

Perioperative Laboratory and Diagnostic Testing—What is Needed and When?

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Preoperative patient evaluation is an essential component of any surgical practice. A complete history and physical, along with appropriate diagnostic tests, are performed routinely to ensure a safe and predictable delivery of care. Oral and maxillofacial surgeons use this principle in everyday practice. Regardless of type of surgery and practice (office-based dentoalveolar surgery, orthognathic surgery, trauma, elective aesthetic surgery), oral and maxillofacial surgeons must formulate a decision-making process and a treatment plan regarding the perioperative management of patients. The anesthetic plan and the surgical plan must be assessed preoperatively.

Preoperative evaluation of surgical patients and the decisions regarding choosing the appropriate and specific presurgical laboratory tests can be a daunting task at times because often it is riddled with confusion and ambiguity. The dilemma facing health-care providers is twofold: one, there is the need to reduce or eliminate nonindicated preoperative tests; two, there is a responsibility to continue to order indicated tests to maximize and improve patient care. There is no doubt that there exist some limitations regarding preoperative testing of surgery patients. One of the first difficulties faced by clinicians is the definition of the word, “abnormal.” When ordering a test, clinicians are attempting to discriminate between patients who have normal values and those who have abnormal ones. This knowledge then is used to determine the possibility for the existence of a pathologic condition, which ultimately may have an impact on the proposed surgical and anesthetic plan. Un-

fortunately, most laboratory values are based on a 95% confidence limit; therefore, it is possible that 5% of “normal” patients who do have any pathologic condition have an “abnormal” test result [1]. This may lead to misinterpretation of a pathologic condition. It is just as important to consider not only if a laboratory value is abnormal but also if an abnormal value may affect the perioperative care of patients or is able to predict a complication [2]. It is estimated that only 0.22% of all “abnormal” preoperative tests done before elective surgery could influence the perioperative management of the surgical patients [3].

It is estimated that the health care industry spends 20 to 30 billion dollars annually on preoperative laboratory testing in this country [4]. This is an enormous expense considering the volume of scientifically based studies refuting the benefits of routine preoperative laboratory work. A 1-year study of outpatient surgical patients at a teaching hospital reveals the potential of more than \$400,000 in cost reduction if preoperative laboratory tests had been ordered properly [2].

A PubMed search for “preoperative laboratory testing” reveals more than 200 articles. A quick review of these articles demonstrates a paucity of scientific evidence to validate the benefits of a random, preoperative testing paradigm. The American Society of Anesthesiologists (ASA) Task Force on Preanesthesia Evaluation released its report in February of 2002 [5]. The task force was unable to issue true practice standards or guidelines based on strict evidence-based information because of a lack of an adequate number of controlled scientific studies. Instead, a practice advisory report was formulated

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based on noncontrolled studies, opinions of consultants, and a sample of common practices [6]. Unfortunately, this advisory report not always is enforced or used at every medical center or practice. Pasternak aptly states, "... in the past, there existed an assumption that all elective surgical procedures must be preceded by a series of comprehensive tests, regardless of the patient's age, health status, or planned procedures. The traditional system of the protocol 'battery of tests' evolved from a lack of clear definition of their role in preoperative screening, insufficient information on their utility, and a mistaken belief that voluminous information, no matter how extraneous, enhanced the safety of care and reduced physician liability for adverse events" [7]. The object of laboratory testing should be to assist in the decision-making process when planning surgical or anesthetic intervention; laboratory testing is a complement, not a substitute for, a good, accurate history and physical.

It also is imperative to note that although there are medical practices based on personal preference and anecdotal experience, there still are many irrefutable studies supporting proper preoperative evaluation for elective surgery [8–10]. One large study documents at least one complication in 17% of all surgical patients [9]. This and other studies demonstrate an overall increased risk for surgical morbidity and mortality associated with advanced age; therefore, appropriate preoperative tests are recommended based solely on the age of patients [9,10].

The purpose of this article is to provide a comprehensive review of the current literature regarding appropriate preoperative assessment of patients undergoing oral and maxillofacial surgery. Unfortunately, because of contradictory data, lack of randomized studies, and absence of a consistent system for risk assessment, the recommendations listed in this article are suggested screening tools based on specific clinical conditions. At attempt is made to include as many of the routine and useful preoperative tests as possible. Clinicians also are advised to become familiar with trends and policies of affiliated medical institutions and surgical centers, because slight variations may exist. The majority of policies regarding preoperative assessment of surgical patients are determined by the department of anesthesiology in most medical centers.

Recommended guidelines

Familiarity with the ASA patient classification is critical when performing a preoperative patient

Table 1
American Society of Anesthesiologists Patient Classification

ASA Class I	Healthy patients
ASA Class II	Patients who have mild systemic disease
ASA Class III	Patients who have severe systemic disease that limits activity but is not incapacitating
ASA Class IV	Patients who have an incapacitating systemic disease that is a constant threat to life
ASA Class V	Moribund patients not expected to survive 24 hours with or without an operation

Note: if a surgical procedure is performed emergently, an "E" is added to the previously defined ASA classification.

assessment (Table 1). The ASA classification is a universally accepted, overall impression of surgical patients who are to undergo an anesthetic procedure. Preoperative risk stratification also can include a surgical classification system (Table 2) [4]. This classification is especially useful for healthy patients undergoing a surgical procedure, because risk assessment is determined solely by the nature of the procedure rather than the ASA classification. Regardless of the classification system used, a complete history and physical is the most important parameter for patient assessment during the preoperative period. Preoperative testing should be ordered only for those conditions that may have an impact on the perioperative management of patients, including [4]

- Medical status of patients (ASA classification or presence of a specific condition based on patient history and physical)
- Nature of the surgical procedure (surgical classification system)
- Nature of the anesthetic technique
- Patient inclusion in a high-risk group based on epidemiology (eg, ECG for age ≥ 40)
- Baseline determination requirements because of likely changes resulting from the surgery or postoperative interventions

Testing without specific indications is shown to be neither of clinical benefit nor cost effective [2,11–18]. Furthermore, such action may increase patient discomfort and augment the potential adverse effects of further assessment of clinically unimportant, yet ordered and documented, laboratory abnormalities.

After reviewing the current literature, certain conclusions can be derived regarding choosing appropriate preoperative laboratory tests. Figs. 1

Table 2
Surgical classification system

Category 1	Minimal risk to patients independent of anesthesia Minimally invasive procedures with little or no blood loss Often done in an office setting
Category 2	Minimal to moderately invasive procedure Blood loss less than 500 µL
Category 3	Mild risk to patients independent of anesthesia Moderately to significantly invasive procedure Blood loss potential 500–1500 µL
Category 4	Moderate risk to patients independent of anesthesia Highly invasive procedure Blood loss greater than 1500 µL Major risk to patients independent of anesthesia

and 2 and Tables 3 and 4 list current recommendations regarding appropriate preoperative patient assessment.

Several comments need to be made regarding the current recommendations. First and foremost, clinicians must realize that the recommendations are suggestions; as stated previously, there is no standardized testing paradigm. Other testing methods, in addition to the current recommendations, may be warranted based on patient clinical condition or other concomitant diseases.

Although age alone should not be an indication for preoperative tests, most healthy patients of advanced age are at increased risk for perioperative complications [9,10,19]. Specific criteria, therefore, are established to address this issue (see Table 4). It is imperative to remember that age-specific re-

