Research Paper

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Prevalence and treatment of neuropathic pain diagnoses among U.S. nursing home residents

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Abstract

Neuropathic pain is a common condition experienced by older adults. Prevalence estimates of neuropathic pain and descriptive data of pharmacologic management among nursing home residents are unavailable. We estimated the prevalence of neuropathic pain diagnoses and described the use of pain medications among nursing home residents with possible neuropathic pain. Using the Minimum Data Set 3.0 linked to Medicare claims for residents living in a nursing home on November 30, 2016, we included 473,815 residents. *ICD-10* codes were used to identify neuropathic pain diagnoses. Identification of prescription analgesics/adjuvants was based on claims for the supply of medications that overlapped with the index date over a 3-month look-back period. The prevalence of neuropathic pain was 14.6%. Among those with neuropathic pain, 19.7% had diabetic neuropathy, 27.3% had back and neck pain with neuropathic involvement, and 25.1% had hereditary or idiopathic neuropathy. Among residents with neuropathic pain, 49.9% received anticonvulsants, 28.6% received antidepressants, 19.0% received opioids, and 28.2% had no claims for analgesics or adjuvants. Resident characteristics associated with lack of medications included advanced age, dependency in activities of daily living, cognitive impairment, and diagnoses of comorbid conditions. A diagnosis of neuropathic pain is common among nursing home residents, yet many lack pharmacologic treatment for their pain. Future epidemiologic studies can help develop a more standard approach to identifying and managing neuropathic pain among nursing home residents.

Keywords: Neuropathic pain, Nursing home residents, Pharmacologic pain management

1. Introduction

Neuropathic pain is defined as "pain caused by a lesion or disease of the somatosensory nervous system."[24] Various lesions in the peripheral or central nervous system can lead to neuropathic pain, which is characterized as persistent or intermittent burning, prickling, or lancinating pain that may occur spontaneously or be evoked by stimuli.[2,16] Common causes include diabetes, stroke, herpes zoster, trigeminal neuralgia, and nerve compression and entrapment syndromes.[2,16,41] Owing to its broad etiology and association with multiple pain processes, neuropathic pain is challenging to diagnose and treat.[7,12] Those suffering with ineffectively treated neuropathic pain have significant detriments to their health-related quality of life.[7,25,30]

The prevalence of the diseases that cause neuropathic pain increase with age; older individuals are more likely to have neuropathic pain.[34] However, owing to the lack of a standardized approach to identify neuropathic pain in observational studies, estimates of its prevalence in various populations are highly variable.[35,40] Estimates have relied on the use of validated screening instruments[5] or review of medical records in addition to observed signs and symptoms.[39] The prevalence of neuropathic pain has been estimated among individuals with specific conditions that cause neuropathic pain.[20,35] Between 21% and 26% of individuals with type 2 diabetes have painful diabetic neuropathy.[1,11] Among those with chronic low back pain, neuropathic pain is the predominant complaint (37%).[19]

There is limited information on the prevalence and characteristics of neuropathic pain and neuropathic pain–associated conditions among nursing home residents. Studies among Dutch nursing home residents have estimated the prevalence of neuropathic pain to be between 2.4% and 10.9%.[41,42] These available studies have small sample sizes and may have limited generalizability to nursing homes in the United States. Older individuals also tend to have multiple comorbid conditions that complicate the pharmacologic management of their pain.[34] Information on the use of drug regimens among U.S. nursing home residents with neuropathic pain is unavailable. This study sought to address this research gap. The study objectives were to (1) estimate the prevalence of neuropathic pain among nursing home residents, (2) describe the use of pain medications among persons with neuropathic pain, and (3) identify the characteristics associated with lack of pharmacologic pain management among individuals with neuropathic pain.

2. Methods

2.1. Ethics approval

This study was approved by the Institutional Review Board of the University of Massachusetts Medical School.

