Feature Article

Characteristics associated with transition from opioid initiation to chronic opioid use among opioid-naïve older adults

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ABSTRACT

Our primary objective was to determine the prevalence and characteristics of opioid-naïve older adults who initiated opioids and transitioned to chronic use. Study populations included older adults ≥ 65 years with continuous medical and drug plan enrollment one-year prior to opioid initiation (pre-period) through one-year after initiation (post-period). Characteristics were determined using multivariate logistic regression. Among eligible insureds (N = 180,498), 70% used only the initial opioid prescription; 30% continued to use opioids requiring ≥ 2 prescriptions with ≥ 15 days' supply. Overall, 6% transitioned to chronic use > 90 days. Characteristics associated with chronic use included: (1) Low income, older, females, in poor health, with new/chronic back pain; (2) opioid initiation with long-acting opioids or tramadol; (3) prescriptions for other pain, sleep or antspsychotic medications; and (4) indications of pre and/or post mental health issues. Careful screening, monitoring and/or alternative non-opioid pain management strategies may be warranted for those at risk for chronic opioid use.

Introduction

Opioids have primarily been utilized to manage acute, short-term pain with the physician's general intention that opioid use should terminate as pain intensity diminishes.[1,2] However, for some individuals, opioid initiation involves a transition to long-term, chronic use.[1−3] To address this issue, in 2016, the Centers for Disease Control and Prevention (CDC) published guidelines for prescribing opioids for non-cancer pain management of adult patients.[4] The guidelines included 12 recommendations cautioning care when initiating and managing opioid therapy for general populations age 18 years and older. Special attention was given to opioid-naïve patients who initiated opioids and transitioned to chronic use. While much focus has been given to younger adults who more often suffer serious adverse effects associated with substance abuse, addiction and overdose, less attention has been directed to older adults who are less likely to experience these specific adverse effects.[3]

In a subsequent set of guidelines published in 2017 focusing on initial prescriptions of opioids, the CDC indicated that, while dosages are important, duration of exposure to opioids was the more important driver of long-term opioid use, with each day beyond three days' exposure increasing the likelihood of long-term use.[1] Additionally, the recommendations noted that initiation of long acting-opioids and concurrent use of opioids and benzodiazepines should be avoided. These recommendations, however, also were focused on general populations 18 years and older. Thus, a better understanding of this process is warranted as it applies to older adults, who may suffer acute, short-term pain but are more likely to also experience chronic long-term pain issues.[3,5−9]

Although there are different definitions of "long-term" opioid use based on number of prescriptions (3−6),[2,8,10−12] number of months of use (6−2)[1,5,13] or days of supply (> 90),[9,14−19] the prevalence of those who transition from opioid initiation to long-term or chronic opioid use is quite consistent at about 5% to 7% for general populations.[1,2,6,7,14,17,18] Meanwhile, 50% to 80% of patients terminate opioid use with one prescription fill and no further use.[1,2,15] Characteristics of those who transition vary with study populations but most often include low income, females, in poor health, with pain diagnoses (e.g., chronic pain, back, neck or arthritis) and mental health

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issues (e.g., anxiety or depression).[1,2,7,10−18,21−23] Other diverse predictors associated with long-term opioid use include white race, residence in Midwest and South regions of the US and use of other medications (e.g., benzodiazepines or muscle relaxants).[9−13,16−19,22,23] Despite this rather extensive list of possible characteristics, no determinants, including self-reported pain intensity or pain interference,[7,10,17,21,23,24,26] have been identified that consistently predict a physician's decision to prescribe opioids compared to other non-opioid analgesics for a specific patient and, more importantly, to continue to prescribe opioids longer-term. Furthermore, the long-term efficacy of opioids remains inconsistent, with pain management outcomes similar to those experienced by non-opioid users.[10,15,20,25,27]

