

# Special REPORT

## Best Practices for Implementing a Multimodal Approach to Postsurgical Pain Management:

*Lessons Learned in the Era of the Opioid Crisis*

### Faculty

#### **Darren Adams, DO**

Chairman, Obstetrics Surgery  
Southern Ohio Medical Center  
Portsmouth, Ohio

#### **Erik Askenasy, MD**

Assistant Professor of Surgery  
UT Health Department of Surgery  
McGovern Medical School  
Houston, Texas

#### **Linda Carroll, RN-BC, BSN, MSN**

Vice President of Patient Care Services  
Saint Peter's University Hospital  
New Brunswick, New Jersey

#### **Attila Kett, MD, MBA**

Chairman  
Department of Anesthesiology  
Saint Peter's University Hospital  
New Brunswick, New Jersey

#### **Ragui Sadek, MD, FACS**

Clinical Assistant Professor of Surgery  
Rutgers Robert Wood Johnson Medical School  
Director of Bariatric Center of Excellence  
Robert Wood Johnson University Hospital  
New Brunswick, New Jersey

Postsurgical pain management remains a challenge and often may be treated with suboptimal results.<sup>1</sup> Opioids are the most commonly prescribed medication for postsurgical pain, with 56 million patients receiving opioids after surgery each year.<sup>2</sup> Efforts to manage postsurgical pain may lead to overprescribing and ultimately chronic opioid use.<sup>2,3</sup> Estimates show that patients discharged with an opioid prescription are 44% more likely to become long-term opioid users within 1 year.<sup>4</sup> Additionally, 1 of 15 surgical patients who are prescribed an opioid by their physician will continue to long-term nonmedical opioid use or abuse.<sup>4,5</sup> Studies also have shown that most IV drug users transitioned to illicit use after misusing opioid pain relievers.<sup>6</sup> These statistics provide substantive evidence on the evolution of chronic opioid use that began with an initial prescription for postsurgical pain management, and how the operating room (OR) has become an unintended gateway to opioid abuse and dependence.<sup>2</sup>

In addition to risk for abuse and dependence, opioids may impose a clinical burden and carry hidden costs associated with opioid-related adverse events (ORAEs), affecting patient recovery and hospital costs.<sup>7,8</sup> A retrospective study of 21 acute care hospitals consisting of 135,379 patients undergoing at least 1 colorectal, abdominal, obstetric-gynecologic, orthopedic, cardiovascular, or endoscopic procedure showed that those who experienced an ORAE (n=14,386) had an increased length of stay (LOS; 6.8 vs 5.2 days) and a higher cost of hospitalization (\$25,599 vs \$17,374) compared with those without an ORAE.<sup>8</sup> Additionally, there was a 2.9% increase in mortality (3.0% vs 0.1%) for patients with an ORAE and an increased 30-day readmission (8.9% vs 7.1%;  $P<0.0001$ ) compared with those without an ORAE.<sup>8</sup>

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Similarly, a retrospective cohort study of postsurgical opioid use in an 11-hospital state system showed that patients experiencing ORAEs had an increase in mortality, complications, and readmission rates; LOS increased by 4.5 days on average and led to an increase of \$13,737 in hospital costs per patient.<sup>9</sup> In general, patients who experience an ORAE are 3 times more likely to incur additional hospital costs.<sup>10</sup>

Certain types of patient populations are particularly vulnerable to ORAEs, including morbidly obese patients, pregnant or breastfeeding women, and patients who have cancer or respiratory disease. When stratified by comorbid risk factors, almost 1 of 2 patients can be classified as high risk for an ORAE.<sup>10</sup>

Researchers have shown that postsurgical addiction to opioids can be predicted by a patient's substance abuse history, self-perceived risk for abuse, and the presence of mental or psychiatric disease (eg, depression, anxiety, or post-traumatic stress disorder).<sup>5</sup> Questionnaires and survey assessments conducted preoperatively are important in identifying patients at risk for becoming long-term opioid users and for whom it is best to use alternative strategies for pain management.

In the wake of the opioid crisis, interventions designed to reduce the number of prescription opioids are critical. A paradigm of postsurgical pain management that uses a multimodal protocol to manage pain while reducing reliance on opioids and decreasing the risk for ORAEs provides an optimal approach.

### **Evidence-Based Recommendations for Multimodal Analgesia**

In multimodal analgesia, combinations of the following agents can be used: analgesics (opioids, nonsteroidal anti-inflammatory drugs [NSAIDs], and acetaminophen), gabapentinoids ( gabapentin and pregabalin), dexamethasone, serotonin–norepinephrine reuptake inhibitors, *N*-methyl-D-aspartate antagonists, peripheral nerve blocks, and neuraxial analgesia (epidural and intrathecal interventions; intraarticular and wound infiltration with local analgesia).<sup>11,12</sup>

Adding different analgesic agents minimizes perioperative opioid use and reduces requirements for opioid rescue medications and associated side effects. The lowest possible dose of opioids should be used as part of the multimodal regimen.<sup>13</sup> Decisions related to medication dosing, use, delivery, and duration can be individualized for every patient, and doses can be adjusted in special populations such as the elderly, pregnant patients, and cancer patients.

