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LONG-ACTING OPIOID INITIATION IN UNITED STATES NURSING HOMES

Jacob N. Hunnicutt, PhD¹, Anne L. Hume, PharmD², Christine M. Ulbricht, PhD¹, Jennifer Tjia, MD¹, and Kate L. Lapane, PhD, MS¹

¹Department of Quantitative Health Sciences, University of Massachusetts Medical School, Worcester, MA

²Department of Pharmacy Practice, College of Pharmacy, University of Rhode Island, Kingston, RI

Abstract

Purpose: To estimate the proportion of residents newly initiating long-acting opioids in comparison to residents initiating short-acting opioids, and examine variation in long-acting opioid initiation by region and resident characteristics.

Methods: This cross-sectional study included 182,735 long-stay nursing home residents in 13,881 United States nursing homes who were Medicare beneficiaries during 2011–2013 and initiated a short- or long-acting opioid (excluding residents <50 years old; those with cancer, receiving hospice care). Medicare Part D prescription claims were used to identify residents as newly initiating short- or long-acting opioids, defined as having a prescription claim for an opioid with no prior opioid prescriptions in the preceding 60 days. We estimated the overall proportion of initiators prescribed long-acting opioids. Regional variation was examined by mapping results by state and hospital referral regions. Logistic models were used to estimate adjusted odds ratios (aOR) and 95% confidence intervals (CI).

Results: Two percent of opioid initiators were prescribed long-acting opioids. State variation in long-acting opioid initiation ranged from 0.6% to 7.5% (5th–95th percentiles: 0.6–6.4%). Resident characteristics associated with increased long-acting opioid initiation included severe physical limitations (vs. none/mild limitations; aOR: 2.13, 95% CI: 1.92–2.37) and pain (staff-assessed vs. no pain; aOR: 1.59 95% CI: 1.40–1.80), whereas being non-white was inversely associated (non-Hispanic black vs. non-Hispanic white; aOR: 0.70, 95% CI: 0.62–0.79).

Conclusion: United States nursing home residents predominantly initiate short-acting opioids in accordance with Center for Disease Control and Prevention guidelines. Documented variation by geographic and resident characteristics suggests that improvements are possible.

Corresponding Author: Jacob N. Hunnicutt, PhD, Address: Department of Quantitative Health Sciences, University of Massachusetts Medical School, 55 Lake Road North, Worcester MA 01655, USA, Jacob.Hunnicutt@umassmed.edu, Phone: 508-856-8798, Fax: 508-856-8993.

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Keywords

prescription opioids; long-acting opioids; nursing homes; long-term care

INTRODUCTION

In the United States (US), the Centers for Disease Control and Prevention's (CDC) opioid prescribing guidelines for persons experiencing nonmalignant chronic pain (outside of the context of palliative or end-of-life care) warn that initiating long-acting opioids in individuals without sufficient opioid tolerance increases the risk of respiratory depression and death.^{1–3} These risks may be higher among older adults living in nursing homes due to age-related physiologic changes, polypharmacy, and multimorbidity altering opioid pharmacokinetics and pharmacodynamics and subsequently increasing the risk of adverse events.^{4–6} Globally, long-acting opioids are frequently prescribed in nursing homes to manage pain. In US nursing homes, 6% of all residents and 17.8% of residents prescribed any opioids received long-acting opioid prescriptions in 2012.⁷ In other countries, long-acting opioids including fentanyl and buprenorphine are frequently prescribed in nursing homes (e.g., Denmark: 18.7%;⁸ Norway: ~15%;⁹ Australia: 18.3%).¹⁰ However, little is known about how long-acting opioids are initiated in nursing homes, especially in comparison to alternative pharmacologic pain management strategies – such as initiating short-acting opioids.

In prior studies restricted to long-acting opioid initiators (i.e., both naïve long-acting opioid initiators and prevalent opioid users later prescribed long-acting opioids), the proportion of residents beginning long-acting opioid therapy without any prior short-acting therapy ranged from 9% to 39%.^{11–13} However, these studies provide limited information on the extent of this inappropriate prescribing practice by solely focusing on long-acting opioid initiation and excluding residents initiating only short-acting opioids. Short-acting opioids are prescribed to over 90% of opioid users in United States nursing homes and are the recommended duration of action to initiate for residents requiring opioids for pain management.^{1,7}

To further understand the magnitude of long-acting opioid initiation in this population, we leveraged a national dataset including all nursing home residents during 2011–2013 to examine the frequency of long-acting opioid initiation among all residents initiating opioids and identify resident-level correlates and geographic variation of long-acting opioid initiation.

