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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/>), 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

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<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 or by scanning the QR code below.



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6. **SOURCE/REFERENCES**

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7. **PRIMARY AUTHOR**

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8. **ALTERNATE CONTACT**

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9. **APPENDICIES**

Appendix A: Routine Preoperative Lab Test Guideline Algorithm

Appendix B: The Johns Hopkins Surgical Classification System

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Appendix A: Routine Preoperative Lab Test Guideline Algorithm

ROUTINE PREOPERATIVE LAB TEST GUIDELINES

For adult patients (≥ 16 years) undergoing elective surgery

TESTS WITHIN 6 MONTHS OF SURGERY are valid, provided there has been no interim change in the patient's condition.

CLINICAL JUDGEMENT IS REQUIRED as additional tests may be appropriate for patients with complex or uncommon surgical or medical conditions.

EXCLUSIONS this guideline does not apply to patients undergoing cardiac surgery or cesarean section.

MINOR SURGERY

Associated with an expected blood loss of <500mL, minimal fluid shifts and is typically done on an ambulatory basis (day surgery/ same day discharge)*. It includes cataract surgery; breast surgery without reconstruction; laparoscopic cholecystectomy and tubal ligation; and most cutaneous, superficial, endoscopic and arthroscopic procedures.

DO NOT ORDER PREOP TESTS including: chest x-rays, Na⁺, K⁺, Cl⁻, TCO₂, serum glucose, CBC, ECG, INR, urinalysis, renal, liver or thyroid function tests in asymptomatic** patients.

** **ASYMPTOMATIC** implies the patient does not have new or worsened symptoms to suggest a new lab test abnormality, (e.g. if the patient does not have new or worsened symptoms of an arrhythmia, congestive heart failure, dyspnea or ischemic heart disease, an ECG would not be recommended).

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 resection of organs; large joint replacements; mastectomy with reconstruction; and spine, thoracic, vascular, or intracranial surgery.

* if the surgery is typically ambulatory but the patient has a medical or social reason for overnight admission (i.e. OSA, no support at home), still consider the surgery minor in determining which lab tests to order.

All Major + Age: 16-49 years old or Age: 50+ years old

Order CBC

• add ECG for patients with DM, HTN, Renal, Cardiovascular or severe Respiratory disease.

• add Na⁺, K⁺, Cl⁻, TCO₂, & Cr/ eGFR for patients with DM; HTN; Malnutrition; BMI > 40; Renal, Liver or Thyroid disease; or for those on Digoxin, Diuretic, ACE, ARB or Oral Corticosteroid therapy.

• add ECG

• add Na⁺, K⁺, Cl⁻, TCO₂,

• add Cr/ eGFR

MAJOR SURGERY, ALL AGES: Other tests indicated by patient characteristics & medications

- Oral Corticosteroids, DM or BMI > 40: add Hemoglobin A1C or fasting plasma glucose.
- Malnutrition, BMI > 40, or Liver disease: add liver function tests and INR.
- At high risk for iron deficiency: add serum iron, TIBC and Ferritin.
- Thyroid disease: add TSH.

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

SPECIFIC DIRECTIONS FOR OTHER TESTS & CONDITIONS

- Urinalysis:** Not recommended except for specific surgeries, at the surgeon's discretion.
- Pulmonary function tests, spirometry, or arterial blood gases:** No routine indications except prior to thoracic surgery, as ordered by the surgeon.
- Pregnancy testing:** Will be carried out by preoperative staff as required.
- Preoperative type and screen:** Will be ordered by surgeon, anesthesiologist or pre-anesthesia clinic when indicated, or by pre-anesthesia clinic where maximum allowable blood loss or type and screen criteria have been instituted.
- Warfarin therapy:** It is unnecessary to test the INR remote from the surgery date solely for the purpose of the preoperative work up.
- Antiepileptic drug (AED) levels:** Should be obtained only for patients on Carbamazepine, Phenobarbital, Phenytoin, or Valproic acid who meet at least one of the following criteria: a history of unstable AED levels, a seizure within the last 6 months, or undergoing major gastrointestinal surgery.

