48% of the cases but only 29% of the controls ($P<.001$). Higher cognitive impairments were associated with greater risk for being injured, as demonstrated by the χ^2 test for linear trend accounting for 93% of the total χ^2 among CPS strata. Injured residents were less dependent in their ADLs. Behavioral pattern was strikingly different between cases and controls: injured residents (cases) were more likely to exhibit symptoms of wandering, being verbally or physically abusive, having socially inappropriate or disruptive behavior, and resisting care. In contrast, injured

Table 4. Characteristics of Residents in Massachusetts Nursing Homes (N = 2266)*

Characteristic	No. (%) of Residents		*P* Value†
	Case (n = 272)	Control (n = 1994)	
Age group, y			
≤40	15 (6)	29 (1)	<.001
41-60	35 (13)	107 (5)	
61-70	22 (8)	151 (8)	
71-80	63 (23)	530 (27)	
81-90‡	104 (38)	807 (40)	
≥91	33 (12)	370 (19)	
Men	130 (48)	584 (29)	<.001
Score (description) on Cognitive Performance Scale			
0 (Intact)‡	12 (4)	669 (34)	<.001
1 or 2 (Borderline or mildly impaired)	53 (19)	451 (23)	
3 or 4 (Moderately impaired)	130 (48)	546 (27)	
5 or 6 (Severely impaired)	77 (28)	328 (16)	
Score (description) on Activities of Daily Living Hierarchy Scale			
0 (Independent)‡	23 (8)	111 (6)	<.001
1 or 2 (Supervision; limited assistance)	92 (34)	672 (34)	
3 or 4 (Extensive assistance)	123 (45)	616 (31)	
5 or 6 (Dependent)	34 (13)	595 (30)	
Behavior Symptom Frequency§			
Wandering	113 (42)	179 (9)	<.001
Verbally abusive	78 (29)	132 (7)	<.001
Physically abusive	55 (20)	107 (5)	<.001
Socially inappropriate or disruptive	87 (32)	182 (9)	<.001
Resists care	91 (33)	283 (14)	<.001
Type of bed rails			
Full	22 (8)	263 (13)	.02
Other or side	99 (36)	1190 (60)	<.001
None	151 (56)	541 (27)	<.001
Postacute care‖	35 (13)	899 (45)	<.001
Alzheimer disease unit¶	24 (25)	27 (2)	<.001
Behavioral program¶	11 (12)	25 (2)	<.001

*Analysis was performed using the first incident among those residents who had more than 1 incident.
†Based on the χ^2 test of statistical independence.
‡Reference group.
§Does not sum to n = 272 and n = 1994 because a resident may exhibit more than 1 behavior.
‖Residents had code related to Medicare in A-8b of the Minimum Data Set.
¶Values were available only in the full assessment Minimum Data Set forms; data were available for 35% of residents in the case group and 64% in control group.

residents were less likely to have bed rails or receive postacute care.

TABLE 5 indicates factors associated with being injured by another resident, which are adjusted by residents' characteristics using the main logistic regression model as well as crude ORs. Male residents were almost twice as likely to be injured than female residents (Table 4; 130 men injured vs 142 women) (adjusted OR [AOR], 2.1; 95% confidence interval [CI], 1.5-2.9; $P<.001$). Compared with those who had a zero score (intact) on the CPS, the likelihood of experiencing injuries was about 5 times higher for those classified as borderline or mildly impaired, 8 times higher for those moderately impaired, and 12 times higher for those severely impaired, with a significant trend over CPS strata ($P<.001$). Compared with those who were classified as independent by the ADL Hierarchy Scale, those who were classified as needing supervision or limited assistance had a lower but not statistically significant likelihood of being injured by other residents (AOR, 0.6; 95% CI, 0.3-1.1). Residents classified as needing extensive assistance (AOR, 0.3; 95% CI, 0.2-0.6) and being severely dependent in ADLs (AOR, 0.12; 95% CI, 0.05-0.27) had a significant reduction in being injured by other residents. The overall trend for the ADL Hierarchy Scale was also statistically significant ($P<.001$).

