Perioperative care coordination

February 2018
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**Problem statement**

Most medical errors involve miscommunication and occur when patients are transferred through different levels of care or during changes in caregivers. The root causes of ineffective transitions involve communication and education breakdowns between the patient care team, the patient, family or caregiver, or breakdowns in provider responsibility for coordinating care across settings and providers. Communication errors are more likely to occur when patients are undergoing surgical procedures due to the numerous transitions in care providers and clinical settings. Inadequate preoperative assessment and optimization for surgery, patient engagement and care coordination contribute to surgical cancellations and delays, poor patient experience, complications, extended length of stay and mortality. Effective care coordination and standardized communication between care providers and patients and their families at all phases of the perioperative process improves safety and reduces complications.

**An analysis of Vizient Patient Safety Organization safety data**

To uncover common issues associated with perioperative care coordination, the Vizient Patient Safety Organization (PSO) conducted a retrospective review of periprocedural events reported nationally from January 2016 through June 2017. Over 250 organizations participate in the Vizient PSO.

The most common event types reported in surgical or procedural areas were preprocedural events (e.g., cancelled, delayed, consent missing or incomplete, or preparation inadequate or wrong), equipment or supply issues (e.g., equipment was not sterilized, was unavailable or wrong, or malfunctioned), and care coordination and communication issues. To improve our understanding of periprocedural care coordination issues, a focused review of the narrative descriptions was completed for events that occurred before the procedure; these descriptions were classified as “procedure cancelled” or “preparation inadequate or incorrect.” In addition, events in surgical or procedural areas categorized as “care coordination or communication issues” were reviewed. Table 1 summarizes the care coordination issues that were identified in the narrative descriptions of these event types; events that were not preventable were excluded from the summary. This review of procedural care coordination events is not inclusive, as events may have been entered under a different event type.

Event reports related to scheduling errors (22 percent) were common, and included the procedure being scheduled for the wrong side or site, the wrong procedure being scheduled or an additional procedure either missing from or added to the schedule. Most scheduling errors were discovered during the preprocedural verification process when documents had discrepancies or the patient or physician identified a different site or procedure than that scheduled. Wrong procedure scheduling errors resulted in the operating room (O.R.) and instrumentation being prepared for the wrong procedure, which resulted in delays. However, when scheduling errors were not caught early in the process, they were more likely to
result in harm. In other scheduling errors, the wrong implant was ordered or the implant was not ordered at all. Sometimes, issues with implants were not discovered until the patient was in the O.R. (i.e., under anesthesia and incision made). In other cases, timing issues resulted in the use of suboptimal implants.

### Table 1. Periprocedural care coordination issues

<table>
<thead>
<tr>
<th>Preoperative</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheduling error</td>
<td>174 (22)</td>
</tr>
<tr>
<td>Test results or physical findings on day of surgery required medical management</td>
<td>123 (16)</td>
</tr>
<tr>
<td>Preoperative surgical prep or tests were either not done or were incorrect or test results were unavailable</td>
<td>80 (10)</td>
</tr>
<tr>
<td>Patient did not maintain NPO status</td>
<td>69 (9)</td>
</tr>
<tr>
<td>Medical or specialty clearance was not done</td>
<td>69 (9)</td>
</tr>
<tr>
<td>Medications were not ordered or were taken incorrectly before the procedure</td>
<td>57 (7)</td>
</tr>
<tr>
<td>Prep in preprocedural area was incorrect or not done</td>
<td>40 (5)</td>
</tr>
<tr>
<td>Inadequate communication with pathology regarding frozen section</td>
<td>34 (4)</td>
</tr>
<tr>
<td>Equipment or supplies were not ordered or were not available, sterile or working</td>
<td>31 (4)</td>
</tr>
<tr>
<td>O.R. did not receive notification (e.g., in emergent cases) or information was missing</td>
<td>16 (2)</td>
</tr>
<tr>
<td>Patient was unaware procedure was scheduled</td>
<td>15 (2)</td>
</tr>
<tr>
<td>Patient was taken to O.R. or procedure area prematurely or to the wrong room, or care was not coordinated</td>
<td>13 (2)</td>
</tr>
<tr>
<td>IV access issue or IV placed on wrong side</td>
<td>7 (1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Postoperative</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Handoff was not given to receiving unit or information or orders were incorrect or missing</td>
<td>35 (5)</td>
</tr>
<tr>
<td>Transportation issue</td>
<td>23 (3)</td>
</tr>
<tr>
<td>No discharge instructions were given or instructions were incorrect or incomplete</td>
<td>22 (3)</td>
</tr>
</tbody>
</table>

Notes: Period of data: January 2016-June 2017; number of events = 775; more than one factor may have been identified in one event.

Abbreviations: IV = intravenous; NPO = nothing by mouth; O.R = operating room.

Many preprocedural events involved inadequate patient assessment, optimization and preparation: on the day of the procedure, the surgeon had to cancel the procedure due to abnormal test results or physical findings associated with a known or recent condition that required medical management or changed the surgical plan (16 percent); the preprocedural surgical prep was not completed appropriately, tests were not completed or the report was unavailable (10 percent); or medical clearance was not completed (9 percent). Other reasons procedures were cancelled included: the patient did not maintain “nothing by mouth” status (9 percent); medication (e.g., aspirin, anticoagulants or insulin) was not taken according to proper protocol because the instructions were wrong or the patient misunderstood them (7 percent); or the patient was not aware that the procedure was scheduled or rescheduled (2 percent). When equipment or supplies were not ordered, available, sterilized or working properly, procedures were
delayed or cancelled. Equipment and supply events in the perioperative setting were not reviewed; therefore, they are more common than reflected in this analysis.

