



Addressing Low-Value Lab Testing in Canada

April 15, 2024



Introduction

Dr. Adina Weirnerman

- Sunnybrook Health Sciences Centre
- Choosing Wisely Canada

Learning Objectives

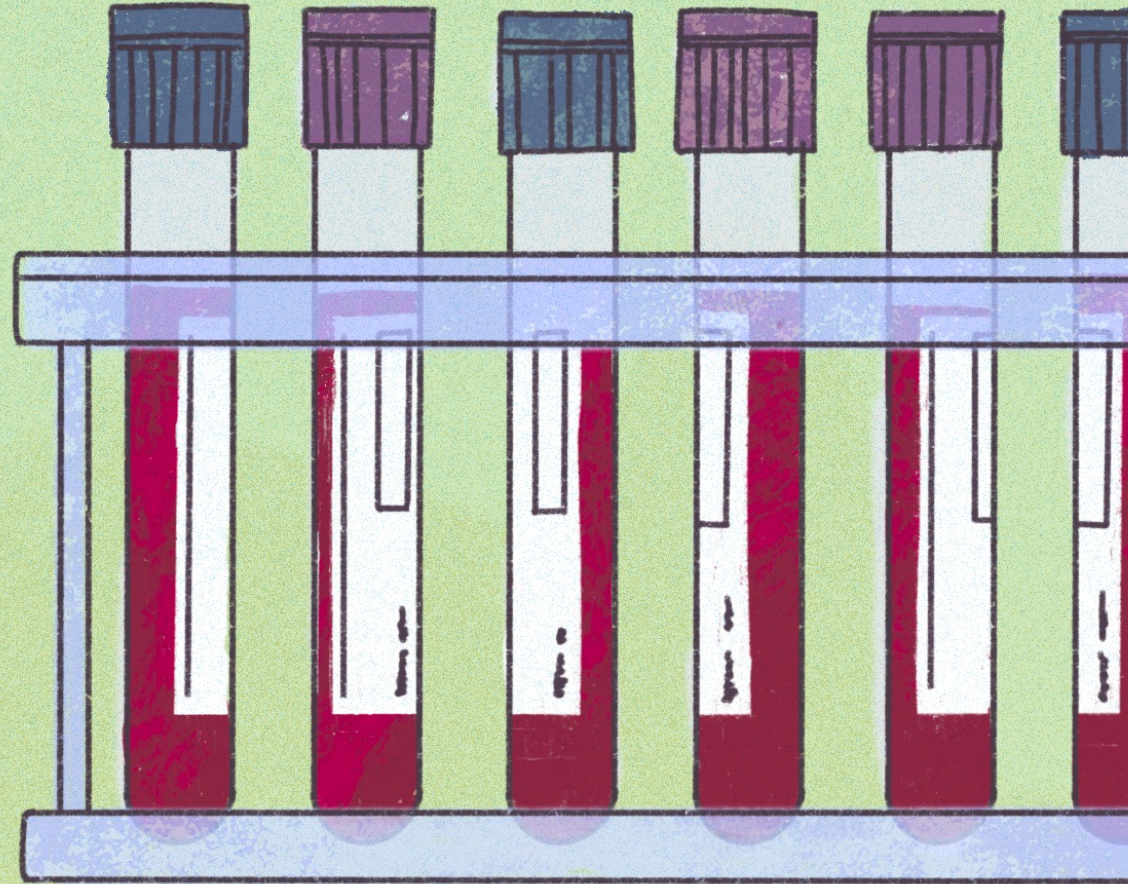
- Learn about ways to reduce lab overuse in your hospital or health system
- Describe examples of how implementation efforts have led to reductions in unnecessary lab testing
- Discuss new initiatives to create resources for hospitals and health systems to help curb lab overuse in Canada

Our Partners



Lab Testing in Canada

- Lab testing is the single highest volume medical activity
- Approximately **\$5.9 billion** annually spent on lab testing
- Estimated **16-56%** of lab tests offer no clinical value
- Risks of low-value lab testing: false positives, unnecessary follow-up referrals, potential patient harm





**Overuse
and
in C**

**Prog
Noveml**

This report found that overuse of **8 of the 12** selected tests and treatments declined by **10% or more** between 2014–2015 and 2019–2020.

Overuse remains an issue, and further reductions in low-value care are both possible and necessary.



To achieve widespread change, we need system-level changes in addition to continued efforts from front-line clinicians and patients.



Lab Supply Shortages (2022)

THE GLOBE AND MAIL

CANADA WORLD BUSINESS INVESTING OPINION POLITICS SPORTS LIFE ARTS DRIVE REAL ESTATE

Shortage of blood-test materials leaves hospitals scrambling to treat patients

CARLY WEEKS > HEALTH REPORTER
PUBLISHED FEBRUARY 11, 2022

GTA

Ontario hospitals facing critical shortage of blood collection tubes

Some hospitals are telling staff to conserve supplies and reconsider the number of blood tests they order as fears grow about prolonged shortages.

