# Investigation of an Opioid Prescribing Protocol After Third Molar Extraction Procedures

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**Purpose:** The United States is experiencing an epidemic of opioid overdoses and deaths. The relation between prescription opioids and opioid abuse is well documented. Oral and maxillofacial surgeons and other dentists are proportionately among the most prevalent prescribers of opioids. Practitioners are looking for evidence-based ways to decrease excess opioid prescriptions and adequately manage postoperative pain. The authors recently analyzed the impact of a mandated nonopioid prescribing protocol at their institution. Although broad guidelines have been useful for treating postoperative pain, there are no procedure-specific guidelines for managing pain after third molar extraction. The purpose of this study was to determine whether an opioid prescribing protocol was sufficient to decrease opioid prescribing after third molar extractions.

**Materials and Methods:** This retrospective study compared the use of opioids prescribed for patients undergoing third molar extraction before introducing and after implementing a postoperative opioid prescribing protocol. The inclusion criterion was third molar extraction performed at the Division of Oral and Maxillofacial Surgery at the University of Minnesota (Minneapolis, MN) during the fourth quarters of 2015 and 2017 with complete records.

**Results:** The number of opioid prescriptions decreased and the number of nonopioid analgesics prescribed increased for all procedure codes after implementation of the protocol. Higher Current Dental Terminology (CDT) codes were associated with increased opioid prescriptions, indicating increased surgical difficulty was a rationale for opioid prescriptions. The mean number of opioid tablets per prescription was 15.9 in 2015 and decreased to 11.5 in 2017. No statistical difference was observed for average tablets for various CDT codes.

**Conclusion:** Data from this study suggest an acute postoperative pain opioid prescribing protocol leads to fewer opioid prescriptions after third molar extraction procedures, less variance in opioid prescribing among practitioners, a decreased number of opioid tablets prescribed per patient, and safe and effective management of acute postoperative pain.



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The United States is experiencing a marked increase in opioid-related overdoses and deaths.[1,2] In 2015, drug overdose deaths exceeded 50,000 in the United States and 30,000 involved opioids.[3] Recent reports have indicated 1 of 25 adults in the United States uses prescription opioids regularly.[4] The role of prescribers in this epidemic has become a major focus of prevention efforts. Oral and maxillofacial surgeons and other dentists are proportionately among the most prevalent prescribers of opioids to adolescents.[5] An estimated 56 million tablets of hydrocodone 5 mg are prescribed to patients with an average age of 20 years after third molar extractions each year in the United States.[6] Although dentistry has shown a relative decrease in the total volume of opioid prescriptions to 6.4% in 2012 from a high of 15.5% in 1998, the number of opioid prescriptions per 1,000 dental patients has actually increased, especially for patients 11 to 18 years old.[7] Researchers have shown that adolescents who use a prescription opioid have a considerably increased risk of future opioid misuse compared with those who do not receive an opioid prescription.[8] Investigations into sources of nonmedical use of prescription opioids have found that substantial amounts of leftover prescription opioids are reused, shared among friends and family, or abused nonmedically.[9,10] In addition, increasing the morphine milligram equivalent (MME) has been associated with an increased risk of addiction.[11] Therefore, it is incumbent on clinicians to carefully consider the most appropriate means for managing acute postoperative pain.

Acute postoperative pain management that minimizes risk and provides adequate pain relief after third molar extraction is a considerable challenge for oral and maxillofacial surgeons and other dentists. A recent study showed the positive effect of acute postoperative pain opioid prescribing guidelines on prescribing behaviors at the University of Minnesota School of Dentistry (Minneapolis, MN).[12] This study found a marked overall decrease in opioid prescriptions by oral and maxillofacial surgeons and other dentists for adequately managing acute pain after implementation of an opioid prescribing protocol. The authors' primary objective was to evaluate opioid prescribing patterns after third molar extraction procedures to determine whether an opioid prescribing protocol resulted in decreased opioid prescribing after third molar surgery. A better understanding of which specific procedures might benefit from opioid versus nonopioid analgesics will help to develop more detailed evidence-based guidelines for safe and effective management of acute postoperative pain after third molar extraction.

## Materials and Methods

This retrospective cross-sectional study compared postoperative opioid prescribing for patients who underwent third molar extraction procedures at the University of Minnesota School of Dentistry. Two periods were examined: *1)* the fourth quarter of 2015 before implementation of an acute postoperative pain opioid prescribing protocol and *2)* the fourth quarter of 2017 after implementation of an acute postoperative pain opioid prescribing protocol.

The University of Minnesota School of Dentistry Acute Postoperative Pain Opioid Prescribing Guidelines became mandatory in February 2016. The guidelines are available at the University of Minnesota School of Dentistry website and are presented in Figure 1. Faculty, students, and residents received education and training on the protocol from the senior author (H.K.T.). Training consisted of educational lectures and detailed presentations on the opioid protocol and the reasons and rationale for its implementation.

