



Pain Management in Breast Surgery: Recommendations of a Multidisciplinary Expert Panel—The American Society of Breast Surgeons

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ABSTRACT Opioid overdose accounted for more than 47,000 deaths in the United States in 2018. The risk of new persistent opioid use following breast cancer surgery is significant, with up to 10% of patients continuing to fill opioid prescriptions one year after surgery. Over prescription of opioids is far too common. A recent study suggested that up to 80% of patients receiving a prescription for opioids post-operatively do not need them (either do not fill the prescription or do not use the medication). In order to address this important issue, The American

Society of Breast Surgeons empaneled an inter-disciplinary committee to develop a consensus statement on pain control for patients undergoing breast surgery. Representatives were nominated by the American College of Surgeons, the Society of Surgical Oncology, The American Society of Plastic Surgeons, and The American Society of Anesthesiologists. A broad literature review followed by a more focused review was performed by the inter-disciplinary panel which was comprised of 14 experts in the fields of breast surgery, anesthesiology, plastic surgery, rehabilitation medicine, and addiction medicine. Through a process of multiple revisions, a consensus was developed, resulting in the outline for decreased opioid use in patients undergoing breast surgery presented in this manuscript. The final document was reviewed and approved by the Board of Directors of the American Society of Breast Surgeons.

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Opioid overdose, which accounted for more than 47,000 deaths in 2018,¹ has for the first time surpassed motor vehicle collisions as the leading cause of injury-related death in the United States. Due to the surge of drug overdoses and suicides, both related to the use of opioid drugs, life expectancy in the United States entered a period of sustained decline for the first time in 100 years.² The rate for death from drug overdoses more than tripled between

1999 and 2017, and that for opioid overdoses increased almost sixfold during the same period. The last time life expectancy in the United States showed a similar decline was in 1915–1918 as a result of military deaths in World War I and the 1918 influenza pandemic.²

Conversely, in most high-income countries, during the past decades, life expectancy has been gradually increasing. The crisis in the United States started in the 1980s, when pain became recognized as a problem that required treatment. This practice culminated in 1998, with the American Pain Society framing pain as a “fifth vital sign” that should be monitored and managed in the same way as heart rate and blood pressure. The structure of the U.S. health care system, in which volume and satisfaction drive reimbursement, likely incentivized the prescription of pain medication and contributed to the over-prescription of opioids.

Breast surgery is not immune to this practice. In a study by Lee et al.³ of 68,463 eligible patients, including breast cancer and melanoma patients who underwent curative-intent surgery and filled opioid prescriptions, among opioid-naïve patients, the risk of new persistent opioid use was 10.4% (95% confidence interval [CI], 10.1–10.7%). These patients continued filling prescriptions 1 year after surgery, with daily doses similar to those of chronic opioid users ($P = 0.05$), equivalent to six tablets of 5-mg hydrocodone per day.³

Fortunately, prescription trends have decreased during the past 10 years. However evidence-based guidelines are needed to tailor analgesic prescriptions according to patients’ need and not prescription habit.⁴ Recent studies have suggested that up to 80% of patients receiving a prescription for opioids postoperatively do not need them (either do not fill the prescription or do not use the medication when it is filled).³ This article provides an outline for decreasing the use of opioids by patients undergoing breast surgery.

METHODS

The American Society of Breast Surgeons (ASBrS) is the primary leadership organization for surgeons who treat patients with diseases of the breast in the United States. The Society, founded in 1995, currently has more than 3000 members. The ASBrS Patient Safety and Quality Committee, together with the Research Committee, created a combined workgroup to evaluate opioid-prescribing and pain management strategies for breast surgery patients.

The Committee conducted a survey of physician members belonging to ASBrS about their practices for pain control after surgery. The survey’s findings, previously reported in *Annals of Surgical Oncology*,⁴ suggested that

educational efforts addressing knowledge gaps in postoperative pain control would be helpful for surgeons treating patients with breast cancer.

To this end, an interdisciplinary panel was tasked with developing a consensus statement on pain control in breast surgery. The group included 14 experts from the fields of breast surgery, anesthesiology, plastic surgery, rehabilitation medicine, and addiction medicine. Representatives were nominated by the American College of Surgeons, the Society of Surgical Oncology, The American Society of Plastic Surgeons, and The American Society of Anesthesiologists.

For clarity, the key gaps in knowledge identified in the aforementioned survey⁴ were sorted into pre-, intra-, and postoperative phases of care and assigned to subgroups within the interdisciplinary panel. Each subgroup conducted a literature review pertinent to the questions assigned and brought their work to the group at large. The nominal group technique^{5,6} was used to facilitate the initial phase of consensus development. All the members were encouraged to provide independent input privately to the project chairs, who then brought the feedback to the entire panel.

