Postoperative Opioid Prescribing After Female Pelvic Medicine and Reconstructive Surgery

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Objective: This study aimed to provide female pelvic medicine and reconstructive surgery (FPMRS) providers with evidence-based guidance on opioid prescribing following surgery.

Methods: A literature search of English language publications between January 1, 2000, and March 31, 2021, was conducted. Search terms identified reports on opioid prescribing, perioperative opioid use, and postoperative pain after FPMRS procedures. Publications were screened, those meeting inclusion criteria were reviewed, and data were abstracted. Data regarding the primary objective included the oral morphine milligram equivalents of opioid prescribed and used after discharge. Information meeting criteria for the secondary objectives was collected, and qualitative data synthesis was performed to generate evidence-based practice guidelines for prescription of opioids after FPMRS procedures.

Results: A total of 6,028 unique abstracts were identified, 452 were screened, and 198 full-text articles were assessed for eligibility. Fifteen articles informed the primary outcome, and 32 informed secondary outcomes.

Conclusions: For opioid-naive patients undergoing pelvic reconstructive surgery, we strongly recommend surgeons to provide no more than 15 tablets of opioids (roughly 112.5 morphine milligram equivalents) on hospital discharge. In cases where patients use no or little opioids in the hospital, patients may be safely discharged without postoperative opioids. Second, patient and surgical factors that may have an impact on opioid use should be assessed before surgery. Third, enhanced recovery pathways should be used to improve perioperative care, optimize pain control, and minimize opioid use. Fourth, systemic issues that lead to opioid overprescribing should be addressed. Female pelvic medicine and reconstructive surgery surgeons must aim to balance adequate postoperative pain control with individual and societal risks associated with excess opioid prescribing.

Key Words: postoperative opioid, opioids, female pelvic medicine and reconstructive surgery, opioid prescribing, gynecologic surgery, postoperative pain control, perioperative care

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Appropriate postoperative pain control is critical to providing high-quality surgical care, as pain control affects patient satisfaction and [1] postoperative healing[2] and is expected to affect health care reimbursement as models move toward value-based care.[3] Opioid medications are frequently used as part of a postoperative pain control regimen; however, there are well-recognized risks associated with inappropriate opioid prescribing and use.[4] In this complex clinical landscape, surgeons must seek to understand and balance the risks and benefits of opioid prescribing to optimize patient care.

Although opioids are routinely prescribed after pelvic reconstructive surgery, there is no current consensus on best practices. Given the frequency of opioid prescribing and the inherent risks associated with opioid misuse, evidence-based guidance is needed to fill this gap. The target audience for this document is female pelvic medicine and reconstructive surgery (FPMRS) perioperative care providers. The target patient is any patient undergoing FPMRS procedures who is under consideration to be discharged home with an opioid prescription.

This document uses the term *opioid(s)* to refer to the drugs most commonly prescribed after surgery: hydrocodone-acetaminophen, oxycodone-acetaminophen, oxycodone, codeine, hydromorphone, and morphine. When appropriate, the dose has been converted to oral morphine milligram equivalents (MME). For example, 5 tablets of 5 mg of oxycodone are equivalent to 37.5 MME, 10 tablets of 5 mg of oxycodone are equivalent to 75 MME, and 15 tablets of 5 mg of oxycodone are equivalent to 112.5 MME.

PURPOSE

The primary purpose of this Clinical Practice Statement is to inform FPMRS perioperative care providers of best practices in postoperative opioid prescribing by summarizing published data and providing expert consensus on the strength of this literature. The secondary purpose of this Clinical Practice Statement is to identify patient- and surgical-level factors and evidence-based interventions that may have an impact on the amount of opioid required for adequate pain control. Finally, we offer suggestions for systems-level improvements that may mitigate the opioid crisis and recommendations for future research.

This document is not intended to cover all gynecologic surgical procedures; it addresses the FPMRS subspecialty. In addition, although we discuss prior opioid use in patients as a risk factor for increased postoperative opioid use, the primary framework for this document is opioid-naive patients.

HEALTH CARE BURDEN

Global Opioid Burden

The opioid crisis is an epidemic of global proportions. In the United States alone, opioid misuse claimed the lives of approximately 450,000 individuals between 1998 and 2018, and these drugs continue to kill more than 50,000 people per year.[5] Opioid-related mortality is the leading cause of unintentional death in the United States.[6] Although many factors drive this epidemic, physicians and surgeons overprescribing these medications are likely a significant contributor.[7] In 2017, more than 191 million opioid prescriptions were written to patients in the United States (population of approximately 300 million). Importantly, the number of opioid pills prescribed after surgery is heterogeneous, differing considerably

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by geographic region and health care provider factors, rather than being evidence-based.[8]

Excess opioids prescribed after surgery are a primary source of opioid diversion, so these pills pose risks to patients, family members, and the broader community. The number of opioids prescribed after surgery is directly and independently linked to increasing number of opioids consumed by patients,[9,10] and postoperative opioid use increases risk of persistent opioid use.[11–13] Furthermore, the adverse physiologic effects of opioids are well documented, including respiratory depression, ileus, immunosuppression, altered mentation, fall related injury, and paradoxical opioid-induced hyperalgesia.[14]

Opioid Burden in Gynecology and Female Pelvic Medicine and Reconstructive Surgery

Opioids are routinely prescribed after low-risk gynecologic surgery,[15] but up to 80% of postoperatively prescribed opioids go unused.[16] Studies specific to FPMRS demonstrate overprescribing,[17–19] and less than 33% of prescribed opioids are used postoperatively.[20–25] These unused opioids can be misused by patients, lead to accidental exposure, or be diverted or abused by someone other than the prescribed recipient. However, lack of evidenced-based guidelines specific to FPMRS procedures contributes to a knowledge gap that may favor excess opioid prescribing.

METHODS

General Methods

For the purpose of the primary guidance statement, the population evaluated was patients undergoing FPMRS procedures. The intervention was surgery classified as a pelvic reconstructive surgery to include vaginal, robotic, or open hysterectomy with prolapse repairs, +/− mesh, and +/− surgery for urinary incontinence to include midurethral sling, urethral bulking, or placement of sacral neuromodulation device. Because this was a review of literature to guide evidence-based prescribing after surgery, there was no comparator group. The outcome is the optimum number of opioids prescribed after FPMRS procedures. We reviewed English language, published randomized and nonrandomized prospective trials, and prospective and retrospective cohort studies with and without comparator groups, of women 18 years or older who reported the amount of opioid used after pelvic reconstructive surgery. The amount of opioid used was reported in average oral MME after being discharged to home. Papers were excluded if they only included amount of opioid prescribed (not amount used), pharmacokinetic data, and animal models or if they were not published in English. Studies for which data were only reported in abstracts were also excluded. We did not include studies that reported exclusively on postoperative opioid use after general gynecologic procedures if a concomitant reconstructive procedure was not performed. For example, studies that reported on opioid use status after hysterectomy were not included, but studies that reported on hysterectomy with vaginal apical suspension were included. However, for the purposes of secondary guidance statements, retrospective studies, case series, and literature from general gynecology, gynecologic oncology, and other surgical specialties were also referenced when appropriate.

Literature Searches

A structured search of literature published in English from January 1, 2000, to March 31, 2021, was conducted in PubMed, Embase, MEDLINE, and other sources (Cochrane Library, TRIPdatabase.com, UpToDate, and Google Scholar). This search was repeated 2 additional times because of the rapid evolution of data in this area, and these cover April 1, 2020, and December 31, 2020. We used the terms *opioid use* and *pelvic reconstructive surgery* and combined Medical Subject Headings (MeSH) and text terms searched in the title. An advanced search was performed with the search algorithm detailed in (Appendix A, Supplemental Digital Content 1, http://links.lww.com/FPMRS/A265). We performed and reported this review in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines (Appendix B, Supplemental Digital Content 2, http://links.lww.com/FPMRS/A266).

Two authors independently screened titles and abstracts of studies identified by the search strategy described previously to assess potential eligibility for inclusion. Each potentially relevant article was then reviewed for eligibility by 2 writing group members. Any disagreements on abstract or full-text articles were resolved by a third reviewer or during video meetings as a group. References cited in the articles identified by the initial search were also reviewed to identify additional publications that met our objectives. All studies meeting inclusion and exclusion criteria for the primary guidance were examined for data and included if appropriate. A writing group member used the full-text article to extract author name, study type, population, comparison population (if applicable) intervention, and type and quantity of opioid used (Table 1). This information was applied to either the primary or secondary objective of this guidance document, as appropriate.

Data Synthesis, Assessing Evidence, and Grading Recommendations

Meta-analysis was not appropriate for either the primary or secondary objectives of this guidance document because of the heterogeneity of the patient populations, surgical procedures, and opioid use reporting methods. Therefore, study results were summarized, and consensus was reached by writing group members. Strength of evidence was assessed using Oxford Centre for Evidence-Based Medicine levels (A, B, C, D, or X), and each recommendation was given a grade based on this system. The strength of each recommendation was based on the American Academy of Otolaryngology—Head and Neck Surgery system, which was developed from the American Academy of Pediatrics[36] (Table 2).

For the guidance document's secondary objective, we evaluated patient-level factors, including surgery classification (major vs minor), use of enhanced recovery after surgery (ERAS) pathways, opioid naivety, demographics, and other medical comorbidities that may contribute to postoperative opioid prescribing recommendations. The data were summarized, and qualitative recommendations were reached by group consensus.

RECOMMENDATIONS

Primary Objectives

1a. For most opioid-naive patients undergoing pelvic reconstructive surgery, we strongly recommend surgeons to provide no more than 15 tablets of opioids (roughly 112.5 MME) on hospital discharge. Strong recommendation based on grade B aggregate evidence for treatment effect, with a preponderance of benefit over harm.

The search process identified 15 unique articles that informed on this recommendation, and these studies are summarized as follows and in Table 1.

In 2016, Swenson et al[20] first addressed the knowledge gap in postoperative opioid prescribing among FPMRS patients. Women who underwent a qualifying reconstructive surgical procedure and had not experienced a postoperative complication were contacted

TABLE 1. Studies Evaluating Opioid Prescribing and Postoperative Use After Female Pelvic Reconstructive Surgery

