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Opioid Prescribing in a Cross Section of U.S. Emergency Departments:

The Prescribing Opioids Safely in the Emergency Department (POSED) Study Consortium

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Abstract

Objectives—Opioid pain reliever (OPR) prescribing at Emergency Department (ED) discharge has increased in the past decade but specific prescription details are lacking. Prior ED OPR prescribing estimates relied on national survey extrapolation or prescription databases. The main goal of this study was to utilize a research consortium to analyze the characteristics of patients and opioid prescriptions using a national sample of ED patients. We also aimed to examine the indications for OPR prescribing, characteristics of opioids prescribed both in the ED and at the time of discharge, and characteristics of patients who received OPRs compared with those who did not.

Methods—This observational, multi-centered, retrospective cohort study assessed OPR prescribing to consecutive patients presenting to the consortium EDs during 1 week in October 2012. The consortium study sites consisted of 19 EDs representing 1.4 million annual visits, varied geographically, and were predominantly academic centers. Medical records of all patients aged 18-90 years discharged with an OPR (excluding tramadol) were individually abstracted via standardized chart review by investigators for detailed analysis. Descriptive statistics were generated.

Results—During the study week, 27,516 patient visits were evaluated in the consortium EDs. 19,321 (70.2%) were discharged and 3,284 patients (11.9% of all patients and 17.0% of discharged patients) received an OPR prescription. For those prescribed an OPR, mean age was 41.1 (SD 14.7) years and 1,694 (51.6%) were female. Mean initial pain score was 7.7 (SD 2.4). The most common diagnoses associated with OPR prescribing were back pain (10.2%), abdominal pain (10.1%), and extremity fracture (7.1%) or sprain (6.5%). The most common OPRs prescribed were oxycodone (52.3%), hydrocodone (40.9%) and codeine (4.8%). >99% were immediate release, 90.0% were combination preparations, and the mean and median number of pills was 16.6 (SD 7.6) and 15 (IQR=12-20) respectively.

Conclusion—In a study of ED patients treated over a single week across the country, 17% of discharged patients were prescribed OPRs. The majority of the prescriptions had small pill counts and almost exclusively immediate release formulations.

Introduction

Background

Pain is the most common reason for an emergency department (ED) visit; almost two-thirds of patients seeking ED care do so for acute pain or acute exacerbations of chronic pain (1, 2). Emergency physicians frequently treat pain with opioid pain relievers (OPRs) (3). Unfortunately, opioid misuse, addiction, overdose and diversion have reached epidemic proportions in the United States (4). The contribution of ED prescribing to problematic opioid use is not clearly defined. Also, the rate of ED opioid prescribing and the attributes of ED opioid prescriptions have not been directly studied on a large scale.

Importance

Opioid pain relievers are an accepted treatment for the outpatient management in patients with moderate to severe acute pain (5). ED providers care for patients with a spectrum of pain severity and etiologies, and nationally emergency physicians are among the most frequent prescribers of OPRs in patients under age 40 (6). A recent study found that about one-third of all ED patients receive an opioid either administered in the ED or prescribed at discharge, up from 21% in a span of 10 years (7). Prescribing behavior is complicated by the nature of emergency care, which is often provided without the benefit of an established patient-doctor relationship and in an environment characterized by limited time and resources.

Goals of This Investigation

This study sought to describe the characteristics of OPR prescriptions from a cluster of consecutive visits in a one-week period across a large national sample of ED patients. Additionally, we sought to examine the indications for OPR prescribing, doses provided both in the ED and prescribed at the time of discharge, and characteristics of those patients who received OPRs compared to other patients evaluated in the ED during this time period.

Materials and Methods

Study Design and Setting

This was a retrospective cohort study of consecutive ED visits in a one-week period during October 2012. The 19 EDs participating in the study consortium were geographically distributed throughout the United States and were primarily academic (16/19) (Appendix 1). Annual ED census ranged from 42,000 to 230,000 (median 80,000), and in total represented approximately 1.4 million visits per year. Based on a small sample of hospital data, we had hypothesized that approximately 10-15% of discharged patients in our sample would receive an opioid prescription. Institutional Review Board approval was obtained at each site.

