



# Preoperative Assessment for Inpatients

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## Abstract

**Purpose of the Review** This chapter will highlight several important concepts that are relevant to the assessment and optimization of hospitalized patients prior to the administration of an anesthetic.

**Recent Findings** Patients admitted to hospital comprise a unique population. The risk-benefit ratio of pre-procedural investigations and the economic implications of specific management strategies may be significantly different than for patients managed on an ambulatory basis. The anesthesiologist must have a thorough understanding of these factors. Preoperative workflows provide effective coordination of the necessary resources and ensure that each patient's procedure is completed as safely and efficiently as possible.

**Summary** A working knowledge of reimbursement principles, expertise in local procedural workflows, and the ability to quickly and effectively screen patients for high-risk conditions place anesthesiologists at the center of the perioperative process and the financial viability of their inpatient facility.

**Keywords** Preoperative assessment · Preoperative testing · Risk scoring · Risk calculators · Inpatient · Length of stay · Perioperative complications · Standardization · Process management · Cost efficiency · POCUS · Bundled payments · Prospective payment system · Continuous quality improvement · Delay of surgery

## Introduction

Much attention has been devoted in the medical literature to the appropriate risk stratification and preparation of patients undergoing procedures [1, 2, 3<sup>\*\*</sup>, 4<sup>\*</sup>, 5, 6]. Many of the relevant recommendations are implicitly or explicitly structured for patient assessments conducted in an out-patient context in advance of an elective procedure.

Application of an identical approach to patients who have been admitted to hospital may not be appropriate in many instances. For many hospitalized patients, the timing of planned surgical interventions will be more urgent, altering the benefits associated with pre-procedural testing or consultation. Delaying surgery in order to perform further investigations carries different economic implications for hospitalized

patients than for those who are ambulatory. Finally, the size and composition of the physician teams involved with inpatient preoperative management are often significantly more complex than for patients being assessed in a clinic setting.

Recognition of these differences is of growing importance for anesthesiologists. The economic pressures on healthcare institutions continue to increase [7]. Hospital administrators are exquisitely sensitive to the major drivers of the cost of hospital-based care: length of stay and hospital acquired complications.

Thus, anesthesiologists face an existential question: “What is the fundamental role of the specialty in managing hospitalized patients?” There is presently an unmet need for physicians who can safely expedite patient access to procedural care – minimizing both the costs incurred and the incidence of complications. Fulfillment of this role requires concerted efforts to improve efficiency and eliminate waste. The specialty cannot afford to be seen as “cancel-ologists: a group willing to delay any patient who lacks an exhaustive battery of physiological and laboratory tests”. Anesthesiologists must provide leadership and leverage their cognitive and technical expertise to reduce barriers to timely medical interventions.

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## Follow the Money

As healthcare systems become more data driven, physicians must be able to measure and report the results of their efforts. When a hospital's administrative team is weighing the value provided by their anesthesiology department, it is essential to have quantifiable results. Efforts to improve quality should leverage national guidelines and incorporate validated risk calculators to reduce unwanted variations in preoperative assessments [6, 8–10](Tables 1 and 2). Results should be measured and reported to the hospital administration at regular intervals. Testing or treatment that is recommended prior to surgery should augment value by increasing the quality of care and decreasing overall costs [19].

The current practice environment presents a complex mixture of traditional fee-for-service reimbursement as well as emerging value-based compensation models [20](Fig. 1). The latter is growing rapidly and will represent a majority of compensation in the future. In 2017, the Department of Health and Human Services reported that value-based payments comprised over one third of all healthcare payments, which was an increase of 23% compared to 2015 [21]. Given this rapid shift, physicians must demonstrate their role in efforts to increase value.

Length of stay for patients admitted to hospital is being aggressively managed and has become a defacto benchmark for value. Under Medicare's Prospective Payment System, hospitals have long been paid for inpatient admissions using bundled payments according to the patient's admitting diagnosis. The lump sum compensation for each admission then transfers both the risk and reward for resource management to the institution. If the duration of stay is poorly managed, costs may equal or exceed the Medicare reimbursement. Conversely, if components of care are utilized only where they bring genuine value, the net revenue realized for each admission may increase. The implications for the inpatient care of Medicaid patients are similar but even more risk-intense. Unlike the national Medicare system, each

**Table 1** Society guidelines for preoperative assessment

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery [4]
Canadian Cardiovascular Society Guidelines on Perioperative Cardiac Risk Assessment and Management for Patients Who Undergo Noncardiac Surgery [2]
ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management [11]
ACC/AHA Guideline Update on Duration of Dual Antiplatelet Therapy in CAD Patients [12]
2019 AHA/ACC/HRS Focused Update of the 2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation [13]
2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease [14]

**Table 2** Risk assessment tools

Duke Activity Status Index [15]
Revised Cardiac Risk Index [16]
Gupta (MICA) Perioperative Cardiac Risk [9]
Gupta Postop Respiratory Failure Risk [17]
Charlson Comorbidity Index [18]

state is permitted to define their own reimbursement rules for their local Medicaid program. These state programs may involve bundled prospective payment for each hospital admission or may assign a fully capitated amount to a healthcare system for annual spending on each patient's healthcare needs.

Reducing the direct costs of care is the most obvious financial rationale for minimizing length of stay, but other potential benefits should not be overlooked. The risk of hospital acquired conditions and iatrogenic complications increases with the duration of admission [22, 23]. A hospital stay which is longer than is medically necessary for optimal care also results in reduced patient throughput for the institution. A hospital with a fixed capacity to admit patients and a longer than expected length of stay may accommodate fewer elective surgical admissions, may need to decline elective patient transfers, and may experience an increase in emergency department boarding or closure of the emergency department entirely. Each of these results will reduce annual revenue available to the facility under the Prospective Payment System and are also associated with increased patient mortality [24–27].

Equally important to an institution's financial performance is decreasing unnecessary testing prior to surgery. The current system of bundled payments does not provide separate institutional reimbursement for investigations undertaken once a patient is admitted. Each additional test must be covered by the global hospital payment for the patient's stay. While testing that may change medical management during the hospital admission is usually justified, recommending low-yield investigations not immediately germane to the reason for admission or the pre-anesthetic evaluation must be avoided.

$$\text{Value} = \frac{\text{Quality}}{\text{Cost}}$$

**Value can be increased by increasing quality while maintaining cost or by reducing cost while maintaining quality.**

**Fig. 1** The classic value equation as it applies to healthcare

## Work as a Team

The successful implementation of an efficient preoperative assessment strategy is dependent on the ability of the involved medical specialties to work in a coordinated fashion and in accordance with standardized protocols. In recent years, the American College of Surgeons has promoted the Strong for Surgery campaign. The goal of this initiative is to optimize comorbidities, provide high quality care, and improve the financial results for surgical intervention.

Evidence to support this approach can be found in a recent study of elective total hip arthroplasty (THA). The American College of Surgeons NSQIP database was used to identify perioperative risk factors which were then compared with delays in surgical intervention [26, 27, 28]. This study demonstrated that any delay in surgery after admission to hospital significantly increased length of stay and hospital costs. The study also noted a lack of standardization for the criteria used in mandating postponement of surgery. These results underscore the need for multidisciplinary and uniform management of patients prior to surgery.

The adoption of objective risk-scoring systems for screening purposes may reduce variability among individual physicians and hospital services. One such tool is the Charlson Comorbidity Index (CCI) which can be used to guide delivery of high-quality cost-effective perioperative medical management. The CCI was originally devised to predict 10-year survival rate for patients with a variety of chronic medical conditions. However, recent retrospective investigations have demonstrated a correlation between CCI score and both early (30 days) and late (1 year) mortality as well as readmission rates following either emergency or elective surgery [28].

Regardless of the specific guidelines and or risk calculators used, preoperative assessment should be concise and population focused. Subspecialty consultations may be prudent to assess frailty and cognitive dysfunction in elderly patients as both may be associated with increased morbidity postoperatively. Laboratory testing should be focused on answering specific questions about underlying disease processes that will affect perioperative management [29]. Routine panels of blood tests and ECGs based solely on age are not warranted. Consultations with a cardiology service may be eliminated for the majority of patients if predetermined perioperative standards are developed.