Study	Sample Size	Study Design	Methods	Amount of Opioid Prescribed	Amount of Opioid Used
Swenson et al[20]	50 Women	Observational cohort Vaginal or robotic prolapse surgery	Telephone contact at 2 wk	Median of 40 tabs of various opioids (IQR, 35–60)	Median of 13 tablets of various opioids (IQR, 1–30 tablets)
Reagan et al,[26] Ramaseshan et al[23]	68 Women in multimodal treatment arm	Randomized trial of multimodal vs usual care Vaginal, abdominal, or robotic prolapse surgery Excludes patients with chronic pain or opioid use	Telephone contact at 7–9 d postoperative	50 Tablets of various opioids	Mean of 121.3 ± 103.7 mg MME among those who needed opioids 34.8% of Patients used no opioids 30 Tablets sufficient for 75% of patients
Linder et al[21]	97 Women, 39 after implementation of restrictive opioid prescribing	Prospective observational cohort Vaginal, abdominal, or robotic prolapse surgery Excludes those with baseline opioid use or mesh excision for pain	Telephone contact at 2 wk	200 mg MME (IQR, 150–225 mg MME) before intervention 112.5 mg MME (IQR, 22.5–112.5 mg MME) postintervention	Preintervention: 15 mg MME (0–106 mg MME) Postintervention: 7.5 mg MME (0–75 mg MME) 15 Tablets sufficient for 80% of patients
Ramaseshan et al[27]	113 Women	Prospective observational cohort Open, vaginal, laparoscopic prolapse surgery Excluded those with baseline opioid use	Telephone contact at 1 wk and between 4 and 6 wk postoperative	15 Tablets of 5 mg oxycodone (112.5 mg MME) or 2 mg hydromorphone (120 mg MME)	Median of 24 mg MME (IQR, 0–82 mg MME), <4 tablets of 5 mg oxycodone Roughly 75% of patients used 11 or fewer tablets 10.6% Refill rate 29.2% of Patients used no opioids postdischarge
Davidson et al[28]	118 Women (59 in each study arm)	Randomized controlled trial, routine or reduced opioid prescription Apical prolapse surgery—robotic or vaginal Excluded those with chronic pain, baseline opioid use, Pain Catastrophizing Scale score of >75%, or SDD	Daily self-reported diary entries	Randomized to routine (28 tablets of 5 mg oxycodone, 210 mg MME) or reduced (5 tablets of 5 mg oxycodone, 37.5 mg MME)	Routine arm—median of 3 tablets of oxycodone (IQR, 0–14 tablets) Reduced arm—median of 1 tablet of oxycodone (IQR, 0–3 tablets) 93% were satisfied with pain control and satisfaction with pain control was noninferior 2% (Routine) vs 15% (reduced) refill rate
Petrikovets et al[29]	63 Women (ICE-T arm, 30; standard care arm, 33)	Randomized controlled trial, ICE-T protocol vs standard care Vaginal pelvic reconstructive surgery (89% included apical suspension) ICE-T: scheduled ice packs, Tylenol, and Toradol, with IV hydromorphone for breakthrough pain Standard care: as-needed ibuprofen, as-needed acetaminophen/oxycodone, and IV hydromorphone for breakthrough pain Excluded those with chronic pelvic pain, baseline analgesic use	Telephone contact 96 h after discharge	ICE-T arm: none	ICE-T arm: 4.9 tablets ketorolac, no opioid use Standard arm: 4.6 tablets oxycodone
Solouki et al[24]	183 Women, 84 before restrictive prescribing and 99 after implementation	Retrospective cohort Prolapse or anti-incontinence procedures Major or minor procedures Excluded those with baseline opioid use	Telephone contact at 30 d	Preintervention: mean of 108.5 mg MME (14.5 tablets) Postintervention: mean of 75 mg MME (10 tablets)	Preintervention: mean of 75 mg MME (10 tablets) Postintervention: mean of 22.5 mg MME (3 tablets) Refill rate 11% vs 7% postintervention

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TABLE 1. *(Continued)*

Study	Sample Size	Study Design	Methods	Amount of Opioid Prescribed	Amount of Opioid Used
Hota et al[22]	57 women	Prospective observation cohort Prolapse or anti-incontinence procedures Major or minor procedures Included patients with anxiety, depression, or chronic pain	Office visit at 14 d postoperative	Major rx: 30 various opioids Minor rx: 10–15 various opioids 66% had excess tablets	Laparoscopic/robotic median of 2.5 tablets used (IQR, 0–10 tablets) Vaginal median of 2 tablets used (IQR, 1–12 tablets) Midurethral sling median of 6 tablets used (IQR, 5–10 tablets)
Moskowitz et al[30]	82 Before intervention, 67 postintervention	Retrospective cohort followed by prospective observational group Sacral neuromodulation, midurethral sling, prolapse repair Excluded those with baseline opioid use	Telephone contact 14–56 d postoperative	Preintervention: mean of 94.2–170.6 mg MME Postintervention: mean 50.6–101.1 mg MME	Mean mg MME used postintervention: SNM, 35; MUS, 18.5; prolapse repair, 47.9 Refill rate: 2.4% vs 6% postintervention
Ackenbom et al[31]	80 Women	Secondary analysis of prospective cohort Robotic, laparoscopic, vaginal prolapse surgery	Daily self-reported diary entries 7 d postoperative	Of women who filled and opioid prescription, the median was 225 mg MME (IQR, 150–225 mg MME)	Median MME, 30 (IQR, 7.5–65.75), which equates to 4 (IQR, 1–9) 5 mg oxycodone tablets 8 Tablets (5 mg oxycodone) were sufficient for 75% of patients Opioid use primarily occurred in first 3 postoperative days
Leffelman et al[32]	75 Women	Prospective observational cohort Ambulatory surgery Midurethral sling, anterior or posterior prolapse repair, benign adnexal surgery Excluded those with baseline opioid use or chronic pain diagnosis	Telephone contact at 3 d and 1 wk postoperative	Mean of 70.6 mg MME (range, 0–150 mg MME) Mean of 14.3 tablets of various opioids	Mean of 19.5 mg MME (3.9 tablets) 75% of Patients used 6 or fewer tablets within 7 d of surgery
Shah et al[33]	29 Women (therapeutic suggestion arm, 15; control arm, 14)	Randomized controlled trial; therapeutic suggestion vs control Vaginal hysterectomy with laparoscopic or robotic sacrocolpopexy Excluded those with chronic pain diagnosis	Postoperative hospitalization and self-reported outpatient medication log through 14 d postoperative	Not reported	Intervention group: median, 52.5 mg MME (IQR, 25.5–58.9 mg MME); 2 d (IQR, 1–4 d) Control group: median, 66 mg MME (IQR, 7.3–125.8 mg MME); 2.5 d (IQR, 1–6 d)
Evans et al[34]	72 Women (liposomal bupivacaine arm, 36; control arm, 36)	Randomized controlled trial; liposomal bupivacaine vs normal saline placebo injection Posterior colporrhaphy and perineorrhaphy, concomitant minimally invasive FPMRS surgery included (vaginal, laparoscopic/robotic) Excluded those with chronic pain disorder, regional anesthesia, daily opioid consumption for more than 3 wk	Self-reported medication log through 3 d postoperative	Not reported	Liposomal bupivacaine group: 22.5 mg MME (IQR, 45 mg) Placebo group: 22.5 mg MME (IQR, 60 mg)
Buono et al[35]	146 Women	Randomized trial of preoperative educational handout vs usual care Vaginal, abdominal, or robotic/laparoscopic prolapse surgery	Patient reported consumption at 2 and 6 wk postoperative visit	20 Tablets of oxycodone	Median of 2 tablets of oxycodone 40% of Patients used 0 tablets 8% Refill rate

FPMRS, female pelvic medicine and reconstructive surgery; ICE-T, ice packs and Tylenol; IQR, interquartile range; IV, intravenous; MME, oral morphine milligram equivalents; MUS, midurethral sling; rx, prescription; SDD, same-day discharge; SNM, sacral neuromodulation.

TABLE 2. Grading and Recommendations

	Grade	Strength of Recommendation
1a. For most opioid-naive patients undergoing pelvic reconstructive surgery, surgeons should provide no more than 15 tablets of opioids (roughly 112.5 MME) on hospital discharge	Grade B aggregate evidence (randomized controlled trials with limitations and cohort studies)	Strong recommendation, for treatment effect, with a preponderance of benefit over harm
1b. Patients who used no opioids during their hospitalization may be discharged without an opioid prescription	Grade B aggregate evidence (randomized controlled trials with limitations and cohort studies)	Recommendation, for treatment effect, with a preponderance of benefit over harm
2. Patient and surgical factors that may impact opioid prescribing should be assessed before surgery	Grade C aggregate evidence (nonrandomized or controlled studies including case-control and observational)	Recommendation, for treatment effect, with a preponderance of benefit over harm
3. Use enhanced recovery pathways to improve perioperative care, optimize perioperative pain control, and minimize opioid use	Grade A aggregate evidence (systematic reviews and randomized controlled trials with and without limitations)	Strong recommendation, for treatment effect, with a preponderance of benefit over harm
4. Address systemic issues that lead to opioid overprescribing and increased risk of diversion/abuse	Grade B aggregate evidence (randomized trials or observational studies with dramatic effects of highly consistent evidence)	Strong recommendation, for treatment effect, with a preponderance of benefit over harm

Strength of evidence was assessed using Oxford Centre for Evidence-Based Medicine levels (A, B, C, D, or X), and each recommendation was given a grade based on this system. The strength of each recommendation was based on the American Academy of Otolaryngology—Head and Neck Surgery system, which was developed from the American Academy of Pediatrics.[36]

MME, oral morphine milligram equivalents.

by telephone on postoperative day 14 regarding pain and narcotic use. The median amount of opioid prescribed was 40 tablets, and the median number of tablets used was 13. A total of 75% of patients used ≤30 tablets. The authors demonstrated significant positive associations between the number of prescribed postoperative opioids and both a chronic pain diagnosis and preoperative opioid use.

The following year, Reagan et al[26] assessed the impact of a multimodal pain regimen versus usual care in patients undergoing pelvic reconstructive surgery who required an overnight hospital stay. Results showed that patients who received multimodal care were more likely to require no opioids at home (34.8% vs 10.6%, $P = 0.001$), and there were no between group differences among patients who used opioids postoperatively. An average of 30 tablets (equal to 225 MME when oxycodone used) was used after discharge. This was one of the first large randomized trials to assess opioid use after FPMRS procedures, and at this time, it was standard to discharge patients with larger amounts of narcotics. Subsequent trials (detailed as follows) have found lower amounts to be adequate for the purposes of pain control and patient satisfaction. A secondary analysis of the multimodal group's postdischarge opioid use by Ramaseshan et al[23] found no difference in postdischarge opioids according to surgical approach (abdominal, vaginal, or laparoscopic), but a linear relationship was observed between in-hospital opioid use and subsequent postdischarge use.

Linder et al[21] prospectively surveyed patients 2 weeks after major reconstructive surgery and determined prescribing recommendations to support the opioid needs of 80% of the patients in each surgical approach (vaginal, abdominal, or robotic), and these were 15 (112.5 MME), 15 (112.5 MME), and 18 tablets (135 MME) of 5 mg of oxycodone, respectively. After implementation of a postoperative prescribing protocol, total opioid prescribing decreased by 45%. Median MME used by patients after discharge was 7.5 mg (interquartile range [IQR], 0–75), and only the MME used during the hospital stay was predictive of MME used after discharge. Although the new prescribing guidelines in this study resulted in an 18% refill request rate (up from 3.5% at baseline), this did not adversely affect patient satisfaction with postoperative pain management. Notably, patients who used no opioids during their hospitalization were discharged without an opioid prescription, and none needed a rescue prescription.

