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Georgia Quality Improvement Programs Multi-Institutional Collection of Postoperative Opioid Data Using ACS-NSQIP Abstraction

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Abstract

Background: Excessive postoperative opioid prescribing contributes to opioid misuse throughout the US. The Georgia Quality Improvement Program (GQIP) is a collaboration of ACS-NSQIP participating hospitals. GQIP aimed to develop a multi-institutional opioid data collection platform as well as understand our current opioid-sparing strategy (OSS) usage and postoperative opioid prescribing patterns.

Methods: This study was initiated 7/2019, when 4 custom NSQIP variables were developed to capture OSS usage and postoperative opioid oral morphine equivalents (OMEs). After pilot collection, our discharge opioid variable required optimization for adequate data capture and was expanded from a free text option to 4 drop-down selection variables. Data collection then continued from 2/2020-5/2021. Logistic regression was used to determine associations with OSS usage. Average OMEs were calculated for common general surgery procedures and compared to national guidelines.

Results: After variable optimization, the percentage where a total discharge prescription OME could be calculated increased from 26% to 70% ($P < .001$). The study included 820 patients over 10 operations. There was a significant variation in OSS usage between GQIP centers. Laparoscopic cases had higher odds of OSS use (1.92 (1.38-2.66)) while OSS use had lower odds in black patients on univariate analysis (.69 (.51-.94)). On average 7 out of the 10 cases had higher OMEs prescribed compared to national guidelines recommendations.

Conclusion: Developing a multi-institutional opioid data collection platform through ACS-NSQIP is feasible. Pre-selected drop-down boxes outperform free text variables. GQIP future quality improvement targets include variation in OSS use and opioid overprescribing.

Introduction

Excessive postoperative opioid prescriptions contribute to opioid misuse throughout the United States.[1,2] Prescription opioids after surgery make up a large degree of the opioids circulating in our communities, as most of these prescriptions remain unused.[3] Unused tablets can be diverted into abuse and lead to chronic opioid usage or transition into heroin use.[4,5] Studies have shown a wide variation in opioid prescribing practices among similar surgical procedures within homogenous patient populations.[6,7] Multimodal analgesia focused on an opioid-sparing strategy (OSS) has been shown to reduce 24-hour morphine consumption after surgery, and these strategies may prevent chronic postoperative opioid dependence.[8]

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This highlights the potential that standardization of both perioperative OSS use and postoperative opioid prescriptions could have in reducing the morbidity and mortality caused by opioids.

State-wide opioid prescription analysis and guideline creation was pioneered by the Michigan Opioid Prescribing Engagement Network (Michigan-OPEN) partnered with the Michigan Surgical Quality Collaborative (MSQC). Opioid prescription guidelines for common general surgery procedures were created by tracking the average amount of opioids actually consumed by patients postoperatively and were implemented across the state. This reduced postoperative opioid prescribing by 50% while providing adequate patient reported pain management.[9,10] These successful projects along with ongoing opioid related deaths in our state lead the Georgia Quality Improvement Program (GQIP) to target perioperative opioids as a state-wide quality initiative.

GQIP is a multi-hospital regional collaboration of ACS-NSQIP and TQIP participating hospitals that focus on surgical quality improvement projects throughout Georgia. In 2019, GQIP decided to focus on state-wide perioperative OSS use and determine the amount of oral morphine equivalents (OMEs) prescribed for common general surgery procedures. To accomplish this, 4 diverse contributing centers, were designated to pilot the creation of a multi-institutional opioid data collection platform using ACS-NSQIP custom variables. We aimed to develop and optimize this collection platform to understand our current state-wide OSS use and postoperative opioid prescribing patterns for common surgical procedures.

Methods

This retrospective cohort study met criteria for exemption from Institutional Review Board approval at the main institution under 45 CFR 46.104(d),[4] and interhospital data followed GQIP data use agreements. Four pilot centers within GQIP were selected to develop and optimize a multi-institutional data collection platform using ACS-NSQIP to capture primary endpoints: OSS usage and postoperative opioid prescription OMEs.

The study was initiated on 7/2019, when 4 custom NSQIP variables were developed to capture the primary endpoints. Original variables included 1. Did the patient receive any opioids in the hospital (preoperative–postoperative) and/or upon discharge (select all that apply) 2. Did the patient receive any non-opioids for pain management during hospital stay and/or upon discharge (select all that apply) 3. Was an opioid sparing strategy used (Yes or No) 4. Total mg of each opioid prescribed upon discharge (Free Text). Initial data collection spanned through 12/2019 and the preliminary review showed poor capture of the discharge opioid prescription "Free Text" variable. The GQIP study group optimized this variable from "Free Text" to a 4-part list of drop-down variables with pre-populated selections including: Drug (select one), Dose (select one), Number of pills (select one), and Duration (select one). After variable revision, trained surgical clinical reviewers at each hospital captured these custom variables in addition to standard NSQIP variables for 10 common general surgery procedures from 2/2020 to 5/2021. General surgery procedures included Open: colon, inguinal hernia, hepatobiliary, mid-gut, and ventral hernia surgery as well as Laparoscopic: appendectomy, colon, cholecystectomy, inguinal hernia, and foregut surgery. Patients with missing data were excluded from the analysis.

OSS analysis was conducted by comparing patients where an OSS was implemented versus patients where it was not implemented. OSS was defined using the ACS-NSQIP definition of multi-modal pain management under the enhanced recovery pathway. This definition includes the use of 2 or more drugs/interventions that act by different mechanisms than systemic opioids to provide analgesia utilized within 12 hours postoperatively. Covariates compared between this outcome included: GQIP facility, age, sex, race, case type, admit status, emergency surgery, opioid prescription greater than national recommendations, readmission, and reoperation. Univariate logistic regression was used to determine associations between covariates and OSS usage. A multivariable logistic regression model was developed using univariate odds and clinical knowledge.

To determine GQIP postoperative opioid prescription OMEs, each drug was multiplied by its respective oral morphine conversion factor and the number of pills prescribed for each case. Median OMEs and interquartile range for each GQIP case type were then compared to national postoperative opioid prescribing recommendations to benchmark GQIP prescribing patterns. National recommendations used for comparison were the average OMEs within each case between Johns Hopkins Expert Panel Consensus and the Michigan-OPEN.[10,11] For ease of interpretation, OMEs for each case were converted into the equivalent amount of Oxycodone 5mg tablets and compared with national recommendations. The percentage of cases within each case type greater than national recommendations was also calculated.

SAS software (version 9.4, SAS Institute, Inc., Cary NC) was used to analyze all statistics. All hypothesis testing was two sided and conducted at a .05 level of significance, and any confidence interval that crossed 1 was not significant.

Results

Data collection with original variables including the "Free Text" variable for discharge prescription analysis spanned from 5/2019 through 12/2019. 261 patients were

Table1. Comparison between opioid sparing strategy groups with univariate and multivariable odds of opioid sparing strategy use.

	Opioid sparing strategy used			
Variable	No (N = 277)	Yes (N = 554)	Univariate OR (95% CI)	Multivariable OR (95% CI)
Facility	—			
1	158 (57.0%)	79 (14.3%)	REF	REF
2	86 (31.1%)	134 (24.2%)	3.12 (2.12-4.57)	3.37 (2.26-5.04)
3	20 (7.2%)	296 (53.4%)	29.6 (17.5-50.1)	29.7 (17.4-50.8)
4	13 (4.3%)	45 (8.1%)	6.92 (3.53-13.6)	6.82 (3.44-13.5)
Age (years)	53.4 ± 16.0	54.3 ± 16.6	.99 (.99-1.00)	—
Sex	—			
Female	132 (47.6%)	293 (52.9%)	REF	
Male	145 (52.3%)	261 (47.1%)	.81 (.61-1.08)	
Race	—			
White	145 (52.4%)	335 (60.5%)	REF	REF
Black	120 (43.3%)	192 (34.7%)	.69 (.51-.94)	.87 (.61-1.25)
Hispanic	12 (4.3%)	27 (4.9%)	.97 (.48-1.98)	.79 (.35-1.81)
Case type	—			
Open	90 (32.8%)	111 (20.3%)	REF	REF
Laparoscopic	184 (67.2%)	435 (79.7%)	1.92 (1.38-2.66)	1.61 (1.06-2.43)
Admit status	—			
Inpatient	162 (58.5%)	269 (48.6%)	REF	REF
Outpatient	115 (41.5%)	285 (51.4%)	1.49 (1.12-2.00)	.98 (.68-1.43)
Emergency	—			
No	217 (78.3%)	422 (76.2%)	REF	—
Yes	60 (19.8%)	132 (23.8%)	.89 (.64-1.24)	
Opioid script	—			
≤ Guideline	106 (44.2%)	166 (47.0%)	REF	—
> Guideline	134 (55.8%)	187 (53.0%)	.89 (.64-1.24)	
Readmission	13 (4.7%)	25 (4.5%)	.96 (.48-1.91)	1.32 (.59-2.92)
Reoperation	8 (2.9%)	10 (1.8%)	.62 (.24-1.58)	—