Frequently, the experience of pain is complicated by mental health issues which can precede or be concurrent with pain, especially chronic pain.[2,7,9,15,17,19,21,23] Those with mental health issues are more likely to receive opioid prescriptions or concurrent opioid and benzodiazepine prescriptions, despite recommendations to the contrary.[2,7,9,10,17,19,21,23,25] Moreover, mental health issues are associated with higher potency, higher dosages and longer duration of opioids even though there does not appear to be a pain relief advantage compared to lower potency opioids or non-opioid analgesics.[10,17,24,25] Screening for depression and anxiety are recommended for all patients prior to opioid initiation, with either prior mental health treatment or careful monitoring should opioids be initiated.[7,9,21,23,25] New-onset depression may be a proxy for loss of control associated with either depression and/or the ineffectiveness of pain management.[19]

Meanwhile, the nature or intensity of an initial acute pain episode does not necessarily appear to be associated with long-term opioid use.[7,10,17,19,24,25] For example, minor and major surgical procedures were associated with similar transition rates to chronic opioid use (5.9% and 6.5%, respectively) with the study authors concluding the individual patient characteristics were more important than the surgical procedure per se.[17] In comparison, 12% to 24% of new back pain patients filled two or more prescriptions of opioids or were more likely to remain on opioids up to 24 months later.[8,22] Thus, chronic pain treatment strategies may need to be distinguished from acute, short-term pain episodes and may require ongoing multidisciplinary approaches to monitor concurrent changes in physical and mental health, pain interference, functional abilities and quality of life.[25]

No published research studies to date were found that considered the prevalence or characteristics of those who initiated opioids and then transitioned to chronic use among older opioid-naïve adults with Medicare Supplement plans (i.e., Medigap).[28] In the US, government-funded Medicare covers adults age 65 and older, as well as those under 65 and disabled. Medicare fee-for-service plans (about 70% of all Medicare plans) pay about 80% of medical expenditures for these individuals but offer minimal prescription drug benefits. Those enrolled in these Medicare plans are personally responsible for obtaining additional insurance plans to cover the remaining 20% of medical expenses (i.e., Medicare Supplement or Medigap plans) and more inclusive prescription drug coverage (Medicare Part D plans). While most (about 90%) of those with original fee-for-service Medicare coverage have some type of supplemental insurance coverage, about 28% (currently about 10.2 million adults) have purchased Medigap coverage.[28] Since this population may differ in demographic, socioeconomic or health status characteristics from general older adult and/or specifically overall Medicare populations, it was of interest to determine (1) the prevalence of older adults within an opioid-naïve study group who initiated opioids and then transitioned to chronic opioid use, and (2) the characteristics associated with such use. This study adds to the opioid literature in its focus on a large population of older adults that compares study results with previous research conclusions derived from younger adult populations.

Thus, our primary objective was to determine the prevalence and characteristics of opioid-naïve older adults who initiated opioids and subsequently transitioned to chronic opioid use lasting more than 90 days. A secondary objective was to consider the likelihood of transition to chronic opioid use for four common conditions: new or chronic back pain, total knee arthroplasty (TKA) and trauma. This research was covered under the New England IRB #120,160,532.

It was hypothesized that older adults who transitioned to chronic opioid use would be more likely to be female, older, lower income, in poorer health, suffer from chronic pain conditions such as back pain, be depressed and more likely to use other medications to address mental health issues or to supplement opioids for pain management. A second hypothesis projected that those with new or continuing chronic back pain would be more likely to use opioids longer-term compared to patients with acute surgical pain (e.g., TKA) or trauma pain (e.g., falls).

Methods

Study sample

In 2016, approximately 5 million Medicare insureds were covered by an AARP® Medicare Supplement plan insured by UnitedHealthcare Insurance Company. These plans are offered in all 50 states, Washington DC, and various US territories. A sample of 2016 AARP Medicare Supplement insureds with AARP® MedicareRx plans insured by UnitedHealthcare (about 55% of insureds) who were at least 65 years of age was utilized to identify opioid-naïve older adults who initiated opioid treatments. Inclusion criteria for the study sample included: (1) 12-month continuous medical and drug plan enrollment with no evidence of opioid prescriptions prior to the opioid initiation index date in calendar year 2016 (opioid-naïve); (2) 12-month continuous medical and drug plan enrollment follow-up after opioid initiation through December 2017; and (3) exclusion of all cancer and sickle cell patients. The study design was based on administrative medical claim and pharmaceutical drug databases maintained by UnitedHealthcare. The final study sample that met inclusion criteria included 180,498 opioid-naïve insureds.

