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Pain Treatments after Hip Fracture among Older Nursing Home Residents

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Abstract

Objectives—To examine the association between use of opioids versus other analgesics with death and functioning after hip fracture in older nursing home (NH) residents.

Design—Retrospective cohort using national Medicare fee-for-service claims linked to the Minimum Data Set.

Setting—U.S. NHs.

Participants—NH residents aged ≥65 years who became a long-stay resident (>100 days in the NH) between January 2008 and December 2009, had a hospitalized hip fracture, and returned to the NH.

Exposure—New use of opioid versus non-opioid analgesics (acetaminophen or non-steroidal anti-inflammatory drugs) within 14 days post-hip fracture.

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Conflicts of Interest: V.M. holds stock of unknown value in PointRight, Inc. an information services company providing advice and consultation to various components of the long-term care and post-acute care industry, including suppliers and insurers. In addition, V.M. Chairs the Independent Quality Committee for HRC Manor Care, Inc., a nursing home chain and serves as chair of a Scientific Advisory Committee for NaviHealth, a post-acute care service organization. D.P.K. serves as an author for the “Falls” chapters in UpToDate and receives royalties from Wolters Kluwer for this. D.P.K. also served as editor for the book “Osteoporosis in Older Persons” and received an honorarium from Springer for this activity. S.D.B. serves as an author for the “Falls” chapters in UpToDate and receives royalties from Wolters Kluwer for this. The other authors have no relevant conflicts of interest to disclose.

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Measurements—Follow up began on the index date and continued until the first occurrence of death, significant functional decline (3-point increase on MDS Activities of Daily Living scale), or 120 days of follow-up. Odds ratios (ORs) with 95% confidence intervals (CIs) for outcomes were estimated using inverse-probability-of-treatment-weighted multinomial logistic regression models.

Results—Among the 2,755 NH residents with a hip fracture included in our study, 1,155 (41.9%) were opioid users and 1,600 (58.1%) were non-opioid analgesic users. The mean age was 86.3 years, 73.8% were female, and 86.0% were white race. Opioid use was associated with a significantly lower likelihood of death (OR=0.47, 95% CI 0.39–0.56) and a non-significant decrease in functional decline (OR=0.77, 95% CI 0.58–1.03).

Conclusion—A rigorous study that addresses the limitations of this study is critical to validate our preliminary findings and provide evidence about the effect of using opioid versus non-opioid analgesics to optimize acute pain in NH residents with a hip fracture.

Keywords

nursing homes; hip fractures; analgesics; opioids; anti-inflammatory agents; non-steroidal; pain; activities of daily living

Introduction

Despite the high incidence of hip fractures in long-term care settings, there is limited knowledge of current pain management practices and the impact of these practices on pain, functional outcomes, and adverse sequelae among older nursing home (NH) residents.[1, 2] Opioid use is controversial in this population due to the risk of adverse effects [3, 4], but poor pain control is also associated with delirium and other adverse outcomes in older adults.[3, 5, 6] Oligoanalgesia (undertreatment of pain) is a known concern in older adults with traumatic injuries like hip fracture.[7–9] However, little is known about optimizing pain control, and specifically the impact of opioids, in the more vulnerable population of post-hip fracture NH residents. We therefore conducted a retrospective cohort study to examine the association between use of opioids versus other analgesics with death and functioning during the immediate post-acute period after hip fracture among NH residents.

Methods

We used national Medicare fee-for-service claims linked to the Minimum Data Set (MDS) for U.S. NH residents aged 65 years or older who became a long-stay resident (>100 days in the NH) between January 2008 and December 2009, had a hospitalized hip fracture, and returned to the NH without receiving care under the Medicare Skilled Nursing Facility (SNF) benefit. Residents had 6 months of continuous Medicare Parts A, B, and D enrollment without use of an analgesic medication in the 60 days before the index date, defined as the post-fracture NH admission date.

