

Understanding Risk Factors in Pre-Operative and Peri-Operative Evaluations for Podiatric Surgery

Here's a review of how to identify potential dangers and implement strategies to minimize them.

BY PETER VANNUCCHI, DPM

Goals/Objectives

Upon completion of this article the reader should:

- 1) Have a strong understanding of the preoperative and perioperative risk factors in podiatric surgery.
- 2) Be aware of screening modalities available to assist in preoperative evaluation.
- 3) Implement strategies to mitigate the risk in hospital and outpatient surgery using careful preoperative evaluation in order to improve patient safety and quality care.
- 4) Be able to recognize signs and symptoms for post operative complications in the clinical setting.
- 5) Become interested in the resources and obtain more information from the referenced material from which the article was drawn.

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Following this article, an answer sheet and full set of instructions are provided (pg. 204).—*Editor*

Introduction

Every Surgical procedure carries some degree of risk, but most surgeries carry minimal risk. This discussion is to identify these pre-operative and peri-operative risk factors in patients having operative procedures, and by so doing implement strategies to minimize these risks and determine appropriate post-

operative care. In order to improve practice patterns, the following are some helpful questions one should ask before undertaking elective surgery.

What is the risk for medical complications from performing surgery on a healthy patient?

Healthy individuals have signifi-

cant physiologic reserves and can generally tolerate major and minor surgical interventions quite well. The risk for serious medical complication from most surgery is quite small (reported to be less than 0.1 percent overall). Nevertheless, when evaluating healthy patients for surgical procedures, a fo-

Continued on page 200

cused history and physical (H&P) should be used to predict the risk for serious medical complications.

How do underlying chronic conditions influence the risk for medical complications following surgery?

Any patient with a serious medical condition has a high risk for peri-operative complications. Some of these comorbidities include ischemic heart disease, heart failure, cardiovascular disease, diabetes mellitus, and renal insufficiency. In addition, low serum albumin level, a measure of protein-energy malnutrition, is associated with high peri-operative morbidity according to one study done by the national VA in archives of surgery¹ and cirrhosis of the liver is associated with a poor outcome in abdominal and other types of surgery.²

How do lifestyle factors influence the risk for peri-operative outcomes?

A patient's lifestyle can play an important role in the risk for operative complications. The following factors are the most important.

1) Exercise

A person's ability to exercise is a strong prediction of peri-operative complications. Peri-operative cardiac and neurologic complications can double in patients who report an inability to walk four blocks or climb two flights of stairs, even after adjustments for age.³ This is particularly relevant for patients undergoing procedures inherently associated with pulmonary complications such as upper abdominal surgery. An inability of a patient to climb a few flights of stairs was associated with a positive predictive value of 82 percent for post-operative complications.⁴

2) Smoking

As would be expected, smoking is a high risk factor for peri-operative pulmonary complications. For patients who smoke, clinicians should strongly recommend cessation and consider delaying elective procedure for four to eight weeks, not just two, particularly if the procedure incurs a high risk for pulmonary complications.^{5,6}

3) Alcohol and other substances

High levels of alcohol consumption increase the risk for complications be-

cause alcohol has cardiovascular, gastrointestinal, metabolic, neurologic, and immunologic effects. Withdrawal symptoms from abrupt discontinuation may contribute to peri-operative morbidity. During pre-operative evaluations, ask patients about the quantity of alcohol use and pattern and time since they had their last drink. Any use of recreational drugs can be associated with pulmonary and cardiac distress that may affect management through the peri-operative period. Always assess patients' use of stimulants, marijuana, cocaine or any illicit drugs.⁷

Does an obese patient have an increased risk for operative complications?

Obesity carries a higher risk for wound problems as well as pulmonary complications and difficulties with general anesthesia. Diabetes, both primary and secondary hypertension, and cardiovascular disease are all associated with obesity and increased surgical risk. Many studies have shown that overweight patients have a higher risk for post-operative deep venous thrombosis (DVT) reflux and aspiration of gastric contents peri-operatively.