Ramaseshan et al[27] recruited 113 patients undergoing inpatient reconstructive surgery and implemented a multimodal pain control protocol, which universally prescribed 15 tablets of either 5 mg of oxycodone (112.5 MME) or 2 mg of hydromorphone (120 mg MME). Results showed that median postoperative use was 24 mg of MME (<4 tablets of 5 mg of oxycodone). This figure included the 29% of patients who used no opioids after discharge, and roughly 75% of patients required 11 or fewer oxycodone tablets. The authors reported that 89% of patients felt that the amount prescribed was sufficient, and the refill rate was 10.6%. There was no association between postdischarge opioid use and inpatient opioid use, preoperative pain scores, or activity levels.

Ackenbom et al[31] published secondary analyses of a prospective cohort of women 60 years and older who underwent major prolapse surgery and reported use of a median (total of inpatient and outpatient use) of 30 MME (IQR, 7.5–66 MME) after surgery. Eight tablets of 5 mg of oxycodone were sufficient to cover outpatient opioid use of 75% of patients, and home postoperative opioid use was significantly associated with same-day discharge. The authors also reported that most opioid consumption occurred within the first 3 postoperative days.

Davidson et al[28] randomized patients undergoing major pelvic reconstructive surgery to routine (28 tablets, 187.5 MME) versus reduced (5 tablets, 37.5 MME) prescribing of 5 mg of oxycodone after discharge from an overnight stay. Importantly, high-risk opioid patients, such as those with chronic pain, preoperative opioid users, and those with high scores on psychometric testing, were excluded from this study. Both prescribing groups had low median opioid use (3 vs 1 tablets) of 5 mg of oxycodone, and inpatient opioid use predicted postdischarge use. The reduced opioid arm had a 15% refill request rate, and satisfaction with pain control between groups was noninferior.

Petrikovets et al[29] randomized patients undergoing vaginal pelvic reconstructive surgery to an opioid-sparing multimodal postoperative pain regimen ("ICE-T"; scheduled ice packs and Tylenol, with as needed intravenous hydromorphone for breakthrough pain

and ketorolac) versus a standard pain regimen (as needed ibuprofen, as needed acetaminophen/oxycodone, as needed intravenous hydromorphone for breakthrough pain). The ICE-T regimen improved pain control the morning after surgery and 96 hours postoperatively with no differences in satisfaction between groups. After discharge, patients in the ICE-T arm used no opioids, whereas the standard group used an average of 4.6 tablets of oxycodone/acetaminophen (34.5 MME). There were no requests for opioid prescriptions after discharge among ICE-T patients.

Shah et al[33] conducted a randomized controlled trial evaluating the impact of therapeutic suggestion versus routine care on postoperative pain control. The study included 29 women undergoing vaginal hysterectomy with laparoscopic or robotic sacrocolpopexy. There was no difference in postoperative pain or analgesic use between the study groups, and opioid use in both arms was low. The median total opioid use (inpatient and self-reported outpatient use through postoperative day 14) was 52.5 mg MME for the intervention group and 66 mg MME for the control group.

Evans et al[34] conducted a randomized, placebo-controlled trial evaluating the impact of local liposomal bupivacaine injection during posterior colporrhaphy and perineorrhaphy on postoperative pain scores and opioid use. The study included women undergoing concomitant surgery via vaginal or laparoscopic/robotic approach. Notably, local analgesic injection during the posterior repair was not associated with a significant difference in pain score or opioid use. Both groups had low opioid requirements in the 72 hours after hospital dismissal (median, 22.5 mg MME in each group).

Buono et al[35] performed a randomized controlled trial of 146 women undergoing major or minor pelvic reconstructive surgery to assess the impact of a preoperative educational handout on postoperative opioid consumption. All patients received a standardized opioid prescription (generally 20 tablets of 5 mg of oxycodone). No difference was seen in opioid consumption between the educational handout group and the control group. Overall postdischarge opioid consumption was low in the study, with median MME consumption reported as 22.5 for native tissue apical reconstruction, 15.0 for mesh-augmented apical reconstruction, 0 for colpocleisis, and 7.5 for isolated colporrhaphy. Importantly, 40% of participants denied postoperative opioid consumption. Eight percent of patients received an opioid prescription refill. High consumers of postoperative opioids were younger, more likely to have a chronic pain condition, and less likely to have been prescribed ibuprofen preoperatively.

Solouki et al,[37] Hota et al,[22] Moskowitz et al,[30] and Leffelman et al[32] followed patients prospectively for opioid use after both major and minor (eg, midurethral urethral sling, sacral neuromodulation) FPMRS procedures. The heterogeneity of these studies creates challenges for summarizing results for opioid use, but they reported mean and median postoperative usage of less than 10 to 15 tablets for major surgery and less than 5 to 10 tablets for minor surgery. Where data were available, medication refill rates were between 6% and 13%.

Overall, data from the studies reviewed previously indicate that most patients without comorbid pain who undergo pelvic reconstructive surgery will use the equivalent of approximately 15 tablets of 5 mg of oxycodone (112.5 mg MME) or less after hospital discharge. However, lower prescribing may result in higher postdischarge refill rates of 10.6% to 18%.[21,27,28,37] Although refills may be inconvenient for patients, we believe that this is preferable to larger initial prescriptions because of the potential for misuse, diversion, or improper disposal of excess drug.

