

Association of Clinical Outcomes With Surgical Repair of Hip Fracture vs Nonsurgical Management in Nursing Home Residents With Advanced Dementia

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IMPORTANCE The decision whether to surgically repair a hip fracture in nursing home (NH) residents with advanced dementia can be challenging.

OBJECTIVE To compare outcomes, including survival, among NH residents with advanced dementia and hip fracture according to whether they underwent surgical hip fracture repair.

DESIGN, SETTING, AND PARTICIPANTS We conducted a retrospective cohort study of 3083 NH residents with advanced dementia and hip fracture, but not enrolled in hospice care, using nationwide Medicare claims data linked with Minimum Data Set (MDS) assessments from January 1, 2008, through December 31, 2013.

METHODS Residents with advanced dementia were identified using the MDS. Medicare claims were used to identify hip fracture and to determine whether the fracture was managed surgically. Survival between surgical and nonsurgical residents was compared using multivariable Cox proportional hazards with inverse probability of treatment weighting (IPTW). All analyses took place between November 2015 and January 2018. Among 6-month survivors, documented pain, antipsychotic drug use, physical restraint use, pressure ulcers, and ambulatory status were compared between surgical and nonsurgical groups.

RESULTS Among 3083 residents with advanced dementia and hip fracture (mean age, 84.2 years; 79.2% female [n = 2441], 28.5% ambulatory [n = 879]), 2615 (84.8%) underwent surgical repair. By 6-month follow-up, 31.5% (n = 824) and 53.8% (n = 252) of surgically and nonsurgically managed residents died, respectively. After IPTW modeling, surgically managed residents were less likely to die than residents without surgery (adjusted hazard ratio [aHR], 0.88; 95% CI, 0.79-0.98). Among 2007 residents who survived 6 months, residents with surgical vs nonsurgical management had less documented pain (29.0% [n = 465] vs 30.9% [n = 59]) and fewer pressure ulcers (11.2% [n = 200] vs 19.0% [n = 41]). In IPTW models, surgically managed residents reported less pain (aHR, 0.78; 95% CI, 0.61-0.99) and pressure ulcers (aHR, 0.64; 95% CI, 0.47-0.86). There was no difference between antipsychotic drug use and physical restraint use between the groups. Few survivors remained ambulatory (10.7% [n = 55] of surgically managed vs 4.8% [n = 1] without surgery).

CONCLUSIONS AND RELEVANCE Surgical repair of a hip fracture was associated with lower mortality among NH residents with advanced dementia and should be considered together with the residents' goals of care in management decisions. Pain and other adverse outcomes were common regardless of surgical management, suggesting the need for broad improvements in the quality of care provided to NH residents with advanced dementia and hip fracture.

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Hip fractures occur commonly among nursing home (NH) residents.^{1,2} Hip fractures are typically managed with surgical repair because a nonsurgical approach is associated with poor short-term mortality rate and functional recovery.³ However, the decision to undergo surgical repair vs a palliative approach is less straightforward among residents with advanced dementia because at baseline, they have profound cognitive and functional disability and a limited life expectancy.

Management decisions for NH residents with advanced dementia should be guided by the goal of care as articulated by their health care proxy. Prior research indicates that the majority of these proxies prioritize comfort-focused care, and only a minority opt for life-prolonging care.⁴ To make informed decisions that are aligned with preferences, evidence regarding the outcomes of treatment options is necessary. No prior studies to our knowledge have examined whether surgical repair of a hip fracture is associated with increased survival or reduced adverse outcomes (eg, pain) in NH residents with advanced dementia. In the absence of evidence, hip fractures remain the exceptional sentinel event for which a surgical approach is often sought, even when the goal of care is comfort.

A randomized clinical trial of surgery vs a nonsurgical approach in persons with advanced dementia and hip fracture is unlikely to be conducted due to ethical and feasibility concerns. Thus, this study's objective was to leverage nationwide Minimum Data Set (MDS) assessments linked to Medicare claims to conduct a cohort study comparing outcomes between NH residents with advanced dementia who did and did not undergo surgical repair of a hip fracture, including survival, pain, antipsychotic drug use, physical restraint use, pressure ulcer, and ambulatory status.

