

Position statement on routine laboratory testing before endoscopic procedures

This is one of a series of statements discussing the use of GI endoscopy in common clinical situations. The Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy prepared this text. In preparing this guideline, MEDLINE and PubMed databases were used to search publications related to endoscopy by using the key words “endoscopy” and “laboratory” with each of the following: “preanesthesia,” “preoperative,” “routine,” “screening,” and “testing.” The search was supplemented by accessing the “related articles” feature of PubMed with articles identified on MEDLINE and PubMed as the references. Pertinent studies published in English were reviewed. Studies or reports that described fewer than 10 patients were excluded from analysis if multiple series with greater than 10 patients addressing the same issue were available. The reported evidence and recommendations on the basis of reviewed studies were graded on the strength of the supporting evidence (Table 1).

Guidelines for appropriate use of endoscopy are based on a critical review of the available data and expert consensus. Further controlled clinical studies may be needed to clarify aspects of this statement, and revision may be necessary as new data appear. Clinical consideration may justify a course of action at variance with these recommendations.

Routine preprocedure laboratory testing is the practice of ordering a set panel of tests on all patients undergoing a given procedure, irrespective of specific information obtained from the history and physical examination. There are insufficient data to determine the benefit of routine laboratory testing before endoscopic procedures, and therefore data must be extrapolated from surgical series and nonsurgical interventions such as bronchoscopy with biopsy and transjugular liver biopsy, among others. Most studies indicate that physicians overuse laboratory testing and that routine preoperative screening tests are usually unnecessary.¹⁻⁷ In 1 study involving 2000 patients,⁸ only 40% of preoperative tests were done for a recognizable indication, and fewer than 1% of the tests revealed abnormalities that would have influenced perioperative

management. Moreover, no complications were attributable to the identified laboratory abnormalities. Because procedural risks in patients undergoing elective outpatient endoscopy are generally less than those for patients undergoing general surgery, recommendations mandating use of screening laboratory tests should be critically reviewed. An evaluation of this issue should consider the frequency of abnormal test results within a given population, the accuracy of the tests, and whether an abnormal result will affect either the decision to perform endoscopy or alter perioperative management or procedural outcome. The cost of screening and the expense of follow-up testing must also be considered to evaluate often minor abnormalities that seldom enhance patient care. Furthermore, falsely abnormal test results may unnecessarily delay endoscopy and may even subject the patient to additional risks, which themselves lead to untoward health and economic consequences.

COAGULATION STUDIES

The definitions of coagulopathy and thrombocytopenia and the threshold laboratory values (international normalized ratio [INR], platelets) that are considered acceptable for endoscopy and surgery have not been clearly established. This guideline is designed to assist in the selection of patients for whom testing is performed, but it is not intended to determine how a health care professional applies these results to individual patients.

Prothrombin time, INR, and partial thromboplastin time

In patients without evidence of a bleeding disorder or coagulopathy, the prothrombin time (PT), INR, and partial thromboplastin time (PTT) neither predict nor correlate with intraoperative or postoperative hemorrhage.⁹⁻¹² Furthermore, when bleeding does occur, it typically does so in patients with normal coagulation parameters in the absence of clinical risk factors, as shown in studies evaluating patients who underwent bronchoscopy with biopsy or transjugular liver biopsy.^{10,13}

In the absence of clinical suspicion of a bleeding diathesis, abnormal PT results are found in fewer than 1% of patients.^{14,15} Moreover, an abnormal PT result does not accurately predict bleeding, nor does a normal value ensure hemostasis.¹⁶ As opposed to the PT, abnormal PTT

TABLE 1. Grades of recommendation

Grade of recommendation	Clarity of benefit	Methodologic strength supporting evidence	Implications
1A	Clear	Randomized trials without important limitations	Strong recommendation; can be applied to most clinical settings
1B	Clear	Randomized trials with important limitations (inconsistent results, nonfatal methodologic flaws)	Strong recommendation; likely to apply to most practice settings
1C+	Clear	Overwhelming evidence from observational studies	Strong recommendation; can apply to most practice settings in most situations
1C	Clear	Observational studies	Intermediate-strength recommendation; may change when stronger evidence is available
2A	Unclear	Randomized trials without important limitations	Intermediate-strength recommendation; best action may differ depending on circumstances or patients' or societal values
2B	Unclear	Randomized trials with important limitations (inconsistent results, nonfatal methodologic flaws)	Weak recommendation; alternative approaches may be better under some circumstances
2C	Unclear	Observational studies	Very weak recommendation; alternative approaches likely to be better under some circumstances
3	Unclear	Expert opinion only	Weak recommendation. Likely to change as data become available

