Emergency Department Opioid Prescribing Practices for Chronic Pain: a 3-Year Analysis

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Published online: 3 December 2014
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Abstract Chronic pain is a common reason for emergency department (ED) visits. Our objective was to describe opioid prescribing practices of ED providers when treating patients with chronic pain. We retrospectively evaluated opioid prescriptions from EDs at two tertiary care military hospitals. We queried the outpatient record database to obtain a list of opioid medications prescribed and ICD-9 codes associated with visits for chronic pain. We collected provider type and gender, number of pills, opioid type, and refills. We compared the incidence with chi-square or Fisher's exact tests. Wilcoxon test was used for non-parametric continuous variables. Over 3 years, 28,103 visits generated an opioid prescription. One thousand three hundred twenty-two visits were associated with chronic pain, and 443 (33 %) visits were associated with an opioid prescription. Providers were 79 % physicians, 19 %

physician assistants (PAs), 81 % male, and 69 % active duty military. Medications were 43 % oxycodone, 30 % hydrocodone, 9.5 % tramadol, 2.5 % codeine, and 15 % other. The number of pills was 20 [interquartile range (IQR) 15–30] (range 1–240), morphine equivalents (M.E.) per pill was 7.5 [7.5–7.5] (2.5–120) and total M.E. per prescription was 150 [112.5–270] (15–6000). Physicians were more likely to prescribe a non-opioid than PAs (77 vs 45 %, $p<0.0001$). Civilian providers were more likely to prescribe an opioid than active duty providers (58 vs 42 %, $p<0.0001$). Providers prescribed a median of 20 pills per prescription and most commonly prescribed oxycodone. PAs were more likely to prescribe an opioid for chronic pain than physicians. Civilian providers were more likely to prescribe an opioid than active duty providers.

Meetings American College of Medical Toxicology Annual Meeting, Phoenix, AZ, March 2014, oral presentation and poster. Military Health System Research Symposium Fort Lauderdale, FL, August 2014, poster presentation.

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Keywords Opioids · Chronic pain · Emergency
medicine · Opioid abuse · Military

Introduction

Pain is the most common reason for emergency department (ED) visits, and it is estimated that more than half of patients present to the ED in pain [1, 2]. There are 44 million pain-related visits in the USA annually [3]. Treatment of pain is a top priority for a number of medical organizations including the World Health Organization (WHO), American Medical Association (AMA), and American College of Emergency Physicians (ACEP) [4].

In the last 10 years, there has been a rise in the therapeutic use of opioids as well as their misuse and abuse [5]. Between 2001 and 2010, ED visits that generated an opioid prescription increased from 21 to 31 %. During this time period, prescriptions for hydromorphone, morphine, oxycodone, and hydrocodone increased [6]. An estimated 5.2 million people

reported using prescription opioids for a nonmedical reason in the USA in 2007 [7]. In 2011, 29 % of ED visits for nonmedical use of prescription medications were due to opioid pain relievers. From 2004 to 2011, medical emergencies related to opioid use rose by 183 % [8].

Health-care providers in the ED are at the frontline of treating patients with acute and chronic pain and are frequently called upon to prescribe opioid pain medications [9]. Over 100 million adults in the USA suffer from a chronic pain condition with the costs related to persistent pain reaching as much as \$635 billion annually [10]. These patients have been associated with increased utilization of health-care resources, to include frequent use of ambulatory care, when compared to those without pain [11–13]. Low triage priority and time constraints are obstacles to caring for patients with chronic pain: usually a nonurgent condition in most hospital EDs. In addition, the signs of chronic pain are not always easily definable. Given that ED visits can be brief encounters, coupled with the lack of access to medical records, it can be difficult for ED providers to adequately treat the patient's pain while limiting the opportunity for misuse [14]. The provider's demographics, training, and experience all contribute to the differences in how these patients are managed [4].

Many studies look at the effect of patient characteristics on the decision of the medical provider to prescribe pain medications [4, 15–22], but few describe the variability of prescribing habits of ED providers [23–25]. The objective of our study was to describe the opioid prescribing practices of physicians and PAs, to include civilian and military providers, in an emergency department when treating patients with a discharge diagnosis of chronic pain.