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

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2.2. Data sources

Data were obtained from the Minimum Data Set (MDS) 3.0, a mandated comprehensive assessment of clinical and functional status indicators of residents in Centers for Medicare and Medicaid Services–certified nursing homes in the United States. About 96% to 98% of nursing homes in the United States have this certification. The database also contains sociodemographic information of residents.[8,33] The MDS data were then linked to Medicare part A (inpatient) and part D (prescription drugs) claims and enrollment data.

2.3. Study population

Individuals were included if they met the following criteria (**Fig. 1**): current long-stay residents (≥90 days) in a nursing home facility on November 30, 2016, with no evidence of a recent skilled nursing facility or hospital stay. One new admission, quarterly or annual assessment for each eligible resident was included. Residents had continuous Medicare fee-for-service part A, B, and D coverage in the 3 months preceding the target date (September, October, and November 2016) and were aged 50 years or older (although most residents were Medicare eligible owing to age ≥ 65 years). Residents who were on hospice, comatose, or missing information on key variables were excluded. A few reasons guided this sample selection strategy. Medicare part A provides coverage for inpatient care received at a hospital, skilled nursing facility, or home, whereas part B covers outpatient visits such as use of preventive services. Part D provides prescription drug coverage.[9] However, part D coverage does not apply for residents who receive care during a part A-covered stay. In addition, medications are included in the bundled payment model implemented by the Centers for Medicare and Medicaid Services for hospice care**.** Therefore, we could not use part D claims to identify specific prescriptions for residents who receive any of these services. The final sample comprised 473,815 residents.

2.4. Neuropathic pain

Using Medicare claims and information on the MDS active diagnoses section for assessments conducted between January 1, 2016, and November 30, 2016, we defined neuropathic pain diagnoses based on at least 1 primary or secondary *ICD-10*-CM diagnosis code for any of the following conditions[6,32]: diabetic neuropathy, back and neck pain with neuropathic involvement, spinal cord injury, facial nerve disorders, postherpetic neuralgia or neuropathy, hereditary or idiopathic neuropathy, neuralgia, upper or lower limb neuropathies, unspecified mononeuropathy or polyneuropathy, and other conditions associated with neuropathic pain (Appendix 1, available online as supplemental digital content at http://links.lww.com/PAIN/B527). Residents with any of these codes were classified as having neuropathic pain. Residents may have had multiple conditions.

2.5. Prescription medications to treat pain

Prescriptions of identified medications, alone or in combination, where the date filled plus number of days' supply overlapped with November 30, 2016, with a 3-month (September-November) look-back period, were used to determine the prevalence of analgesic or adjuvant use among the subpopulation of residents with neuropathic pain. Specific drugs commonly used to treat neuropathic pain were identified and classified into the following groups[3,17]: anticonvulsants (eg, gabapentin, pregabalin, carbamazepine, and oxcarbazepine), antidepressants (eg, amitriptyline, duloxetine, desvenlafaxine, bupropion, and fluoxetine), nonopioid analgesics (eg, acetaminophen, diclofenac, ibuprofen, and meloxicam), and opioid analgesics (eg, fentanyl, hydrocodone, oxycodone, and tramadol). The primary outcome of interest was *lack* of receipt of any of these prescription medications.

2.6. Covariates

Covariates included in the analyses were demographic characteristics (age groups, race/ethnicity, sex, marital status etc),

