

# Hospital Medicine and Perioperative Care: A Framework for High-Quality, High-Value Collaborative Care

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**BACKGROUND:** Hospitalists have long been involved in optimizing perioperative care for medically complex patients. In 2015, the Society of Hospital Medicine organized the Perioperative Care Work Group to summarize this experience and to develop a framework for providing optimal perioperative care.

**METHODS:** The work group, which consisted of perioperative care experts from institutions throughout the United States, reviewed current hospitalist-based perioperative care programs, compiled key issues in each perioperative phase, and developed a framework to highlight essential elements to be considered. The framework was reviewed and approved by the board of the Society of Hospital Medicine.

**RESULTS:** The Perioperative Care Matrix for Inpatient Surgeries was developed. This matrix characterizes perioperative phases, coordination, and metrics of success. Additionally, concerns and potential risks were tabulated. Key questions regarding program effectiveness were drafted, and examples of models of care were provided.

**CONCLUSIONS:** The Perioperative Care Matrix for Inpatient Surgeries provides an essential collaborative framework hospitalists can use to develop and continually improve perioperative care programs. *Journal of Hospital Medicine* 2017;12:277-282. © 2017 Society of Hospital Medicine

Of the 36 million US hospitalizations each year, 22% are surgical.<sup>1</sup> Although less frequent than medical hospitalizations, surgical hospitalizations are more than twice as costly.<sup>2</sup> Additionally, surgical hospitalizations are on average longer than medical hospitalizations.<sup>2</sup> Given the increased scrutiny on cost and efficiency of care, attention has turned to optimizing perioperative care. Hospitalists are well positioned to provide specific expertise in the complex interdisciplinary medical management of surgical patients.

In recent decades, multiple models of hospitalist involvement in perioperative care have evolved across the United States.<sup>3-19</sup> To consolidate knowledge and experience and to develop a framework for providing the best care for surgical patients, the Society of Hospital Medicine organized the Perioperative Care Work Group in 2015. This framework was designed for interdisciplinary collaboration in building and strengthening perioperative care programs.

## METHODS

The Society of Hospital Medicine recognized hospital medicine programs' need for guidance in developing collaborative care in perioperative medicine and appointed the

Perioperative Care Work Group in May 2015. Work group members are perioperative medicine experts from US medical centers. They have extensive knowledge of the literature as well as administrative and clinical experience in a variety of perioperative care models.

**Topic Development.** Initial work was focused on reviewing and discussing multiple models of perioperative care and exploring the roles that hospital medicine physicians have within these models. Useful information was summarized to guide hospitals and physicians in designing, implementing, and expanding patient-centric perioperative medicine services with a focus on preoperative and postoperative care. A final document was created; it outlines system-level issues in perioperative care, organized by perioperative phases.

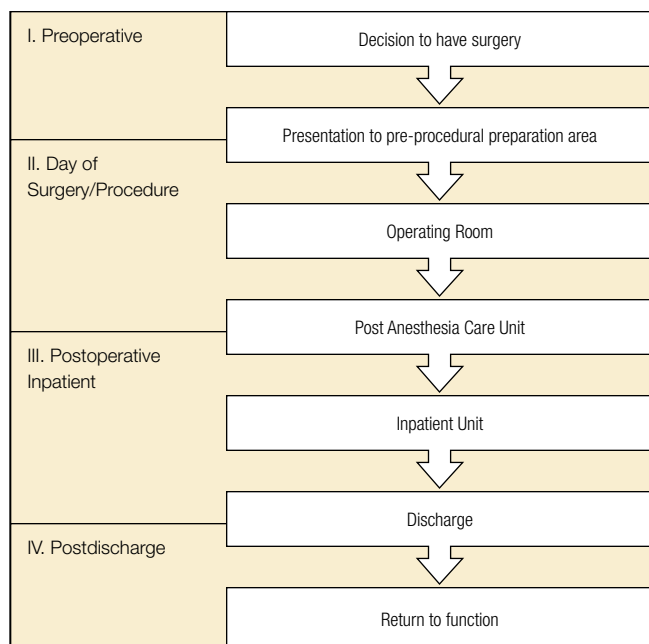
**Initial Framework.** Group members submitted written descriptions of key issues in each of 4 phases: (1) preoperative, (2) day of surgery, (3) postoperative inpatient, and (4) post-discharge. These descriptions were merged and reviewed by the content experts. Editing and discussion from the entire group were incorporated into the final matrix, which highlighted (1) perioperative phase definitions, (2) requirements for patients to move to next phase, (3) elements of care coordination typically provided by surgery, anesthesiology, and medicine disciplines, (4) concerns and risks particular to each phase, (5) unique considerations for each phase, (6) suggested metrics of success, and (7) key questions for determining the effectiveness of perioperative care in an institution. All members provided final evaluation and editing.

**Final Approval.** The Perioperative Care Matrix for Inpatient Surgeries (PCMIS) was presented to the board of the Society of Hospital Medicine in fall 2015 and was approved

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**FIG.** Phases of perioperative period.

for use in centering and directing discussions regarding perioperative care.

**Models of Care.** The Perioperative Care Work Group surveyed examples of hospitalist engagement in perioperative care and synthesized these into synopses of existing models of care for the preoperative, day-of-surgery, postoperative-inpatient, and postdischarge phases.

## RESULTS

### Defining Key Concepts and Issues

Hospitalists have participated in a variety of perioperative roles for more than a decade. Roles include performing in-depth preoperative assessments, providing oversight to pre-surgical advanced practice provider assessments, providing inpatient comanagement and consultation both before and after surgery, and providing postdischarge follow-up within the surgical period for medical comorbidities.

Although a comprehensive look at the entire perioperative period is important, 4 specific phases were defined to guide this work (Figure). The phases identified were based on time relative to surgery, with unique considerations as to the overall perioperative period. Concerns and potential risks specific to each phase were considered (Table 1).

The PCMIS was constructed to provide a single coherent vision of key concepts in perioperative care (Table 2). Also identified were several key questions for determining the effectiveness of perioperative care within an institution (Table 3).

### Models of Care

Multiple examples of hospitalist involvement were collected to inform the program development guidelines. The specifics noted among the reviewed practice models are described here.

**Preoperative.** In some centers, all patients scheduled for surgery are required to undergo evaluation at the institution's preoperative clinic. At most others, referral to the preoperative clinic is at the discretion of the surgical specialists,

**TABLE 1.** Concerns and Potential Risks Specific to Each Phase of Perioperative Period

Phase	Concerns and Risks
Preoperative	Inadequate or nonstandardized communication and handoffs among providers Unclear or contradictory information provided to patients before surgery Failed communication regarding needs for additional testing or optimization Unknown or incomplete medical history from patient or in records Determination that patient is not optimized Determination that surgery is not best option Patient needs direction regarding alternatives Inability to medically optimize patient in given time—send patient to surgery with increased risk or postpone surgery Disagreement among providers as to whether patient is truly optimized
Day of surgery	Patient not medically optimized by time of arrival in operating room Identification of previously unrecognized or new medical condition that requires further evaluation Several transitions occur this day—careful attention to handoffs is essential
Postoperative inpatient	Clinical concerns, including surgical wound (dehiscence, inadequate healing, infection), bleeding (evaluation for hemostasis, need for reoperation), pain, nausea/vomiting/constipation/ileus, venous thromboembolism, delirium, electrolyte derangement, atelectasis, hyperglycemia, hypoglycemia, anemia Chronic disease decompensation Unmasking of underlying disease Inadequate or nonstandardized communication and handoffs among providers regarding patient's progress and ongoing needs Unclear follow-up instructions, including which team member is expected to manage abnormal findings or complications Situations that require change in service (surgery to medicine) or level of service (floor to intensive care unit)
Postdischarge	Poor postoperative recovery Poor coordination of care Ongoing or postdischarge postoperative complications Hospital readmissions Triaging management of postoperative or postdischarge complications to appropriate providers (surgical vs medical)

