



American Association of
NURSE ANESTHESIOLOGY

Enhanced Recovery after Surgery

Considerations for Pathway Development and Implementation

Table of Contents	
Purpose	2
Introduction	2
The Patient's Interdisciplinary Team	2
Culture and Leadership	3
Enhanced Recovery after Surgery Pathway Development	3
Begin with the Project Plan	3
Project Vision and Strategy	4
Pathway Development	4
Change Management	4
Step 1. Create a Sense of Urgency	8
Step 2. Form a Powerful Guiding Coalition	8
Steps 3 and 4. Create and Communicate the Vision for Change	8
Step 5. Empower Broad-based Action	9
Step 6. Generate Short-term Wins	9
Step 7. Consolidate and Build on Change	9
Step 8. Anchor Changes into Organization and Team Culture	9
Enhanced Recovery after Surgery Pathway Implementation	9
Coordination of Care Support	13
Prehospital/Preadmission Phase	14
Preoperative Phase	15
Intraoperative Phase	16
Postoperative Phase	23
Discharge Phase	23
Post-Discharge Phase	23
Continued Quality Improvement Team Activities	23
What Data to Collect	24
Data Collection	24
Translating Data to Action	24
Addressing Implementation Challenges	25
Conclusion	26
Enhanced Recovery Resources	26
References	31

Purpose

These practice considerations are intended to support the anesthesia professional, as a member of the interdisciplinary team that includes the patient, to implement and continually improve Enhanced Recovery after Surgery (ERAS®) pathways across the continuum of care from before admission to return home. By collaboratively developing specialty and facility specific evidence-based ERAS pathways, the team limits individual provider variation in care to improve patient engagement, quality of recovery, safety and outcomes. As members of the interdisciplinary team, anesthesia professionals are well positioned to lead and collaborate for the successful implementation of ERAS pathways across the perioperative period.

Introduction

Enhanced Recovery after Surgery (ERAS) refers to patient-centered, evidence-based, interdisciplinary team developed pathways for a surgical specialty and facility culture to reduce the patient's surgical stress response, optimize their physiologic function, and facilitate recovery.¹ Originally developed for colorectal surgery in Denmark in the late 1990s, ERAS pathways have been implemented successfully in many other specialties, including pancreatic, gynecologic, cardiovascular, thoracic, pediatric, orthopedic, and urologic surgery.²

Terms such as fast-track, rapid or accelerated recovery programs are similar, but do not encompass the comprehensive culture of care represented by the pathway that engages the patient from their first visit to their surgeon's office through 30-90 days post discharge. An ERAS pathway and program represents a fundamental shift away from each individual clinician's practice decisions to one that uses a procedure and facility specific pathway that limits variability, yet can be modified to address each patient's unique needs. Quality measures are reported and analyzed by the interdisciplinary team to continuously improve the pathway and patient outcomes.³

Growing evidence suggests that ERAS contributes to improved patient outcomes,^{4,5} reduces postoperative complications,^{2,6} accelerates recovery,⁶ and supports early discharge,^{2,4,6-9} with savings from decreased length of stay, complications and readmission offsetting increased cost of care.^{7,9,10} Though individual elements of an ERAS pathway are beneficial, implementation and compliance with patient appropriate elements of a comprehensive pathway across the entire perioperative continuum have been shown to improve outcomes.¹¹ Each patient must be evaluated for the value and appropriateness of the enhanced recovery pathway in their plan of care. The key elements of ERAS include patient/family education, patient optimization prior to admission, minimal fasting that optimally includes a carbohydrate beverage and at a minimum clear fluids up until 2 hours before anesthesia, multimodal analgesia with appropriate use of opioids when indicated, return to normal diet and activities the day of surgery, and return home.^{10,12,13}

The Patient's Interdisciplinary Team

An interdisciplinary team refers to a group of healthcare professionals from diverse fields who work together in a cohesive and collaborative fashion with trust to share expertise, knowledge, and skills to engage and optimize the patient across the entire pathway.^{14,15,16} The anesthesia professional integrates the core values of their profession and practice to optimize patient and team communication, patient safety, and evidence-based practice.¹⁶ The interdisciplinary team

supports the patient, as an active member of the team, to contribute to the development of the plan of care and realistic goals for recovery.³

Most effective change begins with a small, engaged team that is interested in continued improvement. Team success is optimized when initial learning and ongoing education, training and development are core to engagement and continued improvement of the program.¹⁵ The opportunity to develop and pilot a unique, evidence-based and valuable initiative can be a powerful motivator. The first step after leadership buy in is development of an enhanced recovery pathway involves the identification of a surgical specialty (e.g., colorectal, gynecologic, oncology surgery) that has interest in the creation and implementation of an ERAS pathway. Beginning with a small team (e.g., one pathway, one surgeon) and gradually refining the original pathway prior to a larger program rollout will keep the process on track and help identify any implementation gaps for improvement.

Culture and Leadership

Building a successful ERAS program goes far beyond simply creating a protocol or a pathway.¹⁷ Translating change across the care continuum into practice takes considerable effort for patient, healthcare professional and organization. It requires committed and engaged leadership that creates and invests in a sustainable culture of trust, learning, communication, and effective teamwork.¹⁸ Effective leaders are able to:¹⁹

- Communicate to support the vision and culture necessary for the comprehensive, long-term program.
- Create the strategic plan or roadmap to guide the program.
- Encourage engagement and commitment for ownership and continued excellence from all participants.

Enhanced Recovery after Surgery Pathway Development

Successful change management and implementation occur as a process that evolves from creation of the climate for change, to engagement and empowerment of those involved, through development of the change initiative, implementation or trial of the pathway, and sustained change with continued improvement.²⁰ Project and change management techniques and tools are not universally part of an entry into practice healthcare education program curriculum. Partnering with professionals in your facility and accessing tools and literature will be helpful in managing the scope of this project.^{21,22} Project management, safety and team training resources are helpful considerations when embarking on a change initiative of this magnitude. The team's success to create a specialty enhanced recovery pathway is also leveraged through learning from the experience of others by joining a collaborative network of colleagues by attending meetings or contributing to a related listserv, as well as the continued review of the literature and practice outcomes.^{15,21}

Begin with the Project Plan

Even before engaging the team in the idea of creating an enhanced recovery after surgery pathway, it is necessary for the project leadership team to develop the project plan to assess the scope of the project. Elements of the project plan include readiness, preimplementation, implementation and readiness, evaluation.²³ During the assessment of readiness the team reviews the related literature, existing protocols, case studies, the current program's data, and

benchmark information from similar internal and external projects to provide the team with information to create a project charter and plan.²⁴ The project plan includes identification of factors that may facilitate or impede the project.^{3,25}

Project Vision and Strategy

Next, an assessment of staff readiness and capability to support the change is helpful during the development of the project strategy and vision. One approach to identify related elements unique to your facility culture and people's biases related to their own practice and ERAS is to conduct focus sessions, survey, and individual interviews with representative members of the practice. Consider the following questions:²⁶

- Perception of current state. What is working well and not working well with patient preparation, patient ambulation the day of surgery, pain management, and other areas of interest?
- Who should lead the change? Who is a trusted thought leader?
- What needs to be done and changed to implement the change?
- What resources (e.g., staff, equipment) do we have and what will be required?
- Who, which specialty is prepared to trial the pathway?
- What is the timeline to develop and implement the change?
- What training and materials need to be developed for all staff and patients?

Pathway Development

Definition and development of facility and culture specific care pathway(s) is accomplished through a systematic review of outcome data, published ERAS guidelines, protocols, and trials. The review is based not only on the quality of evidence, but also on an analysis of how the ERAS program may fit with the culture of the practice, its skills and resources.²¹ The perioperative members of the ERAS team represent the patient and family, the surgeon's office, preanesthesia, nursing units, surgery, anesthesia, administration, patient education, and representatives of other core professions. This team reviews the evidence, assess current practice and culture, and make a decision as to which pathway(s) should be implemented in the practice. It is always beneficial to partner with other specialties and facilities who have an ERAS program to learn from their experience to identify successes and barriers.²⁶

Change Management

There are many models that offer a construct or framework to lead, develop, implement, and sustain successful change initiatives. Kotter's 8-Step Change Model offers a framework to generate and implement planned and sustainable change.²⁰ The model guides the team through development and implementation of an ERAS pathway.²⁰

In March 2017, The Agency for Healthcare Research and Quality (AHRQ) Safety Program for ERAS launched an initiative to increase implementation of ERAS pathways in U.S. hospitals through the use of an adaption of AHRQ's Comprehensive Unit-based Safety Program (CUSP).²⁷ The CUSP multifaceted approach facilitates front line teams to more rapidly adopt of evidence-based practices. The CUSP Toolkit supports Kotter's 8-Step Change Model and is compatible with TeamSTEPS® to support units in improving culture (See Table 1).²⁸

Table 1. Comparison of Kotter’s 8-Step Change Model, AHRQ’s Comprehensive Unit-based Safety Program (CUSP), and TeamSTEPPS®^{20,28}