Adapted from Guyatt G, Sinclair J, Cook D, et al. Moving from evidence to action: grading recommendations—a qualitative approach. In: Guyatt G, Rennie D eds. *Users' guides to the medical literature*. Chicago: AMA Press; 2002. pp. 599-608.

results are common, averaging 6.5%,⁵ but can be as high as 16.3% of patients.¹² Nevertheless, an abnormal PTT result does not reliably predict perioperative hemorrhage. Furthermore, a study of 1,000 patients found that all patients with a prolonged PTT had clinical risk factors for bleeding,¹⁷ suggesting the need to base testing on a directed history and physical examination. Routine PT and PTT measurements are not clinically useful unless the patient has a history of abnormal bleeding or known bleeding disorder, liver disease, or malnutrition; is receiving prolonged therapy with antibiotics associated with clotting factor deficiencies; is receiving anticoagulant therapy; or has prolonged biliary obstruction.^{5,18} Similarly, a recent study evaluating the utility of routine coagulation screening in children undergoing endoscopic procedures found abnormal PT and/or PTT tests results in 16.8% of patients, that when present, did not predict bleeding episodes.¹⁹

Platelet count

Similar to coagulation studies, a routine platelet count is not advised unless the history or physical examination suggests thrombocytopenia. Such clues may include a history of excessive bleeding or easy bruisability, myeloproliferative disorder, or use of medications that decrease the

platelet count. Fewer than 1% of operative patients are thrombocytopenic, which alters care in $\leq 0.3\%$.^{3,5,14}

Bleeding time

Multiple studies indicate that routine measurement of the preoperative bleeding time is not useful in predicting hemorrhage.²⁰ Although newer techniques to assess platelet function are available,^{21,22} these tests have not been validated in terms of assessing the risk for perioperative bleeding.²³⁻²⁵ Contradictory results have been reported between test results and clinical end points such as bleeding.^{24,26,27} It is unclear whether these tests are clinically useful in patients with renal failure²⁸ or in patients receiving aspirin, clopidogrel, or other antiplatelet agents.

von Willebrand disease

One presumed justification for routine coagulation screening is to identify patients with previously undiagnosed hemophilia or von Willebrand disease. Mild cases of hemophilia may escape detection until early adulthood, when hemorrhage may complicate major trauma or surgery. The PTT is not sensitive for hemophilia and has a false-positive rate of approximately 2.3%.²⁹ However, the calculated incidence of hemophilia in men without

a family history of the disease or a history of major trauma or surgery is only 0.0025%.³⁰ Therefore, obtaining a screening PTT for hemophilia is not recommended in the absence of clinical suspicion. The PT does not detect either von Willebrand disease or hemophilia because it measures only the extrinsic coagulation pathway, which does not include factors VIII, IX, or XI.

In summary, in the absence of clinical suspicion, abnormalities in hemostasis are uncommon. Therefore, routine preoperative screening for coagulopathy with the PT, PTT, platelet count, or bleeding time, either alone or in combination, is not recommended.^{1,2,8-10,17,31-33}

CHEST X-RAY FILM

Preoperative chest radiography is often recommended for patients aged 60 years or older, particularly those with a strong smoking history, recent upper respiratory infection, or signs or symptoms suggestive of advanced cardiopulmonary disease.^{5,34} However, there is a high incidence of detecting incidental minor radiographic abnormalities that seldom alter patient care or clinical outcome.³⁵⁻³⁷ In 1 meta-analysis, 10% of preoperative chest radiographs were abnormal and 1.3% of patients had unexpected findings; however, patient care was altered in only 0.1% of patients.³⁵ Therefore, routine chest radiography is not recommended before endoscopy.^{1,33,38-41}

