1. **PRACTICE OUTCOME**
   1.1. This document provides evidence informed clinical practice guidelines for practitioners ordering preoperative laboratory tests for adult patients undergoing elective surgery.
   1.2. Pre-operative testing will be based on the proposed surgical procedure, the patient’s age, and an assessment of the patient’s health status. (see Appendix A).
   1.3. Use of these standards will enhance patient care by eliminating unnecessary tests and avoiding duplicate tests, and will support the efficient use of existing resources.

2. **BACKGROUND**
   - A guideline (and grid) was developed in 2010 as one phase of a provincial initiative to improve the quality and coordination of preoperative care.
   - At that time, there were no regional or widely accepted national standards to guide physicians into ordering required preoperative tests.
   - For the initial guideline, physicians from Surgery, Anesthesia, and providers from Family Medicine- Primary Care supported the need to develop these standards collaboratively, and formed a clinical group. The group reviewed available clinical evidence and guidelines. For specific tests, consultations with neurology, hematology and blood conservation were obtained.
   - In the absence of a widely accepted national standard, consensus on indications for each preoperative lab test were then obtained and developed into a grid which was widely vetted and accepted as an EIPT.
   - Since 2010 there have been three important developments on this topic.
     1. Serial audits of the guideline’s effectiveness in reducing the ordering of unnecessary tests showed only a transient reduction at 6 months post implementation, with a return to pre-guideline implementation levels at 2 years post implementation.
     2. A new project supported by the Manitoba Patient Access Network was convened to identify reasons for poor uptake, and to design knowledge translation tools to improve use of the guideline. This project identified that some users found the 2010 guideline too difficult to interpret and follow within the time constraints of a busy clinical practice.
     3. In September 2015, the Canadian Anesthesiologists’ Society, through Choosing Wisely Canada (CWC), made 5 recommendations that vastly simplify preoperative testing for patients undergoing minor surgery ([http://www.choosingwiselycanada.org/recommendations/anesthesiology](http://www.choosingwiselycanada.org/recommendations/anesthesiology)), which were discordant with the WRHA 2010 guidelines and grid. As CWC is a nationally recognized and respected organization, an opportunity was identified to improve and revise the WRHA guidelines and replace the grid with a simpler algorithm.

3. **DEFINITIONS**
   - **Minor surgery**: Corresponds to Category 1 and 2 on the Johns Hopkins Surgical Classification System (see Appendix B), low risk surgery in the American College of Cardiology Guidelines (Fleisher et al.), and Grade 1 and 2 surgery in the NICE guidelines (National Institute for Clinical Excellence). It is associated with an expected blood loss of
<500mL, minimal fluid shifts and includes ambulatory surgery, breast lumpectomy, cataract surgery and endoscopic surgery, among other types of surgery. A list of common minor surgeries is provided for guideline users on p.2 of the algorithm.

**Major surgery:** Corresponds to Categories 3, 4 and 5 on the Johns Hopkins Surgical Classification System (see Appendix B), intermediate and high risk surgery in the American College of Cardiology Guidelines (Fleisher et al.), and Grade 3 and 4 surgery in the NICE guidelines (National Institute for Clinical Excellence). It includes open and laparoscopic surgery on major abdominal organs, operations on the brain or in the chest, most vascular and spine surgery and typically involves at least one night in hospital. A list of common major surgeries is provided for guideline users on p.2 of the algorithm.

4. **GUIDELINES**

4.1 The 2015 guideline and algorithm provides clear direction for preoperative testing based first, on the type of surgery (minor versus major surgery) and second, on patient factors (age, medical comorbidities, drug therapies, etc). Indications for each preoperative lab test are identified in the attached algorithm.

4.2 For patients with stable chronic disease, even if no preoperative tests are indicated by the algorithm, caregivers are still expected to review available paper and electronic records to establish baseline laboratory values. For example, a baseline creatinine and electrolytes in a patient with stable chronic renal insufficiency, or a baseline ECG for a patient with stable ischemic heart disease.

4.3 Tests are valid for 6 months provided there has been no interim change in the patient’s condition.

4.4 For patients with complex or uncommon surgical or medical conditions, tests beyond what is suggested in the algorithm may be appropriate.

4.5 The guideline and algorithm do not apply to the following:
- pediatric patients (< 16 years old)
- patients undergoing cardiac surgery at St. Boniface Hospital
- patients undergoing cesarean section

5. **RESOURCES**

A two page algorithm is attached to practice guideline (see Appendix A). The guideline and algorithm will reside online.

A Preoperative Testing App is also available at [www.logixmd.com/preop](http://www.logixmd.com/preop) or by scanning the QR code below.
6. **SOURCE/REFERENCES**


Fisher, S., Bader, A., & Sweitzer, B. Chapter 34: Preoperative Laboratory and Diagnostic Studies, Miller’s Anesthesia, 7th edition.