METHODS

Study Design and Data Sources

We conducted a cross-sectional study comparing long-acting to short-acting opioid initiators using national, routinely-collected administrative and claims data from 2011–2013, including the Minimum Data Set (MDS) 3.0 and Medicare Part D. This study was approved by the University of Massachusetts Medical School Institutional Review Board.

The MDS 3.0 is a clinical assessment required in Medicare- and Medicaid-certified nursing homes (~96% of all US facilities) that provided data on resident characteristics and the geographic location of the nursing home. Assessments are conducted by registered nurses who consult the resident, the resident's medical record, their caregivers, and other nursing home staff. Assessments have demonstrated validity and reliability and include measures of demographics, pain, cognitive and physical functioning, and other measures.^{14–16} These data were merged to Medicare Part D, an outpatient prescription drug insurance program used by >80% of nursing home residents.¹⁷ Part D claims provided data on national drug codes, generic drug names, dosage strength, and days' supply that were used to identify opioid prescriptions.

Analytic Sample

We identified 182,735 fee-for-service Medicare beneficiaries (Part A/B/D coverage for 3 months; no Medicare Advantage) who were long-stay nursing home residents (90 consecutive days at the same nursing facility) and initiated a short- or long-acting opioid. We focused on long-stay nursing home residents because they generally require long-term assistance to manage their chronic disabilities.¹⁸ We then applied several criteria to exclude: 1) those with no prior MDS assessment within 120 days because of limited data on important resident characteristics preceding opioid initiation (e.g., pain); 2) residents receiving skilled nursing facility care in the prior 90 days because opioid prescriptions during this time would likely be bundled into the Part A per diem rate and would not appear as a Part D claim; 3) residents in provider-based facilities and free-standing skilled nursing facilities because these settings have a different case-mix than other facilities; 4) residents <50 years old because they may have different clinical needs than older residents; 5) those with cancer or receiving hospice care (identified using MDS 3.0 assessments [item O0100K2], which are required when residents enter hospice)¹⁹ because of different treatment guidelines for these populations; 6) those who were comatose; and 7) those missing data on resident characteristics. See Supplementary Figure 1 for more detail.

Opioid Initiation

Opioid initiation was defined as the first Part D opioid prescription claim during follow-up with no prior opioid claims in the past 60 days; this lookback period was chosen to compare our results to prior studies.^{11–13} Opioids were classified by their duration of action (short-acting and long-acting). Short-acting opioids including products combined with acetaminophen or non-steroidal anti-inflammatory drugs included codeine, dihydrocodeine, hydrocodone, hydromorphone, fentanyl citrate, meperidine, morphine, oxycodone, nalbuphine, tapentadol, and tramadol. Long-acting opioids included hydromorphone extended release (ER), methadone, morphine ER, oxycodone ER, tapentadol ER, and tramadol ER.

Our primary outcome was the proportion of opioid initiators prescribed long-acting opioids. The numerator was the number of residents newly prescribed long-acting opioids; the denominator was the number newly prescribed any (long- or short-acting) opioids.

We also estimated the average daily dose based on all prescriptions filled on the index date in oral morphine equivalents (OME) by estimating the total OME dispensed (by multiplying the dosage strength by the quantity dispensed and OME conversion factor)²⁰ and then dividing by the total days' supply. Average daily doses were categorized as <50, 50–89, and 90 mg OME/day.¹

Geographic Variation

Long-acting opioids in nursing homes may vary by geographic region, as substantial variation in the quality of prescribing has been documented among older community-dwelling adults.^{21,22} We first examined overall geographic variation by state but also grouped residents into hospital referral regions (HRRs; n=306) to examine variation within smaller regional healthcare markets (where each region has at least one hospital that performs both major cardiovascular procedures and neurosurgery). Data on HRRs were linked to our sample using a publically available crosswalk provided by the Dartmouth Atlas Project based on residents' nursing home location.²³

Resident Characteristics

Resident characteristics were derived from the most recent MDS 3.0 assessment prior to opioid initiation and included age (50–64, 65–74, 75–84, 85–94, 95 years), gender, race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic/Latino, Asian, and other), cognitive impairment, physical limitations, and pain. We exclusively focused on these characteristics because they have been strongly associated with pain and analgesic prescribing in prior studies.^{7,24–29} Cognitive impairment was defined using Centers for Medicare and Medicaid Services (CMS) definitions based on the Brief Interview for Mental Status (BIMS; range 0–15) when the resident was able to self-report and the Cognitive Performance Scale (CPS; range 0–6) otherwise as none/mild (CPS: 0–2, BIMS: 13–15), moderate (CPS: 3–4, BIMS: 8–12), and severe impairment (CPS: 5–6; BIMS: 0–7).³⁰ Physical limitations were categorized using the MDS Activities of Daily Living Self-Performance Hierarchy Scale (range 0–6) as none/mild (0–2), moderate (3–4), and severe limitations (5–6).³¹ Pain in the five days before the MDS assessment was based on resident self-report when the resident was capable of responding and staff assessment otherwise. We classified residents as being in no pain (self-reported or staff-assessed), having self-reported pain, or staff-assessed pain.

Analysis

We estimated the overall proportion of opioid initiators prescribed long-acting opioids. We then examined the most commonly used medications and average daily dose by duration of action initiated and tabulated overall and stratum-specific estimates of the proportion of initiators prescribed long-acting opioids by state, HRR, and resident characteristics. To examine geographic variation, we grouped HRRs into quartiles of long-acting opioid initiation and created maps. Finally, we fit logistic models using generalized estimating equations to estimate crude and adjusted odds ratios and 95% confidence intervals (CI) between resident characteristics and initiating long-acting opioids. The models used an exchangeable correlation structure to account for clustering within facilities. Adjusted

models included only the resident characteristics described previously; no other covariates were considered or tested for inclusion.

In sensitivity analyses, we examined the prevalence and correlates of long-acting opioid initiation after excluding younger Medicare beneficiaries (e.g., residents <65 years old who were Medicare eligible by having end-stage renal disease or being chronically disabled) because these residents may be systematically different from older beneficiaries.^{32,33}

RESULTS

Long-acting opioids were prescribed to 2.2% (95% CI: 2.1–2.2%) of residents initiating opioids with no evidence of variation by study year (2011: 2.1%; 2012: 2.2%; 2013: 2.2%). For those prescribed long-acting opioids, 82.2% initiated transdermal fentanyl. Hydrocodone (42.5%) and tramadol (31.0%) were the most commonly prescribed short-acting opioids (Table 1). Residents most commonly initiated doses <50 mg OME/day (92.2% and 77.7% for those initiating long- and short-acting opioids, respectively); 3.3% of long- and 8.5% of short-acting opioid initiation were prescribed doses ≥ 90 mg OME/day.

By state, the crude proportion of opioid initiators prescribed long-acting opioids ranged from 0.6% in Louisiana to 7.5% in South Dakota (Figure 1; 5th–95th percentiles: 0.6–6.4%). By hospital referral region, the proportion receiving long-acting opioid prescriptions ranged from 0% in 16 unique HRRs to 9.5% in Great Falls, Montana (Figure 2; 5th to 95th percentiles: 0%–5.1%). Long-acting prescribing among those initiating opioids was primarily concentrated in the Northeast and throughout the northern regions of the Midwest and West census regions. Conversely, long-acting opioids were sparingly initiated in the South (e.g., Texas, Oklahoma, and Louisiana), though other regions such as southern California also had low prescribing.

When examining variation by resident characteristics, crude differences in the proportion of initiators prescribed long-acting opioids never exceeded 2% (Table 2), though in adjusted models older age (e.g., ≥ 95 years vs. 65–74 years; aOR: 1.45, 95% CI: 1.27–1.67), being a woman (aOR: 1.16, 95% CI: 1.07–1.25), being severely cognitively impaired (vs. none/mild impairment; aOR: 1.35, 95% CI: 1.23–1.47), having severe physical limitations (vs. none/mild limitations; aOR: 2.13, 95% CI: 1.92–2.37), and having self-reported pain (vs. no pain; aOR: 1.16, 95% CI: 1.07–1.25) or staff-assessed pain (vs. no pain; aOR: 1.59, 95% CI: 1.40–1.80) was associated with increased odds of initiating long-acting opioids instead of short-acting opioids. Being non-white was associated with reduced odds of being prescribed long-acting opioids (non-Hispanic black vs. non-Hispanic white: aOR: 0.70, 95% CI: 0.62–0.79; Hispanic/Latino vs. non-Hispanic white: aOR: 0.64, 95% CI: 0.53–0.78).

Sensitivity analyses excluding younger residents (<65 years) had little impact on the prevalence and correlates of long-acting opioid initiation (Supplementary Table 1).

DISCUSSION

In 2011–2013, the overwhelming majority of prescription opioids initiated in US nursing homes were short-acting opioids. For this particular aspect of opioid prescribing, nursing

homes were largely aligned with the general CDC prescribing guidelines,¹ and the estimated 2.2% initiating long-acting opioids (3,977 initiators of long-acting opioids) between 2011–2013 is lower than previously reported.¹² However, we documented meaningful variation by region and resident characteristics, which may indicate that improvements are possible. Further, the proportion initiating long-acting opioids was higher than reports from community-dwelling populations and raises additional questions on how long-acting opioids are initiated in frail elderly nursing home residents.^{2,34,35}

We found that fewer US nursing home residents (in overall numbers) initiated long-acting opioids with no prior opioid therapy during 2011–2013 than previously reported during 2009¹² and was similar to a study using 2011 data only.¹¹ Though potential causes of such a reduction between 2009 and 2011–2013 remain unclear, possible contributing factors include repeated public warnings from the Food and Drug Administration (FDA) for transdermal fentanyl,³⁶ updated pain management guidelines,^{4,37} and heightened concern when prescribing due to the ongoing opioid epidemic,^{38,39} including nursing home specific warnings from CMS on the appropriate and safe disposal of used transdermal fentanyl to prevent the diversion of used patches.⁴⁰ In contrast to prior studies,^{11,13} we found that the majority of long-acting opioid initiators were prescribed transdermal fentanyl. It is currently unclear why the proportion of long-acting initiators being prescribed fentanyl would increase given FDA and CMS warnings explicitly pertaining to fentanyl. We cannot rule out other explanations for the observed differences including different analytic samples (e.g., restricting to those newly admitted to nursing homes) and studying different short- and long-acting opioids.^{11–13}

Outside of the US, no studies to our knowledge have examined long-acting opioid initiation in nursing homes, which prohibits us from making international comparisons on this aspect of opioid prescribing. Available studies however show that these medications may be used even more frequently in some countries.^{8–10} This may be an important area for future research given the competing concerns of potential inadequacies of nursing home pain management and safe opioid prescribing globally.^{41,42}

Nursing home residents appeared to have a higher proportion of initiators prescribed long-acting opioids than community-dwelling populations in the United States including veterans with chronic pain (1.9% between 2000–2009),² commercially insured persons (0.5% in two studies between 2006–2015),^{34,35} older adults with Medicare Advantage (0.9% between 2009–2015),³⁵ and disabled adults with Medicare (1.9% between 2009–2015).³⁵ Given that the proportion of initiators prescribed long-acting opioids is higher among older adults and other populations with a higher burden of painful comorbidities, it is possible that the risk of naively initiating long-acting opioids is higher in those with more severe pain. In nursing homes, this may be residents at the end of life (or perceived to be at the end of life), which is consistent with the positive associations we found between being prescribed a long-acting opioid and older age, cognitive impairment, physical limitations, and staff assessed pain. If this is the case, CDC prescribing guidelines may not be applicable because they were not intended for persons receiving palliative care.¹ Yet, even some palliative care guidelines discourage initiating transdermal long-acting opioids as first line treatment when oral opioids can be used,⁴³ which was the most commonly initiated dosage form among long-

acting opioid initiators in our study. Further work is needed to understand why long-acting opioids are initiated with no prior opioid therapy—both within and outside of nursing homes.

When examining resident correlates of newly initiating long-acting opioids, our results are largely consistent with a prior study despite different treatment contrasts.¹² Our prior work on the pharmacological management of non-malignant pain suggests that non-white residents are less likely to receive scheduled analgesics and be prescribed opioids long-term in comparison to white residents.^{7,29} We are uncertain if similar mechanisms are driving the differences observed in this study because initiating long-acting opioids is contraindicated, whereas scheduled analgesics and long-term opioid use may be necessary for residents experiencing moderate to severe chronic pain.⁴