Opioid use in the one-year follow-up

Opioids were identified from National Drug Codes (NDCs) as recommended by the 2018 HEDIS quality measures associated with opioid use.[29] Opioids were categorized into six mutually exclusive categories based on US Drug Enforcement Administration (DEA) opioid drug schedules for acceptability of medical use and potential for abuse or dependency. Those categories are: (1) long-acting; (2) short-acting, other Schedule II; (3) short-acting, oxycodone; (4) short-acting, hydrocodone; (5) short-acting, Schedule III-IV and nalbuphine; and (6) tramadol.[1,30]

Days of supply for the initial prescription and for the one-year follow-up period were calculated from prescriptions recorded in the pharmaceutical drug database. Opioid dosages were determined by converting to morphine milligram equivalents (MMEs) using the following formula: drug quantity times the opioid strength per unit and the ingredient opioid conversion factor, summed over the opioid prescriptions filled for the initial prescription (initial MMEs) or during the one-year follow-up period (total MMEs).[31] Based on the CDC priority on opioid duration[1] and HEDIS quality measures,[29] we used number of prescriptions and days of supply (duration of opioid use) to categorize opioid users in the follow-up period as: 1 prescription or ≤ 14 days' supply; ≥ 2 prescriptions and 15−30 days' supply; ≥ 2 prescriptions and 31−90 days' supply; and ≥ 2 prescriptions and > 90 days' supply. Chronic opioid use was defined as ≥ 2 prescriptions and > 90 days' supply of opioids.

Covariates

Covariates were included to characterize categories of opioid users and to adjust for other risk factors. These covariates included measures of demographics, socioeconomic factors, health status, and other characteristics taken from health plan eligibility and administrative medical claims.

Demographic questions included age and gender. Age groups were defined as: 65−69; 70−74; 75−79; 80−84; and ≥ 85 years. Geographical location (Northeast, South, Midwest or West); metropolitan area (urban or other); low (less than 15% non-white), medium (15% to 59% non-white), and high (≥ 60% non-white) minority areas; and low (< $40,179), medium ($40,179 to < $ 57,199), and high (≥ $57,199) median household income levels were geocoded from zip codes as determined by the US Census Bureau. AARP Medicare Supplement plan types were grouped by cost-sharing levels, including high-level coverage plans with minimal copayments or deductibles, medium-level coverage plans with relatively more copayments or deductibles, and all other plans. A measure of health services access was calculated as primary care physicians (PCPs) per 100,000 capita. Level of medical services utilization from medical claims was calculated as the Hierarchical Condition Category (HCC) score.[32] This score is used by Centers for Medicare & Medicaid Services (CMS) to risk adjust medical payments across various medical plans according to the health status of the different insured populations. HCC subgroups were defined as follows and utilized to control for health status: HCC scores < 0.5 (healthy and active); HCC scores 0.5 to < 1.2 (above average); HCC scores 1.2 to < 2.8 (at risk); and HCC scores ≥ 2.8 (very sick). Physical therapy sessions were identified from procedure codes not linked to any specific diagnosis codes.

Other medications

Other medications often used concurrently with opioids to manage pain included other pain medications (non-steroidal anti-inflammatory drugs (NSAIDs) and muscle relaxants) and medications associated with treatment of mental health issues (benzodiazepines and antipsychotics). Benzodiazepines, muscle relaxants and antipsychotics were defined from National Drug Codes (NDCs) included in the drug classes for general use benzodiazepines, muscle relaxants or antipsychotics. Prescription sleep medication users were defined from NDCs for insomnia recommended by the CDC.[33]

New or chronic back pain, TKA or trauma

Four common conditions often associated with opioid use in older adults were identified from diagnosis and procedure codes to compare rates of transitions from initiation to chronic opioid use as examples of chronic pain or acute pain: new or chronic back pain, TKA and trauma. New and chronic musculoskeletal back pain was defined from suggested HEDIS diagnoses codes after excluding all back pain associated with cancer, trauma and drug abuse.[29] New back pain patients must have been without a back pain diagnosis in a 12-month pre-period and with a new back pain diagnosis in 2016 associated with a new opioid prescription. Chronic back pain patients must have had a previous back pain diagnosis in the pre-period but to have been opioid-free until a back pain diagnosis in 2016 at which opioids were initiated. The back pain coding from HEDIS exclusion criteria for trauma was used as a separate condition of trauma in this analysis. TKA was identified from surgery procedure codes.