Institute of Health Economics (2007) Routine Preoperative Tests: are they necessary?


7. **PRIMARY AUTHOR**

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Trevor Lee: Head of St. Boniface Department of Anesthesia
Practice Guideline:
Routine Preoperative Tests for Adult Patients Undergoing Elective Surgery

Approved By:
WRHA Professional Advisory Council

Approval Date:
July 6, 2016

Supercedes:
November 2010

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9. APPENDICIES

Appendix A: Routine Preoperative Lab Test Guideline Algorithm
Appendix B: The Johns Hopkins Surgical Classification System
Appendix A: Routine Preoperative Lab Test Guideline Algorithm

**Routine Preoperative Lab Test Guidelines**

For adult patients (>16 years) undergoing elective surgery

**Minor Surgery**
- Associated with an expected blood loss of <500mL, minimal fluid shifts and is typically done on an ambulatory basis.
- Routine tests include: Na⁺, K⁺, BUN, TCO₂, serum glucose, CBC, ECG, INR, albumin, renal, liver or thyroid function tests in asymptomatic patients.

**Major Surgery**
- Associated with an expected blood loss of >500mL, significant fluid shifts and typically at least one night in hospital.
- Includes laparoscopic surgery (except cholecystectomy and tubal ligation), open excision of large joint replacements, mastectomy, with reanastomosis, and spine, thoracic, vascular, or intracranial surgery.

- *If the surgery is reported as major, but the patient has a medical resource reason for overnight admission (i.e., ASA or support resource), still consider the surgery minor in determining which lab tests to order.*

**DO NOT ORDER PROOF TESTS**
- **Including**: AST, ALT, Bilirubin, albumin, INR, CRP, and other inflammatory markers.

**Major Surgery, All Ages:** Other tests considered by patient characteristics & complications
- Oral Carotid Ultrasound: DM or HbA1C > 40 add Carotid A & V or fasting plasma glucose.
- Malnutrition: BMI > 40, or linear distance: add lower function tests and LWR.
- At high risk for renal dysfunction: add serum urea, BUN and creatinine.
- Thyroid disease: add TSH.

**Chest X-rays:** Not recommended for any surgery except to facilitate the diagnosis of new or unexplained symptoms, or ordered by the surgeon prior to thoracic surgery or to work up a malignancy.

**Specific Directions for other Tests & Conditions**
- **Tinnitus:** Not recommended except for specific surgical or anesthesia discretion.
- **Pulmonary function tests, audiometry, or arterial blood gases:** Not required except prior to thoracic surgery, as ordered by the surgeon.
- **Fertility testing:** Will be carried out by preparative staff as needed.
- **Perioperative type and screen:** Will be ordered by surgeon, anesthesiologist, or neuroradiologist, as indicated, or blood bank (UNI) where minimum allowable blood loss of type and screen criteria have been instituted.
- **Warfarin therapy:** It is unnecessary for the INR remote from the surgery date only for the purpose of the preoperative work-up.
- **Antithrombotic drug (AED) levels:** Should be obtained only for patients on Carisoprodol, Tranexamic acid, Phenprocoumon, or Warfarin, and who meet at least one of the following criteria: a history of unstable AED levels, a surgery within the last 6 months, or undergoing major gastrointestinal surgery.

**Legend: Tests**
- CBC: Complete Blood Count
- ALT: Alanine Aminotransferase
- AST: Aspartate Aminotransferase
- BUN: Blood Urea Nitrogen
- Glu: Glucose
- INR: International Normalized Ratio
- K: Potassium
- Na: Sodium
- TCO₂: Total Carbon Dioxide
- Cr: Creatinine
- MCH: Mean Corpuscular Hemoglobin
- MCHC: Mean Corpuscular Hemoglobin Concentration
- HCT: Hematocrit
- WBC: White Blood Cells
- RBC: Red Blood Cells
- Hgb: Hemoglobin

**Legend: Patient Characteristics**
- **ACE Inhibitors, Angiotensin Receptor Blockers:**
- **Diabetes Mellitus:**
- **Hypertension:**
- **Congestive Heart Failure:**
- **COPD:**
- **Chronic Obstructive Pulmonary Disease:**
- **Renal Disease:**
- **Liver Disease:**
- **Multifactorial Health Risks:**

For more examples of minor & major surgery, please see the reverse side.

To access the electronic version of this document, please visit: wrha.mb.ca/standard/guidelines/gp03.php

For an interactive preop test decision aid, visit: lagunard.com/preop/test or use the QR code above.

