Cost-effective Preoperative Evaluation and Testing*

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Cost-effective preoperative evaluation can be approached from a variety of methods, educational strategies, and use of data to modify clinical practice. This article focuses on the proposed organizational and clinical changes in the process of preoperative evaluations, the cost-effective outcomes, and the relative merits these changes provide the physicians, operating room nurses, and center administrators. (CHEST 1999; 115:96S–100S)

Providing quality, cost-effective preoperative preparation of patients undergoing anesthesia and surgical procedures is a central issue in perioperative patient management.1–3 Historically, few physicians in training were exposed to managed care philosophies and often were taught to be thorough and exhausting in their diagnostic evaluations, with little regard to cost.

In preoperative patient preparation, physicians are directly responsible for providing and ordering virtually all of the patient evaluation, preoperative diagnostic testing, and referrals to specialists. It is often difficult for the individual physician or group to change the manner or routine of clinical practice patterns. Cost-effective preoperative evaluation is within the ability of each health-care provider and can be approached from a variety of methods, education, and the use of data to modify clinical practice. The first step toward positive redirection in today’s practice of medicine must begin with the awareness of physicians and the willingness to change their approach to patient care. Keys to promoting cost-effective preoperative preparation include the following: (1) physician education and modification of physician practice (for example, learn the cost of each diagnostic test ordered preoperatively); (2) review and adapt practice guidelines; (3) utilization of clinical pathways (requires interdepartmental teamwork); (4) information sharing (in areas of evaluative protocols and avoiding duplication of services); (5) economic analysis (cost identification, effectiveness, and cost-benefit studies); (6) medical resource management (in efficiency and effectiveness); and (7) outcomes measurement.

This article will focus on proposed organizational and clinical changes in the process of preoperative evaluation, the cost-effective outcomes, and the relative merits these changes provide the physician, operating room nurses, and center administrators.

THE PREOPERATIVE EVALUATION CLINIC

The successful development and implementation of a preoperative evaluation clinic (PEC)4 seeks to do the following: (1) decrease surgical morbidity; (2) minimize expensive delays and cancellations on the “day-of-surgery”; (3) evaluate and optimize patient health status; (4) facilitate the planning of anesthesia and perioperative care; (5) reduce patient anxiety through education; and (6) obtain informed consent. Cost-effectiveness and enhanced quality of patient care are the outcomes that occur at a time when patient satisfaction and decreased costs have never been more important.

A centralized PEC is a positive investment and value in hospital management and hospital quality enhancement.4–14 The PEC can become a recognized center for establishing a standard of efficient clinical services, decreased costs, and for increased patient/surgeon satisfaction.

The operational goals adopted for Stanford University Hospital’s PEC are summarized below: (1) to improve the client’s perception of the preoperative evaluation experience by increasing personalized patient care, comfort, and convenience; (2) to provide a centralized site for preoperative evaluation; (3) to institute an anesthesia scheduling system for timely patient access and flow; (4) to ensure the presence of an anesthesiologist on-site when patients are present; (5) to appoint a medical director of the PEC to coordinate all activities; (6) to ensure the availability of medical records and surgical notes at the time of the preoperative evaluation; (7) to decrease logistical shuffling of patients to multiple hospital service...
areas; (8) to integrate and coordinate services by means of on-site admitting/registration, insurance authorization, and on-site laboratory and EKG facilities; (9) to improve education of patients and families about the elements of their surgical procedure and the proposed anesthesia, including postoperative pain control options; (10) to ensure and coordinate cost-effective ordering of preoperative laboratory and diagnostic studies; (11) to provide a medical consultation service for evaluation of medically complex inpatients and outpatients; (12) to decrease cancellations and delays of operative procedures on the “day-of-surgery”; (13) to enlist the skills of a registered nurse practitioner to assist in preoperative evaluations and patient/family education; (14) to develop protocols, policies, and clinical pathways; (15) to perform quality assurance reviews; (16) to maximize efficiency in operating room function and turnover time by coordinating all preoperative information into one location (the PEC); and (17) to enhance patient and surgeon satisfaction.

Changes and the Necessity of Teamwork

The visual concept of a PEC is illustrated in Figure 1. Patients from the surgical services are evaluated or screened through the PEC in order to proceed to the operating rooms (ORs) or “out of OR” locations. Figure 2 illustrates a typical flow pattern in a PEC program.

Establishment of a PEC requires the following: (1) a financial and time commitment; (2) changes in support resources; (3) defined organizational goals; (4) interdepartmental teamwork; and (5) cooperation of administration to operational changes.

Preoperative Laboratory Testing and Diagnostic Studies

The value and utility of preoperative diagnostic studies have become a central issue in evaluating cost-effective health care in the surgical patient. It is estimated that up to 3 billion dollars is spent in the United States annually on preoperative laboratory and diagnostic studies. The use of preoperative testing as a screening tool to detect disease and to determine the stability of the patient’s condition for surgery has become the focus of numerous academic publications.

Unnecessary testing is inefficient, expensive, and requires additional technical resources. Inappropriate studies may lead to evaluation of “borderline” or false-positive laboratory abnormalities. This may result in unnecessary OR delays, cancellations, and potential patient risk through additional testing and follow-up.