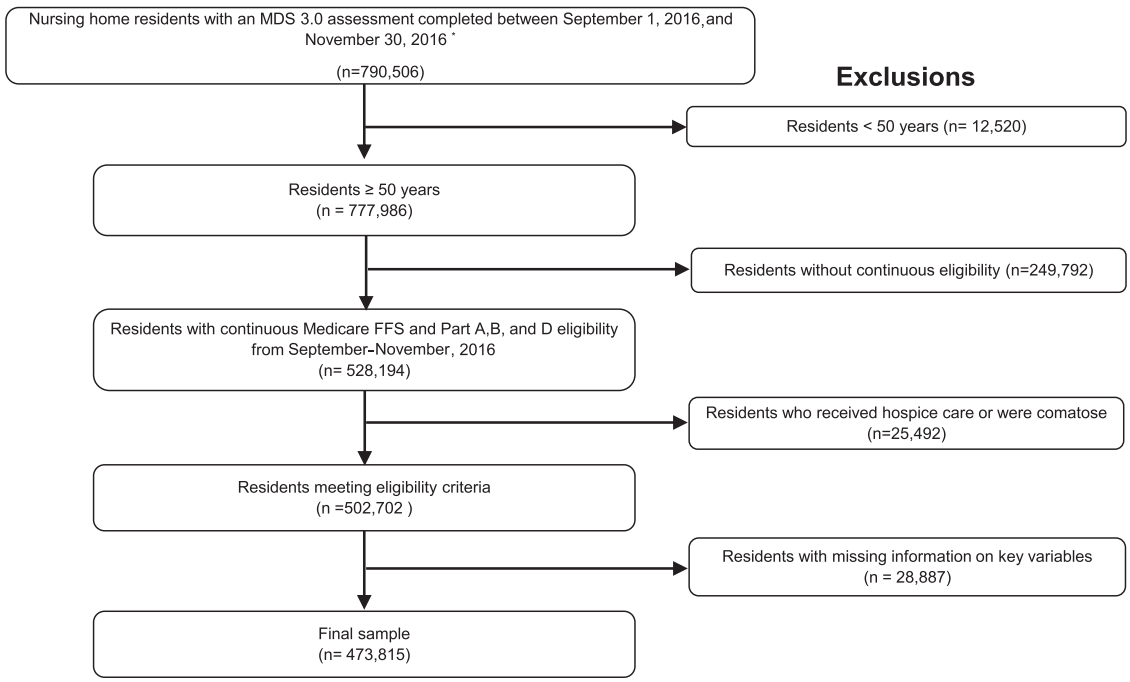

Figure 1. Sample selection procedure.

activities of daily living (ADL) dependence (categorized as independent, modified dependence, or dependent),[28] level of cognitive impairment (cognitively intact, mildly, moderately, and severely impaired),[38] and comorbid conditions such as cancer, heart failure, coronary artery disease, arthritis, seizure disorder or epilepsy, and venous thromboembolism.

2.7. Analytic approach

We described the distributions of demographic and clinical characteristics by the presence or absence of neuropathic pain. Because the sample size is large, trivial differences would be statistically significant. Instead, we used a 5% absolute difference to focus on noteworthy differences. The prevalence of specific drugs was estimated among residents with neuropathic pain. Using an extension of the robust Poisson models,[36] we accounted for clustering of nursing home facilities to estimate crude and adjusted prevalence ratios (PR) with 95% confidence intervals (CIs) for lack of prescribed analgesics or adjuvant medications among residents with neuropathic pain.

3. Results

Most residents were White (79.2%), female (69.5%), aged 75 years and older (72.2%), and had some level of dependence in activities of daily living (77.0%). Overall, 35% had moderate cognitive impairment and 12% had severe cognitive impairment. The prevalence of neuropathic pain was 14.6% (95% CI = 14.5%-14.7%). Common neuropathic conditions included diabetic neuropathy (19.7%), back and neck pain with neuropathic involvement (27.3%), hereditary or idiopathic neuropathy (25.1%), and unspecified mononeuropathy or polyneuropathy (28.7%) (**Table 1**). Three percent had multiple neuropathic conditions. Thirty-eight percent of residents with neuropathic pain were 85 years and older, compared with 45.5% of those without neuropathic pain. Although 47% of residents with neuropathic pain were cognitively intact, 28% of those without pain were cognitively intact. On the other hand, 5% of residents with neuropathic pain and 14% of those without neuropathic pain were severely impaired in cognitive function. Differences in the prevalence of comorbid conditions were also observed among residents with and without neuropathic pain, including dementia (49.9% vs 64.7%, respectively), depression (66.8% vs 58.0%, respectively), diabetes (49.0% vs 32.6%, respectively), and arthritis (40.0% vs 30.6%, respectively).

Common medications prescribed among residents with neuropathic pain included anticonvulsants (49.9%), antidepressants (28.6%), and opioid analgesics (30.6%) (**Table 2**). Of those with neuropathic pain, 43.3% used gabapentin, 10.6% used hydrocodone (or hydrocodone in combination with other analgesics), and 10.4% used duloxetine. Twenty-eight percent of residents with neuropathic pain had no claims for analgesics or adjuvants.

Among those with any indication of neuropathic pain, resident characteristics associated with lack of prescription medications included age (vs 50-64 years: 65-74 years [adjusted PR = 1.10, 95% CI = 1.04-1.16], 75-84 years [adjusted PR = 1.24, 95% CI = 1.18-1.30], and ≥ 85 years [adjusted PR = 1.45, 95% CI = 1.38-1.52]), being female (adjusted PR = 0.79, 95% CI =0.77-0.81), ADL dependency status (vs independent: modified dependence [adjusted PR = 1.09, 95% CI = 1.06-1.12] and dependent [adjusted PR = 1.09, 95% CI 1.05-1.14]), and cognitive impairment (vs cognitively intact: mildly impaired [adjusted PR = 1.21, 95% CI = 1.17-1.25], moderately impaired [adjusted PR = 1.47, 95% CI = 1.42-1.52], and severely impaired [adjusted PR = 1.65, 95% CI = 1.57-1.73]) (**Table 3**). The diagnoses of comorbid conditions such as Alzheimer disease or other dementias (adjusted PR = 1.13, 95% CI = 1.10-1.16), fractures (adjusted PR = 1.11, 95% CI = 1.07-1.15), and cancer (adjusted PR = 1.16, 95% CI = 1.11-1.21) were associated with lack of prescription analgesic or adjuvant use, whereas multiple sclerosis (adjusted PR = 0.86, 95% CI = 0.78-0.95), arthritis (adjusted PR = 0.90, 95% CI = 0.88-0.92), and seizure disorder or epilepsy (adjusted PR = 0.78, 95% CI = 0.75-0.82) were associated with receipt of analgesics or adjuvants.

4. Discussion

This study estimated the prevalence of neuropathic pain among nursing home residents. Among those with neuropathic pain, we described associations between demographic and clinical characteristics and lack of prescription medications for pain. We found that 1 in 7 residents experienced neuropathic pain and that among those with indications of neuropathic pain, 28% lacked any prescription medication to treat neuropathic pain. Factors associated with lack of treatment included advanced age, increased severity of cognitive impairment, and dependency in ADLs.

Nearly 15% of nursing home residents had neuropathic pain. Although some studies have examined the prevalence of painful neuropathic conditions among the general population in the United States, to the best of our knowledge, none have examined the prevalence among nursing home residents. In 1 study, the prevalence of probable neuropathic pain among older segments of the general population (55 years and older) ranged from 7% to 17%.[12] Available studies among nursing home residents in Holland and Poland reported pain prevalence ranging from 2.4% to 32%.[37,41,42] This variability could be due to differences in methodological approaches to sample selection and to measuring the diagnosis of neuropathic pain. For example, among Dutch nursing home residents, the estimated prevalence of actual neuropathic pain (diagnosis of neuropathic pain in medical records, along with complaints of neuropathic pain–related symptoms in the past year) was 10.9% and that of possible neuropathic pain (undiagnosed neuropathic pain, but with complaints of neuropathic pain–related symptoms in medical records) was 5.6%.[41] Another Dutch study found that 2.4% of residents with dementia had neuropathic pain (diagnosis of neuropathic pain in medical records, with symptoms and signs of neuropathic pain observed during physical examinations), whereas the prevalence of mixed pain (nociceptive pain combined with possible neuropathic pain) was 25.0%.[42] Other studies have also relied on the use of screening instruments to diagnose neuropathic pain.[12,42] The prevalence of neuropathic pain in these studies could also vary because of differences in the look-back period for diagnosis of neuropathic pain, such as up to 1 week[42] instead of the past year diagnoses used in our study.

Similar to other studies,[6,12,41,42] diabetic neuropathy and back and neck pain with neuropathic involvement were commonly diagnosed conditions. In addition, residents with neuropathic disorders were more likely to have chronic comorbid conditions such as diabetes, heart failure, coronary artery disease, and arthritis. On the other hand, moderate and severe cognitive impairment and diagnosis of dementia or Alzheimer disease were less common among residents with

Table 1

Demographic and clinical characteristics of U.S. nursing home residents, stratified by the presence of neuropathic pain (N= 473,815).

Characteristic	Neuropathic pain	
	Yes (n = 69,160)	No (n = 404,655)
	Percentage	
Age, y		
50-64	11.6	9.5
65-74	21.1	17.5
75-84	28.9	27.5
85+	38.4	45.5
Race/ethnicity		
Non-Hispanic White	80.7	78.9
Non-Hispanic Black	12.3	13.7
Hispanic of any race	4.7	5.0
Women	68.6	69.6
Married*	18.2	17.0
Rejects care	7.2	8.4
Activities of daily living limitations		
Independent	23.9	22.8
Modified dependence	56.7	54.8
Dependent	19.4	22.4
Cognitive impairment		
Cognitively intact	47.3	27.8
Mildly impaired	24.2	22.0
Moderately impaired	23.5	36.6
Severely impaired	5.0	13.6
Painful neuropathic disorders		
Diabetic neuropathy	19.7	
Back and neck pain with neuropathic involvement	27.3	
Spinal cord injury	1.4	
Facial nerve disorders	3.8	
Postherpetic neuralgia/neuropathy	1.4	
Hereditary/idiopathic neuropathy	25.1	
Neuralgia	3.7	
Upper/lower limb neuropathies	4.4	
Unspecified mononeuropathy or polyneuropathy	28.7	
Other conditions	4.0	
Multiple painful neuropathic disorders	2.5	—
Diagnoses		
Dementia/Alzheimer	49.9	64.7
Anxiety disorder	41.9	36.6
Depression	66.8	58.0
Diabetes	49.0	32.6
Cancer	6.1	5.0
Cardiovascular		
Heart failure	28.2	21.2
Coronary artery disease	25.1	19.1
Venous thromboembolism	3.6	2.7
Peripheral vascular/arterial disease	20.5	12.8
Cerebrovascular accident, transient ischemic attack, or stroke	16.1	15.0
Multiple sclerosis	2.3	1.5
Human immunodeficiency virus	0.01	<0.01
Musculoskeletal		
Arthritis	40.0	30.6
Osteoporosis	17.1	15.3
Fracture (hip and other)	9.3	7.6
Urinary tract infection (last 30 d)	19.8	13.2
Seizure disorder/epilepsy	11.8	12.8

(*continued on next page*)

Table 1 (*continued*)

Characteristic	Neuropathic pain	
	Yes (n = 69,160)	No (n = 404,655)
Number of medications		
0	28.2	57.7
1-4	70.4	42.0
≥5	1.4	0.3

* Residents with missing information on marital status (among those with neuropathic pain n = 953 and among those without neuropathic pain n = 6118).

neuropathic pain than among those without neuropathic pain. A possible explanation for this result is that pain is often underreported and underdiagnosed among individuals with cognitive impairment and dementia.[14,15,23]