The geographic variation observed at the state and HRR levels suggests that efforts to reduce long-acting opioid initiation in nursing homes may be more pressing in the Northeast and northernmost states in the Midwest and West. This is similar to trends of long-acting opioid prescribing in the broader US population in 2012,⁴⁴ though not all northern Midwest and Western states in the larger population were in the highest quartile of long-acting opioid prescribing. Similarly, many states with the lowest proportion of residents initiating long-acting opioids also had low long-acting opioid prescribing in the general population (e.g., California, Texas, and Louisiana). This variation raises further questions on how policies and laws regulating opioid prescribing, the prescribing culture, and other factors affect opioid use and initiation in nursing homes, as this may influence both resident safety and pain management in a population that has historically had their pain undertreated.^{24–29}

Efforts to improve opioid prescribing in nursing homes must keep in mind the unique needs of residents, as opioids may often be the only treatment option because acetaminophen may be insufficient to manage moderate to severe pain and nonsteroidal anti-inflammatory drugs have cardiovascular, renal, and other risks in older adults.^{4,45} Although certain aspects of opioid prescribing can likely be improved (e.g., reducing the co-prescribing of opioids with other psychotropic medications),⁷ they should be balanced against the palliative care needs of these residents. For example, we found that many residents initiated opioids at doses 50 mg OME/day, which is discouraged due to the strong dose-response relation between opioids and opioid-related adverse events (e.g., falls/fractures, overdoses)¹ but may be necessary to manage pain if palliative care is the goal of treatment.

Strengths of this study include using a large, national sample during the height of US opioid prescribing (2011–2013).⁴⁶ Our study design also emulated the clinical decision-making process that a prescriber would make when beginning opioid therapy – whether to initiate a long- or short-acting opioid – by examining the proportion of all opioid initiators prescribed long-acting opioids.⁴⁷ Finally, we evaluated aspects of prescribing that haven't been previously examined, including geographic variation and dosage strength initiated. This study also has limitations. Prescription claims may overestimate opioid use if medications were not actually used by residents. Claims also provided no data on how opioids were used to manage pain (i.e., scheduled or as needed). We excluded residents receiving hospice care based on MDS assessments rather than hospice claims. Although the potential for bias is limited given that MDS assessments are required when residents enroll in hospice, our

estimates of long-term opioid initiation may be conservative if we failed to completely exclude residents in hospice and hospice enrollees predominantly initiated short-acting opioids.⁴⁸ In our adjusted statistical models, we included a limited number of resident characteristics that have been strongly associated with receiving pain management in nursing homes.^{7,24–29} We cannot rule out residual or unmeasured confounding. Because we exclusively focused on long-stay residents, we could not comment on opioids initiated shortly after entering the nursing home. Finally, we relied on prescription claims from a single payer and could not account for stockpiled medications or medications obtained from sources other than Medicare Part D.

In conclusion, we found that the majority of residents initiate short-acting opioids instead of long-acting opioids, and that the absolute number of residents initiating long-acting opioids is lower than previously documented.^{11–13} Although further efforts to understand why long-acting opioids are naively initiated are still needed due to its frequency in nursing homes versus community settings,^{2,34,35} efforts to improve opioid prescribing in this care setting must consider the unique palliative care needs of these residents.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Key points:

- In the United States, 2.2% of long-stay residents initiating opioids during 2011–2013 were prescribed long-acting opioids.
- Geographic variation in proportion of initiators prescribed long-acting opioids ranged from 0.6% in Louisiana to 7.5% in South Dakota.
- Resident characteristics were associated with initiating long-acting opioids including older age, being a woman, being non-Hispanic white, being severely cognitively or physically impaired, and having staff- or self-reported pain before opioid initiation.
- This study provides evidence that long-acting opioid initiation is lower than previously documented in nursing homes, though variation by region and resident characteristics suggests that improvements are possible.

Figure 1.

Geographic variation in the proportion of opioid initiators prescribed long-acting opioids by state/district (N=182,735).

Figure 2.
Geographic variation in the proportion of opioid initiators prescribed long-acting opioids by HRRs grouped into quartiles of long-acting opioid prescribing (N=182,735).

Table 1.

Characteristics of medications initiated by opioid duration of action initiated (N=182,735).