Societies such as the American College of Surgeons, American Pain Society, American Society of Anesthesiologists, and American Society of Regional Anesthesia and Pain Medicine have endorsed multimodal analgesia in the perioperative setting, and they recommend an individualized, patient-centered approach to pain management.<sup>14–16</sup> In their joint guidelines for the management of postoperative pain, these societies outline components of a multimodal regimen for each type of surgery as a strategy to reduce opioid consumption and improve patient outcomes.<sup>14–16</sup>

### **Implementing Enhanced Recovery Protocols**

An enhanced recovery protocol (ERP), or an enhanced recovery after surgery (ERAS) program, is a set of multimodal

perioperative care pathways designed to mitigate the stress response after surgery.<sup>17,18</sup> This includes reducing postoperative pain, minimizing ORAEs, and accelerating postsurgical recovery while decreasing hospital LOS and readmission rates.<sup>11</sup> Although colorectal surgery is among the earliest surgical models to which an ERP was applied,<sup>19</sup> other specialties have since implemented ERPs, including obstetrics, orthopedics, and urology.

Although pain management strategies may vary across ERPs, they all adhere to the same core principle of multimodal analgesia—the use of multiple classes of analgesics with different mechanisms of action and/or concurrent use of regional and systemic analgesia for optimal pain relief—while minimizing or avoiding high doses of opioids and, consequently, ORAEs.<sup>11,20</sup>

### **Pain Management: A Multidisciplinary Team Approach**

Implementing a successful ERP requires a multidisciplinary approach involving different members of the care team, including anesthesiologists, surgeons, nurses, nutritionists, and physical therapists, as well as the patients and family members.<sup>21</sup> Effective communication between clinicians, as well as patients and providers, may help mitigate the risks for postsurgical opioid abuse.<sup>21</sup>

Expert opinions, supported by guidelines, ask that all anesthesiologists offering perioperative analgesia educate and train members of the clinical team about the different analgesic options available at their hospitals. This includes training in procedures, such as epidural analgesia, patient-controlled analgesia (PCA), and regional anesthesia techniques, with agents in the multimodal regimen.<sup>15</sup>

### **Establishing an Opioid Task Force**

Reducing opioid use and improving pain assessment and management for postsurgical patients are paramount in light of the current opioid epidemic. To further the efforts, in January 2018, the Joint Commission released revised pain assessment and management standards for accredited hospitals.<sup>22</sup> Under the new standards, hospitals are required to establish a clinical leadership team, such as an opioid task force, that can actively engage staff and hospital executives to improve pain assessment and management by reducing opioid therapy and the risks associated with their use.<sup>22</sup> In addition to leadership, the standards require that medical staff be actively involved in pain assessment and management as well as safe opioid prescribing by participating in the establishment of protocols and quality metrics and reviewing performance improvement data.<sup>22</sup>

This monograph addresses the successful implementation of an ERP using multimodal pain management strategies, including the use of bupivacaine liposome injectable suspension (EXPAREL®) in various hospitals and settings, the organizational changes and cultural challenges that ensued, and the resulting surgical outcomes. EXPAREL is indicated for single-dose infiltration in adults to produce postsurgical local analgesia and as an interscalene brachial plexus nerve block to produce postsurgical regional analgesia.<sup>23</sup> Safety and efficacy have not been established in other nerve blocks.<sup>23</sup>

# ERAS Program in Obstetrics

Attila Kett, MD, MBA

In 2012, the ERAS pathway was introduced in multiple obstetric units across the United Kingdom, including the Royal Hallamshire Hospital in Sheffield, with positive results. In the United States, Attila Kett, MD, MBA, the chairman of the Department of Anesthesiology at Saint Peter's University Hospital (SPUH), in New Brunswick, New Jersey, and his team recognized the success of the Royal Hallamshire Hospital's ERAS protocol after cesarean delivery—shortened recovery times and better patient outcomes—and contacted the head of the program, Ian J. Wrench, MBChB, to learn more about the hospital's experience in preparing for the launch of its own program. Dr Kett started designing the ERAS program at SPUH in February 2016.

To better understand patient values and attitudes toward the hospital stay after a cesarean delivery, surveys and questionnaires were distributed to prospective mothers. Survey results showed that the most important attributes of a successful surgery were a fast recovery, pain control allowing a return to the patient's independence and ability to take care of family, skin contact with the baby at birth, access to information, and staff availability. Other attributes included a sense of safety and reliability as well as the avoidance of complications and infections.

The obstetric ERAS program is based on 3 pillars: staff education and empowerment, improved patient information and autonomy, and standardized care with an emphasis on clinical outcomes.

SPUH worked with a technology provider to deliver patient education via a remote smartphone application (app). The app provided detailed instructions in preparation for the surgery, engaged patients to take control of their own health, and encouraged a shared decision-making approach between patients and their assigned health care teams.

The change management model used at SPUH was based on John Kotter's 8-stage model for transformational change that places teams in charge of program delivery at the front line of decision making, restricting bureaucracy, facilitating the deployment of strategic initiatives, and accelerating innovation.<sup>24</sup> By flattening the hierarchy of responsibilities, the interdisciplinary model aims to generate short-term wins and prompt sustained changes.