The exposure was the new use of opioid versus non-opioid analgesics within the immediate post-acute period, 14 days after hip fracture. As we were interested in the impact of being prescribed an opioid, and since acetaminophen and non-steroidal anti-inflammatory drugs are often used to treat hip fracture pain, but are typically unobservable in prescription

claims, we broadly classified all individuals who were not dispensed opioids as non-opioid users. Outcomes were death and significant functional decline, defined as a 3-point increase on the 28-point MDS Activities of Daily Living scale.[10] Follow up began on the index date and continued until the first occurrence of one of the outcomes of interest or 120 days of follow-up. In stability analyses, we also examined 30-day, 60-day, and 90-day follow-up periods. Pre-analgesic confounding covariates were adjusted for using inverse probability of treatment weighting (IPW; covariates listed at the bottom of Table 2).[11–13] Data sources and measurement are described elsewhere.[1, 14] We estimated the intention-to-treat association between opioids versus other analgesics and outcomes using IP-weighted multinomial logistic regression models. The institutional review board at Hebrew SeniorLife approved the study protocol.

Results

Among the 2,755 NH residents with a hip fracture included in our study, 1,155 (41.9%) were opioid users and 1,600 (58.1%) were non-opioid analgesic users. Overall, the mean age was 86.3 years, 73.8% were female, and 86.0% were white race. Baseline characteristics were similar between opioid and non-opioid analgesic users before and after IPW (Table 1). Before IPW, opioid use was associated with a lower likelihood of death (OR=0.50, 95% CI 0.42–0.59) and functional decline (OR=0.35, 95% CI 0.27–0.45) at 120 days (Table 2). After IPW, opioid use was still associated with a significantly lower likelihood of death (OR=0.47, 95% CI 0.39–0.56) and a non-significant decrease in functional decline (OR=0.77, 95% CI 0.58–1.03). The 30-day, 60-day, and 90-day outcomes were similar to each other and the primary 120-day results (Table 2).

Discussion

Our preliminary results suggest that opioid analgesics (versus non-opioid analgesics) are associated with a reduction in death and functional decline among older NH residents after hip fracture. Despite careful study design and the use of IPW to adjust for measured confounding, the risk of bias is still high due to several limitations of the data. Our findings need to be confirmed in a study that is able to thoroughly address these limitations.

A major limitation is the exclusion of individuals who received care under the SNF benefit. These individuals were excluded because prescription drug dispensings are not observable in Part D claims during the SNF period. While the exclusion likely improved the validity of the study results, it may have reduced generalizability. A study that obtains drug administration records or observable drug dispensing information for the SNF period is a necessary next step. With this information, individuals who receive SNF care can be included in the study population. Moreover, immortal time bias (follow-up time preceding the actual start of exposure to analgesics misclassified as exposed time) will become less of a concern because the exact date of the first non-opioid (non-prescription) analgesic dispensing can serve as the index date.[15] Finally, medication administration data for the SNF period will help reduce exposure misclassification and potentially allow for a time-varying exposure definition, which is important given that analgesics are often used as needed (i.e., *pro re nata* [PRN]) rather than scheduled to be given at regular times.

Another important limitation of our study is that covariate and outcome information spans two versions of the MDS (2.0 and 3.0).[16] Many covariates are not available in both versions or differ between them (e.g., pain), which forced us to select a smaller set of covariates that may not have been sufficient to adjust for confounding.[16] A next study should focus on using MDS version 3.0 data to overcome this barrier.[17]

Conclusion

In summary, a rigorous study that addresses all of the aforementioned limitations is critical to provide evidence about the effect of using opioid versus non-opioid analgesics to optimize acute pain in NH residents with a hip fracture.

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Table 1

Selected baseline characteristics of opioid (n=1,155) and non-opioid (n=1,600) analgesic users before and after inverse probability of treatment weighting (N=2,755).

Characteristic	n (%) [*]			
	Before Weighting		After Weighting	
	Opioid	Non-opioid	Opioid	Non-opioid
Age, mean (SD), years	86.5 (7.6)	86.2 (7.7)	86.4 (7.5)	86.3 (7.7)
Female sex	75.9	72.3	73.7	73.8
White race	87.1	85.2	85.6	85.8
Married	65.0	66.4	64.9	65.5
Body mass index, mean (SD), kg/m ²				
Underweight	11.2	12.5	11.2	11.6
Normal weight	53.6	51.7	53.9	52.3
Overweight	25.1	24.7	24.2	25.2
Obese	10.0	11.1	10.7	10.8
History of tobacco use	8.9	8.8	9.0	8.9
No. of comorbidities, mean (SD)	6.3 (3.0)	6.3 (3.4)	6.2 (3.2)	6.3 (3.2)
Cognitive status [†]				
Intact or borderline intact	7.5	9.8	8.5	8.7
Mild to moderate dementia	77.7	77.9	77.8	77.9
Moderately severe to very severe dementia	14.9	12.4	13.7	13.4
ADL status [‡]				
Independent to limited assistance required	41.3	43.5	44.9	43.9
Extensive assistance required	25.7	28.3	25.5	26.2
Extensive dependency	33.0	28.2	29.6	29.9
Bladder incontinence	77.9	68.8	72.6	72.3
History of falls	30.9	22.5	26.4	25.8
Depression	55.5	59.6	57.3	57.9
Hospitalization in the 6 months before hip fracture	21.1	22.9	22.4	22.6
Medication use				
Atypical antipsychotics	13.9	16.4	16.2	15.4
Sedative hypnotics	4.8	4.3	4.7	4.4
Anticonvulsants	4.2	4.0	3.8	3.9
Glucocorticoids	2.8	3.4	3.1	3.1