Kotter	CUSP	TeamSTEPPS®
1. Create a sense of urgency <ul style="list-style-type: none"> • Help others see the need for change • Emphasize the importance of acting immediately 	Understand the Science of Safety <ul style="list-style-type: none"> • Describe the historical and the contemporary context of the Science of Safety • Explain how system design affects system results • List the principles of safety designs and their applicability in practice • Encourage diverse and independent input 	Step 1. Create a change team <ul style="list-style-type: none"> • Identify leaders and key staff members • Determine readiness for a TeamSTEPPS® initiative
2. Form a powerful guiding coalition <ul style="list-style-type: none"> • Create support from leadership, key stakeholders and staff thought leaders 	Assemble the Team <ul style="list-style-type: none"> • Understand the value of the team • Build a successful team • Identify facilitators/barriers • Define roles and responsibilities within the team 	Step 2. Define the Problem <ul style="list-style-type: none"> • Identify the specific problem, challenge or opportunity for improvements
	Engage Senior Leadership <ul style="list-style-type: none"> • Recruit effectively • Describe the roles and responsibilities • Engage effectively/develop shared accountability 	
3. Create a compelling vision for change <ul style="list-style-type: none"> • Obtain “by-in” from all the team members 	Identify Defects through Sensemaking <ul style="list-style-type: none"> • Use CUSP and Sensemaking tools to identify defects and errors 	Step 3. Define the aims <ul style="list-style-type: none"> • State specific aims of the TeamSTEPPS® intervention
4. Communicate vision <ul style="list-style-type: none"> • Develop a concise story that can be told in a less than 5 minutes 	Understand the Science of Safety/Identify Defects through Sensemaking <ul style="list-style-type: none"> • See 1. and 3. above 	Step 4. Design an intervention <ul style="list-style-type: none"> • Provide a detailed description of the TeamSTEPPS® intervention (including

Kotter	CUSP	TeamSTEPPS®
		strategies/tools to be used to correct or improve the problem)
5. Empower action, remove obstacles	Assemble the Team	Step 5. Develop a plan for testing the effectiveness
<ul style="list-style-type: none"> Identify persons, processes and other factors to address the barriers for the engaged team's success 	<ul style="list-style-type: none"> See 2. above 	<ul style="list-style-type: none"> Includes measures, methodologies, target outcome ranges, and pilot testing as appropriate
	Identify Defects through Sensemaking	
	<ul style="list-style-type: none"> See 3. above 	
	Implement Teamwork and Communication	
	<ul style="list-style-type: none"> Recognize the importance of effective communication Identify barriers to communication Understand the connection between communication and medical error Identify and apply effective communication strategies from CUSP and TeamSTEPPS® 	
6. Create short-term wins	Identify Defects through Sensemaking	Step 6. Develop an implementation plan
<ul style="list-style-type: none"> Identify short-term targets to share quick, early victories for celebration of success and to create momentum 	<ul style="list-style-type: none"> See 3. above 	<ul style="list-style-type: none"> Includes implementation date and identification of person(s) responsible for implementation and oversight
7. Consolidate and build on change	Identify Defects through Sensemaking	Step 7. Develop a plan for sustained improvement
<ul style="list-style-type: none"> Use momentum from quick wins to continue to build on what is going well and to identify improvement opportunities 	<ul style="list-style-type: none"> See 3. above 	<ul style="list-style-type: none"> Includes a monitoring plan for an on-going assessment of the TeamSTEPPS®
8. Anchor changes into organization and team culture	Understand the Science of Safety/Implement Teamwork and Communication	Step 8. Develop a communication plan

Kotter	CUSP	TeamSTEPPS®
<ul style="list-style-type: none"> • The change becomes core to your culture through stories, recognition, orientation, and recruiting 	<ul style="list-style-type: none"> • See 1. and 5. above 	<ul style="list-style-type: none"> • Generate support for the TeamSTEPPS® Initiative to keep major stakeholders informed of progress, and to maintain and spread positive changes

Adapted with permission of the Agency for Healthcare Research and Quality

Step 1. Create a Sense of Urgency

Tell a compelling story for individuals and team to visualize the need and importance of their engagement in the change initiative.²⁰

Encouraging interest and engagement with a new initiative, no matter the size, can be optimized by creating a sense of urgency and importance through the use of a brief, repeatable story that captures the project vision and encourage others to join, participate and retell the story.²⁰ Early engagement of the team who hold diverse opinions regarding an initiative makes this stage very important for success. A brief vision story that is both spoken and visual is a powerful tool to quickly communicate that the interprofessional team's expertise is critical to create the care pathway to improve patient outcomes and satisfaction for both the patient and the team.²⁰ Early in the change initiative, it is helpful to understand that staff will engage at different times, for different reasons and others will chose to stay where they are.

Step 2. Form a Powerful Guiding Coalition

Visible, coordinated support from top levels of leadership, key stakeholders and staff thought leaders who will lead the team to design and drive change.²⁰

ERAS “champion(s)” and operational leaders representative of the perioperative professions (e.g., surgeon, surgeon office staff, nursing, anesthesia professional, pharmacist, nutritionist) are key to form the core team who will drive an effective and sustainable ERAS program.^{14,17} The champions also play an important role in facilitating education and communication in their area of practice and across practice teams to increase awareness and acceptance of the ERAS program through their “can do” attitude.^{29,30} There is no perfect champion. However, the foundational qualities and behaviors of an effective champion include the ability to:²⁹

- Clearly articulate the value of the program.
- Provide direction, inspiration and encouragement.
- Create trust in themselves and the process.
- Build and sustain interprofessional relationships.
- Effectively communicate and negotiate with the colleagues and others.

Steps 3 and 4. Create and Communicate the Vision for Change

Develop concise story that can be told in a less than 5 minutes, that is easily understood and remembered.²⁰

Once the vision is clearly understood by the leadership team, it is important to obtain “by-in” from all members of the practice.²⁹ The ability to clearly articulate and engage others in the vision is a core element of effective change leadership and change initiative.¹⁹ A vision embodies the “desired future state”. When others are able to “see” and share the vision, they are able to actively contribute to the development of the comprehensive, patient-centered pathway that works for their service line, patients, team, and culture. Involving all members of the team in early decision-making regarding the program's goals, as well as potential strengths and weaknesses creates a sense of ownership and helps overcome initial resistance to practice change.¹⁹

Step 5. Empower Broad-based Action

Identify persons, processes and other factors to address the barriers for the engaged team's success.²⁰

Empowering broad-based action involves identifying and removing potential and actual barriers to change development and implementation. The leadership team continues to play a central role in delivering the change by addressing challenges and providing support to all members of the team. This process can empower the team to execute the vision, and help the change move forward.²⁰

Step 6. Generate Short-term Wins

Identify short-term targets to share quick, early victories for celebration of success and to create momentum.²⁰

Celebrating initial and new successes encourages the team's compliance with the pathway for patient outcome and other improvements. Celebrating success to recognize staff and patient excellence validates and involves everyone in the program's vision and strategy, builds confidence in the program, and attracts late adopters to join in the practice change.^{20,29}

Step 7. Consolidate and Build on Change

Use momentum from quick wins to continue to build on what is going well and to identify improvement opportunities.²⁰

Kotter warns against declaring victory too early as the team may lose motivation to continue to improve the ERAS program before the entire transformation takes place. Communication, feedback on progress, teamwork and motivation remain critical to stabilize the practice change. Short-term wins create an opportunity to analyze what went right and what needs improving.²⁰

Step 8. Anchor Changes into Organization and Team Culture

The change becomes core to your culture through stories, recognition, orientation, and recruiting.²⁰

In order to secure sustainability in the longer run, it is important to view the ERAS program as a continuum and not as a final destination.²⁹ Continued leadership presence and contribution, team staff education and training, updates on the progress of the ERAS program, and celebration of short-term wins will help sustain momentum and enthusiasm until the ERAS program becomes simply part of practice.²⁶

Enhanced Recovery after Surgery Pathway Trial Implementation

Following the development of the project plan and enhanced recovery pathway, acquisition of necessary supplies and medications, creation of patient education resources, completion of trial team staff education, and the many other elements, it is time to trial a case or several cases to identify successes and gaps in your preparation and execution.

Basic considerations for the participating practice areas and various professional roles within an ERAS pathway are summarized in Table 2. This table serves as a resource that may be

modified to fit a specific program and is not intended to be inclusive. The ERAS related practice areas and roles vary across specialties, patients, facilities and health systems.

Table 2. Practice Areas and the Interdisciplinary Team Members of an ERAS program

Practice Areas	
<ul style="list-style-type: none"> • Surgeon’s Office • Preadmission Clinic • Same Day Unit • Surgery Holding Area • Surgery • Post Anesthesia Care Unit 	<ul style="list-style-type: none"> • Intensive Care Unit • Nursing Unit • Pharmacy • Central Service • Physical and Occupational Therapy
Professional Contributors	
<ul style="list-style-type: none"> • Patient • Surgeon • Surgery Scheduling • Anesthesia • Primary Care and Specialty Medicine • Advanced Practice Professionals • Nursing • Management Team • Administration • Quality/Process Improvement • Risk Management • Infection Control and Prevention • Information Technology 	<ul style="list-style-type: none"> • Care Navigator • Pain Management Service • Nutrition • Physical and Occupational Therapy • Social Workers • Educators <ul style="list-style-type: none"> ○ Patient ○ Staff ○ Professional Education Programs (e.g., student nurse anesthetists, residents) • Chaplin • Research

Anesthesia professionals deliver many of the enhanced recovery elements that are summarized in Figure 1. This figure or a similar format may be expanded and modified as a project management tool to develop the surgical specific ERAS pathway with the addition of the many more professions who play a valuable role to support the patient’s engagement with the management of their care.