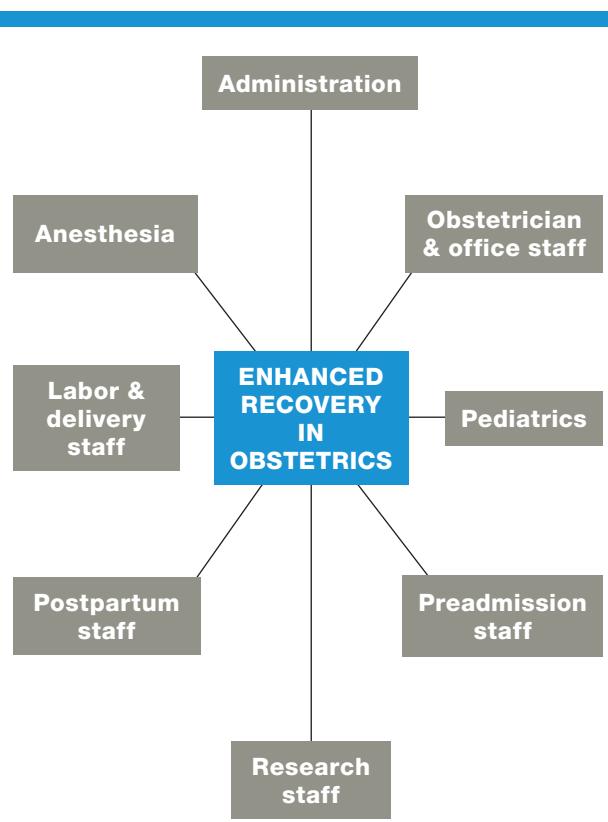
Education and training of the front-line staff shared all elements of the program with every stakeholder. Staff received detailed modules about preoperative patient assessment and surgery planning, immediate perioperative and postsurgical pain management, catheter removal and monitoring, and early mobilization of the patient.

The implementation of the ERAS protocol after cesarean delivery was a multidisciplinary team effort that resulted from the successful collaboration of community anesthesiologists, obstetricians and pediatricians, nurse managers, educators, and front-line staff (Figure 1). The program has undergone evaluation and reevaluation by stakeholders through committee meetings, where staff members have shared successes and suggested improvements.

## A Multimodal Approach

In the ERAS program, patients receive 30 mg of IV ketorolac in addition to 0.15 mg of intrathecal morphine administered in the OR. The dose of intrathecal morphine is reduced to 0.15 mg from the 0.2 mg used before implementation of the ERAS protocol. EXPAREL is administered using a multilayer infiltration technique: 20 mL liposomal bupivacaine (266 mg), 24 mL 0.5% bupivacaine (120 mg), and 36 mL normal saline mixed together and used to infiltrate the subcutaneous and fascial plane evenly. Alternatively, EXPAREL is administered by transversus abdominis plane (TAP) block guided by ultrasound.

Before the ERAS program, patients received an average of 60 morphine milligram equivalents (MMEs) compared with an average of 32 MMEs after ERAS implementation. Once EXPAREL has been integrated into the ERAS multimodal regimen, the average opioid requirement decreases to 12 MMEs.



**Figure 1.** Application of an interdisciplinary model for transformational change for ERAS implementation in obstetrics.

ERAS, enhanced recovery after surgery

Before implementing the ERAS protocol, the urinary catheter was not removed for 24 hours, leading to delays in ambulation and recovery as well as an increased risk for complications. With the new protocol, the catheter can be removed as early as 6 hours after surgery.

Postsurgical pain management is multimodal in nature and includes around-the-clock NSAIDs and acetaminophen (IV acetaminophen and IV ketorolac on the day of surgery continued with oral 600 mg of ibuprofen and 975 mg of acetaminophen on postoperative day [POD] 1). In contrast to pre-ERAS stages, where food was not allowed from the night before the procedure and until 24 hours postoperatively, the ERAS protocol introduces carbohydrate loading before surgery and early postoperative feeding. The newborn is brought to the post-anesthesia care unit (PACU) where breastfeeding is encouraged, and then the mother is transferred to the postpartum floor. Hospital discharge occurs 2 days after cesarean delivery (Figure 2).

#### **Patient Monitoring and Protocol Adherence**

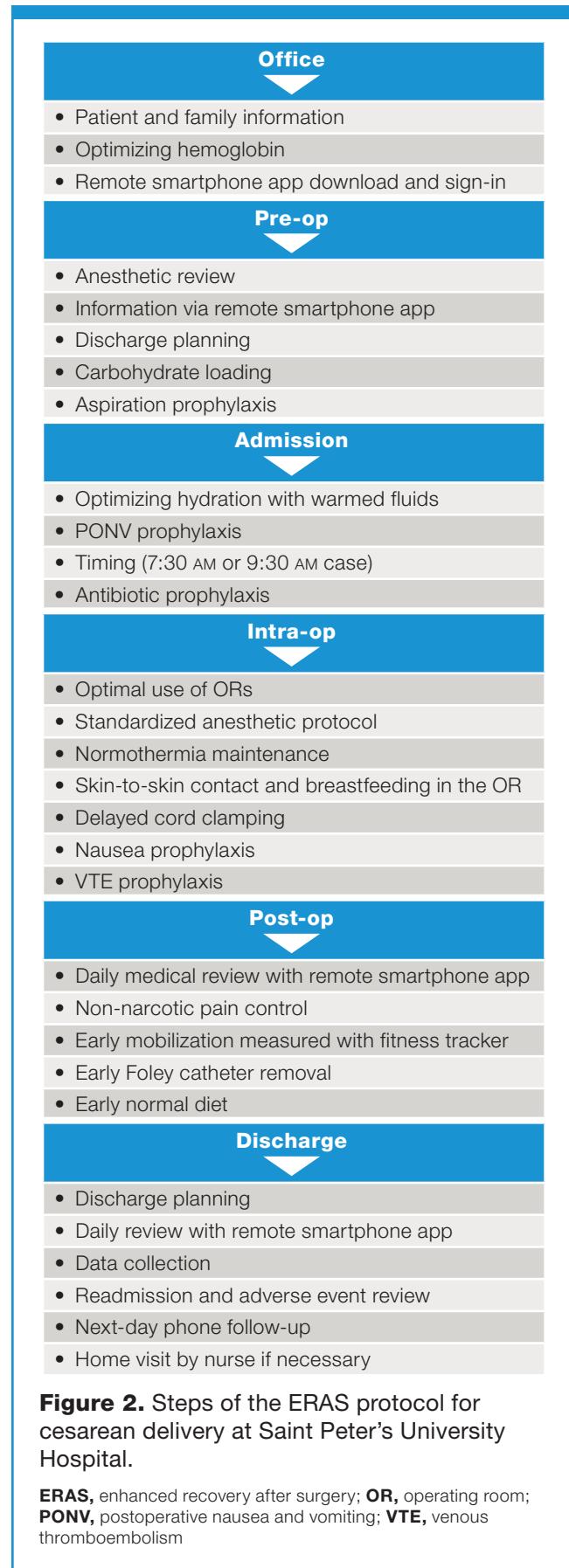
Using the remote smartphone app, patients are monitored and prompted to answer follow-up questions at different intervals of time before and after their surgery. Patients have the ability to provide input on side effects; ask their providers questions; and answer performance questions about pain, functional status, and medication compliance. Most importantly, patients can alert nurses and other providers to problems arising post-discharge, such as surgical infections and other complications. By promptly addressing these issues, the app's interactive functionality identifies at-risk patients at an early stage, preventing readmissions.

Reports generated by the system are fed into the electronic health record and analyzed by the physicians. Continuous tracking allows a live review of the protocol's rate of success and measures compliance with each part of the protocol, as well as the nursing staff's adherence to medication administration and protocol application.

By switching patient status from inpatient to discharged, the app is able to track LOS. In addition, the team reviews patient records to report opioid use, pain scores at rest and during ambulation, and the overall hospital experience. Chart review and result tracking also are part of the ERAS implementation as a way to measure its outcomes.

When the pilot program launched in August 2016, it was slowly rolled out in 3 phases: Initially, it aimed to enroll 100 patients into the ERAS protocol in year 1 with subsequent increases in years 2 and 3. In the first year of implementation, the ERAS program resulted in a decrease in LOS from 3.7 to 2.4 days, and was associated with significant cost savings.

The ERAS protocol at SPUH has been widely acclaimed, not only winning the top prize at the annual congress of the American Society for Enhanced Recovery but also being validated in continuing medical education courses and webinar sessions. Efforts are being made to further the implementation of an ERAS protocol after cesarean delivery. In July 2018, the American College of Obstetricians and Gynecologists issued specific recommendations to use multimodal analgesia in postsurgical pain after cesarean delivery, citing side effects of opioids on mothers and newborns.<sup>25</sup>



**Figure 2.** Steps of the ERAS protocol for cesarean delivery at Saint Peter's University Hospital.

**ERAS**, enhanced recovery after surgery; **OR**, operating room; **PONV**, postoperative nausea and vomiting; **VTE**, venous thromboembolism

## Opioid-Free ERAS Program in Bariatric Surgery

**Ragui Sadek, MD, FACS**

Candidates for bariatric surgery present with typical comorbidities that place them at high risk for ORAEs. Most are morbidly obese and have undiagnosed obstructive sleep apnea, a condition that can be exacerbated by opioids and cause respiratory depression. The risk for opioid-induced postoperative ileus after bariatric surgery is very high in this population. Evidence-based guidelines for the general management of pain after surgery advise against the use of sedatives and suggest a multimodal regimen of analgesia, regional anesthesia techniques, early mobilization, and improved respiratory function.<sup>26</sup> For Ragui Sadek, MD, FACS, being aware of the complications of bariatric surgery and the added risk of exposing patients to opioids were motivating factors in implementing an enhanced recovery after bariatric surgery (ERABS) protocol.

Dr Sadek pioneered ERABS in his practice, developing the protocol and presenting it to the administration of Robert Wood Johnson University Hospital, in New Brunswick, New Jersey. The implementation of the ERABS protocol was a concerted effort of a multidisciplinary team of anesthesiologists, nurse supervisors, nurses, and hospital coordinators that took 3 months.

As part of the program, the patient consumes a high-protein liquid diet and 1 yogurt daily for the week leading up to a bariatric procedure. Patients are prescribed carbohydrate loading the night before and on the morning of the surgery. Preoperative carbohydrate supplements facilitate a rapid return of bowel function and faster recovery, and prevent insulin resistance and the loss of muscle mass after surgery.<sup>27</sup>

On the day of the procedure, the ERABS preoperative protocol consists of IV hydration, a transdermal scopolamine patch to prevent preoperative and postoperative nausea and vomiting, and gabapentin to improve postsurgical pain. As a component of multimodal analgesia, gabapentin has been shown to decrease

anxiety and neuropathic pain as well as have postoperative opioid-sparing effects in different settings.<sup>28,29</sup> Also, IV pantoprazole is used to reduce gastrointestinal irritation postoperatively.