It is important to emphasize that many of the prospective trials that evaluated opioid use excluded patients who may require higher levels of opioids (see exclusion criteria in Table 1). In these cases, additional individualization of opioid prescribing may be needed. These and other factors that may affect postoperative opioid needs are discussed hereinafter as part of the secondary objectives of this guidance document.

1b. Patients who used no opioids during their hospitalization may be discharged without an opioid prescription. Recommendation based on grade B aggregate evidence for treatment effect, with a preponderance of benefit over harm.

Many studies have reported associations between the amount of in-hospital opioid use and postdischarge use, and this information can help guide discharge prescribing.[21,23,28] It is reasonable to eliminate outpatient opioid prescribing for patients with low or no opioid use during hospitalization.[21,27,29] At this time, published evidence supports discharging patients without opioids if they have not required opioids to manage postoperative pain while in the hospital.

Secondary Objectives: Recommendations Based on Analysis of Patient- and Surgery-Related Variables

2. Patient and surgical factors that may impact opioid prescribing should be assessed before surgery. Recommendation based on grade C aggregate evidence (nonrandomized or controlled studies including case-control and observational), for treatment effect, with a preponderance of benefit over harm.

There are factors that may affect the number of opioids used by an individual patient after FPMRS procedures. Several recent studies provide insight into these factors and how they can help guide opioid prescribing practices. For example, multiple studies have demonstrated that increasing age is associated with both lower reported pain and opioid use.[31,38–42] Given the increased risk of opioid-related adverse events in elderly patients such as falls, respiratory depression, and cognitive changes, judicious prescribing is especially appropriate in this population.

Studies in general gynecologic surgery show associations between increased postoperative opioid use and endometriosis, centralized or overall body pain, chronic pain, preoperative opioid use, anxiety and depression, pain catastrophizing, anticipated postoperative pain, and other psychosocial factors.[32,37,43–46] These factors are likely transferable to FPMRS patients, leading many authors to exclude patients with these factors from opioid use studies (see exclusion criteria in Table 1). These exclusion criteria reduce heterogeneity, but they also limit the generalizability of study findings. Other gynecologic surgical factors associated with increasing opioid use include laparotomy and increasing uterine weight, and these too may be applicable to FPMRS patients.[44]

Studies specific to FPMRS have confirmed increased postoperative opioid use in patients with chronic pain and history of preoperative opioid use[20] and in patients who used more opioids during their hospitalization.[21,23] In a recent study, Willis-Gray et al[47] analyzed a large population-based cohort of 217,460 opioid-naive women undergoing FPMRS procedures using a database of commercially insured patients. Seventy-seven percent of all patients included filled an opioid prescription with a median quantity of 30 tablets (IQR, 20–30 tablets). In regression analysis, factors that were significantly associated with filling of a prescription included younger age, hysterectomy, mesh use, and prolapse surgery with or without stress incontinence surgery. Importantly, rates of continuously refilled opioid prescriptions were low at 0.06% at 180 days postoperatively and 0.04% at 1 year after surgery.[47] Screening for these comorbid conditions preoperatively may help surgeons to tailor

preoperative education and postoperative opioid prescriptions to an individual patient's needs.

The amount of opioid used after FPMRS procedures may be associated to the route of surgery used, but available data remain inconsistent on this question. In a retrospective cohort examining inpatient pain scores, opioids prescribed at discharge, and opioid refills, patients who underwent endoscopic surgery were prescribed the lowest number of MME at discharge (but had similar refill rates), followed by patients who underwent vaginal and open surgery, respectively.[18] Although this study examined prescribed MME, other reports evaluated the self-reported amount of opioid that was used postoperatively.[22,23] In secondary analyses of a randomized trial, no difference was observed in opioids used after discharge among abdominal, vaginal, and laparoscopic reconstructive surgery. However, this study was not powered to examine the impact of route of surgery on opioid use. A prospective quality improvement study found increased opioid use after discharge among patients who underwent laparotomy (median, 23 tablets) compared with those who underwent laparoscopic/robotic surgery (median, 2.5 tablets) or vaginal surgery (median, 2.0 tablets).[22] Although these data suggest that laparotomy may be a factor in increased opioid need postoperatively, many pelvic reconstructive cases are now performed vaginally or laparoscopically/robotically. When an open case is planned, alternative options, such as total intravenous anesthesia,[48] regional blocks, and/or use of liposomal bupivacaine,[49] could prevent the need for excessive opioid prescribing after surgery.

Data on the impact of concomitant procedures within FPMRS are also mixed. In the Leach et al[18] retrospective cohort study, within group comparisons of the vaginal surgery group (n = 1,345 patients) revealed that inpatient pain scores were lower in patients undergoing vaginal surgery with 0 versus 1 or more concomitant procedures. Despite this finding, there was no difference by concomitant procedures in the number of opioids prescribed or in the rate of refills.[18] Similarly, a large study of a national insurance claims database found that additional vaginal repairs (beyond apical support) were associated with increased odds of a new postoperative pain diagnosis 1 to 7 months after surgery.[42] Another retrospective cohort noted that midurethral sling was predictive of opioid administration in the immediate postoperative period.[38] In a telephone administered survey of postdischarge opioid use, investigators noted that only posterior repair at the time of prolapse surgery was associated with increased opioid use.[30] However, an observational study of women who were surveyed regarding postdischarge opioid use after FPMRS procedures reported that posterior repair was 1 of 3 procedures with the greatest discrepancy between opioids prescribed versus used (15 prescribed vs 10 used).[37] The latter observation suggests that FPMRS specialists may still overestimate the need for opioids in the setting of certain procedures that are considered more painful (Table 3).