Behavioral problems associated with residents being injured by other residents were wandering, being verbally abusive, and socially inappropriate. The characteristics of being physically abusive and resisting care were not significant. Having some type of bed rail and receiving postacute care were inversely associated with being harmed. When we included the month of the MDS assessment in this main regression model, the direction of association was the same and the OR changed by less than 10% for all variables except 2 (age groups 1 and 3, which changed less than 20%); thus we concluded the month was not a confounder and eliminated it from the final main analysis model. TABLE 6 shows the subgroup analysis that included only residents drawn from facilities that had at least 1 case and 1 control; the ORs showed the same direction and approximate magnitude as those in Table 5.

TABLE 7 indicates the impact of the injured individuals' residence on an Alzheimer unit and participation in behavioral programs. Residents living in an Alzheimer unit were almost 3 times as likely to be injured as those in another unit (AOR, 3.2; 95% CI, 1.4-7.5). On the other hand, behavioral intervention did not appear to have a statistically significant impact on the risk of being injured. The association between being injured and the injured residents' characteristics (eg, cognitive level, ADL, behavioral symptoms) was similar with the results in Table 5 and the overall trends for cognitive level and ADLs were both significant ($P<.001$).

COMMENT

Resident-to-resident violence in nursing homes is virtually unstudied, with little information available on the frequencies of violence with associated risk factors or potentially effective interven-

Table 5. Association of Injured Residents' Characteristics With Resident-to-Resident Incidents (N = 2266)*

Characteristic	Association of Injured Resident Characteristics and Incident, OR (95% CI)†		*P* Value‡	
	Crude	Adjusted	Actual	Trend
Age group, y				
≤40	4.0 (1.9-8.0)	2.1 (0.8-5.4)	.14	.05
41-60	2.5 (1.6-4.0)	1.7 (0.9-3.4)	.12	
61-70	1.1 (0.7-1.9)	1.1 (0.7-2.0)	.66	
71-80	0.9 (0.7-1.3)	0.9 (0.6-1.3)	.68	
81-90§	1.00	1.00		
≥91	0.7 (0.4-1.1)	0.7 (0.5-1.1)	.09	
Men	2.2 (1.7-2.9)	2.1 (1.5-2.9)	<.001	
Score (description) on Cognitive Performance Scale				
0 (Intact)§	1.00	1.00		<.001
1 or 2 (Borderline or mildly impaired)	6.6 (3.4-13.6)	4.5 (2.4-8.6)	<.001	
3 or 4 (Moderately impaired)	13.3 (7.2-26.6)	8.0 (3.9-16.6)	<.001	
5 or 6 (Severely impaired)	13.1 (6.9-26.7)	11.9 (5.3-26.5)	<.001	
Score (description) on Activities of Daily Living Hierarchy Scale				
0 (Independent)§	1.00	1.00		<.001
1 or 2 (Supervision; limited assistance)	0.7 (0.4-1.1)	0.6 (0.3-1.1)	.08	
3 or 4 (Extensive assistance)	1.0 (0.6-1.6)	0.3 (0.2-0.6)	.001	
5 or 6 (Dependent)	0.3 (0.2-0.5)	0.12 (0.05-0.27)	<.001	
Behavior Symptom Frequency				
Wandering	7.2 (5.4-9.7)	2.8 (1.9-4.1)	<.001	
Verbally abusive	5.7 (4.1-7.9)	1.9 (1.2-2.9)	.005	
Physically abusive	5.0 (3.4-7.2)	1.1 (0.7-1.8)	.56	
Socially inappropriate or disruptive	5.0 (3.6-6.8)	1.6 (1.1-2.3)	.04	
Resists care	3.2 (2.4-4.2)	1.2 (0.8-1.9)	.45	
Presence of bed rails‖	0.3 (0.2-0.4)	0.7 (0.5-0.9)	.02	
Postacute care¶	0.2 (0.1-0.3)	0.3 (0.2-0.5)	<.001	

Abbreviations: CI, confidence interval; OR, odds ratio.
*Analysis was performed using the first incident among those residents who had more than 1 incident. *C*-statistic = 0.86; $P = .19$ (goodness of fit; evaluated by Hosmer-Lemeshow test).
†Adjusted for age, sex, Cognitive Performance Scale score, Activities of Daily Living Hierarchy Scale score, Behavior Symptom Frequency, presence of bed rails, and postacute care.
‡Evaluated using logistic regression analysis. *P* for trend was assessed for age, Cognitive Performance Scale score, and Activities of Daily Living Hierarchy Scale score.
§Reference group.
‖Indicates full; other or side.
¶Residents had code related to Medicare in A-8b of the Minimum Data Set.