To better manage pain in the recovery phase, 1 g of IV acetaminophen is administered before surgery and IV ketorolac is administered postoperatively. EXPAREL (20 mL) is diluted with 150 or 200 mL saline and is injected into the left and right upper quadrants and midline via a TAP block immediately before the procedure. A separate dose of bupivacaine is administered subcutaneously.

Patients are counseled preoperatively by nurses from the bariatric and anesthesiology teams and educated on what to expect and how to manage the pain experience after surgery. Patients are also given an instruction booklet. Most patients do not ask for opioids and are later discharged without a prescription for them.

With the ERABS protocol, patients are more functional and have better ambulation, as they are free of opioids. The lack of opioids and improved patient functionality reduce the risk for respiratory and pulmonary complications, which is a major concern in obese patients. Also, quicker return to ambulation means fewer days spent in the hospital, resulting in a decrease in LOS post-ERABS from 1.8 days to less than 1 day, freeing up hospital resources and generating cost savings.

One week after surgery, patients are seen in the office for a follow-up appointment to assess the surgical outcome. The majority of patients report minimal pain and overall satisfaction with their experience.

Dr Sadek's ERABS protocol is the first opioid-free bariatric surgery program in the country. Since its implementation, it has gradually rolled out to additional types of surgery in the hospital, including colorectal and vascular procedures.

## ERAS Program in Colorectal Surgery

**Erik Askenasy, MD**

The ERAS protocol in elective colorectal surgery (eg, colectomy) at Memorial Hermann Southeast Hospital, pioneered by Erik Askenasy, MD, is an integrated program across all phases of the perioperative timeline, and aims to provide the patient with a comprehensive surgical experience starting at the counseling phase and ending several weeks after surgery.

Dr Askenasy emphasizes the need for preoperative patient counseling. This is first done in the office and serves to help prepare the patient mentally for the surgical experience and sets expectations about postsurgical pain. Patients must understand that some discomfort after surgery is not unexpected. In his experience, most patients do not want to use

opioids and request an opioid-free surgery and hospital stay. For instance, patients undergoing elective surgery should reasonably expect that at times their pain level will reach 4 of 10. This level does not require opioids. Conversely, pain that prevents patients from sleeping at night, corresponding to a pain scale score of 6 or 7, may be treated with opioids.

In Dr Askenasy's experience, opioid-sparing procedures have resulted in overall patient satisfaction and improvement in every score. The return to baseline functions, such as bowel function and ambulation, is much faster with the newly implemented ERAS protocol.

Dr Askenasy recognized the need for a program that would minimize the use of opioids for pain management. He

wrote the first version of the ERAS protocol and presented it to his fellow colleagues, surgeons, and anesthesiologists in a casual exchange and as a potential way to improve outcomes. Their response was favorable; Dr Askenasy then presented his ideas to preoperative and postoperative nurses. ERAS implementation required collaboration with anesthesia providers as well as nursing education. For example, nurses were trained on preoperative patient counseling, and are an integral part of a comprehensive ERAS program. Throughout the introduction of the protocol, Dr Askenasy continuously engaged PACU nurses asking for feedback about the protocol, patient performance, and pain levels, and invited their ideas on how to improve the technique and the patients' experience. Floor nurses who tended to patients after they had left the PACU also were asked for feedback. Dr Askenasy also actively engaged administration, as the pharmacy department was always looking at ways to limit costs but maximize outcomes. Some aspects of the protocol have some costs associated with it, as long-term hospital savings are harder to quantify. However, over time, as nurses, anesthesia providers, and administration began seeing the benefits of the program and its significant cost savings, initial skepticism turned into enthusiasm for the program.

Collectively, nurses adhered to the protocol and physicians and patients increasingly requested it, prompting a culture change and establishing the protocol as a new standard of care in surgical anesthesia. It took about a year of negotiation and one-on-one discussions with physicians and nurses to achieve institutional buy-in.

#### **ERAS Protocol**

The ERAS protocol starts 5 days preoperatively, with an instruction kit mailed to the patient's home containing all the medications the patient will need before and after surgery—such as an antibiotic, mechanical bowel preparation, pre- and post-op medications, and complex carbohydrate supplements—and detailed instructions on how to take the medications.

Prior to using EXPAREL, Dr Askenasy treated postsurgical pain with either PCAs or elastomeric pumps. In Dr Askenasy's experience, patients receiving EXPAREL, as part of a multimodal regimen, required less rescue pain medications and did better in terms of pain control than those using either PCAs or elastomeric pumps. An additional benefit of EXPAREL was its ease of administration as a one-time intraoperative block as opposed to the elastomeric pumps which were bulky and required patient's to carry them when they ambulated. Also, patients receiving EXPAREL had faster catheter removal compared with those receiving ropivacaine and dexamethasone.

Dr Askenasy administers EXPAREL as a large-volume block preincision under ultrasound guidance (Table). Initially these blocks were performed in 4 locations (posterior rectus sheath as well as TAP space on both sides of the abdomen). As the protocol has matured, he now also performs subcostal blocks. These blocks typically take about 5 to 10 minutes to administer. According to Dr Askenasy, the time spent up front is well spent, as it significantly decreases opioid requirements during and after surgery. In addition, the ERAS protocol includes ketamine and dexmedetomidine drips that allow anesthesiologists

to run a lower intraoperative inhaled anesthetic gas rate. Dexmedetomidine administration is continued at a low rate through the PACU, which helps keep patients comfortable. Patients routinely receive no narcotics throughout their entire operation. This has been a significant culture shift. Previously, the anesthesia providers administered opioids at the beginning of the case *before* the patient manifested physiologic symptoms of pain (ie, elevated heart rate, rising blood pressure). Now, opioids are only given *if* the patient's vital signs indicate the need for additional pain control.