Through a process of multiple revisions, statements for each issue were drafted and voted upon. The final recommendations were determined using the “consensus development conference method”^{5,6} during a series of electronic meetings. The resulting manuscript was reviewed and approved by the Board of Directors of the American Society of Breast Surgeons.

PREOPERATIVE PHASE

Identification of Patients at Increased Risk for Postoperative Pain Management Problems

Although insufficient evidence exists to account for all variability in postoperative pain, some studies suggest that specific phenotypic factors are associated with more acute postoperative pain and persistent postsurgical pain than expected, which may be useful for screening (Table 1).^{7–13}

In general, breast surgery patients may experience lower levels of pain after surgery than patients undergoing many other operations. In one large registry study of 179 surgical procedures, a median numeric rating scale score of 3–10 (0 = no pain to 10 = worst possible pain) was reported for both breast-conserving surgery and total mastectomy without reconstruction.¹⁴ The experience of postoperative pain for breast cancer is both patient- and procedure-specific.

Recommendations The factors associated with having more acute postoperative pain and chronic pain than

TABLE 1 (a) Factors associated with greater acute postoperative pain than expected, (b) factors associated with persistent postsurgical pain

Patient phenotypic factors	Surgical factors
(a)	
Younger age ^{7,8}	Bilateral procedures ⁸
Asian race ⁸	Prophylactic mastectomy ⁸
High preoperative pain ⁸	
Preoperative anxiety ⁸ or distress ⁹	
Preoperative depression ⁸	
Preoperative expectations ⁹	
(b)	
Younger age ⁹⁻¹¹	Adjuvant radiation therapy ^{9,10}
Non-white race ⁷	Axillary lymph node dissection ⁹⁻¹²
Moderate to severe preoperative pain ¹⁰⁻¹²	Preservation of the intercostobrachial nerve ¹¹
Severe acute postoperative pain ^{7, 10-12}	
Catastrophizing ¹³	

expected after surgery overlap considerably. Younger patients and those with preexisting pain, comorbid psychiatric diagnoses, or both may be at higher risk. For these patients, especially if more extensive surgery such as a bilateral procedure or axillary dissection is planned, additional preoperative screening with the Pain Catastrophizing Scale may be warranted.¹³

Role of Preoperative Education

Inferences regarding the importance of preoperative patient education on pain after breast surgery may be drawn from the Enhanced Recovery After Surgery (ERAS) literature as well as studies that demonstrate disparities between patient expectations and outcomes.^{15,16} Additional relevant studies include those demonstrating that pain outcomes are related to preoperative physical and psychosocial patient factors¹⁷⁻¹⁹ and those showing a direct impact of education on patient choices and patient-reported outcomes.²⁰⁻²³ Current investigations are underway to address these issues (Fig. 1).²⁴

Optimizing perioperative pain control begins during the preoperative visit. Setting expectations about multimodal analgesia plans, perioperative pain expectations, and wound and drain care help to reduce complications by improving postoperative nutrition and pain control²⁵ and may shorten the patient's hospital stay.²⁶ Adding preoperative education to a multimodal ERAS protocol also has been found to reduce postoperative pain and nausea.^{26,27}

Recommendations Appropriately preparing patients for surgery minimizes patient anxiety and may improve postoperative pain control. Preoperative education should include not only surgical decision-making, but also a discussion about appropriate postoperative pain and the multimodal analgesia plan, including optimization of non-opioid adjuncts. Nutritional optimization, smoking

cessation, activity instructions, and wound and drain care should also be reviewed at this time.