There were a number of events involving inadequate patient preparation for surgery in transitions between the inpatient unit, the preprocedural area or the O.R. (5 percent), such as vital signs not being taken preprocedurally, the area of the procedure not being clipped, the patient being allergic to products (latex catheters, iodine) that were used, the patient wearing clothes or jewelry, or contact lens not being removed prior to surgery.

On the day of the procedure, handoff communication issues were reported during transitions from the O.R. to the postanesthesia care unit (PACU), intensive care unit (ICU) or other unit. Reports were either not given to the receiving nurse or information or orders were missing or incorrect. In some cases, the nurse did not receive accurate information on the medications administered to the patient pre-, intra- or postoperatively, or the verbal report was not consistent with what was documented in the medical record. In other cases, critical information was not given to the receiving unit postoperatively about necessary medical equipment, supplies or precautions (e.g., ventilator, monitor cables or isolation) before transfer; therefore, supplies were not available or the room was not set up to care for the patient. Postoperatively, patients did not receive discharge instructions or the instructions were incorrect or incomplete. In a number of cases, the patient did not have acceptable transportation or caregiving arrangements.

Care coordination and communication breakdowns resulted in delays, cancellations of procedures, patient inconvenience and additional costs. Figure 1 displays the Agency for Healthcare Research and Quality Common Format v.1.1 harm scores assigned to these events. In some cases, inadequate assessment, optimization, preparation and care coordination led to adverse patient outcomes, such as increased bleeding, hypotension, cardiac events, incorrectly processed tissue specimens, infection, high blood glucose, extended time under anesthesia or delay in organ transplant. Sometimes, the patient was already in the O.R. and under sedation or anesthesia before it was determined that the surgery would have to be cancelled due to incorrect implants, equipment, supplies or patient optimization.
Perioperative care coordination: defining the project focus

Based on guidance from an expert advisory team (Appendix A) and the issues identified in safety reports, the Vizient PSO developed leading practices in perioperative care coordination in the following areas:

- Patient engagement and experience
- Scheduling the procedure
- Preoperative assessment and triage
- Medical optimization
- Postoperative handoffs

Perioperative programs should be customized according to the patient population, needs and resources of each institution. Although there is no single, standard model for perioperative care coordination, this document summarizes the leading practices from the literature and successful strategies used by Vizient members. Organizations can use this information to evaluate how these practices might be incorporated into their perioperative processes to improve care coordination.

Leading practices and member case studies

Standardized, structured perioperative processes should be developed and key elements should include:

- Early patient and family engagement
- Standardized processes to ensure each case is scheduled accurately and all necessary resources are available
- Early assessment, risk stratification and triage
• A centralized evaluation process and system for triaging patients who need to go through a preoperative evaluation clinic or prehabilitation program (e.g., preoperative exercise or strength building, nutritional counseling or smoking cessation) for medical optimization

• Surgery-specific evidence-based protocols and perioperative care planning

**Early patient and family engagement and education**

Effective care coordination begins by ensuring that accurate clinical information is available to support medical decisions by patients. Successful transitions in perioperative care depend on whether providers have adequately educated patients about key elements of their own care. Patients who are educated and well-prepared will be more engaged and communicative, better prepared to make decisions about their health care and will have realistic expectations.¹¹-¹³

• Design processes to be patient-centered by bringing services and resources to the patient.

• Evaluate, plan and coordinate care based on the patient and family’s goals and needs early in the process and throughout the continuum of care, including the weeks and months after the procedure.¹³-¹⁴

• Whenever possible, include the patient’s family or caregiver in the teaching process to increase retention of information.⁹

• Develop multimodal, easy to understand, standardized methods for educating and communicating with patients and their families, including verbal, written or electronic perioperative instructions, checklists and reminders or web-based learning. Education should begin at the time surgery is decided on in the surgeon’s office, and support the patient and family in making decisions and planning for their care needs. Education should include the following:
  – The diagnosis, procedure and options, as well as risks, benefits and alternatives.¹²
  – What patients need to do to prepare both before and after surgery and what to expect in each phase of the perioperative process, including:

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**UCLA’s mobile app for surgical preparation and patient education**

In partnership with their Patient and Family Advisory Council, the UCLA Department of Neurosurgery team developed a mobile app to address the challenge of providing comprehensive, up-to-date information to patients and their families and to improve patient engagement and experience. The app serves as the central resource for preparing patients for neurosurgical procedures and includes:

• Education on clinical diagnoses and treatment options

• A surgery timeline that provides reminders and alerts at key points leading up to surgery, during the inpatient visit and in the postoperative period

• A roster of physicians, residents and clinical staff

• Department and hospital contact information, as well as hospital and local amenities

Over a 16-month period, the app has been downloaded more than 1,500 times and patient feedback has been overwhelmingly positive.
• Preoperative medical assessment and testing appointments or consults, food and fluid intake and medication instructions\textsuperscript{10,15,16}
• Education on the surgical team,\textsuperscript{12} as well as information about anesthesia,\textsuperscript{15} surgical site infection prevention, smoking and alcohol cessation, nutritional alterations and exercise\textsuperscript{17}
• Instructions that include the procedure being performed, the provider performing the procedure and the arrival time\textsuperscript{15}
• Education on postoperative care requirements
• What to expect after discharge and during their recovery\textsuperscript{3,12,18}

