

Physician Characteristics Associated With Opioid Prescribing After Same-Day Breast Surgery in Ontario, Canada

A Population-Based Cohort Study

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Background and Objectives: Opioid overprescribing in patients undergoing breast surgery is a concern, as evidence suggests that minimal or no opioid is needed to manage pain. We sought to describe characteristics of opioid prescribers and determine associations between prescriber's characteristics and high opioid prescribing within 7 days of same-day breast surgery.

Methods: Patients ≥ 18 years of age who underwent same-day breast surgery in Ontario, Canada from 2012 to 2020 were identified and linked to prescriber data. The primary outcome was *current* high opioid prescribing defined as >75 th percentile of the mean oral morphine equivalents (OME; milligrams). Prescriber characteristics including age, sex, specialty, years in practice, practice setting, and history of high (>75 th percentile) opioid prescribing in the previous year were captured. Associations between prescriber characteristics and the primary outcome were estimated in modified Poisson regression models.

Results: The final cohort contained 56,434 patients, 3469 unique prescribers, and 58,656 prescriptions. Over half (1971/3469; 57%) of prescribers wrote ≥ 1 prescription that was >75 th percentile of mean OME of 180mg, of which 50% were family practice physicians. Adjusted mean OMEs prescribed varied by specialty with family practice specialties prescribing the highest mean OME (614 ± 38 mg) compared to surgical specialties (general surgery [165 ± 9 mg], plastic surgery [198 ± 10 mg], surgical oncology [154 ± 14 mg]). Whereas 73% of first and 31% of second prescriptions were provided by general surgery physicians, family practice physicians provided 2% of first and 51% of second prescriptions. Prescriber characteristics associated with a higher likelihood of high current opioid prescribing were family practice (risk ratio [RR], 1.56; 95% confidence interval [CI], 1.35–1.79 compared to general surgery), larger community practice setting (RR, 1.34; 95% CI, 1.05–1.71 compared to urban), and a previous high opioid prescribing behavior (RR, 2.28; 95% CI, 2.06–2.52).

Conclusions: While most studies examine surgeon opioid prescribing, our data suggest that other specialties contribute to opioid overprescribing in surgical patients and identify characteristics of physicians likely to overprescribe.

Keywords: breast surgery, opioid prescribing, prescriber characteristics

INTRODUCTION

Postoperative pain management practices in breast surgery vary among surgeons^{1,2} with high rates of opioid analgesic overprescription,³ despite evidence that patients undergoing same-day breast surgery can achieve adequate pain control

with minimal to no postoperative opioids.⁴ Furthermore, the amount prescribed is often greater than what is consumed, resulting in a large amount of unused opioids.^{5,6} To monitor prescribing practices, the Narcotic Monitoring System (NMS) was established in Ontario in 2012.⁷ The NMS records dispensing of controlled substances, as listed under the federal *Controlled Drugs and Substances Act*, including narcotic analgesics regardless of the mode of payment. Using this data source, we previously reported that 72% of same-day breast surgery patients in Ontario filled an opioid analgesic prescription within a week of surgery, with a wide range in cumulative oral morphine equivalents (OMEs) (median 135 mg [range: 8–35526 mg]).⁸

Targeted interventions to reduce opioid overprescribing are needed and may be informed by prescriber data. Therefore, the aims of this study were to (1) describe the characteristics of opioid analgesic prescribers and (2) determine the associations between prescriber and patient characteristics and high OME.

METHODS

Study Cohort and Setting

A retrospective population-based cohort study was conducted. Patients at least 18 years of age in Ontario, Canada who underwent same-day breast surgery, with or without axillary intervention, were identified from July 1, 2012 to June 30, 2020. Ontario has a population of ~ 14 million people, which represents nearly

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38.8% of the Canadian population,⁹ and a universal health insurance plan that covers basic healthcare services (ie, costs associated with physician visits, inpatient hospitalizations, etc). Patients were excluded if they had concomitant breast reconstructive surgery (due to anticipated higher pain levels), were less than 18 years of age, died within 30 days of surgery, and did not fill an opioid prescription within 7 days of surgery, if patient data could not be linked to prescriber data, or if OME could not be calculated. If a patient had more than one breast surgery during the study period only the first breast surgery encounter was included; therefore, the number of unique surgeries is the same as the number of patients (Supplemental Figure 1, see <http://links.lww.com/AOSO/A282>). Of the 9820 excluded surgeries, only 17 (<0.2%) were within 7 days of the index surgery.