The inclusion criterion was third molar extractions completed at the Department of Oral and Maxillofacial Surgery at the University of Minnesota School of Dentistry and completely documented in the electronic health record software (axi-Um; Exan, Las Vegas, NV) during the fourth quarter of 2015 and the fourth quarter of 2017. Complete records included documentation of postoperative opiate or non-opiate prescriptions in tablet form and the number of opioid tablets prescribed. Third molar procedure codes included those based on the Current Dental Terminology (CDT) code set maintained by the American Dental Association. Third molar extraction procedures were classified according to the degree of impaction using the following CDT procedure codes: D7210 (surgical extraction), D7220 (soft tissue impaction), D7230 (partial bony impaction), and D7240 (full bony impaction). The highest CDT procedure code was recorded for patients who underwent multiple third molar extraction procedures during a single appointment. For each patient, postoperative pain medication prescriptions and tablet numbers were collected for Drug Enforcement Administration schedule II, III, and IV opioid and nonopioid analgesics. De-identified patient data, including tablet forms of postoperative opiate and number of tablets and non-opiate prescriptions, were gathered through the University of Minnesota Dental Information Technology Service.

The variables reviewed were the total number of postoperative opioid prescriptions written, the number written for each procedure code, and the number written per patient procedure. Other variables were the total number of postoperative opioid tablets prescribed, the number of tablets prescribed for each procedure code, the number of tablets prescribed for each patient undergoing each procedure code, and the average number of opioid tablets

**University of Minnesota School of Dentistry**
**Acute Postoperative Pain Opioid Prescribing Guidelines**

If NSAIDS can be tolerated:

| Pain Severity | Analgesic Recommendation |
|---|---|
| Mild | Ibuprofen (200-400 mg) q4-6 hours prn for pain |
| Mild to Moderate | **Step 1:** Ibuprofen (400-600 mg) q6 hours: fixed intervals for 24 hours<br>**Step 2:** Ibuprofen (400 mg) q4-6 hours prn for pain |
| Moderate to Severe | **Step 1**: Ibuprofen (400-600 mg) with APAP (500 mg) q6 hours: fixed interval for 24 hours<br>**Step 2**: Ibuprofen (400 mg) with APAP (500 mg) q6 hours prn for pain |
| Severe | **Step 1:** Ibuprofen (400-600 mg) with APAP (650 mg) with (5mg) hydrocodone q6 hours: 3-day supply.<br>**Step 2:** Ibuprofen (400-600 mg) with APAP Ibuprofen (400-600 mg) with APAP (500 mg) q6 hours: prn for pain |

If NSAIDS are contraindicated:

| Pain Severity | Analgesic Recommendation |
|---|---|
| Mild | APAP (650-1000 mg) q6 hours prn for pain |
| Moderate | **Step 1:** APAP (650-1000 mg) with hydrocodone (5 mg) q6 hours: 3- day supply.<br>**Step 2:** APAP(650-1000 mg) q4-6 hours prn for pain |
| Severe | **Step 1:** APAP (650 mg) with hydrocodone (5 mg) q6 hours: 3-day supply.<br>**Step 2:** APAP(650-1000 mg) q6 hours: prn for pain |

**FIGURE 1.** University of Minnesota School of Dentistry Acute Postoperative Pain Opioid Prescribing Guidelines. APAP; acetaminophen; NSAIDs, nonsteroidal anti-inflammatory drugs; prn, when necessary.

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prescribed. MME was calculated as the opioid prescribed multiplied by the conversion factor multiplied by the dose and number of tablets. These variables were compared before and after implementing the acute postoperative pain opioid prescribing protocol.

Data were analyzed using SPSS 25 (IBM Corp, Armonk, NY) for case selection, creating derived data, and data documentation. Bivariate statistics included means, *t* test, and analysis of variance for statistical significance. Means compared by 2-sample *t* test with a *P* value less than .05 were considered statistically significant. Linear regression was used to model the relation between variables. Figures were generated in Excel 2016 for Windows (Microsoft, Redmond, WA). Averages are displayed as mean and median and error bars indicate standard deviation.

The University of Minnesota Human Research Protection Program reviewed this project and determined ongoing institutional review board review and approval for this research was not required (identification STUDY00002666).

## Results

A total of 344 patients underwent third molar extraction during the study period of the opioid protocol (Fig 1); 173 patients were included from the fourth quarter of 2015 before implementing the protocol.

This group was composed of 56 patients with surgical extraction (CDT code D7210), 20 patients with soft tissue impaction (CDT code D7220), 64 patients with partial bony impaction (CDT code D7230), and 33 patients with complete bony impaction (CDT code D7240). The other group included 171 patients from the fourth quarter of 2017 after implementing the protocol. This group was composed of 18 patients with surgical extraction (CDT code D7210), 31 patients with soft tissue impaction (CDT code D7220), 48 patients with partial bony impaction (CDT code D7230), and 74 patients with complete bony impaction (CDT code D7240; Table 1).

During the study period, there were notable changes in the number of opioid prescriptions written before and after implementing the opioid prescribing protocol. A total of 201 postoperative opioid prescriptions were written during the study period. For patients who received opioids, 164 (82%) prescriptions were written before implementing the protocol. After implementation, 37 (18%) patients received opioid prescriptions.

