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Variation in post-discharge opioid prescriptions among members of a surgical team

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ABSTRACT

Background: Surgeons play a pivotal role in the opioid epidemic but it is unknown how different members of a surgical team vary in the way they prescribe opioids after surgical episodes.
Study design: We conducted a retrospective cohort study of all inpatient discharges for 5 common surgeries. Total number of tablets and total milligram equivalents (MME) prescribed were calculated and differences in prescription patterns were determined for attending surgeons, surgical residents and advanced practice providers. Using a generalized ordered logistic regression, we examined factors associated with ordering a higher number of tablets or MME.
Results: The median number of tablets (range) prescribed by rank were attending surgeon 30 (6–72), surgical resident 20 (6–189) and advanced care practitioner 40 (5–1000); $p < 0.001$.The median total MME prescribed by rank were attending surgeon 140 (30–600), surgical resident 200 (30–1600) and advanced practice provider 240 (25–1000); $p < 0.001$. There was no statistically significant difference by resident postgraduate year (PGY) for both total tablets and total MME prescribed. General surgery residents on average ordered a narrower range of total MME compared to surgical residents in other surgical specialties [20 (50–600) vs 20 (30–1600); $p = 0.03$]. On regression analysis, residents were less likely to order a higher number of tablets compared to attending surgeons (OR 0.29, $p = 0.01$). However, surgical residents and advanced care providers were more likely to prescribe a higher total MME compared to attending surgeons (OR 7.12, $p < 0.001$; OR 3.39, $p = 0.01$ for surgical resident and OR 6.46, $p = 0.01$) for advanced practice providers).
Conclusion: There is wide variation in opioid prescription patterns by surgical providers. More studies are needed to clearly define the ideal number of tablets or MMEs to prescribe for common surgical procedures.

1. Introduction

The United States is in the midst of an opioid epidemic. Death from opioid abuse is the leading cause of accidental death, surpassing motor vehicle accidents for the first time ever on record.[1] Currently, about 19 000 people die of opioid-related causes per year; a number that has grown four-fold in the last 30 years.[2,3] 55 billion dollars is spent in health and social costs related to opioid abuse and 20 billion dollars in inpatient and emergency department -related expenses.[4]

A key contributor to this epidemic may be the excess number of opioid pills prescribed following common surgical procedures and several studies suggest that surgeons often prescribe more opioid pills following a surgical procedure than are consumed by patients.[5–7] Recent studies of opioid use suggest that 70–80% of the opioid pills prescribed are not consumed by patients making them available for potential diversion, abuse or misuse.[7–9] Diversion

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occurs when a prescription medication is prescribed for a medically appropriate purpose but is used for a non-medical purpose or transferred to someone other than the intended user. Diversion is the single biggest source of non-medical use of prescription opioids.[10] Furthermore, surgeons were responsible for approximately 10% of all opioid prescriptions filled in 2012 or 28 million prescriptions, resulting in a staggering amount of opioid pills available for potential diversion.[11] Another study about opioid related deaths due to abuse found that surgeons were the responsible prescriber for 11.5% of cases.[5] These data suggest that surgeons are playing a pivotal role in the opioid epidemic.

About a quarter of American Hospital Association registered hospitals in the United States have surgical training programs.[12] In these hospitals, a team of individuals including interns, residents and attending surgeons, as well as, advanced practice providers (physician assistant or advanced practice nurse) prescribe postoperative pain medications. Yet, little is known about how different members of surgical teams prescribe opioids. Thus, our study sought to examine the variation in prescribing of opioids for patients being discharged after surgery by type of surgical provider, level of training, and surgical resident subspecialty type within a single, large, academic medical center. We hypothesized that while surgical residents are probably the most frequent team members to write discharge opioid prescriptions, there are significant differences in the number of opioid pills prescribed by advanced practice providers, surgical residents, and attending surgeons.

2. Methods

We conducted a retrospective cohort study of all inpatient discharges for patients who underwent five common surgical procedures at a single, large academic medical center. We examined all surgical discharges between July 2015 and July 2016 by an electronic query of health records, compiled in an electronic data warehouse. The procedures included laparoscopic cholecystectomy, laparoscopic appendectomy, open umbilical hernia repair, simple mastectomy, and thyroidectomy. The primary prescriber, medication, medication dosage, number of days prescribed, and the quantity of pills to be dispensed were retrieved. For easier interpretation of the data, total number of tablets and total morphine milligram equivalents (MME) prescribed were calculated.[13] Prescribers were grouped into three categories: attending surgeon, surgical resident, and advance practice provider. For sub-group analysis, we categorized surgical residents by post-graduate year (PGY) into interns (PGY 1), junior surgical residents (PGY 2–3), and senior surgical residents (PGY 4–5). All advanced practice providers prescribed under attending physicians and all surgical residents prescribed under an institutional license.

Univariate analysis was performed by type of surgical provider (attending surgeon, surgical resident or advanced practice provider) and PGY group for surgical residents. At our institution, residents in surgical subspecialties typically rotate on general surgical services during their PGY1 and 2 years, as such we were interested in how their opioid prescribing habits, learned during their time in their respective subspecialty programs, translated when rotating for a month or two on general surgery services. As such residents were further categorized into general surgery and surgical subspecialty residents. Surgical subspecialties for residents included were vascular surgery, urologic surgery, plastic surgery, orthopedic surgery, otolaryngology and cardiac surgery. Median values are reported because of the skewed nature of the data used for the analysis. Kruskal-Wallis H tests were used to determine differences in distribution of total tablets and total MME across prescriber types.

Finally, we sought to determine the likelihood of prescribing a higher number of tablets or MMEs by provider type. Total tablets and total MMEs prescribed were grouped into tertiles in order to create ordered, categorical variables. We used generalized ordered logistic regression to evaluate the effects of provider type on the number of total tablets or total MMEs prescribed. Because surgical residents, as a distinct category, violated the assumption of proportional odds needed to perform ordered logistic regressions, separate odds ratios were estimated to reflect the effect of surgical resident on the odds of prescribing in tertiles 2–3 (higher tertiles) versus tertile 1 (lowest tertile) and tertile 3 (highest tertile) versus tertiles 1–2 (lower tertiles). Using this approach, the proportional odds assumption was relaxed, created a parsimonious model, and maintained information inherent in the ordering of tertiles. The model that was created adjusted for patient age, type of procedure and clustering within prescribers.

All analyses were performed with Stata, version 13.1 (Stata Corp., College Station, TX). The study was reviewed by the Northwestern Institutional Review Board and was deemed exempt.

3. Results

The sample consisted of 615 unique surgical cases. Surgical residents prescribed 352 (57.24%) of the opioid medications, attending surgeons prescribed 147 (23.90%), and advanced practice providers prescribed 116 (18.86%). Interns and junior surgical residents prescribed most, 137 (38.92%) and 146 (41.48%), respectively, with only 69 (19.60%) by senior surgical residents. There were 251 (71.31%) orders from general surgery residents and 101 (28.69%) orders from residents in other surgical subspecialties [Table 1].

Median number of total tablets prescribed (range) was 20 (6–189) for surgical residents; 30 (6–72) for attending surgeons; and 40 (5–100) for advance practice providers [Table 2]. There was a statistically significant difference in the total number of tablets prescribed between the three groups ($p < 0.001$). The median number (range) of total tablets prescribed by surgical resident level was 20 (6–189) for interns, 20 (6–120) for junior surgical residents, and 28 (7–60) for senior surgical residents, with no statistically significant difference in the total number of tablets prescribed between the three resident groups ($p = 0.28$). Finally, when surgical residents were grouped by surgical specialty, the median number (range) of total number of tablets prescribed was 24 (6–189) for general surgery and 20 (6–180) for other surgical subspecialties, with no statistically significant difference in the total number of tablets prescribed between the resident specialty groups ($p = 0.07$). Similar analysis by type of procedure is shown in Appendix A.

When comparing provider type by total MMEs prescribed, the median number (range) was 200 (30–1600) for surgical residents, 140 (30–600) for attending surgeons, and 240 (25–1000) for advanced practice providers [Table 2]. There was a statistically significant difference in the total number of MMEs prescribed between the three groups ($p < 0.001$). Subgroup analysis comparing surgical residents across resident levels showed that median (range) total MMEs were 200 (20–1600) for interns, 300 (30–600) for junior surgical residents and 200 (70–600) for senior surgical residents and there was no statistically significant difference between the three groups ($p = 0.19$). Finally, when residents were grouped by surgical subspecialty, median (range) total MMEs for general surgery residents was 200 (50–600) versus 200 (30–1600) for residents in other surgical subspecialties. There was a statistically significant difference observed between these two groups, probably due to the skewed nature of the prescribing pattern ($p = 0.03$). Similar analysis by type of procedure is shown in Appendix A.

Interestingly, we found that, when compared to attending surgeons, surgical residents were less likely to prescribe a higher

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