

Point-of-Care Testing: Summary of Evidence

Point-of-care, or POC, testing occurs at or near where a patient is located and may be used for many different purposes. POC testing can include tests conducted by a patient (self-monitoring), family member, care provider, or community health professional at home; and tests conducted inside a clinic, hospital, laboratory, or long-term care facility.

CADTH has reviewed the evidence on POC testing for the following health services areas, which are included in this summary:

- cardiac/vascular
- diabetes
- infectious diseases
- ultrasound and imaging.

CADTH resources on **optimizing the use of lab tests** and **diabetes management** provides more evidence-based information.

Cardiac/Vascular

Testing the International Normalized Ratio for Patients on Warfarin

Point-of-Care Testing of the International Normalized Ratio

(INR) for Patients Taking Warfarin or Other Vitamin K Antagonists

[systematic review, economic analysis, and guidance; and summary tool, 2013]

Technology: When prescribed oral anticoagulation therapy with warfarin or other vitamin K antagonists to prevent blood clots, patients must be monitored to ensure they are getting the right amount of the medication and are not at risk for bleeding or blood clots. The standard method for monitoring the drug therapy is laboratory testing of blood to measure the INR. POC testing is another way of monitoring the INR.

CADTH assessed relevant evidence found in six randomized controlled trials (RCTs) and 41 diagnostic accuracy evaluation studies. A cost-utility analysis was conducted using resource utilization related to various INR testing strategies and effectiveness measured in quality-adjusted life-years.

Key Messages:

- Point-of-care INR testing with a POC INR device is an accurate alternative to lab INR testing.
- Patient self-management (POC INR testing and dose adjustment) is the most cost-effective option, when feasible.
- Patient self-testing with health care provider dose adjustment may be an option when lab INR testing is difficult.
- Clinic-based POC INR testing requires careful consideration of context and costs.

Troponin Testing for Patients with Acute Coronary Syndrome

Point-of-Care Troponin Testing in Patients with Symptoms Suggestive of Acute Coronary Syndrome [systematic review and economic analysis, 2015]

Technology: POC cardiac troponin tests offer short turnaround times for biomarker detection, typically providing results within 10 to 20 minutes compared with the typical turnaround time of an hour for central laboratory testing. As a result, POC troponin testing could potentially expedite care in the emergency department, improving patient flow and reducing emergency room congestion.

CADTH assessed relevant evidence found in 41 diagnostic accuracy studies (plus five companion reports) and two evidence-based guidelines. The economic evaluation investigated the cost-effectiveness of POC troponin compared with central laboratory testing.

Key Messages:

- Use POC testing for patients with suspected acute coronary syndrome, myocardial infarction, or unstable angina if immediate access to a central laboratory is not possible.
- Use laboratory troponin testing if a central laboratory is immediately available.

The 2013 CADTH report on high-sensitivity troponin for acute coronary syndrome may also be of interest: *High-Sensitivity Cardiac Troponin for the Rapid Diagnosis of Acute Coronary Syndrome in the Emergency Department* [systematic review, economic analysis, and guidance, 2013]

Testing for Vascular Surgery and Obstetrics

Viscoelastometric Point-of-Care Testing for Vascular Surgery and Obstetrics [summary with critical appraisal, 2016]

Technology: Viscoelastometric POC testing is used to determine whether bleeding is a result of coagulopathy (i.e., an impairment of the blood's ability to clot) or other factors (e.g., surgical bleeds) — mainly in people undergoing major surgery or in need of emergency control of bleeding caused by postpartum hemorrhage.

CADTH assessed relevant evidence found in one RCT and two non-randomized controlled studies.

Key Messages:

- Significant reductions in the transfusion of some blood products and the administration of some coagulation factors were reported for patients undergoing aortic surgery.
- It is uncertain whether the study sample sizes had sufficient ability to detect a real difference in outcomes and if their findings are generalizable to Canadian patients and settings.

Diabetes

Self-Monitoring of Blood Glucose

Optimal Self-Monitoring of Blood Glucose [current practice and recommendations report, 2009; and tools, 2016]

Technology: Self-monitoring of blood glucose (SMBG) is used to collect information about glucose levels. This information can be used to inform appropriate action should levels be outside of the desired range. SMBG requires obtaining a small blood sample. The blood sample is applied to a reagent or test strip, and glucose concentration is determined by an electronic blood glucose monitor.

CADTH assessed relevant evidence found in 12 RCTs, one non-randomized trial, and 18 observational studies. The economic evaluation focused on cost-effectiveness, cost-utility, and cost consequence analysis.

Key Messages:

- For people with type 1 or type 2 diabetes using basal-bolus insulin regimens, SMBG should be individualized to guide adjustments in insulin therapy to achieve optimal blood glucose control.
- In adults with type 2 diabetes using basal insulin, SMBG should be individualized, but testing of up to 14 times per week should be sufficient for most patients, at most times.
- Most adults with type 2 diabetes managed on oral antidiabetes drugs do not require routine SMBG. Periodic testing in selected patients (e.g., those with unstable glucose levels, acute illness, pharmacotherapy changes, risk of hypoglycemia with insulin secretagogues like glyburide) should be linked to specific patient actions (e.g., prevention or management of hypoglycemia, self-directed dosage adjustment).
- Most adults with type 2 diabetes controlled by diet alone should not require routine SMBG.

Blood Glucose Monitors and Test Strips

Blood Glucose Monitors and Test Strips: An Update

[summary with critical appraisal, 2013; and an update of the 2011 report]

Technology: SMBG requires obtaining a small blood sample – usually capillary blood from a finger puncture. The blood sample is applied to a reagent strip (or blood glucose test strip), and the glucose concentration is determined by an electronic monitor. A variety of blood glucose monitors and test strips are available in Canada.

CADTH assessed relevant evidence found in two diagnostic accuracy studies.

Key Messages:

For SMBG for patients with diabetes:

- Five blood glucose monitors available in Canada were reviewed and are clinically accurate.
- No evidence was found on the cost-effectiveness of blood glucose monitors and test strips for patients with diabetes.
- No evidence on glucose monitors or test strip features related to better patient outcomes was found.

Infectious Diseases

Testing for Infectious Diseases

Point of Care Tests for Infectious Diseases

[summary with critical appraisal, 2016]

Technology: Over-the-counter POC testing for patient self-testing or pharmacist testing is available for HIV, hepatitis C, influenza, and streptococcal infections. To identify antibodies for HIV and hepatitis C infections, a rapid antibody test (e.g., OraQuick) is available for POC testing. For influenza A and B infections, and streptococcal infection, a rapid antigen detection test (e.g., QuickVue) can be used as a POC diagnostic test.

CADTH assessed relevant evidence found in two systematic reviews/meta-analyses, one diagnostic accuracy study, and one cost study.

Key Messages:

- POC tests provide a reliable diagnostic strategy for hepatitis C virus and group A streptococcal pharyngitis infections, but performance may vary among different POC tests.
- Findings from one trial showed that POC testing can be a useful tool for influenza A and B infections, but its low sensitivity suggests that a negative POC test needs confirmation.
- For patient self-testing or pharmacist testing for HIV, hepatitis C, influenza, or streptococcal infections, there was no evidence found on the clinical effectiveness or evidence-based guidelines compared with conventional testing in a laboratory.
- The costs – per test, per person – were similar between POC tests and laboratory-based assays.

Blood Testing for Patients in the Emergency Department

Three- versus Five-Part Differential Complete Blood Count Testing for Patients in the Emergency Department [summary with critical appraisal, 2016]

Technology: White blood cell counts and their five subgroups of cell types (often called “differentials”) are common clinical measurements. The five-part differentials usually performed in central laboratories are neutrophils, lymphocytes, monocytes, eosinophils, and basophils.

Three-part differentials consider granulocytes (neutrophils, eosinophils, and basophils together as one group), lymphocytes, and monocytes. POC blood analyzers usually measure three-part differentials. POC analyzers reduce turnaround time (e.g., for patients presenting to the emergency department). More timely medical decisions can be made in remote sites or in outpatient settings with blood taken from a finger stick.

CADTH assessed relevant evidence found in one diagnostic accuracy study.

Key Messages:

- The use of Chempaq XBC in the emergency room setting showed good agreement with laboratory-based analyzer results for the granulocyte and the lymphocyte counts but not for the monocytes.
- There is potential risk of misdiagnosis for conditions where monocyte counts may be high or low.
- There were no evidence-based guidelines found regarding the use of three-part differentials of complete blood cell count tests for patients presenting to emergency departments.

Testing for White Blood Cell Counts

Point of Care Testing Compared to Laboratory Testing for the Assessment of White Blood Cell Counts and Differentials [summary with critical appraisal, 2013]

Technology: After drawing a blood sample from a patient, white blood cell counts and differentials are performed in central laboratories using blood analyzers. POC-testing technologies are currently being developed with the aim of reducing the turnaround time for receiving blood cell count results and, therefore, allowing for more timely medical decisions to be made in remote sites or in outpatient settings.

CADTH assessed relevant evidence found in four observational studies and one guideline.

Key Messages:

- In general, POC testing technologies are as accurate and precise as analyzers in centralized laboratories.
- No studies comparing the clinical or cost-effectiveness of POC testing with that of standard laboratory testing were found.

Ultrasound and Imaging

Ultrasound Devices Used in Emergency Medical Services

Portable Ultrasound Devices in the Pre-Hospital Setting
[summary with critical appraisal, 2015]

Technology: Portable ultrasound can assist in treating patients in critical conditions. Portable ultrasound devices, also referred to as point-of-care ULTRASOUND (POCUS), mobile ultrasound, bedside ultrasound, and encompassing specific procedures such as focused assessment with sonography for trauma (FAST), comprise a range of technologies including hand-held devices, conventional mobile bedside devices, and other devices with mobility.

CADTH assessed relevant evidence found in two systematic reviews and one non-randomized study (retrospective chart review).

Key Messages:

- Pre-hospital portable ultrasound use for a variety of clinical applications may improve the patient care process.
- There was insufficient evidence directly evaluating the clinical benefits of portable ultrasound regarding direct patient outcomes.

Computed Tomography Imaging for the Diagnosis of Kidney Stones

Computed Tomography Imaging for the Diagnosis of Renal Colic
[summary with critical appraisal, 2014]

Technology: There are alternatives to computed tomography (CT) that can minimize or avoid radiation. For example, portable ultrasound uses high-frequency sound waves to produce images of structures inside the body. These technologies may not be as accurate as standard CT when kidney stones are small.

CADTH assessed relevant evidence found in one RCT.

Key Messages:

- Patients undergoing CT and portable ultrasound experience similar complication rates from delayed or missed diagnoses of renal colic.
- No evidence was found on the cost-effectiveness of using CT compared with portable ultrasound to diagnose renal colic in an emergency setting.

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CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

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