tions. We examined injured residents' characteristics and systematically reviewed the injury types, anatomical location, narrative reports regarding circumstances, and the locations of incidents within a facility. Our original expectation was that physical disability and cognitive impairment would be associated with being injured. However, through the narratives in the reporting system, we found that some of the alleged injured residents may have provoked the aggressive physical contact—whether unintentionally, unknowingly, or otherwise. Injured residents appeared to be more physically independent than the controls, suggesting 2 types of patients: those who may be more susceptible to "getting in harm's way" and those who themselves might behave in a manner that proceeds an aggressive response. On the other hand, as was expected, injured residents were more likely to be cognitively impaired, suggesting that they may find it hard to avoid harm due to their impaired cognitive function. Thus, those who were less likely to be injured due to aggressive physical contact from other residents may have been either cognitively intact enough to avoid trouble or too physically dependent to get into trouble.

Table 6. Association of Injured Residents' Characteristics (n = 736) With Resident-to-Resident Incidents in Nursing Homes*

Characteristic	No. (%) of Injured Residents		Adjusted OR (95% CI)†	*P* Value‡	
	Case (n = 250)	Control (n = 486)		Actual	Trend
Age group, y					
≤40	15 (6)	12 (3)	1.1 (0.4-3.2)	.91	.88
41-60	35 (14)	30 (6)	1.3 (0.6-2.7)	.54	
61-70	19 (8)	34 (7)	0.9 (0.5-1.7)	.68	
71-80	56 (22)	133 (27)	0.8 (0.5-1.3)	.42	
81-90§	94 (38)	193 (40)	1.00		
≥91	31 (12)	84 (17)	0.9 (0.6-1.5)	.80	
Men	121 (48)	147 (30)	2.2 (1.5-3.3)	<.001	
Score (description) on Cognitive Performance Scale					
0 (Intact)§	12 (5)	99 (20)	1.00		<.001
1 or 2 (Borderline or mildly impaired)	49 (19)	112 (23)	2.3 (1.2-4.4)	.02	
3 or 4 (Moderately impaired)	120 (48)	156 (32)	4.0 (1.8-8.6)	<.001	
5 or 6 (Severely impaired)	69 (28)	119 (25)	4.1 (1.7-9.9)	.002	
Score (description) on Activities of Daily Living Hierarchy Scale					
0 (Independent)§	22 (9)	25 (5)	1.00		<.001
1 or 2 (Supervision; limited assistance)	87 (35)	148 (30)	0.6 (0.3-1.2)	.15	
3 or 4 (Extensive assistance)	111 (44)	155 (32)	0.4 (0.2-0.9)	.02	
5 or 6 (Dependent)	30 (12)	158 (33)	0.2 (0.1-0.4)	<.001	
Behavior Symptom Frequency‖					
Wandering	105 (42)	72 (15)	2.3 (1.4-3.8)	.001	
Verbally abusive	70 (28)	43 (9)	2.2 (1.2-3.9)	.007	
Physically abusive	52 (21)	35 (7)	1.3 (0.7-2.3)	.41	
Socially inappropriate or disruptive	76 (30)	61 (13)	1.4 (0.9-2.2)	.18	
Resists care	80 (32)	90 (19)	1.1 (0.7-1.7)	.83	
Presence of bed rails¶	111 (44)	316 (65)	0.9 (0.6-1.4)	.76	
Postacute care	34 (14)	168 (35)	0.4 (0.2-0.6)	<.001	

Abbreviations: CI, confidence interval; OR, odds ratio.
*Facilities that had at least 1 case and 1 control. Analysis was performed for the first incident among those residents who had more than 1 incident. *C*-statistic = 0.80; *P* = .98 (goodness of fit; evaluated by Hosmer-Lemeshow test).
†Adjusted for age, sex, Cognitive Performance Scale score, Activities of Daily Living Hierarchy Scale score, Behavior Symptom Frequency, presence of bed rails, and postacute care.
‡Evaluated using logistic regression analysis. *P* for trend was assessed for age, Cognitive Performance Scale score, and Activities of Daily Living Hierarchy Scale score.
§Reference group.
‖Does not sum to n = 250 and n = 486 because a resident may exhibit more than 1 behavior.
¶Indicates full; other or side.