By **Megan Ogilvie** Health Reporter
Tue., Feb. 15, 2022 | 4 min. read

JOIN THE CONVERSATION (2)



Forbes

HEALTHCARE

We're Facing A Critical Shortage Of Medical Laboratory Professionals

Judy Stone Senior Contributor

I am an Infectious Disease specialist and author of Resilience: One Family's Story of Hope and Triumph over Evil and of Conducting Clinical Research, the essential guide to the topic

Apr 28, 2022, 11:00am EDT

Follow

Forbes

HEALTHCARE

Blood Collection Tube Shortages Continue - 'Routine' Labs Should Be Limited

Nova Scotia

How some N.S. doctors are preparing for a global shortage of blood collection tubes

[f](#) [t](#) [e](#) [r](#) [in](#)



Choosing Wisely Nova Scotia working to limit unnecessary tests, treatments

Emma Smith · CBC News · Posted: Mar 29, 2022 8:53 PM AT | Last Updated: March 29

Choosing Wisely Canada and Lab Utilization

Choosing Wisely Canada Hospital

Make Choosing Wisely a cornerstone of your quality improvement efforts and organizational strategy.




Choosing Wisely Canada

PAUSE THE DRAWS

A toolkit for reducing repetitive routine blood draws in hospitals

Version 1.1
May 2019



TALKS

CHOOSING WISELY


PRESENTED BY: ASSOCIATION MEDICALE CANADIENNE | CANADIAN MEDICAL ASSOCIATION

Five Recommendations for Using Labs Wisely During Global Blood Tube & Other Resource Shortages

FEB 24 | 12 PM ET

Using Labs Wisely

During Global Blood Tube & Other Resource Shortages



Choosing Wisely Canada | **ESCC** | **SECC** | **CAMB** | **AMBC**



Using Labs Wisely

Soft Launch (Cohort 1)

February 2022

National Launch (Cohort 2)

September 2022

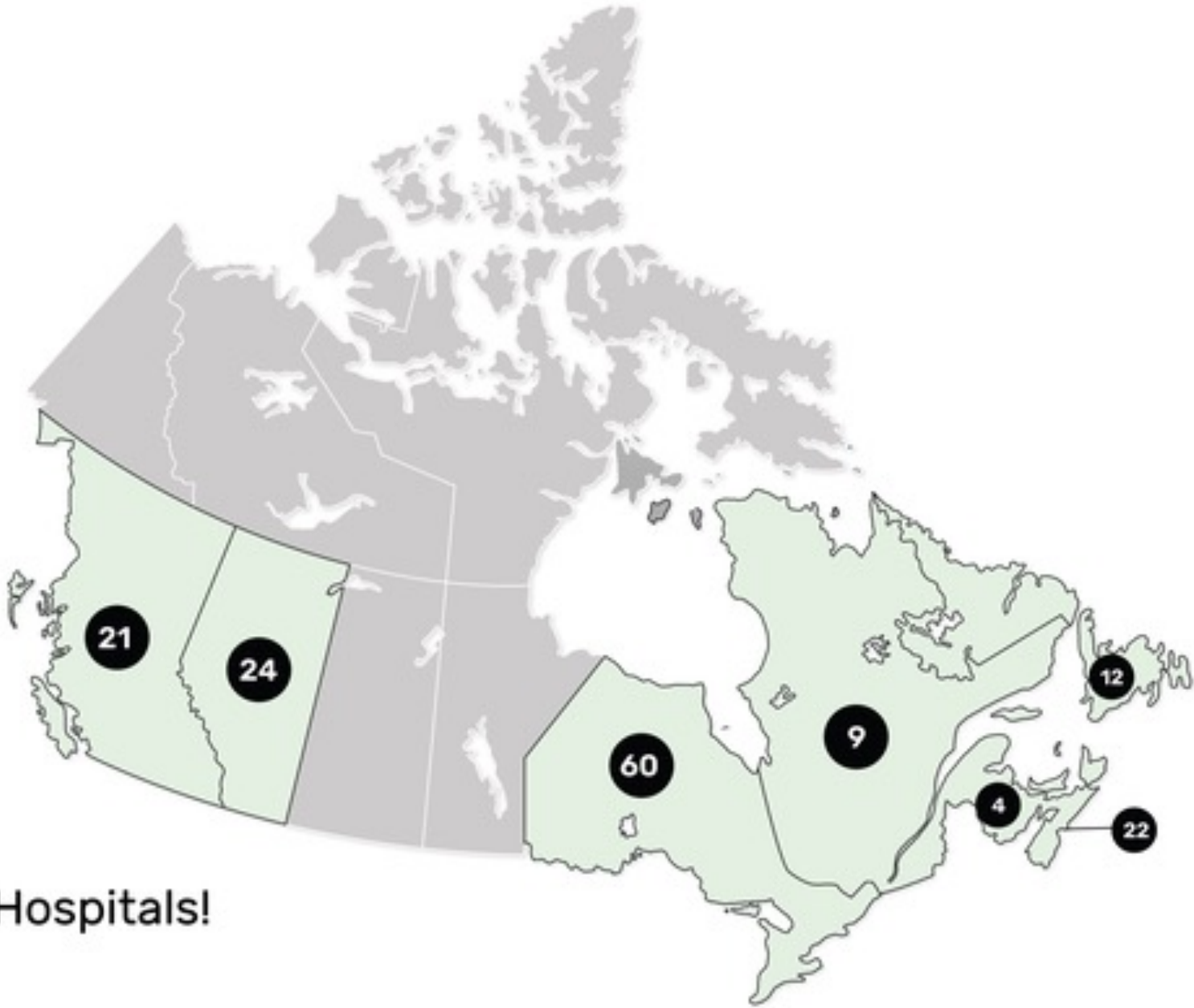
Cohort 3 Launch

April 2023

Cohort 4 Launch

January 2024

Using Labs Wisely.



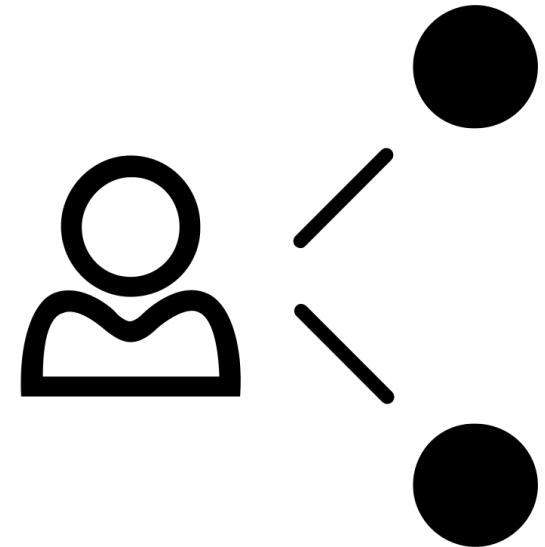
As of January 2024

152 Participating Hospitals!

1

Be Part of a Learning Community

- Participate in interactive learning sessions with hospitals from across Canada
- Gain access to tools, coaching, and mentoring opportunities.
- Network with like-minded clinicians, laboratory experts, researchers and administrators



Using Labs Wisely Tools



Low-Value Lab Tests

A tool focused on appropriate use of specific laboratory tests and evidence-based interventions that have reduced unnecessary use of the test or practice.



Lab Recommendations

A collection of Choosing Wisely Canada recommendations related to lab utilization.



CADTH Cost Calculator

Provides insights on potential resource savings associated with the reduction of five low-value laboratory tests.



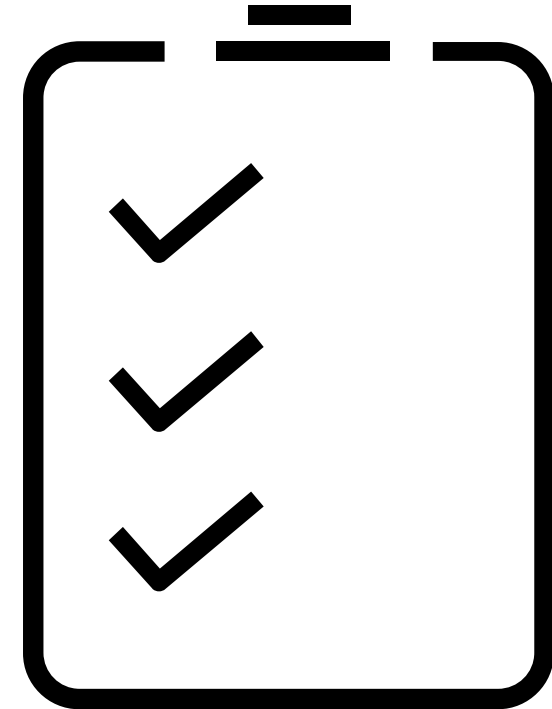
Members Database

A list of Using Labs Wisely participating members.

2

Implement Change

- Identify local improvement priorities and develop annual quality improvement plans.
- Implement intervention to reduce lab utilization and measure the change.



Using Labs Wisely: Quality Improvement Plan

Problem Statement* Required

Please provide one or two sentences that identifies and summarizes a condition, problem, or issue. A problem can be defined as the gap between the existing state and the desired state of a process.

Background and Alignment with Organization Strategic Direction* Required

Please detail how the QI initiative(s) aligns with the strategic direction of the organization (link the QI initiative with the specific organizational strategic priority).

Establishing a Quality Gap with Baseline Data (if available)* Required

Aim Statement)* Required

Should, at minimum, describe the target population, desired improvement and targeted timeframe (remember "how much, by when") Consider using the SMART approach: specific, measurable, actionable, realistic and timely.

Data/M Measurement)* Required

What data will you be collecting and analyzing to support the QI initiative? Please list the data elements that will support the QI initiative.