ELECTROCARDIOGRAM

The value of a screening electrocardiogram (ECG) is limited by the high incidence of abnormalities, which is approximately 30%, and by the lack of influence on patient care.⁴²⁻⁴⁵ Although convincing data are not available to suggest a benefit, an ECG is often obtained in patients with advanced age.³³ However, there is no consensus regarding the minimum age for obtaining an ECG, and age alone is a poor indicator of who will benefit from screening.^{1,5,6,33} An ECG is often obtained in patients with comorbid illnesses (eg, heart disease, arrhythmias, diabetes mellitus, hypertension, and electrolyte disturbances) undergoing surgery,^{1,5,6,33} particularly when symptomatic and when undergoing more complex or prolonged procedures. Routine preoperative ECG in patients undergoing endoscopic procedures is not recommended. The exception to this is when the use of droperidol for sedation is being considered because this drug is associated with prolongation of the QT interval and is contraindicated in those with a prolonged QT interval on baseline ECG.

BLOOD CROSS-MATCHING

Blood type and screening is unnecessary before most surgical procedures⁴⁶ unless it is anticipated that blood

may be transfused. The risk of bleeding after endoscopy is anticipated to be lower than that for surgery. Therefore, routine blood typing before endoscopy is not recommended.

HEMOGLOBIN/HEMATOCRIT

Severe anemia is found in fewer than 1% of asymptomatic patients,⁸ whereas mild decreases in hemoglobin levels are relatively common. The baseline hemoglobin level has been shown to predict the need for transfusion in patients undergoing surgical procedures associated with significant blood loss.⁴⁷ In addition, because a hemoglobin level <8 mg/dL has been associated with cardiac morbidity and operative death,⁴⁸ obtaining a baseline hemoglobin or hematocrit levels is recommended before major surgery in patients anticipated to have significant intraoperative blood loss. However, such testing is not recommended for patients undergoing minor surgeries in the absence of clinical findings suggestive of anemia.^{49,50} Routine measurement of hemoglobin or hematocrit before elective endoscopy is not recommended.^{1,5,6,33} Measurement of hemoglobin should be considered for patients who have existing anemia or risk factors for bleeding, are at high risk for adverse events with significant bleeding, have advanced liver disease or a hematologic disorder, and are undergoing endoscopic procedures where there is a high risk of bleeding complications.³³

URINALYSIS

The rationale for a preoperative urinalysis is primarily to detect urinary tract infections or unrecognized renal disease. The incidence of abnormal preoperative screening urinalysis is approximately 19%⁵ but has been reported in up to 39.2% of patients.⁵¹ However, an abnormal urinalysis rarely affects patient care,^{4,5,51} and specifically there are no data to suggest that urinary tract infections affect endoscopic outcome.³³ Therefore, routinely obtaining a urinalysis is not recommended before endoscopy.^{1,5,6}

PREGNANCY TESTING

Although pregnancy is not a contraindication to endoscopic procedures and the use of moderate sedation, there are situations when it is important to be aware of pregnancy status because it may affect certain procedural aspects such as use of fluoroscopy and choice of sedation agents.^{33,52-54} When possible, it is advisable to avoid or delay elective endoscopic procedures until after delivery or to take appropriate measures to lessen the potential risk to the unborn child when procedural delay is not possible. The American Society for Anesthesiologists states

that “the literature is inadequate to inform patients or physicians on whether anesthesia causes harmful effects on early pregnancy.”³³ All women of child-bearing age should be queried about the possibility of being pregnant. Pregnancy testing may be considered in women of child-bearing age unless there is a history of total hysterectomy, bilateral tubal ligation, or absent menses for 1 year (menopause). The threshold for pregnancy testing should be lower when fluoroscopy use is planned.