Figure 1. Sample Enhanced Recovery after Surgery Pathway Continuum to Develop Pathway and Team Engagement

Perioperative Phase	Responsibility					
	Surgeon	Nurse	Anesthesia	Patient	Physical Therapist	Others as Needed
Prehospital/Preadmission Phase						
• For patient/family education						
• Pain management plan	Include patient's advanced pain management team as needed					
• Patient optimization	Include primary and specialty medicine as needed					
• Prehabilitation of select patients (e.g., diabetic, hypertensive)						
Preoperative Phase						
• Limited fasting (light meal up to 6 hours preop)						
• Carbohydrate beverage (up to 2 hours preop)						
• Initial multimodal medications and/or regional block placement						
• Discharge planning, education and home medication plan						
Intraoperative Phase						
• Opioid sparing, multimodal analgesia						
• Normovolemia						
• Nausea/vomiting prophylaxis						
• Normothermia						
• Normoglycemia						
• Avoid tubes and drains						
Postoperative Phase						
• Early nutrition						
• Early mobilization					As needed	
• Multimodal analgesia						
• Nausea/vomiting management						

• No or judicious IV fluid management						
• Patient/family education						
Post-Discharge Phase						
• Monitor for symptoms or changes in health to seek assistance						
• Follow-up with surgeon, proceduralist, primary care and/or specialty care						
• Continue therapy and other activities for recovery as planned						
Continued Quality Improvement Team Activities						
• Use data to celebrate successes and identify opportunities for improvement						

Coordination of Care Support

Little takes the place of the value and effectiveness of face to face communication. Electronic health records (EHR) that are interfaced so support the coordination of care for patient safety and modification of the patient specific plan of care across the various practice settings and transitions of care. These transitions include prehospital through the patient's return home for recovery, therapy when necessary and follow-up with surgeon, primary and specialty care providers. Integrating electronic health records and scheduling systems improves safety, compliance and efficiency of the ERAS program.¹⁷ When EHR products do not interface or are not available, it is important to assess communication handoff pathways and tools to optimize safe care.

Patient Engagement

Patient education and expectation management in the Prehospital/Preadmission phase are critical to the success of the ERAS program. The patient learns about the ERAS program and establishes realistic goals for pain after surgery, nutrition, mobilization, and expected hospital stay.³² Education may also encourage the patient to engage in a physical activity or nutrition program to get in a better physical condition prior to the procedure to improve outcomes.^{86,87}

Patient-related barriers to ERAS implementation include understanding why perioperative processes they have come to expect have changed. Providing early education in the community and surgeon's office allows the patient to be a significant contributor to their care experience success. Patient comorbidities, such as hypertension, hypercholesterolemia, chronic obstructive airway disease, and diabetes can be optimized preoperatively with careful evaluation and assessment to participate in the ERAS pathway of care. If the patient is found to be a candidate for the pathway, additional planning to optimize their health through prehabilitation prior to surgery is important for rapid return to health postoperatively.⁸⁷

Multimodal pain management may also be a new concept to patients and their family. Education, success stories and data are often helpful for the patient to develop a realistic understanding of the multimodal, instead of one medication plan for analgesia.⁸⁸ Patients are also most successful when they are able to actively engage in lifestyle activities, such as exercise to lose weight or stop smoking more than 2 weeks prior to surgery.²⁵

Language, cultural and religious beliefs, and health literacy may also impact a patient's understanding of the enhanced recovery process. Please see the AANA document titled *Informed Consent for Anesthesia Care* for strategies to address communication, health literacy, and cultural competency.⁸⁹

Engaging Staff

Staff attitudes, biases and behaviors may also make ERAS implementation challenging. Barriers may be due to resistance to personal practice change related to limited understanding of ERAS value.^{14,90} It is helpful to educate staff members to support the adoption of ERAS principals in their practice. Education includes the program itself, how their practice will change and offering new education and skills opportunities will position the staff member as a successful contributor. Using many channels for effective communication across all ERAS team members contributes to the success of an ERAS program.²² There is much to be done. Breaking down the project into small elements allows multiple teams and individuals to

contribute to the success of the pathway from the beginning, through implementation and continued improvement.

Engaging the Team and Leadership

Practice-related barriers to ERAS implementation may include limited facility resources, low compliance with the program plan due to leadership, and administrative support.^{14,25} Actively addressing these factors and other pathway barriers through the use of data and communication are critical prior to implementing the ERAS program.

Prehospital/Preadmission Phase

Surgeon's Office

The ERAS pathway begins when the patient visits their surgeon and the office team with a focus on patient education, patient expectations, engagement and development of a plan to optimize their health before surgery and anesthesia for rapid return to health post procedure. Identification of patients who will enter the pathway and early engagement of the interprofessional team may begin here. Patients, depending on their individual needs and ERAS pathway they are entering, may meet only a few of the team members. As the complexity of the patient increases, they may not only meet the entire team preoperatively to partner with the clinical team earlier for prehabilitation and longer post procedure for successful rehabilitation.

Patient Optimization and Prehabilitation

Patients present for surgery and anesthesia with varying states of health. The goal of preprocedure prehabilitation is to identify patients with preexisting chronic and acute conditions in whom physiologic reserves can be improved or optimized prior to surgery.³¹ Creating a preoperative triage system of patient and surgical complexity improves patient assessment to develop prehabilitation plan, when necessary. Patient assessment and health history collection can occur through a patient portal, telephone interview, and when appropriate a preanesthesia assessment clinic to further assess and prepare complex patients for anesthesia and surgery.³²

Patient assessment and evaluation focuses general health and the patient's functional capacity and comorbidities to identify risk factors that may prolong recovery or lead to complications. A healthy patient has less to gain from preoperative medical optimization, though they may benefit from a health assessment and discussion of opportunities to maintain and improve health.³¹ Conditions associated with an increased risk of perioperative complications include cardiovascular disease, hypertension, chronic obstructive pulmonary disease (COPD), anemia, obesity, and diabetes mellitus.³³ The patient with comorbid conditions should begin assessment and optimization weeks prior to the procedure.

While certain health factors cannot be modified (e.g., age, extent of disease), there are modifiable elements (e.g., body mass index) that can be improved with exercise and diet modifications to enhance functional reserve.³⁴ Patients with low functional and physiologic reserves (e.g., elderly, frail, morbidly obese) may benefit from a plan for prehabilitation to improve physical fitness before surgery.³⁴ Addressing cigarette smoking, alcohol intake and nutritional status to identify nutritionally depleted patients are also important to reduce

intraoperative complications.³² Some prehabilitation programs use assessment tools, such as a cardiopulmonary exercise testing (CPET), to evaluate the patient's exercise capacity preoperatively.³⁵

Patient/Family Education

The anesthesia professional plays a pivotal role in patient/family education by engaging the patient as an active participant in his or her care and the recovery process.³ Anesthesia professionals continue to build on these activities throughout the Prehospital/Preadmission Phase through patient assessment and evaluation to identify unique elements of the patient's health, pain and anesthesia history that may require modification of the ERAS pathway to coordinate development of the plan of care with the patient and their primary care and specialty team, as appropriate.²⁶

Pain Management Plan

As part of the preanesthesia assessment, the anesthesia professional discusses with the patient their previous pain experiences and possible intensity of surgical discomfort to offer considerations for elements of a comprehensive perioperative plan to manage surgical pain. Collaboration with the patient's advanced pain management team and utilizing multi-modal pain management strategies can improve outcomes, especially for patients with difficult to control pain (e.g., chronic pain patient, substance use disorder).³⁶⁻³⁸

Preoperative Phase

Preoperative Fasting

The 2011 updated report by the American Society of Anesthesiologist's Committee on Standards and Practice Parameters, *Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration: Application to Healthy Patients Undergoing Elective Procedures*, recommends that patients are able to eat a light meal up to 6 hours preoperatively and a minimum fasting period of between 2 and 4 hours for clear fluids, such as water, fruit juices without pulp, carbonated beverages, clear tea, and black coffee.³⁹ Though the preoperative fasting guidelines have been in place for some time, many anesthesia professionals, for varying reasons, require that the patient be NPO after midnight.

Current ERAS literature recommends preoperative fasting time to be kept to a minimum to reduce preoperative thirst, hunger, anxiety, as well as reduce perception of pain.^{10,40} In some ERAS pathways, the patient is asked to drink 800 mL of a 12.5 percent carbohydrate-rich beverage before midnight and 400 mL of the same or similar beverage 2 hours prior to anesthesia. Drinking a carbohydrate beverage 2 hours prior to the induction of anesthesia has been shown to reduce insulin resistance, minimize nitrogen and protein loss, and maintain muscle strength to accelerate recovery.⁴¹⁻⁴⁴ However, further research is required for diabetic patients, as the carbohydrate beverage must be considered as part of the glycemic management plan.^{45,46}

In addition to 12.5 percent carbohydrate rich "sports drinks", some patients may benefit from one of the several commercially available nutritionally balanced products on the market. In collaboration with dietary and nutrition services, considerations for selecting an optimal beverage include:⁴⁶

- Avoidance of renal solute load.
- Low osmolality.
- A maltodextrin component for optimal insulin secretion profile.
- Pleasant taste.
- Prepackaged in clinically relevant doses.
- Available and affordable to patients/hospitals.

Discharge Education and Planning

Discharge education and planning begins early in the surgeon's office, during the preoperative phase and continues through discharge and return home. Early patient education and engagement increases understanding of the importance of their contribution and participation in their plan of care for best outcomes, as well as to monitor for compliance of the entire team in their care pathway. The following activities may be included as part of discharge planning:

- An understanding of the timing of the elements and goals along the care continuum prepare the patient and family to participate in care they will receive.
- Transitions in experience of pain and how pain can be managed with medications and non-pharmacologic modalities.
- Clear instructions about mobilization and diet with daily activity targets to achieve.
- Circumstances that may delay discharge and how they will be addressed.

Intraoperative Phase

Multimodal Analgesia

Multimodal analgesia describes the use of more than one modality or techniques to achieve effective pain control from the preoperative period through initial recovery and return home.⁴⁷ A multimodal, instead of the traditional unimodal opioid approach involves the administration of several analgesics with separate mechanisms of action across the perioperative period and/or concurrent field block using local anesthetic, regional or neuraxial analgesia (e.g., paravertebral block with non-opioid analgesia).⁴⁷ It is important to take into consideration the complexity of the surgical procedure, patient pain experience history and preferences, anticipated level of postoperative pain, and duration of action of analgesics and local anesthetics when deciding on pain management options for pathway development and for individual patients. Multimodal analgesia may eliminate or significantly reduce the use of opioids and adverse side effects such as respiratory depression, postoperative nausea and vomiting (PONV), and delayed return of gastrointestinal function.⁴⁸ However, low dose opioids for a defined period of time should be made available when necessary when other modalities are not effective to address the patient's discomfort.⁴⁸ Opioids should be administered in a dose sufficient for adequate analgesia while limiting side effects (e.g., respiratory depression, sedation, nausea and vomiting).⁴⁹

Non-opioid medications include acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), systemic lidocaine or ketamine infusion, long-acting local anesthetics, and gabapentinoids (gabapentin/pregabalin).⁵⁰ Other modalities using local anesthetics of varying durations of action include surgical site local anesthetic infiltration, field blocks (e.g., transversus abdominis plane (TAP) block), central neuraxial techniques (e.g., epidural and spinal analgesia), and regional blocks.⁴⁷ Non-pharmacological analgesia (e.g., acupuncture, music therapy) as well as cognitive-behavioral techniques (e.g., guided imagery, relaxation), may be used as an adjunct to

pharmacological methods to support the patient to reduce postoperative pain, anxiety, and use of pain medication.^{47,51}

Several factors to consider when developing multimodal pain management plan of care with the patient include:^{51,52}

- Patient preferences and previous experience with pain.
- Medical history, including comorbidities.
- Emotional and psychological status, including previous related experiences and concerns.
- Type of surgery and anticipated postsurgical pain experience.
- The risk-benefit of the various non-opioid multimodal strategies.

The following table offers a starting point to begin developing an ERAS multimodal analgesia pathway. The science is changing rapidly as teams review their outcome data. The facility formulary will provide a list of available medications to choose from or to identify medications to request addition to the formulary. In addition to reviewing existing pathways, a review of the literature will provide the team with peer reviewed evidence to craft and improve their ERAS pathway.

Table 3. Considerations for Classes of Medications and Local Anesthetic Techniques to Create Procedure Specific Enhanced Recovery Pathway^{51,53,54}

	Class of Medication/Technique	Medication	Considerations
Preop	<ul style="list-style-type: none"> • Gabapentinoid 	<ul style="list-style-type: none"> • pregabalin, gabapentin 	<ul style="list-style-type: none"> • risk of sedation, confusion postop
	<ul style="list-style-type: none"> • Cyclooxygenase-2 inhibitor 	<ul style="list-style-type: none"> • celecoxib, rofecoxib 	<ul style="list-style-type: none"> • NSAID subclass with fewer side effects, less risk of perioperative bleeding
	<ul style="list-style-type: none"> • Nonsteroidal anti-inflammatory drug (NSAID) 	<ul style="list-style-type: none"> • Ibuprofen • ketorolac 	<ul style="list-style-type: none"> • nonselective NSAID • decrease inflammation • administered intranasally for oral surgery provided rapid analgesia for 8 hours
Intraop	<ul style="list-style-type: none"> • Acetanilide derivative 	<ul style="list-style-type: none"> • acetaminophen 	<ul style="list-style-type: none"> • hepatic toxic metabolite, limit daily dose to 4 grams/day from combination drugs with acetaminophen⁵⁵ • IV maximum drug concentration, 70 percent greater than oral; overall drug exposure similar between IV and oral⁵⁵ • IV ketorolac and acetaminophen effective for moderate pain in children⁵⁵
	<ul style="list-style-type: none"> • Nonsteroidal anti-inflammatory drug (NSAID) 	<ul style="list-style-type: none"> • ketorolac 	<ul style="list-style-type: none"> • increased risk of gastrointestinal bleeding^{53,56} • concern for increased surgical site bleeding, limited evidence in the literature^{53,56}
	<ul style="list-style-type: none"> • Alpha 2 agonist 	<ul style="list-style-type: none"> • dexmedetomidine, clonidine 	<ul style="list-style-type: none"> • anti-hypertensive effect • sedative, anxiolytic, analgesic⁵⁷ • side effects: bradycardia, hypotension sedation⁵⁷
	<ul style="list-style-type: none"> • Opioid 	<ul style="list-style-type: none"> • narcotics 	<ul style="list-style-type: none"> • may cause nausea and vomiting, sedation • low to moderated dose(s) considered for anticipated moderate to severe pain

	Class of Medication/Technique	Medication	Considerations
	• N-methyl-D-aspartate receptor antagonist	• Ketamine	• higher doses of ketamine may have psychotropic effects
	• Glucocorticoid steroid	• dextromethorphan	• when added to nonopioid analgesics, time to discharge is reduced
	• Lidocaine infusion	• dexamethasone	• treat neuropathic pain
	• Field block	• lidocaine	• continued postop, may improve bowel function
	• Infiltration of surgical site with local anesthesia as single dose or infusion	• bupivacaine	• significant side effects are rare when intravascular injection is avoided
• Regional, neuraxial block	• ropivacaine	• chondrolysis for intra-articular injections and infusion should be considered	
	• Technology	• liposomal bupivacaine for prolonged release, single-dose administration	• ketorolac added to 0.5 percent lidocaine for intravenous regional anesthesia (IVRA) provides effective anesthesia and analgesia ⁵³
Postop	• Acetanilide derivative	• disposable local anesthetic infusion systems	• cost
	• Gabapentinoid	• acetaminophen	• patient education
	• Nonsteroidal anti-inflammatory drug (NSAID)	• pregabalin, gabapentin	• plan for removal post-discharge
	• Lidocaine infusion	• ibuprofen	• IV or oral acetaminophen
	• Ketamine infusion	• lidocaine	• may cause increased sedation when administered with an opioid
	• Oral dextromethorphan	• Ketamine	• in some procedures may increase bleeding
		• dextromethorphan	• increased risk of nausea and vomiting
			• treat neuropathic pain
			• continued postop, may improve bowel function
			• controls refractory pain, reverses opioid tolerance and hyperalgesia related to chronic opioid use
			• helpful for patients with chronic opioid use

	Class of Medication/Technique	Medication	Considerations
	<ul style="list-style-type: none"> • Low to moderate dose IV or oral opioid for breakthrough pain 	<ul style="list-style-type: none"> • oxycodone • morphine • hydromorphone 	<ul style="list-style-type: none"> • useful for acute treatment of moderate-to-severe pain • increased risk of PONV, decrease in bowel motility
	<ul style="list-style-type: none"> • Technology 	<ul style="list-style-type: none"> • transcutaneous electrical nerve stimulation (TENS) 	<ul style="list-style-type: none"> • patient education to manage post-discharge

Nausea/Vomiting Risk Assessment and Prophylaxis

Proactive management of PONV is core to the patient returning to preprocedure health and activity. Several risk factors for PONV include history of PONV or motion sickness, female, nonsmoker, surgical procedure, surgical procedure lasting more than 60 minutes, and the use of inhalation agent and/or opioids.⁵⁸

PONV Risk Assessment

Several validated tools for assessment of PONV are available. The Apfel Score assesses the patient for four PONV risk factors - female gender, nonsmoking status, postoperative use of opioids, and previous history of PONV or motion sickness.^{59,60} Each of the elements, if present, receives a score of 1 to predict risk of PONV.