Patient Data

As previously described,⁸ we used linked administrative databases housed at ICES (www.ices.on.ca). Same-day surgery (SDS) was captured using the Canadian Institute for Health Information (CIHI) Same Day Surgery database, which are mandatory submissions from hospitals to the Ministry of Health. Between 2012 and 2020, SDS records linked to other ICES data ranged from a low of 98.67% to a high of 98.77%. Procedures were categorized into partial (ie, lumpectomy, excisional biopsy), total (ie, mastectomy), radical (ie, mastectomy with removal of axillary lymph nodes), and bilateral breast procedures, with simultaneous axillary intervention if applicable, using codes from the Canadian Classification of Health Interventions (Supplemental Table 1, see <http://links.lww.com/AOSO/A282>).¹⁰ These procedures were then categorized by increasing invasiveness with partial < total < radical < bilateral. International Classification of Diseases (ICDs) 10th revision diagnostic codes identified malignancy (Supplemental Table 2, see <http://links.lww.com/AOSO/A282>). Opioid prescriptions were categorized according to most common agents⁸ (Supplemental Table 3, see <http://links.lww.com/AOSO/A282>). Patient demographic characteristics including age and sex were captured in the Registered Persons Database. The CIHI Discharge Abstract Database was used to capture patient comorbidities.

Patients were characterized by sex (male, female), age at time of surgery, and Charlson Comorbidity Index (CCI, 0–1, 2+) in the 5 years before the index breast surgery. CCI categorizes ICD diagnosis codes into predefined comorbid conditions and assigns a weight based on disease burden and its relative importance to patient prognosis.¹¹ Postal codes linked to the postal code conversion file were used to assign patient neighborhood-level income quintiles, where quintile 1 represents the lowest incomes. Patient residence was defined as either rural (community size <10,000) or urban using postal code conversion file. Institutions were defined as those providing instruction to medical trainees (teaching hospitals), those that do not (small [<100 beds] and community [\geq 100 beds] hospitals), and pediatric hospitals, typically providing care to those younger than 18 years of age. Diagnoses were categorized as benign or malignant. Year of breast surgery was categorized.

Prescriber Data

Characteristics of opioid prescribers at the time of prescription filling by patients were obtained from Corporate Provider Database and ICES Physician Database. We characterized prescribers by sex (male, female), age, years in practice, main specialty (general surgery, plastic surgery, surgical oncology, family and general practice, and Other), practice setting (urban, large, small, rural, and remote-rural communities), and opioid prescribing practices in the previous year. Physician's prescribing practices were determined by averaging the OME per prescription dispensed (mg) using the ICES algorithm for all patients

prescribed by the physician in the previous year. High prescribing was defined as a mean OME prescribed in the prior year of >75th percentile (180 mg). The datasets were cleaned and linked using unique encoded identifiers and analyzed at ICES. Data were reported in accordance with recommendations from the RECORD (Reporting of studies conducted using observational routinely-collected data) statement.¹²

OME Calculation for Patients Undergoing Same-Day Breast Surgery

If a same-day breast surgery patient filled an opioid prescription within 7 days after their surgery, the prescriber was identified and the OME was calculated in milligrams (mg) using the ICES algorithm. The primary outcome was *current* high opioid prescribing defined as >75th percentile of the mean OME (180 mg).

ICES Algorithm

Nonfentanyl prescriptions were converted to OME doses by multiplying the quantity of opioid units (eg, tablet, capsule, liquid, or patch), the original strength per unit, and the corresponding OME conversion factor found on the Ontario Drug Policy Research Network NMS Master Drug List. Fentanyl formulations were converted to OME by first multiplying the quantity of units (eg, transdermal patches, lozenges, or buccal/sublingual tablets), the corresponding fentanyl equivalent, and the OME conversion factor for fentanyl. Rarely used opioids and opioids administered through routes other than oral or transdermal do not have a valid conversion factor and were, therefore, excluded. We also excluded methadone due to the absence of a valid conversion factor.