The surgical patient requires preoperative laboratory and diagnostic studies that should be consistent with his or her medical history, the proposed operative procedure, and the potential for blood loss. Preoperative laboratory and diagnostic testing should be ordered for specific clinical indications, rather than simply because the patient is about to undergo a surgical procedure.

Preoperative diagnostic guidelines provide basic recommendations. They are not intended as absolute or standard requirements. Practice guidelines should be modified based on clinical needs and individual practice to ensure the highest quality of anesthesia and surgical patient care.

Chest Radiograph

Overview: A preoperative chest radiograph should be utilized to assess presence of acute, progressive, or chronic changes of cardiac/pulmonary disease. The decision to obtain a preoperative chest radiograph should be individualized and based on clinical indications. Chest radiographs should not be a routine preoperative protocol.
Clinical Indication: These include the following: pneumonia; pulmonary edema; atelectasis; aortic aneurysm; mediastinal or pulmonary masses; trachea deviation; pulmonary hypertension; cardiomegaly; advanced obstructive lung disease and blebs; dextrocardia; and pulmonary embolism.

**Table: Preoperative Diagnosis**

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**Notes:**
- X = obtained
- ± = consider
- Patients on Diuretics
- Patients on Digoxin
- Patients on Theophylline

**Figure 3.** Diagnosis-based preoperative testing.
Electrocardiogram

Overview: ECG evaluates cardiac rhythm/conduction disturbances, ischemia, myocardial infarction, metabolic and electrolyte disorders, and hypertension. Suspected or known history of coronary artery disease, patient age > 50 years, cardiovascular risk factors, and type of surgery are important factors.

Clinical Indication: These include the following: hypertension; chest pain; congestive heart failure; diabetes; cerebral vascular and peripheral vascular disease; syncope or presyncope; dizziness; shortness of breath; dyspnea on exertion; paroxysmal nocturnal dyspnea; palpitations; leg/ankle edema; and abnormal valvular murmurs.

Liver Function Tests

Overview: Included are aspartate transaminase, alanine transaminase, γ-glutamyl transferase, alkaline phosphatase, serum albumin, and bilirubin. Liver function tests establish the absence or presence of hepatic injury and the degree of hepatic reserve in disease states.

Clinical Indication: These include the following: hepatitis (infection [viral], inflammation [alcohol, drugs], infiltration [tumor, immunologic]); cirrhosis; portal hypertension; gallbladder or biliary tract disease; jaundice; and intravascular hemolysis.

Renal Function Testing

Overview: Basic includes creatinine and BUN; extended includes electrolytes, serum/urine osmolality, and creatinine clearance. Renal function testing determines the extent of renal tubular function and glomerular filtration in patients with known or suspected renal dysfunction.

Clinical Indication: These include the following: hypertension, increased fluid overload (congestive heart failure/peripheral edema/ascites) associated with cardiac, hepatic, or renal impairment; dehydration; diabetes; nausea, emesis, or anorexia; polyuria; nocturia; oliguria; anuria; high-risk surgery in patients with low cardiac output syndrome; hematuria; CVA pain; renal transplant history; renal disease; and dialysis.

Hemoglobin, Hematocrit, CBC

Overview: WBC abnormalities, anemia, or polycythemia history requires preoperative baseline determination in patients with known or suspected hematologic disorders. The decision to obtain a preoperative hemoglobin, hematocrit, or CBC count should be individualized and based on clinical indications, medical history, and the proposed surgical procedure. Hemoglobin/hematocrit or CBC count should not be a routine preoperative protocol.

Clinical Indication: These include the following: hematologic disorder; bleeding/coagulopathy history; malignancy; chemotherapy; radiation therapy (CBC); renal disease; anticoagulant and steroid therapy; surgical procedures with high blood loss (> 1,500 mL); highly invasive or trauma surgery; malabsorption/poor nutrition status; and CNS disease.

Pregnancy Testing

Overview: This test is to diagnose pregnancy. Several assays are available (serum human chorionic gonadotropin [HCG], urine HCG); β-HCG is detectable in maternal urine and blood 8 to 9 days postconception. The decision to obtain a preoperative pregnancy test should be individualized and based on clinical history and examination.

Clinical Indication: These include the following: sexually active status; time of last menstrual period; presence or absence of birth control method; and patient intuition.

Coagulation Testing

Overview: Testing includes prothrombin time, partial prothrombin time, international normalized ratio, and platelet count. Coagulation testing or clotting function studies should not be routine but obtained in patients with known, suspected, or potential coagulopathies secondary to medical history and drug therapies.

Clinical Indication: These include the following: bleeding disorder history; anticoagulants or other drugs affecting coagulation; critical risk surgical procedures with significant blood loss expected; hepatic disease; and malabsorption/poor nutrition.

Urine Analysis

Overview: Included are the following: assessment of renal function, inflammation, and infection; intravascular volume status; and metabolic disorders. There are no routine anesthesia preoperative requirements for a urine analysis.

Figure 3 summarizes the suggested preoperative laboratory testing for selected medical conditions and diseases.

REFERENCES

2 Twersky RS. The ambulatory anesthesia handbook. St. Louis, MO: Mosby Year Book, 1995