3. Use enhanced recovery pathways to improve perioperative care, optimize perioperative pain control, and minimize opioid use. Strong recommendation based on grade A aggregate evidence (systematic reviews and randomized controlled trials with and without limitations), for treatment effect, with a preponderance of benefit over harm.

Enhanced recovery after surgery pathways are evidence-based interventions that are implemented in a protocol-like manner and span the perioperative period. Level I evidence shows that ERAS decreases the physiologic stress of surgery and improves patient outcomes.[50,51] Variations on pathway components are common, and examples of pathways are available from the ERAS Society,[52] The Council on Patient Safety,[53] the Agency for Healthcare Research and Quality,[54] the American College of Obstetricians and Gynecologists,[55] the American Urogynecologic Society,[56] and individual institutions with well-established programs.

Multimodal, opioid-sparing pain management is a core component of all ERAS protocols, a strategy that is supported by evidence showing that multimodal pain regimens lower the risk of pain and postoperative pain scores and facilitate same-day discharge after FPMRS procedures without increasing complications.[41,57,58] This approach decreases opioid consumption during hospitalization and after discharge.[17,26] For management of perioperative pain, current recommendations support use of adjunct medications including pregabalin (in place of gabapentin), tricyclic antidepressants, and serotonin/norepinephrine reuptake inhibitors and ketamine.[59] A systematic review from the Society of Gynecologic Surgeons[60] found that preoperative paracetamol, gabapentin, bupivacaine, and phenothiazine decreased postoperative opioid use, compared with placebo, in patients who underwent total abdominal hysterectomy. Local injection of ropivacaine to the uterosacral ligaments has been shown to decrease opioid consumption in the first 24 hours postoperatively in patients undergoing uterine surgery for hysterectomy/myomectomy and could be considered for FPMRS patients.[61] Attention should also be given to use of preoperative dexamethasone, which has analgesic properties in addition to postoperative nausea/emesis prophylaxis.[62–64] Finally, phenazopyridine can provide relief from bladder discomfort and may increase voiding trial success rates.[65]

Together with the other components of ERAS protocols, multimodal pain regimens facilitate lower opioid utilization and improved perioperative outcomes. However, ERAS protocols vary, and patient-level characteristics need to be considered when choosing a protocol.

4. Address systemic issues that lead to opioid overprescribing and increased risk of diversion/misuse. Strong recommendation based on grade B aggregate evidence (randomized trials or observational studies with dramatic effects of highly consistent evidence), for treatment effect, with a preponderance of benefit over harm.

Although awareness of overprescribing of postoperative opioids among FPMRS professionals is a crucial step in addressing the opioid crisis, additional health care provider and system-level factors must also be acknowledged and optimized. For health care providers, issues that may affect prescribing practices include individual prescribing preferences and persistent knowledge gaps about postoperative opioid use, availability of electronic prescribing, and concerns regarding medication refill rates and adversely affecting patient experience. From a systems perspective, several mechanisms can enhance appropriate opioid prescribing and monitoring, including improved provider and patient education and increased accessibility of electronic prescribing and monitoring. Finally, patients must be instructed on proper storage and disposal of excess tablets.

Health care provider education regarding multimodal analgesic regimens and real-world postoperative opioid use are associated with significant decreases in opioid prescribing.[66,67] These interventions have spillover effects, with decreased opioid prescribing observed for other procedures within the same practice.[68]

Health care provider concerns about patient satisfaction scores and medication refill rates may be barriers to restrictive opioid prescribing practices. This issue is increasing in an era where up to 30% of Medicare reimbursement is tied to patient Hospital Consumer Assessment of Healthcare Provider and Systems scores. Numerous studies among both FPMRS and general gynecology patients report that decreased opioid prescribing does not

TABLE 3. Summary of Patient and Surgical Risk Factors and Impact on Opioid Use

Patient and Surgical Factor	Impact on Opioid Use (Increase or Decrease)
Increased patient age	Decrease
Chronic pain condition (endometriosis, fibromyalgia, generalized body pain, preexisting opioid use)	Increase
Psychological factors (anxiety, depression, pain catastrophizing)	Increase
Mesh use, anti-incontinence procedures, additional prolapse repairs (beyond apical repair)	Mixed data
Laparotomy (vs laparoscopic or vaginal)	Likely increase

adversely affect patient satisfaction.[24,28–30] These studies included patients with same-day discharge and those with overnight observation. Studies of the impact of lower initial opioid prescribing on medication refill rates yield conflicting results.[21,23,24,30] However, even if lower initial prescribing increases refill rates, the resulting burden may be mitigated by electronic prescribing. Systematic changes to care delivery such as electronic prescribing, preoperative education aimed at establishing appropriate patient expectations, and standardized use of multimodal perioperative medication minimize risk of excess opioid prescribing without diminishing patient satisfaction.