Statistical Analyses, Sensitivity Analyses, and Ethics Approval

To examine the representativeness of our cohort, characteristics of same-day breast surgery patients whose data were linked to prescriber data were compared with those whose data could not be linked (Supplemental Table 4, see <http://links.lww.com/AOSO/A282>) and characteristics of patients who did not fill an opioid prescription were compared with patients who did (Supplemental Table 5, see <http://links.lww.com/AOSO/A282>) using standardized differences; a difference of ≥ 0.10 indicated a meaningful imbalance between groups.¹³ Prescriber characteristics were summarized. Adjusted OMEs prescribed, duration of prescription, and daily OME dose by main specialty were reported as prescribed mean \pm 95% confidence intervals (CIs). Associations (adjusted risk ratios [RRs] and 95% CI) between prescriber (years in practice, sex, main specialty, practice setting, and previous high prescribing) and patient (age, sex, comorbidities, type of surgery, cancer diagnosis, and year of surgery) characteristics (chosen based on our previous work and known relevance to opioid prescribing) and the primary outcome for first prescriptions (which removes clustering at the patient level) were estimated in multivariable modified Poisson regression models. In the Poisson models, generalized estimating equations accounted for correlated outcomes between prescriptions written by the same prescriber. In sensitivity analyses, we generated models accounting for prescription order for patients in whom multiple prescriptions were filled within 7 days of surgery. The results of this model were similar to that which considered only the first prescription per patient, and therefore, we report below the adjusted model restricted to *first prescriptions only*. Further, most patients only filled one prescription. Small cells (<6) were suppressed to prevent reidentification per ICES privacy policy.

A second sensitivity analysis was conducted excluding patients with known opioid use disorder in the 5 years before

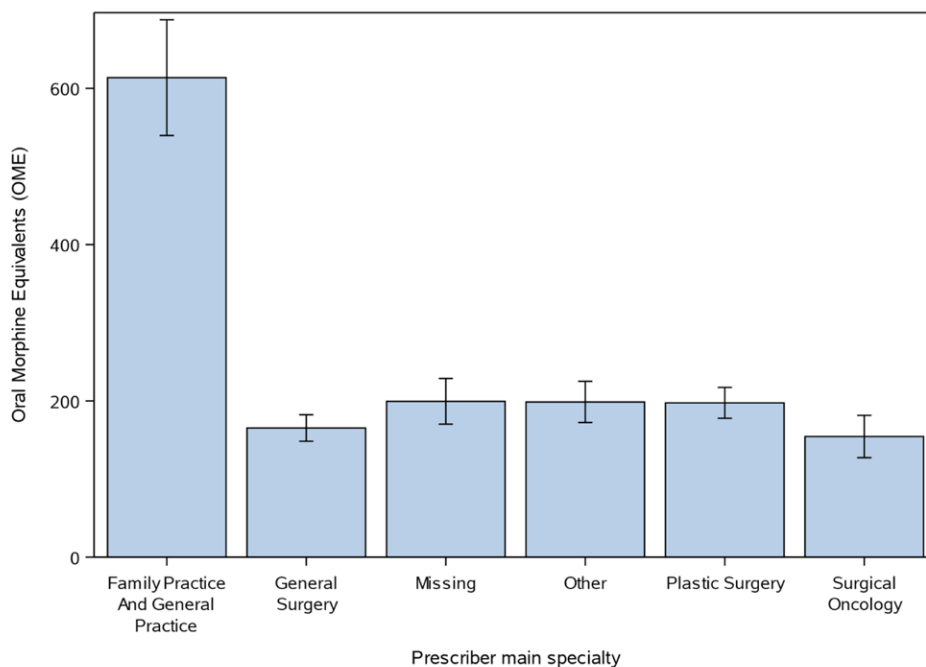


FIGURE 1. Adjusted mean OME prescribed to same-day breast surgery patients by prescriber's main specialty.

breast surgery (ICD-10 codes: F11.1X, F11.2X, and F11.9X) and those prescribed buprenorphine and methadone during the study period ($n = 124$, data not shown). The results of these analyses were similar to the primary analysis and, therefore, only the results of the primary analysis are reported. Patients were not excluded based on missing data¹⁴ and were included in all analyses. We used SAS version 9.4.5 (SAS Institute, Cary, NC). This study was approved by Queen's University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board.