• Engage patient and family advisors in the development of patient-centered education that is easy to understand and access.\textsuperscript{12,18}

• During phone calls and in-person interviews prior to the day of surgery, evaluate patients’ understanding of the process, what they need to do and should expect through each phase of perioperative care, and provide education and reinforce instructions. Confirm the correct procedure is scheduled.\textsuperscript{9,18}

• Implement processes or systems — such as an interactive online teaching application — that evaluate the effectiveness of education and validate that patients understand the instructions provided to them. Use a teach-back method to confirm that patients understand what is being explained to them, and provide an opportunity for questions and answers.\textsuperscript{15}

Scheduling processes

The surgical verification process begins at the time the procedure is scheduled by the surgeon’s office with the health care facility’s surgical scheduler. Scheduling errors are common and are typically discovered on the day of surgery, which can result in delays and either the procedure being performed on the wrong side or site or the wrong procedure being performed.\textsuperscript{4,19} In The Joint Commission Center for Transforming Healthcare wrong site surgery project, scheduling errors were identified as one of the top four factors that increased the risk of wrong site surgery.\textsuperscript{20}

At time of scheduling

• Schedule the surgical procedure in collaboration with patients and their preferences.

• Address the factors that contribute to communication errors (e.g., verbal bookings, legibility or no verification process).\textsuperscript{20}

• Require physicians to enter orders directly into the electronic medical record within the system if possible, so that the information in the order flows through the patient’s entire record and is the main source of information.
• If electronic entry of orders is not available, establish other, less error-prone processes to verify that booking information is accurate:
  − Create an electronic scheduling system that requires the physician performing the surgery to fill out certain sections such as the procedure, level and laterality, and requires completion of mandatory documentation.20
  − Define a process for office staff to independently cross-check documents to confirm accuracy of the procedure.
  − Require the office or clinic to complete scheduling forms and submit via fax, email or electronically instead of or in addition to verbal correspondence. Information should be typed rather than handwritten to prevent errors in legibility.
  − Do not accept unapproved abbreviations and require scheduling forms and consents that contain inaccurate, illegible information and cross-outs to be corrected.20

• Educate office staff on the scheduling process and the importance of accurate and complete scheduling information.20

**Before the day of surgery**

• Confirm the presence and cross-check the accuracy of all primary documents including the orders, physician’s notes, history and physical, consent and imaging tests. If information in the documents is not in agreement or is incomplete, notify the physician’s office before the day of surgery. Require that missing documents and discrepancies be reconciled prior to the day of surgery. Establish a deadline for reconciling issues or surgery will be cancelled.20

• Establish a process to verify the scheduled procedure is accurate.
  − Contact the office staff to ensure the procedure scheduled is accurate and obtain written verification.4,20
  − Contact the patient to verify the correct procedure.4

• Develop a process for holding daily multidisciplinary meetings to review scheduled surgical cases in the upcoming week and days before surgery. Discuss the patient’s medical, psychosocial and operative needs (e.g., implants, equipment or supplies) so that identified issues can be addressed in advance and scheduling adjustments are made as needed.15,21

**Day of surgery (pre-op/holding area)**

• Educate surgical staff to notify the surgeon of any discrepancies in the scheduled procedure when completing the pre-procedure checklist.

• Encourage staff to report scheduling errors.
• Establish a handoff process that outlines essential information prior to the patient leaving the holding area, such as pending or abnormal laboratory and test results, consent, procedural site and patient concerns.

Ongoing monitoring, awareness and follow-up

• Evaluate reports of near misses; close calls; errors in the scheduling of the laterality, site or type of procedure; or the wrong patient. Identify risks in the process.

• Create a process for notifying the surgeon, office manager and staff about scheduling errors to increase their awareness. Encourage the office manager to define a process for cross-checking documents to confirm accuracy of the procedure.

UK HealthCare’s crystal process promotes multidisciplinary team collaboration to ensure that each case has all necessary resources to provide care in a safe, effective, efficient and timely manner. UK’s scheduling process is dynamic, with modifications and additions to provide optimal care. Their multidisciplinary team — managers, preadmission testing, scheduling, anesthesia, materials, central sterile, radiology, service line coordinators and a board runner — meets daily at 9:30 a.m. to review cases scheduled for the next 72 hours. For cases 48 to 72 hours out, a preliminary review is conducted to determine if cases are appropriate for the ambulatory surgery center or whether special equipment or supplies need to be ordered, borrowed or arranged (e.g., neurophysiological or nerve monitoring, special lasers), or whether there are inadequate resources for the number of requests (e.g., microscope cases, C-arm, special O.R. room tables). For cases 24 hours out, the team reviews each case to make sure all equipment, supplies and resources or limited or special supply items are available and scheduled appropriately so that there are no conflicts and there is adequate time for turnover of instruments between cases.