Paper prescriptions, which have historically been required for controlled substances, can create barriers for patients and health care providers, and they can also promote heterogeneity in opioid prescribing and hinder prescription monitoring. Electronic prescribing can streamline the process for health care providers and help decrease disparities in medication refill access for lower-income and rural patients. Moreover, electronic prescribing may help combat the notion that excessive prescriptions are needed at discharge because of the cumbersome process of providing a refill if it is needed. Electronic prescribing also provides the opportunity for improved opioid monitoring. For instance, system changes such as having a lower default preselection on the initial prescription quantity can lead to decreased prescribing.[69] Likewise, the use of Prescription Drug Monitoring Programs can enable health care providers and pharmacies to evaluate a patient's pattern and history of opioid use, helping to prevent fraud or misuse. The transition to electronic prescribing has been permitted by federal law since 2010. However, because adoption of electronic opioid prescribing is not yet universal, the benefits that it offers are still not available to all health care providers and their patients. States continue to individually increase access to opioid electronic prescribing and are beginning to mandate use over the next 1 to 2 years.[70,71] An additional legislative measure that has been used in many states is to amend regulations related to opioid prescribing and counseling, including guidance on maximum prescribing quantities by MME and/or duration. In some instances, this has been associated with lower postoperative opioid prescribing.[19]

In addition to efforts aimed at decreasing opioid prescribing, it is important that health care providers counsel patients on safe medication storage and disposal. Several studies confirm that counseling on these topics is limited.[21,24,46] When patients are actively using their medication, storage in the original bottle in a locked cabinet or container decreases risk of accidental exposure or misuse.[72] When the medication is no longer needed, excess should be disposed of in an approved manner to eliminate the potential for misuse or diversion. Mechanisms for disposal vary depending on geographic location and the specific medication. If available, the preferred option is a U.S. Drug Enforcement Administration (DEA) registered drug take-back program.[73] Patients and health care providers can find these locations on the DEA website.[74] If a DEA take-back program is not feasible, a list of medication that can be safely flushed down the toilet are available from the U.S. Food and Drug Administration. This list includes many opioids such as oxycodone, hydrocodone, morphine, and hydromorphone. The U.S. Food and Drug Administration has reported that disposal of approved medications in this manner presents a negligible ecotoxicology risk.[75]

FUTURE RESEARCH NEEDS

The studies that are reviewed in this document offer guidance on opioid prescribing for a "typical" patient without comorbid pain. However, because many patients have comorbid pain, future research should explore pain management strategies for patients with pain and other comorbidities that may require expanded use of nonopioid and opioid-based pain management strategies. In addition, data are needed to guide physicians on how to prescribe the appropriate quantity of opioids based on patient-specific needs rather than uniform prescribing strategies, and 3 areas merit further investigation: (1) clinical factors, (2) genetic factors, and (3) physician factors.

Based on literature,[20] we anticipate that some patients with chronic pain, fibromyalgia, endometriosis, and preexisting opioid use may require more opioids after surgery. However, current data are not adequate to support detailed prescribing recommendations for these populations. Elevated opioid use has also been shown in patients with anxiety and depression and in those who anticipate higher postoperative levels of pain or who catastrophize.[32,43–46] Further research is needed to determine how these factors, individually and in combination, affect the amount of needed postoperative opioids. Similarly, ERAS research should focus on which multimodal regimen is best suited for FPMRS patients, and whether and how pain risk factors affect protocol selection.

Opioid metabolism is highly variable. Most analgesics are metabolized by the CYP3A4 and CYP2D6 enzymes, but genetic variations in enzyme function can result in faster- or slower-than-normal opioid metabolism. In turn, these differences may result in variations in pain perception and opioid efficacy. Identifying genetic polymorphisms that affect opioid metabolism may allow for more precise prescribing patterns. Additional study is warranted on the clinical implications of these genetic associations and how they can help promote personalized medicine in FPMRS patients in the future.[76]

Nonpharmacologic therapies, as an adjunct for perioperative pain control, is an area of advancing research. In one study, transcutaneous electrical nerve stimulation therapy, cognitive-behavioral therapies, and postoperative environmental factors such as music and landscape images have not been shown to have an impact on postoperative pain scores, but these interventions did have a positive effect on patients' postoperative experiences.[77] These therapies may have the greatest impact in patients who are at risk of severe postoperative pain, and additional research is needed to define the role of these interventions in routine perioperative pain management.

Improved quality of care is a key goal of effective health care policy. However, these policies are works in progress because we continue to define quality care, the metrics to measure it, and the features of health care systems that are needed to drive favorable metrics. Current policies may have unintended consequences that result in well-intentioned but misguided efforts to drive metrics rather than quality care.[78] For example, prescription habits vary by patient insurance, with Medicaid patients receiving a greater

number of postoperative opioids than patients with commercial insurance.[79] Future research to investigate potential provider biases that lead to variations in prescribing as well as sociocultural and economic factors that may affect both opioid prescribing and usage may help in the development of meaningful interventions to minimize the harms of opioids in our communities.

SUMMARY

In conclusion, FPMRS clinicians should be aware of the important role that they play in appropriate opioid prescribing while simultaneously working to support patients with appropriate postoperative pain management. At this time, available evidence indicates that effective pain management can be obtained without excessive opioid prescribing. For opioid-naive patients, we strongly recommend a prescription for no more than 15 tablets of opioids (112.5 MME) upon discharge after pelvic reconstructive surgery should be adequate for pain management. Patients who do not use opioids in the hospital can be safely discharged without an opioid prescription.

In considering the evidence presented in this guidance document, it is important to emphasize that information regarding decreased opioid prescribing is presented with the firm assumption that postoperative pain should be appropriately treated. The importance of appropriate pain treatment cannot be overemphasized because poor pain management can lead to higher rates of hospitalization,[80] increased postoperative complications,[81] and development of chronic pain.[82] We encourage physicians to prescribe the appropriate quantity of opioids based on patient-specific needs, rather than using uniform prescribing strategies that are not based on patient-level characteristics. Under this framework, some patients will need higher than average oral MME to achieve adequate pain control, and others will need less.

Widespread adoption of ERAS protocols, increased utilization of minimally invasive surgical approaches, optimization of nonopioid analgesia, and judicious prescribing will give FPMRS clinicians the tools they need to achieve optimum pain management while minimizing risks associated with opioid overprescribing.

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