Differences in drug pharmacokinetics in severely overweight patients and normal-weight individuals must be considered when choosing and administering anesthetic agents. Regional and local anesthesia is preferred when feasible in order to avoid some of the difficulties posed by general anesthesia in obese patients and should always be discussed with anesthetic services.

The bottom line is that the overall risk for serious medical complications in elective surgery is quite small—0.1 percent in healthy patients. But when there are co-morbid conditions, the incidence for risk goes up, especially with patients having ischemic heart disease, cardiovascular disease, heart failure, diabetes mellitus, renal insufficiency, bleeding disorders, and liver disease. Underlying poor nutritional status, obesity, smoking, excessive alcohol use, and illicit substance use can also affect peri-operative risk. Poor exercise tolerance and sedentary life style are all associated with peri-operative cardiac, pulmonary, and neurologic problems. Above all, the nature of the surgery influences risk for complications, independent of other factors.

What are some key elements for evaluating patients for surgery?

Every surgical patient should have a pre-operative evaluation. In low-risk procedures such as dental extractions, cataract surgery, and minor podiatric procedures, the evaluation may only involve confirming the lack of significant risk factors. But for more complex procedures such as rear foot arthrodesis and severe trauma cases with prolonged operative time, evaluation by a physician experienced in pre-operative assessment may be judicious and is frequently required in many states for hospital-based surgery.

Pre-operative H&P

The main essentials of the history and physical include the patient's age, medication use, exercise tolerance, tobacco, alcohol, and illicit substance use. Overall health, including co-morbid conditions, and reaction to past surgeries and exposure with prior anesthesia (local, regional, and general) must be evaluated. The history should include any and all information about the condition for which the surgery is planned. It should focus on risk-factors including cardiac, pulmonary, thrombo-embolic, risk of bleeding and infection. It should include a determination of a patient's functional capacity. It also is important to know whether a patient is pregnant.

Cardio-pulmonary

The physician should question about any history of chest discomfort, allergies, cough, shortness of breath, edema, lightheadedness, chest pain, exertional symptoms, and palpitations, as well as any coronary revascularization, heart attacks and failure, cardiovascular disease, primary and secondary hypertension, valvular heart disease, and lung disease.

Hemostasis

The bleeding risk following any surgery can be patient-specific or due to the type and complexity of the surgery. The patient's prior anti-coagulation regimen, including out-patient heparin, aspirin, and clopidogrel, need to be assessed, and one needs to balance the risk of patient bleeding or developing a thrombo-embolism. Any history of easy bruising or bleeding may be signs of an

Continued on page 201

undetected blood congenital factor deficiency, and although relative coagulation testing is common practice before any hospital-based surgery, patient history is a better prediction for bleeding problems than laboratory testing. Low risk procedures that can generally be performed without stopping anticoagulation agents include simple dental extractions, cataract removal, simple podiatric skin or nail excisions, joint aspirations, and soft tissue injection. There is always a judgment call on the part of the physician.

Pre-operative Laboratory Testing

Laboratory studies can be limited in healthy patients especially when undergoing minor procedures. The history and physical exam should guide laboratory testing. Table 1 summarizes the indications for laboratory studies that may be helpful in the pre-operative evaluation of patients.⁸

The history and physical examination is always the best guide for laboratory testing. The incidence in which abnormal test results alter peri-operative care in some studies ranges up to 2.6 percent.⁹ General routine chest x-rays are not necessary in young patients with a normal history and physical, or if the procedure does not carry a high cardio-pulmonary risk.

What are some risk-reduction considerations for patients with major medical problems?