Table 4. Apfel Score to Predict Postoperative Nausea and Vomiting^{58,60-63}

					Score*
Female					
Nonsmoker					
Post-operative use of opioids					
Previous history of PONV or motion sickness					
Risk Factor(s) Present	0	1	2	3	4
Percent Risk of PONV	10	21	39	61	78

*Score 1 is present, 0 is absent

Strategies to reduce risk of PONV include:⁵⁸

- Use regional anesthesia (rather than general anesthesia).
- Use of propofol for induction and maintenance of anesthesia.
- Avoid nitrous oxide.
- Avoid volatile anesthetics.
- Minimize opioids.
- Adequate hydration, while avoiding excessive fluid.

Goal Directed Fluid Therapy

Each element of the ERAS pathway is important to successful patient recovery. Euvolemia through goal-directed fluid therapy (GDFT) is maintained in the intraoperative phase through cardiac function monitoring to track the effects of small crystalloid or colloid boluses and vasopressors on cardiac parameters, instead of administering large volumes of clear intravenous fluids without cardiac function monitoring. GDFT has been shown to reduce complications and length of stay using non-invasive or invasive monitoring of varying cardiac function parameters depending on the monitoring platform to maintain normovolemia, optimized cardiac function, as well as decreased fluid and salt excess.^{64,65}

Evidence suggests that GDFT results in better patient outcomes compared to standard intra and post-operative fluid management. The age old formula that calculated volume deficit from fasting, insensible volume loss, hourly fluid rate, and crystalloid boluses to maintain blood pressure, heart rate and urine output is a reference from our past that has been shown to place the patient at risk of complications and slow recovery.⁶⁶ A meta-analysis of 32 randomized controlled trials involving 5,056 patients showed a significant reduction in mortality in the high-

risk (expected mortality > 20 percent) group.⁶⁷ Another study examined 29 randomized controlled trials involving 4,085 patients also found a significant reduction in mortality and surgical complications for all patients.⁶⁸

To decrease variability in fluid administration during surgery and to improve outcomes, it is important to tailor GDFT protocols to each patient’s unique surgical and patient risk factors.⁶⁹ This can be achieved with an individualized patient and procedure fluid management plan.^{48,70} GDFT maintains intraoperative normovolemia by monitoring stroke volume, cardiac output, and/or oxygen delivery to avoid hypovolemia and postoperative oxygen debt.^{48,71} Monitoring technologies include esophageal doppler, arterial waveform analyzers, photoplethysmography-based devices, volume clamp-based devices, and bioactance devices.⁷²

Active Warming

Intraoperative normothermia is another important element of the ERAS pathway to decrease oxygen demand from shivering post-operatively, as well as to improve healing and decrease risk of surgical site infection.³² Core temperature should be regularly monitored and maintained above 35.5° C in the intraoperative and immediate postoperative period.^{32,73,74}

Glycemic Management

Perioperative hyperglycemia is associated with an increased risk of morbidity and mortality.³² Surgical patients may develop hyperglycemia as a result of the hypermetabolic stress response that is responsible for increased glucose production and insulin resistance.⁷⁵ Overtreatment and undertreatment of hyperglycemia presents a significant risk to patients with and without diabetes.⁷⁶ Factors that may affect optimal blood glucose control include concern for overtreatment of hypoglycemia, clinical inertia to adopt policy, and medical management errors.⁷⁶

Early studies showed a significant reduction in postoperative complications when patients received intensive insulin therapy to maintain glucose concentrations at 80-110 mg/dL or normoglycemia. This management is also known as “tight” glucose control.^{77,78} While current recommendations for the optimal perioperative blood glucose levels in critically ill patients vary (see Table 3), national organizations agree that “tight” glucose control may not be beneficial.⁷⁵ More recent studies found no benefit, and in fact, identified increased risk of complications related to “tight” glucose control including hypoglycemia.^{79,80,81} In general, maintaining blood glucose concentrations of 180 mg/dL or less is recommended.^{75,82}

Table 5. Recommendations for Optimal Blood Glucose Range Levels in Critically Ill Patients

National Organization	Recommendations
American Association of Clinical Endocrinologists (AACE) and American Diabetes Association (ADA) Consensus Statement on Inpatient Glycemic Control ⁷⁶	Target blood glucose level of 140 and 180 mg/dL
American College of Physicians ⁸³	Target blood glucose level of 140 to 200 mg/dL
Society of Thoracic Surgeons ⁸⁴	Target blood glucose level <180 mg/dL. If patient in ICU >3 days, then keep blood glucose of 150 mg/dL

Tubes and Drains

Whenever possible, the routine use of postoperative nasogastric or orogastric tube, urinary catheters, and abdominal and pelvic drains without clear indications should also be avoided.⁸⁵ These strategies help promote postoperative feeding and mobilization, avoid dehydration and promote patient comfort.⁸⁵

Postoperative Phase

The facility delineates specific criteria for patient assessment, evaluation, monitoring, and documentation intervals during the recovery period. The patient is assessed and evaluated, noting the patient's recovery status and return to adequate function (e.g., level of consciousness, ability to ambulate, etc.). For additional guidance, review *AANA Postanesthesia Care Standards for the Certified Registered Nurse Anesthetist*.⁸⁶ Patients are encouraged to resume their normal diet and activities of daily living on the day of surgery.⁸⁷ These activities are supported by capping or removing the IV catheter, avoiding salt and water overload, preventing PONV, and administering non-opioid and when necessary opioid analgesia.⁴⁸

Discharge Phase²⁶

Patients can be discharged after they meet the facility's criteria for recovery.²⁶ These criteria may include:

- Hemodynamically stable within 20 percent of admission vital signs or as determined by the facility.
- Ability to eat and drink, without nausea or vomiting.
- Adequate pain control with oral analgesia or alternative technique.
- Independently mobile; able to get out of bed and on/off the toilet or return to level of preprocedure activity.
- No complications requiring extended hospital care.

Prior to discharge, the patient continues to receive comprehensive education that began in their surgeon's office related to anesthesia, surgical procedure and pain management to address any questions and concerns. The patient, family or caregiver also receive written information that includes instructions, symptoms to monitor for that need to be reported and who to report them to, emergency contact information, strategies to aid recovery (e.g., how to control pain with medicine, how to care for the incisions).

Post-Discharge Phase

The patient's ERAS pathway and participation of the interprofessional team continues when they return home. The patient is scheduled for follow-up appointments, as necessary, with the surgeon, proceduralist, primary care and/or specialty care clinician.²⁶ When indicated, additional members of the team will be added to address specific patient needs.

Continued Quality Improvement Team Activities

Identification of desired ERAS pathway outcomes and facility pre-ERAS pathway outcomes are helpful to identify opportunities for improvement and education for pathway compliance and outcomes. Several process and outcome measures, such as length of stay, readmission, pneumonia, venous thromboembolism, urinary tract infection, surgical site infection are being collected and reported by most facilities for several procedures. Considerations include:²⁶

- What data is currently being collected?
- What additional data should be collected?
- How data will be entered, analyzed and reported?
- How to use collected data?

What Data to Collect

Developing a sustainable ERAS program requires tracking of outcome and process measures.¹⁷ While gathering data on every ERAS element may help improve patient outcomes, it may be unrealistic to expect compliance with every ERAS element on every patient for a number of clinical or process reasons.¹⁷ It is important to consider a balanced approach to collect information to identify trends from available resources that can be used for process improvement. Data related to an ERAS program may include:²⁶

- Demographics, physical characteristics (e.g., age, physical status, body mass index, gender)
- Elements of patient health history (e.g., chronic pain, co-morbidities).
- Patient compliance with the elements (e.g., as percentage or number of elements chosen)
- Provider compliance with pathway elements within their specialty.
- Patient outcome measures:
 - Length of stay
 - Readmission
 - Surgical site infection
 - Surgical complication
 - Dehydration requiring IV fluids
 - Mortality rate
- Benefits and costs per patient in the pathway.

Data Collection²⁶

- Use existing systems (if available) to collect baseline data:
 - Electronic health record(s) (EHR)
 - The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP)
 - Others
- Adapt or develop ERAS checklists for preoperative and perioperative care.
- Consider learning from existing facility data collection practices to improve the data collection process.

Translating Data to Action²¹

Determine how best to analyze and communicate the ERAS pathway data to guide decision-making for pathway improvement and individual practice compliance to match their peers. Data may be posted and also shared at regular ERAS team meetings and through publications.

Addressing Implementation Challenges

Despite the well-established benefits of ERAS programs as effective and economically viable, challenges arise when introducing ERAS pathways into routine practice.^{9,22} Barriers to implementation may be attributed to patient-related, staff-related and practice-related factors.