LEGEND: TESTS


- CBC:** Complete Blood Count.
- Cr/ eGFR:** Creatinine and if available, estimated Glomerular Filtration Rate.
- ECG:** Electrocardiogram.
- Liver function tests:** AST, ALT, Alk Phos, GGT, albumin, total and direct bilirubin.
- Na⁺, K⁺, Cl⁻, TCO₂:** Serum sodium, potassium, chloride and total carbon dioxide.

LEGEND: PATIENT CHARACTERISTICS

- ACE:** Angiotensin Converting Enzyme inhibitor medication.
- ARB:** Angiotensin Receptor Blocker medication.
- DM:** Diabetes Mellitus.
- HTN:** Hypertension.
- Cardiovascular disease:** Previous or current myocardial infarction, angina, congestive heart failure, valvular heart disease, atrial fibrillation or other arrhythmia, stroke, TIA or peripheral vascular disease.
- Severe respiratory disease:** Dyspnea or other physical limitation prevents the patient from climbing a flight of stairs or running a short distance.
- Renal disease:** History of proteinuria or elevated creatinine / reduced GFR.
- Liver disease:** Includes jaundice, hepatitis, cirrhosis, hepatic metastases and ethanol abuse (defined as average intake > 2 standard drinks per day).
- Malnutrition:** Includes patients with BMI < 19; Unintentional ≥ 10% body weight loss over previous 6 months; inflammatory bowel disease; oral, esophageal, gastric or pancreatic malignancy.
- High risk of iron deficiency:** Anemic patients with low MCV or high RDW on CBC.

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/extranet/eipt/EIPT-003.php
 For an interactive preop test decision aid, visit: logixmd.com/preop or use the QR code above

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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 lysis of adhesions for endometriosis).

MINOR	MAJOR	MINOR	MAJOR
ENT and Oral Surgery <ul style="list-style-type: none"> • Tooth extraction • Tonsillectomy and/or adenoidectomy • Septoplasty, turbinatectomy and rhinoplasty • Pharyngeal or laryngeal biopsy or minor excision by laser or other means • Middle ear surgery, mastoidectomy, cochlear implantation • Endoscopic sinus surgery • Small resections of benign and malignant masses, done on an ambulatory basis (i.e. mandibular tori, brachial cleft cyst, small tongue cancer) • Thyroidectomy 		Orthopedic Surgery <ul style="list-style-type: none"> • Arthroscopic surgery including ACL repair • Routine hardware removal, not for infection • Tendon surgery • Bunionectomy • Discectomy 	
General Surgery <ul style="list-style-type: none"> • Breast lumpectomy or mastectomy with or without lymph node biopsy or axillary dissection • Inguinal or umbilical hernia repair by laparoscopic or open approach • Laparoscopic cholecystectomy • Hemorrhoidectomy 		Plastic Surgery <ul style="list-style-type: none"> • Carpal tunnel release • Dupuytren's contracture release • Major and minor tendon surgery • Small rotational flaps and skin grafts • Basal cell carcinoma resection • Lipoma excision • Reduction mammoplasty and other surgery for benign breast disease • Cosmetic breast surgery 	
Gynaecology <ul style="list-style-type: none"> • Dilatation and curettage • Diagnostic hysteroscopy, laparoscopy • Endometrial ablation by thermal balloon • Tubal ligation • Laparoscopy - limited endometriosis • Transvaginal tape insertion 		Thoracic Surgery <ul style="list-style-type: none"> • Bronchoscopy • Mediastinoscopy • Resection of lung, esophagus or mediastinal mass (Thoracoscopic or open) • Hiatal hernia repair (Thoracoscopic or open) 	
Neurosurgery and Spine Surgery <ul style="list-style-type: none"> • Discectomy 		Urology <ul style="list-style-type: none"> • Cystoscopy, Ureteroscopy, Renoscopy for stone, stricture or biopsy • Hydrocele and varicocele excision • Vasectomy • Circumcision 	
Ophthalmology <ul style="list-style-type: none"> • Cataract extraction and most other ophthalmological procedures 		Vascular Surgery <ul style="list-style-type: none"> • Varicose vein excision 	
		<ul style="list-style-type: none"> • Free flap reconstruction • Panniculectomy 	
		<ul style="list-style-type: none"> • Resection of bladder or prostate tumor (transurethral or open) • Resection of kidney or ureter (laparoscopic or open) • Resection of testis (transscrotal or abdominal) 	
		<ul style="list-style-type: none"> • Amputation • Peripheral arterial bypass surgery • Aortic aneurysm repair (endovascular or open) • Carotid endarterectomy 	
		<ul style="list-style-type: none"> • Mastectomy with immediate tissue reconstruction, with or without lymph node biopsy or axillary dissection • Laparoscopic or open repair or resection of stomach, small bowel, colon, liver, pancreas, spleen, adrenals or liver • Open cholecystectomy • Large incisional, epigastric or ventral hernia repairs 	
		<ul style="list-style-type: none"> • Hysteroscopic resection or ablation • Hysterectomy and/or adnexal surgery (any approach) • Laparoscopy for extensive endometriosis • Abdominal or transvaginal pelvic floor surgery 	
		<ul style="list-style-type: none"> • Intracranial surgery • Spinal laminectomy and/ or fusion 	

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Appendix B: THE JOHNS HOPKINS SURGICAL CLASSIFICATION SYSTEM

<p style="text-align: center;">Category 1</p> <p>Minimal risk to the patient independent of anaesthesia Minimally invasive procedures with little or no blood loss Often done in an office setting with the operating room used principally for anaesthesia and monitoring</p> <p style="text-align: center;"><i>Includes:</i></p> <ul style="list-style-type: none"> Breast biopsy Removal of minor skin or subcutaneous lesions Myringotomy/tubes Hysteroscopy Cystoscopy Vasectomy Circumcision Fibreoptic bronchoscopy <p style="text-align: center;"><i>Excludes:</i></p> <ul style="list-style-type: none"> Open exposure of internal body organs Repair of vascular or neurological structures Placement of prosthetic devices Entry into abdomen, thorax, neck, cranium or extremities Placement of prosthetic devices Postoperative monitored care setting (ICU, ACU) 	<p style="text-align: center;">Category 3</p> <p>Moderately to significantly invasive procedure Blood loss potential 500–1500 cc Moderate risk to patient independent of anaesthesia</p> <p style="text-align: center;"><i>Includes:</i></p> <ul style="list-style-type: none"> Thyroidectomy Hysterectomy Myomectomy Cystectomy Cholecystectomy Laminectomy Hip/knee replacement Nephrectomy Major laparoscopic procedures Resection/reconstructive surgery of the digestive tract <p style="text-align: center;"><i>Excludes:</i></p> <ul style="list-style-type: none"> Open thoracic or intracranial procedure Major vascular repair (e.g. aortofemoral bypass) Planned postoperative monitored care setting (ICU, ACU)
<p style="text-align: center;">Category 2</p> <p>Minimal to moderately invasive procedure Blood loss less than 500 cc Mild risk to patient independent of anaesthesia</p> <p style="text-align: center;"><i>Includes:</i></p> <ul style="list-style-type: none"> Diagnostic laparoscopy Dilatation and curettage Fallopian tubal ligation Arthroscopy Inguinal hernia repair Laparoscopic lysis of adhesions Tonsillectomy/adenoidectomy Umbilical hernia repair Septoplasty/rhinoplasty Percutaneous lung biopsy Laparoscopic cholecystectomy Extensive superficial procedures <p style="text-align: center;"><i>Excludes:</i></p> <ul style="list-style-type: none"> Open exposure of internal body organs Repair of vascular or neurological structures Placement of prosthetic devices Postoperative monitored care Open exposure of abdomen, thorax, neck, cranium Resection of major body organs 	<p style="text-align: center;">Category 4</p> <p>Highly invasive procedure Blood loss greater than 1500 cc Major risk to patient independent of anaesthesia</p> <p style="text-align: center;"><i>Includes:</i></p> <ul style="list-style-type: none"> Major orthopaedic/spinal reconstruction Major reconstruction of the gastrointestinal tract Major genito-urinary surgery (e.g. radical retropubic prostatectomy) Major vascular repair without postoperative ICU stay
	<p style="text-align: center;">Category 5</p> <p>Highly invasive procedure Blood loss greater than 1500 cc Critical risk to patient independent of anaesthesia Usual postoperative ICU stay with invasive monitoring</p> <p style="text-align: center;"><i>Includes:</i></p> <ul style="list-style-type: none"> Cardiothoracic procedure Intracranial procedure Major procedure on the oropharynx Major vascular, skeletal, neurological repair