1) Patients with Cardiovascular Disease

a) Hypertension

Severe hypertension and left ventricular hypertrophy (LVH) are risk factors for adverse peri-operative outcomes. Persistent diastolic pressure above 110 mm Hg is associated with peri-operative risk, independent of the presence of LVH. Generally, in the absence of other cardiovascular disease, hypertension with systolic pressure less than 160 mm Hg and diastolic pressure less than 100 mm Hg does not increase peri-operative risk among patients undergoing non-cardiac surgery.¹⁰ It is wise to obtain a pre-operative electrocardiogram (ECG) to check for LVH or other abnormalities and also to check renal insufficiency and electrolyte disturbances. Detection of LVH, myocardial ischemia, or previously undetected infarction in patients with hypertension should prompt pre-operative investigation, referral to a cardiologist and delay or postponement of surgery.

b) Coronary Artery Disease

Patients with placed coronary stents are at risk for peri-operative stent throm-

bosis with bare-metal stents. The risk diminishes four to six weeks after implantation, for drug-eluting stents. An elevated risk for rethrombosis persists for at least 12 months after placement because of delayed endothelialization. These patients require anti-platelet treatment to mitigate the risk, purely elective procedures should be delayed accordingly and the interval without anti-platelet therapy should be minimized when surgery is required within the window of vulnerability. Statins should be continued in all patients already receiving them because they may reduce the incidence of peri-operative cardiovascular events.¹¹

c) Congestive Heart Failure

Decompensated heart failure is a major predictor of increased peri-operative risk, and compensated heart failure is an intermediate predictor of risk.¹² Before any planned elective surgery, the physician should establish an effective medical regimen for the treatment of heart failure by having a team in place that can assist in case of a medical emergency and for referral to an internist or cardiologist. Some studies claim that beta-blockers are beneficial for patients with compensated congestive heart failure prior to elective surgery but this is controversial and there is always a problem with tolerability. On

Continued on page 202

TABLE I
Laboratory Testing and Indications Before Elective Surgery

Test	Indication
Hemoglobin	Anticipated major blood loss or symptoms of anemia
Leukocyte count	Symptoms suggest infection, myeloproliferative disorder, or myelotoxic medications
Platelet count	History of bleeding diathesis, myeloproliferative disorder, or myelotoxic medications
Prothrombin time	History of bleeding diathesis, chronic liver disease, malnutrition, recent or long-term antibiotic use
Partial thromboplastin time	History of bleeding diathesis
Electrolytes	Known renal insufficiency, congestive heart failure, medications that affect electrolytes
Renal Function	Age >50 years, hypertension, cardiac disease, major surgery, medications that may affect renal function
Glucose	Obesity or known diabetes
Liver function tests	No indication. Consider albumin measurement for major surgery or chronic illness
Urinalysis	No indication.
Electrocardiography	Men >40 years, women >50 years, or known coronary artery disease, diabetes, or hypertension
Chest radiography	Age >50 years, known cardiac or pulmonary disease, or symptoms or examination suggest cardiac or pulmonary disease

the day of surgery, beta-blockers should be continued. Ace-inhibitors and diuretics or both should have their normal doses reduced or withheld the day of or even 24 hours before prolonged elective surgery, because these agents can affect renal function, electrolyte status, and hemodynamic status.

2) Patients and Pulmonary Disease

Pulmonary complications are just as frequent as cardiac problems. The key factors which influence complications include chronic obstructive pulmonary disease (COPD), smoking, uncontrolled asthma, poor exercise tolerance, low albumin, renal insufficiency, and obstructive sleep apnea. General anesthesia also increases the risk. Patients should stop smoking at least four to eight weeks before surgery and not two weeks. All upper respiratory infections should be treated appropriately prior to surgery, and patients with poor functional lung capacity due to exertional dyspnea should be considered for pre-operative chest physical therapy.

3) Patients with Kidney Disease and Renal Insufficiency

Procedures generally considered to be low-risk (tooth extraction, cataract removal, and most podiatric procedures) in normal patients pose a higher risk in patients with chronic renal disease. Expert consensus advises that pre-operative evaluation of these patients should include complete blood count (CBC), serum chemistries, serum creatinine concentration, and estimated glomerular filtration rates. It also should include an ECG in patients with existing cardiac disease. Physicians should review all medications pre-operatively to assess for nephrotoxicity.