Our finding suggested that it is possible that some of the residents who sustained injuries may have provoked the attacks. Wandering was strongly associated with being injured, which suggests that some injured residents may get themselves in trouble by accidentally provoking an attack due to wandering into another residents' "personal space." Residents with verbally abusive symptoms could have provoked an attack of another resident when they repeatedly showed the symptoms. Further research is necessary to understand the mechanism of being injured.

Although this study did not examine aggressors' characteristics, it is possible that a small group of residents who inflict injuries are responsible for most of the incidents. Some residents with cognitive dependency may find it hard to avoid harm simply due to their residence on nursing units with aggressive residents. Residents who experienced more than 1 physical incident often experienced the second incident within 60 days of the first, indicating that injured residents were at high risk for quick subsequent reinjury even if some preventive efforts might have been made. Thus, research on the characteristics of residents who initiated aggressive physical contact should be prioritized.

There were quite a few younger residents (range, 18-40 years) who were injured during resident-to-resident physical contact. Although diagnoses were not fully available in the same proportion for controls and cases (because diagnoses are only listed on full assessments in the MDS), cognitive and psychiatric problems included psychoses, personality disorder, abuse of drugs, disturbance of conduct, mental retardation, Huntington chorea, and anoxic brain damage. Anecdotal reports suggested that younger patients who used to stay in state-owned mental health hospitals due to their severe behavioral problems might have been transferred to nursing homes when many mental hospitals

were closed more than a decade ago. It may be advisable to explore whether such residential arrangements maximize the safety of both younger and older individuals.

We examined 2 facility-related aspects: Alzheimer unit and behavioral program. Our results suggested that individuals living on an Alzheimer unit have a higher probability of being injured by another resident even after adjusting for cognitive level. A prior study also showed that crowding and having a high number of patients with psychiatric disease increased the risk that another resident became violent, which might have arisen from threats and prior injury.[32] Effective interventions may include training nursing staff and environmental modification such as using soft barriers (eg, Velcro nets) or familiar symbols (eg, stop signs) in doorways of nondemented residents who, as noted in the narratives, sometimes became violent when confronted by a demented resident who wandered into his/her room.[33] On the other hand, participation in a behavioral program was not associated with injury in this study. Some studies have suggested that music therapy may improve behavioral problems among patients with dementia or psychiatric disorders[34,35] and organized activities (eg, recreational therapy, exercise, increasing social contact) may be a proactive way to protect residents from wandering into dangerous situations. Thus, the type of behavioral program may be important and worthy of further study.

Our study has several limitations. First, there may be selection bias due to underreporting by nursing homes. Even though the reporting system is mandatory, the reports are fundamentally dependent on someone acting on behalf of the injured resident; thus the described associated factors represent factors for being *reported*, not necessarily for being injured. Resident-inflicted injuries might not have been reported, or could have been reported to the Department of Public Health as other type of incidents (eg, abuse by staff, trauma of unknown origin), which we did not include in this study. Nevertheless, this incident reporting system probably captures most of the witnessed resident-inflicted injuries because it includes not only reports from nursing home staff but also reports from residents themselves, families, relatives, and friends. Advocates also visit each nursing home once a week under the Ombudsman program organized by Massachusetts Executive Office of Elder Affairs and are encouraged to report any incidents to the Department of Public Health.[36,37] Furthermore, the results were essentially unchanged in the subgroup analysis that attempted to control for such a referral bias by examining only cases and controls from the same facilities.

A second limitation is that we used a proxy variable for the length of stay. Ideally, we should have had the actual length of stay, assuming that the residents who stayed in nursing homes for a long time might have a higher probability of being injured. Because the data were not available, we used a proxy that distinguished between those residents who were receiving long-term care and those admitted for postacute (short-term) care. Nevertheless, in the regression analysis that excluded the variable of postacute care, the impact of the other variables on injury association hardly changed. Third, facility characteristics that could influence our results were not fully available in this study. We examined some clinical characteristics such as Alzheimer unit and behavioral program; however, nonclinical characteristics such as profit type could not be examined. Fourth, 2 of the variables in our final model have unpublished κ scores (ie, resists care and