**TABLE 2. Perioperative Care Matrix for Inpatient Surgeries<sup>a</sup>**

	Phases in the Perioperative Continuum			
	Preoperative	Day of Surgery	Postoperative Inpatient	Postdischarge
Phase definitions	From time of decision to have surgery through arrival in preoperative preparation area	From preoperative preparation, through OR to PACU, to transfer to inpatient unit	From arrival in inpatient unit (acute care floor, telemetry, or ICU) through hospital discharge	From hospital discharge through return to function (includes time in nursing care or rehabilitation facility until return to preoperative living arrangement)
Requirements for passing to next phase	Standardized preoperative medical assessment (may differ for elective, urgent, and emergent surgeries) Optimization of chronic medical conditions to degree possible Appropriate patient and family education with shared decision-making Guideline-based testing, financial stewardship	Appropriate level of care identified for post-PACU (ICU vs acute care floor) Clinical stability confirmed for appropriate care level Crucial information is communicated	Protocol-driven early interventions focused on return to function (pain control, physical/occupational therapy, bowel/bladder function) Standardized approach to preventing complications (eg, venous thromboembolism, surgical site infection, delirium, bleeding) Tailored patient/family education (anticipatory guidance for recovery, management of expectations) As needed, assessment for home safety (per physical/occupational therapy) and for skilled nursing/rehabilitation facility Discharge planning coordination	Resolution of any postoperative complications Transfer of information back to medical home and primary medical providers
Elements of care coordination by discipline	<i>Surgical Team:</i> determines if surgery is an appropriate option, conducts consent process, and provides education on surgical process/expectations <i>Anesthesiology:</i> conducts airway assessment, reviews readiness for surgery, and reviews anesthesia options (may be performed day of surgery) <i>Hospital Medicine:</i> identifies medical issues that affect perioperative risk, ensures optimization of underlying medical conditions, and provides anticipatory guidance	<i>Surgical Team:</i> evaluates readiness for OR and implements postoperative orders, including hospital admission orders <i>Anesthesiology:</i> evaluates readiness for OR, intraoperative monitoring and interventions, PACU care to ensure hemodynamic stability, and adequate pain control <i>Hospital Medicine:</i> available to evaluate and manage acute decompensation or new medical conditions that may arise	<i>Surgical Team:</i> provides general postoperative care, including routine pain management, surgical site care, surgery-specific postoperative recovery, and discharge planning <i>Hospital Medicine:</i> manages chronic disease, acute decompensation, or new medical conditions; may serve as comanager, traditional consultant, or, in some cases, primary service <i>Anesthesiology:</i> follows up intraoperative or PACU complications, provides advanced postoperative pain management, and, in some settings, provides intensive care in surgical intensive care unit	<i>Surgical Team:</i> postoperative follow-up appointment <i>Hospital Medicine:</i> ensures appropriate medical follow-up, as needed, by primary care physician, skilled nursing facility team, or hospital medicine postdischarge clinic
Metrics of success	Adequate patient preparation (patient report, measures of patient understanding) Use of preoperative services Timely scheduling of preoperative clinic appointment Clinic efficiency (no-show rates, information flow) Judicious preoperative testing (no unnecessary tests) Patient-reported experience Surgeon/provider satisfaction	OR efficiency (turnover time, time from patient presentation to OR start) OR delays and cancellations OR complications Reintubation rate Floor transfer to ICU within 24 hours of surgery Patient-reported experience	Complication rates Rate of unanticipated return to OR Length of stay (observed-to-expected ratio) Mortality index Surgical Care Improvement Project and Value-Based Purchasing metrics University HealthSystem Consortium patient safety indicators Patient satisfaction Clarity of patient education and discharge instructions (patient report, measures of patient understanding)	30-day rate of readmissions (related and unrelated) Postacute care needs and expenses Surgery-specific metric (infection rate) Timeliness of return to prior physical function and/or return to work