In line with other studies,[14,15] opioids, antidepressants, and anticonvulsants were commonly prescribed medications in our study population. Among these drugs, gabapentin was prescribed to 43.3% of individuals with a diagnosis of neuropathy consistent with a 2017 Cochrane review supporting its ability to provide moderate or substantial pain relief in some individuals with postherpetic neuralgia and painful diabetic neuropathy based on moderate-quality evidence.[43] The high prevalence of painful comorbid chronic conditions among elderly populations could account for the high usage of opioids observed. Opioid analgesics are commonly used for treatment of moderate to severe nociceptive or neuropathic pain in older adults.[10] Factors such as cognitive impairment, polypharmacy, and aging-related physiologic changes that alter the pharmacokinetics of drugs increase the risk for adverse effects of opioids among this population.[22,26] Among community-dwelling older U.S. adults, opioids have been associated with a higher rate of falls, fractures, and all-cause mortality.[27,31] Added to this is an increasing prevalence of prescription opioid misuse.[21] Further studies can help determine whether similar findings exist among nursing home populations. Nevertheless, opioids remain a vital remedy for relieving suffering, restoring function, and improving quality of life in individuals with persistent pain and associated functional impairment that is unresponsive to other types of analgesics. Careful consideration of the related risks and benefits is warranted in such situations.[22,26]

Although evidence has also supported beneficial effects of pregabalin in postherpetic neuralgia, painful diabetic neuropathy, and mixed or unclassified posttraumatic neuropathy pain, its usage in our study was significantly lower potentially due to its controlled status and higher cost. Of note, both drugs are associated with somnolence, gait disturbances, and other central nervous system adverse effects potentially of concern in a frail older population. Additional anticonvulsants were identified in our study population with neuropathic pain; however, multiple Cochrane reviews have indicated that insufficient evidence exists for their efficacy. Among the antidepressants, duloxetine was prescribed to 10.4% of our study population. While amitriptyline, bupropion, and venlafaxine have demonstrated efficacy, their usage was significantly lower. Trazadone was identified in 10.1% of individuals, although it is unclear whether its usage was for neuropathic pain or insomnia, a common reason in the nursing home population. While fluoxetine usage was reported by 2.9% of individuals, its efficacy in neuropathic pain has not been established. Multiple nonsteroidal anti-inflammatory drugs were prescribed in our study population. Although this is commonly performed in clinical practice, evidence of their efficacy in neuropathic pain is lacking.

Other studies also found that nonopioids such as acetaminophen[37,42] were the most prescribed analgesics. In addition, older age and decline in cognitive function were associated with increased likelihood of not receiving any pharmacologic pain management. Other studies reported similar findings.[4,23] Diagnosis of comorbid conditions such as dementia, cancer, coronary artery disease, and fracture was associated with lack of prescriptions medications for pain relief. The coexistence of multiple chronic conditions among older people with neuropathic pain necessitates the use of complex drug regimens that complicate the management of their pain.[34] For instance, some treatments for neuropathic pain can lead to further deterioration in patients' cognitive function.[34] Nevertheless, a tailored treatment approach is needed to relieve the suffering and improve the quality of life of affected individuals.[34,42] Furthermore, the underrepresentation of older adults in clinical trials imposes limitations in the evidence base for treatment decisions and impairs providers' ability to accurately estimate the benefits and risks of treating pain among this population.[34] Clinical guidelines for the management of neuropathic pain[3,18,29] can be a valuable resource for modifying pain treatments to the needs of older residents.

Our findings show that opportunities exist for the improvement of pain management among nursing home residents with neuropathic pain. Guidelines caution that the benefits for improving pain must outweigh the risks,[13] which may factor into the hesitant approach of providers towards pain management in older adults. However, ineffective management of pain risks causing unnecessary suffering and adversely affecting the quality of life of residents.