RESULTS

Patient Cohort

The final cohort contained 56,434 patients, 3469 unique prescribers, and 58,656 prescriptions (Supplemental Figure 1, see <http://links.lww.com/AOSO/A282>). Characteristics of cohort patients are summarized (Supplemental Table 4, see <http://links.lww.com/AOSO/A282>). The majority of patients were female (98%), with mean age of 57 ± 15 years and CCI 0–1 (92%), resided in urban locations (89%), had surgery in community hospitals (74%), and had a diagnosis of cancer (59%). The most common surgical procedure was partial resection of the breast (86%), and less common were total excision (6%), radical excision (3.7%), and bilateral procedures (4.7%). Most patients (96%) filled only one opioid prescription. Few patients filled an additional 1 (3%), 2 (0.3%), and ≥ 3 (0.2%) prescriptions. Mean OMEs filled by patients for all surgical procedures was 162 ± 355 mg.

Prescriber Cohort

Characteristics of prescribers providing 58,656 (n) prescriptions are summarized in Supplemental Table 6, see <http://links.lww.com/AOSO/A282>. Prescribers were mostly male (57%), with a mean age of 46 ± 11 years and a mean of 22 ± 11 years in practice. Most prescribers practiced in urban centers (52%) and large communities (21%). The majority of opioid prescriptions were provided by general surgery (71%),

followed by family practice (4%), plastic surgery (2%), and surgical oncology (1%).

Prescribed Opioids

Over half (1971/3469; 57%) of prescribers wrote at least one prescription that was >75th percentile of the observed distribution of OME. Of these prescribers, 50% were from family practice, 17% general surgery, 5% plastic surgery, and 0.3% surgical oncology. Adjusted mean OME prescribed varied by main specialty with family practice specialties prescribing the highest mean OME (614 ± 38 mg) compared to surgical specialties (general surgery [165 ± 9 mg], plastic surgery [198 ± 10 mg], and surgical oncology [154 ± 14 mg]) (Fig. 1). Adjusted mean prescription duration was also longer for family practice specialties (13.3 ± 0.4 days) compared to surgical specialties (4.2 ± 0.1 days general surgery; 4.5 ± 0.2 days plastic surgery; 4.2 ± 0.3 days surgical oncology) (Fig. 2); however, the adjusted mean daily dose prescribed was similar among the prescriber specialties (Fig. 3). When types of opioid agents were examined, surgical oncologists prescribed hydromorphone more often (32%) as compared to the other prescriber specialties (Fig. 4). Whereas 73% of first and 31% of second prescriptions were provided by general surgery physicians, family practice physicians provided 2% of first and 51% of second prescriptions. On postoperative day 0 (ie, day of surgery) and postoperative day 1, 87.9% and 78.8% of opioid prescriptions, respectively, were provided by general surgery physicians.

Patient, Surgery, and Prescriber Characteristics Associated With High Current Prescribing

Patient characteristics associated with a higher likelihood of high current prescribing were CCI 2+ compared to 0–1 (RR, 1.06; 95% CI, 1.02–1.11), more extensive breast surgery including bilateral surgery compared to partial excision (RR, 1.37; 95% CI, 1.27–1.48), and malignant compared to benign disease (RR, 1.30; 95% CI, 1.24–1.38). Prescriber characteristics associated with a higher likelihood of high current opioid prescribing were family practice