Categorical variables displayed as frequency (percentage). Continuous variable displayed as mean ± standard deviation. Guideline variable refers to national opioid prescription guideline recommendations. Categorical variables without a reference group calculates the odds of having the variable against not having it. Abbreviations: OR: odds ratio, CI: confidence interval, REF: reference group.

submitted for review between all GQIP centers and 76 (26%) patients had adequate data to calculate discharge prescription OMEs. After custom NSQIP variable optimization to drop-down selection variables for discharge prescriptions, data accrual for final analysis ran from 2/2020 through 5/2021. A total of 1,227 were submitted from the GQIP centers. 201 patients were excluded for incorrect case type. The final study population for OSS analysis included 820 patients (206 excluded for missing data) and 721 patients (305 excluded for missing data) for discharge prescription analysis. Data collection post variable optimization saw an increase in usable data for discharge prescription OME calculation from 26% to 70% (P-value < .001).

An OSS was implemented for 554 patients compared to 277 patients without one. There were no differences in age, sex, emergent surgery, opioid prescriptions greater than national recommendations, readmissions, or reoperations between groups. On univariate logistic regression, there were increased odds of OSS usage at facilities 2, 3, and 4 compared to facility 1. The odds of OSS were also higher in laparoscopic cases (1.92 (1.38-2.66)) and outpatient cases (1.49 (1.12-2.0)). African American patients had lower odds of OSS usage compared to Caucasian patients (.69 (.51-.94)) on univariate regression (Table).

GQIP facility, race, case type (open vs laparoscopic), admit status, emergent surgery, and readmission were included in a multivariable logistic regression model with usage of an OSS as the outcome. The odds of OSS usage remained significantly increased when comparing other facilities to facility 1 and comparing laparoscopic surgery to open surgery. Race and admit status were no longer significant when controlling for other variables in the model (Table1 and Figure 1).

Median discharge prescription OMEs for open colon, hernia, and hepatobiliary surgery were higher than national recommendations at 17, 14, and 20 pills,

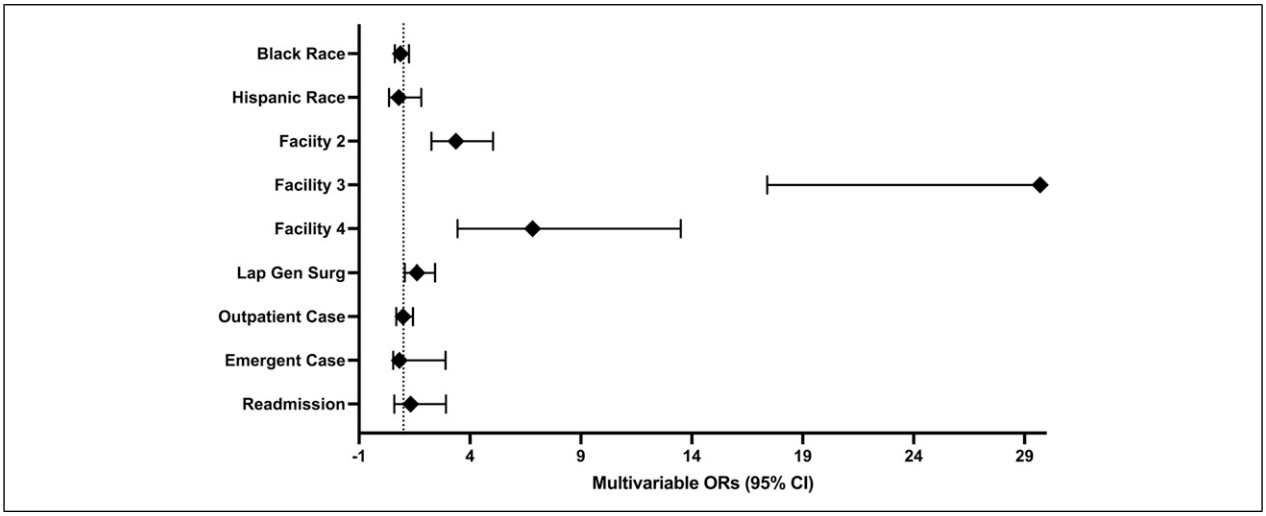

Figure 1. Forest Plot of multivariable logistic regression model odds ratios for opioid sparing strategy use. X-axis: Multivariable odds ratios and confidence intervals. Y-axis: Covariates.

respectively (Figure 2). The percentage of cases where discharge prescriptions were greater than national guidelines for these surgeries were 50.7%, 68.2%, and 63.2%, respectively (Figure 3). Open midgut surgery at 15 pills equaled national recommendations, and open ventral hernia surgery was slightly less with a median of 12 pills prescribed (Figure 2).