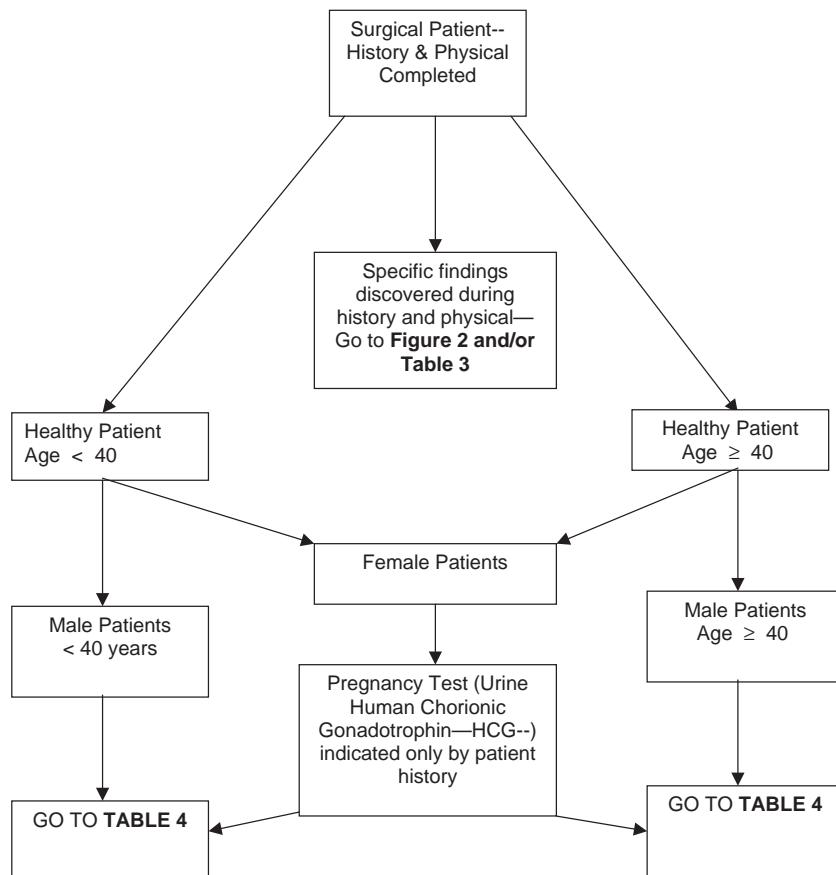


Fig. 1. Universal algorithm for preoperative testing.

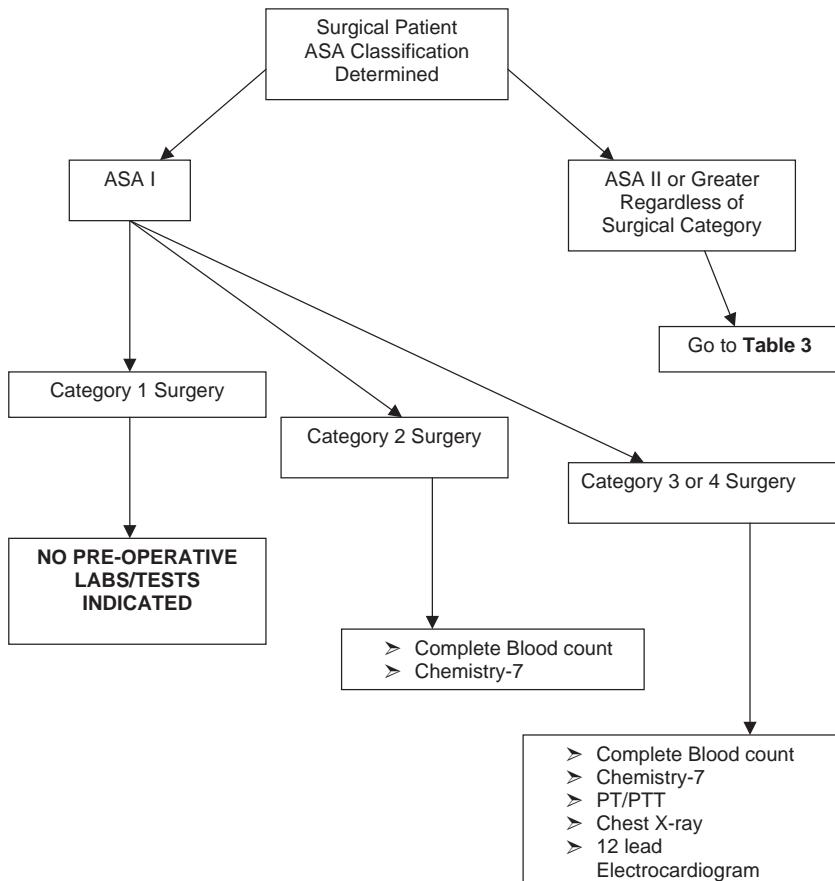


Fig. 2. Indications for routine preoperative laboratory testing based on patient ASA and surgical classification system (independent of patient age).

quirements are independent of other patient factors, such as ASA classification or nature of the planned surgical procedure. For example, a healthy 45-year-old patient undergoing an elective outpatient surgical procedure may not require as many preoperative tests as a 45-year-old patient who has a significant cardiovascular history and is undergoing the same operation.