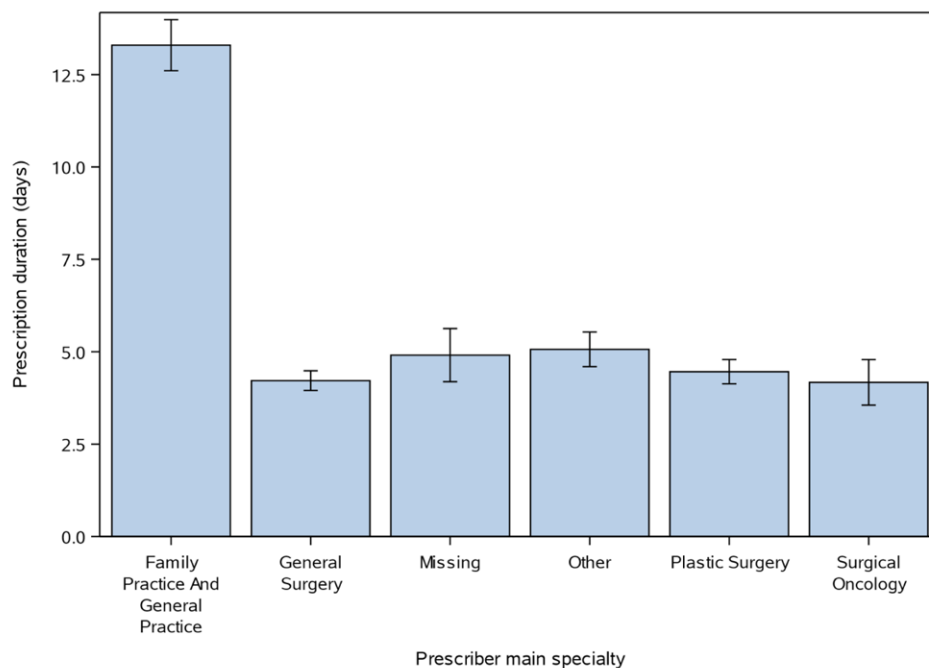


FIGURE 2. Adjusted mean opioid analgesic prescription duration for same-day breast surgery patients by prescriber’s main specialty.

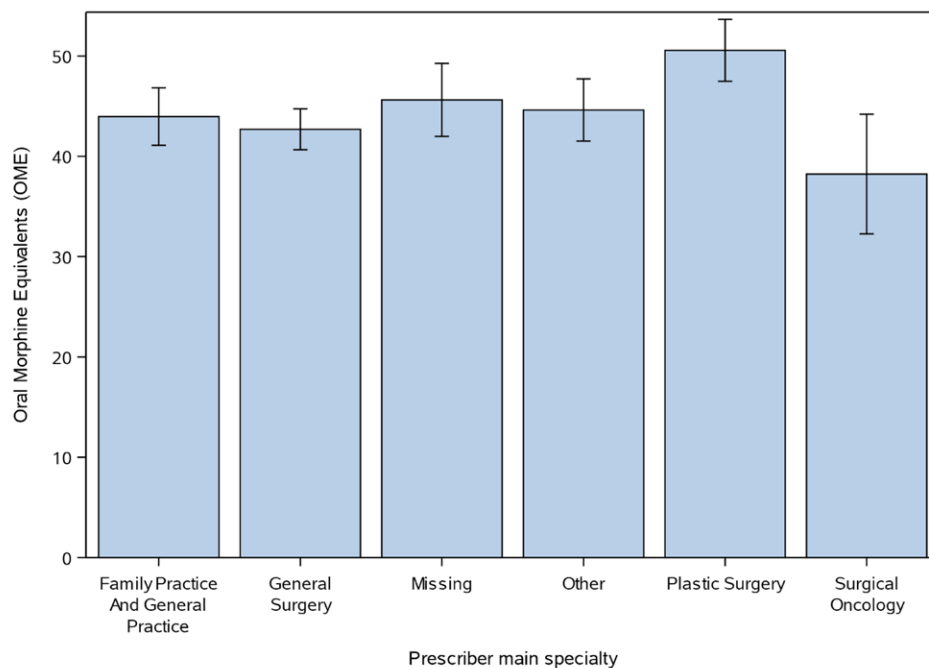


FIGURE 3. Adjusted mean daily opioid dose for same-day breast surgery patients by prescriber’s main specialty.

specialty (RR, 1.56; 95% CI, 1.35–1.79 compared to general surgery), large community practice setting (RR, 1.34; 95% CI, 1.05–1.71 compared to urban), and previous high opioid prescribing behavior (RR, 2.28; 95% CI, 2.06–2.52). Prescriber characteristics associated with a lower likelihood of high current opioid prescribing were a greater number of years in practice (RR, 0.75; 95% CI, 0.58–0.97 for highest compared to lowest quintile) and more recent years of surgery (RR, 0.41; 95% CI, 0.31–0.55 for 2020 compared to 2012) (Supplemental Table 7, see <http://links.lww.com/AOSO/A282>).