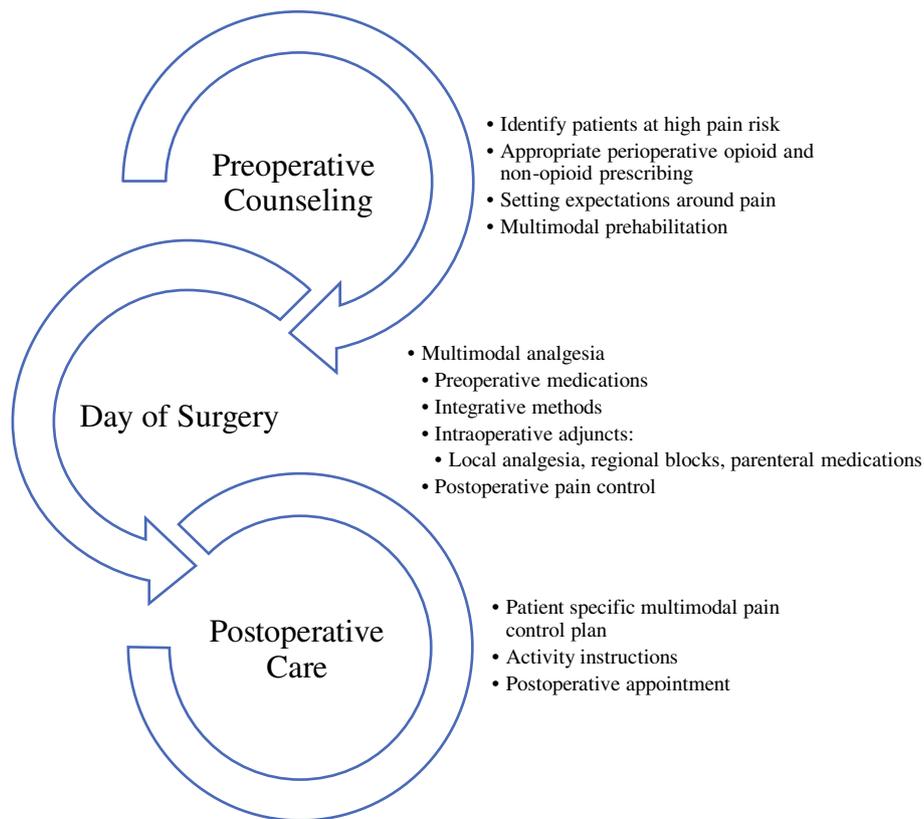
Optimization of Patients Taking Opioids

Preoperative opioid use is independently associated with increased morbidity and postoperative pain despite greater opioid consumption.²⁸ Early preoperative identification of patients taking chronic prescribed opioids, using illicit opioids, or receiving medication-assisted addiction treatment (methadone/buprenorphine) is vital.

Continuation of the preoperative opioid regimen on the day of surgery can be helpful in preventing withdrawal and providing effective pain relief. Although this approach is most common, it may not be optimal. Nguyen et al.²⁹ demonstrated decreased postoperative pain and improved functional outcomes after a reduction in the preoperative opioid burden. When possible, gentle opioid weaning/reduction combined with interventions targeting catastrophizing, expectation management, and multimodal treatment addressing the full range of an individual patient's biopsychosocial challenges should be offered.

Recommendations Patients receiving medication-assisted addiction treatment can be difficult to manage after surgery. Collaboration with an addiction specialist can be helpful. The following are general guidelines. Patients receiving methadone should continue their regular prescribed methadone treatment but in divided doses for better targeting of pain. Oral naltrexone should be discontinued at least 72 h before surgery and extended-release naltrexone at least 30 days before surgery; Patients receiving buprenorphine, a partial opioid-agonist that can block the effects of other opioids, are more complicated to manage. However preoperative dose reduction of the buprenorphine usually allows the use of typical opioid agonists in the perioperative period.

FIG. 1 Depicts the elements of preoperative counseling across the continuum of surgical care including preparation for surgery, multimodal analgesia, and postoperative instructions



PERIOPERATIVE PHASE

Best Practice for Immediate Preoperative Oral Medications

Acetaminophen Acetaminophen, as part of a multimodal preoperative regimen, has been associated with reduced postoperative pain and opioid use in studies of breast surgery and reconstruction.^{30–34}

Pain relief is comparable between oral and intravenous (IV) acetaminophen^{35,36} despite differences in pharmacokinetics,³⁷ onset of analgesia, and cost.³⁸ Notably, a single dose of oral acetaminophen costs about \$0.04 compared with \$29.30 for an IV dose.³⁹

Gabapentin/Pregabalin Strong evidence indicates that preoperative gabapentin reduces acute postoperative pain and analgesic requirements after breast surgery.^{40–47} The results reported for pregabalin are similar.^{42,47–49} Neither preoperative gabapentin nor pregabalin has an impact on the development of chronic postoperative pain.^{40,47,50}

The ERAS Society includes preoperative gabapentin in its guideline for breast reconstruction.⁵¹ However, respiratory depression has been reported.⁵²

Oral NSAIDs/COX-2 Inhibitors Nonsteroidal anti-inflammatory drugs (NSAIDs) or COX-2 inhibitors in combination with other agents or alone have been associated with reduced pain in postoperative and narcotic use.^{30,53,54} Data on bleeding risk due to pre- or perioperative use of oral NSAIDs or COX-2 inhibitors in breast surgery are unclear.⁴² A randomized controlled trial⁵⁵ and a meta-analysis⁵⁶ found no increased bleeding risk with ibuprofen, whereas an institutional series identified lower hematoma risk with COX-2 inhibitor use than with NSAIDs.⁵⁷