Table 6. Possible Barriers to ERAS Pathway Development, Implementation, and Compliance^{14,25}

Patient-related
<ul style="list-style-type: none"> • Needs and expectations • Health literacy, understanding and engagement • Attitudes and behaviors • Health history
Staff-related
<ul style="list-style-type: none"> • Attitudes and behaviors • Engagement • Communication and collaboration • Skills and competencies
Facility, Specialty-related
<ul style="list-style-type: none"> • Leadership and support • Initial and ongoing staff education • Optimizing staff privileges and competencies • Availability of medications, monitoring and resources • Applicable policies and procedures • Use of data for continued pathway improvement

Conclusion

ERAS pathways contribute to positive patient outcomes,^{4,5} reduced postoperative complications,^{2,6} accelerated recovery,⁶ and early discharge,^{2,4,6-9} without increasing costs.^{7,9,10} Successful ERAS implementation depends on many factors, including effective patient and staff education, strong leadership within the interdisciplinary team and the strategic practice management. Anesthesia professionals are well positioned as champion leaders and members of the patient-centered team for ERAS excellence.

Enhanced Recovery Resources

- [American Society for Enhanced Recovery \(ASER\) Protocols](#)
- [ERAS Society Guidelines](#)
- [Peri-Operative Patient Simulation \(POPS\) – Intraoperative Goal Directed Fluid Therapy Protocols](#)
- [Enhanced Recovery for Abdominal Surgery Clinical Pathway](#)
- [University of California, Irvine – Goal-Directed Therapy](#)
- [AANA ERAS Resources](#)

Table 7. ERAS Pathway Development and Implementation Referencing Kotter, CUSP, and TeamSTEPPS®^{14,20,21,26,28,30}

Phases	Kotter	CUSP	TeamSTEPPS®	Implementation Considerations
Creating a climate for change	<ul style="list-style-type: none"> Establish a sense of urgency 	<ul style="list-style-type: none"> Understand the science of safety 	<ul style="list-style-type: none"> Create a change team 	<ul style="list-style-type: none"> Assess and analyze to identify themes of satisfaction, suggestions and concerns in current program Patient satisfaction and other feedback sources Benchmark U.S. and international sources for patient and community education communications and resources Assess the scope of the project Identify existing resources: <ul style="list-style-type: none"> Staff Equipment Drugs Clinical policies Education Documentation Identify facilitators and barriers Conduct an assessment of the readiness and capability Represent an inclusive, “can do” attitude
	<ul style="list-style-type: none"> Create a guiding coalition 	<ul style="list-style-type: none"> Assemble the team Engage senior executive 	<ul style="list-style-type: none"> Define the problem 	<ul style="list-style-type: none"> Identify “champions” (e.g., nurses, anesthesia professionals, surgeon) to lead and facilitate the ERAS program Include patient advocate(s) on leadership team
	<ul style="list-style-type: none"> Communicate the vision for change 	<ul style="list-style-type: none"> Understand the science of safety Identify defects through sensemaking 	<ul style="list-style-type: none"> Define the intervention 	<ul style="list-style-type: none"> Clearly communicate and engage others in the vision Obtain “buy-in” from all the members in the practice Partner with community leaders to develop messaging through multiple channels to communicate understanding of patient and family responsibility, and engage service agencies in pre and post care support services to increase safety, satisfaction and outcomes

Phases	Kotter	CUSP	TeamSTEPS®	Implementation Considerations
Introducing New Practice	<ul style="list-style-type: none"> Empower broad-based action, remove obstacles 	<ul style="list-style-type: none"> Assemble the team Identify defects through sensemaking Implement teamwork and communication 	<ul style="list-style-type: none"> Developing a plan for testing the effectiveness 	<ul style="list-style-type: none"> Develop and pilot ERAS pathway in one surgical specialty Begin with a small team Develop initial learning, ongoing education, training, and continued team development Conduct a systematic review of the literature and facility outcome data Utilize patient feedback in developing the care pathways
Maintaining the Momentum	<ul style="list-style-type: none"> Generate short-term wins 	<ul style="list-style-type: none"> Implement teamwork and communication 	<ul style="list-style-type: none"> Develop an implementation plan 	<ul style="list-style-type: none"> Utilize electronic health records (EHRs) to track progress Celebrate initial and new successes Recognize staff and patient excellence
	<ul style="list-style-type: none"> Consolidate and build on change 	<ul style="list-style-type: none"> Identify defects through sensemaking 	<ul style="list-style-type: none"> Develop a plan for sustained improvement 	<ul style="list-style-type: none"> Develop outcome and process measures to track quality for continued improvement Use outcome and process measures to track quality. Use data/audit feedback to make modifications Audit all steps for compliance, review and process Audit documentation and patient compliance with care Seek both positive feedback and opportunity to improve from patients and family When possible, acquire patient and family assessment of care in real time to address less than satisfactory experiences

Phases	Kotter	CUSP	TeamSTEPS®	Implementation Considerations
	<ul style="list-style-type: none"> Anchor ERAS pathway changes into the organization and team culture 	<ul style="list-style-type: none"> Understanding the science of safety Implement teamwork and communication 	<ul style="list-style-type: none"> Develop a communication plan 	<ul style="list-style-type: none"> View ERAS program as a continuum and not as a final destination Leadership presence, participation and ongoing support Initial and ongoing staff education and training Frequent updates on the successes, challenges and solutions being addressed of ERAS Continue educating the patient and community on the significance and importance of ERAS Celebration of short-term wins

ERAS Phase	Goal	Considerations
Preoperative Phase	<ul style="list-style-type: none"> Engage patient as a contributor and participant in their plan of care 	<ul style="list-style-type: none"> Provide detailed instructions prior to procedure/surgery Provide necessary resources/services for Preoperative Phase Light meal up to 6 hours preoperatively Carbohydrate beverage up to 2 hours preoperatively Initial multimodal medications and/or regional block placement Seek patient's expectations Encourage the patient to ask questions and be active participant in care decisions
	<ul style="list-style-type: none"> Discharge planning begins before admission 	<ul style="list-style-type: none"> Discuss discharge planning, education and home medication plan with patient and family/friends in the surgeon's office and during preanesthesia assessment optimization and care planning Encourage patient to ask questions and be active participant in care decisions Provide the patient with written pamphlets, handouts and/or web resources
Intraoperative phase		<ul style="list-style-type: none"> Opioid sparing, multimodal analgesia Normovolemia/goal-directed fluid therapy Nausea/vomiting prophylaxis Normothermia Normoglycemia Avoid tubes and drains

ERAS Phase	Goal	Considerations
Postoperative Phase	<ul style="list-style-type: none"> • Encourage the patient to resume normal activities 	<ul style="list-style-type: none"> • Multimodal analgesia Nausea/vomiting treatment • No or judicious IV fluid management • Ambulation on the day of surgery • Normal diet on the day of surgery
	<ul style="list-style-type: none"> • Discharge 	<ul style="list-style-type: none"> • Anticipate needs for discharge • Provide patient/family education • Defined discharge criteria and patient/family education • Engage with the interprofessional team and family to understand how to return to health and symptoms to be aware of to seek appropriate help
Post-Discharge Phase	<ul style="list-style-type: none"> • Continue to support the patient to monitor for symptoms or changes in health to seek assistance • Patient follow up with surgeon, proceduralist, primary care and/or specialty care • Continue therapy and other interprofessional activities as planned 	
Continued Quality Improvement Team Activities	<ul style="list-style-type: none"> • Determine how best to analyze and communicate the ERAS pathway data to guide decision-making for pathway improvement and individual practice compliance • Analyze and share quality measures, patient surveys, and staff input to celebrate successes and identify opportunities for improvement • Utilize patient feedback to improve the ERAS program 	