4.1. Strengths and limitations

We believe this was the first attempt to estimate the prevalence of neuropathic pain among a nationally representative sample of nursing home residents. Because Medicare claims are not available for those receiving postacute rehabilitation and there are no Medicare claims for those receiving Medicare-managed care or postacute rehabilitation, caution should be used before generalizing these findings to these types of residents. The lack of a standard definition of clinically assessed neuropathic pain was a challenge in this study. By using *ICD-10* diagnosis codes for the selected health conditions, we increased the likelihood that residents with possible neuropathic pain were identified. However, not all residents may have been experiencing pain at the time of the assessment. The MDS 3.0 lacks detailed information about types of nonpharmacological approaches or over the counter medications for residents in pain, limiting our ability to determine whether residents without Part D claims for analgesics or adjuvants may have received pain relief from

Table 2

Percentage of prescribed analgesic or adjuvant medications* among residents with neuropathic pain (n = 69,160).

Drug	n	%	Dosage range (in mg, unless indicated)
Any prescribed analgesic or adjuvant	49,654	71.8	
Anticonvulsants	34,519	49.9	
Gabapentin	29,916	43.3	100-800
Pregabalin	4395	6.4	20-300
Other anticonvulsants	3065	4.4	
Carbamazepine	1285	1.9	100-400; 100 mg/5 mL; 200 mg/10 mL
Oxcarbazepine	531	0.8	150-600 300 mg/5 mL
Phenytoin	1290	1.9	30-300; 100 mg/4 mL; 125 mg/5 mL; 50 mg/mL
Topiramate	945	1.4	15-200
Valproic acid	387	0.6	250 mg; 250 mg/5 mL; 500 mg/10 mL
Non-opioid analgesics	5245	7.6	
Acetaminophen	47	0.1	50-500
Celecoxib	615	0.9	50-400
Diclofenac	1157	1.7	18%-200%; 0.1%-3.0%
Etodolac	32	0.1	200-600
Ibuprofen	583	0.8	26.6-800; 100 mg/5 mL
Meloxicam	2311	3.3	7.5-15; 7.5 mg/5 mL
Nabumetone	95	0.1	500-750
Naproxen	406	0.6	20-550; 125 mg/5 mL
Opioid analgesics	21,162	30.6	
Fentanyl	3856	5.6	12-100 mcg/hr 200 mcg
Hydrocodone (including combinations)	7306	10.6	2.5-325
Hydromorphone	356	0.5	1-10 mg/mL; 2-12
Methadone	527	0.8	5-10 mg/5 mL 10 mg/mL; 5-10
Morphine	1720	2.5	0.8-200; 10-100 mg/5 mL; 2-50 mg/mL
Oxycodone (including combinations)	4509	6.5	2.5-325; 5 mg/5 mL; 20 mg/mL
Oxymorphone	58	0.1	5-40
Tapentadol	54	0.1	75-200
Tramadol (including combinations)	5344	7.7	37.5-325
Acetaminophen with codeine	573	0.8	15-300
Antidepressants	19,769	28.6	
Amitriptyline (including combinations)	940	1.4	2-100
Bupropion	2312	3.3	75-450
Desvenlafaxine	130	0.2	25-100
Doxepin	237	0.3	3-150; 10 mg/mL; 5%
Duloxetine	7207	10.4	20-60
Fluoxetine	2022	2.9	10-90; 20 mg/5 mL
Imipramine	75	0.1	10-150
Nortriptyline	505	0.7	10-75; 10 mg/5 mL
Trazodone†	6976	10.1	50-300
Venlafaxine	2741	4.0	25-225
Topical analgesics			
Lidocaine (monotherapy/in combination with other drugs)	1376	2.0	10-40 mg/mL; 0.5%-3.0%

* Fewer than 11 residents were on the following medications: indomethacin, diflunisal, ketoprofen, pirozicam, salsalate, codeine, meperidine, and butalbital or codeine combinations. Eslicarbazepine acetate and sulindac were each used by 15 residents. Desipramine was used by 27 residents. Ketorolac (typically for short-term use alone) was used by 120 residents.
† Trazadone is commonly prescribed for insomnia in older adults. The indication for trazadone was unknown.

nonprescription sources or nonpharmacologic pain management. In addition, the adjuvant medications (eg, anticonvulsants and antidepressants) may have been prescribed for conditions other than neuropathic pain. We were unable to determine which conditions were indicated for the prescribed analgesics or adjuvants. However, because the sample contains only those individuals who have been diagnosed with painful neuropathic conditions, there is a higher likelihood that neuropathic pain symptoms necessitated prescription of these medications.