Selection of Participants

Patients aged 18-90 years who presented to the participating EDs between 12:01 am on October 15, 2012 and 11:59 pm on October 21, 2012 were eligible. Each site utilized an electronic medical record from which prescription data could be extracted automatically and

patient records could be evaluated by the site investigators. Each patient discharged with an OPR prescription underwent a manual medical record review.

Methods of Measurement

A query for all ED visits during the study period was generated by a site investigator and the following information was obtained: patient age, gender, insurance status, race/ethnicity, weekday (Monday 12:01 am-Friday 11:59 pm) or weekend (Saturday 12:00am-Sunday 11:59pm) arrival, emergency severity index (ESI) triage level, first documented pain score (0-10), chief complaint, disposition (discharge from ED or other), discharge diagnosis, and a determination if an OPR prescription was given at discharge for the treatment of pain. OPR prescriptions were defined as any OPR prescription provided for a painful condition (e.g. oxycodone, hydrocodone, hydromorphone, codeine). Cases were excluded if an opioid was specifically prescribed for cough suppression. Tramadol was excluded because it is considered a less potent opioid and was not a scheduled medication at the time of the study.

ED records of the patients discharged with an OPR prescription underwent a manual chart abstraction by an investigator. Investigators entered information in to a structured data collection tool with an explicit protocol, defined variables (usually from a dropdown box if categorical) with a standardized abstraction instrument. There was no formal abstraction training or blinding to the outcome. Each site investigator was responsible for training and data fidelity at their individual site. The following information was collected in a de-identified fashion and transferred to a centralized REDCap (8) database: 1) chief complaint, 2) patient-reported home analgesic medications, 3) allergies to non-opioid pain medications, 4) opioid medications, total doses, and route given in the ED, 5) other analgesics given in the ED, 6) primary discharge diagnosis, 7) pain scores at arrival and discharge, 8) opioid pain reliever medications, dose and quantity prescribed at discharge, 9) other analgesic medications prescribed at discharge, 10) characteristics of the primary caregiver in the ED (Appendix 2).

Primary Data Analysis

Summary data regarding the overall ED population were entered into Microsoft Excel (Microsoft Corp., Redmond, WA) and analyzed using SAS and JMP (both SAS Institute Inc., Cary, NC). The primary outcome of interest was the provision of a prescription for an OPR (including specific drug, dosage, and quantity dispensed) in patients discharged from the ED. Descriptive statistics were utilized for this purpose. Characteristics of prescriptions stratified by provider type were also evaluated and compared with the chi-squared test.

Results

Overall, there were 27,516 total patient visits at the 19 participating hospital sites during the study week. 19,321 patients (70.2%) were discharged, and 3,284 patients (11.9% of all patients and 17.0% of discharged patients) received an OPR prescription for the purpose of treating pain. Detailed characteristics of the 3,284 patients discharged with an opioid prescription compared with discharged patients who did not receive an opioid prescription are displayed in Table 1. The mean age of these patients was 41.1 (SD 14.7) years, range

18-90 years. A total of 900 (27.4%) reported prior use of analgesics at home: 434 (13.2%) used nonsteroidal anti-inflammatory medications (NSAIDs), 382 (11.6%) used OPRs and 167 (5.1%) used acetaminophen. Medication allergies were reported by 975 (29.7%) of patients, and 270 (8.2% overall/28% of those reporting medication allergy) specifically reported allergies to non-OPRs.

The top ten chief complaints and discharge diagnoses are demonstrated in Table 2. Of patients prescribed an OPR at discharge, 2321 (70.7%) also received an opioid in the ED. The most common OPRs given while in the ED were: oxycodone 49.2% (n=1142), morphine 27.6% (n=640), hydrocodone 26.5% (n=614) and hydromorphone 17.9% (n=416). The total is greater than 100% because 524 patients (22.6% of those given an OPR while in the ED) were given more than one type of OPR. Initial pain scores (possible response range 0-10) were recorded for 3004 (91.5%) patients. The mean initial pain score was 7.7 (95% CI 7.7-7.8, range 0-10). Discharge pain scores were recorded for 1761 (53.6%) patients, and the mean was 4.4 (95% CI 4.3-4.6, range 0-10).