Preoperative evaluation and triage

The preoperative evaluation involves the assessment of the medical record, patient interview and physical examination, and, when indicated, findings from preoperative tests and consultations with other providers and specialists. The primary goals of preoperative evaluation and preparation include:\(^8,22:\)

• Documentation of the conditions requiring surgery

• Assessment of the patient’s health status and risks, existing medical conditions and treatments, and unknown conditions that could cause problems during and after surgery

• Optimization of the patient’s medical condition

• Formulation of a plan and alternatives for perioperative anesthesia care
• Education and engagement of the patient, reduction of the patient’s anxiety through education about the perioperative process and care, and improved patient satisfaction
• Facilitation of recovery
• Minimization of cancellations of surgery, reduction in length of stay and costs

Early assessment

The prompt identification of high-risk patients followed by timely interventions for medical optimization and anesthesia care can lead to significant reductions in morbidity and mortality.\(^8,10\) Risk stratification systems, preoperative testing and biochemical markers can help predict possible complications and mortality.\(^10\) Acceptable timing of specific tests and consultations should be individualized based on the preoperative assessment.\(^8,22\)

• For elective procedures, maximize the window of time between the decision to have surgery and the day of the procedure to provide adequate time to assess, complete necessary tests and optimize patients for their procedure. Organizations should provide pertinent medical information related to the severity of illness and surgical procedure to the anesthesiologist well in advance of the scheduled procedure.\(^10,22\)

• The timing of the preoperative evaluation should be guided by patient factors such as age, severity of disease, type and invasiveness of the procedure, and the nature of the health care system.\(^22\)

• Organizations should establish guidelines for the time frame in which test results are acceptable (e.g., within 30 days of surgery) as long as there is no change in the patient’s clinical status.\(^22\)

• The surgeon should notify the primary care physician of the decision for surgery.

Gathering and tracking prerequisites for surgery and documents

• Obtain the patient’s medical records for chart review and medical history in advance of the procedure and establish a deadline for when records should be obtained.\(^23,24\)

• Improve the efficiency of surgery documentation by instituting an integrated health information system that compiles all required documents, notes by clinicians and necessary tasks to improve communication among the multidisciplinary team; allow for easy retrieval of information through the process; and determine what tasks need to be completed.\(^11,21\)

• Assign responsibility for ensuring test results and referrals are checked and implement systems that incorporate double-checks for review of selectively ordered lab work and tests (e.g., cardiac clearance or pulmonary function tests).\(^21,22\)
• Use electronic pre-procedure tools that improve communication and care coordination for staff involved in preparing patients for their procedures. For example, a patient-specific electronic document is created when a case request or procedure order is placed and gathers information in one place. A task list that is linked to the procedure and unique to the patient is driven by data in the chart and rule-based criteria or protocols. This type of electronic tool can help staff determine the patient’s readiness before and on the day of the procedure; it also generates alerts or automated emails about incomplete tasks.11,21

Preoperative evaluation process

Preoperative evaluation clinics play a key role in coordinating patient care and are becoming a necessity as evidence grows that early risk assessment, medical optimization and protocols of care improve patient outcomes, lower costs and improve operational efficiency.10,11,13 Various models of the surgical home concept that focus on the coordination of care, adherence to evidence-based patient management guidelines and patient engagement through all phases of the perioperative process have been described (Appendix B).10,11,13,25 Preoperative evaluation clinics that operate in conjunction with the perioperative process are associated with decreased perioperative complications, length of stay and in-hospital mortality; reduced surgical delays and cancellations due to inadequate preoperative preparation; less unnecessary preoperative testing; and lower costs.9-11,17

• Evaluate the role of the nurse in improving perioperative care coordination (e.g., nurse navigators) including3,10:
  − Assessment of the patient’s needs, risks and vulnerabilities during all perioperative phases
  − Facilitation of communication between internal and external providers (e.g., primary care physician, specialist or surgical team) to address gaps in care
  − Management of the patient’s expectations and provision of patient and family education on the disease, surgical process and their responsibilities in preparing for surgery
  − Direction to patients to health care services for further diagnosis, treatment and support services (e.g., financial, transportation or cultural), and expedite appointments
  − Coordination of aftercare appointments, local resources and support, and follow up with the patient after discharge

• Develop processes for identifying high-risk patients early in the process9 and incorporate medical, functional and psychosocial domains.14
Wake Forest Baptist Medical Center’s Surgical Navigation Center reduces cancellations and improves efficiency and outcomes

To improve reliability, patient outcomes and experience, and operational efficiency, Wake Forest embarked on a journey to redesign their perioperative care processes.

- Processes are designed to be patient-centered:
  - A Getting Ready for Surgery folder guides the patient from the ambulatory phase through discharge.
  - A Getting Ready for Surgery video reinforces the folder of written materials.
  - Anesthesia multimedia content is ordered for all elective surgery patients.
  - Surgeons choose the appropriate multimedia modules based on the type of surgery.
  - Eighty-five percent of patients who begin their patient education content finish their education. A brief patient satisfaction survey at the end of the content provides information on the effectiveness of the education.
  - A nurse navigator calls the patient within two days of case posting to begin the assessment and triage, coordinates perioperative care and reinforces the patient’s expectations for surgery.

- The time between the decision for surgery and the day of the procedure is maximized to provide adequate time to assess and prepare the patient for surgery.

- Processes were developed for the early identification and triage of high-risk patients (American Society of Anesthesiologists [ASA] class 3 and 4) through the preoperative clinic. The ASA class is assigned by the surgeon at the time of scheduling; a software program then abstracts the medical record for 28 internally developed risk criteria and assigns a risk score.

- Prior to surgery, patients are medically optimized through perioperative care pathways and prehabilitation programs.

- Care is coordinated and discharge planning begins preoperatively.

Wake Forest’s redesign has resulted in a seamless interface between ambulatory and perioperative phases of care; a 57 percent reduction in case cancellations due to preventable reason codes, and improved patient experience and efficiency in the O.R. Data on surgical outcomes, length of stay, readmissions and postoperative complications that correlate with the adoption of the Surgical Navigation Center is forthcoming.

