



Context

Clinical laboratory testing is integral to the delivery of health care, as a significant majority of medical decisions are influenced by the results of laboratory tests.¹⁻³ However, it is suggested that approximately 20% to 50% of laboratory testing may not be appropriate; that is, the testing is redundant, not clinically relevant for the patient, or not ordered as per evidence-based practice.^{2,4-10} Overutilization of tests may lead to the provision of health care services and interventions of questionable benefit, while underutilization of appropriate tests may lead to adverse health outcomes and increased future use of health care resources.^{8,11} Furthermore, laboratory costs are increasing disproportionately compared to other health care costs, and many laboratory budgets are strained.^{2,7-9}

There is a desire across many jurisdictions to ensure laboratory tests are utilized optimally for patient health and to promote more efficient use of increasingly limited health care resources. There are examples of initiatives and strategies aimed at optimizing laboratory utilization across Canada and around the world; however, few mechanisms are in place to promote awareness of such initiatives. This report will help inform health care decision-makers who operate within hospitals, health regions, and/or ministries of health on initiatives underway in Canada and internationally.

Objectives

The purpose of this Environmental Scan is to promote awareness of Canadian and international laboratory utilization optimization initiatives that are recently completed, currently underway, or planned in the near

future. While initiatives designed to improve laboratory quality assurance, accreditation standards, service delivery, equitable access, and/or technical training are important to the effective delivery of diagnostic services, they are not the focus of this report.

This Environmental Scan complements a previous scan prepared by CADTH in 2011 pertaining to the funding of laboratory testing in Canada,¹² a 2013 CADTH Rapid Response report on techniques to improve diagnostic laboratory test ordering,¹³ and a 2013 French-language report prepared by INESSS — Institut national d'excellence en santé et en services sociaux — on Canadian and international strategies implemented to optimize the appropriateness of laboratory test ordering.¹⁴

Findings

This Environmental Scan is not intended to provide a comprehensive review of the topic. Results are based on a limited search of the literature published during the last five years (2009 to 2014) and information provided by individuals involved in the provision of laboratory services across Canada. The information gathered is current as of April 2014.

Laboratory optimization initiatives vary substantially in their objectives and approaches. Strategies identified by this scan included:

- limiting or eliminating reimbursement of specific tests¹⁵
- reorganizing laboratory services¹⁶
- changing test order forms¹⁷
- incorporating clinical decision support tools¹⁸
- providing health care provider and patient education¹⁹
- analyzing and communicating ordering practices²⁰

- reassessing reflex testing²¹
- providing financial incentives.²²

In Canada, laboratory utilization optimization initiatives are being led at micro-, meso-, and macro-levels; that is, national or regional professional associations, provincial ministries of health, regional health care authorities, and hospitals.

National Initiatives

Choosing Wisely Canada, launched in April 2014 and modelled after the American Choosing Wisely campaign,²³ is an initiative “to help physicians and patients engage in conversations about unnecessary tests, treatments and procedures, and to help physicians and patients make smart and effective choices to ensure high-quality care.”¹⁹ Unlike many health care optimization campaigns, Choosing Wisely Canada is not funded or governed by health care payers but by the Canadian Medical Association (CMA), the University of Toronto, and national medical specialty organizations. Appropriate laboratory testing was mentioned in the Choosing Wisely Canada lists of treatments and procedures that “physicians and patients should question” provided by the Canadian Rheumatology Association,²⁴ the Canadian Society of Internal Medicine,²⁵ and the CMA’s Forum on General and Family Practice Issues together with the College of Family Physicians of Canada.²⁶

Choosing Wisely Canada is attempting to form a “national learning collaborative” and is seeking contact with early adopters of its recommendations.²⁷ Three such early adopters are Diagnostic Services of Manitoba Inc. (Jim Slater, Chief Executive Officer, Diagnostic Services of Manitoba Inc., Winnipeg, MB: personal communication, Aug 2014), a collaboration of organizations in Alberta,²⁸ and North York General Hospital in Ontario.²⁹

Provincial, Regional, and Local Initiatives

Several provinces, including Ontario³⁰ and Manitoba,³¹ have instituted or are in the process of instituting province-wide electronic laboratory information systems that should improve both access to and timeliness of laboratory and diagnostic imaging test results. Such systems should guide those who order laboratory tests toward more appropriate use — for example, by reducing unnecessary repeat testing. These systems may also facilitate the identification of patterns of potential over- and underutilization of tests, and provide standardized data to inform future initiatives.