Methods

Data Sources

Data were ascertained from the MDS (version 2.0) files linked to the Medicare enrollment files, Parts A, B, and D claims, and hospice claims, from January 1, 2008, through December 31, 2013. The MDS is a comprehensive resident assessment instrument containing over 400 items and federally mandated for all US NH residents at the time of admission and quarterly thereafter.⁵ The clinically rich MDS has the advantage of allowing for the adjustment of differences between the surgical and nonsurgical groups, as well as the examination of key postfracture outcomes other than survival. This research was approved by the Institutional Review Board of Hebrew SeniorLife, waiving written informed consent.

Study Design

This retrospective cohort study included long-stay NH residents older than 65 years with advanced dementia and hip fracture (Figure 1). To establish this cohort, we first identified 1 257 279 long-stay NH residents with a full MDS assessment from January 1, 2008, through December 31, 2009, and who were not in hospice. *Long-stay residence* was defined as residing in the same NH for 100 days or longer with no more than 10 consecutive days outside the facility.

Next, residents who experienced a hip fracture within 2 years of the full MDS assessment were identified using Medicare claims

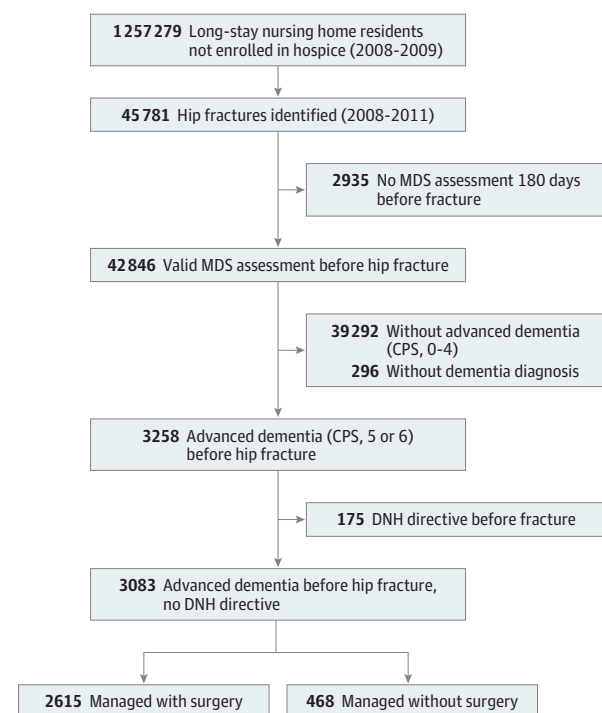
Key Points

Question Do outcomes for nursing home residents with advanced dementia and hip fracture differ with vs without surgical repair?

Findings In this cohort study of 3083 nursing home residents with advanced dementia and hip fracture, over 2-year follow-up, the mortality rate was 12% lower in residents whose hip fracture was treated with surgery. Among 6-month survivors, pain, antipsychotic drug use, physical restraint use, pressure ulcers, and loss of ambulation were common regardless of surgical management.

Meaning In nursing home residents with advanced dementia and hip fracture, the potential survival benefit of surgery should be considered together with the patients' goals of care; there is an opportunity to improve quality of care regardless of how the fracture is managed.

Figure 1. Enrollment of Long-Stay Nursing Home Residents With Advanced Dementia and Hip Fracture



CPS, Cognitive Performance Scale⁶; DNH, do not hospitalize; MDS, Minimum Data Set.

(n = 45 781) using a validated approach with a positive predictive value of 94%.⁷ A hip fracture was defined using the *International Classification of Diseases, Ninth Revision (ICD-9)* diagnostic codes (820.xx and 733.14) in Part A (inpatient) or B (outpatient) claims. For hospitalized fractures identified using Part A claims, we did not require an accompanying procedural code. For nonhospitalized fractures identified using Part B claims, we required a procedural code for hip fracture management on the same encounter as the diagnostic code, based on a published list of codes.⁸ We also considered as a hip fracture any Part B diagnostic claim for pelvic or femoral shaft fracture with a procedural code specific to the hip on the same encounter (n = 119).

Among residents with hip fracture, we then selected those with advanced dementia using the MDS assessment just prior to the date of the fracture. *Advanced dementia* was defined as a Cognitive Performance Scale (CPS)⁶ of 5 or 6 and diagnosis of “dementia” or “Alzheimer disease.” Advanced dementia residents with do-not-hospitalize (DNH) directives on any MDS 1 year before the fracture (n = 183) were excluded.

Finally, we determined whether residents underwent surgical repair using procedural codes, as reported previously.⁸ Residents with Part A diagnostic claims for hip fracture without a surgical procedural code were considered to have nonsurgical management.

Based on an a priori assumption that residents who were and were not ambulatory may be fundamentally different in terms of decision making for surgery and outcomes following fracture, we stratified our analyses according to whether the resident could ambulate in a room without assistance based on the MDS assessment just preceding the hip fracture.

Outcomes

All-cause mortality was ascertained by the Medicare Enrollment File through 2013. Among residents who survived 6 months, data on pain, physical restraint use, and pressure ulcers were obtained from the first MDS assessment completed between 120 and 240 days following the fracture. Pain was assessed using the validated MDS 2.0 pain instrument that relies on nursing assessment, rather than self-report, to capture the frequency and severity of pain in the prior 7 days.⁹ We categorized pain as present if pain of any severity was noted. *Physical restraint use* was defined as the use of any trunk, limb, or chair restraint in the past 7 days. *Pressure ulcers* were defined as any stage 2 to 4 pressure ulcer. Six-month antipsychotic drug use (all types) was ascertained via Medicare Part D claims. Residents were considered users of antipsychotic drugs if the resident was alive and taking the drug 180 days following the fracture based on the amount and frequency of drug prescribed. In the subset of residents who were ambulatory before the fracture and survived 6 months, we determined ambulatory status between 120 and 240 days.

Covariates

Resident characteristics potentially related to both the decision to operate and the outcomes of interest based on the literature¹⁰ and our clinical expertise were selected as covariates, including resident race (white, black, and other/unknown), the Advanced Dementia Prognostic Tool (ADEPT) score,¹¹ and CPS score (5 vs 6). ADEPT is a validated risk score that estimates 6-month mortality in NH residents with advanced dementia.¹¹ Items in ADEPT include NH admission date less than 90 days (n = 0 for all NH residents in this cohort), age, male sex, shortness of breath, bowel incontinence, congestive heart failure, bedfast, pressure ulcer, consumption of less than 75% of meals, dependence for all activities of daily living, body mass index below 18.5, and recent weight loss.

Comfort Care After Fracture

To examine the initiation of comfort-focused care after hip fracture, we described the proportion of residents in the surgical and nonsurgical groups who had a Medicare Hospice claim or a new DNH order (MDS assessment) in the 180 days following the fracture.

Statistical Approach

All data were analyzed using SAS software, version 9.4 (SAS Institute Inc). Descriptive statistics were conducted using means with standard deviations (SDs) for continuous variables and proportions for categorical variables.

Kaplan-Meier curves were used to describe survival among residents who did and did not undergo surgery. Cox proportional hazards regression was used to examine the association between surgical repair (main independent variable) and survival before and after adjusting for race, ADEPT score, and dementia severity (CPS, 5 or 6). Analyses were performed for all residents and then stratified by prefracture ambulatory status.

In the subset of residents who survived 6 months, logistic regression models were used to examine the association between surgical repair and the following outcomes: pain, antipsychotic drug use, physical restraint use, and pressure ulcer. Models were adjusted for age, race, dementia severity, ADEPT score, and the prefracture status of the examined outcome. In the subset of residents who were ambulatory before the fracture and survived 6 months, we described ambulatory status between 120 and 240 days according to whether the resident received surgery.

Finally, logistic regression models were used to generate propensity scores that estimated the odds of receiving surgery vs no surgery (covariates are listed in eTable 1 in the Supplement). Adjustment for differences in characteristics before the hip fracture was performed using inverse probability of treatment weighting (IPTW) models.

Results

Population

We identified 3083 long-stay NH residents with advanced dementia and hip fracture, 879 (28.5%) of whom ambulated prior to the fracture. The mean (SD) age was 84.2 years (7.1) years; 79.2% were female (n = 2441), and 85.4% (n = 2633) had CPS scores of 5. A total of 2615 residents (84.8%) underwent surgical repair, whereas 468 (15.2%) did not. Among ambulatory residents, 94.4% (n = 830 of 879) had surgical repair. **Table 1** lists the baseline characteristics of the entire cohort and stratified by prefracture ambulatory status. Residents managed nonsurgically were more often black, female, had BMI lower than 18.5, had more pressure ulcers, and were totally dependent in activities of daily living compared with residents managed surgically.

Survival

A total of 1076 residents (34.9%) died within 6 months, and 1908 residents (61.9%) died within 2 years of the fracture (**Figure 2**). Mortality differences between residents managed with and without surgery were greatest in the first 30 days (11.5% [n = 300] among residents with surgery vs 30.6% [n = 143] among nonsurgically managed residents) (eTable 2 in the Supplement). Median survival was 1.4 years in residents managed with surgery compared with 0.4 years in residents managed without surgery. In the unadjusted Cox proportional hazards model, surgical repair was associated with a decreased risk of death (hazard ratio [HR], 0.55; 95% CI,

Table 1. Prefracture Ambulatory Status and Clinical Characteristics of Nursing Home Residents With Advanced Dementia and Hip Fracture

Characteristic	Nursing Home Residents, No. (%)					
	Overall (n = 3083)		Ambulatory (n = 879) ^a		Nonambulatory (n = 2202) ^a	
	Surgical Repair (n = 2615)	No Surgical Repair (n = 468)	Surgical Repair (n = 830)	No Surgical Repair (n = 49)	Surgical Repair (n = 1783)	No Surgical Repair (n = 419)
Age, mean (SD), y	84.0 (7.1)	85.1 (7.5)	83.1 (6.9)	83.9 (7.1)	84.4 (7.1)	85.3 (7.5)
Race						
White	2345 (89.7)	385 (82.3)	753 (90.7)	45 (91.8)	1592 (89.3)	340 (81.1)
Black	178 (6.8)	63 (13.5)	48 (5.8)	2 (4.1)	129 (7.2)	61 (14.6)
Other	92 (3.5)	20 (4.3)	29 (3.5)	2 (4.1)	62 (3.5)	18 (4.3)
Female	2052 (78.5)	389 (83.1)	636 (76.6)	36 (73.5)	1414 (79.3)	353 (84.2)
ADEPT score, mean (SD) ^b	12.4 (2.9)	14.0 (3.3)	11.4 (2.6)	12.8 (3)	11.8(2.8)	14.3 (3.2)
Shortness of breath	76 (2.9)	22 (4.7)	12 (1.4)	1 (2.0)	64 (3.6)	21 (5.0)
Bedfast	20 (0.8)	26 (5.6)	2 (0.2)	0	18 (1.0)	26 (6.2)
Congestive heart failure	263 (10.1)	62 (13.2)	51 (6.1)	5 (10.2)	212 (11.9)	57 (13.6)
BMI <18.5	274 (10.5)	80 (17.1)	74 (8.9)	8 (16.3)	200 (11.2)	72 (17.2)
Bowel incontinence	1579 (60.4)	363 (77.6)	359 (43.3)	21 (42.9)	1220 (68.4)	342 (81.6)
Consumes <75% of meals	712 (27.2)	112 (23.9)	196 (23.6)	11 (22.4)	516 (28.9)	101 (24.1)
Pressure ulcer ^c	85 (3.3)	45 (9.6)	4 (0.5)	1 (2.0)	81 (4.6)	44 (10.5)
ADL score = 28 ^d	147 (5.6)	121 (25.9)	0	0	147 (8.2)	121 (28.9)
Transfer dependence ^e	1453 (55.6)	384 (82.1)	105 (12.7)	8 (16.3)	1348 (75.6)	376 (89.7)
CPS ^f						
5	2310 (88.3)	323 (69.0)	794 (95.7)	48 (98.0)	1514 (84.9)	275 (65.6)
6	305 (11.7)	145 (31.0)	36 (4.3)	1 (2.0)	269 (15.1)	144 (34.4)

Abbreviations: ADEPT, Advanced Dementia Prognostic Tool¹¹; ADL, activities of daily living; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CPS, Cognitive Performance Scale.⁶

^a Two residents missing prefracture walking status were excluded.

^b Range, 1.0 to 32.5; higher score indicates greater risk of death.

^c Any prefracture stage 2 to 4 pressure ulcer.

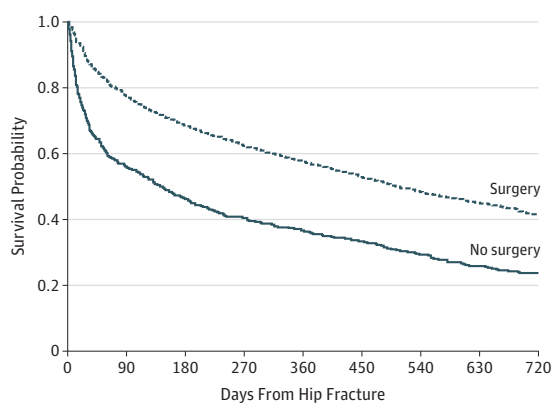
^d ADL score of 28 indicates complete dependence in bathing, dressing,

toileting, feeding, grooming, transferring, and locomotion.

^e Dependence defined as staff-provided extensive assistance 3 or more times in the past week.

^f CPS of 5 indicates severe cognitive impairment without total dependence on eating; CPS of 6 indicates severe cognitive impairment with total dependence on eating.

Figure 2. Survival Among Nursing Home Residents With Advanced Dementia and Hip Fracture



No. at risk
 No surgery 468 263 218 190 172 156 138 122 111
 Surgery 2615 2029 1797 1635 1506 1386 1268 1179 1080

Illustrated are residents who underwent surgery vs no surgery to manage their hip fracture. The adjusted hazard ratio to describe the association between surgical repair vs no surgery and mortality is 0.56 (95% CI, 0.49-0.63).

0.49-0.61; Table 2). In the multivariate model, the association was similar (adjusted HR [aHR], 0.56; 95% CI, 0.49-0.63). In IPTW models, the results were attenuated but remained significant (aHR, 0.88; 95% CI, 0.79-0.98). When

Table 2. Unadjusted and Adjusted Mortality in Nursing Home Residents With Advanced Dementia and Surgical Repair of Hip Fracture Compared With No Surgical Repair by Prefracture Ambulatory Status

Status	HR (95% CI)		IPTW Models (95% CI) ^a
	Unadjusted	Adjusted ^a	
Overall	0.55 (0.49-0.61)	0.56 (0.49-0.63)	0.88 (0.79-0.98)
Ambulatory	0.50 (0.36-0.70)	0.50 (0.36-0.70)	0.89 (0.72-1.10)
Nonambulatory	0.57 (0.50-0.65)	0.58 (0.51-0.66)	0.88 (0.78-0.99)

Abbreviations: ADEPT, Advanced Dementia Prognostic Tool¹¹; CPS, cognitive performance scale⁶; HR, hazard ratio; IPTW, inverse probability of treatment weighting.

^a Fully adjusted model includes ADEPT score, race, and CPS.

stratified by prefracture ambulatory status, the results were similar: IPTW models, ambulatory, aHR 0.89 (95% CI, 0.72-1.10); nonambulatory, aHR, 0.88 (95% CI, 0.78-0.91).

Other Outcomes

A total of 2007 residents were alive 6 months following the hip fracture, and 1794 residents (89.4%) had a valid MDS assessment between 120 and 240 days following the fracture (mean [SD], 170 [24] days). Residents who underwent surgical repair vs those without had less documented pain (29.0% [n = 465] vs 30.9% [n = 59]), greater use of antipsychotic medication (29.5% [n = 529] vs 20.4% [n = 44]), greater physical restraint use (13.0% [n = 233] vs 11.1% [n = 24]), and fewer pressure ulcers (11.2% [n = 200] vs 19.0% [n = 41]) (Table 3). In

Table 3. Association of Outcomes With Surgical Repair vs No Surgical Repair of Hip Fracture in Nursing Home Residents With Advanced Dementia Who Survived 6 Months With Valid MDS Assessment

Outcome	Surgical Repair (n = 1603)	No Surgical Repair (n = 191)	OR (95% CI)		IPTW Model (95% CI) ^b
			Unadjusted	Adjusted ^b	
Pain	465 (29.0)	59 (30.9)	0.91 (0.66-1.27)	0.89 (0.63-1.26)	0.78 (0.61-0.99)
Antipsychotic use ^a	529 (29.5)	44 (20.4)	1.64 (1.16-2.32)	1.43 (0.93-2.19)	1.02 (0.76-1.37)
Physical restraint use	233 (13.0)	24 (11.1)	1.18 (0.75-1.85)	1.44 (0.86-2.40)	1.83 (1.21-2.76)
Pressure ulcer	200 (11.2)	41 (19.0)	0.52 (0.36-0.76)	0.68 (0.45-1.03)	0.64 (0.47-0.86)

Abbreviations: ADEPT, Advanced Dementia Prognostic Tool¹¹; CPS, cognitive performance scale⁶; HR, hazard ratio; IPTW, inverse probability of treatment weighting; MDS, Minimum Data Set; OR, odds ratio.

^a Among 2007 residents who survived 6 months following the hip fracture.

^b Adjusted for ADEPT score, race, and CPS. Each model is also adjusted for

prefracture status of the examined outcome; ie, models examining pain, antipsychotic drug use, restraint use, and pressure ulcer as outcomes were adjusted for prefracture pain, antipsychotic drug use, restraint use, and pressure ulcer, respectively.

adjusted Cox proportional hazards models, there was no difference in these secondary outcomes according to surgical repair. In adjusted IPTW models, there was less pain (aHR, 0.78; 95% CI, 0.61-0.99) and fewer pressure ulcers (aHR, 0.64; 95% CI, 0.47-0.86) among residents managed with surgery.

Among the 879 residents who were ambulatory before the hip fracture, 536 (61.0%) were alive and had a valid MDS assessment between 120 and 240 days following the fracture. A total of 96.1% (n = 515 of 536) underwent surgical repair. A greater proportion of residents managed surgically were ambulatory at 6 months vs those without surgery: 55 of 515 (10.7%) vs 1 of 21 (4.8%).

Comfort Care After Fracture

Overall, 662 residents (21.5%) utilized hospice care within 6 months following the hip fracture. The mean (SD) time to utilize hospice care was 56 (49) days. Among residents managed surgically, 19.3% (504 of 2615) utilized hospice care compared with 33.8% (158 of 468) managed nonsurgically. Among residents who survived 6 months, only 1.1% in both the surgical (n = 28) and nonsurgical (n = 5) groups acquired a DNH directive.

Discussion

In a large nationwide study of NH residents with advanced dementia and hip fracture, mortality was high, with approximately one-third of residents dying within 6 months of the fracture. Surgical repair was associated with a significantly lower risk of death and median increased survival of 1 year compared with a nonsurgical approach. Pain and pressure ulcers were more common in residents managed without surgery. Potentially treatable adverse outcomes, including pain, antipsychotic drug use, restraint use, and pressure ulcers, were common among residents who survived 6 months, regardless of whether they were managed surgically. Only a minority of patients who ambulated before their hip fracture were ambulatory at 6 months after the fracture, even among those who underwent surgical repair. Despite the high morbidity and mortality in these profoundly impaired residents, only about 20% were referred to hospice care, and directives to avoid future hospitalizations were rare.