4) Special Consideration for Patients with Rheumatologic Disease

Rheumatic disease and its treatments increase the risk for peri-operative infections. Consider holding disease-modifying anti-rheumatic drugs in the peri-operative period, including discontinuing methotrexate one to two weeks before surgery, and holding leflunomide or infliximab during the peri-operative period. Hypotensive shock during the stress of surgery is an important risk consideration among patients who have been on previous corticosteroid therapy. Patients who have received the equivalent of five or more

mg/d of prednisone for three or more weeks within the year before surgery may be at risk for this complication.

5) Special Consideration for Patients with Diabetes and PVD

Diabetics face a higher risk for post-surgical complications, namely hyperglycemia, hypoglycemia, diabetic ketoacidosis (DKA), post-operative infections, cardiac complications, and post-operative stroke. Early morning surgery is generally advised to minimize disruption in glycemic control. Before surgery, the patient should be advised on how to adjust insulin and oral medications while preparing for surgery. If the glucose level is very high (220 mg/dL), or if patients have signs of dehydration due to hyperglycemia, consider postponing surgery. Diabetes as a disease leads to many causes for failure in bone surgery, especially with fixation and infection. Multiple factors play a role, notably deterioration in renal function and low vitamin D levels, which create a susceptibility to infection.¹³

Conclusion

The main purpose for this article on risk assessment in pre-operative and peri-operative evaluations is to educate as well as to improve patient safety, quality care, and surgical outcomes. These guidelines are meant to be a tool and to assist decision-making in operative cases. But the information contained herein should never be used as a substitute for sound clinical judgment. A careful evaluation of the patient before undergoing elective surgery is a critical step in patient safety. This evaluation is becoming more rigid for pre-operative clearance now that more states are allowing podiatric physicians to admit their patients into hospitals without the need for a co-admitting physician. Remember, these guidelines are the beginning and not the end of surgical care. **PM**

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SEE ANSWER SHEET ON PAGE 205.

- 1) The risk for any medical complication from elective surgery in healthy individuals is reported to be less than _____.
A) 20%
B) 10%
C) 1%
D) 0.1%
- 2) According to the article, all of the following lifestyle factors have the most influence on risk for peri-operative complications except _____.
A) Exercise
B) Occupation
C) Smoking
D) Alcohol and illicit drug use.
- 3) The main elements of the history and physical (H&P) include all of the following except _____.
A) Age, height, and weight
B) Medication use, as well as alcohol and illicit drug use
C) Patient expectations
D) Co-morbid conditions
- 4) Patient anti-coagulation regime before surgery includes all of the following except _____.
A) Heparin
B) Aspirin
C) Estrogen
D) Clopidogrel
- 5) Low-risk procedures that can be performed generally without stopping anti-coagulation therapy include all of the following, except _____.
A) Dental extractions
B) Cataract removal
C) Simple podiatric skin and excisions
D) Ankle fracture repair with internal fixation
- 6) Laboratory testing pre-operatively for a patient with a bleeding diathesis includes all the following except _____.
A) Platelet count
B) Partial thromboplastin time
C) Prothrombin time
D) Leukocyte count
- 7) Indications for a pre-operative electrocardiography include which of the following:
A) Men > 40 years Women > 50 years, or a known history of CAD, diabetes, or hypertension
B) History of bleeding diathesis
C) Obesity or history of smoking
D) Any chronic illness
- 8) In considering risk-reduction in patients undergoing elective surgery which statement(s) is generally true?
A) Severe hypertension and left ventricular hypertrophy are risk factors for adverse peri-operative outcome.
B) Hypertensive patients with systolic pressure less than 160 mm Hg and diastolic pressure less than 100 mm Hg do not generally have peri-operative risk in minor elective surgery.
C) Both A and B
D) Neither A nor B
- 9) Beta-blockers are generally beneficial, and ace-inhibitors and diuretics both should have their normal doses reduced or withheld the day of surgery and even 24 hours before in which of the following patients:
A) 70 year old man undergoing cataract surgery
B) 56 year old man with rheumatoid arthritis undergoing total knee replacement
C) 50 year old women undergoing arthroscopic ankle repair
D) Both compensated and uncompensated congestive heart failure patients undergoing bunion surgery
- 10) In patients with pulmonary disease undergoing elective surgery with general anesthesia, smoking cessation should begin _____.
A) 2 days before surgery
B) 2 weeks before surgery
C) 1 month before surgery
D) 2 months before surgery
- 11) Patients with renal insufficiency and chronic kidney disease with existing heart disease should have which of the following tests done peri-operatively:
A) CBC serum chemistries or creatinine concentrations.
B) Electrocardiogram and chest x-rays
C) All of the above
D) None of the above
- 12) Methotrexate, Leflunomide and infliximab are drugs used to treat which of the following diseases:
A) Hypertension
B) Diabetes
C) Peripheral neuropathy
D) Rheumatoid arthritis
- 13) Hypertensive shock during stress of surgery can occur in patients previously on which class of drug?
A) Steroids
B) Anti-hypertensives
C) Statins
D) Anti-platelet agents
- 14) Diabetic patients undergoing elective surgery are generally advised to have early morning surgery in order to _____.
A) Minimize disruption of glycemic control.
B) Avoid having anything to eat.
C) Avoid having their surgery postponed due to immediate surgical emergencies in operating room.
D) Allow enough time for in-office patient care by the physician.
- 15) A 55 year old female with chronic kidney disease, presumed secondary to diabetic nephropathy, is referred to you for in-house debridement of her left great toe for a chronic non-healing diabetic foot ulcer 7mm in size and extending across the top of her great toe, with a purulent drainage. Which of the following is recommended to determine the stage of this patient's chronic kidney disease and appropriate drug therapy?
A) Check renal function using blood urea nitrogen, serum creatinine level and the formula for estimation of glomular filtration rate.
B) 24 hour urine for creatinine clearance
C) renal ultra sonography
D) all of the above
- 16) A 46 year old male needs to have an elective arthroscopic ankle repair for a sports-related injury.