Project Results)* Required

Anticipated Barriers and Mitigation Strategies)* Required

Lessons Learned)* Required

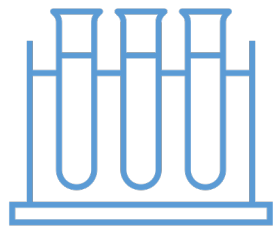
Please list the strategies your organization will utilize to support physicians in the reflection of the individual or group data that is being used for the QI initiative.

Lab Target Considerations

- **Scope of the problem**
 - Frequency, ubiquitous, test characteristics
- **Availability of effective solutions**
 - Evidence, strategies
- **Implementation issues**
 - Costs, complexity, unintended consequences
- **Institutional alignment**
 - Synergy with other priorities, creating momentum
- **Resources**
 - Data collection, project support, study costs



A data-driven approach can identify potential targets for lab resource stewardship

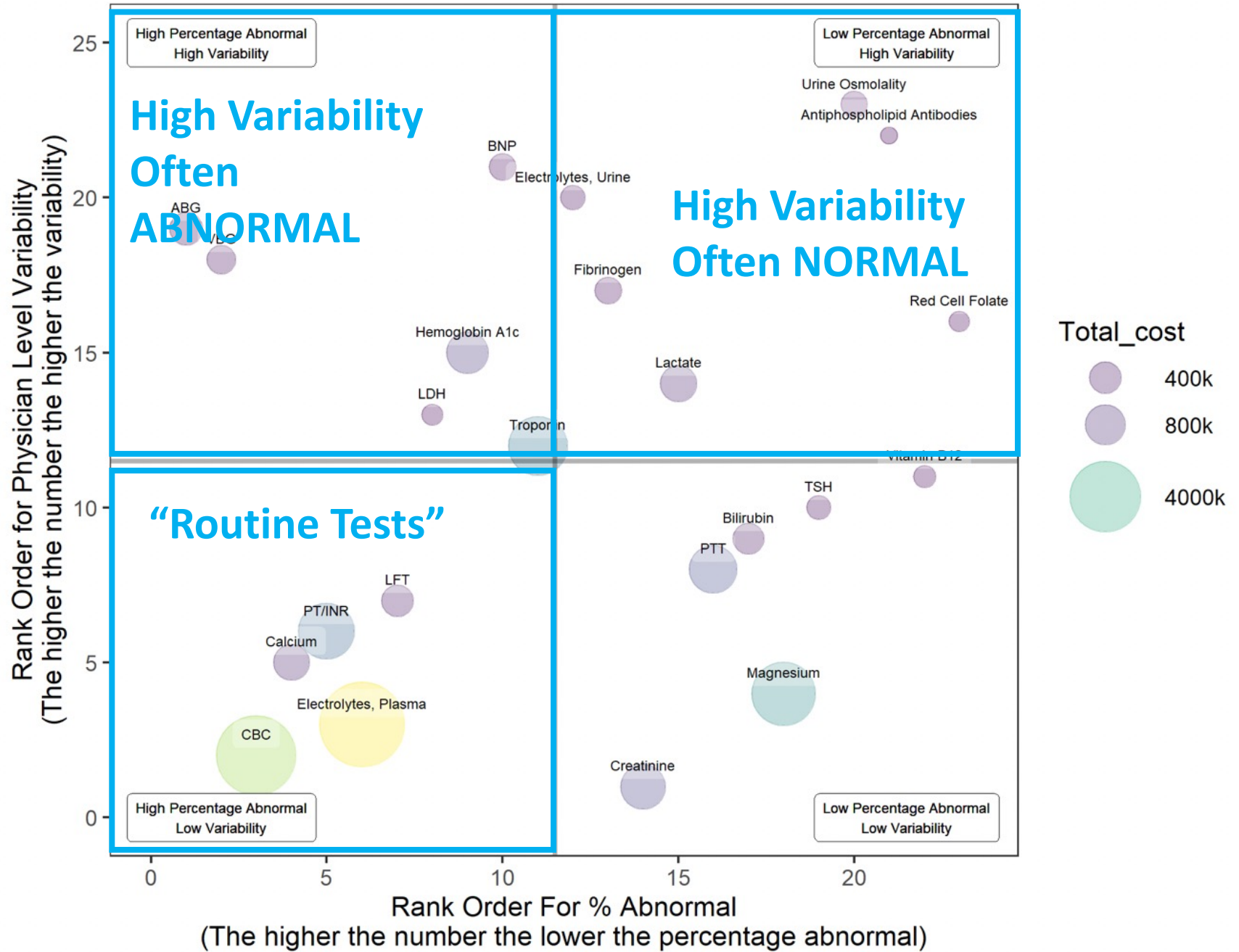


All laboratory tests

- GIM admissions
- Three hospitals

Ranked tests by:

- Total Cost
- % Abnormal
- Variation in physician ordering

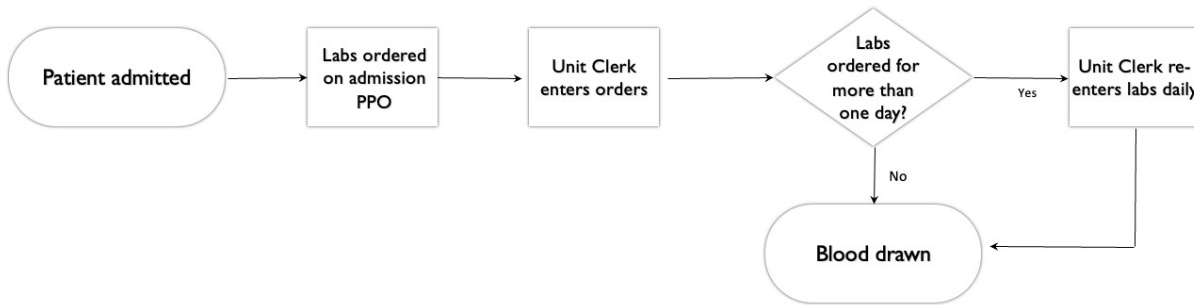


5 Tests with the Highest Cumulative Rank

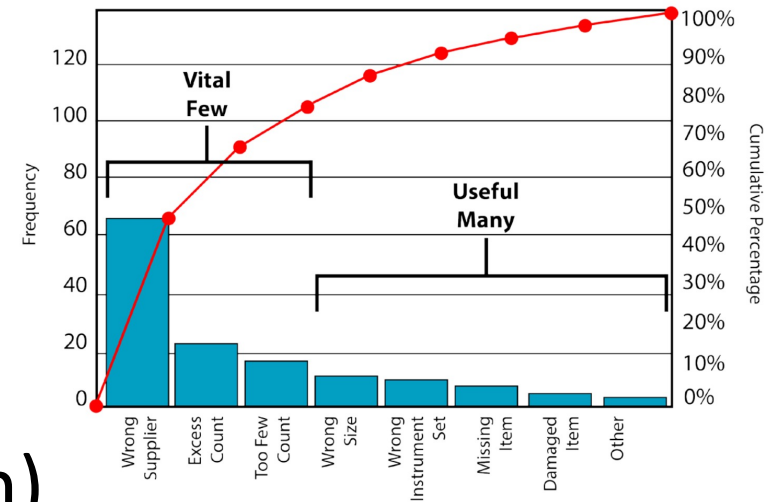
Test Name	Cumulative Cost (US\$)	Cumulative Abnormal Proportion	Cumulative Physician-level Variation
Lactate	\$474,620	34.2%	1.48
Antiphospholipid Antibodies	\$65,601	6.7%	3.08
Magnesium	\$2,324,627	24.6%	0.76
Troponin	\$1,894,480	51%	1.41
Partial Thromboplastin Time (PTT)	\$1,047,095	30.3%	1.07