Our work corroborates and extends previous studies that found a very high mortality in persons with advanced dementia and hip fracture.^{3,12,13} Prior studies of NH residents or com-

munity dwellers with advanced dementia report that 7% to 12% of persons were managed without surgery,^{3,13,14} whereas 15% of residents in our study were managed without surgery. These studies estimate 6-month mortality rates following a hip fracture to be between 36% and 55% compared with 35% found in our study. This suggests that mortality rate is increased approximately 1.5- to 2-fold in NH residents with advanced dementia and hip fracture compared with advanced dementia residents who do not have hip fracture (18%-25%).¹¹ In comparison, population-based studies of hip fracture in older persons report an approximately 3.5-fold increased risk of death in months 4 through 6 following the fracture.¹⁵

Our findings are also consistent with studies of hip fracture that describe a survival benefit in persons undergoing surgical repair. Two studies of NH residents with hip fracture, one in the United States,³ the other in Canada,¹⁴ found that hip fracture managed without surgery had approximately a 2-fold increased mortality over 6 months compared with surgically managed fracture. Neither study reported mortality outcomes specifically among residents with advanced dementia or according to prefracture ambulatory status. In our study, both ambulatory and nonambulatory residents with advanced dementia and hip fractures experienced a notable survival advantage within the first 30 days when their fracture was managed surgically. We cannot discern the reason for this observation, but it is possible that because mortality is greatest immediately following hip fracture, surgical repair with its concomitant treatments (eg, parenteral fluids) attenuates this risk.

Although we observed a survival benefit in residents who underwent operative repair, it is important to consider other outcomes important to both patients and families in this frail population. Among those who survived 6 months after the fracture, pain was reported in approximately one-third of residents regardless of surgical or nonsurgical management. Pain is underreported and undertreated in patients with dementia. In a prospective cohort study by Sieber et al,¹⁶ patients with dementia and hip fracture managed surgically received one-third less opioid medications compared with cognitively intact patients. We found that pain was more commonly reported among residents managed without surgery. If underreporting of pain occurred more often in surgically managed residents, this could explain our findings. Regardless, our findings suggest an opportunity to improve pain management in residents with advanced dementia and hip fracture.

Among 6-month survivors, the use of antipsychotic drugs and physical restraints was common in both those managed with and without surgery. The frequency of antipsychotic drug use in our study was similar to estimates by Jung et al,¹⁷ who found that 29% of persons with advanced dementia (CPS, 5-6) and hip fracture received an antipsychotic drug prescription during their NH stay. Given the adverse effects associated with antipsychotic drugs,¹⁸ it is important to avoid these medications whenever possible. Similarly, physical restraints have been associated with injury¹⁹ and even mortality²⁰ in NH residents and should be avoided. Pressure ulcers were documented in 13% of residents who survived 6 months after hip fracture in the present study (n = 241). Other studies have demonstrated that up to one-third of persons with hip fracture and surgical repair will develop a pressure ulcer,²¹ and it is possible that our estimates are low if pressure ulcers are underreported in the MDS.

Goals of care should drive treatment decisions for NH residents with advanced dementia. Prior work suggests that roughly 60% of proxies for these residents feel that only treatments promoting comfort best align with their goals of care, even if that means relinquishing potentially life-prolonging interventions.²² Only 7% of proxies feel that the resident would still want very intensive medical care (eg, mechanical ventilation) with the hope of prolonging survival. The remaining one-third of proxies opt for care that lies somewhere between these extremes, such as potentially curative treatments that are relatively conservative with the goal of maintaining the resident at their baseline health status (eg, antimicrobial drugs for an infection but not mechanical ventilation). Our findings clearly suggest that surgery would be a reasonable approach for the minority of NH residents with advanced dementia and hip fracture whose primary goal of care remains life prolongation. Our finding that surgical patients may experience less pain and fewer pressure ulcers at 6 months after hip fracture suggests that surgical repair may also promote a goal of comfort. However, we do not know the quality of palliative care provided to these patients, which could potentially ameliorate these issues without surgery.