<sup>a</sup>The perioperative care continuum encompasses care from the time the decision is made to have surgery to the time function returns after surgery. A myriad of transitions and complicated handoffs among several disciplines is involved in every phase. Thus, it is imperative to have clear plans for coordination of and communication about services throughout the care continuum. This matrix is structured by phases of the perioperative continuum. It outlines requirements for passing from one phase to the next, elements of care coordination, potential risks, unique considerations, and metrics associated with each phase. It concludes with suggested key questions that assist in designing perioperative programs.

NOTE: Abbreviations: ICU, intensive care unit; OR, operating room; PACU, postanesthesia care unit.

who have been informed of the clinic's available resources. Factors determining whether a patient has an in-person clinic visit, undergoes a telephone-based medical evaluation, or has a referral deferred to the primary care physician (PCP) include patient complexity and surgery-specific risk. Patients who have major medical comorbidities (eg, chronic lung or heart disease) or are undergoing higher risk procedures (eg, those lasting >1 hour, laparotomy) most often undergo a formal clinic evaluation. Often, even for a patient whose preoperative evaluation is completed by a PCP, the preoperative nursing staff will call before surgery to provide instructions and to confirm that preoperative planning is complete. Confirmation includes ensuring that the surgery consent and preoperative history and physical examination documents are in the medical record, and that all recom-

mended tests have been performed. If deficiencies are found, surgical and preoperative clinic staff are notified.

During a typical preoperative clinic visit, nursing staff complete necessary regulatory documentation requirements and ensure that all items on the preoperative checklist are completed before day of surgery. Nurses or pharmacists perform complete medication reconciliation. For medical evaluation at institutions with a multidisciplinary preoperative clinic, patients are triaged according to comorbidity and procedure. These clinics often have anesthesiology and hospital medicine clinicians collaborating with interdisciplinary colleagues and with patients' longitudinal care providers (eg, PCP, cardiologist). Hospitalists evaluate patients with comorbid medical diseases and address uncontrolled conditions and newly identified symptomatology. Additional testing is

**TABLE 3. Key Questions for Determining Effectiveness of Perioperative Care in an Institution**

Phase	Key Questions
Preoperative	<p>How extensive a preoperative evaluation is medically necessary, and how is that determined?</p> <p>What is the current process for preparing patients for surgery? Who is involved or should be involved? How will underlying medical issues be assessed and optimized?</p> <p>How is patient care coordinated, and how is communication ensured among providers? How are disagreements managed?</p> <p>What is the rate or frequency of last-minute operating room cancellations and delays? What strategies are in place to optimize the preoperative process? How else might the institution measure the value of preoperative assessments?</p> <p>What planning can and should be done in anticipation of the perioperative course? How is this plan communicated to the patient, family members, and providers?</p>
Day of surgery	<p>How will pertinent information from the operating room be transferred to the intensive care unit or the acute care floor?</p> <p>Is there a need for inpatient comanagement? How will this be determined?</p> <p>What clinical conditions or situations determine whether the hospital medicine team or the surgical team should provide primary services once the patient is out of the operating room?</p> <p>For urgent cases, what methods are used to address preoperative medical stability and to implement risk reduction strategies?</p> <p>Who is responsible for immediate care or triage when a new or an acute medical issue is identified during preoperative preparation or in the postanesthesia care unit?</p>
Postoperative inpatient	<p>What process is or should be in place for accurate and efficient communication and handoffs?</p> <p>What are the provider roles after surgery? How can the surgical team, anesthesiology, and medicine best collaborate and coordinate to provide optimal inpatient care?</p> <p>Regarding length of stay for the top 10 surgical procedures, how well does this hospital compare with its "peer" hospitals?</p> <p>What other performance metrics are in most need of refinement?</p> <p>How can discharge planning begin in the preoperative phase and be coordinated across the perioperative period? What elements of transition programs (eg, BOOST [Better Outcomes by Optimizing Safe Transitions]) should be incorporated, and how?</p> <p>What effective and innovative inpatient postoperative processes has the institution endorsed and actively supported?</p>
Postdischarge	<p>What standardized process and protocols are needed for communication and handoffs among providers?</p> <p>What are the provider roles after surgery? How can the surgical team, anesthesiology, and medicine best collaborate and coordinate to provide optimal patient care?</p> <p>What instructions are provided to the patient? How and by whom?</p> <p>What is the 30-day readmission rate for surgical patients? What are common causes? How can these be anticipated and prevented?</p>

determined by evidence- and guideline-based standards. Patients receive preoperative education, including simple template-based medication management instructions. Perioperative clinicians follow up on test results, adjust therapy, and counsel patients to optimize health in preparation for surgery.

Patients who present to the hospital and require urgent surgical intervention are most often admitted to the surgical service, and hospital medicine provides timely consultation for preoperative recommendations. At some institutions, protocols may dictate that certain surgical patients (eg, elderly with hip fracture) are admitted to the hospital medicine service. In these scenarios, the hospitalist serves as the primary inpatient care provider and ensures preoperative medical optimization and coordination with the surgical service to expedite plans for surgery.

**Day of Surgery.** On the day of surgery, the surgical team verifies all patient demographic and clinical information, confirms that all necessary documentation is complete (eg, consents, history, physical examination), and marks the surgical site. The anesthesia team performs a focused review and examination while explaining the perioperative care plan to the patient. Most often, the preoperative history and physical examination, completed by a preoperative clinic provider or the patient's PCP, is used by the anesthesiologist as the basis for clinical assessment. However, when information is incomplete or contradictory, surgery may be delayed for further record review and consultation.

Hospital medicine teams may be called to the pre-anesthesia holding area to evaluate acute medical problems (eg, hypertension, hyperglycemia, new-onset arrhythmia) or to give a second opinion in cases in which the anesthesiologist disagrees with the recommendations made by the provider who completed the preoperative evaluation. In either scenario, hospitalists must provide rapid service in close collaboration with anesthesiologists and surgeons. If a patient is found to be sufficiently optimized for surgery, the hospitalist clearly documents the evaluation and recommendation in the medical record. For a patient who requires further medical intervention before surgery, the hospitalist often coordinates the immediate disposition (eg, hospital admission or discharge home) and plans for optimization in the timeliest manner possible.

Occasionally, hospitalists are called to evaluate a patient in the postanesthesia care unit (PACU) for a new or chronic medical problem before the patient is transitioned to the next level of care. At most institutions, all PACU care is provided under the direction of anesthesiology, so it is imperative to collaborate with the patient's anesthesiologist for all recommendations. When a patient is to be discharged home, the hospitalist coordinates outpatient follow-up plans for any medical issues to be addressed postoperatively. Hospitalists also apply their knowledge of the limitations of non-intensive care unit hospital care to decisions regarding appropriate triage of patients being admitted after surgery.

**Postoperative Inpatient.** Hospitalists provide a 24/7 model of care that deploys a staff physician for prompt assessment and management of medical problems in surgical patients. This care can be provided as part of the duties of a standard hospital medicine team or can be delivered by a dedicated perioperative medical consultation and comanagement service. In either situation, the type of medical care, comanagement or consultation, is determined at the outset. As consultants, hospitalists provide recommendations for medical care but do not write orders or take primary responsibility for management. Comanagement agreements are common, especially for orthopedic surgery and neurosurgery; these agreements delineate the specific circumstances and responsibilities of the hospitalist and surgical teams. Indications for comanagement, which may be identified during preoperative clinic evaluation or on admission, include uncontrolled or multiple medical comorbidities or the development of nonsurgical complications in the perioperative period. In the comanagement model, care of most medical issues is provided at the discretion of the hospitalist. Although this care includes order-writing privileges, management of analgesics, wounds, blood products, and antithrombotics is usually reserved for the surgical team, with the hospitalist only providing recommendations. In some circumstances, hospitalists may determine that the patient's care requires consultation with other specialists. Although it is useful for the hospitalist to speak directly with other consultants and coordinate their recommendations, the surgical service should agree to the involvement of other services.