Anesthesiologists should act as facilitators for the inpatient preoperative process and can decrease the overutilization of perioperative testing [30]. The Choosing Wisely Campaign has been embraced by anesthesiologists and has heightened awareness of low value perioperative testing, as well as appropriate limitations on other perioperative interventions. It is now generally accepted that testing should be guided by a patient's specific medical history, physical examination and surgery type [31]. The necessary next steps in most

institutions are to create, implement, and disseminate hospital-wide standards that have acceptance by the relevant multidisciplinary patient care teams.

Challenges should be anticipated when introducing a new standardized approach in a hospital setting. A reasonable first step may be to examine the quality of the existing system of perioperative assessments. Variability in the quality of perioperative evaluations may be associated with a higher than anticipated rate of delays or cancelations. At least one study has proposed a system for categorizing preoperative assessments as “satisfactory” or “unsatisfactory” [32]. In a large academic healthcare center, this methodology permitted identification of the most common causes of “unsatisfactory” assessments and their subsequent correction. It is important to note that one of the major causes of “unsatisfactory” assessments was missing or mis-documented information.

The British NICE guidelines from 2016 suggest a stepwise approach to introducing perioperative assessment guidelines into practice [33]. An early goal is to raise awareness of the issue among all of the involved clinical teams as well as with the hospital administration. Representatives from each group need to participate in the development of guidelines. Cost and quality of care measurements should be incorporated in the tracked outcomes. Finally, outcomes must be monitored, and feedback was provided to those involved in implementation on a scheduled basis. Anesthesiologists are uniquely well suited to coordinate these efforts as they have expertise with pre-procedural testing, an intimate familiarity with specific surgical procedures, and a broad understanding of hospital logistics.

## Be All That You Can Be

While streamlining the preoperative process and eliminating unnecessary testing is a requirement, this may also be accomplished by re-examining how specific questions are answered. In many industries, disruptive innovation takes the form of a “minimally viable product” (MVP). An MVP may mimic some limited functionality of an established good or service which is both more sophisticated and more expensive. The MVP may be substituted for the more expensive good or service in specific scenarios where time or expense was previously prohibitive, allowing new uses at a lower cost. At present, point-of-care ultrasound (POCUS) imaging can be considered an MVP creating disruptive innovation in healthcare [34]. Expertise with this technology may allow anesthesiologists to rapidly exclude relevant conditions such as severe aortic stenosis or pneumothorax at the bedside, accelerating medical decision-making, improving care, and reducing costs.

Perioperative cardiovascular complications are a leading cause of morbidity and mortality in surgical populations. Formal transthoracic echocardiographic (TTE) and

transesophageal echocardiographic (TEE) studies have been used extensively to guide perioperative decision-making [35]. However, only a limited number of echocardiographic diagnoses are important to perioperative outcomes. Delaying surgical intervention to obtain a formal comprehensive echocardiographic examination may result in an increase in direct costs (unreimbursed technical fees for the hospital), indirect costs (opportunity costs resulting from occupied hospital beds and underutilized operating rooms), and medical risks associated with delay of the scheduled procedure [36].

In recent years, the use of POCUS in critical care settings and in emergency medicine has been shown to significantly benefit clinical decision making [37]. However, its use in anesthetic practice beyond the operating room suite has only recently become more widespread. The reasons driving adoption of this technology are multifactorial and interrelated: an increased availability of portable ultrasound devices with adequate imaging capability; a growing understanding of the limitations of conventional physical examination and common preoperative tests such as electrocardiograms and chest radiography; and the need for timely access to critical information.

While the use of POCUS in the perioperative setting is increasing, its value has yet to be fully defined especially during inpatient care [38]. An abbreviated POCUS examination can be performed by a trained anesthesiologist to answer specific clinical questions. Such an examination can rapidly establish if a patient has significant pathology likely to pose a risk during surgery and if more definitive imaging is warranted. Substantial delays may occur when institutional protocols require a cardiology consultation before obtaining a formal TEE examination. By eliminating consultation or TTE imaging for those patients with an unremarkable POCUS examination, throughput to the operating room can be maintained and institutional costs reduced.