Because patients now present to the PACU with abdominal blocks and low-dose dexmedetomidine, PACU opioid use has decreased. This also was a significant culture change and required up-front discussions with PACU nurses who were counseled to replace opioids with a multimodal regimen alternating NSAIDs, methocarbamol, and gabapentin as the new ERAS protocol (Table). In Dr Askenasy's experience, this culture shift occurred rapidly as improved patient outcomes were clearly visible. PACU nurses now adhere to an opioid-free protocol and administer them only when necessary.

Opioids are constipating agents; therefore, eliminating or limiting their use postoperatively allows patients to quickly return to normal bowel activity. Shortly after surgery, patients are allowed liquid food and advance to a soft diet either the same day or the next morning. All patients experience a return of bowel function before discharge.

The ERAS program has been operational for about a year and has already shown positive results in terms of decreases in LOS, rate of complications, hospital readmissions, hospital costs, and, more importantly, opioid consumption.

#### **Assessing Patient Outcomes**

Since the start of the program, Dr Askenasy has performed a weekly retrospective chart review recording the results. To assess the program's efficacy, he measures patient outcomes, defined as LOS; opioid use during the operation, in the PACU, and on the floor; and readmission and surgical site infection rates.

Narcotic use was divided by pre-, intra-, and postsurgical use and converted to IV hydromorphone milliequivalents to measure opioid use (1.5 mg of intramuscular [IM], IV, and subcutaneous hydromorphone equivalent to 10 mg of IM, IV, and subcutaneous morphine, or 0.2 mg of fentanyl). The average amount of opioid used was 1.1-mg IV hydromorphone milliequivalents during the entire hospital stay, and it decreased to 0.9-mg IV hydromorphone milliequivalents for minimally invasive or robotic surgery.

Results show that approximately one-third of Dr Askenasy's patients undergoing elective colon surgeries had a completely narcotic-free hospitalization including the operation itself, and only 12% of patients (n=84) were prescribed an opioid at discharge.

Other outcomes included LOS, readmissions, and surgical site infections. Compared with the average LOS of 3 to 5 days in similar surgeries, the LOS observed in elective surgeries since the implementation of the ERAS protocol was 1.64 days. Dr Askenasy noted that the least amount of time spent in the hospital was in robotic surgeries at 1.52 days. The multimodal analgesic regimen reduced the LOS by at least 1 to

1.5 days. Of the 84 patients undergoing elective colon surgery, 60% were discharged on POD 1 and 87% left the hospital on POD 2.

At the 2-week follow-up visit, pain level, bowel function, activity level, overall status of the patient, and ability to return to

work are evaluated. Since the ERAS protocol started, patients have been discharged earlier and with normal bowel function; they are able to start eating and drinking sooner; and they have a faster return to normal activities than with the traditional standard of care.

**Table.** ERAS Colorectal Surgery Protocol at Memorial Hermann Southeast Hospital

Timing	Step in the colectomy pathway
<b>5 d before surgery</b>	Begin taking immune-boosting nutritional supplement
<b>3 d before surgery</b>	Stop taking fiber supplements and begin a low-fiber diet
<b>1 d before surgery</b>	No solid foods; liquids only
<b>Day of surgery</b>	<p>Drink sugar-free clear liquids until 3 h before surgery; complex carbohydrate nutrition drink before arrival at the hospital</p> <p>Preventive multimodal analgesia: pre-op 600 mg of gabapentin, 1,000 mg of acetaminophen, and 750 mg of methocarbamol</p> <p>Nothing further to eat or drink until after surgery</p>
<b>Anesthesia</b>	<p>Lidocaine or dexmedetomidine plus ketamine (see below for doses)</p> <p>EXPAREL (TAP, posterior rectus sheath, and subcostal block under ultrasound guidance before surgery)</p> <p>Mix 20 mL of EXPAREL in 100 mL of saline and add 30 mL of 0.25% bupivacaine (total volume, 150 mL)</p> <p>Use 20 mL for each block site (total of 6 sites = 120 mL total) after intubation. Last 30 mL used for peritoneal block and for skin incisions</p>
<b>Induction anesthesia regimen (lidocaine or dexmedetomidine plus ketamine)</b>	<p>Lidocaine (2 g in 250 mL D5W) or dexmedetomidine (200 mg in 50 mL NS): infuse 0.2-0.7 mcg/kg/h; turn down to 0.1 mcg/kg/h 1 h before end of surgery</p> <p>Ketamine 0.5-mg/kg bolus for induction; start infusion at 10-20 mg/h versus bolus of 10-20 mg/h; 1 h before end of surgery, give 10 mg of ketamine IV bolus and stop infusion</p> <p>Dexamethasone (optional): 10 mg intravenously as a single dose after induction</p>
<b>Postoperative pain management</b>	<p>Celecoxib 200 mg by mouth every 12 h; acetaminophen 1,000 mg intravenously every 6 h; methocarbamol 750 mg intravenously every 6 h; gabapentin 300 mg by mouth every 8 h; all scheduled around the clock</p> <p>Hydromorphone 1 mg by mouth every 4 h as needed, or 0.3 mg intravenously every 3 h as needed</p>