SERUM CHEMISTRY TESTING

Serum electrolyte determinations, tests of renal function, and serum glucose levels are all generally reported together as part of a “chemistry” panel. Routine preoperative chemistry testing rarely yields an abnormality that might influence perioperative management in a patient without a history to suggest abnormal test results.⁸ In most patients, abnormal chemistries can be predicted on the basis of suggestive history or clinical grounds.⁵ When laboratory studies are performed on the basis of clinical considerations, as many as 30% of the test results may be abnormal,⁵⁵ and such identification of abnormalities by selective testing may result in substantial changes in the surgical management of the patient.⁵⁵ Unsuspected abnormalities are found in only 0.2% to 1.0% of patients undergoing routine preoperative chemistry screening,^{8,56,57} and there is no evidence that these unexpected abnormalities alter anesthetic or surgical treatment or lead to an adverse surgical outcome.^{4,15} On the basis of data from a literature review and 1 large study encompassing 2570 patients, it was recommended that routine preoperative chemistry testing not be performed.^{50,58} It has been suggested that a test of renal function be performed in surgical patients more than 40 years old because it leads to adjustment of doses of perioperative medications. In addition, renal dysfunction (creatinine >1.9 mg/dL) has been shown to correlate with poor outcome in patients undergoing major surgery.^{59,60} As such, the American College of Cardiology and the American Heart Association both classify renal insufficiency as an intermediate clinical risk predictor for an adverse outcome after major surgery.⁶¹ However, there are no data to support this recommendation in patients undergoing endoscopy, and mild impairment in renal function appears to have no bearing on the outcome with use of moderate and deep sedation.

Considering the aggregate cost and the lack of correlation between abnormal results and a poor outcome, routine performance of screening chemistry tests in an otherwise healthy patient undergoing endoscopy is not justified. Testing may be indicated for a subset of patients with a history of endocrine, renal, or hepatic dysfunction and when taking medications that may further impair function. In patients with known insulin-requiring diabe-

tes mellitus, preprocedural evaluation of blood glucose level may be considered.

RECOMMENDATIONS FOR ROUTINE PRE-ENDOSCOPY LABORATORY TESTING

There are no data to support routine preprocedure testing in patients undergoing elective GI endoscopic procedures. Extrapolation from surgical data and from other nonsurgical interventions leads to the conclusion that routine pre-endoscopy testing will not alter the risk of the planned procedure and that the absence of such testing will not adversely affect outcome. The potential legal implications when abnormal laboratory test results are not followed up may outweigh the liability of not ordering the test. Detection of unsuspected but clinically important abnormalities on routine screening is rare, and there is no clear relationship between detection of abnormalities and procedure-related morbidity. Even for higher-risk endoscopic procedures such as endoscopic sphincterotomy, there is no evidence to support routine preprocedure testing. Screening tests should not be ordered routinely before endoscopic procedures. Endoscopists should pursue preprocedure testing selectively on the basis of the patient’s medical history and physical examination and associated risk factors.

Recommendations

1. Routine testing to include coagulation studies, chest x-ray films, ECG, blood cross-matching, hemoglobin level, urinalysis, and chemistry tests are not recommended before endoscopy. (1C)
2. All women of child-bearing age should be queried about the possibility of being pregnant. Pregnancy testing may be considered in women of child-bearing age unless there is a history of total hysterectomy, bilateral tubal ligation, or absent menses for 1 year (menopause). (3)
3. Consider testing based on the perceived level of risk as determined by the medical history and physical examination as follows:
 - a. Coagulation studies: Active bleeding, known or clinically suspected bleeding disorder, medication risk (eg, anticoagulant use, prolonged antibiotics), prolonged biliary obstruction, history of abnormal bleeding (egm easy bruisability, epistaxis, bleeding after dental procedures), history of liver disease, malabsorption (eg, sprue), malnutrition, or other conditions associated with acquired coagulopathies (eg, leukemia) (3)
 - b. Chest x-ray film: Advanced age, significant smoking history, recent upper respiratory tract infection, and severe or decompensated cardiopulmonary disease (3)

- c. ECG: Advanced age and comorbid illness (eg, heart disease, arrhythmia, diabetes, hypertension, and electrolyte disturbances), particularly for symptomatic patients undergoing more invasive and prolonged procedures (3)
- d. Blood cross-matching: Blood transfusion considered likely (3)
- e. Hemoglobin/hematocrit: Existing anemia, risk factors for bleeding, high risk for adverse events with significant bleeding, advanced liver disease or hematologic disorder, endoscopic procedures associated with a high risk of bleeding complications (3)
- f. Urinalysis: There are no clear indications for obtaining a urinalysis before endoscopy. (1C)
- g. Chemistry testing: Significant endocrine, renal, or hepatic dysfunction and when taking medications that may further impair function (3)

Abbreviations: ECG, electrocardiogram; INR, international normalized ratio; PT, prothrombin time; PTT, partial thromboplastin time.

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