Changes in benzodiazepine use, depression diagnoses or anxiety diagnoses pre to post

In order to control for mental health status in the pre and post time periods or for changes in mental health status over time pre to post, three separate change variables were created associated with benzodiazepine use, depression diagnoses and anxiety diagnoses. Benzodiazepine use was defined from NDCs; depression (major) and anxiety diagnosis codes were identified from Psychiatric Diagnosis Groups (PDGs).[34] The variables included four levels: pre only (discontinued or ended), post only (new), both pre and post (continuing) and neither pre nor post (none).

Statistical models

Demographic variables were unilaterally tested across opioid use categories using chi-square or t-tests for categorical or continuous variables, respectively. Characteristics associated with opioid users who transitioned to chronic opioid use compared to those who terminated opioid use with one prescription were determined using multivariate logistic regression models. Covariates included all of those variables listed in Table 1. Variables with high correlations (e.g., > 0.5) were dropped from regression models. All analyses were completed using SAS Enterprise Guide Version 7.1 (SAS Institute Inc., Cary, NC, USA).

Sensitivity analyses

As a sensitivity analysis, the analyses described above were repeated with single prescription opioid users propensity matched[35,36] to the chronic opioid users on the demographic (age, gender, minority, location, region), socioeconomic (income, plan type), mental health (number of PDGs), access to care (number of PCPs) and health status (HCC score) variables listed in Table 1. Since the results were similar indicating adequate control of these factors with regression modeling we opted to show only the results using the full study population.

Results

Overall, 32% of AARP Medicare Supplement insureds filled at least one opioid prescription in 2016, and, among these, 47% were opioid-naïve (N = 336,015). From this initial study population, 14% (N = 47,044) and 13% (N = 44,644) were excluded due to continuous enrollment criteria in the pre and post time periods, respectively; 18% (N = 61,334) were excluded due to cancer or sickle cell diagnoses according to the HEDIS rules; and 1% (N = 2,495) were excluded for age < 65 years or missing gender. After these exclusions, the final study populations included 180,498 opioid-naïve insureds in the following opioid use categories: 70% (N = 125,639) 1 prescription or ≤ 14 days' supply; 11% (N = 20,731) ≥ 2 prescriptions and 15−30 days' supply; 12% (N = 22,422) ≥ 2 prescriptions and 31−90 days' supply; and 6% (N = 11,706) ≥ 2 prescriptions and > 90 days' supply. (Table 1)

As a group, those who initiated opioid use were mostly female (61%), 70−75 years of age (29%), white (48%), high income (48%), lived in the South region (41%) and were in high coverage medical plans (79%). (Table 1) Initial opioid prescriptions were most often short-acting hydrocodone (41%), tramadol (27%) or short-acting oxycodone (21%). Common concurrent medications included benzodiazepines (21%), NSAIDs (27%), muscle relaxants (12%) and sleep medications (7%). Physical therapy was utilized by 34% initiated in the post period as part of pain management therapy along with opioids. New or chronic back pain, TKA and trauma were evident in 5%, 26%, 3% and 4% of the study population initiating opioids, respectively. New or continuing benzodiazepine use and new or continuing depression or

Table 1
Unadjusted demographic characteristics associated with opioid use by number of prescriptions and days of supply.