Opioids Few studies of breast surgery have evaluated scheduled opioids, compared with opioids titrated to pain levels, and the studies that have made the comparison report mixed outcomes. One trial of oxycodone administered before and after mastectomy compared with placebo showed lower opioid requirements and pain scores on postoperative day 1.⁵⁸ A trial of tramadol administered before and after mastectomy, however, demonstrated minimal differences in postoperative pain scores or opioid use.⁵⁹

Anxiolytics/Muscle Relaxants Research on the impact of anxiolytics and muscle relaxants in breast surgery is limited. A study evaluating IV midazolam versus placebo

demonstrated no improvement in perceived “quality of recovery.”⁶⁰ A smaller study of muscle relaxants showed improved postoperative pain control after mastectomy with reconstruction.⁶¹

Hypnosis/Aromatherapy/Mindfulness Hypnosis, aromatherapy, and mindfulness have not been shown to reduce postoperative pain, but can have other positive effects such as decreased anxiety and fatigue.^{62–66}

Nausea and Vomiting Prophylaxis Postoperative nausea and vomiting (PONV) is feared by patients, decreases satisfaction while increasing pain perception, and impairs rehabilitation.⁶⁷ This alone justifies preemptive therapy,⁶⁸ but PONV also carries risks of increased complications.⁶⁹ Patients undergoing breast surgery, particularly reconstruction, are at high risk for PONV,⁶⁹ and prophylaxis should be strongly considered. Combination therapy and perioperative opioid reduction are essential components, but no consensus exists regarding optimal algorithms.^{70–73} Of the many antiemetics available, data most strongly support prophylactic use of 5-HT₃ receptor antagonists (e.g., ondansetron), dexamethasone, and transdermal scopolamine.^{68,72,74,75}

Recommendations Preoperative administration of oral acetaminophen and gabapentin are recommended as part of a multimodal regimen for postoperative pain reduction. Prevention of PONV with a multimodal regimen also is recommended, including a combination of 5-HT₃ antagonists, dexamethasone, and/or transdermal scopolamine.

Role of Nerve Blocks

Regional analgesia should be considered as part of any multimodal analgesic regimen for breast surgery patients. Providing potent, prolonged analgesia acutely can decrease the incidence of chronic pain after breast surgery.^{76,77} Understanding and matching intervention to trajectory are key to preventing chronic pain and other adverse outcomes.

For major bilateral breast surgery with inpatient postoperative care, thoracic epidural analgesia is an established regional analgesic technique that has been shown to provide improved analgesia and patient satisfaction as well as a shorter hospital stay.^{78,79}

Unilateral regional blocks allow for more selective regional analgesia, and the technique most supported by evidence is the thoracic paravertebral block (PVB). Paravertebral blocks decrease pain intensity, postoperative nausea and vomiting, and opioid requirements and improve quality of recovery.^{80–91} Based on available evidence, the

European PROSPECT (PROcedure SPECific postoperative pain management) group recommends paravertebral blocks as the first choice for major breast surgery.⁹² The impact of any blocks on the incidence of chronic pain is unclear,^{83,91} and availability of paravertebral blocks is far from universal.

Newer interfascial plane blocks guided by ultrasound such as pectoral (Pecs), serratus plane, and erector spinae plane (ESP) blocks have recently emerged as alternative regional analgesic techniques for breast surgery. The limited evidence for these blocks suggests improved pain control with decreased opioid use.^{93–108} They may be considered acceptable alternatives to PVB for major breast surgery when PVB is contraindicated or unavailable.⁹²

More comparative-effectiveness research is needed to evaluate these newer regional analgesic techniques against each other, paravertebral block, and local anesthetic infiltration by the surgeon. The Pecs block has been compared with the paravertebral block, but the results have been inconsistent.^{109–112} However, the Pecs block has been associated with decreased chronic pain compared with the serratus plane block.¹¹³

The Pecs block may provide better analgesia than the ESP block for certain surgeries.^{114,115} Although ESP and paravertebral blocks have been shown to produce similar pain-related outcomes after mastectomy,⁹⁹ paravertebral blocks may provide superior analgesia in non-mastectomy breast surgeries.¹¹⁶ Either type of block reduces opioid consumption compared with no block at all.⁹⁹

For minor breast surgery, regional analgesia may not be indicated or available, and local anesthetic infiltration by the surgeon is recommended.⁹² Despite the lack of rigorous investigation, local anesthetic infiltration carries a relatively low risk and may offer short-term pain relief after minor breast procedures.^{117,118}

Recommendations For more extensive breast surgeries, existing evidence supports PVB. When PVB is not indicated or unavailable, interfascial plane blocks (i.e., Pecs) may represent acceptable alternatives, and further study is warranted. For less extensive surgeries, local anesthetic infiltration, at a minimum, is recommended based on availability and expected level of postoperative pain.