- Use validated risk calculators to help predict the patient’s surgical risk. These tools can aid as a supplement to the clinician’s own judgment but certain limitations exist. Examples include:
  - A Surgical Risk Calculator developed by the American College of Surgeons (ACS) National Surgical Quality Improvement Program estimates the chances of an unfavorable outcome (such as a complication or death) after surgery based on the patient’s medical history.
- **The Revised Cardiac Risk Index** estimates a patient's risk of perioperative cardiac complications. It is not designed for or validated in ambulatory or low-risk surgery.\(^{28}\)
- **The Gupta Perioperative Cardiac Risk Calculator** estimates perioperative cardiac risk for individual patients.\(^{29}\)
- **The Postoperative Respiratory Failure Risk Calculator** estimates the risk of postoperative respiratory failure.\(^{30}\)
- **The ASA Physical Status Classification System** assesses patient-specific risk independent of the procedure. A lack of interrater reliability with this system improved after the addition of examples.\(^{31}\)

- Evaluate the patient’s functional status (ability to perform activities of daily living), which is a consistent predictor of postoperative complications (e.g., cardiac, pulmonary or death) after major surgery.\(^{32}\) For geriatric patients, an assessment should include cognition, behavior, cardiac and pulmonary status, functionality, frailty, nutrition, polypharmacy and social support (Appendix C).\(^{33,34}\) Care models involving geriatricians’ input have resulted in more thorough preoperative medical assessments and comprehensive medical management through the postoperative period.\(^{35}\)

- Stratify the patient’s risk and determine the need for further medical evaluation and preprocedure testing based on the patient’s comorbidities, medications and invasiveness of the planned procedures and type of anesthetic to be administered.\(^{8-10}\)

- Establish criteria for the assessment of patients who should be referred to the preoperative evaluation clinic (e.g., ASA class, medical condition or enhanced recovery after surgery protocol).\(^{9}\)

- Order preoperative tests on a selective basis to guide or optimize perioperative management. Specific tests and their timing should be individualized based on a review of the patient’s medical record, physical examination and invasiveness of the planned procedure.\(^{22,34}\)

- Selective ordering by anesthesiologists and clinical decision support has been shown to reduce unnecessary and duplicate testing and costs.\(^{11,36,37}\)

- Begin discharge planning early during the preoperative phase, with the goal of decreasing length of stay and earlier transfer to more appropriate care settings such as home with either proper support, rehabilitation or skilled nursing facilities.\(^{10,11}\) Plan for postoperative needs such as transportation, caregiver support, referrals to rehabilitation or nursing facilities, and durable medical equipment. Involve social workers in assessing the patient’s social needs through the perioperative process.\(^{10}\)
Medical optimization

Medically optimize the patient’s modifiable medical conditions such as cardiac conditions (American College of Cardiology/American Heart Association Guideline38, Medical College of Wisconsin update in perioperative medicine36), pulmonary conditions,39 anemia,40 glycemic control,41 malnutrition and smoking cessation prior to surgery to reduce postoperative complications.22 Develop perioperative care pathways for preoperative workup based on the patient’s risks, management of existing conditions and medications. Incorporate prehabilitation programs that address exercise, nutrition and stress reduction techniques as well as smoking and alcohol cessation.9,10,42

- Enhance the fitness level and functional capacity of patients before surgery based on the type of procedure to reduce the length of hospital stay, improve physical function and cardiopulmonary fitness, and facilitate the patient’s recovery.42-46

- Malnutrition is a risk factor for postoperative complications, infections, mortality and longer lengths of stay.39,47-49 Conduct a nutritional screening during preoperative evaluation, as optimization of the patient’s metabolic state improves surgical outcomes.50

- Smoking cessation more than four weeks before surgery may decrease the risk of postoperative respiratory complications.39,51

- Alcohol cessation interventions prior to surgery — including pharmacological strategies for relapse prophylaxis and withdrawal symptoms — may reduce postoperative complication rates.52

- Reconcile medications and formulate a plan to discontinue or continue each of the patient’s chronic medications preoperatively and during each phase of perioperative care. Pay special attention to high-risk medications including anticoagulants,53 opioids, antihypertensives, diabetes, and cancer or chemotherapy medications.

- Ensure the patient understands and receives written instructions that comply with protocols.34

- Access the ACS’s website for the Strong for Surgery Toolkit, as well as information and preoperative checklists on medication, nutrition, glycemic control and smoking cessation for elective surgical patients.

Evidence-based protocols and enhanced recovery pathways

Standardized, surgery-specific clinical protocols and pathways that include a preoperative patient engagement component have resulted in improved efficiency and reduction in day of surgery cancellations, hospital length of stay, readmission rates and patient anxiety. Each clinical pathway should be developed by a multidisciplinary team using up-to-date, evidence-based practices and include a pre-, intra- and postoperative component. The team should be led by an anesthesiologist and surgeon, and include medical subspecialists, a certified registered nurse anesthetist champion, a resident champion, a
nurse navigator or clinic nurse, and a nursing manager or leader. These team members disseminate information and champion the clinical pathway through the department.9,10

Enhanced recovery pathways (ERPs) are bundles of evidence-based practices delivered by a multidisciplinary team through each perioperative care phase to help patients recover more quickly after elective major surgery. ERPs accelerate the patient’s recovery by maintaining preoperative organ function and lessening the endocrine and metabolic stress response. ERPs result in improved patient outcomes including reduced complications, length of stay (by 30 to 50 percent), and use of analgesia as well as improved patient comfort and satisfaction.\textsuperscript{54-61}

**OSUMC’s colon enhanced recovery after surgery pathway reduces length of stay and cost of admission**

At The Ohio State University Wexner Medical Center, a multidisciplinary team of physicians, residents, pharmacists, nurse practitioners, nurses, social workers, perioperative staff, and operations and process improvement experts designed an evidence-based enhanced recovery after surgery pathway for elective colectomies (CERAS).

All patients receive preoperative counseling to ensure adherence to expectations around food intake, nutritional supplements and early mobilization. During the preoperative clinic visit, each patient receives:

- Counseling on nutrition (if albumin is less than 4 or body mass index is less than 18) and smoking and alcohol cessation as indicated
- Prehabilitation, including 30 minutes of exercise per day, four times per week
- An education booklet
- A kit that includes their preoperative bowel prep, antibiotic prophylaxis and skin cleanse with chlorhexidine, and a nutritional beverage with instructions

The perioperative pathway also includes specific protocols and order sets that address:

- Standardized perioperative analgesia and analgesic regimes
- Multimodal postoperative pain management
- Multimodal nausea prophylaxis
- Thromboembolism prophylaxis
- Intraoperative esophageal Doppler fluid monitoring
- Early removal of the nasogastric tube and Foley catheters postoperatively
- Daily physician and nurse rounding on the floor, early mobilization to a chair and ambulation, and multimodal pain management and antiemetics

The outcomes of the CERAS pathway include a 51 percent reduction in length of stay, and a $101,000 average decrease in the cost of admission.
The key elements of enhanced recovery after surgery (ERAS) protocols address preoperative counseling, nutrition, anesthesia or analgesia, and early mobilization. Because these protocols involve a shift in traditional surgical practice, there may be a lack of acceptance by providers. First implemented for colorectal surgery, ERAS protocols have been successfully expanded to other surgical specialties; ERAS Society guidelines are available for colonic surgery,62 pancreaticoduodenectomy,63 rectal and pelvic surgery,54 radical cystectomy,64 gynecologic oncology,65 bariatric surgery66 and gastrectomy.67 These guidelines have also been adapted for other specialties. Common elements of these perioperative protocols are described in Table 2.54,56,57,62,68,69 Standardized order sets can be developed for perioperative protocols to maintain compliance with established practices. Organizations should audit patient compliance with these protocols and monitor patient outcomes including length of stay, postoperative complications, readmissions, patient experience, pain and functional capacity.42-46

Table 2. Common elements of enhanced recovery pathways

<table>
<thead>
<tr>
<th>Preoperative protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient and family education and counseling about the surgical and anesthetic procedures, what to expect and their responsibilities enhances recovery, diminishes anxiety and facilitates discharge planning</td>
</tr>
<tr>
<td>Assessment and optimization of medical conditions and nutrition (e.g., malnutrition)</td>
</tr>
<tr>
<td>Cessation of smoking and excess consumption of alcohol</td>
</tr>
<tr>
<td>Avoidance of fasting fluid and carbohydrate loading up to 2 hours preoperatively</td>
</tr>
<tr>
<td>No or selective bowel preparation</td>
</tr>
<tr>
<td>Antibiotic prophylaxis and skin cleanse with chlorhexidine</td>
</tr>
<tr>
<td>Pharmaceutical and mechanical prophylaxis against thromboembolism</td>
</tr>
<tr>
<td>Avoidance of preoperative medication</td>
</tr>
<tr>
<td>Use of epidurals for pain control</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intraoperative protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardized anesthetic and analgesic regimes (epidural and short-acting anesthetic agents)</td>
</tr>
<tr>
<td>Maintenance of normothermia</td>
</tr>
<tr>
<td>Optimize fluid balance by targeting cardiac output and avoiding overhydration</td>
</tr>
<tr>
<td>Avoidance of drains and tubes</td>
</tr>
</tbody>
</table>
**Postoperative protocols**

<table>
<thead>
<tr>
<th>Early mobilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevent and treat nausea and vomiting</td>
</tr>
<tr>
<td>Early oral nutrition</td>
</tr>
<tr>
<td>Early removal of drains and tubes; avoidance of nasogastric tubes</td>
</tr>
<tr>
<td>Nonopioid oral analgesia (nonsteroidal anti-inflammatory drugs)</td>
</tr>
<tr>
<td>Stimulation of gut motility (e.g., use of chewing gum)</td>
</tr>
</tbody>
</table>

**Measuring outcomes and efficiency**

- Develop process and outcome measures with an automated way of obtaining the information.
- Develop processes aimed at monitoring surgical necessity and preventing overuse of surgical procedures. Improve the safety of surgery by ensuring that the planned surgery is correct and is being performed by the right provider at the right facility, and that the decision reflects the patient's values and preferences. Develop standards for minimum hospital and surgeon volume for select procedures.
- Identify gaps in care during the preoperative process.
- Monitor the frequency and reasons for case cancellations such as inadequate preoperative testing, optimization, and anesthesia or medical clearance; transportation issues; patient no-shows; patient unawareness of surgery date or unprepared for surgery; and noncompliance with food or fluid restrictions.
- Monitor efficiency of the perioperative process such as frequency and reasons for case delays (e.g., missing consents or medical tests, late arrival, practitioner issues and insufficient postoperative beds).
- Monitor patient outcomes including patient experience, length of stay, postoperative complications, mortality, hospital-acquired conditions including infections, admissions or readmission to ICU, readmissions to hospital after discharge and postoperative pain.
- Monitor functional capacity at baseline (typically four weeks prior to surgery) compared to postoperative functional capacity 30 days after surgery.
- Align patient outcomes with the surgeon.

**Postoperative handoff**

Transfer protocols and standardized, structured verbal and written communication between care providers at transitions in perioperative care should be used to improve the quality of handoffs and prevent the loss of patient information.
• Implement a standardized process and format for handoff communications regarding transitions of care from the operating room to the PACU, ICU and inpatient unit. A core team of providers (e.g., anesthesia, surgeons or nurses) should participate in postoperative handoff communication.  

• Define which clinical roles will be involved in the handoff and expectations.  

• Develop a written or electronic handoff format that standardizes or guides the communication of critical patient information. Checklists can increase the amount of information exchanged during handoffs and may be associated with reduced complications. Organizational examples include:
  – University of Toledo’s Anesthesia Report
  – Tufts Nurse to Nurse Handoff Report
  – UNC Handoff Report Worksheet

• Allow opportunities for the team to share and receive information and ask questions. The handoff should include a conversation and provide an opportunity to review care and potentially correct mistakes.

• Educate clinical staff on conducting a successful handoff.  

• Provide simulation training to clinical staff to inform and model the structured communication needed during handoffs.  

• Provide undivided attention, which improves postoperative anesthesia handover recall.  

• Include the following information in the standardized handover format:
  – An assessment of nurses’ readiness to receive the report.
  – Identification and verification of patient, procedure performed and surgeon.
  – Patient’s medical history: past health conditions, surgeries and allergies.
  – Anesthesia: type used, airway management and concerns, antibiotics, vascular access and invasive monitoring.
  – Intraoperative course: anesthetic and surgical events, medications administered including dose and time, intake and output, estimated blood loss, blood products and laboratory tests.
  – Postoperative patient status: vital signs, airway and oxygenation status, ventilator settings, infusions, information related to surgical site (dressings, tubes, drains and packing), special needs, equipment, precautions and level of pain.
  – Expectations and plans for the early post-procedure period including an analgesia, sedation and antiemetic plan, and disposition.
  – The opportunity to ask questions and acknowledge that the report is understood.
• Build redundancies into the handoff communication to ensure information is not lost in transitions of care.\textsuperscript{4}

• Prepare monitors and equipment prior to patient arrival and complete all other urgent tasks.

• Ensure that immediate postoperative orders have been completed.\textsuperscript{4}

• Meet with the patient and family to share what occurred during the procedure as well as outcomes, what to expect postoperatively and their responsibilities.

• Conduct interdisciplinary rounds (anesthesiologists and nursing staff) in the PACU to improve care coordination and discuss the patient’s postoperative status. Include the family in the process.\textsuperscript{74,83}

• Reinforce quality and measurement:
  – Demonstrate leadership commitment to successful handoffs
  – Monitor compliance with use of standardized forms, tools and methods for handoffs
    ▪ Percentage of patients, regardless of age, who were admitted to a PACU and were under the care of an anesthesia practitioner in which a post-anesthesia formal transfer of care protocol or checklist was used. Include the key transfer of care elements.
  – Use data to determine a systematic approach for improvement\textsuperscript{76}

For more information, contact Tammy Williams, collaborative advisor, Vizient PSO, or Ellen Flynn, associate vice president, safety, Vizient PSO.
References


## Appendix A. Expert advisory team

Vizient PSO gratefully acknowledges the experts that contributed to this work.

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eliza Wright Beal, MS, MD</td>
<td>Post-Doctoral Research Fellow, Department of Surgery</td>
<td>The Ohio State University Wexner Medical Center</td>
</tr>
<tr>
<td>Elizabeth Byall, RN, BSN, MBA</td>
<td>Administrative Director, Perioperative Services</td>
<td>IU Health</td>
</tr>
<tr>
<td>Andrew B. Casabianca, MD, DMD</td>
<td>Medical Director of Operative Services, University of Toledo</td>
<td>IU Health</td>
</tr>
<tr>
<td>Christopher Caspers, MD</td>
<td>Chief, Observation Medicine</td>
<td>NYU Langone Health System</td>
</tr>
<tr>
<td>Janet M. Chadwick, RN, MBA</td>
<td>Director, Perioperative Education and Quality</td>
<td>UNC Hospitals</td>
</tr>
<tr>
<td>Steve Cohen, MHA</td>
<td>Chief Administrative Officer, Dept. of Neurosurgery</td>
<td>David Geffen School of Medicine at UCLA</td>
</tr>
<tr>
<td>Sherri Crumley, RN</td>
<td>Clinical Nurse Educator</td>
<td>Loyola University Medical Center</td>
</tr>
<tr>
<td>Ryan Day, BSN, RN, CCRN</td>
<td>Quality Improvement Advisor</td>
<td>Sanford Health</td>
</tr>
<tr>
<td>Mary Dobbie, RN, CNOR, CURN</td>
<td>Senior Quality Specialist</td>
<td>NYU Langone Health System</td>
</tr>
<tr>
<td>Heather DuCharme</td>
<td>Quality Improvement Specialist</td>
<td>Denver Health</td>
</tr>
<tr>
<td>Ellen Flynn, RN, MBA, JD</td>
<td>Associate Vice President, Safety</td>
<td>Vizient PSO</td>
</tr>
<tr>
<td>Susan Field</td>
<td>AVP of Case Management</td>
<td>NYU Winthrop Hospital</td>
</tr>
<tr>
<td>Maureen Fitzpatrick</td>
<td>VP, Perioperative Services</td>
<td>NYU Langone Health System</td>
</tr>
<tr>
<td>Daniel Forest, MD</td>
<td>Medical Director of Surgical Navigation Center</td>
<td>Medical Director Preoperative Assessment Clinic</td>
</tr>
<tr>
<td>Kim Grubb</td>
<td>Case Manager</td>
<td>Vidant Health</td>
</tr>
<tr>
<td>Lyla Hance, MPH</td>
<td>Manager, Enhanced Recovery Program, Dept. of Anesthesiology</td>
<td>UNC Hospitals</td>
</tr>
<tr>
<td>Rosemarie Hevner, RN, MBA, CNOR</td>
<td>Professional Development Director, Perioperative Services</td>
<td>Tufts Medical Center and Floating Hospital for Children</td>
</tr>
<tr>
<td>Donna Heavener</td>
<td>Nurse Manager</td>
<td>The Ohio State University Wexner Medical Center</td>
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</tbody>
</table>

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Appendix B. Perioperative models of care

- **Preoperative and preanesthesia evaluation clinics** facilitate the early identification of patient risk factors associated with increased intra- and postoperative complications and enable early patient access to anesthesiologists. Preoperative history and physicals, medical testing and data gathering are conducted through preoperative clinics, leading to improved patient engagement and care coordination and communication within the interdisciplinary team. Preoperative evaluation clinics reduce surgical delays and cancellations due to inadequate preoperative preparation, perioperative complications, length of stay and in-hospital mortality. In addition, they promote the involvement of anesthesiologists in protocol development and coordination of postoperative care to reduce pain, complications, morbidity and mortality.

- **A perioperative surgical home** is a patient-centered, physician-led, interdisciplinary, team-based system of coordinated patient care from pre-procedure assessment through the acute care episode, recovery and post-acute care. The anesthesiologist’s role expands to include preoperative evaluation, management of intraoperative and PACU care, critical care and pain medicine. The model was created by the ASA and is designed to prevent fragmentation and lapses in care throughout transitions in the care process with the goal of improving patient satisfaction and reducing complications and costs.

- **Internal medicine-led preoperative assessment, consultation and treatment** examines patients and gathers health data before noncardiac surgery outlining the risks, optimizing medical conditions before surgery, coordinating care between specialists for complex medical conditions and making pre- and postoperative recommendations.

- **Nurse-led preadmission clinics or services** such as chart collation, review and risk assessment screening in a clinic or via the telephone followed by a complete assessment by an anesthesiologist on the day of surgery may be an effective strategy for improving patient preparedness, satisfaction, and outcomes and reducing patient anxiety and cancellations. Nurses can help bridge the gaps in perioperative care transitions and carry out more patient-centered methods.
## Appendix C. Components of a geriatric assessment

<table>
<thead>
<tr>
<th>Preoperative assessment</th>
<th>Perioperative risks</th>
<th>Recommendations if screening or assessment is positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive impairment and dementia screening</td>
<td>Strong predictor of postoperative delirium, functional decline, increased LOS, complications or mortality</td>
<td>Refer for further evaluation to a primary care physician, geriatrician or mental health specialist. Avoid administration of benzodiazepines and antihistamines.</td>
</tr>
<tr>
<td>Preoperative depression screening</td>
<td>Longer LOS after CABG and valve operations and increased mortality after CABG, increased postoperative analgesic use and delirium</td>
<td>Refer for further evaluation to a primary care physician, geriatrician or mental health specialist.</td>
</tr>
<tr>
<td>Alcohol abuse and dependence screening</td>
<td>Increased rates of postoperative mortality and complications (e.g., pneumonia, sepsis or wound infection), prolonged LOS and delirium</td>
<td>Refer for substance abuse evaluation. Give daily multivitamins (with folic acid) and thiamine.</td>
</tr>
<tr>
<td>Cardiac evaluation</td>
<td>Elderly patients are at greater risk of cardiac adverse events</td>
<td>Determine appropriate perioperative management and selective tests for elderly patients at higher risk.</td>
</tr>
<tr>
<td>Pulmonary evaluation</td>
<td>Postoperative pulmonary complications contribute to morbidity and mortality</td>
<td>Optimize pulmonary function in patients with COPD and asthma, promote smoking cessation, provide intensive inspiratory muscle training and use selective X-ray or PFTs.</td>
</tr>
<tr>
<td>Functional screening</td>
<td>Strong predictor of mortality, delirium, institutionalization after discharge, surgical site infection with MRSA</td>
<td>Screen ADLs, occupational and physical therapy as indicated, proactive discharge planning.</td>
</tr>
<tr>
<td>Nutritional status screening</td>
<td>Infections, wound complications and increased LOS</td>
<td>Refer to dietician to address deficits.</td>
</tr>
<tr>
<td>Polypharmacy</td>
<td>Cognitive impairment, increased morbidity, mortality, ADR</td>
<td>Discontinue nonessential medication and avoid adding new medications when possible.</td>
</tr>
<tr>
<td>Social support</td>
<td>No advance directives or support system</td>
<td>Refer to social worker if inadequate family or social support system.</td>
</tr>
</tbody>
</table>

Abbreviations: ADL = activities of daily living; ADR = adverse drug reaction; CABG = coronary artery bypass graft; COPD = chronic obstructive pulmonary disease; LOS = length of stay; MRSA = methicillin-resistant Staphylococcus aureus; PFT = pulmonary function test.