Table 7. Association of Injured Residents' Characteristics With Residence on Alzheimer Units or Participation in Behavioral Programs (n = 1371)

Characteristic	No. (%) of Injured Residents*		Adjusted OR (95% CI)†	*P* Value‡	
	Case (n = 95)	Control (n = 1276)		Actual	Trend
Men	45 (47)	404 (32)	2.1 (1.2-3.6)	.007	
Score (description) on Cognitive Performance Scale					
0 (Intact)§	NA‖	573 (45)	1.00		<.001
1 or 2 (Borderline or mildly impaired)	15 (16)	292 (23)	4.1 (1.4-11.9)	.01	
3 or 4 (Moderately impaired)	48 (51)	282 (22)	9.5 (3.8-26.0)	<.001	
5 or 6 (Severely impaired)	27 (28)	129 (10)	15.1 (4.8-48.0)	<.001	
Score (description) on Activities of Daily Living Hierarchy Scale					
0 (Independent)§	NA‖	66 (5)	1.00		<.001
1 or 2 (Supervision; limited assistance)	36 (38)	515 (40)	0.7 (0.2-2.1)	.54	
3 or 4 (Extensive assistance)	42 (44)	365 (29)	0.4 (0.1-1.2)	.11	
5 or 6 (Dependent)	12 (13)	330 (26)	0.2 (0.1-0.5)	.003	
Behavior Symptom Frequency					
Wandering	46 (48)	88 (7)	3.1 (1.7-5.8)	<.001	
Verbally abusive	27 (28)	47 (4)	4.2 (2.0-8.7)	<.001	
Presence of bed rails	43 (45)	972 (76)	0.5 (0.3-0.9)	.02	
Postacute care	33 (35)	892 (70)	0.4 (0.2-0.6)	<.001	
Alzheimer unit	24 (25)	27 (2)	3.2 (1.4-7.5)	.007	
Behavioral program	11 (12)	25 (2)	1.3 (0.4-4.1)	.66	

Abbreviations: CI, confidence interval; NA, data not available; OR, odds ratio.
*Analysis was performed for those who had Minimum Data Set full assessments. *C*-statistic (area under receiver operating characteristic curve) = 0.90; *P* = .43 (goodness of fit; evaluated by Hosmer-Lemeshow test).
†Adjusted for sex, Cognitive Performance Scale score, Activities of Daily Living Hierarchy Scale score, Behavior Symptom Frequency, presence of bed rails, postacute care, being in Alzheimer unit, and being in the intervention program.
‡Evaluated using logistic regression analysis. *P* for trend was also assessed for Cognitive Performance Scale score and Activities of Daily Living Hierarchy Scale score.
§Reference group.
‖Fewer than 10 residents (not shown pursuant to Centers for Medicare and Medicaid Services' policy regarding sparse Minimum Data Set cell data).

use of bed rails), although we are encouraged by the relatively high κ scores on other items that would appear to be even more subjective. Finally, this study design cannot assert a causal link but only an association.

Physical injury resulting from other residents' actions in nursing homes can contribute to major morbidity and possibly mortality. In an effort to reduce reporting bias, we only included residents who had visible evidence of trauma but there were several hundred violent incidents that did not result in identifiable trauma, which were categorized as "no lasting harm" (ie, incident which does not have visible evidence of physical harm). These may be a precursor of more severe trauma and may be psychologically (or physically) as detrimental as incidents leaving visible evidence.[38-40]

Although it is certainly not our intent to perpetuate an erroneous "blame the injured residents" paradigm, our findings suggest that nursing home resident–inflicted violence is committed against residents whose cognitive impairment coupled with relative physical independence may put them at substantial risk for assault. Interventions to protect this highly suscpetible group may go far to reduce physical and psychological trauma.

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Study concept and design: Shinoda-Tagawa, Leonard, Pontikas, McDonough.
Acquisition of data: Shinoda-Tagawa, Pontikas, Allen, Dreyer.
Analysis and interpretation of data: Shinoda-Tagawa, Leonard, Allen.
Drafting of the manuscript: Shinoda-Tagawa, Leonard, Pontikas.
Critical revision of the manuscript for important intellectual content: Shinoda-Tagawa, Pontikas, McDonough, Allen, Dreyer.
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