**D5W**, 5% dextrose in water; **ERAS**, enhanced recovery after surgery; **NS**, normal saline; **TAP**, transversus abdominis plane

## ERP for Cesarean Delivery in a Community Hospital

**Darren Adams, DO**

**D**arren Adams, DO, witnessed the evolution of the opioid epidemic firsthand at Southern Ohio Medical Center (SOMC), a 250-bed community hospital in Portsmouth, Ohio, that performs 1,200 deliveries per year, of which 35% are cesarean deliveries. A high number of mothers presenting to the delivery unit had a strong history of substance abuse or were actively addicted and required treatment for opioid dependence, prompting Dr Adams to train in the use of buprenorphine-naloxone and buprenorphine in the context of addiction.

Opioid-addicted mothers carry a higher risk for neonatal abstinence syndrome (NAS), a postnatal opioid withdrawal syndrome occurring in newborns of mothers who are addicted to opioids during pregnancy.<sup>30</sup> NAS requires additional monitoring, increases LOS in newborns, and may result in complications and readmissions. Withdrawal symptoms in newborns have a delayed onset of around 3 to 7 days or longer, extending the typical LOS in the neonatal care unit up to 2 weeks. NAS may delay growth and development, and it causes a longer separation of mothers from their infants, delaying the start of bonding time with babies and negatively affecting new mothers.<sup>30</sup>

To tackle the opioid crisis unfolding in the delivery unit, SOMC sought a partnership with the Ohio Perinatal Quality Collaborative and launched a “maternal neonatal task force,” a team effort engaging the pediatric nursing team, emergency physicians, social workers, anesthesiologists, and obstetricians to decrease NAS and LOS for babies born to opioid-addicted mothers.

In standard practice, bupivacaine analgesia was previously delivered via a pump. However, the pump was associated with functional problems, including frequent leaking, and was prone to medication errors, making nurses feel uncomfortable using it. In the post-recovery stage, a standard order including acetaminophen-hydrocodone, ketorolac, and morphine was prescribed to control the pain. Hydromorphone was indicated in cases of severe pain.

The new protocol replaced long-acting morphine with the short-acting formulation. Dr Adams first heard about EXPAREL through colleagues in the orthopedic surgery department and decided to incorporate it into his practice. He administered EXPAREL as a TAP block guided by ultrasound visualization. Although his colleagues use the infiltration technique, Dr Adams prefers the TAP block, which requires fewer needlesticks and decreases the risk for contamination in a population of opioid users with a high risk for hepatitis C infection. The TAP block starts with a 1-mL test dose, followed by an injection of 39 mL of a mixture of 20 mL of EXPAREL with 30 mL of sterile saline and 30 mL of bupivacaine on each side. This technique is also faster than surgical infiltration. EXPAREL is used intraoperatively in addition to IV acetaminophen and IV ketorolac. In cases of severe pain, a unique dose of hydromorphone is allowed. Patients are discharged on alternating doses of acetaminophen and ketorolac every 6 hours.

The implementation of EXPAREL at the hospital was met with administrative hurdles and budget restrictions, as in

## The Opioid Task Force

**Linda Carroll, RN-BC, BSN, MSN**

**T**he successful ERAS cesarean delivery program at SPUH has become an example for other departments and hospitals of a way to decrease opioid use perioperatively. The Opioid Task Force is the result of a close collaboration between SPUH, schools, law enforcement agencies, and other public institutions that launched in Middlesex, New Jersey, in 2017 to fight the opioid epidemic. The rapid rise of opioid and substance abuse and overdoses leading to exponential police interventions and resuscitation at people's homes prompted this action at the public level.

The Opioid Task Force is a multifaceted approach that invests in educational outreach to all public and private schools in Middlesex and the larger community. Educational sessions are delivered by individuals from the community

who have been deeply and personally affected by the opioid crisis and who can strongly influence youth to change behaviors.

The root causes that lead to substance abuse often can be traced to an opioid prescription after a tooth extraction, sports injury, or cesarean delivery. In an effort to influence the prescribers, the Opioid Task Force has educated sports trainers, athletic directors, coaches, guidance counselors, superintendents, principals, and teachers in schools, as well as students, about the long-term side effects of opioid prescriptions in children. Because of schools' and society's competitive sports culture, sports medicine physicians are under pressure to return young student athletes to the field in the shortest amount of time, and as a result, are

addition to acquisition cost, EXPAREL requires preparation by the pharmacy team. Despite facing firm resistance, Dr Adams applied the technique in clinical practice, trained fellow colleagues, and started reporting individual results to the hospital administration.

As the chairman of the obstetric surgery department, Dr Adams had to prove the efficacy of his technique to get approval. He recorded outcomes on a cohort of 15 patients to the administration. The outcomes measured were LOS, pain control, overall experience, and readmissions. The combined results of cost savings, reduction in narcotic use, and patient-physician satisfaction with analgesia eventually established EXPAREL as the new standard of care.

As part of ongoing education, nurses have been trained to counsel patients preoperatively, manage their pain expectations, and explain prevention techniques. In fact, educating the hospital team about EXPAREL has created a paradigm shift in the management of postsurgical pain in their patients undergoing a cesarean delivery.