Methods

Our retrospective study was approved by the Wilford Hall Ambulatory Surgical Center (WHASC) Institutional Review Board (IRB) in San Antonio, TX. We evaluated the oral opioid prescribing practices of emergency department health-care providers treating patients with chronic pain at two military facilities (WHASC and San Antonio Military Medical Center (SAMMC)) between June 2009 and June 2012. WHASC emergency department closed on July 1, 2011 and transitioned to an Urgent Care Center. San Antonio Military Medical Center is a level I trauma center where approximately 85,000 military and civilian patients a year are treated. The hospital is on a military base which is open to civilian ambulances and approximately 80 % of our patients are nonuniformed.

The Composite Health Care System (CHCS) was queried using File Manager (FileMan). CHCS is an information system designed to support the delivery of health care in Department of Defense (DoD) hospitals. FileMan is an

integrated tool used to enable data processing needs and queries. We provided the data management team with a list of all available generic oral opioids in our health-care system. Using this list, a data table was produced containing all of the oral opioid prescriptions generated during the 3-year study period, the ED patient encounter associated with each prescription, and demographic information about the prescribing clinical provider.

Data collected included the generic name of the oral opioid medication, medication strength, number of pills prescribed, medication refill status, ICD-9 codes associated with the patient visit, provider type (physician, physician assistant (PA), nurse practitioner (NP)), provider gender, and, if applicable, provider military branch and rank. Oral opioid names used in the search were any combination of the following medications: oxycodone immediate release (IR), hydrocodone, tramadol, codeine, morphine, hydromorphone, oxycodone extended release (ER), methadone, meperidine, and propoxyphene napsylate-acetaminophen. Morphine equivalents were calculated using a conversion chart utilized by Cepeda et al. [26]. The age of the providers was not available via our data pull, so when available, military rank was used as surrogate for experience level. Most physicians who are captains are in residency or within 3 years of graduation, and most physicians who are majors are between 3 and 8 years of residency graduation. Thus, we assigned those with the rank of captain and major into the “less experienced” group and lieutenant colonels and colonels into the “more experienced” group.

No standing system exists in the electronic medical record to identify those patients with chronic pain or those who show patterns of elevated opioid consumption. Particular ICD-9 codes were used to identify visits for chronic pain and included: Code 338.2 Chronic pain, Code 338.21 Chronic pain due to trauma, Code 338.28 Other chronic postoperative pain, Code 338.29 Other chronic pain, Code 338.3 Neoplasm related pain (acute) (chronic), and Code 338.4 Chronic pain syndrome.

For this study, the subject of interest was the provider rather than the patient. All identifying information was removed by the study clinical research nurse, and each provider was assigned a randomization number. No personal health information (PHI) of the patients was recorded. The study database was stored in a locked, password-encrypted, electronic database (Microsoft Excel 2010, Redmond, WA).

Statistical Analysis

The data was consolidated using Excel 2010 (Microsoft Corp., Redmond, WA). Statistical analysis was performed with JMP version 10 (SAS Institute Inc., Cary, NC). As this was a retrospective, descriptive study using already existing data, no sample size calculation or power analysis was planned. Frequency analysis was completed to report count,

Table 1 Opioid prescriptions by study year

	Prescriptions (<i>n</i>)	Pills per prescription (mean±SD; median [IQR])	M.E. per pill (mean±SD; median [IQR])	M.E. dose per prescription (mean±SD; median [IQR])
Study year 1 (2009–2010)	7654	25±25; 20 [15–21]	6.5±4.2; 7.5 [4.2–7.5]	148±184; 150 [75–150]
Study year 2 (2010–2011)	8424	23±19; 20 [15–20]	6.7±4.2; 7.5 [7.5–7.5]	147±187; 150 [75–150]
Study year 3 (2011–2012)	12,024	24±24; 20 [15–20]	7.0±3.9; 7.5 [7.5–7.5]	154±270; 150 [75–150]

IQR interquartile range, *M.E.* morphine equivalent, *SD* standard deviation

proportions, and percentages. Data were analyzed based on study group categorization into opioid vs non-opioid, physician vs PA, male vs female, less experienced vs more experienced, and active duty vs civilian. Continuous data were analyzed using Student's *t*-tests or Wilcoxon tests when appropriate based on Shapiro-Wilks test for normality, and findings reported as median [interquartile range (IQR)] with the addition of (range) when appropriate. Chi-square or Fisher's exact tests, when needed, were used to compare categorical data and reported as proportions. A $p<0.05$ was considered significant.