Continued on page 204

jury. His medical history includes hypertension treated with Atenolol, hydrochloro thiazide, and daily low dose aspirin. He has no bleeding problems or any other medical problems. He usually drinks two glasses of wine with dinner, is anicteric, and does not use illicit drugs. Results of laboratory studies performed six months ago including serum electrolyte levels, creatinine level and lipid profile, were normal. Which of the following is the most appropriate approach to pre-operative lab testing in this patient?

- A) ECG and Serum electrolyte and creatinine measurement
 - B) chest x-ray, complete CBC, and serum electrolyte measurement
 - C) ECG, serum electrolyte measurement, CDC, and urinalysis
 - D) CBC, prothrombin time, and urinalysis
- 17) When assessing patients for elective surgery, what conditions double in frequency post-operatively when patients reported an inability to climb two flights of stairs?
- A) Cardiac and neurologic complications
 - B) Deep venous thrombosis and pulmonary embolism
 - C) Post-operative infections
 - D) Low back pain from sciatica
- 18) Insulin-dependent diabetic patients deserve special pre-operative consideration because they face a higher risk for peri-operative morbidity and mortality from which of the following complications:
- A) Hyperglycemia and hypoglycemia
 - B) Diabetic ketoacidosis (DKA)
 - C) Cardiac complications, stroke, and infection
 - D) All of the above
- 19) Patients undergoing distal lower extremity elective surgery can benefit from wearing properly fitted elastic stockings pre-operatively and post-operatively to prevent _____.
- A) Claudication
 - B) Thrombo-embolism
 - C) Restless leg syndrome
 - D) Stasis dermatitis
- 20) According to the author, which statement is the most accurate?
- A) A careful evaluation of each patient before undergoing elective surgery is a critical step in patient safety.
 - B) Knowledge of both risk and benefits for both provider and patient is requisite to the success of any elective surgery.
 - C) Guidelines are the beginning and not the end of surgical care.
 - D) All of the above

See answer sheet on page 205.

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