Some jurisdictions are in the process of adopting strategic plans or legislation that, while not utilization optimization initiatives in and of themselves, may provide frameworks and support for the development of such initiatives. Examples include the Diagnostic Services of Manitoba 2013-2016 Provincial Strategic Plan³² and the Legislative Assembly of British Columbia’s Bill 7 – 2014 *Laboratory Services Act*.³³

While not all regions have formal laboratory utilization management strategies or working groups, other appropriate-use efforts are being undertaken, such as memoranda on specific tests (e.g., at Health PEI, the health authority in Prince Edward Island³⁴) and attempts to unify or coordinate test services across hospitals (e.g., EORLA — the Eastern Ontario Regional Laboratory Association^{16,35}).

Alberta

Toward Optimized Practice (TOP) is an initiative to help Alberta’s health care professionals “implement evidence-based practices to enhance the care of their patients.”³⁶ While TOP provides clinical practice guidelines by clinical indication, many of its publications incorporate guidance on the appropriateness of laboratory tests — for example, vitamin D testing³⁷ and thyroid testing.³⁸

Also, Alberta Health Services Laboratory Services has provided clinicians and laboratory professionals with a series of bulletins³⁹ aimed at supporting the key objectives of improving access to services, improving laboratory processes, and standardizing best practices within its regions.⁴⁰ In 2013, Alberta established a provincial laboratory utilization office to support utilization management initiatives.⁴¹

British Columbia

The Laboratory Reform Committee of the British Columbia (BC) Ministry of Health and the British Columbia Medical Association made 43 recommendations in 2013 on a variety of provincial laboratory services including delivery, integration, utilization, costing, clinical guidance programs, and technology and information sharing. These recommendations were intended to achieve savings from outpatient services, and increase the efficiency and value of in-patient laboratory services.⁴² Additionally, the BC Ministry of Health commissioned a 2012 report on options for laboratory transformation that was primarily based on consideration of the perceived costs, strengths, and weaknesses of the BC laboratory system. Ideas from stakeholders on improving laboratory test ordering included implementing intelligent order entry with decision support systems, improving education and training of both practising physicians and medical students, and monitoring physician ordering practices.⁴³

Manitoba

As a participant in the “early adopter collaborative” of the National Choosing Wisely Canada initiative, Manitoba is committed to implementing recommendations put forth by Choosing Wisely Canada. Currently, five diagnostic recommendations have been selected. To implement these recommendations, Diagnostic Services Manitoba in collaboration with the George and Fay Yee Centre for Healthcare Innovation will operationalize a multi-faceted approach including, but not limited to, clinical champions, technical experts, project management support,

and resources dedicated to sustained change management for behaviour and practices. (Jim Slater, Chief Executive Officer, Diagnostic Services of Manitoba Inc., Winnipeg, MB: personal communication, Aug 2014).

Nova Scotia

The Nova Scotia Diagnostic Imaging, Pathology & Laboratory Medicine (DIPLM) Initiative is a joint partnership between the province’s district health authorities and the Department of Health and Wellness. The DIPLM Initiative is intended to be “an integrated provincial approach to planning services to enhance quality of care and patient safety, ensure equitable access, and ensure sustainability of the health care system in Nova Scotia.”⁴⁴ This initiative is also exploring collaboration opportunities across the Atlantic provinces.

The Cape Breton District Health Authority Health Transformation Office has communicated guidance on 26 laboratory and diagnostic imaging tests to physicians, along with some of the costs associated with each test.²⁰ In addition to the guidance, the physicians responsible for the top 50% of individual tests ordered are sent memos explaining their test ordering volume relative to total orders, as well as a follow-up memo comparing each physician’s post-intervention ordering to the same period in the previous year. As reported in June 2013, there was a 14.6% reduction in the volumes of 26 measured tests, representing a savings of approximately \$330,000 annually.

In the Capital District Health Authority in Nova Scotia, the Laboratory Utilization Committee was formed within the Department of Pathology and Laboratory Medicine in 2010 to monitor and evaluate utilization initiatives.⁴⁵ Utilization measures within the department include, but are not limited to, reviewing test ordering patterns with physicians, reviewing test utilization guidelines and algorithms, evaluating requests for new tests to be added

to the testing menu, and auditing individual physician test ordering patterns.