Laparoscopic general surgery cases with median discharge prescriptions greater than the national recommendation of 10 oxycodone 5 mg pills included: appendectomy (12 pills), colectomy (15.5 pills), cholecystectomy (12 pills), and foregut surgery (12 pills). The percentage of cases within each surgery greater than this recommendation were 52.8, 64.1, 56.8, and 58.8%, respectively. Laparoscopic hernia cases had a median of 12 pills prescribed with 52.9% of cases less than or equal to the national recommendation of 15 pills (Figures 2 and 3).

Discussion

This study shows the feasibility and utility of multi-institutional abstraction of opioid data using the ACS-NSQIP platform. Perioperative opioid usage is an important quality metric to report. This study exhibited the optimization of tracking discharge opioid prescribing patterns by using drop-down selection variables as opposed to free text variables. Other studies interested in postoperative opioid prescription volume have gathered data by liking pharmacy platforms and retrospectively gathering prescription data.[10,12,13] If these methods are not feasible, utilizing custom variable creation in ACS-NSQIP to gather prescription data is beneficial due to its prospective nature and ease of coordinating collection across a multi-institutional setting. As described, this method allows hospitals to review data collected during a sample period, which can lead hospitals to implement changes on custom variables to increase the quality of data collected for analysis. Using prospective collection in a multi-institutional collaborative setting allows trained surgical clinical reviewers to communicate regarding how to collect variables consistently and correctly, which leads to more reliable data.

This is the first multi-institutional review of perioperative opioid use across the state of Georgia. There was wide interfacility variation in OSS usage between GQIP hospitals. Facility 1 used as the reference group is a rural private hospital. Other hospitals participating included academic centers in different metropolitan areas, and a mixed academic and private center. Compared to facility 1 the other centers had increased odds of OSS usage. This represents a potentially large area of focus for GQIP. Standardization of multi-modal analgesic usage and OSS throughout the state could have major impacts on postoperative opioid usage and refills. These strategies also set the stage for patient expectations of what to take for pain at home. This preliminary data showing non opioid pain management discrepancies between centers highlights a major area for potential quality improvement efforts for GQIP.

There have been a multitude of studies describing racial disparities in pain management.[14,15] Our study showed decreased odds of OSS use in African American patients compared to Caucasian on univariate analysis. This also shows a potential area for improvement throughout the state. State-wide disparities in health administration are ripe for improvement. GQIP centers need to internally assess racial disparities in pain management. Developing guidelines for multi-modal pain management usage can assist in eliminating potential disparities in care by standardizing methods.

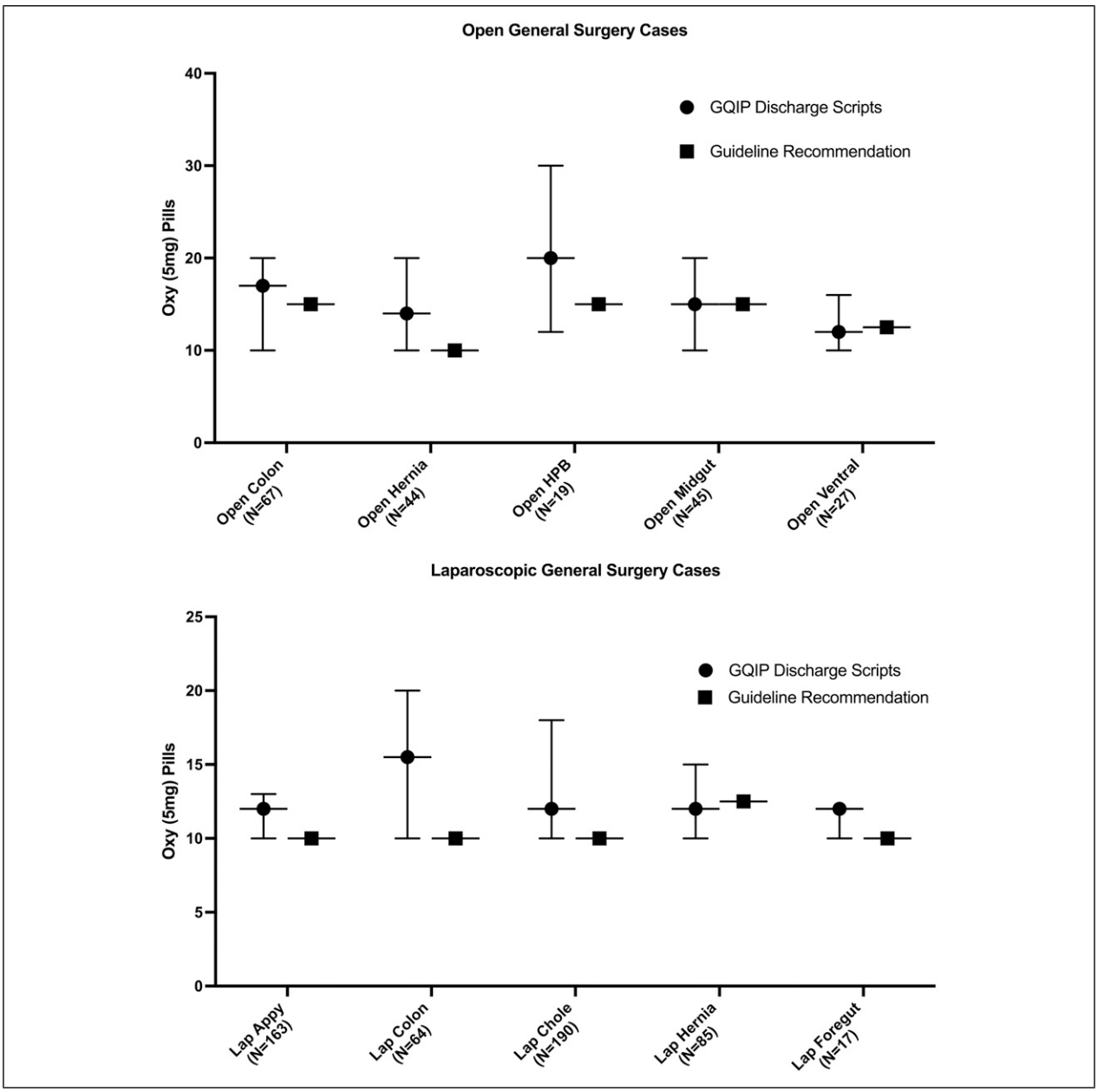

Figure 2. Discharge prescriptions in oxy (5mg) for different case types referenced against national guidelines. X-axis: Case types. Y-axis: Amount of oxycodone 5 mg pills.

Seven out of ten cases analyzed for postoperative opioid prescriptions had higher median prescriptions than national guidelines recommend. This is an important starting point for GQIP to build on. Hospital-specific data will be disseminated to participating hospitals to raise awareness of prescribing patterns and emphasize areas for improvement. Michigan-OPEN partnered with the MSQC has done extensive work on this topic. Michigan-OPEN guidelines set the stage for GQIP to build our own state-wide prescribing guidelines to disseminate throughout the state.[9,10] Our preliminary data shows areas we can improve upon, and we plan to implement state-wide prescribing protocols and track post-implementation discharge prescriptions using our data collection platform which was optimized during this preliminary study.

Study limitations include only having data from 4 centers throughout the state. We cannot make complete state-wide inferences from this preliminary data, but this does lay the groundwork to add more centers for future analysis. Some case types analyzed are limited by a smaller sample size. This opens the possibility for unknown patient factors and disparities in exact case type