Results

During our 3-year study (June 2009–June 2012), ED providers wrote 28,130 prescriptions for oral opioids (Table 1). Prescriptions that were linked to an ICD-9 code for chronic pain totaled 1322. Of those chronic pain prescriptions, 34 % ($n=443$) received an oral opioid medication. Pain medication prescriptions for chronic pain were written by 103 ED providers. Providers were 79 % physicians, 19 % PAs, and 2 % unknown. PAs wrote 55 % of opioid prescriptions, and physicians wrote 77 % of non-opioid prescriptions. Of the providers, 81 % were male and 69 % were active duty. Active duty providers were 33 % captains, 33 % majors, 27 % lieutenant colonels, and 7 % colonels. Providers were 66 % “less experienced”, and 34 % “more experienced.”

Opioids prescribed during ED visits for chronic pain were 43 % immediate-release (IR) oxycodone-containing

medications, 30 % hydrocodone-acetaminophen, 9.5 % tramadol, 2.5 % contained codeine, and 15 % other opioids (morphine, hydromorphone, extended-release (ER) oxycodone, methadone, meperidine, and propoxyphene napsylate-acetaminophen). The median number of pills prescribed was 20 [interquartile range (IQR) 15–30] (range 1–240). The morphine equivalent (M.E.) dose per pill was 7.5 [IQR 7.5–7.5] (range 2.5–120) and the total M.E. per prescription was 150 [IQR 112.5–270] (range 15–6000). When analyzing medications individually, tramadol prescriptions accounted for the largest number of pills (Table 2).

Provider experience level was not associated with whether a provider chose to prescribe a non-opioid or an opioid for chronic pain ($p=0.817$). The experience level also had no relationship with the number of pills prescribed ($p=0.398$). Gender was not correlated with prescribing preferences (opioid vs non-opioid) ($p=0.422$), or the number or pills prescribed ($p=0.629$).

Civilian providers were more likely to prescribe an opioid for chronic pain than active duty providers (41 vs 27 %, $p<0.0001$). Civilian providers prescribed more pills than active duty providers (20 [IQR 15–30] (range 1–240) vs 20 [IQR 12–25] (range 4–84), $p<0.0001$) and a higher total M.E. dose per prescription (200 [IQR 150–300] (range 15–6000) vs 150 [IQR 90–225] (range 30–3600), $p<0.0001$) (Table 3). Active duty providers were associated with a higher incidence of hydrocodone prescriptions in comparison to civilian providers (37 vs 25 %, $p=0.006$). Over 50 % of the prescriptions ordered by active duty providers were for hydrocodone as compared to other opioids (52 vs 38 %, $p=0.006$). Civilian providers were more likely to prescribe drugs categorized into

Table 2 Opioid prescriptions of patients with chronic pain

	Prescriptions (<i>n</i>)	Pills per prescription (mean±SD; median [IQR])	Dose (mg) per pill (mean±SD; median [IQR])	M.E. dose (mg) per prescription (mean±SD; median [IQR])
Oxycodone/oxycodone-acetaminophen	189	23±15; 20 [15–30]	5±0; 5 [5–5]	174±112; 150 [112.5–225]
Hydrocodone-acetaminophen	133	25±27; 20 [15–30]	5±0; 5 [5–5]	191±201; 150 [112.5–225]
Other opioid	68	28±30; 20 [8–37.5]	22±24; 10 [10–30]	854±1355; 300 [134–900]
Tramadol	42	42±39; 30 [20–50]	50±0; 50 [50–50]	416±390; 300 [200–500]
Codeine/codeine-acetaminophen	11	16±5; 20 [10–20]	30±0; 30 [30–30]	41±13; 50 [25–50]

IQR interquartile range, *SD* standard deviation, *M.E.* morphine equivalent

Table 3 Differences between active duty and civilian providers

	Active duty	Civilian
Number of prescriptions (<i>n</i>)	186	257
Opioid prescriptions (%) [*]	27	41
Non-opioid prescriptions (%) [*]	73	59
Number of pills per prescription [*]	20±12; 20 [12–24.75]	30±29; 20 [15–30]
Mean±SD; median [IQR]		
M.E. dose per pill	8.6±4.5; 7.5 [7.5–7.5]	12±17; 7.5 [7.5–10]
Mean±SD; median [IQR]		
M.E. dose per prescription [*]	187±275; 150 [90–225]	387±754; 200 [150–300]
Mean±SD; median [IQR]		

IQR interquartile range, *M.E.* morphine equivalent, *SD* standard deviation

^{*}*p*<0.0001

the other opioids group than active duty providers (21 vs 8 %, *p*=0.0002) and had a higher incidence of prescribing opioids in the other opioid category when compared to all other opioids (78 vs 54 %, *p*=0.0002).