Ontario

Health Quality Ontario's Appropriateness Initiative,⁴⁶ overseen by a working group of the Ontario Health Technology Advisory Committee (OHTAC), investigates and informs OHTAC recommendations on health technology interventions that are potentially being used inappropriately. Previous OHTAC recommendations have led to changes in test coverage by the Ontario Health Insurance Plan, including changes to vitamin D,⁴⁷ folate, and aspartate aminotransferase testing.¹⁵

The Joint Pathology and Clinical Advisory Committee (JPCAC) of The Ottawa Hospital reviews physician and clinical program utilization of laboratory resources, and advises medical staff and hospital administration on their effective and efficient use.⁴⁸ The JPCAC establishes appropriateness of use and areas for improvement using data acquired from sources such as the Ontario Laboratories Information System to examine physician test ordering patterns. Additionally, JPCAC is undertaking a review of current order forms and care pathways to ensure appropriateness from both a laboratory and clinical practice perspective.⁴⁹

Quebec

The OPTILAB project, a program of the Quebec Ministère de la Santé et des Services sociaux, formed four committees dedicated to optimizing laboratory services within the province. Each committee has its own area of responsibility: improving access to laboratory services, improving the organization of laboratory services, ensuring the relevance of laboratory tests, and revising the provincial medical laboratories act.⁵⁰ An OPTILAB expert committee examining the appropriateness of medical laboratory tests, in conjunction with the Institut national d'excellence en santé et en services sociaux (INESSS), recently published clinician-friendly guidance on 14 biochemical

and hematological tests that are often used inappropriately.⁵¹

Saskatchewan

The Project Lead and Operations Committee at 3sHealth (Shared Services Saskatchewan) started a collaborative process aimed at saving costs in the medical laboratory services system, while simultaneously improving quality, reducing patient wait times, and increasing patient satisfaction. The 3sHealth project team has conducted several multidisciplinary "Visioning Days" to identify ideal future attributes for Saskatchewan's medical laboratory services system.⁵²

Initiatives Outside of Canada

Choosing Wisely, an initiative of the American Board of Internal Medicine (ABIM) Foundation in partnership with national medical specialty societies and consumer-focused organizations, produces physician- and patient-friendly educational materials aimed at facilitating shared decision-making to reduce unnecessary or inappropriate medical tests, interventions, and procedures.²³ The initiative has been adapted by Canadian medical societies into Choosing Wisely Canada (see the National Initiatives section in this scan) and other countries have expressed interest in implementing similar initiatives within their own borders.⁵³

The Centers for Disease Control and Prevention and the Association of Public Health Laboratories co-sponsor the Laboratory Efficiencies Initiative (LEI), which supports a sustainable public health laboratory system in the United States (US). The LEI's strategic goals include implementing innovative laboratory management practices, assuring informatics capabilities, identifying barriers to greater efficiency, assuring adequate resources, educating on the critical purpose of public health laboratories, and encouraging a culture of efficiency.⁵⁴

There are several hospital initiatives underway in the US, as well. The College of American Pathologists published a 2013 report on examples of laboratory utilization committees of major American hospitals, including the Mayo Clinic, Massachusetts General Hospital, Geisinger Medical Center, Lancaster General Hospital, the University of Michigan Health System, and Cedars-Sinai Medical Center.⁵⁵

Australia’s National Coalition of Public Pathology documented and reviewed laboratory test demand management strategies used in Australia in its 2012 *Encouraging Quality Pathology Ordering in Australia’s Public Hospitals* report. It made recommendations on the development of a standard definition of “appropriate” pathology test ordering, the

development of standard data sets on pathology use, and the monitoring of and participation in electronic health records and physician order-entry systems development.⁵⁶ The International Federation of Clinical Chemistry and Laboratory Medicine’s Education and Management Division, as part of its mission, facilitates the provision of critically evaluated information and education. Topics include principles and methods, quality management, utilization, and cost-effectiveness of laboratory measures and observations.⁵⁷ Several US and international hospitals or health authorities have recently published peer-reviewed journal articles on initiatives to optimize laboratory testing. These are captured in Table 1.

Table 1: International Institution-Based Laboratory Utilization Management Initiatives			
Lead Author, Year	Location	Intervention	Results
Initiatives Aimed at Single or Selected Tests			
Dickerson et al., 2014; ⁵⁸ Astion, 2014 ⁵⁹	US — Seattle Children’s Hospital	Active utilization management: Laboratory orders meeting specific criteria were flagged and reviewed for accuracy, medical necessity, insurance pre-authorization, and appropriateness of sequential rather than concurrent testing.	Over 8 months, 251 genetic test orders were reviewed. 8% of orders were changed to sequential testing, 16% of orders were cancelled, and 19% of the total costs for reviewed tests were saved.
Froom and Barak, 2012 ²¹	Israel — Clalit Health Services	Cessation of lab-initiated microscopic reflex testing of positive dipstick urinalysis results. Microscopic analysis done only upon physician request.	Microscopic analyses of dipstick tests decreased from 17.9% to less than 0.2% 78 months after the intervention, saving a minimum of US\$105,000 per year. No complaints were received related to the policy change.
Levick et al., 2013 ¹⁸	US — Lehigh Valley Health Network, Pennsylvania	Clinical decision support intervention was incorporated into established computerized order-entry system notifying physicians if a patient had already	Multivariate regression analyses indicated that, during the 28 months post-intervention, the clinical decision support feature was responsible for a 21% reduction in B-type natriuretic

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		undergone a B-type natriuretic peptide test and providing results. Physicians were permitted to continue with repeat test, if desired.	peptide test orders relative to the mean of the previous 17 months. Direct cost savings were estimated at US\$92,000 per year.
Luo et al., 2013 ⁶⁰	US — Stanford Medicine, California	A new policy rejecting repeat ordering of PCR testing for <i>C. difficile</i> was instituted. Repeat orders within 7 days yielded automated pop-up alerts with results and date of previous tests. A second message explaining the rationale of the policy was given to doctors who continued the order, with a notice that the laboratory would manually review the appropriateness of the order.	Repeat testing within 7 days fell from 14.5% of PCR for <i>C. difficile</i> tests prior to the intervention, to 1.3% of tests during the 3 years post-restriction ($P < 0.001$, retrospective analysis). The proportion of repeat tests done from 7 to 14 days after the initial test did not significantly change ($P = 0.12$). An informal estimate of US\$54,120 was saved over the 3-year follow-up, not including labour, antibiotic usage, isolation days, or hospital-wide costs.
Pageler et al., 2013 ⁶¹	US — Lucile Packard Children’s Hospital, California	Computerized order-entry system restricted the ordering of specific tests (CBC, certain chemistry and coagulation tests) to the current day (i.e., could not order repeat or future testing), encouraging daily evaluation for need. An alert informed the physician of the rule, with an allowable override.	During the year post-intervention, there were significantly lower CBC, chemistry, and coagulation tests run per patient-day compared with the pre-intervention year. Mean length of stays in both the pediatric intensive care unit and hospital decreased significantly over the year. Mortality decreased but was not statistically significant. Decreased costs were estimated at US\$500,000 per year.
Multifaceted or Comprehensive Test Utilization Initiatives			
Baricchi et al., 2012 ⁶²	Italy — Castelnovo né Monti health care district	Training sessions were given to all GPs in the district on 7 pathology-specific laboratory profiles, and the inclusion of a provisional diagnosis on order forms was encouraged. A second district without training	The overall number of tests decreased 5% over the following year (retrospective audit) in the district that provided the intervention, versus a 1% increase in the control district. GPs in the intervention district also increased reporting of