There were considerable differences in the number of opioid prescriptions written for each third molar extraction procedure before and after implementing the protocol (Table 1). Before implementing the protocol, the number of opioid prescriptions ranged from 11% (CDT code D7220) to 38% (CDT code D7230) of all opioid prescriptions. After implementing the protocol, the number of opioid prescriptions ranged from 14% (CDT code D7220) to 46% (CDT code D7240) of all opioid prescriptions. In the fourth quarter of 2015, 51 of 164 (31%) opioid prescriptions were written for surgical extraction (CDT code D7210) compared with 6 of 37 (16%) in the fourth quarter of 2017. In the fourth quarter of 2015, 18 of 164 (11%) opioid prescriptions were written for soft tissue impaction (CDT code D7220) compared with 5 of 37 (14%) in the fourth quarter of 2017. In the fourth quarter of 2015, 62 of 164 (38%) opioid prescriptions were written for partial bony impaction (CDT code D7230) compared with 9 of 37 (24%) in the fourth quarter of 2017. In the fourth quarter of 2015, 33 of 164 (20%) opioid prescriptions were written for complete bony impaction (CDT code D7240) compared with 17 of 37 (46%) during the fourth quarter of 2017. Before implementing the protocol, opioid prescriptions written for patients for each third molar extraction procedure ranged from 90% (CDT code D7220) to 100% (CDT code D7240). After implementing the protocol, opioid prescriptions written for patients for each third molar extraction procedure ranged from 16% (CDT code D7220) to 33% (CDT code D7210). Of patients with CDT code D7210, 51 of 56 (91%) received postoperative opioids in 2015 compared with 6 of 18 (33%) in 2017. Of patients with CDT code D7220, 18 of 20 (90%) received postoperative opioids in 2015 compared with 5 of 31 (16%) in 2017. Of patients with CDT code D7230, 62 of 64 (97%) received postoperative opioids in 2015 compared with 9 of 48 (19%) in 2017. For patients with CDT code D7240, 33 of 33 (100%) received postoperative opioids in the fourth quarter of 2015 compared with 17 of 74 (23%) in the fourth quarter of 2017. Overall, 164 of 173 (95%) patients received a postoperative opioid prescription during the fourth quarter of 2015 compared with 37 of 171 (22%) during the fourth quarter of 2017 (Fig 2).

During the study period, there were notable changes in the number of opioid tablets prescribed. A total of 3,195 opioid tablets were prescribed during the study period. Before the protocol, 2,776 (87%) opioid tablets were prescribed. After implementing the protocol, 419 (13%) opioid tablets were prescribed.

The number of opioid tablets prescribed for each third molar extraction procedure ranged from 10% of all opioid tablets for soft tissue impaction procedures to 33% of opioid tablets for surgical extraction and partial bony impaction procedures (Table 1). After implementing the protocol, the number of opioid tablets prescribed for each third molar extraction procedure ranged from 15% of all opioid tablets for surgical extraction and soft tissue impaction procedures to 42% of opioid tablets for complete bony impaction procedures. In the fourth quarter of 2015, 906 of 2,776 (33%) opioid tablets were prescribed for surgical extraction (CDT code D7210) compared with 63 of 419 (15%) opioid tablets in the fourth quarter of 2017. During the fourth quarter of 2015, 281 of 2,776 (10%) opioid tablets were prescribed for soft tissue impaction (CDT code D7220) compared with 62 of 419 (15%) opioid tablets in the fourth quarter of 2017. In the fourth quarter of 2015, 925 of 2,776 (33%) opioid tablets were prescribed for partial bony impaction (CDT code D7230) compared with 116 of 419 (28%) opioid tablets in the fourth quarter of 2017. In the fourth quarter of 2015, 664 of 2,776 (24%) opioid tablets were prescribed for complete bony impaction (CDT code D7240) compared with 178 of 419 (42%) during the fourth quarter of 2017.

Before the protocol, the median number of opioid tablets prescribed for patients for each third molar extraction procedure ranged from 15 tablets for surgical extraction and partial bony impaction to 16 tablets for soft tissue and complete bony impaction (Table 1). The median number of opioid tablets prescribed for each third molar extraction procedure after implementing the protocol ranged from 10 tablets for surgical extraction to 12 tablets for soft tissue, partial, and complete bony impaction. In the fourth quarter of 2015, 906 opioid tablets were prescribed

**Table 1. THIRD MOLAR PROCEDURES PERFORMED WITH OPIOIDS AND NONOPIOIDS PRESCRIBED**

| | CDT Code | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | D7210 | | D7220 | | D7230 | | D7240 | | | |
| | 2015 | 2017 | 2015 | 2017 | 2015 | 2017 | 2015 | 2017 | 2015 | 2017 |
| Procedure | 56 | 18 | 20 | 31 | 64 | 48 | 33 | 74 | 173 | 171 |
| Patients receiving opioid Rx | 51 (91%) | 6 (33%) | 18 (90%) | 5 (16%) | 62 (97%) | 9 (19%) | 33 (100%) | 17 (23%) | 164 (95%) | 37 (22%) |
| Tablets | | | | | | | | | | |
| Total | 906 (33%) | 63 (15%) | 281 (10%) | 62 (15%) | 925 (33%) | 116 (28%) | 664 (24%) | 178 (42%) | 2776 | 419 |
| Mean | 16.2 | 11 | 15.6 | 12.4 | 14.9 | 12.9 | 17 | 12.7 | 15.9 | 11.5 |
| Median | 15 | 10 | 16 | 12 | 15 | 12 | 16 | 12 | 15 | 12 |
| SD | 6.4 | 2.9 | 4.6 | 3.6 | 4.7 | 3.9 | 6.3 | 5.3 | 5.6 | 4.3 |
| MME total | 105.5 | 45.0 | 101.2 | 52.5 | 98.9 | 50.0 | 97.8 | 44.4 | 101.3 | 49.3 |
| MME per day calculated | 21.1 | 20.0 | 25.6 | 19.0 | 23.2 | 22.0 | 23.3 | 20.0 | 22.8 | 20.3 |
| Patients receiving nonopioid Rx | 5 (9%) | 12 (67%) | 2 (10%) | 26 (84%) | 2 (3%) | 39 (81%) | 0 (0%) | 57 (77%) | 9 (5%) | 134 (78%) |