Limitations

There are some limitations of our study. Despite our relatively homogeneously defined cohort and adjustment for many factors that could influence the relationship between hip fracture

management and mortality, unmeasured differences may persist between residents who did and did not undergo surgery that could influence our findings. To attempt to adjust for these unmeasured differences, we used an IPTW approach that included many characteristics that could be related to the decision to operate. Despite this approach, we could not include every characteristic potentially related to this decision such as differences in comorbidities not included in the MDS. Thus, it is possible that residual confounding may persist and that these unmeasured differences between residents with and without surgery, rather than the surgery itself, explains the observed mortality difference between the groups. Second, misclassification of surgical repair using claims data or cognitive and functional status using the MDS is possible. It is likely that this misclassification is nondifferential and may not affect our results. Third, we measured secondary outcomes at a single time point, although they likely fluctuate in the weeks to months following a fracture. Finally, we did not have information on time to surgery, and it is possible that some residents in the nonoperative group died before they had the opportunity for surgery. Although we cannot entirely disentangle the effect that inclusion of these most frail residents might have had on the measured outcome, our results still provide insight on the anticipated survival differences between the groups.

Conclusions

Our findings highlight the need to improve the quality of care provided to NH residents with advanced dementia who experience a hip fracture. Proxies for these residents should consider the survival benefit of surgery together with the overall goals of care when making the difficult decision of whether to pursue surgery. Discomfort, hazardous interventions (eg, restraints, antipsychotic drugs), and adverse outcomes (eg, pressure ulcers) should be minimized, regardless of surgical management or goals of care. Utilization of hospice care and directives reflective of a more comfort-focused approach (ie, DNH) were surprisingly low in this very frail population near the end of life. We encourage greater use of hospice and palliative care services in residents with advanced dementia and hip fracture regardless of surgical repair in an effort to reduce suffering.

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Drafting of the manuscript: Berry, Rothbaum, Mitchell.

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Invited Commentary

Hip Fractures in Patients With Advanced Dementia What Treatment Provides the Best Palliation?

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Nursing home residents sustaining a hip fracture have poor outcomes both in terms of survival and ambulation. Using US Medicare data on nursing home residents from 2005 through 2009, Neuman and colleagues¹ found that by 6 months after the fracture, 36.2% had died; moreover,

among residents who were not totally dependent in prefracture locomotion, 54% had either died or developed new total dependence. Nonetheless, unless patients are imminently dying, conventional wisdom suggests that the advantages of repairing hip fractures in terms of managing pain and facilitating mobility usually outweigh the disadvantages. These issues are particularly pertinent for nursing home residents with advanced dementia for whom a goal of maintaining comfort is often the predominant preference of their proxy decision maker.² However, the literature contains limited information to guide proxy decision makers regarding short- and long-term outcomes of operative or nonoperative management of hip fracture in these patients.

In this issue of *JAMA Internal Medicine*, Berry and colleagues³ use Medicare claims and nursing home Minimum Data Set (MDS) data to report on several outcomes of nursing home residents with advanced dementia whose hip fractures were treated operatively (85%) or nonoperatively (15%).³ By 6 months after fracture, deaths occurred in 31.5%

of those treated surgically and 53.8% of those treated without surgery. One might have expected an even higher figure for the nonoperative group. Although we are not presented exact figures for earlier mortality, including in-hospital mortality, the survival curve in the nonoperative cohort drops much more steeply in the first few months following the fracture. Consistent with this, the adjusted median survival is only 0.4 years in the nonoperative group. Among survivors, MDS assessments between 120 and 240 days following the fracture showed that 29% and 31% of residents reported pain among those treated operatively and nonoperatively, respectively. Antipsychotic use was more common in the operative group (29.5% vs 20.4%), and pressure sores were more common in the nonoperative group (19% vs 11%); however, neither of these results was statistically significant.

There are many methodological strengths in this study³; however, as with all observational studies of treatment, there are issues in interpreting the results. Residents treated nonoperatively were much more impaired at baseline than those in the operative group, which likely influenced both the choice not to operate and their poor outcomes. For example, 26% of residents in the nonoperative group were completely dependent in their activities of daily living, as opposed to 5% in the surgical group. Similarly, only 10.5% of those in the nonoperative group were fully ambulatory prior to the fracture compared with 31.8% in the operative group. The authors used a multivariable



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