Role of Local Anesthetics

Long-Acting Local Analgesia in Breast Surgery Local anesthetics not only may provide postoperative analgesia, but also may limit neuronal inflammation and pain sensitization.¹¹⁹ Post-incision infiltration of a long-acting local anesthetic such as ropivacaine has been shown to decrease postoperative pain scores immediately after surgery¹²⁰ and at 48 h.¹¹⁷ However, a meta-analysis showed that although ropivacaine or bupivacaine

decreased immediate postoperative pain, they did not reduce pain at 12, and 24 h postoperatively.¹²¹

Liposomal Bupivacaine in Breast Surgery Liposomal bupivacaine, like other long-acting local anesthetics, may have utility for patients undergoing mastectomy and has been successfully used as a “field block” in an opioid-sparing multimodal analgesia protocol.¹²² Patients undergoing implant-based reconstruction who received liposomal bupivacaine reported lower postoperative pain scores than those who received a bupivacaine pain pump,¹²³ IV narcotics,¹²³ or preoperative paravertebral blocks.¹²⁴ However, there is no direct comparison with bupivacaine hydrochloride using similar infiltration techniques in breast surgery, and the literature for other surgical subspecialties has not demonstrated persistent superiority over other long-acting anesthetics.¹²⁵

Although the heterogeneity of results may be explained by unique methods required for infiltration with liposomal bupivacaine, its use has also been limited by cost. Some of this cost may be offset by the more recent availability of a 10-ml bottle instead of a 20-ml bottle, together with an update to Center for Medicare and Medicaid rules and regulations allowing separate reimbursement for liposomal bupivacaine in ambulatory surgery centers.

Recommendations Field-block injection of a long-acting anesthetic (i.e., ropivacaine, bupivacaine) is recommended to reduce early postoperative pain for patients who have not received a regional nerve block. Field-block injection also should be considered at the conclusion of mastectomy with or without reconstruction. Liposomal bupivacaine is an acceptable alternative to standard long-acting agents but requires unique infiltration techniques due to its viscous properties. Weight-based recommendations should not be exceeded.

The Role of IV Pain Medications Provided at the Conclusion of Surgery

Intravenous acetaminophen and ketorolac are common analgesics used at the conclusion of surgery. Intravenous acetaminophen, compared with IV NSAID, showed similar pain control, and both were better than placebo.^{126,127} A Cochrane Review of 36 studies analyzing IV acetaminophen showed that 36% of patients experience at least 50% pain relief for more than 4 h after any surgery compared with placebo. The medication was administered either 30 min before surgery end or sometime in the postoperative period. This finding was affirmed when 39 more studies were evaluated (75 total studies), with no change in results. Given the cost differential between IV and oral acetaminophen, it is important to note that studies

comparing IV and oral acetaminophen showed no significant difference in pain control.^{35,36,128}

With intra- and perioperative use of ketorolac, several studies have shown no increase in risk of bleeding or hematoma across several different types of surgery, including breast surgery.^{56,129–131} Intravenous ketorolac use decreases narcotic use and shortens the hospital stay.¹³⁰ A retrospective review of patients treated with transverse rectus abdominis myocutaneous (TRAM) flaps did not find an increased incidence of hematoma when ketorolac was used.¹³² When ketorolac is given for 5 days or less, the risk of acute kidney injury is low, the same as with opioids.¹³³ Findings have shown that the 10- to 15-mg dose is equivalent to the 30-mg dose.¹³⁴ Finally, IV acetaminophen and NSAIDs (if not administered orally before surgery) are recommended for an opioid-sparing pain control regimen by the ERAS Society for breast reconstruction surgery.⁵¹

Recommendation Administration of IV ketorolac (15–30 mg) at the conclusion of surgery is recommended for reduction of postoperative pain. Intravenous acetaminophen also can be used at the conclusion of surgery for pain reduction if not administered preoperatively.

