



Enhanced recovery after surgery, perioperative medicine, and the perioperative surgical home: current state and future implications for education and training

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Purpose of review

The purpose of this review is to summarize the current state of perioperative medicine, including the perioperative surgical home (PSH) and enhanced recovery after surgery pathways (ERAS) as well as the educational implications of these concepts for current and future anesthesiology trainees.

Recent findings

Although there is significant, ongoing discussion surrounding the structural concept of the PSH, there remains little clinical evidence to support its development. On the other hand, publications surrounding ERAS principles continue to show clinical benefit in reducing length of stay, cost, and perioperative complications for a variety of surgical populations. In this milieu, perioperative medicine is increasingly being recognized as its own specialty in perioperative care that encompasses, but is larger than, ERAS.

Summary

There is sufficient evidence to support widespread adoption of ERAS principles, although the specifics of local implementation may vary from site to site. There is significant uncertainty as to what the PSH actually is. However, perioperative medicine is a defined specialty in medicine that overlaps significantly with anesthesiology core training and practice and will be a significant focus in future education, research, and clinical care provided by anesthesiologists.

Keywords

education, enhanced recovery after surgery, perioperative medicine, perioperative surgical home

INTRODUCTION

Optimal care delivery in the perioperative period is receiving significant attention. And because anesthesiologists have a long history of improving patient safety and outcomes, there is increasing attention being paid on expanding the role of the anesthesiologist to the entire perioperative care arc – from the time a decision is made to operate until care is returned to the patient's longitudinal care provider(s) [1–4]. There are three main components that are currently included in the conversation: enhanced recovery after surgery (ERAS), perioperative medicine, and the perioperative surgical home (PSH).

In Europe and the UK, the concept and principles of ERAS have become a large part of surgical care provided to multiple different types of surgical patients [5–8]. In addition to ERAS, there has been a large focus on perioperative medicine with

development of the evidence-based perioperative medicine society. In the USA, this has taken a bifurcated approach. On the one hand, the American Society of Anesthesiologists (ASA) has endorsed the structural concept of the PSH as the future of our specialty, whereas on the other, the American

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KEY POINTS

- In order for anesthesiology to become more involved in perioperative medicine, a more robust training curricula needs to be developed.
- The PSH, ERAS, and perioperative medicine are three concepts each attempting to achieve improvement in perioperative outcomes.
- Each of these concepts remain relatively early in their development and it is yet to be proven if they can produce long-lasting impact without development of a 'perioperative team' to ensure ongoing compliance.

ENHANCED RECOVERY AFTER SURGERY

ERAS programs are evidence-based multimodal interventions aimed at achieving early postoperative recovery. These interventions focus on minimizing the stress response that occurs in the perioperative period to achieve early recovery and minimize morbidity [10]. To achieve this, principles of care focus on common reasons that patients remain in the hospital after surgery: need for parenteral analgesia, delayed return of bowel function and thus need for intravenous fluids, and lack of mobility [11]. Multimodal analgesia, avoidance of nasogastric tubes, early refeeding, optimal surgical technique to minimize stress response, and early ambulation are all pillars to the ERAS programs. They have reduced length of stay by 30% and postoperative complications by 50% in colorectal surgery [6,12]. In addition to successful implementation in colorectal surgery, ERAS programs have been reported to reduce postoperative length of stay in bariatric surgery, pancreaticoduodenal operations, gastrectomies, urologic procedures, total knee arthroplasty, and microvascular breast reconstruction procedures (Fig. 1) [5,7,13–16].

Society of Enhanced Recovery has partnered with evidence-based perioperative medicine society to approach ERAS as one component within a larger field of perioperative medicine. In all of this dialogue and debate, it remains to be addressed how we train future generations of anesthesiologists in this expanded role, or how this expanded role interacts with our surgical colleagues who have traditionally provided perioperative care [9]. This article will present a brief overview of the current state of ERAS programs, perioperative medicine, and the PSH and then describe one model of training in perioperative medicine that has been successful in anesthesiology graduate medical education.

Although the concept of ERAS was born in Europe, it is gaining traction in the USA. ERAS programs have been developed at several institutions, including Vanderbilt University Medical Center (VUMC), Duke University, and the University of

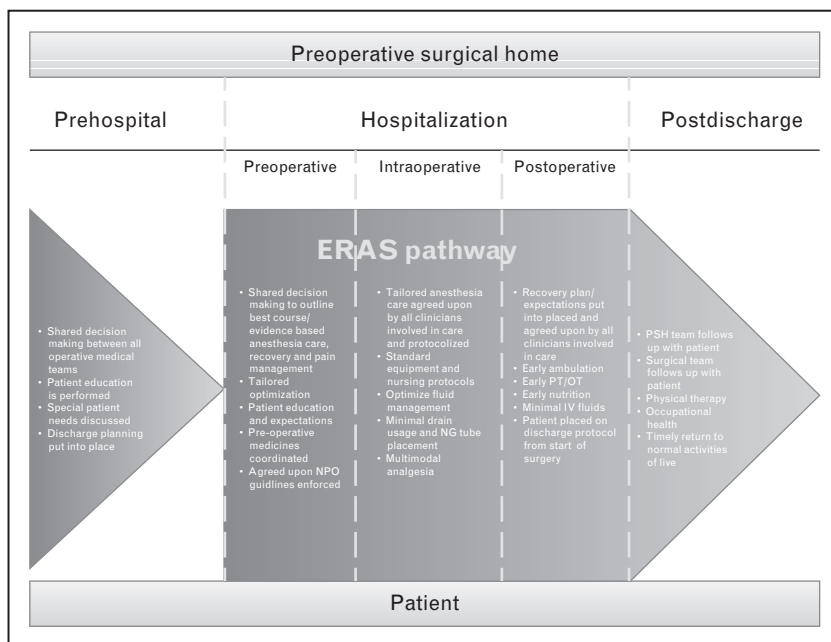


FIGURE 1. Summary of the fusion that should exist between the perioperative surgical home and an ERAS pathway. ERAS, enhanced recovery after surgery.

Virginia, with publication of outcomes showing an improvement compared with historical baseline [12,13,17,18]. However, despite the large body of evidence supporting ERAS programs, uptake has been slow, likely secondary to the difficulty in changing the established dogma of how perioperative care is provided. There has also been difficulty with compliance, especially in the postoperative period [19,20] because of these concerns; it has come into question whether an ERAS protocol is enough to achieve sustained improvements in patient care [19,20].

PERIOPERATIVE SURGICAL HOME

The PSH has been introduced as an organizing idea for ERAS pathways and perioperative medicine (Fig. 1). The PSH is proposed as a patient-centered, team-based system of care developed by the ASA [21]. The PSH was developed as an answer to the institute for healthcare improvement's triple aim; therefore, the goals of the PSH are to improve patient satisfaction, improve the quality of perioperative care delivered, and reduce the cost of surgical care [22,23]. Ideally, a PSH would reduce variability in practice that occurs during the perioperative period and provide patients with continuity of care throughout their surgical episode [24]. Additionally, the PSH calls for anesthesiologists to expand their role from the intraoperative period to the entire perioperative period [24]. Internists who work with surgeons to provide care traditionally occupy this space. However, because internists

are not trained in the perioperative arena, it is believed they lack specific training in the physiologic changes that occur around an episode of surgical care as well as the knowledge and skills to provide optimal nonopioid analgesia, a key component of speeding functional recovery [24]. The PSH suggests that the anesthesiologist is well suited to provide perioperative care because of greater understanding of perioperative physiology and it would place the anesthesiologist outside the operating room to help coordinate and provide care alongside the surgeon [24]. PSHs have been reported to be developed at the University of Alabama at Birmingham, the University of California at Irvine, VUMC, and the Tennessee Valley Health System Veteran Affairs Hospital (Fig. 2) [22,25]. However, despite development of these programs, it currently remains unclear if these programs improved patient outcomes or if it is simply the execution of ERAS principles. It is equally unclear what actually comprises a PSH. That is, uncertainty remains about whether a practice or institution needs to structurally create a 'home', or if the specialty of anesthesiology simply needs to define a pathway for training the next generation of perioperative physicians with a broader skill set in perioperative medicine.

PERIOPERATIVE MEDICINE

In addition to ERAS programs, the larger concept of perioperative medicine as a distinct domain has emerged and is quickly growing – and for which there is significant published evidence [4]. ERAS

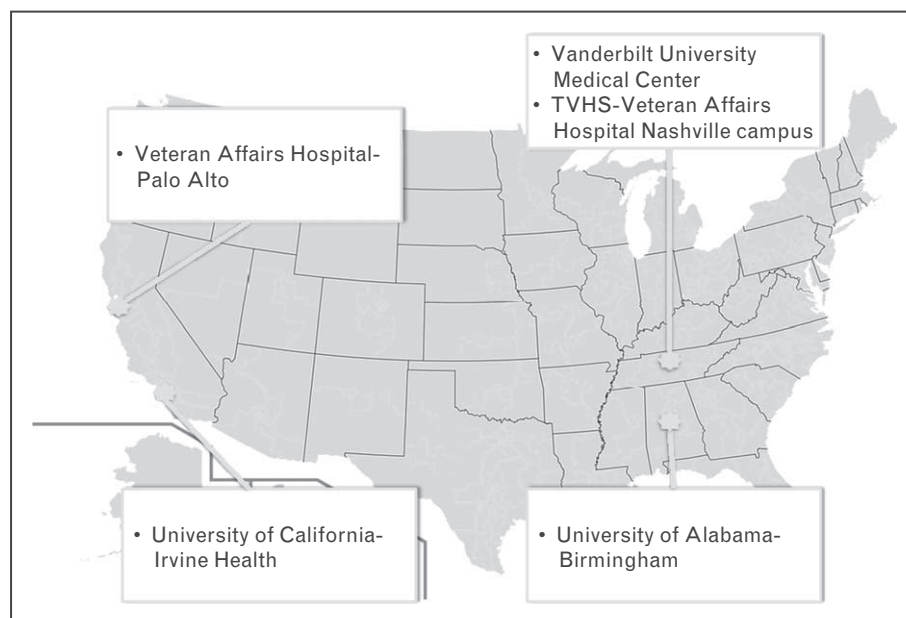


FIGURE 2. A geographical representation of some of the US locations of implemented perioperative surgical homes.

pathways focus on surgical populations, such as colorectal or total joint arthroplasty. Perioperative medicine is a larger domain that encompasses those ERAS concepts, but also includes focus on the medically complex patient during their entire perioperative course. It is an area of healthcare where there can be intense collaboration between specialties, as in critical care medicine, to deliver the highest quality of patient care throughout the index surgical admission. This is especially true as anesthesiologists increasingly work to improve preoperative assessment and management (particularly of high-risk patients) and as surgeons increasingly, and appropriately, focus more time on new and specialized technical procedures [4]. Accordingly, several groups have suggested a matrix that accounts both for ERAS pathways and areas of perioperative medical interventions [3,9]. At VUMC, we have a scalable and growing matrix through which we develop and deliver perioperative patient care in close collaboration between perioperative medicine specialists, the operating room based anesthesia care team, surgeons, and nurses (see Fig. 3).

In light of the recognition that perioperative medicine is a distinct domain of healthcare, the perioperative physician should have an appropriate portfolio of competencies to manage the most complex patients undergoing a variety of surgical interventions. It should be noted that while the perioperative physician may come from a variety of base specialties (i.e., anesthesiology, surgery, medicine); the training needed to develop this skillset is still being defined [9,26,27]. At a minimum, this skillset involves understanding proper medical evaluation, optimization, and management prior to and after the immediate perioperative period, with a clear understanding of how these phases of care interact with the surgery performed and the anesthetic delivered, which is why anesthesiologists may be best suited for this role.

CURRENT EDUCATIONAL STATE

It is self-evident that improving perioperative outcomes and patient experience while reducing the cost of care is an important goal for our patients and society. However, it remains to be seen what is the best method for achieving these goals. ERAS programs come close to achieving this goal, but have difficulty with spread of ideas, sustainability, and compliance outside the research environment [19[¶]]. The idea of the PSH places the anesthesiologist into an expanded role as a team leader in a perioperative 'home,' but it lacks evidence backing its effectiveness [22,24]. Additionally, except for critical care medicine, anesthesiologists

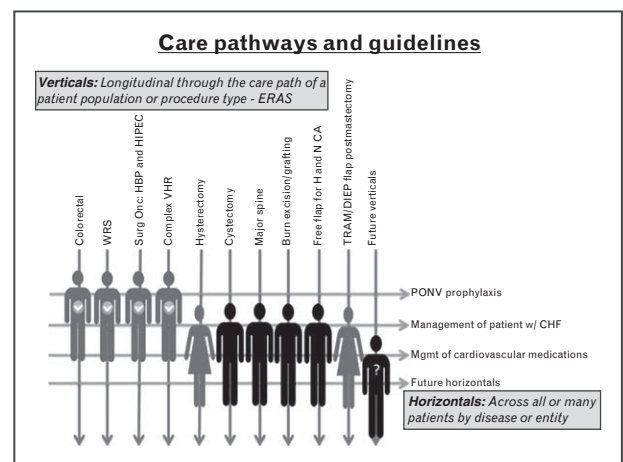


FIGURE 3. The figure displays the scalable matrix that we have used at Vanderbilt University Medical Center for the creation and execution of perioperative medicine. ERAS, enhanced recovery after surgery; H&N CA, head and neck cancer; VHR, ventral hernia repair; WRS, weight reduction surgery; CHF, congestive heart failure; HBP, hepatobiliary surgery; HIPEC, hyperthermic intraperitoneal chemotherapy; PONV, postoperative nausea and vomiting. Adapted with permission from [9].

traditionally lack training in routine postoperative management of patients outside the postanesthesia recovery unit. Accordingly, we suggest that additional training is needed in perioperative medicine beyond what is currently offered through core anesthesiology residency requirements as set forth by the Accreditation Council for Graduate Medical Education. Like critical care and pain medicine, perioperative medicine is becoming a definable and growing domain of knowledge and skills. Therefore, this will require expanded training opportunities for anesthesiologists to be prepared for this potential new role – and the exact curriculum is still being defined and tested.

University of California at Irvine has recently reported on a robust curriculum delivered to their residents that encompasses a significant amount of knowledge important for perioperative patient management [28]. However, it is uncertain from their report, whether their trainees are actually the team leaders during the clinical care of any patient population from decision to discharge and beyond. Institutions, like our own, have started postgraduate fellowship programs [29]. However, it remains unclear whether this training should be an extension of all core anesthesiology training programs or whether it is an extension of training, as with other fellowships. As curricula develop, time and consensus will tell, but what is becoming clear is that perioperative medicine is a unique subspecialty of the practice of medicine.