PAs were more likely to prescribe an opioid for chronic pain than physicians (55 vs 23 %, *p*<0.0001). PAs prescribed a higher M.E. dose per pill than physicians (7.5 [IQR 7.5–10] (range 2.5–120) vs 7.5 [IQR 7.5–7.5] (range 2.5–20), *p*<0.0001) (Table 4). PAs also prescribed more pills (20 [IQR 20–40] (range 1–240) vs 20 [IQR 12–24] (range 3–84), *p*<0.0001) and a higher total M.E. dose per prescription (225 [IQR 150–300] (range 15–6000) vs 150 [IQR 90–200] (range 25–630), *p*<0.0001) (Table 4). Physicians were more likely to prescribe either hydrocodone (37 vs 24 %, *p*=0.0017) or oxycodone (50 vs 36 %, *p*=0.003) than PAs. PAs were more likely to prescribe codeine (4.2 vs 0.5 %, *p*=0.0070), tramadol (12 vs 6 %, *p*=0.0391), or other opioids (24 vs 5.4 %, *p*<0.0001) than physicians (Fig. 1).

Discussion

We found that patients with an ED discharge diagnosis of chronic pain were more likely to receive a prescription for a non-opioid analgesic; with opioids only being prescribed in 33 % of chronic pain cases. Civilian providers were more likely to prescribe an opioid analgesic than active duty

providers and PAs were more likely to prescribe opioids than physicians.

Our sites see an average of 5700 patients in their EDs each month. Over a 36-month period, this equates to 205,200 visits. Opioids are prescribed 14 % of the time at our sites. Given the ongoing concerns about opioid over-prescription, it was surprising that the prescribing rate was not higher [5–8]. However, this percentage is similar to those reported in other civilian studies [6, 27]. One possible reason that the prescribing rate was not higher could be due to rising concerns about opioid misuse, and ED providers are consciously attempting to utilize non-opioid alternatives when treating patients with pain. Another is that in the military community, there has been annual health-care education for providers on sending those patients with chronic pain to their primary care or pain clinic providers when in need of pain medication so the ED providers are not providing opioids to these patients. In addition, there is considerable effort within the military to limit opioid prescriptions [28]. A comparison of military and civilian prescribing practices in the military setting has not been previously reported.

Gender of the provider was not associated with the provider's likelihood to prescribe an opioid pain medication or the number of pills prescribed. While our study did not, other studies have shown a relationship between provider gender and prescribing practices. Weisse et al. reported that gender played a role in determining the number of opioids prescribed

Table 4 Differences between physicians and PAs

	Physician	PA
Number of prescriptions (<i>n</i>)	203	240
Opioid prescriptions (%) [*]	23	55
Non-opioid prescriptions (%) [*]	77	45
Number of pills per prescription [*]	20±12; 20 [12–24]	31±29; 20 [20–40]
Mean±SD; median [IQR]		
M.E. dose per pill [*]	7.9±1.8; 7.5 [7.5–7.5]	13±18; 7.5 [7.5–10]
Mean±SD; median [IQR]		
M.E. dose per prescription [*]	157±106; 150 [90–200]	427±801; 225 [150–300]
Mean±SD; median [IQR]		

IQR interquartile range, *M.E.* morphine equivalent, *SD* standard deviation

^{*}*p*<0.0001

Fig. 1 A comparison of opioid prescription written by physicians and physician assistants listed by each drug category. * $p \leq 0.0391$

by primary care providers. They were influenced by either the gender or race of their patients [29]. Safdar et al. reported that the gender of ED physicians influenced the quantity of opioid analgesics they prescribed to those of their same gender [23]. In our study, age and experience level also were not associated with opioid prescriptions or the number of pills but other studies did show a relationship. Heins et al. reported that the ED physician's training and experience contributed to variations in ED analgesia [4]. Dhalla et al. found that the characteristics associated with greater opioid prescribing were male sex ($p=0.003$), older age ($p<0.001$), and a greater number of years in practice ($p<0.001$) [30]. Among these studies, the influence of gender, age, and experience level on prescribing practices was not consistent and was typically dependent on the characteristics of the patients. For our study, the subject of interest was the provider and as such, we did not collect any demographic information about the patients.

PAs were more likely to prescribe opioids than physicians. PAs may be more likely to prescribe opioids due to the way our ED is organized. There is a fast track area for less acutely ill patients and a main ED for those patients with more serious diagnoses. This lower acuity ED is primarily staffed by PAs with one supervising primary care physician. Typical patients in the fast track have chronic pain issues such as lower back pain or headaches. These PAs frequently see patients seeking refills of already existing opioid pain medications. This could explain the higher numbers of opioid prescriptions. PAs were also more likely to prescribe medications in the other opioid category. The other opioid category contains hydromorphone, morphine, long-acting oxycodone, and methadone. Medications like oral morphine and methadone are not typically given to a patient in an ED setting without prior exposure to opioids and are most likely prescribed as a refill of ongoing opioid medications.

Civilian providers were more likely to prescribe opioid analgesics than active duty providers. PAs wrote 55 % of the civilian opioid prescriptions and physicians wrote 85 % of the active duty prescriptions. It is possible that the civilian

providers showed similar prescribing habits to the PAs simply because PA prescriptions make up a larger portion of the sample. Another reason for civilian providers to have written more opioid prescriptions than the active duty providers is that active duty providers are required to participate in additional educational efforts aimed at reducing opioid prescribing that their civilian colleagues may not be required to partake [28].

In this study, we have looked at a small cohort of patients with chronic pain. As this is only a small portion of the population who receive opioid medications in the ED, we intend to further investigate what provider characteristics effect the treatment of those patients seen for non-chronic complaints. Another idea for future research could be to expand the data collection window from 3 years out to 5 or even 10 to see what changes may occur over time. Or, to join with other nonmilitary facilities in our area to create a multi-cohort study to evaluate not only differences in provider types within one system but also across multiple different environments.

This study contains standard limitations consistent with a retrospective review. However, through the use of electronic medical records, we were able to consistently pull the data points of interest with minimal missing data and thus ensure data quality. Because of our ability to pull the data from a computerized system, we were able to avoid having to go through patient charts and abstract data which removed any possible bias or variability in data collection. The size of our chronic pain cohort was small; however, the larger sample of 28,130 opioid prescriptions was sufficient to make preliminary statistical comparisons of large groups. Our study was performed using data collected from two military facilities and may not be representative of the general population. While our hospitals are located on military bases, they reside in a city with a catchment area of 2 million with an even larger non-military population. At both EDs civilian (nonuniformed members) account for 80 % of the patient volume and most of our admissions are geriatric patients as with most US emergency departments. As described in the “Methods” section, SAMMC is a level I trauma center and cardiac center

receiving and treating civilian patients from the community. In addition, while most of our providers are active duty military, 60 % are trained in civilian residencies and all ED residents are required to do more than one third of their residency training in civilian facilities. Thus, as every hospital is unique and each community is unique, our study should be comparable to similar studies at nonmilitary facilities.

A major limitation of our study was that because we did not collect any patient data, we only had ICD-9 codes to use to define those prescriptions written for chronic pain. The chronic pain ICD-9 codes are intended to only be used in the absence of or in combination with the baseline diagnosis. Thus, it is very likely that we missed many patients who were seen for a condition that caused chronic pain but were discharged using their primary diagnosis ICD-9 code. On the other hand, with the lack of any patient information, we could not use any prescriptions that did not specifically say chronic pain in order to ensure that we were truly describing chronic pain prescribing practices. This has more than likely lead to our chronic pain cohort being falsely small. In the future, it would be beneficial to collect some patient visit data in order to use a combination of an ICD-9 code for pain or a diagnosis likely to have related pain and the patient's admitting complaint or the provider's notes in order to have a clearer picture of whether the patient was being seen for chronic pain. Finally, a minor limitation was that the prescriptions were written from our electronic medical record (EMR) system which allowed the number of pills prescribed for tramadol to rely on a computer default. However, all other opioid prescriptions require the provider to choose the number of pills without the option of a default.

Conclusion

Providers prescribed a median of 20 pills per prescription with oxycodone being the most commonly prescribed opioid analgesic. PAs were more likely to prescribe an opioid for chronic pain than physicians. Civilian providers were more likely to prescribe an opioid than active duty providers.

Acknowledgments We are grateful to all members of the En Route Care Research Center and to Mrs. Kathy Carey and Mr. Howard Little for their assistance and support.

Grant None.

Conflicts of Interest None of the authors have a potential conflict of interest.

Disclaimer The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Air Force, Department of the Army, or the Department of Defense.

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