POSTOPERATIVE PHASE

Oral Medications

Numerous trials have shown that using oral acetaminophen and NSAIDs postoperatively is safe and reduces opioid use.^{34,55, 135,136} In a double-blinded trial, acetaminophen plus codeine was compared with ibuprofen plus acetaminophen in outpatient breast surgery. Pain control did not differ between the two groups.⁵⁵ Acetaminophen and NSAIDs used as the primary postoperative analgesics in a multimodal analgesic strategy after breast surgery showed a significant reduction in opioid use (decrease of 50 morphine milligram equivalents [MMEs]), total narcotics prescribed (25 vs 10 tablets), and rate of opioid prescription use (85% vs 44%).¹³⁵

Similar reductions in opioid use have been shown after implementation of ERAS protocols for mastectomy with immediate reconstruction. In two similar pathways, ibuprofen and acetaminophen were used postoperatively. Rescue opioids were available if needed. Both studies reported significantly less postoperative opioid use. The findings showed no difference in overall pain score, infection rate, or hematoma rate.^{31,34}

With the use of nonopioid adjuncts, some patients may not require any opioids after breast surgery.^{122,137,138} Among those who do require an opioid prescription, the quantity of opioids prescribed may not mirror the patient's

TABLE 2 Mind–body medicine techniques

Technique	Amount of data	Summary comment
^a Music therapy ^{166–168}	Strong evidence	Reduces anxiety significantly. Live or recorded and started preoperatively is recommended
^a Aromatherapy (i.e., lavender oil) ^{64,169}	Strong evidence	Anxiolytic with minimal side effects
^a Cold therapy ¹⁷⁰	Strong evidence in orthopedic patients	Reduces pain scores
^a Massage therapy ^{171–173}	Strong evidence in other fields, limited data for breast	Reduction in pain, stress, and muscle tension Increase relaxation in mastectomy patients
Relaxation techniques ¹⁷⁴	Medium evidence	Improvement in psychological well-being; no evidence to improve analgesic intake or length of hospital stay
Guided imagery ^{174–176}	None for breast but strong evidence for cardiac surgery	Reduces anxiety, pain, and hospital of stay
Transcutaneous electrical nerve stimulation ^{177,178}	Weak evidence	May help with chronic pain; special equipment and skills needed
Hypnosis ¹⁷⁹	Strong evidence	Reduction in anxiety and shorter hospital stay
^a Melatonin ¹⁸⁰ 6 mg for 3 months starting 1 week before surgery	Limited evidence	May help with depressive symptoms postoperatively
Reiki ¹⁸¹	Limited evidence	Possible reduction in pain and anxiety

^aHas at least one randomized trial

actual opioid use. Opioid overprescription in breast surgery results in patients having residual opioids after pain resolution, increasing the quantity available for diversion.^{136,139,140} Teaching hospitals are particularly at risk for overprescription.

A recent study found that the mean number of 5-mg oxycodone tablets recommended by residents was greater than that recommended by the attending surgeon for all breast procedures.^{141,142} Formal education about appropriate opioid-prescribing may help mitigate this overprescription, and providers who receive formal education in opioid-prescribing have been found to order fewer superfluous opioids after common procedures.¹⁴³ Risk factors for high postoperative opioid use are delineated in Table 1.¹⁴⁴

Recommendations Oral acetaminophen and NSAIDs (ibuprofen or naproxen) are recommended for postoperative pain control after breast surgery. Rescue opioids should be available if needed, but not prescribed on a schedule. Careful clinical judgment should be used to individualize the number of prescribed opioids to prevent overprescription and opioid diversion.

Intravenous Medications

Breast surgery patients undergoing “minor” procedures, defined as Current Procedure Terminology (CPT) codes 19301, 19120, 19125, and 38525, typically do not require

IV pain medication other than that needed in the post-anesthesia care unit (PACU). Multimodal pain management, including oral acetaminophen and gabapentin, can further reduce PACU intravenous medication requirements.

Inpatient breast surgery patients (CPT codes 19303 and 19307) should be managed differently. Once optimal multimodal pre- and intraoperative pain management is obtained, these patients may benefit from breakthrough pain control with IV opioids and IV ketorolac. Ketorolac also can also be administered orally and does not increase bleeding risk.

Recommendations Multimodal pain therapy, including preemptive analgesia, intraoperative local anesthesia, and nerve blocks, minimizes postoperative IV opioid requirements. For breakthrough pain, when oral medications are not tolerated or effective, IV ketorolac should be considered first-line therapy followed by IV narcotics.