THE VANDERBILT UNIVERSITY MEDICAL CENTER TRAINING MODEL

We practice a unique model of care and training at VUMC that involves a matrix interaction of ERAS pathways for surgical populations with perioperative medicine topics (Fig. 3 – verticals). This matrix of care was developed in 2014 and has been managed by our Perioperative Consult Service (PCS) with over 2000 patient encounters since that time. Furthermore, all 72 anesthesia residents participate in this service multiple times during their training. The PCS team has developed and applied ERAS protocols for seven surgical services: colorectal, surgical oncology, living donor nephrectomy, abdominal wall reconstruction, microvascular breast reconstruction, bariatric surgery, and orthopedic trauma [12,13,30]. The PCS has been successful in achieving reductions in length of stay for these surgical populations and expanding the training of anesthesiology residents into the perioperative period [9]. In addition, this team has also developed (and continues to refine) a variety of care pathways related to comorbid conditions and perioperative complications (Fig. 3 – horizontals). What follows is a description of the key components of this program and the key steps needed for other practices and institutions to consider as they develop clinical care team and training curricula for this domain of care.

STEPS FOR CREATING AND SUSTAINING A PERIOPERATIVE MEDICINE CONSULT SERVICE AND TRAINING CURRICULUM

Vision and macrostructure

To create a perioperative medicine program there must be a culture of innovation and embracing change that begins early in training [31]. Interns must be taught that innovation and change are key components of a healthcare system and that anesthesiology has a long history of innovation and leadership in improving patient safety, which now needs to expand throughout the entire perioperative care arc. At VUMC, this is accomplished through a month-long rotation in professional development. This month focuses on key concepts in change management such as lean six sigma, entrepreneurship, healthcare finance, research, patient safety, healthcare policy, and medical humanities [9]. Interns also sign up for longitudinal quality improvement projects that will span their residency to encourage their engagement in becoming active change agents within the medical center. This experience is interwoven with 2 months of experience on our PCS team, exposing them to the practice of perioperative medicine early in their training.

These experiences are continued each year through their anesthesiology residency with increasing responsibility each year (5 months total). During their final year of training, residents work to manage the whole team providing perioperative care. At VUMC, this team is currently comprised each day of three attendings, four residents, four interns, and five nurse practitioners, who, on average, provide perioperative care for 40–60 postoperative surgical patients and preoperative consultation and care coordination for 5–10 medically complex patients each day.

Nuts and bolts of getting started

To begin development of a perioperative medicine training program, it is important to identify a patient population where there is a high likelihood of success. Each institution will have a unique surgical population that is amenable to intervention. For example, enacting an ERAS pathway for colorectal surgery patients has a high likelihood of success given the long history of success in that patient population [6,12]. Once a population is identified, finding a surgical champion with whom to work is paramount. Your team should plan to work with the surgeon(s) to develop an evidence-based clinical pathway that involves detailed components of surgical care, anesthesia care, and perioperative management. At VUMC, we call these vertical care pathways, as noted above (Fig. 3), which is a detailed plan of care across an entire surgical population. Once this pathway is deployed, it is easy to overlay plans of care (horizontals) for comorbid conditions and/or perioperative events: prevention and treatment of postoperative nausea and vomiting, postoperative pulmonary complications, or delirium.

Another key component to successful deployment of a perioperative medicine service is the ability to track compliance and outcomes with each intervention. Real-time tracking of data allows for structured monthly meetings with surgeons and administration about the success of the change implemented. Currently at VUMC, outcomes for each month are reviewed with each surgical service. These outcomes include not only length of stay but also acute kidney injury, postoperative ileus rates, hospital readmission rates, and emergency room visits.

CONCLUSION

The PSH has been embraced by the ASA as part of the future of anesthesiology as a specialty. However, there remains little evidence that the PSH improves patient outcomes. What is apparent is that patients

deserve better perioperative care. Anesthesiologists have a long history of improving patient safety, understand perioperative physiology, and pain management. Despite our current skill set, more work needs to be done to develop true expertise in perioperative medicine. If the specialty wants to embrace perioperative care of surgical patients, anesthesiology resident training needs expansion past its traditional core rotations into the perioperative arena.

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Conflicts of interest

There are no conflicts of interest.

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