DISCUSSION

We provide new information on opioid prescribers in the context of same-day breast surgery in Ontario, Canada. Within our cohort of prescribers, despite family practice prescribers accounting for 4% of opioid prescriptions, they accounted for 50% of prescriptions that were above the 75th OME percentile. They also prescribed a higher opioid dose for a longer number of days and a higher percentage of second prescriptions compared to surgical specialists.

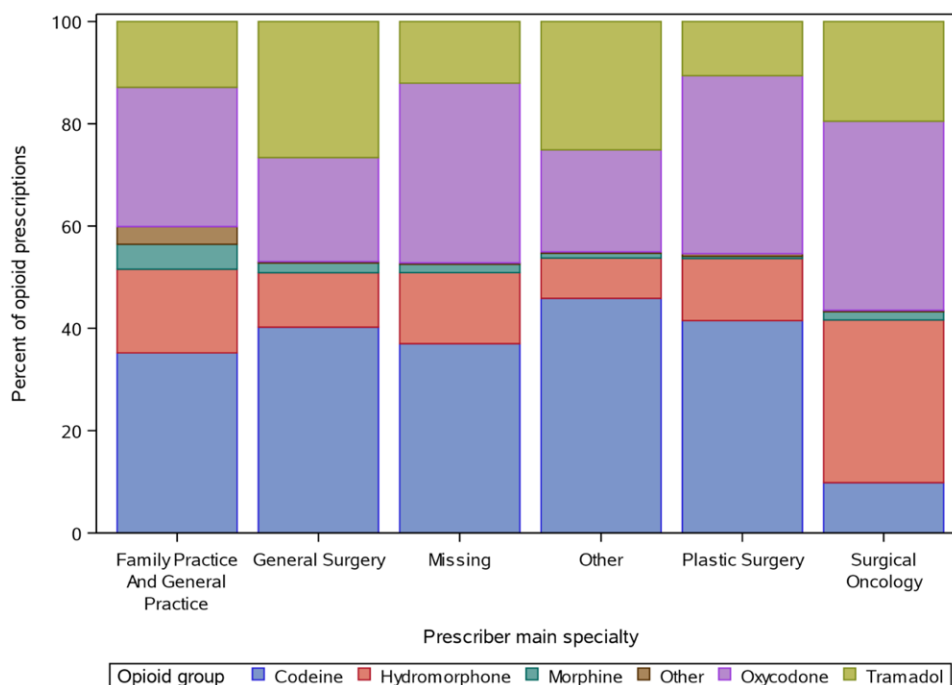


FIGURE 4. Opioid agents prescribed to same-day breast surgery patients by prescriber's main specialty.

Health Quality Ontario Standards support minimizing opioids and maximizing nonopioid analgesics in patients undergoing surgery.¹⁵ Recent studies suggest that patients undergoing partial breast excision who consume nonopioid analgesics (ie, acetaminophen, anti-inflammatories) do not require opioids to manage postsurgical pain.^{16,17} Despite this, we observed that 57% of prescribers in our cohort were high prescribers of opioids. Overall, surgical specialists prescribed lower mean OME and a shorter duration of opioids; therefore, they were less likely to be high prescribers compared to family practice prescribers.

Postoperative opioid overprescribing by surgeons has been reported in the United States and Canada compared to other countries.^{3,18} Consequently, initiatives to reduce opioid prescribing by surgeons have been reported.^{19,20} Our study confirms emerging evidence that surgeons may not be the only group of prescribers requiring such initiatives. Similarly, in the United States, advanced practice nurses accounted for 1 in 5 opioid prescriptions and prescribed larger amounts compared to physicians for patients undergoing a variety surgical procedures.²¹

It is possible that these patterns of higher prescribing may be due to lack of knowledge pertaining to recommended doses of opioids after breast surgery, which was recently reported to be only 5 days.²² Best practices published by anesthesiologists in Ontario recommend prescribing only up to 5 tablets of 5 mg morphine (25 OME) for minor breast resection and up to 15 tablets (75 OME) for major breast resection (SolvingPain.ca). Our observed mean OME doses were well above this suggested threshold for all prescriber specialties. Patients may also present to their family practice physician for pain medication unrelated to surgery; however, due to the nature of administrative databases, we were not able to accurately ascertain the specific reasons for seeking opioid medications.