Abbreviations: CDT, Current Dental Terminology; MME, morphine milligram equivalent; Rx, prescription; SD, standard deviation.

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for 51 patients (median, 15 tablets per patient) for surgical extraction (CDT code D7210) compared with 63 opioid tablets for 6 patients (median, 10 tablets per patient) in the fourth quarter of 2017. In the fourth quarter of 2015, 281 opioid tablets were prescribed for 18 patients (median, 16 tablets per patient) for soft tissue impaction (CDT code D7220) compared with 62 tablets for 5 patients (median, 12 tablets per patient) in the fourth quarter of 2017. In the fourth quarter of 2015, 925 opioid tablets were prescribed for 62 patients (median, 15 tablets per patient) for partial bony impaction (CDT code D7230) compared with 116 tablets for 9 patients (median, 12 tablets per patient) in the fourth quarter of 2017. In the fourth quarter of 2015, 664 opioid tablets were prescribed for 33 patients (median, 16 tablets per patient) for complete bony impaction (CDT code D7240) compared with 178 tablets for 17 patients (median, 12 tablets per patient) during the fourth quarter of 2017 (Fig 3).

Before implementing the protocol, the median number of 15 opioid tablets was prescribed for each patient during the fourth quarter of 2015. After implementing the protocol, the median number of 12 tablets was prescribed for each patient during the fourth quarter of 2017 (Fig 3).

Before implementing the protocol, the mean MME prescribed after all third molar extractions was 101.3. After implementing the protocol, the mean MME prescribed after all third molar extractions decreased markedly to 49.3 (51.3% decrease). There was no relevant difference in the MME prescribed among the various CDT codes before or after implementing the protocol (Fig 4).

The MME per day was calculated, and no relevant difference was observed before versus after implementing the protocol. There was no relevant difference among CDT codes in mean daily MME prescribed.

During the study period, there were notable changes in the number of nonopioid prescriptions written before and after implementing the opioid prescribing protocol. A total of 143 postoperative nonopioid prescriptions were written during the study period. Of the patients who received nonopioids, 9 (6%) received nonopioid prescriptions before implementing the protocol. After implementing the protocol, 134 (94%) patients received nonopioid prescriptions.

There were considerable differences in the number of nonopioid prescriptions written for each third molar extraction procedure before and after implementing the protocol. Before implementing the protocol, nonopioid prescriptions ranged from 0% for complete bony impaction procedures to 56% for surgical extraction procedures. After implementing the protocol, nonopioid prescriptions ranged from 9% for surgical extraction procedures to 43% for complete bony

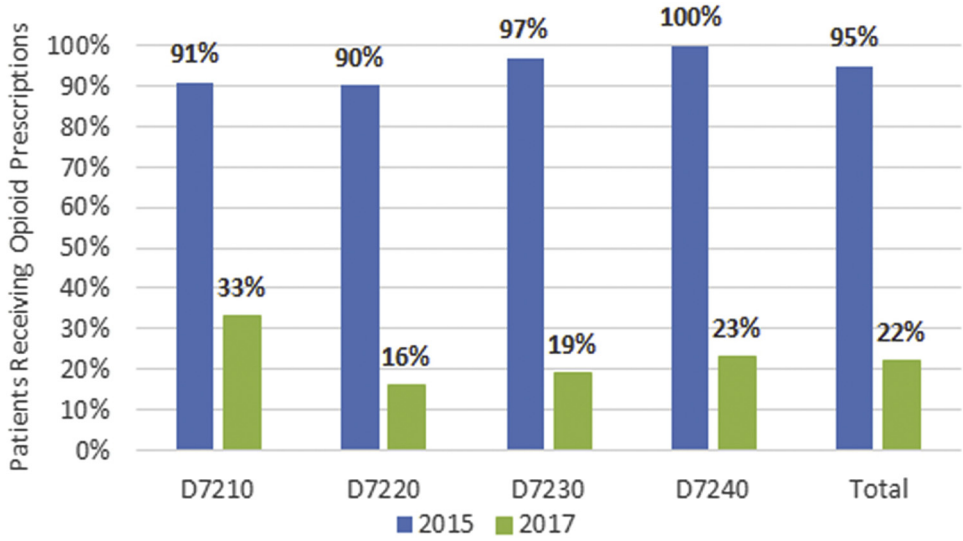


**FIGURE 2.** Percentage of patients receiving opioid prescriptions before and after implementing the protocol according to procedure code.