	Total population % or Mean	1 opioid or ≤ 14 day supply % or Mean	≥2 opioids and 15−30 day supply % or Mean	≥2 opioids and 31−90 day supply % or Mean	≥2 opioids and > 90 day supply % or Mean	p-value
Number	180,498	125,639	20,731	22,422	11,706	
Gender						
Male	39.1	41.3	36.5	32.9	32.3	<0.0001
Female	60.9	58.7	63.6	67.1	67.7	
Age	75.5	75.2	75.3	76.3	77.1	<0.0001
65−69	24.6	25.4	24.7	21.9	21.0	<0.0001
70−74	28.7	29.3	28.9	27.4	24.1	
75−79	20.6	20.6	21.2	20.7	19.3	
80−85	12.3	12.0	12.3	13.0	14.3	
≥ 85	13.8	12.7	12.9	17.1	21.3	
Minority (from zip code)						
Low	47.7	47.9	47.6	46.6	47.6	0.001
Medium	45.3	45.1	45.3	46.2	45.8	
High	3.0	3.0	3.0	3.3	3.2	
Median income (from zip code)						
Low	14.6	13.9	14.7	16.5	18.0	<0.0001
Medium	34.4	33.9	35.0	35.6	37.3	
High	48.3	49.5	47.4	45.3	42.4	
Location						
Urban	81.9	82.3	81.3	81.2	80.2	<0.0001
Other	18.1	17.7	18.7	18.8	19.8	
Region						
Midwest	15.5	15.1	16.2	16.3	16.5	<0.0001
Northeast	19.9	20.7	18.1	18.6	17.3	
South	41.1	40.5	42.1	42.4	43.4	
West	20.8	20.9	20.8	20.1	20.5	
Healthcare supply						
PCPs per 100,000	131.3	131.7	130.8	130.3	130.2	<0.0001
Plan type						
High coverage	78.7	78.6	79.8	78.6	77.5	<0.0001
Medium coverage	2.7	2.7	2.5	2.7	3.1	
Other	18.6	18.6	17.6	18.7	19.4	
HCC score						
< 0.50	29.4	31.7	28.4	23.9	16.9	<0.0001
0.50 to < 1.20	44.4	44.8	45.0	43.6	41.4	
1.20 to < 2.80	22.5	20.6	22.6	27.4	33.2	
≥ 2.8	3.7	2.9	4.0	5.1	8.5	
Event: 1st opioid prescription						
> 30 days after chronic back pain	26.3	22.6	28.7	34.8	44.5	<0.0001
Within 30 days after new back pain	5.0	4.1	6.4	8.0	6.6	<0.0001
Within 30 days after TKA	2.8	1.6	7.6	5.9	1.4	<0.0001
Within 30 days after trauma	4.3	4.1	6.1	5.0	2.8	<0.0001
Initial opioid prescription						
Days of supply	8.5	6.4	7.7	13.8	22.0	<0.0001
Total MMEs	232.3	182.6	260.0	322.0	545.6	<0.0001
Opioid categories (initial)						
1: Long-acting	0.8	0.2	1.5	2.0	4.2	<0.0001
2: Short-acting, other Schedule II	1.3	1.1	1.7	1.7	1.9	<0.0001
3: Short-acting, oxycodone	21.2	21.8	24.5	18.5	13.6	<0.0001
4: Short-acting, hydrocodone	40.9	44.1	37.8	32.5	28.7	<0.0001
5: Short-acting, Schedule III - IV	10.8	12.3	8.5	7.3	5.3	<0.0001
6: Tramadol	26.6	21.0	31.1	42.4	49.4	<0.0001
Other medications						
Antipsychotics	2.5	2.1	2.5	3.5	5.7	<0.0001
Sleep medication	7.2	4.9	9.8	13.0	16.2	<0.0001
Muscle relaxant	11.8	9.8	13.9	16.3	20.6	<0.0001
NSAIDs	26.5	23.0	33.6	35.7	33.5	<0.0001
Physical therapy	33.9	27.8	51.2	49.8	39.0	<0.0001
Benzodiazepine use						
Pre only	4.7	4.8	4.8	4.9	4.0	<0.0001
Post only (new)	8.1	6.5	9.9	11.6	15.8	
Pre and post	12.7	11.3	14.2	16.7	18.2	
None	74.4	77.5	71.1	66.9	62.1	
Depression diagnosis						
Pre only	3.6	3.3	4.1	4.1	5.2	<0.0001
Post only (new)	6.5	5.3	7.7	9.6	12.2	
Pre and post	5.4	4.5	6.2	7.4	9.8	
None	84.4	86.9	82.0	78.9	72.8	
Anxiety diagnosis						
Pre only	5.4	5.0	5.9	5.9	7.2	<0.0001

(continued)

Table 1 (*Continued*)