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Lead Author, Year	Location	Intervention	Results
		was used as a control.	provisional diagnoses more than in the control district.
Vegting et al., 2012 ⁶³	The Netherlands — VU University Medical Center Amsterdam	<p>There were multiple interventions within Internal Medicine, with the remainder of the hospital used as a control:</p> <ul style="list-style-type: none"> • Supervisors increased attention to test ordering • Panel tests were unbundled • National protocols were made easily accessible, and physicians were instructed to follow them • Posters and pocket cards with laboratory test costs were distributed to physicians • Weekly overviews of ordered tests were presented during the departmental morning report 	Internal Medicine reduced its laboratory test spending by 21% (€230,000) in the year following the intervention compared with a reduction of 14% (€1.2 million) in the rest of the hospital ($P < 0.02$).
Vidyarthi et al., 2014 ²²	US — UCSF (University of California, San Francisco) Medical Center	<p>Multiple interventions:</p> <ul style="list-style-type: none"> • Elimination of standing daily orders • Resident education sessions on over-testing, probability, and interpretation • Social marketing by opinion leaders • Academic detailing • Price lists for tests in newsletter • Financial incentives for residents if whole group met target goals 	Tests cumulatively reduced by 8% (260,666 tests) over 3 years, with savings of more than US\$2 million (\$1.3 million after incentives accounted for). No observed increases in readmissions or mortality.

CBC = complete blood count; *C. difficile* = *Clostridium difficile*; GP = general practitioner; PCR = polymerase chain reaction; US = United States.

Conferences and Continuing Education

Health care conferences, symposia, and education programs are more frequently incorporating laboratory utilization optimization presentations into their agendas. Upcoming or recent examples include:

- The Professional Development and Conferencing Services of the Faculty of Medicine, Memorial University 2013 webinar “Ordering Lab Tests? Let’s Talk About Five Things,” online⁶⁴
- Special Section in *Clinica Chimica Acta*, Volume 427, entitled “Utilization Management in the Clinical Laboratory,” January 2014, online⁶⁵
- The Canadian Society of Clinical Chemists June 2014 Conference, Charlottetown, PEI, Canada⁶⁶
- International Congress of Clinical Chemistry and Laboratory Medicine June 2014 Conference (IFCC WorldLab), Istanbul, Turkey⁶⁷
- The Canadian Association of Pathologists July 2014 Annual Meeting, Toronto, Ontario, Canada⁶⁸
- The Mayo Clinic Utilization Management Conference, September 2014, Rochester, Minnesota, US⁶⁹
- Preventing Overdiagnosis September 2014 conference, Oxford, United Kingdom⁷⁰
- The American Association for Clinical Chemistry 2014 webinar on Rational Utilization of Clinical Laboratory Testing, online⁷¹
- The Canadian Society for Medical Laboratory Science national conference (LABCON 2015), May 2015, Montreal, Quebec, Canada⁷²
- The Pathology Informatics Summit 2015 Conference in May, Pittsburgh, Pennsylvania, US⁷³
- Executive EDGE Innovations in Laboratory Management for Lab Leaders, October 2015 conference, Toronto, Ontario, Canada⁷⁴

Conclusion

Laboratory utilization optimization initiatives are underway in many jurisdictions in Canada. Additionally, the Choosing Wisely Canada campaign has the potential to impact the test utilization behaviour of clinicians and patients nationwide. Institutions outside Canada are also making strides to improve patient care and reduce costs through test utilization management.

Despite the numerous initiatives identified in this scan, there appears to be a general lack of data regarding their effectiveness. This is unfortunate, as published evaluations could promote more rapid uptake of strategies that are found to be effective.

While there are many laboratory utilization optimization initiatives underway, it is important to note that there are barriers that prevent the establishment and reduce the effectiveness of such initiatives. One barrier relates to the size of the data sets; “big data” typically constitute millions of data points and require new management and analysis methodologies, as conventional tools are often insufficient. Data structures that do not lend themselves to useful analysis represent another barrier, particularly when the use of different information management systems in various settings results in a lack of standardization or the need for resource-intensive data cleaning. Additionally, there are logistic, ethical, and legal difficulties in combining laboratory data with other medical or non-medical information that may be useful in determining the effectiveness of laboratory initiatives — for example, discharge diagnoses, ultimate patient outcomes, or socioeconomic status. Lastly, a lack of engagement from physicians and other key stakeholders can compromise the success of laboratory utilization optimization initiatives.

It is likely that the initiatives on laboratory utilization optimization identified in this scan significantly under-represent the total number of initiatives that have occurred, are occurring, or are planned to occur in Canada and internationally. This is due to the paucity of publicly available information, especially for regional and local efforts. While this report attempts to raise awareness of laboratory utilization optimization initiatives, it also highlights the need for increased access to publicly available information on these initiatives so others can benefit from knowledge of their successes, effectiveness, impact, and lessons learned.

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