References

1. Paton F, Chambers D, Wilson P, et al. Effectiveness and implementation of enhanced recovery after surgery programmes: a rapid evidence synthesis. *BMJ Open*. 2014;4(7):e005015.
2. Hughes MJ, McNally S, Wigmore SJ. Enhanced recovery following liver surgery: a systematic review and meta-analysis. *HPB*. Aug 2014;16(8):699-706.
3. Brady KM, Keller DS, Delaney CP. Successful Implementation of an Enhanced Recovery Pathway: The Nurse's Role. *AORN J*. Nov 2015;102(5):469-481.
4. Miller TE, Thacker JK, White WD, et al. Reduced length of hospital stay in colorectal surgery after implementation of an enhanced recovery protocol. *Anesth Analg*. May 2014;118(5):1052-1061.
5. Scott MJ, Miller TE. Pathophysiology of major surgery and the role of enhanced recovery pathways and the anesthesiologist to improve outcomes. *Anesthesiol Clin*. Mar 2015;33(1):79-91.
6. Adamina M, Kehlet H, Tomlinson GA, Senagore AJ, Delaney CP. Enhanced recovery pathways optimize health outcomes and resource utilization: a meta-analysis of randomized controlled trials in colorectal surgery. *Surgery*. Jun 2011;149(6):830-840.
7. Archibald LH, Ott MJ, Gale CM, Zhang J, Peters MS, Stroud GK. Enhanced recovery after colon surgery in a community hospital system. *Dis Colon Rectum*. Jul 2011;54(7):840-845.
8. Braga M, Pecorelli N, Ariotti R, et al. Enhanced recovery after surgery pathway in patients undergoing pancreaticoduodenectomy. *World J Surg*. Nov 2014;38(11):2960-2966.
9. Chandrakantan A, Gan TJ. Demonstrating Value: A Case Study of Enhanced Recovery. *Anesthesiol Clin*. Dec 2015;33(4):629-650.
10. Melnyk M, Casey RG, Black P, Koupparis AJ. Enhanced recovery after surgery (ERAS) protocols: Time to change practice? *Can Urol Assoc J*. Oct 2011;5(5):342-348.
11. Scott MJ, Baldini G, Fearon KC, et al. Enhanced Recovery After Surgery (ERAS) for gastrointestinal surgery, part 1: pathophysiological considerations. *Acta Anaesthesiol Scand*. Nov 2015;59(10):1212-1231.
12. Fitzgerald TL, Mosquera C, Koutlas NJ, Vohra NA, Edwards KV, Zervos EE. Enhanced Recovery after Surgery in a Single High-Volume Surgical Oncology Unit: Details Matter. *Surg Res Pract*. 2016;2016:6830260.
13. Thiele RH, Bartels K, Gan TJ. Inter-device differences in monitoring for goal-directed fluid therapy. *Can J Anaesth*. Feb 2015;62(2):169-181.
14. Gotlib Conn L, McKenzie M, Pearsall EA, McLeod RS. Successful implementation of an enhanced recovery after surgery programme for elective colorectal surgery: a process evaluation of champions' experiences. *Implement Sci*. Jul 17 2015;10:99.
15. Nancarrow SA, Booth A, Ariss S, Smith T, Enderby P, Roots A. Ten principles of good interdisciplinary team work. *Hum Resour Health*. May 10 2013;11:19.
16. Patient-centered Care: CRNAs and the Interprofessional Team Park Ridge, IL: American Association of Nurse Anesthetists; 2012.
17. Bloomstone J. Overcoming Challenges - Anesthesiologists In: Gan TJ, Thacker JK, Miller TE, Scott MJ, Holubar SD, eds. *Enhanced Recovery for Major Abdominopelvic Surgery* West Islip, NY: Professional Communications, Inc.; 2016:277-292.
18. Mitchell G. Selecting the best theory to implement planned change. *Nurs Manag (Harrow)*. Apr 2013;20(1):32-37.

19. Gill R. Change management - or change leadership? *Journal of Change Management* 2003;3(4):307-318.
20. Kotter's 8-Step Change Model
https://www.mindtools.com/pages/article/newPPM_82.htm. Accessed March 23, 2017.
21. McLeod RS, Aarts MA, Chung F, et al. Development of an Enhanced Recovery After Surgery Guideline and Implementation Strategy Based on the Knowledge-to-action Cycle. *Ann Surg.* Dec 2015;262(6):1016-1025.
22. Kahokehr A, Sammour T, Zargar Shoshtari K, Taylor M, Hill AG. Intraperitoneal local anesthetic improves recovery after colon resection: a double-blinded randomized controlled trial. *Ann Surg.* Jul 2011;254(1):28-38.
23. The Council of Academic Hospitals of Ontario (CAHO): Implementation of an Enhanced REcovery after Surgery (ERAS) Program ARTIC Project <http://caho-hospitals.com/wp-content/uploads/2014/02/CAHO-ERAS-ARTIC-Participant-Information-Package-Final.pdf>. Accessed June 2, 2017.
24. Gramlich LM, Sheppard CE, Wasylak T, et al. Implementation of Enhanced Recovery After Surgery: a strategy to transform surgical care across a health system. *Implement Sci.* May 19 2017;12(1):67.
25. Lyon A, Solomon MJ, Harrison JD. A qualitative study assessing the barriers to implementation of enhanced recovery after surgery. *World J Surg.* Jun 2014;38(6):1374-1380.
26. American Society for Enhanced Recovery (ASER). Enhanced Recovery Implementation Guide. <http://aserhq.org/implementation-guide/>. Accessed March 1, 2017.
27. Agency for Healthcare Research and Quality. AHRQ Safety Program for Enhanced Recovery after Surgery. <https://www.ahrq.gov/professionals/quality-patient-safety/hais/tools/enhanced-recovery/index.html>. Accessed March 23, 2017.
28. Agency for Healthcare Research and Quality. Learn about CUSP: CUSP Toolkit. <https://www.ahrq.gov/professionals/education/curriculum-tools/cusptoolkit/modules/learn/sllearnensp.html> (slides 3-8). Accessed March 23, 2017.
29. Lorenzi NM, Kouroubali A, Detmer DE, Bloomrosen M. How to successfully select and implement electronic health records (EHR) in small ambulatory practice settings. *BMC Med Inform Decis.* 2009;9:15-27.
30. Pearsall EA, Meghji Z, Pitzul KB, et al. A qualitative study to understand the barriers and enablers in implementing an enhanced recovery after surgery program. *Ann Surg.* Jan 2015;261(1):92-96.
31. Zambouri A. Preoperative evaluation and preparation for anesthesia and surgery. *Hippokratia.* Jan 2007;11(1):13-21.
32. Baldini G, Fawcett WJ. Anesthesia for colorectal surgery. *Anesthesiol Clin.* Mar 2015;33(1):93-123.
33. West MA, Grocott MP. Preoperative Assessment and Optimization In: Gan TJ, Thacker JK, Miller TE, Scott MJ, Holubar SD, eds. *Enhanced Recovery for Major Abdominopelvic Surgery*. West Islip, NY: Professional Communications, Inc; 2016:65-88.
34. Minella EM, Bousquet-Dion G, Carli F. Prehabilitation for Abdominopelvic Surgery In: Gan TJ, Thacker JK, Miller TE, Scott MJ, Holubar SD, eds. *Enhanced Recovery for Major Abdominopelvic Surgery*. West Islip, NY: Professional Communications, Inc; 2016:89-101.
35. Smith TB, Stonell C, Purkayastha S, Paraskevas P. Cardiopulmonary exercise testing as a risk assessment method in non cardio-pulmonary surgery: a systematic review. *Anaesthesia.* Aug 2009;64(8):883-893.

36. Vadivelu N, Mitra S, Kaye AD, Urman RD. Perioperative analgesia and challenges in the drug-addicted and drug-dependent patient. *Best Pract Res Clin Anaesthesiol.* Mar 2014;28(1):91-101.
37. Shah S, Kapoor S, Durkin B. Analgesic management of acute pain in the opioid-tolerant patient. *Curr Opin Anaesthesiol.* Aug 2015;28(4):398-402.
38. Pulley DD. Preoperative Evaluation of the Patient with Substance Use Disorder and Perioperative Considerations. *Anesthesiol Clin.* Mar 2016;34(1):201-211.
39. American Society of Anesthesiologists C. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures: an updated report by the American Society of Anesthesiologists Committee on Standards and Practice Parameters. *Anesthesiology.* Mar 2011;114(3):495-511.
40. Abola RE, Gan TJ. Preoperative Fasting Guidelines: Why Are We Not Following Them?: The Time to Act Is NOW. *Anesth Analg.* Apr 2017;124(4):1041-1043.
41. Gustafsson UO, Scott MJ, Schwenk W, et al. Guidelines for perioperative care in elective colonic surgery: Enhanced Recovery After Surgery (ERAS[®]) Society recommendations. *Clin Nutr.* Dec 2012;31(6):783-800.
42. Gustafsson UO, Nygren J, Thorell A, et al. Pre-operative carbohydrate loading may be used in type 2 diabetes patients. *Acta Anaesthesiol Scand.* Aug 2008;52(7):946-951.
43. Can MF, Yagci G, Dag B, et al. Preoperative administration of oral carbohydrate-rich solutions: Comparison of glucometabolic responses and tolerability between patients with and without insulin resistance. *Nutrition.* Jan 2009;25(1):72-77.
44. Yilmaz N, Cekmen N, Bilgin F, Erten E, Ozhan MO, Cosar A. Preoperative carbohydrate nutrition reduces postoperative nausea and vomiting compared to preoperative fasting. *J Res Med Sci.* Oct 2013;18(10):827-832.
45. Jones C, Badger SA, Hannon R. The role of carbohydrate drinks in pre-operative nutrition for elective colorectal surgery. *Ann R Coll Surg Engl.* Oct 2011;93(7):504-507.
46. British Columbia Enhanced Recovery Collaborative Guidance on Pre-Operative Carbohydrate-Loading Beverage 2016; http://enhancedrecoverybc.ca/wp-content/uploads/2016/06/Pre-Op-CHO-Loading-Guidance_FINAL-FOR-DISTRIBUTION_20160610.pdf. Accessed March 23, 2017.
47. Tan M, Law LS, Gan TJ. Optimizing pain management to facilitate Enhanced Recovery After Surgery pathways. *Can J Anaesth.* Feb 2015;62(2):203-218.
48. Miller ET, Gan TJ, Thacker JK. Enhanced Recovery pathways for major abdominal surgery *Anesthesiology News* 2014.
49. Abesoye A, Duncan N. Acute Pain Management in Patients with Opioid Tolerance *US Pharm.* 2017;42(3):28-32.
50. Siu-Chun Law L, Ah-Gi Lo E, Gan TJ. Preoperative Antiemetic and Analgesic Management In: Gan TJ, Thacker JK, Miller TE, Scott MJ, Holubar SD, eds. *Enhanced Recovery for Major Abdominopelvic Surgery.* West Islip, NY: Professional Communications, Inc; 2016:105-120.
51. Montgomery R, McNamara SA. Multimodal Pain Management for Enhanced Recovery: Reinforcing the Shift From Traditional Pathways Through Nurse-Led Interventions. *AORN J.* Dec 2016;104(6S):S9-S16.
52. Gritsenko K, Khelemsky Y, Kaye AD, Vadivelu N, Urman RD. Multimodal therapy in perioperative analgesia. *Best Pract Res Clin Anaesthesiol.* Mar 2014;28(1):59-79.
53. Elvir-Lazo OL, White PF. The role of multimodal analgesia in pain management after ambulatory surgery. *Curr Opin Anaesthesiol.* Dec 2010;23(6):697-703.

54. McDonald LT, Corbiere NC, DeLisle JA, Clark AM, Kuxhaus L. Pain Management After Total Joint Arthroplasty. *AORN J*. Jun 2016;103(6):605-616.
55. The Food and Drug Administration. Prescription Drug Products Containing Acetaminophen: Actions to Reduce Liver Injury from Unintentional Overdose 2011; <https://www.regulations.gov/document?D=FDA-2011-N-0021-0001>. Accessed June 6, 2017.
56. U.S. Food and Drug Administration. Ketorolac Tromethamine. 2014; https://www.accessdata.fda.gov/drugsatfda_docs/label/2014/074802s038lbl.pdf. Accessed June 6, 2017.
57. Helander EM, Menard BL, Harmon CM, et al. Multimodal Analgesia, Current Concepts, and Acute Pain Considerations. *Curr Pain Headache Rep*. Jan 2017;21(1):3.
58. Gan TJ, Diemunsch P, Habib AS, et al. Consensus guidelines for the management of postoperative nausea and vomiting. *Anesth Analg*. Jan 2014;118(1):85-113.
59. Apfel CC, Bacher A, Biedler A, et al. [A factorial trial of six interventions for the prevention of postoperative nausea and vomiting]. *Anaesthetist*. Mar 2005;54(3):201-209.
60. Apfel CC, Laara E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. *Anesthesiology*. Sep 1999;91(3):693-700.
61. Ebell MH. Predicting postoperative nausea and vomiting. *Am Fam Physician*. May 15 2007;75(10):1537-1538.
62. Apfel CC, Korttila K, Abdalla M, et al. A factorial trial of six interventions for the prevention of postoperative nausea and vomiting. *N Engl J Med*. Jun 10 2004;350(24):2441-2451.
63. Apfel CC, Heidrich FM, Jukar-Rao S, et al. Evidence-based analysis of risk factors for postoperative nausea and vomiting. *Br J Anaesth*. Nov 2012;109(5):742-753.
64. Cannesson M, Gan TJ. PRO: Perioperative Goal-Directed Fluid Therapy Is an Essential Element of an Enhanced Recovery Protocol. *Anesth Analg*. May 2016;122(5):1258-1260.
65. Srinivasa S, Kahokehr A, Soop M, Taylor M, Hill AG. Goal-directed fluid therapy- a survey of anaesthetists in the UK, USA, Australia and New Zealand. *BMC Anesthesiol*. Feb 22 2013;13:5.
66. Nisanevich V, Felsenstein I, Almogy G, Weissman C, Einav S, Matot I. Effect of intraoperative fluid management on outcome after intraabdominal surgery. *Anesthesiology*. Jul 2005;103(1):25-32.
67. Gurgel ST, do Nascimento P, Jr. Maintaining tissue perfusion in high-risk surgical patients: a systematic review of randomized clinical trials. *Anesth Analg*. Jun 2011;112(6):1384-1391.
68. Hamilton MA, Cecconi M, Rhodes A. A systematic review and meta-analysis on the use of preemptive hemodynamic intervention to improve postoperative outcomes in moderate and high-risk surgical patients. *Anesth Analg*. Jun 2011;112(6):1392-1402.
69. Navarro LH, Bloomstone JA, Auler JO, Jr., et al. Perioperative fluid therapy: a statement from the international Fluid Optimization Group. *Perioperative medicine*. 2015;4:3.
70. Miller TE, Roche AM, Mythen M. Fluid management and goal-directed therapy as an adjunct to Enhanced Recovery After Surgery (ERAS). *Can J Anaesth*. Feb 2015;62(2):158-168.

71. Manecke GR, Asemota A, Michard F. Tackling the economic burden of postsurgical complications: would perioperative goal-directed fluid therapy help? *Crit Care*. Oct 11 2014;18(5):566.
72. Morris JD, Thiele RH. Hemodynamic Monitoring and Goal-directed Therapy In: Gan TJ, Thacker JK, Miller TE, Scott MJ, Holubar SD, eds. *Enhanced Recovery for Major Abdominopelvic Surgery*. West Islip, NY: Professional Communications, Inc; 2016:151-160.
73. Bernard H. Patient warming in surgery and the enhanced recovery. *Br J Nurs*. Mar 28-Apr 10 2013;22(6):319-320, 322-315.
74. World Health Organization Surgical Site Infection Prevention Guidelines. Web Appendix 14. Summary of a systematic review on maintaining normal body temperature (normothermia). <http://apps.who.int/gpsc/appendix14.pdf>. Accessed March 29, 2017.
75. Duncan AE. Hyperglycemia and perioperative glucose management. *Curr Pharm Des*. 2012;18(38):6195-6203.
76. Moghissi ES, Korytkowski MT, DiNardo M, et al. American Association of Clinical Endocrinologists and American Diabetes Association consensus statement on inpatient glycemic control. *Endocr Pract*. May-Jun 2009;15(4):353-369.
77. van den Berghe G, Wouters P, Weekers F, et al. Intensive insulin therapy in critically ill patients. *N Engl J Med*. Nov 08 2001;345(19):1359-1367.
78. Krinsley JS. Association between hyperglycemia and increased hospital mortality in a heterogeneous population of critically ill patients. *Mayo Clin Proc*. 2003;78(12):1471-1478.
79. Brunkhorst FM, Engel C, Bloos F, et al. Intensive insulin therapy and pentastarch resuscitation in severe sepsis. *N Engl J Med*. Jan 10 2008;358(2):125-139.
80. Preiser JC, Devos P, Ruiz-Santana S, et al. A prospective randomised multi-centre controlled trial on tight glucose control by intensive insulin therapy in adult intensive care units: the Glucontrol study. *Intensive Care Med*. Oct 2009;35(10):1738-1748.
81. Wiener RS, Wiener DC, Larson RJ. Benefits and risks of tight glucose control in critically ill adults: a meta-analysis. *JAMA*. Aug 27 2008;300(8):933-944.
82. Reddy P, Duggar B, Butterworth J. Blood glucose management in the patient undergoing cardiac surgery: A review. *World J Cardiol*. Nov 26 2014;6(11):1209-1217.
83. Qaseem A, Humphrey LL, Chou R, Snow V, Shekelle P. Use of intensive insulin therapy for the management of glycemic control in hospitalized patients: a clinical practice guideline from the American College of Physicians. *Ann Intern Med*. 2011;154(4):260-267.
84. Lazar HL, McDonnell M, Chipkin SR, et al. The Society of Thoracic Surgeons practice guideline series: Blood glucose management during adult cardiac surgery. *Ann Thorac Surg*. Feb 2009;87(2):663-669.
85. Day RW, Young-Fadok TM. Surgical Approaches and Techniques In: Gan TJ, Thacker JK, Miller TE, Scott MJ, Holubar SD, eds. *Enhanced Recovery for Major Abdominopelvic Surgery*. West Islip, NY: Professional Communications, Inc; 2016:189-199.
86. Postanesthesia Care Standards for the Certified Registered Nurse Anesthetist. Park Ridge, IL: American Association of Nurse Anesthesiology; 2012.
87. Kitching A, O'Neil S. Fast-track surgery and anesthesia. *Continuing Education in Anaesthesia, Critical Care & Pain* 2009;9(2):39-43.
88. Davis-Evans C. Alleviating anxiety and preventing panic attacks in the surgical patient. *AORN J*. Mar 2013;97(3):354-364.

89. Fearon KC, Jenkins JT, Carli F, Lassen K. Patient optimization for gastrointestinal cancer surgery. *Br J Surg*. Jan 2013;100(1):15-27.
90. Nay PG. Postoperative pain. *Anaesthesia*. Dec 1997;52(12):1233.
91. Informed Consent for Anesthesia Care. Park Ridge, IL: American Association of Nurse Anesthetists; 2016.
92. Bakker N, Cakir H, Doodeman HJ, Houdijk AP. Eight years of experience with Enhanced Recovery After Surgery in patients with colon cancer: Impact of measures to improve adherence. *Surgery*. Jun 2015;157(6):1130-1136.

Adopted by AANA Board of Directors July 2017

© Copyright 2017