	Total population % or Mean	1 opioid or ≤ 14 day supply % or Mean	≥2 opioids and 15−30 day supply % or Mean	≥2 opioids and 31−90 day supply % or Mean	≥2 opioids and > 90 day supply % or Mean	*p*-value
Post only (new)	7.1	6.0	8.5	10.2	11.6	
Pre and post	5.9	5.1	6.5	7.6	10.3	
None	81.6	84.0	79.1	76.3	70.9	

Notes: PCP = primary care physician; HCC = Hierarchical Condition Category; TKA = total knee arthroplasty; MME = morphine milligram equivalents; NSAIDs = nonsteroidal anti-inflammatory drugs; Missing categories were deleted for brevity.

anxiety diagnoses were evident among 21%, 12% and 13% of the population, respectively, after opioid initiation.

Transition rates from opioid initiation to chronic use by condition

Transition to chronic opioid use was most evident among those with new or chronic back pain. Compared with the overall 6% transition to chronic use, 9% and 11% of new or chronic back pain patients transitioned to chronic use whereas only 3% and 4% of those having TKA surgery or experiencing a trauma transitioned, respectively, to chronic opioid use. (Table 2)

Characteristics associated with transition to chronic opioid use

The strongest characteristics associated with a transition to chronic opioid use were the nature of the opioid itself: long-acting opioids or tramadol (Table 3) along with other medication use including benzodiazepines, muscle relaxants, NSAIDs, prescription sleep medications and antipsychotics. Demographic characteristics included low income, older, females in poor health (high HCC scores) with new or chronic back pain. While any evidence of mental health issues was associated with a higher likelihood of chronic opioid use, new benzodiazepine use or new-onset depression and/or anxiety were associated with higher odds ratios to transition to chronic use compared to pre only or continuing (pre and post) evidence of mental health issues.

Discussion

In this population of AARP Medicare Supplement insureds, 6% of opioid-naïve patients transitioned from opioid initiation to chronic use; 70% terminated opioid use with one prescription in 14 days or less. Although definitions of "chronic or long-term" opioids vary and studies measuring transitions to chronic use have focused on

populations 18 years and older, the prevalence of those who transitioned to chronic use in this study was in general agreement with previous publications (i.e., 5.0% to 7.0%).[1,2,6,7,14,17,18] Those who transitioned to chronic use were often taking other medications to manage mental health issues (e.g., benzodiazepines, antipsychotics or sleep medications) or to augment pain management (e.g., NSAIDs or muscle relaxants).[10,13,16,18,19] While longer initial days of supply demonstrated a dose-response trend with longer durations of opioid use, the most common opioids prescribed during follow-up were primarily short-acting hydrocodone (49%) and tramadol (34%) which may suggest a deliberate pain management strategy for low-level chronic pain.[1,6,15,20]

Characteristics associated with transition to chronic use compared to single prescription users included: (1) being low income, older, female, depressed, in poorer health and suffering from back pain; (2) initiating with long-acting opioids or tramadol; (3) using other pain, mental health or sleep medications; and (4) demonstrating mental health issues in the pre and/or post periods. Generally, these characteristics were similar to those demonstrated for adult populations 18 years and older.[1,2,6,7,9−12,15−19,20−23] Of note, the initiation of benzodiazepines in the post period or new diagnoses of depression or anxiety in the post period were more strongly associated with a transition to chronic opioid use than either evidence of mental health issues in the pre only (ending) or in the pre and the post (continuing). These results are in agreement with other studies that indicate that new mental health issues may be associated with opioid intake.[10,19,25] Although we measured only total MMEs used during the follow-up period, other studies have indicated that escalation in opioid dosages contributes more strongly to new-onset depression than higher opioid dosages per se.[19] New-onset mental health issues may be a critical marker for ineffective pain management, and should be monitored carefully.

As expected, new and chronic back pain were highly associated with a transition to chronic use (ORs 1.78 and 2.17, respectively)

Table 2
Transition to chronic opioid use > 90 days by event type: chronic back pain, new back pain, total knee arthroplasty and trauma.