In addition to providing medical care throughout a patient's hospitalization, the hospitalist consultant is crucial in the discharge process. During the admission, ideally in collaboration with a pharmacist, the hospitalist reviews the home medications and may change chronic medications. The hospitalist may also identify specific postdischarge needs of which the surgical team is not fully aware. These medical plans are incorporated through shared responsibility for discharge orders or through a reliable mechanism for ensuring the surgical team assumes responsibility. Final medication reconciliation at discharge, and a plan for prior and new medications, can be formulated with pharmacy assistance. Finally, the hospitalist is responsible for coordinating medically related hospital follow-up and handover back to the patient's longitudinal care providers. The latter occurs through inclusion of medical care plans in the discharge summary completed by the surgical service and, in complex cases, through direct communication with the patient's outpatient providers.

For some patients, medical problems eclipse surgical care as the primary focus of management. Collaborative discussion between the medical and surgical teams helps determine if it is more appropriate for the medical team to become the primary service, with the surgical team consulting. Such triage decisions should be jointly made by the attending physicians of the services rather than by intermediaries.

**Postdischarge.** Similar to their being used for medical

problems after hospitalization, hospitalist-led postdischarge and extensivist clinics may be used for rapid follow-up of medical concerns in patients discharged after surgical admissions. A key benefit of this model is increased availability over what primary care clinics may be able to provide on short notice, particularly for patients who previously did not have a PCP. Additionally, the handover of specific follow-up items is more streamlined because the transition of care is between hospitalists from the same institution. Through the postdischarge clinic, hospitalists can provide care through either clinic visits or telephone-based follow-up. Once a patient's immediate postoperative medical issues are fully stabilized, the patient can be transitioned to long-term primary care follow-up.

## DISCUSSION

The United States is focused on sensible, high-value care. Perioperative care is burgeoning with opportunities for improvement, including reducing avoidable complications, developing systems for early recognition and treatment of complications, and streamlining processes to shorten length of stay and improve patient experience. The PCMIS provides the needed platform to catalyze detailed collaborative work between disciplines engaged in perioperative care.

As average age and level of medical comorbidity increase among surgical patients, hospitalists will increasingly be called on to assist in perioperative care. Hospitalists have long been involved in caring for medically complex surgical patients, through comanagement, consultation, and preoperative evaluations. As a provider group, hospitalists have comprehensive skills in quality and systems improvement, and in program development across hospital systems nationwide. Hospitalists have demonstrated their value by focusing on improving patient outcomes and enhancing patient engagement and experiences. Additionally, the perioperative period is fraught with multiple and complicated handoffs, a problem area for which hospital medicine has pioneered solutions and developed unique expertise. Hospital medicine is well prepared to provide skilled and proven leadership in the timely development, improvement, and expansion of perioperative care for this increasingly older and chronically ill population.

Hospitalists are established in multiple perioperative roles for high-risk surgical patients and have the opportunity to expand optimal patient-centric perioperative care systems working in close concert with surgeons and anesthesiologists. The basics of developing these systems include (1) assessing risk for medical complications, (2) planning for perioperative care, (3) developing programs aimed at risk reduction for preventable complications and early identification and intervention for unavoidable complications, and (4) guiding quality improvement efforts, including planning for frequent handoffs and transitions.

As a key partner in developing comprehensive programs in perioperative care, hospital medicine will continue to shape the future of hospital care for all patients. The PC-

MIS, as developed with support from the Society of Hospital Medicine, will aid efforts to achieve the best perioperative care models for our surgical patients.

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