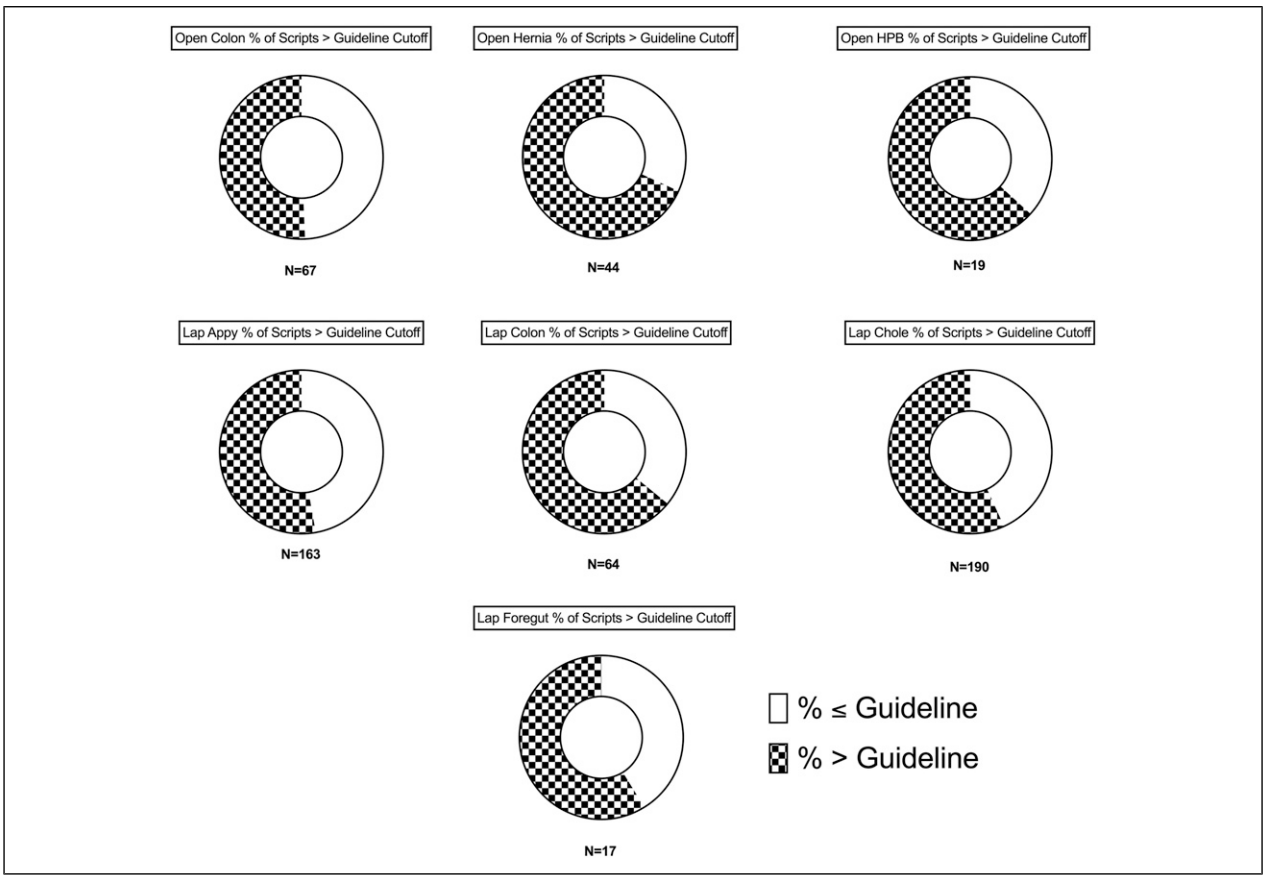

Figure 3. Percentage of cases where discharge opioid prescriptions were greater than national guideline recommendations.* Case types included when median opioid prescription was greater than national guidelines.

to contribute to prescription variation. Hospital course and patient outcomes were also not assessed in this analysis, which has the potential to impact perioperative opioid use.

In summary, this study describes the development and optimization of a multi-institutional perioperative opioid data collection platform using ACS-NSQIP. We found that drop-down boxes with prepopulated common selections results in increased opioid prescription data to calculate OMEs compared to free text variables. GQIP identified multiple targets for future quality improvement efforts. There was interfacility variation in the use of an OSS. Seven out of ten common general surgery procedures were found to have increased postoperative opioid prescriptions compared to national recommendations. Future work will focus on expanding data collection to all GQIP centers, and implementation of state-wide perioperative multimodal pain management and opioid prescribing guidelines to help curb the opioid epidemic in our state.

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Declaration of Conflicting Interests

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Appendix

Abbreviations

Lap gen surg: Laparoscopic general surgery,
ORs: Odds ratios,
CI: Confidence interval.
GQIP: Georgia quality improvement Program,
oxy: Oxycodone,
HPB: Hepatobiliary,
ventral: Ventral hernia surgery,
lap: Laparoscopic,
appy: Appendectomy,
chole: Cholecystectomy.
HPB: Hepatobiliary,
Lap: Laparoscopic,
Appy: Appendectomy,
Chole: Cholecystectomy