Abbreviations: SD, standard deviation; No., number; kg/m², kilograms/square meter; ADL, activities of daily living.

^{*} Unless otherwise noted.

[†] Measured by the Cognitive Performance Scale and trichotomized as 0 to 1 (intact to borderline intact), 2 to 3 (mild to moderate dementia), and 4 to 6 (moderately severe to very severe dementia).

[‡] Measured by the Morris 28-point scale of independence in ADLs, and categorized as 0 to 14 (independent to limited assistance required), 15 to 19 (extensive assistance required), and 20 or greater (extensive dependency).

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Table 2

Association between opioid (n=1,155) versus non-opioid (n=1,600) analgesic initiation and outcomes after hip fracture in older nursing home residents (N=2,755).

Follow-up	Outcome	Analgesic Exposure	Events	Risk (%)	OR (95% CI)	
					Unweighted	IPW ^{*,†}
30 Days	Death	Non-opioid	422	26.4	Reference	Reference
		Opioid	153	13.3	0.37 (0.30–0.45)	0.33 (0.27–0.41)
	Functional Decline	Non-opioid	211	13.2	Reference	Reference
		Opioid	53	4.6	0.26 (0.19–0.35)	0.73 (0.51–1.03)
60 Days	Death	Non-opioid	551	34.4	Reference	Reference
		Opioid	245	21.2	0.43 (0.36–0.51)	0.41 (0.34–0.49)
	Functional Decline	Non-opioid	233	14.6	Reference	Reference
		Opioid	63	5.5	0.26 (0.19–0.35)	0.70 (0.51–0.98)
90 Days	Death	Non-opioid	604	37.8	Reference	Reference
		Opioid	301	26.1	0.47 (0.40–0.56)	0.44 (0.36–0.53)
	Functional Decline	Non-opioid	251	15.7	Reference	Reference
		Opioid	67	5.8	0.25 (0.19–0.34)	0.66 (0.48–0.91)
120 Days	Death	Non-opioid	632	39.5	Reference	Reference
		Opioid	330	28.6	0.50 (0.42–0.59)	0.47 (0.39–0.56)
	Functional Decline	Non-opioid	281	17.6	Reference	Reference
		Opioid	103	8.9	0.35 (0.27–0.45)	0.77 (0.58–1.03)

Abbreviations: OR, odds ratio; CI, confidence interval; IPW, inverse probability of treatment weighted.

^{*}The following covariates measured before analgesic drug use were included in the IPW estimation and thus adjusted for: age, sex, race, year that resident qualified as long-stay, year that the hip fracture occurred, marital status, body mass index, location that resident was admitted to nursing home from before becoming long-stay, physical functioning (Activities of Daily Living score), ability to chew, bladder incontinence, history of falls, Alzheimer’s disease, osteoporosis, cognitive status (Cognitive Performance Score), attention deficit hyperactivity disorder, anxiety, depression, bipolar disorder, total number of comorbidities, history of tobacco use, any hospitalization use in the six months before hip fracture, number of quality of life deficits of the nursing home, nursing home ownership, atypical antipsychotic use, sedative and hypnotic use, selective serotonin reuptake inhibitor use, serotonin-norepinephrine reuptake inhibitor use, tricyclic antidepressant use, anticonvulsant use, steroid use, loop diuretic use, thiazide diuretic use, and total number of medications used.

[†]The stabilized IPW had a mean (SD) of 1.00 (0.52), a minimum of 0.51, and maximum of 10.81.