Only a few hours of training are required for practitioners familiar with the use of ultrasound to reliably identify clinically significant pathology [38, 39]. Two models for POCUS examination are PAUSE (Perioperative Anesthesiology Ultra Sonographic Evaluation) and HEART (Hemodynamic Echocardiographic Assessment in Real-Time) [40, 41]. Both examinations employ a focused format, may be completed within 5–10 min, and are intended to detect major valvulopathy, ventricular dysfunction, and volume status.

Nonetheless, in order to ensure reliable and consistent results formal credentialing and standardization of training should be implemented. The information obtained from POCUS can significantly alter a patient's clinical course and a mechanism for continuous quality assurance is required. A system should be implemented to correlate management decisions with patient outcome. When POCUS results in a request for a formal echocardiogram the results of the two examinations should be compared. When delay or cancellation of

surgery follows a POCUS finding the appropriateness of that decision should be assessed and reported.

## Finish Strong

Once patients have been appropriately risk stratified and optimized, the anesthesiology service becomes responsible for streamlining perioperative logistics on the day of surgery.

Efficient communication and collaboration within the anesthesiology service is essential. If inpatient preoperative consultations are delegated to a subset of the department's physicians, they must be capable of representing the consensus opinion of the entire group. Without such a system, a sophisticated and carefully considered approach to patient triage may be thwarted by inconsistent practices once the patient reaches the preoperative area.

Moreover, the process of establishing rational and consistent standards for hospital-based preoperative patient screening and preparation cannot be viewed as a singular event [42]. The initial work required to establish protocols and standards must be revisited at predetermined intervals. This is necessary to ensure that clinical practices remain consistent with current standards of care and reflect the results of the institution's ongoing quality assurance efforts. In addition, time and effort must be earmarked for educating all new physicians who join the group.

The anesthesiology department must maintain efficient mechanisms for communicating with both the procedural service and other stakeholders regarding the needs of specific patients on the day of surgery. If pre-procedural screening identifies issues that require additional resources during the perioperative period, these should be allocated in advance. Ensuring that all clinical staffs who will be involved with the patient's procedure are consistently informed of systemic disease states requiring additional monitoring or physiological supports, specific patient concerns or preferences that may impact the procedural technique, or the need for specialized post-procedural care will minimize the occurrence of last minute delays. The handoff of key information should occur at a time and in a format that permits arrangement of the required resources.

Finally, the outcome of these overall efforts must be monitored carefully to determine if predefined objectives are being met. Same day cancellation rates, last minute delays for additional investigations or consultations, and adverse events should be tabulated and reviewed as key metrics in a program of continuous quality improvement. Compliance with national guidelines or adherence to local community standards cannot be relied upon to optimize results. Practices must be carefully customized to local conditions, such as the specific patient population and the ability to access resources in a timely fashion. Both process and outcome metrics must be measured on a regular basis and deficiencies targeted in an iterative fashion.



## Conclusion

Reformation of the healthcare system is altering the financial implications associated with the surgical or procedural care of patients who have been admitted to hospital. The burning platform of reimbursement reform now provides a unique opportunity for anesthesiologists to redefine their value proposition.

The medical expertise and technical skills already ubiquitous within the specialty provide the optimal foundation upon which to manage perioperative patient flow. Anesthesiologists should step forward as team leaders to establish and monitor standards for inpatient preoperative evaluations. They should leverage their expertise in POCUS and patient assessment to streamline the evaluation process and minimize inefficient resource utilization. They must coordinate within their specialty to ensure uniform and rational practices and minimize delays and case cancellations. Finally, the specialty of anesthesiology should accept the challenge to produce meaningful reductions in time to surgery, length of stay, and complication rates for hospitalized patients who require interventions.

## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interest.

**Human and Animal Rights and Informed Consent** This article does not contain any studies with human or animal subjects performed by any of the authors.

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