Preoperative assessment of pediatric patients also has been evaluated. As for adult patients, many practitioners continue the practice of ordering non-indicated tests for pediatric patients. Studies show no clinical benefit of routine preoperative laboratory testing in children undergoing outpatient or non-invasive surgical procedures [20,21].

Preoperative assessment of female patients of childbearing age also is of interest. One of every

10 women between 15 and 19 years of age becomes pregnant each year in the United States and more than 95% of these pregnancies are unplanned [22]. It is conceivable, therefore, that some of these patients may present for elective surgical procedures. Although there are few data regarding the teratogenic effects of anesthetics on the developing fetus, there is a significant risk of spontaneous abortion, intrauterine growth retardation, and prematurity if a pregnant female is anesthetized during the first trimester. Based on these facts, a recent national survey reveals that 27% of all practitioners routinely order a urine pregnancy test in adolescent patients before surgery [22]. There are a number of multicenter studies indicating, however, that the potential for an unrecognized pregnancy, following a detailed history and physical with specific questions regarding the last

Table 3

Indications for commonly ordered preoperative laboratory tests based on specific findings during history and physical examination (independent of patient age, American Society of Anesthesiologists classification, or surgical procedure)

Test	Indications
Complete blood count	Recent infection Immune compromised states (ie, HIV) History of cancer Chemotherapy or radiation treatment Fever Corticosteroid use Anticoagulation medications
Hemoglobin	History of anemia Anticipated high blood loss Malignancy History of gastrointestinal bleed
Platelet count	Bleeding history Thrombopathy Splenectomy Liver disease Autoimmune disease Malnutrition/dehydration
Chemistry-7	Corticosteroid use Diuretic use Digitalis use Renal failure Diabetes Infection Steroid therapy Diabetes Pancreatic disease Adrenal disease Pituitary disease
Blood glucose	Bleeding disorders Coagulopathy Jaundice Chronic renal failure Alcoholism Anticoagulation medications Liver disease History of stroke Evidence of purpura or petechiae Malnutrition
Prothrombin time/partial thromboplastin time, bleeding time	Liver disease/hepatitis/jaundice Pancreatic disease History of cancer Alcoholism Hepatomegally Dysuria Pregnancy Cardiovascular disease Lung disease (obstructive and restrictive airways diseases, shortness of breath) Upper respiratory infections Chronic smoking
Liver function tests	
Urinalysis/urine pregnancy test	
Chest radiograph	

Table 3 (continued)

Test	Indications
12-lead ECG	History of cardiac disease Chest pains Lung disease Morbid obesity History of stroke
Echocardiogram	Recent myocardial infarction Congestive heart failure Abnormal ECG Unstable angina Significant arrhythmia Severe valvular disease

menstrual cycle, is less than 0.5% [22–24]. Routine preoperative urine human chorionic gonadotrophin testing in the female adolescent surgical population, therefore, may not be necessary.

Summary

There is no doubt that clinicians are faced with conflicting data when deciding on the appropriate preoperative tests for surgical patients. As discussed previously, the ASA, one of the major regulating bodies involved in the perioperative care of surgical patients, is unable to issue standardized testing protocols for patient assessment. This only highlights the dysfunctional and costly current practice of ordering a battery of tests before surgery for every surgical patient, regardless of age, ASA status, or findings on history and physical examination. There is no substitute for a properly performed and detailed history and physical examination. Data suggests that most clinically relevant conditions are recognized during the history and physical examination without the need for further laboratory testing [25–27]. Review of the current literature cited in this article confirms this finding. Most ASA I patients under-

Table 4

Indications for routine preoperative laboratory testing based on patient age only

Age	Indicated tests
Healthy patient under age 40	No routine preoperative tests indicated unless major blood loss or major hemodynamic changes anticipated
Healthy patient age 40 or older	Complete blood count 12-lead ECG Chest radiograph

going an elective, outpatient procedure in an oral and maxillofacial surgery office do not need any preoperative testing based on current clinical data and suggestions. It is warranted, however, to restate that specific laboratory testing is indicated based on key findings during a history and physical examination. The tables cited in this article are guidelines based on current literature; variations from the suggesting testing protocol may be warranted based on patients' surgical condition or other concomitant diseases.

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