Continuous Wound-Infiltration Devices

Continuous wound infiltration (CWI) devices may be used in a broad spectrum of breast surgical procedures. For breast surgical sites, especially mastectomy sites, the continuous wound infiltration technique is safe and has effectiveness similar to that of paravertebral blocks or other techniques for perioperative pain management.^{90,145–147} Compared with no intervention, the technique has

TABLE 3 Nonopioid options for pre-, intra-, and postoperative pain management*

		Comments
<i>Preoperative phase</i>		
In the clinic		
Identify patients at increased risk for postoperative pain management problems		
Prehabilitation	Education, exercise, nutrition, and psychologic interventions	See Prehabilitation section in article
In the preoperative area		
Medications	Acetaminophen 975 mg, PO	With sip of water
	NSAID (celecoxib 400 mg, PO or Ibuprofen 400 mg, PO)	With sip of water
	Gabapentin 300 mg, PO	With sip, after marked by surgeon
	Transdermal scopolamine patch or oral preemptive antiemetic	
Nerve blocks	See “ Nerve Blocks ” section in article	
<i>Intraoperative phase</i>		
Nerve blocks	See “ Nerve Blocks ” section in article	
Infiltration of local area	See “ Local Anesthetics ” section in article	
Medications	The following alone or in combination	
	Dexamethasone 4 mg IV	Given one time
	Acetaminophen 1000 mg, IV or PR if not given preoperatively	Given 30 min before end of surgery, if not given preoperatively
	Ketorolac 10–30 mg, IV if not given preoperatively	Given 30 min before end of surgery if no NSAIDs are given preoperatively
	Ondansetron 4 mg, PO or IV	Given 30 min before end of surgery or immediately postoperatively
<i>Postoperative phase</i>		
Pain control	The following alone or in combination	
	Acetaminophen 975 mg, PO	q 8 h, PRN pain
	Ibuprofen 400 mg, PO	q 8 h, PRN pain
	Gabapentin 300 mg, PO	q 8 h, PRN pain
	Acetaminophen 1,000 mg, IV	q 6 h, PRN pain if not tolerated. PO
	Ketorolac 30 mg, IV	q 6 h, PRN pain if not tolerated. PO
N/V prophylaxis	Ondansetron 4 mg, PO or IV	q 6 h, PRN N/V
Discharge medications	The following alone or in combination	
	Acetaminophen 1000 mg, PO	q 8 h, PRN pain
	Ibuprofen 400 mg, PO	q 8 h, PRN pain
	Gabapentin 300 mg, PO	q 8 h, PRN pain
Alternative approaches	Exercise, education, guided imagery, music therapy, hypnosis, cognitive behavior therapy, and mind–body medicine techniques	

PO, by mouth; NSAID, nonsteroidal anti-inflammatory drug; IV, intravenously; PR, rectally; q, every; PRN, as needed; N/V, by nose

*Avoid exceeding recommended 24-h maximum dosing. Adjustments may be required for patients with impaired renal and/or hepatic function

demonstrated decreased pain and opioid use in the postoperative period.^{148,149}

For cosmetic/reconstructive breast surgery (augmentation mammoplasty or tissue expander/implant placement),

CWI resulted in reduced postoperative pain, sedation, need for antiemetics, and narcotic consumption.^{150,151} For autologous tissue reconstruction, CWI of the abdominal donor site has mixed results. Studies show that CWI is

TABLE 4 Pain management recommendations based on procedure

	Preoperative assessment/ education ^a	Preoperative oral medication ^a	Nerve block ^a	Local anesthesia infiltration ^a	IV medication at end of surgery ^a	Discharge Rx. of acetaminophen/ NSAIDs ^a	Discharge Rx. of back-up opioid tablets ^a
Mastectomy with reconstruction	Yes	Yes	Yes	Consider ^b	Yes	Yes	Preoperative education, expectation setting, multimodal analgesia including nerve blocks, and optimization of nonopioid adjuncts often result in no need for opioids at discharge. For patients with severe breakthrough pain, the fewest number of opioid pills previously agreed upon by the patient and surgeon should be prescribed. ^e
Mastectomy without reconstruction	Yes	Yes	Consider ^c	Consider ^b	Yes	Yes	
Lumpectomy with SLNBx	Yes	Yes	Consider ^d	Yes	Yes	Yes	
Lumpectomy	Yes	Yes	Consider ^d	Yes	Yes	Yes	
SLNBx	Yes	Yes	No	Yes	Yes	Yes	

IV, intravenous; NSAID, nonsteroidal anti-inflammatory drug; Rx, prescription; SLNBx, sentinel lymph node biopsy diagnosis

^aSee article section for specific recommendations

^bWhen no nerve block is provided

^cWhen available and efficient

^dWith larger excisions (i.e., oncologic procedures)

^eSee Michigan OPEN for breast surgery-specific prescribing recommendations (<https://michigan-open.org/prescribing-recommendations/>)

effective, has decreased opioid use, and demonstrates a trend toward reduced antiemetic needs and hospital stay.^{72,152} Other studies have shown decreased patient-controlled narcotic use and overall pain scores, with earlier return of bowel function, but have not demonstrated a decrease in total narcotic use, abdominal pain scores, narcotic side effects, or hospital stay.^{153,154}

Recommendations Clinicians should consider CWI devices for mastectomy and breast reconstructive sites when regional nerve blocks are not available or preferred.