QI Diagnostic Tools

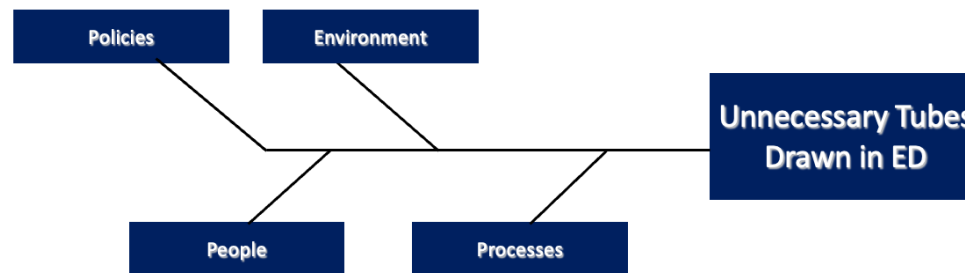
Process Maps

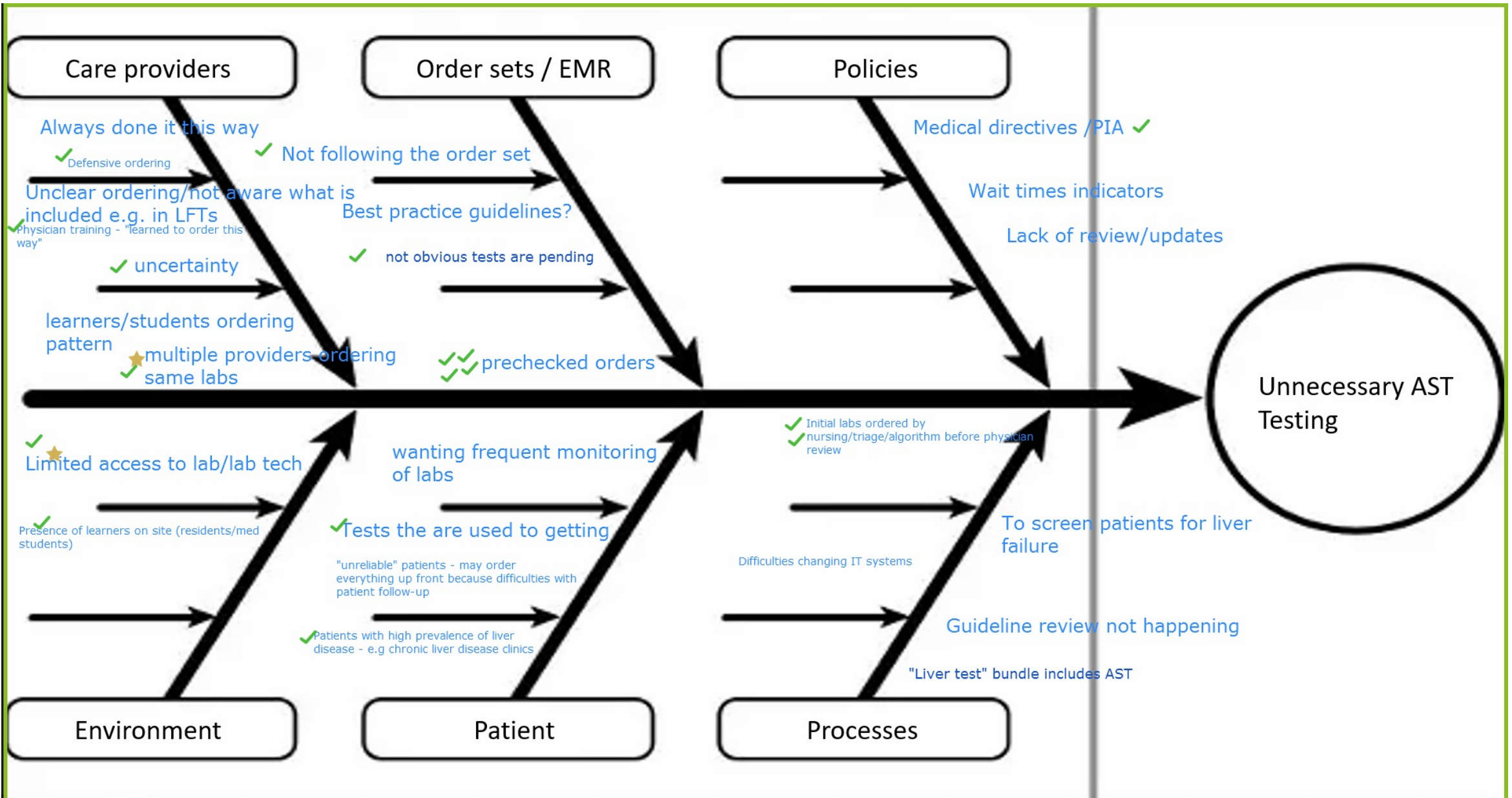


Pareto Charts



Fishbone (Ishikawa diagram)





Data for Lab Utilization

- Use data to further inform lab target selection
- Gather baseline data
 - What is available and how accessible it is?
 - What else do you need?
 - ordering prescriber, location, bed days (denominator), corresponding lab test, balancing measures, etc.
- **Ongoing data to highlight change and sustainability**



DATA



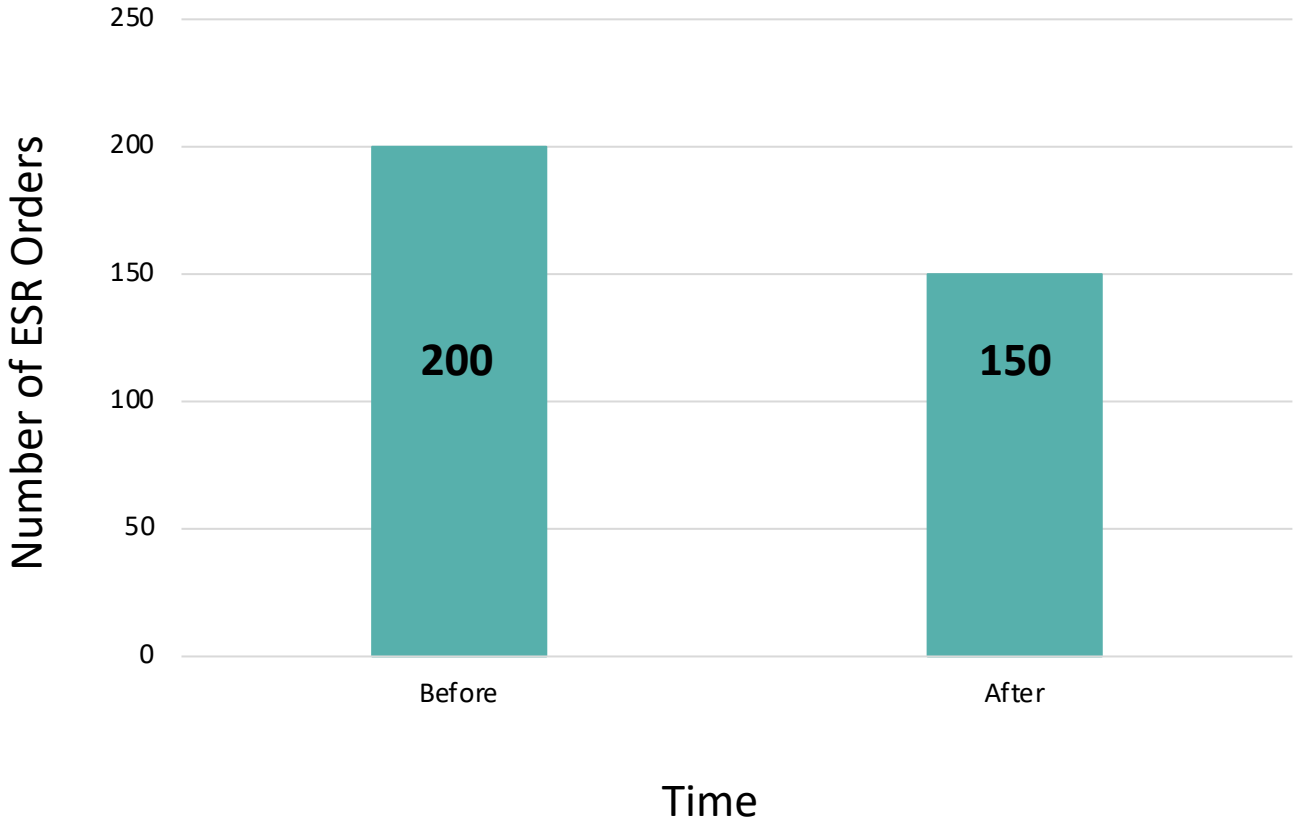
UNDERSTANDING



ACTION

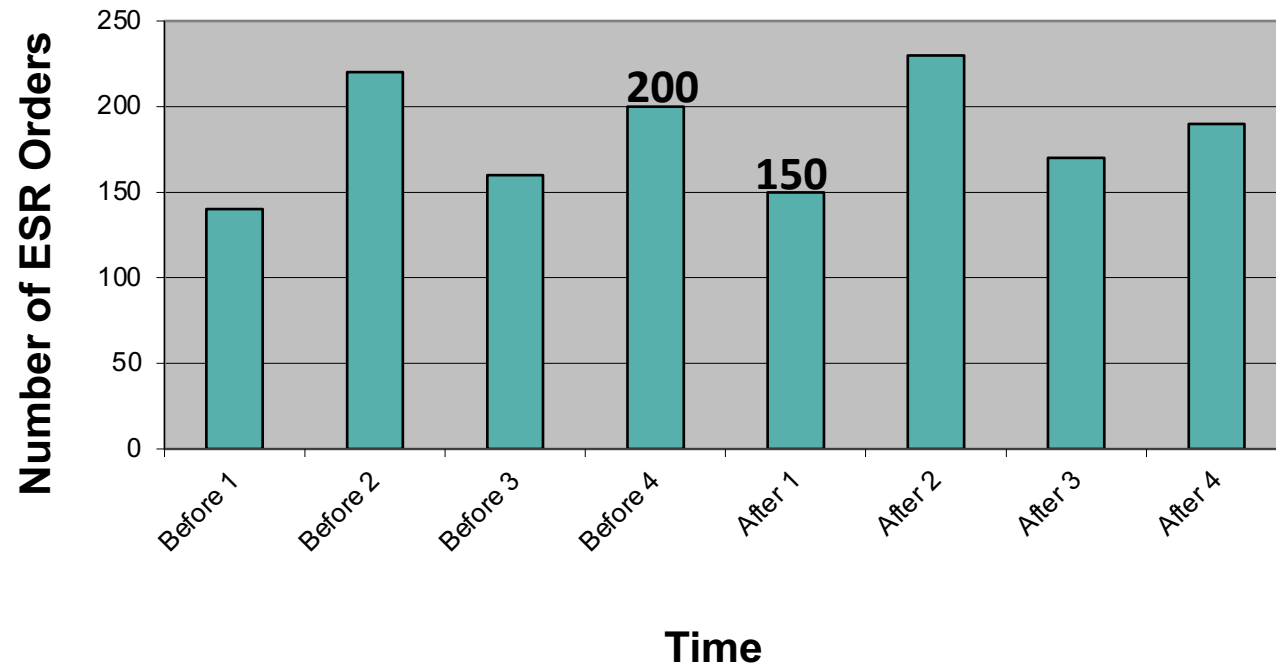
Representative Before-After Study

There were 200 ESR orders before intervention and 150 after - Yay!