The high number (51%) of additional prescriptions provided by family practice physicians may also suggest that patients present to these prescribers after surgery with poorly managed pain. Factors associated with the need for additional opioid prescriptions after surgery include younger age, increased comorbidities, surgery for malignancy, and increased invasiveness of surgery.⁸ Knowledge of these factors preoperatively may help surgeons to tailor the amount of medication required to achieve adequate

pain control and potentially reduce the need for additional prescriptions, although it is well accepted that some patients will have additional pain management requirements.

Other prescriber factors associated with higher prescribing were larger community practice setting and history of high opioid prescribing. History of high opioid prescribing associated with current high prescribing suggests that persistent habits perpetuate cycles of overprescribing. Creative, simple, and effective strategies are required to break the cycle and emerging evidence suggests that more appropriate prescribing can, in fact, be achieved. For example, a 4-component initiative significantly decreased postsurgical opioid prescribing among a variety of prescribers including nurse practitioners and physician assistants.²⁰ However, the long-term data on feasibility and impact of this approach are not yet available. While trying to change potentially undesirable habits is a challenging undertaking, reassuringly, we observed that increased duration in practice is associated with lower opioid prescribing. This could suggest that positive changes in prescribing habits may occur over time as experience is gained by the prescriber. Finally, we observed a significant reduction in high opioid prescribing in more recent years of our study, which may be attributable to increasing provider awareness pertaining to the opioid crisis, national efforts to address the crisis, and awareness of interventions to reduce prescribing.

Limitations

While our study provides new observations on opioid prescribing after same-day breast surgery in Ontario, there are limitations. Due to the nature of the NMS data, we were only able to capture opioid filling, which is a proxy for opioid prescribing. It is possible that some patients who received an opioid prescription either did not fill it or filled it after 7 days of surgery, leading to an underestimation in actual prescribing. While we did not exclude those who may have an opioid use disorder, our sensitivity analysis excluding these patients did not affect the study results. While it is possible that patients receive additional opioid prescriptions from their family practice physicians for reasons other than postsurgical pain, which will overestimate

OMEs, the chosen timeline of 7 days after surgery is commonly reported as appropriate to evaluate postsurgical pain in patients undergoing breast surgery.^{4,23} We were not able to accurately capture the utilization of local anesthetic at the time of surgery that may affect the prescribing of opioid analgesics postoperatively. This analysis also did not include nonphysician prescribers such as nurse practitioners who may have a role in postoperative pain management.

CONCLUSIONS

Data on opioid prescribers is scarce and prescribing habits may be attributed to various factors including the local culture of the institution in which surgery is performed.^{24,25} Our study demonstrates higher opioid prescribing in dosage and duration among family practice prescribers compared to surgical specialists in patients who underwent same-day breast surgery, highlighting that the postsurgical opioid overprescribing problem may not be a phenomenon limited to surgeons. Our findings demonstrate that prescribers other than surgeons are involved in the early postoperative pain management of these patients. Continuing medical education opportunities and tailored interventions in this domain will require special efforts locally to involve all relevant stakeholders involved in the care of these patients. Obtaining a better understanding of prescribing behaviors through interview methodology may be a future research avenue.

DATA ACCESS

The dataset from this study is held securely in coded form at ICES. While legal data sharing agreements between ICES and data providers (eg, healthcare organizations and government) prohibit ICES from making the dataset publicly available, access may be granted to those who meet prespecified criteria for confidential access, available at www.ices.on.ca/DAS (E-mail: das@ices.on.ca). The full dataset creation plan and underlying analytic code are available from the authors upon request, understanding that the computer programs may rely upon coding templates or macros that are unique to ICES and are therefore either inaccessible or may require modification.

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