Table 3

Mutually adjusted prevalence ratios for receipt of no prescription analgesia or adjuvant among residents with neuropathic pain (n = 69,160).

Characteristic	% Who did not receive any pharmacologic treatment for pain	Adjusted prevalence ratio* (95% confidence interval)
Age, y: 50-64	19.4	1.0
65-74	22.5	1.10 (1.04-1.16)
75-84	27.6	1.24 (1.18-1.30)
85+	34.5	1.45 (1.38-1.52)
Race/ethnicity		
Non-Hispanic White	27.6	1.0
Non-Hispanic Black	29.6	1.03 (0.99-1.07)
Hispanic	30.6	1.01 (0.96-1.07)
Women	26.6	0.79 (0.77-0.81)
Rejects care	31.0	1.07 (1.02-1.12)
Activities of daily living		
Independent	24.2	1.0
Modified dependence	29.2	1.09 (1.06-1.12)
Dependent	30.3	1.09 (1.05-1.14)
Cognitive impairment		
Cognitively intact	21.8	1.0
Mildly impaired	28.9	1.21 (1.17-1.25)
Moderately impaired	37.3	1.47 (1.42-1.52)
Severely impaired	42.4	1.65 (1.57-1.73)
Diagnoses		
Dementia/Alzheimer	32.5	1.13 (1.10-1.16)
Anxiety disorder	23.0	0.83 (0.81-0.85)
Depression	23.5	0.68 (0.66-0.70)
Potentially painful conditions		
Diabetes	27.3	1.01 (0.99-1.04)
Cancer	33.2	1.16 (1.11-1.21)
Cardiovascular		
Heart failure	27.1	0.98 (0.96-1.01)
Coronary artery disease	28.7	1.03 (1.00-1.06)
Venous thromboembolism	25.8	0.95 (0.89-1.01)
Peripheral vascular/arterial disease	27.8	0.99 (0.96-1.03)
Cerebrovascular accident, transient ischemic attack, or stroke	27.5	0.99 (0.95-1.02)
Multiple sclerosis	18.4	0.86 (0.78-0.95)
Human immunodeficiency virus (HIV)	10.0	0.43 (0.08-2.39)
Musculoskeletal		
Arthritis	26.6	0.90 (0.88-0.92)
Osteoporosis	28.6	1.02 (0.99-1.06)
Fracture (hip and other)	31.0	1.11 (1.07-1.15)
Urinary tract infection (last 30 d)	28.1	1.03 (1.00-1.06)
Seizure disorder/epilepsy	21.2	0.78 (0.75-0.82)

* Adjusted for variables shown on this table.

5. Conclusions

Neuropathic pain is common among nursing home residents. However, a large proportion of individuals with pain do not receive analgesics or adjuvants for management of their pain. Individuals of advanced age, moderate or severely cognitively impaired, or who were diagnosed with other chronic diseases were more likely to receive no medication. This suggests a need to improve pain diagnosis and management procedures and ensure optimal care outcomes among such individuals. There is also the need for further research aimed at creating standard classifications for the clinical diagnosis of neuropathic pain.[35] The use of such definitions will help produce accurate national estimates of neuropathic pain prevalence using large databases as has been used in our study.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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Appendix A. Supplemental digital content

Supplemental digital content associated with this article can be found online at http://links.lww.com/PAIN/B527.

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