Event	Total population	1 opioid or ≤ 14 day supply	≥2 opioids and 15−30 day supply	≥2 opioids and 31−90 day supply	≥2 opioids and > 90 day supply	*p*-value
Number-total population	180,498	125,639	20,731	22,422	11,706	
Number (among those with event):						
1st opioid prescription						
>30 days after chronic back pain	47,404	28,436	5955	7810	5203	<0.0001
Within 30 days after new back pain	9077	5186	1335	1784	772	<0.0001
Within 30 days after TKA	5010	1948	1578	1320	164	<0.0001
Within 30 days after trauma	7815	5108	1272	1109	326	<0.0001
Percentage-total population	100%	70%	11%	12%	6%	
Percentage (among those with event):						
1st opioid prescription						
>30 days after chronic back pain	46.0%	60.0%	12.6%	16.5%	11.0%	<0.0001
Within 30 days after new back pain	44.4%	57.1%	14.7%	19.7%	8.5%	<0.0001
Within 30 days after TKA	34.2%	38.9%	31.5%	26.4%	3.3%	<0.0001
Within 30 days after trauma	49.4%	65.4%	16.3%	14.2%	4.2%	<0.0001

Notes: TKA = total knee arthroplasty.

Table 3
Characteristics associated with transition to chronic opioid use > 90 days compared with single opioid prescription ≤ 14 days.

Variable	Odds ratio	p-value
Female	1.19	<0.0001
Age 70−74	0.90	0.0003
Age 75−79	0.88	0.0002
Age 80−84	0.94	0.10
Age ≥ 85	1.19	<0.0001
PCP per 100,000	1.00	0.07
Minority low	1.06	0.22
Minority medium	1.04	0.39
Income low	1.49	<0.0001
Income medium	1.27	<0.0001
Urban	0.90	0.0001
Midwest	1.13	<0.0001
Northeast	0.84	<0.0001
West	1.22	<0.0001
Plan type: medium coverage	1.26	<0.0001
Plan type: other	1.05	0.11
Pre-period HCC Score 0.50 to < 1.20	1.58	<0.0001
Pre-period HCC Score 1.20 to < 2.80	2.49	<0.0001
Pre-period HCC Score ≥ 2.8	4.34	<0.0001
Index opioid category = 1: Long-acting	26.24	<0.0001
Index opioid category = 6: Tramadol	3.60	<0.0001
1st opioid > 30 days after chronic back pain	2.17	<0.0001
1st opioid within 30 days after new back pain	1.78	<0.0001
1st opioid within 30 days after TKA	1.02	0.80
1st opioid within 30 days after trauma	0.63	<0.0001
Muscle relaxant use	2.83	<0.0001
Antipsychotic use	1.43	<0.0001
NSAID use	1.62	<0.0001
Sleep medication use	1.79	<0.0001
PT use	1.43	<0.0001
Benzodiazepine in post only (new)	2.21	<0.0001
Benzodiazepine use in pre and post	1.26	<0.0001
Benzodiazepine use in pre only	0.75	<0.0001
Depression in post only (new)	1.77	<0.0001
Depression in pre and post	1.38	<0.0001
Depression in pre only	1.18	0.0006
Anxiety in post only (new)	1.36	<0.0001
Anxiety in pre and post	1.26	<0.0001
Anxiety in pre only	1.15	0.001

Notes: PCP = primary care physician; HCC = Hierarchical Condition Category; TKA = total knee arthroplasty; NSAIDs = Nonsteroidal anti-inflammatory drugs; PT = physical therapy; reference categories: male, 65−69 years; minority high, income high, other location, south region, plan type high coverage; HCC < 0.5; no long acting opioid, no tramadol, no chronic back pain, no new back pain, no TKA, no trauma, no muscle relaxant, no antipsychotic, no NSAID, no sleep medication, no PT, no benzodiazepine, no depression, no anxiety. PCP per 100,000 is a continuous variable.

compared to either TKA or trauma episodes; TKA was not significantly associated (OR 1.02) and trauma events were associated with a reduced likelihood to transition (OR 0.63). These results are in general agreement with previous studies indicating 12% to 24% transition associated with back pain;[8,22] 3% to 10% associated with surgeries;[9,11,17,18,37] and 3% to 7% associated with trauma.[6,7] This evidence further demonstrates that treatment for chronic pain should be distinguished from acute, short-term pain episodes. Physical therapy was associated with increased likelihood to transition to chronic use (OR 1.43) after opioid initiation, apparently when utilized to augment pain management strategies. This appears to be in contrast to those studies indicating that early physical therapy for new back pain may decrease opioid use.[22,38] Some authors suggest that chronic pain, especially among older adults, may warrant low to medium opioid dosages as reasonable and justifiable with close monitoring to maintain physical function and quality of life with aging.[25] It may be advisable for the CDC to consider such exceptions to their recommendations when physicians are treating persistent or chronic pain in older adult patient populations.