Revised: 2016.07.06
### Appendix A: (continued)

#### MAJOR & MINOR SURGERY: COMMON EXAMPLES

The common minor and major surgeries listed in this table generally adhere to the definitions given. However, clinical judgment should be applied. If higher than expected blood loss, fluid shifts and invasiveness are likely due to exceptional surgical pathology, then it would be appropriate to consider a minor surgery as a major surgery and order preoperative tests accordingly (i.e. very large basal cell carcinoma, extensive hyst of adhesions for endomets).
Appendix B: THE JOHNS HOPKINS SURGICAL CLASSIFICATION SYSTEM

<table>
<thead>
<tr>
<th>Category 1</th>
<th>Category 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal risk to the patient independent of anaesthesia</td>
<td>Minimal to moderately invasive procedure</td>
</tr>
<tr>
<td>Minimally invasive procedures with little or no blood loss</td>
<td>Blood loss less than 500 cc</td>
</tr>
<tr>
<td>Often done in an office setting with the operating room used principally</td>
<td>Mid risk to patient independent of anaesthesia</td>
</tr>
<tr>
<td>for anaesthesia and monitoring</td>
<td></td>
</tr>
<tr>
<td>Includes:</td>
<td></td>
</tr>
<tr>
<td>Breast biopsy</td>
<td></td>
</tr>
<tr>
<td>Removal of minor skin or subcutaneous lesions</td>
<td></td>
</tr>
<tr>
<td>Myringotomy/myringoplasty</td>
<td></td>
</tr>
<tr>
<td>Hysteroscopy</td>
<td></td>
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<tr>
<td>Cystoscopy</td>
<td></td>
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<tr>
<td>Vasectomy</td>
<td></td>
</tr>
<tr>
<td>Circumcision</td>
<td></td>
</tr>
<tr>
<td>Fiberoptic bronchoscopy</td>
<td></td>
</tr>
<tr>
<td>Excludes:</td>
<td></td>
</tr>
<tr>
<td>Open exposure of internal body organs</td>
<td></td>
</tr>
<tr>
<td>Repair of vascular or neurological structures</td>
<td></td>
</tr>
<tr>
<td>Placement of prosthetic devices</td>
<td></td>
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<tr>
<td>Entry into abdomen, thorax, neck, cranium or extremities</td>
<td></td>
</tr>
<tr>
<td>Postoperative monitored care setting (ICU, ACU)</td>
<td></td>
</tr>
<tr>
<td>Category 3</td>
<td>Category 4</td>
</tr>
<tr>
<td>Moderately to significantly invasive procedure</td>
<td>Highly invasive procedure</td>
</tr>
<tr>
<td>Blood loss potential 500–1500 cc</td>
<td>Blood loss greater than 1500 cc</td>
</tr>
<tr>
<td>Moderate risk to patient independent of anaesthesia</td>
<td>Major risk to patient independent of anaesthesia</td>
</tr>
<tr>
<td>Includes:</td>
<td></td>
</tr>
<tr>
<td>Thyroidectomy</td>
<td>Major orthopaedic/spinal reconstruction</td>
</tr>
<tr>
<td>Hysterectomy</td>
<td>Major resection of the gastrointestinal tract</td>
</tr>
<tr>
<td>Myomectomy</td>
<td>Major gynaecological surgery (e.g. radical retropubic prostatectomy)</td>
</tr>
<tr>
<td>Cystectomy</td>
<td>Major vascular repair without postoperative ICU stay</td>
</tr>
<tr>
<td>Cholecystectomy</td>
<td></td>
</tr>
<tr>
<td>Laminctomy</td>
<td></td>
</tr>
<tr>
<td>Hip/knee replacement</td>
<td></td>
</tr>
<tr>
<td>Neophrectomy</td>
<td></td>
</tr>
<tr>
<td>Major laparoscopic procedures</td>
<td></td>
</tr>
<tr>
<td>Resection/reconstructive surgery of the digestive tract</td>
<td></td>
</tr>
<tr>
<td>Excludes:</td>
<td></td>
</tr>
<tr>
<td>Open thoracic or intracranial procedure</td>
<td>Major exposure of internal body organs</td>
</tr>
<tr>
<td>Major vascular repair (e.g. aortofemoral bypass)</td>
<td>Major resection of major body organs</td>
</tr>
<tr>
<td>Planned postoperative monitored care setting (ICU, ACU)</td>
<td></td>
</tr>
</tbody>
</table>

Category 3
Moderate risk to patient independent of anaesthesia

Includes:

Category 4
Major orthopaedic/spinal reconstruction

Includes:

Category 5
Highly invasive procedure

Includes:

Cardiopulmonary bypass

Excludes:

Category 4
Major vascular surgery

Includes:

Intracranial procedure

Excludes:

Category 5
Critical risk to patient independent of anaesthesia

Includes:

Major exposure of cranial nerves

Excludes: