Pain Plan Implementation Decreases Postoperative Opioid Use, Hospital Length of Stay, and Clinic Resource Utilization for Patients Undergoing Elective Spine Surgery

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INTRODUCTION:
In an effort to minimize opioid use, a Pain Plan was developed and implemented by two surgeons at our institution for patients undergoing elective spine surgery. The Pain Plan is formulated collaboratively between the patient and surgeon in clinic, and is based on any previous patient opioid experience. The Pain Plan consists of intraoperative, postoperative, and planned discharge medications to address pain, and is referenced across all phases of care.

The study purpose was to evaluate the effect of Pain Plan implementation on inpatient and outpatient opioid use, hospital length of stay (LOS), patient-reported pain scores, and clinic resource utilization in the form of pain management related communication encounters. We postulated that the Pain Plan would have a more significant effect on patients undergoing surgeries of greater magnitude, i.e., surgeries with higher surgical invasiveness (SI) indices.

METHODS:
This is a retrospective cohort study comparing patients with a Pain Plan to patients without a Pain Plan undergoing elective spine surgery. The Pain Plan was implemented on May 1, 2019. The experimental group (with Pain Plan) comprised the 12-month period after Pain Plan implementation (n = 319), and the control group comprised the 12-month period prior to Pain Plan implementation (n = 385). Demographic data collected was based in part on known risk factors for increased opioid use, including patient age, gender, BMI, ASA class, smoking history, alcohol or drug abuse history, insurance status, and anxiety or depression diagnosis. SI indices were calculated for each surgery using a previously published and validated method. Inpatient opioid use and outpatient opioid prescriptions for 90 days postoperatively were tabulated, and converted to morphine milliequivalents (MME) using Center for Disease Control guidelines. Control and experimental groups were evaluated in regard to demographic factors and SI to validate comparability.

Primary outcome variables were inpatient opioid use, outpatient opioid prescription quantities, patient-reported pain scores, number of clinic communication encounters, and communication encounter complexity. Patients were prospectively divided into three subgroups and analyzed based on SI indices ranging from 1-4, 5-8, and ≥ 9, representing small, medium, and large spine surgeries, respectively.

Parallel analysis was performed on data collected from a spine surgeon at our institution who did not implement the Pain Plan, to analyze for potential time-dependent effects on opioid prescriptions as a confounding variable, using the same May 1, 2019 cut date for analysis (n = 165 prior to cut date and n = 106 after cut date).

Data was collected in an online database. Baseline, surgical characteristics, and follow-up data were summarized between Pain Plan groups via mean (SD), median (IQR), or N (%) when appropriate based on the statistical distribution of the variable. Differences between groups were statistically assessed via t-test, Wilcoxon rank sum test, or Chi-square test corresponding to the summary data method above. Similar analyses were conducted when looking at the SI subgroups. All analyses were conducted at a 5% significance level.

RESULTS:
Median inpatient opioid use decreased by 50% (109.8 to 54.5 MME) for large surgeries (p<0.001). For medium surgeries, inpatient opioid use decreased by 49% (75.0 to 38.0 MME) (p<0.001). For small surgeries, there was no difference (1.7%). Median LOS for large surgeries decreased from 54.2 hours to 33.7 hours, a 20.5-hour (38%) decrease (p<0.001). For medium surgeries, LOS decreased from 50.1 to 33.1 hours, a 17-hour (34%) difference (p=0.055). For small surgeries, there was no significant difference, going from 8.1 to 8.4 hours (p=0.734). Outpatient opioid prescription quantities decreased 33% for patients undergoing small surgeries (p=0.040) but there was no statistically significant decrease for patients undergoing medium or large surgeries. The total number of communication encounters was not statistically significant in any group. The number of steps within a communication encounter was significant (p=0.028) for small surgeries but not for medium or large surgeries.

When analyzing the pre- and post-Pain Plan groups as a whole, there was a statistically significant decrease in hospital LOS (p=0.028), inpatient opioid use (p=0.001), and the average number of steps per communication encounter (p=0.010) in Pain Plan patients, and a trend toward decreased outpatient opioid prescription quantities (p=0.052). There was no statistically significant difference in patient-reported pain scores.

Parallel surgeon data analysis showed no significant differences in any outcome variable over the same time frame analyzed for the Pain Plan effects, supporting the hypothesis that the Pain Plan was an independent variable in its impact on decreased postoperative opioid use, LOS, and clinic resource utilization. There were no significant differences in SI or demographic variables between pre- and post-Pain Plan groups, supporting the validity of the comparison groups.

DISCUSSION AND CONCLUSION:
The Pain Plan was implemented to collaboratively address pain management with patients, resulting in decreased opioid use, hospital length of stay, and clinic resource utilization. The effect was related to surgical magnitude. Inpatient opioid use and length of stay were particularly decreased in patients undergoing medium and large spine surgeries (i.e., surgeries with higher surgical invasiveness indices). Patient-reported pain scores did not change, indicating that even with fewer opioids, pain management was appropriate. The Pain Plan was shown to be a powerful tool to assist with postoperative pain management at our institution.