Of the many characteristics associated with continued dependence on opioids, depression and anxiety, either preceding or concurrent with pain issues, may be the most influential in determining longer-term pain management outcomes. Previous research has indicated that those with mental health issues are consistently more likely to receive opioid prescriptions and to use higher dosages for longer periods of time compared to those without these issues.[2,7,9,15,17,19,21,23] In any case, the reasons patients continue to use opioids are complex, involving physical and psychological elements and not solely due to persistent pain intensity as might be assumed. Similarly, in our study, despite CDC recommendations to the contrary, treatment for mental health issues was evident in concurrent prescriptions of benzodiazepines, antipsychotics and/or sleeping medications. These medications were associated with a higher likelihood to transition to chronic use, providing evidence of an adverse selection of patients with mental health and pain issues to longer-term opioid use.[2,7,17,19,21,23,25]

Interventions to reduce the use of opioids have been focused on both providers and patients. Increasing oversight and regulations from Veteran's Administration (VA) as well as from state and federal governing bodies along with published CDC guidelines have dramatically reduced new prescriptions of opioids.[39,40] Nevertheless, there are few clinical guidelines for providers and limited evidence for appropriate use whether emergency room trauma, major or minor surgeries or chronic pain.[5,6,17] In a retrospective study from the VA, the decline in opioid use has been realized primarily in the decrease of new long-term use.[39] Tapering of those currently on chronic opioids is difficult at best, requires cooperation between providers and patients and must utilize long-term strategies; this process has been only minimally successful.[41] Efforts to reduce initial opioid utilization provide a documented prevention strategy to reduce opioid consumption, but this does raise the issue of how best to manage those patients with persistent chronic pain. More research on the complexity of pain management among older adults may be warranted given their higher prevalence of chronic medical and pain conditions.

Non-pharmacological approaches including cognitive behavioral therapy (CBT) for pain, mindfulness for pain and optimized antidepressant therapy with pain management have demonstrated some success as non-opioid alternatives but require additional resources.[26,42−46] Of these alternatives, self-management with CBT and exercise has been effective specifically with older adult patients.[42,43] Physical therapy may provide a useful solution integrated into pain management strategies but Medicare funding specifications and lack of consistency and follow-up for therapy programs limit practical application.[22,38] Little attention has been given to sleep management in the complexity of chronic pain and mental health issues; thus this dimension of pain management is largely unexplored.[21,47] More research on non-pharmacological pain management strategies for older adults may be required.

This study has some limitations. The study population of AARP Medicare Supplement insureds may not generalize to all older adults or other Medicare or Medicare Supplement beneficiaries. Pharmacy databases confirm prescription purchases but we had no indication of whether patients actually consumed the drugs as directed. We had no measurements of pain severity or pain interference, and minimal information on the causes or sites of the pain being managed, which may have enhanced our results. Mental issues were identified from diagnosis codes and/or medication use, thus depression and anxiety were likely underreported. Strengths of the study include a large opioid-naïve study population that identified those older adults who initiated opioid use and subsequently transitioned to chronic use.

Conclusion

Overall, in this population of Medicare Supplement insureds, similar to younger populations, 6% of opioid-naïve older adults who initiated opioid use transitioned to chronic use; 70% terminated opioid use with a single prescription. Other concurrent mental health, pain or sleep medications provided evidence of ongoing or new mental health issues and/or difficulties with pain management increasing the likelihood to transition to chronic opioid use. Careful screening, ongoing monitoring and/or alternative non-opioid treatment options may need to be integrated into pain management strategies especially for those at risk for chronic opioid use.

Conflict of interest statement

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