ALTERNATIVE APPROACHES

The Role of Exercise in Postoperative Pain Control

Prehabilitation in cancer is defined as “a process on the cancer continuum of care that occurs between the time of cancer diagnosis and the beginning of acute treatment and includes physical and psychological assessments that establish a baseline functional level, identify impairments, and provide interventions that promote physical and psychological health to reduce the incidence and/or severity of future impairments.”¹⁵⁵ Multimodal prehabilitation combines exercise with nutrition, smoking cessation, psychologic interventions, and/or education. The components of prehabilitation are similar to those incorporated in the ERAS protocols.¹⁵⁶

A unimodal prehabilitation study in 2017¹⁵⁷ suggested that the risk of seroma formation after surgery did not differ between the exercising and non-exercising cohorts.

As expected, shoulder range of motion decreased after surgery in both groups.

Notably, 220 participants in a study of self-reported physical activity before surgery for breast cancer demonstrated faster recovery for those who engaged in moderate to heavy leisure time physical activity.¹⁵⁸ Multimodal prehabilitation with total body exercise, targeted exercise, nutrition, psychologic aid, and smoking cessation is recommended in breast cancer because surgery, chemotherapy, and radiation can affect all body systems.¹⁵⁹

Exercise in the early postoperative phase typically is well tolerated and should be encouraged. Four to eight walks daily, beginning on the evening of surgery, until discharge to home is recommended in some ERAS protocols.¹⁶⁰ A Cochrane Review of 10 studies demonstrated that exercise can result in a clinically meaningful improvement in upper limb function, including pain after breast cancer treatment.¹⁶¹ Even dance, when observed together with movement therapy, may have a beneficial effect on quality of life, somatization, and vigor of cancer patients according to a Cochrane Review.¹⁶² An analysis of 51 articles across the spectrum of care demonstrated a positive benefit from exercise in five pain-related domains: cancer-related fatigue, physical function, psychological function, body composition, and quality of life.¹⁶³ Although the exact dose should be individualized, moderate to vigorous intensity was recommended.¹⁶³

Further research is underway to explore the genetic and metabolic mechanisms for the positive effect of exercise in cancer-related impairments.^{164,165} Compared with mind-

body controls, exercise alone demonstrated alterations of gene expression in breast tumors.¹⁶⁴

Mind–Body Medicine

Mind–body medicine may reduce the pain experience for selected patients undergoing breast surgery, but the number of validated studies is limited (Table 2).^{64,166–181} However, most techniques are inexpensive and have a favorable risk-to-benefit profile. These techniques may empower patients at risk for greater postoperative pain. For patients who are anxious, guided imagery, music therapy, and hypnosis demonstrate the strongest evidence of benefit, whereas cognitive behavior therapy and incorporation of various mind–body medicine techniques may help with chronic pain-related symptoms. Among these therapies, music therapy, live or recorded, has strong randomized data showing anxiety reduction for breast surgery patients.

Recommendations Alternative therapies have uniquely favorable risk-to-benefit profiles and should be individualized by availability and patient need. Whole-body exercise such as walking or cycling demonstrates the most benefit in terms of decreasing complications that may lead to pain, whereas upper-quarter exercise within restrictions demonstrates the greatest benefit in terms of reducing local postoperative pain. Music therapy has the best evidence for perioperative pain reduction.

CONCLUSION

A comprehensive multimodal approach to postoperative pain control provides excellent patient outcomes, addresses the important issue of opioid addiction directly, and reduces medications available for diversion. Ideally, the approach begins before surgery, and for patients found to be at high risk, preoperative psychiatry consultation and incorporation of integrative techniques should be considered (Table 3).

The “best practice” for the provision of pain control during and after breast surgery is not well defined. A paucity of persuasive, directly obtained data from patients undergoing breast procedures has resulted in numerous approaches. Expert consensus recommendations based on the review conducted by our interdisciplinary group are found in Table 4.

A practice incorporating the following tenets has the highest likelihood of success:

1. Set expectations about postoperative pain before surgery.
2. Provide oral medications immediately before the procedure.

3. Use nerve blocks (pre-, intra-, or postoperatively) when appropriate.
4. Limit narcotic use throughout all phases of care.

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