Although the institution has not yet fully adopted the complete ERP, and does not offer the preoperative nutritional regimen, Dr Adams uses EXPAREL in all of his patients. On the basis of the results that he has observed in using EXPAREL as part of the multimodal approach, opioid use has decreased. Mothers have been more alert, enabling them to meet their newborns shortly after delivery and improving the overall pain experience.

## Conclusion

In the United States, prescription opioid therapy for postsurgical pain has played a role in fueling the current opioid

epidemic, making hospitals and ORs unintended gateways to dependence and abuse. Multiple studies have proven the efficacy of a preventive multimodal analgesic regimen that can reduce ORAEs and improve overall patient satisfaction. ERPs and ERAS programs that use multimodal analgesia, incorporating EXPAREL intraoperatively, have allowed opioid-free cesarean deliveries and colorectal and bariatric surgeries.

Educational initiatives, as well as ERPs and ERAS pathways implemented in different care centers across various surgical procedures, have reduced opioid consumption and improved patient satisfaction and pain management. This has directly decreased hospital LOS and allowed a faster return to normal activities.

Successful implementation of an ERP or ERAS program requires engagement of all stakeholders, including patients and members of the multidisciplinary health care team, and a close interdepartmental collaboration, as well as education and training. The Joint Commission's recent announcement on establishing clinical leadership and actively engaging staff and hospital executives to improve pain assessment and management by reducing opioid therapy and the associated risks only reinforces the shift to a more dynamic model of communication across hospital departments. Additionally, the community at large, especially vulnerable and special populations such as the elderly and pregnant women, must be made aware of the immediate and long-term dangers of opioid use. An active collaborative effort, such as the Opioid Task Force, between members of the community, including private and public institutions, is essential in combating the opioid epidemic.

sometimes compelled to prescribe potent opioids to eradicate pain.

In a partnership with Woodbridge Township in New Jersey, SPUH identifies patients admitted for overdose or heroin addiction, and matches them with a recruited "recovery coach." Coaches—themselves recovering addicts—counsel patients, share experiences, and ultimately connect patients with treatment centers. This strategy has been very successful in preventing readmissions and recurrence of substance abuse and has increased the chance of patients being admitted to treatment centers instead of returning to the streets.

The initiative also has planned a community conference with educational sessions targeting special populations,

such as children who are more vulnerable to addiction when exposed to drugs at a younger age than adults with similar exposure. Individuals with a positive family history of substance abuse and mental health problems are at a high risk for addiction, underlining the importance of screening patients at the hospital using risk assessment tools and finding alternative medications to treat pain.

In September 2017 at the time of launching the program, 3,500 children were receiving education through the program; the goal is to reach 4,000 children. In recognition of its accomplishments, the Opioid Task Force was awarded a social stewardship award from the HealthTrust Purchasing Group in Tennessee.

## Indication

EXPAREL® (bupivacaine liposome injectable suspension) is indicated for single-dose infiltration in adults to produce postsurgical local analgesia and as an interscalene brachial plexus nerve block to produce postsurgical regional analgesia. Safety and efficacy have not been established in other nerve blocks.

## Important Safety Information

EXPAREL is contraindicated in obstetrical paracervical block anesthesia.

Adverse reactions reported with an incidence greater than or equal to 10% following EXPAREL administration via infiltration were nausea, constipation, and vomiting; adverse reactions reported with an incidence greater than or equal to 10% following EXPAREL administration via interscalene brachial plexus nerve block were nausea, pyrexia, and constipation.

If EXPAREL and other non-bupivacaine local anesthetics, including lidocaine, are administered at the same site, there may be an immediate release of bupivacaine from EXPAREL. Therefore, EXPAREL may be administered to the same site 20 minutes after injecting lidocaine. EXPAREL is not recommended to be used in the following patient population: patients <18 years old and/or pregnant patients.

Because amide-type local anesthetics, such as bupivacaine, are metabolized by the liver, EXPAREL should be used cautiously in patients with hepatic disease.

## Warnings and Precautions Specific to EXPAREL

Avoid additional use of local anesthetics within 96 hours following administration of EXPAREL.

EXPAREL is not recommended for the following types or routes of administration: epidural, intrathecal, regional nerve blocks **other than interscalene brachial plexus nerve block**, or intravascular or intra-articular use.

The potential sensory and/or motor loss with EXPAREL is temporary and varies in degree and duration depending on the site of injection and dosage administered and may last for up to 5 days, as seen in clinical trials.

## Warnings and Precautions for Bupivacaine-Containing Products

**Central Nervous System (CNS) Reactions:** There have been reports of adverse neurologic reactions with the use of local anesthetics. These include persistent anesthesia and paresthesia. CNS reactions are characterized by excitation and/or depression.

**Cardiovascular System Reactions:** Toxic blood concentrations depress cardiac conductivity and excitability which may lead to dysrhythmias, sometimes leading to death.

**Allergic Reactions:** Allergic-type reactions (eg, anaphylaxis and angioedema) are rare and may occur as a result of hypersensitivity to the local anesthetic or to other formulation ingredients.

**Chondrolysis:** There have been reports of chondrolysis (mostly in the shoulder joint) following intra-articular infusion of local anesthetics, which is an unapproved use.

**Methemoglobinemia:** Cases of methemoglobinemia have been reported with local anesthetic use.

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