Prescriptions for OPRs, including dosages, are displayed in Table 3. Combination medications (e.g. those containing an OPR plus acetaminophen) accounted for 90.0% (n=2957) of OPR prescriptions. Sustained release products were only given to 11 (0.3%) patients. In addition, there were three prescriptions for methadone and one for a fentanyl patch. The number of pills per prescription was available for 3,110 (94.7%) of the prescriptions (volumes of suspension medications were not included in this analysis). The mean number of pills per prescription was 16.6 (95% CI 16.4-16.9) and the median was 15 (IQR 12-20), with a range 2-100 pills (Figure 1).

We compared OPR prescribing when a physician was involved in the management with those patients primarily cared for by an advanced practice clinician (i.e. a nurse practitioner (NP) or physician assistant (PA)). Specifically for oxycodone and hydrocodone prescriptions, cases involving attending physicians were more often prescribed oxycodone than hydrocodone (OR 1.3 95% CI (1.1-1.5). However, for these two medications there was no difference in average pills per prescription given by attending physicians compared with NP/PA (mean 16.8 (95% CI 16.5-17.1) vs. 16.4 (95% CI 15.9-16.8) respectively). Table 4 demonstrates the characteristics of ED patients who were discharged during the data collection period with and without an OPR prescription.

Limitations

Our data provides a snapshot of prescribing across several academic institutions during a one-week sample and may not reflect prescribing throughout the spectrum of hospitals, settings, and time periods. To address these threats to external validity we included geographically diverse centers. A majority of the sites (16/19) were academic, limiting the application of our findings to non-academic sites. We used seven consecutive days of data, and specifically chose a week with no holidays to avoid any possible selection bias, although the potential for seasonal variation remains. The generalizability of our sample is supported by the similarity to the findings from another study using nationally representative data sets (7).

The retrospective, observational design of our study does not assess the reason OPRs were prescribed in some cases and not in others or why the range of pills per prescription was so large. Our focus was to describe patients who received an OPR prescription and therefore did not manually analyze extensive data about the "control" group of patients that did not receive an opioid for pain (e.g. pain scores) or provider characteristics. This limits some of the direct comparisons that can be made between these patient groups.

The greatest threat to the internal validity of our findings is the limitations of data collection and chart reviews. Researchers were based at each site; however, due to the size of the study and fact that many sites had only one investigator, we were unable to blind them to the outcome, train the abstractors or evaluate the abstraction (either the electronic record query or the specific standardized manual data abstraction) to assess agreement or accuracy of abstraction. However, the primary outcome (percentage of patients who received an OPR at discharge) was based on a controlled substance prescription in the computerized abstraction, and therefore less affected by subjective abstraction. As with any record review, inadequate or incorrect documentation could provide misleading results. Furthermore, it is possible that some of the data points, including home use of pain medications and allergies to non-opioids were provided incorrectly by the patient. However, this is likely not the case for the OPR prescription information, as there was computer order entry prescribing at all sites and this was not extracted manually from the clinical note.

Discussion

Opioid abuse and overdose have reached epidemic proportions in the United States, and recent attention has been focused on ED OPR prescribing guidelines and prescription drug monitoring programs (PDMPs) to potentially decrease diversion and reduce overdose rates (5, 9, 10, 11, 12). Despite these interventions, little is known about actual prescribing behaviors of emergency providers. Our results using individual record abstraction reinforce the findings of prior studies that relied on extrapolation from large databases.

Others evaluated prescriptions from approximately half of the retail pharmacies as a function of physician specialty in 2009 (6). Of the 79.5 million opioid prescriptions studied, emergency physicians were among the top 5 prescribers for all patients from age 0 to 39 years. This study did not describe the number of pills per prescription or how specialty type was determined, particularly in cases where a rotating resident or specialist other than an emergency physician may have been working in an ED.

Another study used the National Hospital Ambulatory Medical Care Survey (NHAMCS) data to detect 10 year trends in OPR prescribing from EDs (7). NHAMCS is a publicly available dataset that allows estimates about ED services based on a random sample of visits. The authors reported that, at discharge in 2010, 9.1% of patients were discharged with hydrocodone, 3.9% with oxycodone and 0.8% with codeine. Numbers for hydromorphone, morphine and meperidine were not reported, nor were the number of pills per prescription. Although used to estimate trends, the NHACMS sampling validity is often criticized (13-17).

We observed than more than 1 in every 6 patients discharged from the ED received an OPR, a finding not surprising given the magnitude of ED visits for pain (1, 2). The most common diagnosis was musculoskeletal back pain, followed by abdominal pain and then extremity fractures and sprains. Prescriptions for abdominal and back pain were also common in a statewide analysis of ED OPR prescriptions in Colorado (18).

In our cohort, the most common OPR prescribed (90%) was an immediate release combination product with acetaminophen, either oxycodone-acetaminophen or hydrocodoneacetaminophen. Of all prescriptions, oxycodone was the most common followed by hydrocodone. These observations are consistent with other prior research (19).

Almost all OPR prescriptions were for immediate release (99%) rather than long acting, patches or extended release medications. This near absence of prescribing extended-release or long-acting OPRs is consistent with most recommendations and reflects well on ED safe opioid prescribing principles for acute pain in this cohort. Another recent study also demonstrated that prescriptions originating from the ED were significantly less likely to be high dose or large quantity when compared to those originating from office-based practices (0.26% vs. 2.62%; $P < .001$) (20). Overall, it suggests that emergency prescribers are not initiating/refilling new prescriptions for these higher dose, higher risk drugs. Finally, it is interesting to evaluate the number of pills prescribed by emergency practitioners. In our study, the median number of pills dispensed was 15, consistent with most prescribing guidelines that recommend a maximum 3-5 day course of these medications from the ED (9, 21, 22, 23). However, as noted in the limitations, our sample included primarily academic institutions and these results may not be fairly extrapolated to other hospital types.

There are several strengths to our study when compared to previous work in this area. We performed a structured chart review with individual prescription level data. Thus our study yields more clarity about current ED opioid prescribing. The use of multiple, geographically diverse, sites improves the external validity of our data and conclusions. We used data abstracted by reviewers at their own institutions, potentially enhancing the insights into prescribing and other chart findings.

In conclusion, we noted OPR prescriptions in 17% of discharged ED patients, with pill counts small and almost exclusively immediate release. These data can inform future opioid prescribing interventions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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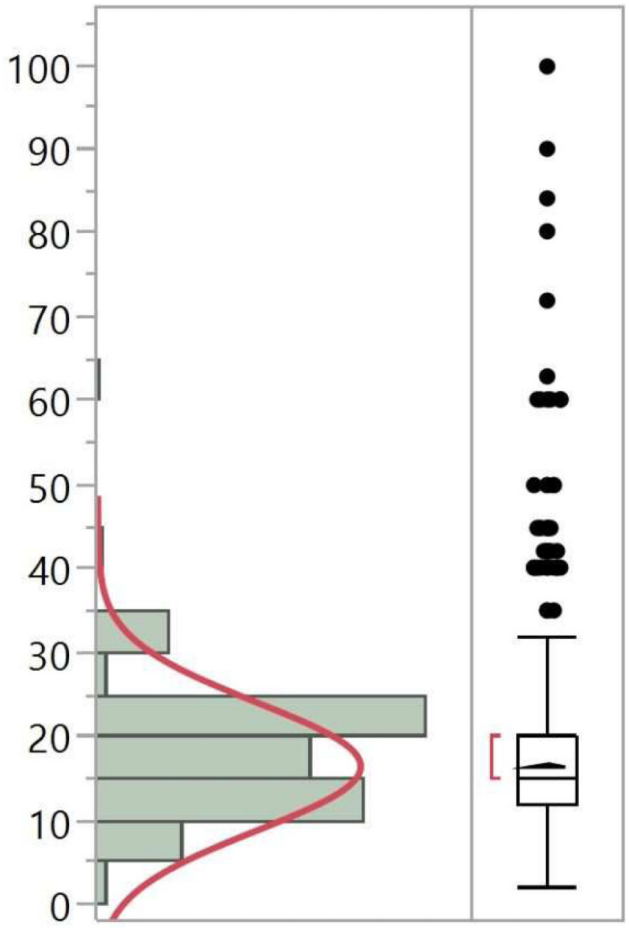

Figure 1.

Histogram demonstrating the number of pills per prescription given to patients (n=3110) at discharge. The figure includes an outlier box plot (right) and fitted normal distribution line (solid line overlying histogram).

Table 1

Descriptive statistics of patients discharged from the ED with and without opioid pain relievers (OPRs)

	Receiving OPRs		Not receiving OPRs		Total	
	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
Age						
18-34	1289	39.3 (37.6-40.9)	6624	41.3 (40.5-42.1)	7913	41.0 (40.3-41.7)
35-49	1023	31.2 (29.6-32.8)	4306	26.9 (26.2-27.5)	5329	27.6 (27.0-28.2)
50-64	756	23.0 (21.6-24.5)	3364	21.0 (20.4-21.6)	4120	21.3 (20.8-22.0)
65+	216	6.6 (5.8-7.5)	1739	10.8 (10.4-11.3)	1955	10.1 (9.7-10.6)
Missing	0		4	0.03 (0.00-0.06)	4	0.02 (0.00-0.05)
Gender						
Female	1694	51.6 (49.9-53.3)	8508	53.1 (52.3-53.8)	10202	52.8 (52.1-53.5)
Male	1590	48.4 (46.7-50.1)	7456	46.5 (45.7-47.3)	9046	46.8 (46.1-47.5)
Missing	0		73	0.5 (0.4-0.6)	73	0.4 (0.3-0.5)
Geographic Region						
Northeast	1633	49.7 (48.0-51.4)	9413	58.7 (57.9-59.5)	11046	57.2 (56.5-57.9)
West	1046	31.9 (30.3-33.5)	3230	20.1 (19.5-20.8)	4276	22.1 (21.6-22.7)
South	417	12.7 (11.6-13.9)	1811	11.3 (10.8-11.8)	2228	11.5 (11.1-12.0)
Midwest	188	5.7 (5.0-6.6)	1583	9.9 (9.4-10.3)	1771	9.2 (8.8-9.6)
Race/Ethnicity						
White	971	29.6 (28.0-31.2)	4517	28.2 (27.5-28.0)	5488	28.4 (27.8-29.0)
Black	531	16.2 (14.9-17.5)	3307	20.6 (20.0-21.3)	3838	19.9 (19.3-20.4)
Hispanic	283	8.6 (7.7-9.6)	1342	8.4 (7.9-8.8)	1625	8.4 (8.0-8.8)
Asian	58	1.8 (1.4-2.3)	413	2.6 (2.3-2.8)	471	2.4 (2.2-2.7)
Missing/Other	1441	43.9 (32.2-45.6)	6458	40.3 (39.5-41.0)	7899	40.9 (40.2-41.6)
Weekend						
Weekday	2102	64.0 (62.4-65.6)	10976	68.4 (67.7-69.2)	13078	67.7 (67.0-68.3)
Weekend	914	27.8 (26.3-29.4)	3991	24.9 (24.2-25.6)	4905	25.4 (24.8-26.0)
Missing	268	8.2 (7.3-9.1)	1070	6.7 (6.3-7.1)	1338	6.9 (6.6-7.3)
Emergency Severity Index						
1-2	348	10.6 (9.6-11.7)	2070	12.9 (12.4-13.4)	2418	12.5 (12.1-13.0)
3-5	2259	68.8 (67.2-70.4)	9227	57.5 (56.8-58.3)	11486	59.5 (58.8-60.1)
Missing	677	20.6 (19.3-22.0)	4740	29.6 (28.9-30.3)	5417	28.0 (27.4-28.7)
First Reported Pain Score						
0-6	437	13.3 (12.2-14.5)	2463	15.4 (14.9-15.9)	2900	15.1 (14.5-15.5)
>6	1527	46.5 (44.8-48.2)	2984	18.6 (18.0-19.2)	4511	23.3 (22.8-23.9)
Missing	1320	40.2 (38.5-41.9)	10590	66.0 (65.3-66.8)	11910	61.6 (61.0-62.3)

Table 2

Ten most common chief complaints and primary discharge diagnoses for patients who were discharged with an opioid pain reliever for the treatment of pain

Chief Complaints	N (%)	Diagnoses	N (%)
Traumatic extremity pain	464 (14.2)	Musculoskeletal back pain	335 (10.2)
Abdominal pain	409 (12.5)	Abdominal pain	330 (10.1)
Back pain	329 (10.1)	Extremity fracture	232 (7.1)
Atraumatic extremity pain	295 (9.0)	Extremity sprain	213 (6.5)
Motor vehicle accident	224 (6.8)	Dental/oral issue	205 (6.2)
Dental complaint	192 (5.9)	Other extremity pain	190 (5.8)
Fall	147 (4.5)	Nephrolithiasis	147 (4.5)
Flank pain	146 (4.5)	Skin contusion	126 (3.9)
Chest pain	107 (3.3)	Chest pain (inc. non-cardiac)	108 (3.3)
Headache	97 (3.0)	Closed head injury	99 (3.0)

Table 3

Characteristics of opioid pain reliever prescriptions from the emergency department

	strength	# of prescriptions (% total)		# pills per prescription mean (SD)*
oxycodone				
(n = 1716, 52.3% of total)	2.5 mg	1	(<0.1%)	18 (N/A)
	5 mg	**1680**	**(97.9%)**	**15.7 (7.1)**
	7.5 mg	3	(0.2%)	13.0 (4.2)
	10 mg	28	(1.6%)	16.3 (6.8)
	15 mg	1	(<0.1%)	10 (N/A)
	30 mg	3	(0.2%)	13.3 (5.8)
hydrocodone				
(n = 1344, 40.9% of total)	**5 mg**	**1192**	**(88.7%)**	**17.3 (7.3)**
	10 mg	104	(7.7%)	20.8 (12.4)
	7.5 mg	37	(2.8%)	17.0 (7.8)
	suspension	11	(0.8%)	N/A
codeine				
(n = 159, 4.8% of total)	5 mg	1	(0.6%)	20 (N/A)
	10 mg	1	(0.6%)	24 (N/A)
	15 mg	3	(1.9%)	30.3 (25.7)
	20 mg	6	(3.8%)	19.8 (9.4)
	30 mg	**137**	**(86.2%)**	**18.0 (6.8)**
	suspension	11	(6.9%)	N/A
hydromorphone				
(n = 47, 1.4% of total)	1 mg	1	(2.1%)	28 (N/A)
	2 mg	**41**	**(87.2%)**	**17.3 (8.6)**
	4 mg	3	(6.4%)	22.7 (18.1)
	5 mg	2	(4.3%)	15.0 (7.1)
morphine				
(n = 14, 0.4% of total)	5 mg	4	(28.6%)	6 (N/A)
	10 mg	1	(7.1%)	20 (N/A)
	15 mg	**8**	**(57.2%)**	**37.1 (34.0)**
	30 mg	1	(7.1%)	20 (N/A)

NB: Other prescriptions accounted for 4 additional prescriptions (3 for methadone, 1 for fentanyl)

*Number of pills per prescription was available for 3118 (94.9%) of patients