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Quality Assessment of Acute Inpatient Pain Management in an Academic Health Center

Richard J. Lin, MD, PhD^{1,2}, M. Carrington Reid, MD, PhD¹, Amy E. Chused, MD, MA¹, and Arthur T. Evans, MD, MPH¹

¹Department of Medicine, Weill Cornell Medical College, New York, NY, USA

²Department of Medicine, NYU Langone Medical Center, New York, NY, USA

Abstract

The quality of acute inpatient pain management remains suboptimal and poorly understood. In this retrospective study, we analyze acute pain management practice in a large academic health center using several quality indicators. Not surprisingly, despite high rate of pain assessment, many patients still have frequent, prolonged, and unrelieved severe pain episodes. Upon examination of naloxone administration, we identify potential inappropriate opioid prescription practices such as the use of wrong opioids in hepatic and renal failure and simultaneous use of multiple short-acting opioids. Most importantly, we find that chronic opioid users appear to suffer the most in terms of undertreatment of pain as well as opioid overdose, highlighting the urgent need to target this underserved population of patients.

Keywords

inpatient pain management; chronic pain; quality improvement; opioid overdose; naloxone; root cause analysis

Introduction

Acute pain is common and often undertreated in hospitalized patients.^{1–3} Although surgical patients and patients with cancer are traditionally the focus of acute pain management, evidence suggests that pain is as prevalent and as severe in general medical inpatients.^{3–6} Acute pain management in medical inpatients can be complex due to medical comorbidities and polypharmacy.^{5,6} Inadequately treated acute pain in the hospital increases the risk for the development of chronic pain, which in turn has significant long-term adverse impact on patients' overall function and quality of life.^{7,8} On the other hand, recent reports have also highlighted the alarmingly high rate of opioid prescribing- and overdose-related deaths,^{9,10} which correlated with a dramatic increase in opioid utilization and distribution in US

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Corresponding Author: Richard J. Lin, MD, PhD, Department of Medicine, NYU Langone Medical Center, 550 First Avenue, New York, NY 10016, USA., Richard.Lin2@nyumc.org.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

hospitals and emergency departments.^{11,12} Given this delicate balance of opioid management, clinicians increasingly need to understand the prevalence of acute pain in medical inpatients and its under- and overtreatment. In this retrospective, cross-sectional survey study, we evaluate the state of acute pain management on the general medical ward of an urban academic health center using pain assessment, frequency and duration of severe pain episodes and treatment response, and administration of naloxone, a synthetic opioid antagonist, as potential quality indicators.¹³ Since naloxone use has not been validated previously as a quality indicator for appropriate opioid prescribing in general medical inpatients, we examine causes and effects of naloxone administration and potential mechanisms of suspected opioid overdose.^{14–16}

Methods

We conducted a retrospective, cross-sectional survey study at our 850-bed tertiary academic health center after approval from the institutional review board. Data related to pain management during hospitalization of a sample of 92 general medical inpatients in 1 general medicine teaching service were extracted manually from the electronic health record followed by in-depth chart reviews. The admission diagnoses were diverse, and patients were hospitalized throughout all inpatient units. We collected demographic and clinical characteristics, including age, gender, length of stay (LOS), and chronic opioid use, defined by daily prescription opioid use for at least 3 consecutive months before admission for a painful condition (chronic pain). Next, we examined daily documentation on pain assessment, pain severity using the 0 to 10 numeric analog scale (If 0 is no pain and 10 is the worst pain you can imagine, what is your pain right now?), and acute pain management practice that recorded frequency of severe pain episodes (score > 6), consecutive days experiencing severe pain episodes, and documented relief of severe pain episodes within 2 hours.¹³ Finally, we identified all cases of naloxone use for suspected opioid overdose through the pharmacy database at our institution among a total of 8117 admissions to the medicine service during the 6-month period. The indications for naloxone use, location of use, opioid usage in house and outpatient, and the treatment outcome were extracted. Events were excluded if it was an illicit drug overdose, if the opioid overdose occurred on admission, or if there was insufficient information in the chart. Patients were judged to have had opioid overdose if clinical providers documented an immediate and adequate improvement in mental status, respiratory rate, and/or blood pressure after naloxone use.¹⁴ Root cause analysis was performed to evaluate potential mechanisms for opioid overdose.¹⁷

Results

The State of Acute Pain Management in a Cohort of General Medical Inpatients

The sample consisted of 52 males and 40 females with a mean age of 63.7 years and a total of 1493 inpatient days. The mean and median LOS were 16.2 days and 9.5 days, respectively. Sixty-six patients (72%) experienced pain, either acute or acute on chronic, during their hospitalization. Patients who experienced pain during their hospitalization tended to have longer LOS (mean 19.3 days vs 8.3 days, $P < .001$; median 11.5 days vs 7.0 days, $P = .064$). Pain was assessed at least once a day 99% of the time (1480 of 1493

inpatient days). In 325 (22%) days, these patients experienced at least 1 episode of severe pain, of which 67% (217 of 325) was on consecutive days. In 58 (18%) days, there was at least 1 instance of failure to relieve severe pain episode within 2 hours based on the lack of documentation. As shown in Table 1, among 66 patients who reported pain during the index hospitalization, the acute on chronic pain of the group of 18 chronic opioid users was significantly worse. They tended to spend more time in severe pain (60% vs 17%, $P < .001$) and more consecutive days in severe pain (65% vs 20%, $P < .001$). There were no significant differences in age, LOS, rate of pain assessment, and rate of failure to relieve severe pain episode within 2 hours between the 2 groups (Table 1).

Naloxone Use on the General Medical Ward

During the 6-month observation period with 8117 total medicine admissions, we identified 26 cases of naloxone administration on the general medical floor for suspected opioid overdose, commonly manifested by altered mental status, sedation, respiratory depression, or unexplained hypotension. Chart review revealed 9 cases of naloxone use for documented outpatient opioid overdose on admission, and naloxone use in all cases led to clinical improvement. These cases were excluded from final analysis. Twelve cases of naloxone use did not result in clinical improvement as documented by their clinical providers and were deemed unrelated to opioid use in the hospital. The remaining 5 cases of naloxone administration were clearly related to opioid overdose according to the criteria specified. Detailed root cause analysis and chart review revealed several findings (Table 2). One patient had periprocedural sedation, likely due to oversensitivity to intravenous fentanyl used before procedure. The other 4 cases all had potential inappropriate opioid use, and 3 of them are chronic opioid users. Two patients with significant renal failure had received intravenous morphine and oral Percocet, while 1 patient with significant hepatic failure had received intravenous morphine. Finally, 1 patient had received multiple long- and short-acting opioids simultaneously, a known high-risk practice, oral methadone, oral hydromorphone, and intravenous morphine.

Discussion

Despite increased attention to the assessment and treatment of pain in hospitalized patients, many barriers still exist causing significant practice gap and patient dissatisfaction.^{18–20} In this study, we found that acute pain management was suboptimal at our institution, manifested by the high percentage of inpatient days in severe pain (22%), consecutive days in severe pain (67%), and unrelieved severe pain episodes within 2 hours (18%), despite a near 100% pain assessment rate. We chose to investigate consecutive days in severe pain and unresolved episodes of severe pain because studies have shown that inadequately treated acute pain predisposes the development of chronic pain.^{7,8} Importantly, the presence of chronic pain also significantly impacted the quality of acute pain management, manifested by increased prevalence and duration of severe pain episodes. Chronic opioid users may develop tolerance and subsequently require higher doses or more potent opioids, a practice that generates fear, uncertainty, and misconceptions among providers, given high risks for mortality and morbidity.²¹

Review of naloxone use over a 6-month period with over 8000 admissions at our institution revealed only 5 definitive cases of opioid overdose, indicating that inappropriate opioid prescribing was low at our institution when compared to published studies.^{13–16,21,22} This finding suggests that our institution has better opioid prescribing practice, or alternatively, opioid maybe underprescribed, especially given our survey results. Our detailed root cause analysis of these 5 cases shed light on potential mistakes in inpatient opioid prescription. For example, although opioid pharmacology in hepatic and renal failure is well known, the inappropriate prescription under these circumstances may be common and underestimated in the hospital.²³ Likewise, another high-risk practice, simultaneous use of multiple short-acting opioids, has not been studied systemically. Our profile for naloxone use was distinct from that of a cancer hospital, where most cases of naloxone occurred during rapid up-titration of opioids (P. Glare, personal communication). Interestingly, 3 of our 4 cases of naloxone administration were chronic opioid users, consistent with the observational finding that chronic opioid users were at increasing risk for opioid adverse effects.²¹ Finally, it was unclear from our chart review whether naloxone administration could precipitate opioid withdrawal in chronic opioid users and refractory pain as observed in a recent analysis.²²

Our study is limited by its single-center study design, its lack of capability to extract large amounts of pain-related data, and its small sample size. The pain score alone may not capture all pain-related outcomes especially for chronic opioid users. Nonetheless, our results are consistent with published observational studies,^{3–6,11,24} highlight chronic pain as a significant risk factor for poor-quality inpatient pain management, which was observed recently in inpatients with cancer,²⁵ and suggest potential mechanisms of inappropriate opioid prescribing through studies of inpatient naloxone administration. These results should be correlated with qualitative and survey studies on barriers to effective pain management among general medical inpatients in order to achieve ultimate goals of quality improvement and opioid stewardship.^{24,26–28}

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Table 1

Quality Measures of Inpatient Pain Management.

Group/variables	Chronic opioid users (N = 18)	Nonchronic opioid users (N = 48)	P value
Female, %	8/18 (40%)	22/48 (44%)	.92
Age, mean (SD), years	57.6 (14.0)	63.6 (17.3)	.19
LOS, mean (SD), days	19.6 (19.9)	19.2 (23.6)	.95
LOS, median (IQR), days	12 (6–27)	11 (5–24)	.58
Pain assessment, % of hospital days	100%	99%	.66
Severe pain, % of hospital days	60%	17%	<.001
Prolonged pain, % of severe pain days that are consecutive	65%	20%	<.001
Failure to relieve severe pain timely, % of severe pain episodes without documented relief in 2 hours	20%	10%	.24

Abbreviations: LOS, length of stay; SD, standard deviation; IQR, interquartile range. Boldface values indicate statistically significant findings ($p < 0.05$).

Table 2

Naloxone Use on the General Medical Ward.

Case	Age/gender	Clinical Situation	Outpatient opioids	Inpatient opioids	Root cause summary
1	59 M	Sedation, respiratory depression	None	Fentanyl IV	Individual sensitivity to perioperative IV opioids
2	67 F	Altered mentation, respiratory depression	Fentanyl patch	Fentanyl patch, morphine IV	Inappropriate opioid use in liver failure
3	58 F	Altered mentation, respiratory depression	None	Morphine IV	Inappropriate opioid use in renal failure
4	79 F	Altered mentation	Morphine PO	Percocet PO	Inappropriate opioid use in renal failure
5	53 F	Altered mentation, respiratory depression	Methadone PO, hydromorphone PO	Methadone PO, morphine IV, hydromorphone PO	Inappropriate combined use of short-acting opioids

Abbreviations: F, female; IV, intravenous; M, male; PO, orally.