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impaction procedures. In the fourth quarter of 2015, 5 of 9 (56%) nonopioid prescriptions were written for surgical extraction (CDT code D7210) compared with 12 of 134 (9%) in the fourth quarter of 2017. In the fourth quarter of 2015, 2 of 9 (22%) nonopioid prescriptions were written for soft tissue impaction (CDT code D7220) compared with 26 of 134 (19%) in the fourth quarter of 2017. In the fourth quarter of 2015, 2 of 9 (22%) nonopioid prescriptions were written for partial bony impaction (CDT code D7230) compared with 39 of 134 (29%) in the fourth quarter of 2017. In the fourth quarter of 2015, 0 of 9 (0%) opioid prescriptions were written for complete bony impaction (CDT code D7240) compared with 57 of 134 (43%) during the fourth quarter of 2017.

There were notable changes in the use of nonopioids for patients for each third molar extraction procedure before and after implementing the protocol (Table 1). Before implementing the protocol, nonopioid prescriptions written for patients for each third molar extraction procedure ranged from 0% of patients for complete bony impaction surgery to 10% for soft tissue impaction. After implementing the protocol, nonopioid prescriptions written for patients for each third molar extraction procedure ranged from 67% of patients for surgical extraction to 84% for soft tissue impaction. In the fourth quarter of 2015, 5 of 56 (9%) patients with surgical extraction (CDT code D7210) received postoperative nonopioids compared with 12 of 18 (67%) in the fourth quarter of 2017. In

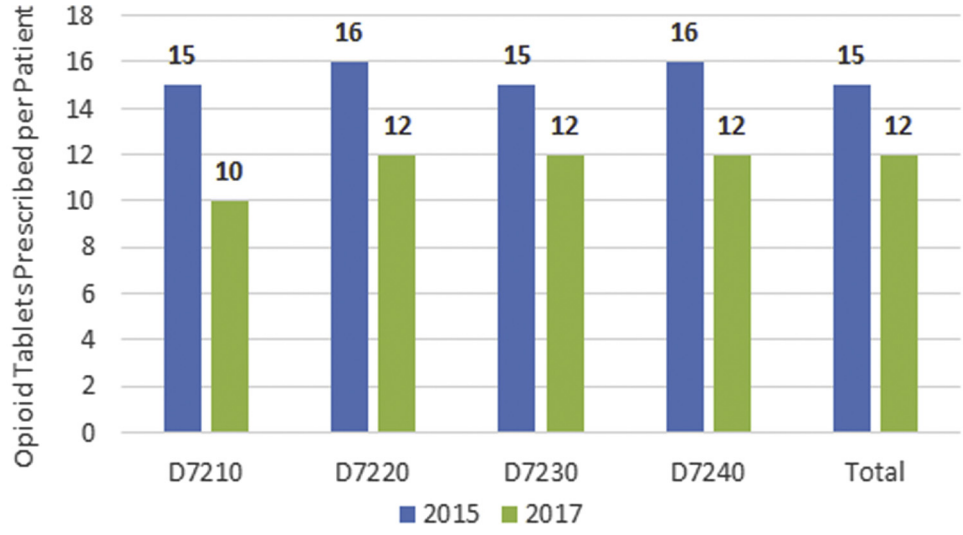


**FIGURE 3.** Median opioid tablet number per patient before and after implementing the protocol.

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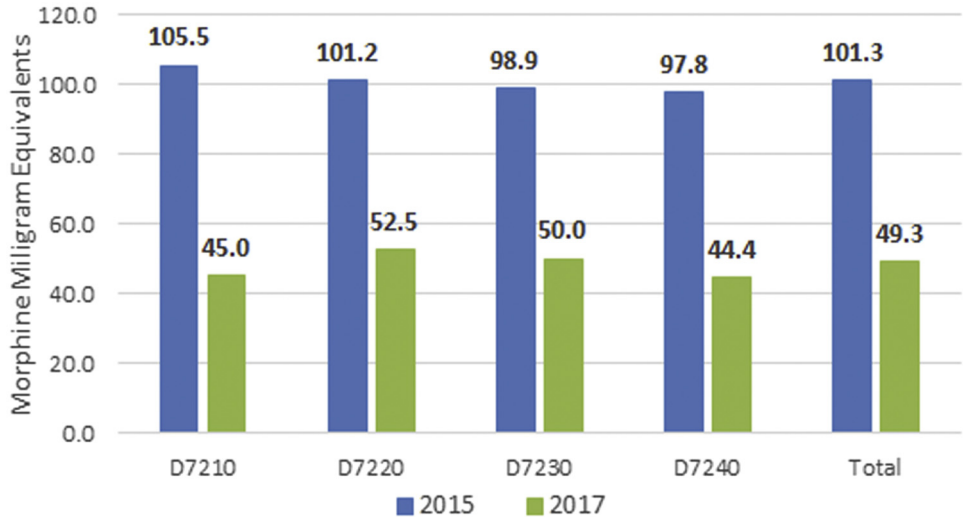


**FIGURE 4.** Morphine milligram equivalents prescribed before and after implementing the protocol.

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the fourth quarter of 2015, 2 of 20 (10%) patients with soft tissue impaction (CDT code D7220) received postoperative nonopioids compared with 26 of 31 (84%) in the fourth quarter of 2017. In the fourth quarter of 2015, 2 of 64 (3%) patients with partial bony impaction (CDT code D7230) received postoperative nonopioids compared with 39 of 48 (81%) in the fourth quarter of 2017. In the fourth quarter of 2015, 0 of 33 (0%) patients with complete bony impaction (CDT code D7240) received postoperative nonopioids compared with 57 of 74 (77%) in the fourth quarter of 2017. Overall, during the fourth quarter of 2015, 9 of 173 (5%) patients received a postoperative nonopioid prescription compared with 134 of 171 (78%) during the fourth quarter of 2017 (Fig 5).

## Discussion

Opioid overdose is the leading cause of injury-related death for adults 25 to 64 years old in the United States.[13] One potential factor related to this mortality might be the increase in opioid prescribing in the United States during the past decade.[14] The availability of prescription opioids has resulted in considerable opioid abuse.[15]

Practitioners, patients, and parents have an increased awareness of the issues related to opioid abuse and diversion. Thus, it is important for clinicians to ensure ideal opioid prescribing practices for acute postoperative pain. The primary objective of this study was to evaluate opioid prescribing patterns after third molar

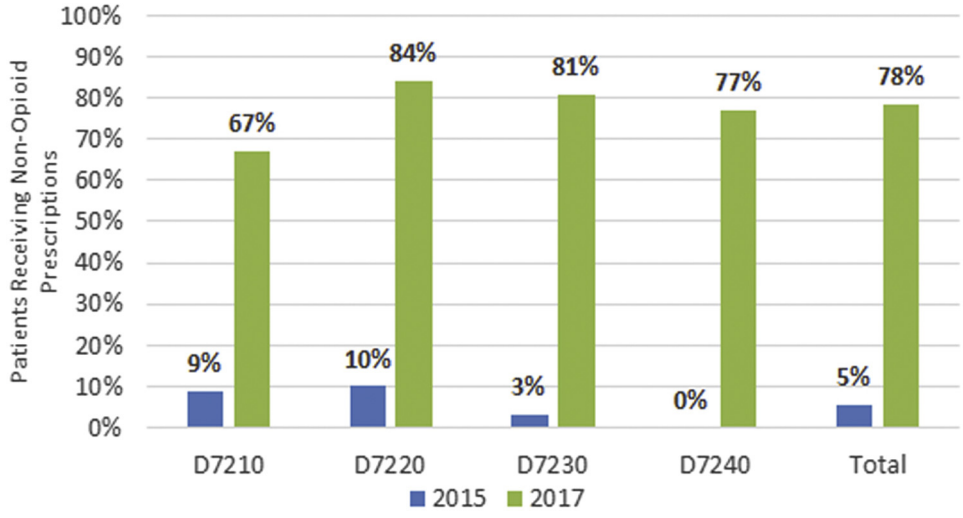


**FIGURE 5.** Percentage of patients receiving nonopioid prescriptions before and after implementing the protocol according to procedure code.

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extraction procedures before and after implementing an opioid prescribing protocol to better understand which specific procedures might benefit from opioid versus nonopioid analgesics. This study shows the successful development and implementation of a designated care pathway. When the opioid prescribing protocol was in place, fewer postoperative opioid prescriptions were written after third molar extraction procedures and more nonopioid analgesics were prescribed. The data also suggest that the protocol decreases the MME prescribed and, as indicated by the observed stasis in daily MME, the authors concur that clinicians are opting to prescribe the same opioid at similar doses but for a shorter postoperative period. This indicates such criteria are an effective guide toward improved practices.

The authors found higher rates of postoperative opioid prescribing and increased prescriber variance before implementing the protocol. This could be a patient-centered variation related to a surgeon's perception that some patients will need more postoperative opioids than others. Variation in prescribing also could be related to a lack of consensus regarding the appropriate use and dosing of opioids and differences in practitioners' perceptions of the standard prescription for a particular procedure. After implementing the protocol, a lower rate of postoperative opioid prescribing and less prescriber variance were noted.

In addition, patients who received opioids had increasing levels of surgical difficulty. The use of opioids in these cases could reflect an expectation of more severe postoperative pain after a more invasive procedure or pain that is further prolonged.

When examining postoperative opioid prescriptions written for patients for each third molar extraction procedure, the authors found that a large percentage of patients with all levels of third molar impaction received opioids before the protocol was implemented. A notably smaller percentage of patients received postoperative opioids after the protocol was implemented. Although postoperative opioid prescriptions decreased after implementing the protocol, patients who received opioids had higher levels of third molar impaction, with the notable exception of surgical extraction procedures (CDT code D7210). This could be a result of the increased surgical difficulty encountered by dental students and first-year residents when extracting erupted third molars that have been in function in older patients for an extended period. In such conditions, these surgical procedures can be longer and more invasive, involving mucoperiosteal flap elevation, bone removal, and tooth division, with the expectation of more severe or prolonged postoperative pain.

When evaluating the number of opioid tablets prescribed for each third molar extraction procedure, the authors found more opioid tablets were prescribed for lower coded third molar extraction procedures and more prescriber variance before implementing the protocol. This could be due to a lack of knowledge about how many opioid tablets are necessary or sufficient to relieve postoperative pain after a particular procedure. Surgeons try to minimize postoperative pain and avoid the inconvenience of an additional clinic visit or a change or refill of a prescription. However, practitioners have the obligation to avoid overprescribing and adequately address patients' postoperative pain. After implementing the protocol, fewer opioid tablets were prescribed for lower CDT coded procedures, less prescriber variance was noted, and patients who received opioids had higher levels of surgical difficulty. This could relate to an overall increased awareness of the opioid epidemic and a general shift toward the use of nonopioid analgesia. The opioid prescribing protocol also involves changes in surgical procedures, including the use of long-acting local anesthetics and pre-emptive analgesia with a nonsteroidal anti-inflammatory drug or acetaminophen before treatment. Presurgical medications have been shown to decrease postoperative pain and lower opioid requirements after third molar extraction.[15-17] In addition, the opioid prescribing protocol involves provider and patient education and routinely incorporates the use of nonopioid analgesics to help manage postoperative pain. Recent evidence has shown that educating surgeons and patients helps set patient expectations about the use of opioids and leads to increased use of nonopioids and fewer opioid prescriptions postoperatively.[18]

After examining the number of opioid tablets prescribed for patients for each third molar extraction CDT code, the authors found a larger median number of opioids tablets prescribed for patients with all levels of surgical impaction before implementing the protocol. This is consistent with prior studies indicating wide variation in opioids prescribed after third molar removal.[19] A notably smaller number of opioid tablets was prescribed for each third molar extraction procedure after implementing the protocol. After implementing the opioid protocol, the median tablet number per prescription decreased from 15 to 12 opioid tablets. This reflects a purposeful decrease in opioid prescribing influenced by the opioid prescribing protocol and routine incorporation of nonopioid analgesics, such as ibuprofen and acetaminophen, for the treatment of acute postoperative pain.

The authors also found that patients undergoing soft tissue impaction third molar extraction procedures require very little, if any, opioid analgesic for postoperative pain. As a function of total postoperative opioid prescriptions written, only 11% of patients with soft tissue impaction received opioids before

implementing the protocol compared with only 14% after implementing the protocol. As a function of total postoperative opioid tablets dispensed, only 10% of opioid tablets were prescribed to patients with soft tissue impaction before implementing the protocol versus 15% after implementing the protocol. A recent study also reported a relatively smaller proportion of opioids dispensed after soft tissue impacted tooth removal versus partial bony or complete bony impacted tooth removal.[20] This could reflect the nature of the soft tissue impacted tooth, which, by definition, is a tooth with the occlusal surface covered by soft tissue. Removing a soft tissue impacted tooth requires only mucoperiosteal flap elevation without removal of tooth structure or bone.

Before implementing the protocol, a lower rate of nonopioid prescribing was noted, with the exception of surgical extraction procedures (CDT code D7210). Higher rates of nonopioid prescribing were noted after implementing the protocol, including for patients with higher levels of surgical difficulty. The increased use of nonopioid analgesics correlated with the marked decrease in postoperative opioid prescribing after implementation of the protocol. This is consistent with evidence showing that a combination of ibuprofen and acetaminophen can provide more effective postoperative analgesia than opioid-containing combinations after third molar removal.[21]

The results of the present study showed that a small percentage of patients with all levels of surgical impaction received postoperative nonopioids before implementing the protocol in 2015. A larger percentage of patients received postoperative nonopioids for all levels of surgical difficulty after implementing the protocol. Although postoperative nonopioid prescriptions increased after implementing the protocol, it is interesting to note that patients received a proportionately large number of nonopioid prescriptions even at higher levels of surgical impaction. This is consistent with the postoperative opioid prescribing protocol, which calls for the use of nonopioid analgesics, including ibuprofen and acetaminophen, as first-line therapy for acute postoperative pain when not contraindicated. Interestingly, preliminary investigations showed no marked increase in after-hours calls, patient return visits, opioid prescription refills, or secondary prescriptions after implementation of the postoperative opioid prescribing protocol. In addition, patient acceptance has been favorable, and patients are increasingly requesting nonopioid analgesics after third molar extraction.

The authors' long-term goal is to develop procedure-specific guidelines for acute postoperative pain management that are safe and effective. The postoperative opioid prescribing protocol supports the careful use of opioids for occasions when pain is sufficiently severe or when a central component for analgesia is required. However, the goal is to target the etiology of pain after third molar extraction that is related to tissue injury and inflammation and typically not the central nervous system. The combination of nonsteroidal anti-inflammatory drugs and acetaminophen is the primary therapeutic strategy for managing acute postoperative pain after third molar extraction. When postoperative opioids are indicated, the protocol calls for practitioners to choose a low-dose, immediate-release, short-acting oral opioid for the shortest duration associated with severe pain. This is supported by current best practice evidence-based research on the use of opioids in pain management.[22,23]

This was a single-center retrospective cross-sectional study of a diverse and heterogeneous patient group involving multiple surgeons at different levels of experience. These factors could influence the reliability of this study. A multicenter prospective study involving more patients and controlled for patient demographics, including age, gender, and race and ethnicity, and provider experience could help identify additional factors influencing opioid prescribing after third molar extraction procedures. In addition, further studies on patient outcomes and patient satisfaction would be useful. The authors are conducting ongoing outcome assessment studies to determine whether the effects seen in this pilot study are long-term and sustainable. The authors also are examining the accuracy and effect of a prescription monitoring program and electronic medical record order-entry systems on opioid prescribing behavior. In addition, they are extending their work with the postoperative opioid prescribing protocol to examine whether patients convert from nonopioids to opioids or require opioid prescription refills to further develop evidence-based treatment strategies to improve clinical outcomes, decrease adverse events, and improve patient satisfaction.

Oral and maxillofacial surgeons and other dentists will play a prominent role in mitigating the opioid crisis. Guidelines that help clinicians manage acute postoperative pain and minimize patient exposure to addictive medication are warranted. An opioid prescribing protocol with procedure-specific guidelines could be helpful in decreasing opioid prescriptions after third molar extraction. The results suggest an acute postoperative pain opioid prescribing protocol leads to fewer opioid prescriptions, less variance in opioid prescribing among practitioners, a decreased number of opioid tablets prescribed per patient, and adequate management of acute postoperative pain after third molar extraction. Further studies will help provide direction for clinicians to adequately treat acute postoperative pain and decrease the amount of opioid doses available for misuse, abuse, and diversion.

## References


1. Rudd RA: Increases in drug and opioid-involved overdose deaths—United States, 2010-2015. MMWR Morb Mortal Wkly Rep 65:1445, 2016
2. Compton WM, Jones CM, Baldwin GT: Relationship between non-medical prescription-opioid use and heroin use. N Engl J Med 374:154, 2016
3. Centers for Disease Control and Prevention: Multiple cause of death, 1999-2015 results. Available at: https://wonder.cdc.gov/controller/datarequest/D77;jsessionid=F60367C4EB3D56812E566F7818CA0177. Accessed March 21, 2018
4. Waljee JF, Brummett CM, Englesbe MJ: Iatrogenic opioid dependence in the United States: Are surgeons the gatekeepers? Ann Surg 265:728, 2017
5. Volkow ND, McLellan TA, Cotto JH, et al: Characteristics of opioid prescriptions in 2009. JAMA 305:1299, 2011
6. Denisco RC, Kenna GA, O'Neil MG, et al: Prevention of prescription opioid abuse: The role of the dentist. J Am Dent Assoc 142: 800, 2011
7. Gupta N, Vujicic M, Blatz A: Opioid prescribing practices from 2010 through 2015 among dentists in the United States. J Am Dent Assoc 149:237, 2018
8. Miech R, Johnston L, O'Malley PM, et al: Prescription opioids in adolescence and future opioid misuse. Pediatrics 136: 1169, 2015
9. McCabe SE, West BT, Boyd CJ: Leftover prescription opioids and non-medical use among high school seniors: A multi-cohort national study. J Adolesc Health 52:480, 2013
10. Bicket MC, Long JJ, Pronovost PJ, et al: Prescription opioid analgesics commonly unused after surgery: A systematic review. JAMA Surg 152:1066, 2017
11. Gomes T, Mamdani MM, Dhalla IA, et al: Opioid dose and drug-related mortality in patients with nonmalignant pain. Arch Intern Med 171:686, 2011
12. Nadeau R, Tu HK, Hasstedt K, et al: Addressing the opioid epidemic: Impact of opioid prescribing protocol at the University of Minnesota School of Dentistry. Craniomaxillofac Trauma Reconstr 11:104, 2018
13. Puja S, Scholl L, Rudd RA, et al: Overdose deaths involving opioids, cocaine, and psycho-stimulants—United States, 2015-2016. MMWR Morb Mortal Wkly Rep 67:349, 2018
14. Manchikanti L, Singh A: Therapeutic opioids: A ten-year perspective on the complexities and complications of the escalating use, abuse, and non-medical use of opioids. Pain Physician 11:S63, 2008
15. Rudd RA, Aleshire N, Zibell JE, et al: Increase in drug and opioid overdose deaths—United States 2000-2014. MMWR Morb Mortal Wkly Rep 64:1378, 2016
16. Joshi A, Parara E, Macfarlane TV: A double-blind randomized controlled clinical trial of the effect of preoperative ibuprofen, diclofenac, paracetamol with codeine and placebo tablets for relief of postoperative pain after removal of impacted third molars. Br J Oral Maxillofac Surg 42:299, 2004
17. Nayyar MS, Yates C: Bupivacaine as pre-emptive analgesia in third molar surgery: Randomized controlled trial. Br J Oral Maxillofac Surg 44:501, 2006
18. Gordon SM: Translating science into the art of acute pain management. Compendium 28:248, 2007
19. Hill MV, Stucke RS, McMahon ML, et al: An educational intervention decreases opioid prescribing after general surgical operations. Ann Surg 267:468, 2018
20. Mutlu IM, Abubaker AO, Laskin DM: Narcotic prescribing habits and other methods of pain control by oral and maxillofacial surgeons after impacted third molar removal. J Oral Maxillofac Surg 71:1500, 2013
21. Baker JA, Avorn J, Levin R, et al: Opioid prescribing after surgical extraction of teeth in medicaid patients, 2000-2010. JAMA 315: 1653, 2016
22. Moore PA, Hersh EV: Combining ibuprofen and acetaminophen for acute pain management after third molar extractions. J Am Dent Assoc 144:898, 2013
23. Dowell D, Haegerich TM, Chou R: CDC guideline for prescribing opioids for chronic pain—United States, 2016. MMWR Morb Mortal Wkly Rep 65:1, 2016