Opioid characteristics, %	Opioid Duration of Action Initiated	
	Long-acting (n=3,977)	Short-acting (n=178,758)
Common medications initiated ^{†,‡}		
Transdermal Fentanyl	82.2	-
Morphine ER	5.5	-
Oxycodone ER	5.5	-
Methadone	4.0	-
Tramadol ER	2.4	-
Hydrocodone	-	42.5
Tramadol	-	31.0
Oxycodone	-	8.1
Codeine	-	5.0
Morphine	-	13.7
Dosage strength in OME [§]		
<50 mg/day	92.3	77.7
50-89 mg/day	4.7	13.8
90 mg/day	3.1	8.5

Abbreviations: ER, extended release; OME, oral morphine equivalents

[†] Only the five most commonly prescribed short- and long-acting opioids displayed. Other short-acting opioids (including products combined with acetaminophen or non-steroidal anti-inflammatory drugs) included: dihydrocodeine, hydromorphone, fentanyl citrate, meperidine, morphine, nalbuphine, and tapentadol. Other long-acting opioids included: hydromorphone ER, tapentadol ER.

[‡] Columns may not add to 100% because 1 long-acting opioid initiator and 1,063 short-acting initiators were prescribed multiple opioids

[§] Oral morphine equivalents were estimated by multiplying the dosage strength in oral morphine equivalents (using conversion factors) by the quantity dispensed and dividing by days' supply of prescriptions dispensed on index date. Columns may not add to 100% because of rounding.

Table 2.

Characteristics associated with being prescribed a long-acting opioid among all residents initiating opioids (N=182,735).

Characteristic	n	Long-acting opioid, %	Crude OR (95% CI) [†]	Adjusted OR (95% CI) ^{†‡}
Age				
50-64	12,340	1.3	0.83 (0.70–0.99)	0.87 (0.73–1.04)
65-74	22,878	1.6	Referent	Referent
75-84	48,900	1.9	1.19 (1.06–1.34)	1.09 (0.97–1.23)
85-94	76,429	2.4	1.44 (1.29–1.60)	1.23 (1.10–1.38)
95	22,188	3.0	1.79 (1.57–2.04)	1.45 (1.27–1.67)
Gender				
Men	48,336	1.7	Referent	Referent
Women	134,399	2.3	1.34 (1.24–1.45)	1.16 (1.07–1.25)
Race/Ethnicity				
Non-Hispanic White	152,339	2.3	Referent	Referent
Non-Hispanic Black	19,670	1.4	0.69 (0.61–0.78)	0.70 (0.62–0.79)
Hispanic/Latino	7,764	1.3	0.62 (0.51–0.76)	0.64 (0.53–0.78)
Asian	1,917	1.7	0.78 (0.54–1.12)	0.77 (0.54–1.11)
Other	1,045	1.7	0.73 (0.44–1.20)	0.76 (0.46–1.26)
Cognitive Impairment [§]				
None/Mild	50,042	1.6	Referent	Referent
Moderate	53,836	2.0	1.29 (1.18–1.42)	1.14 (1.04–1.26)
Severe	78,857	2.7	1.74 (1.60–1.89)	1.35 (1.23–1.47)
Physical limitations [¶]				
None/Mild	44,702	1.3	Referent	Referent
Moderate	94,077	2.1	1.61 (1.46–1.77)	1.46 (1.33–1.61)
Severe	43,956	3.1	2.47 (2.23–2.73)	2.13 (1.92–2.37)
Pain ^{††}				
None	133,702	2.1	Referent	Referent
Any self-reported pain	41,460	2.1	0.99 (0.91–1.07)	1.16 (1.07–1.25)
Any staff-assessed pain	7,573	4.1	1.95 (1.72–2.21)	1.59 (1.40–1.80)

[†] Estimated with logistic models using generalized estimating equations with an exchangeable correlation structure.

[‡] Adjusted for all resident characteristics in table.

[§] Defined using the Brief Interval for Mental Status (BIMS; range 0-15) when the resident was able to self-report and the Cognitive Performance Scale (CPS; range 0-6) otherwise: none/mild (CPS 0-2, BIMS 13-15), moderate (CPS 3-4, BIMS 8-12), severe (BIMS 0-7, CPS 5-6).

[¶] Defined using the Minimum Data Set Activities of Daily Living Self-Performance Hierarchy Scale (range:0-6): none/mild (0-2), moderate (3-4), severe(5-6)

^{††} Defined using MDS 3.0 Section J: any self-reported pain in previous 5 days (J0300 indicated as 'yes'), any staff-assessed pain in previous 5 days (J0850 indicating staff-observed pain)