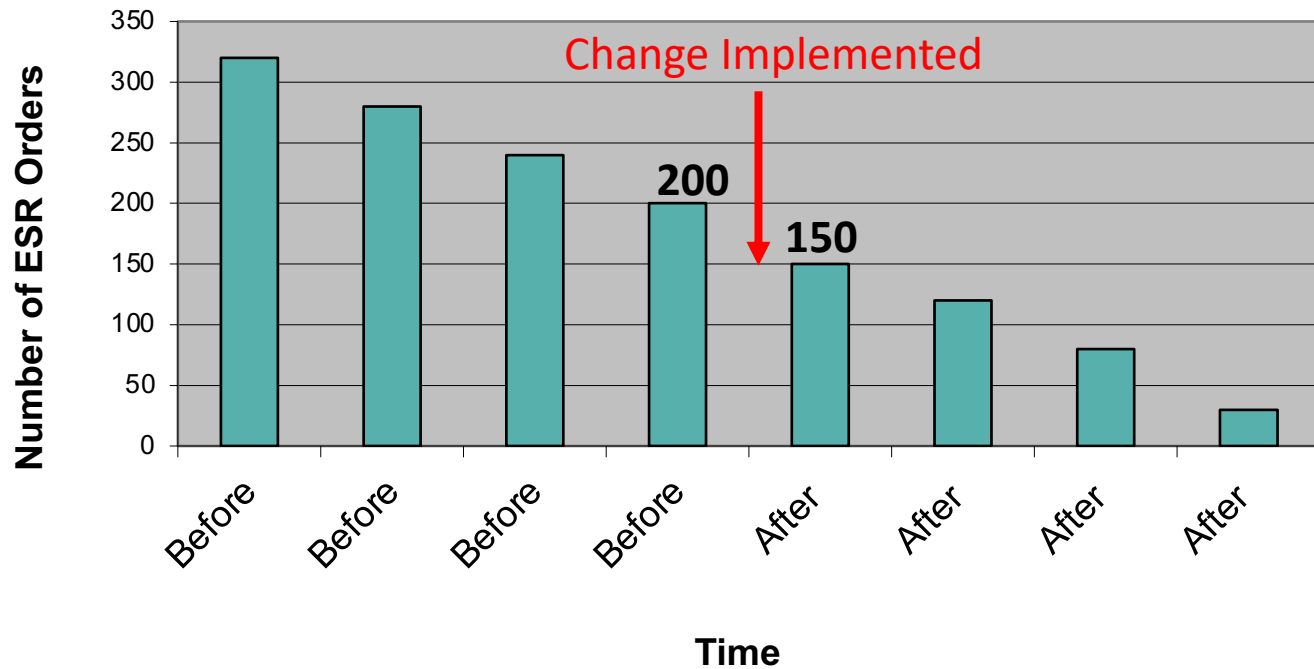
Static View

Problems with simple Before-After Studies: Random variation



Dynamic
View

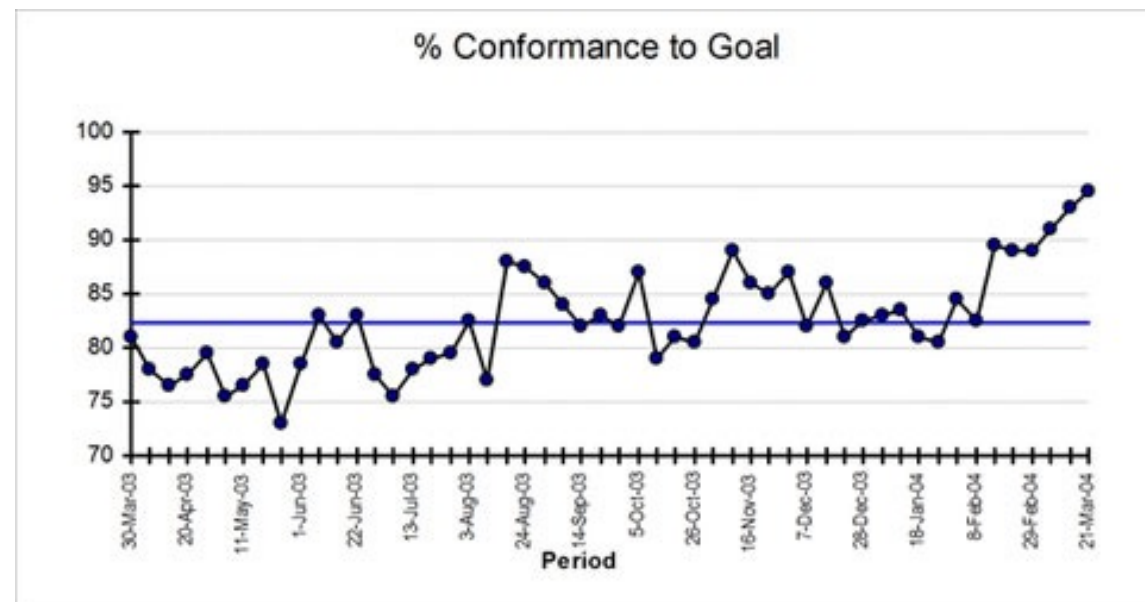
Problems with simple Before-After Studies: Secular Trends



Dynamic
View

Run Charts

- Make process performance **visible**
- Determining if changes resulted in **improvement**
- Determining if changes have been **sustained**



Hierarchy of Effectiveness

Increasing Effectiveness



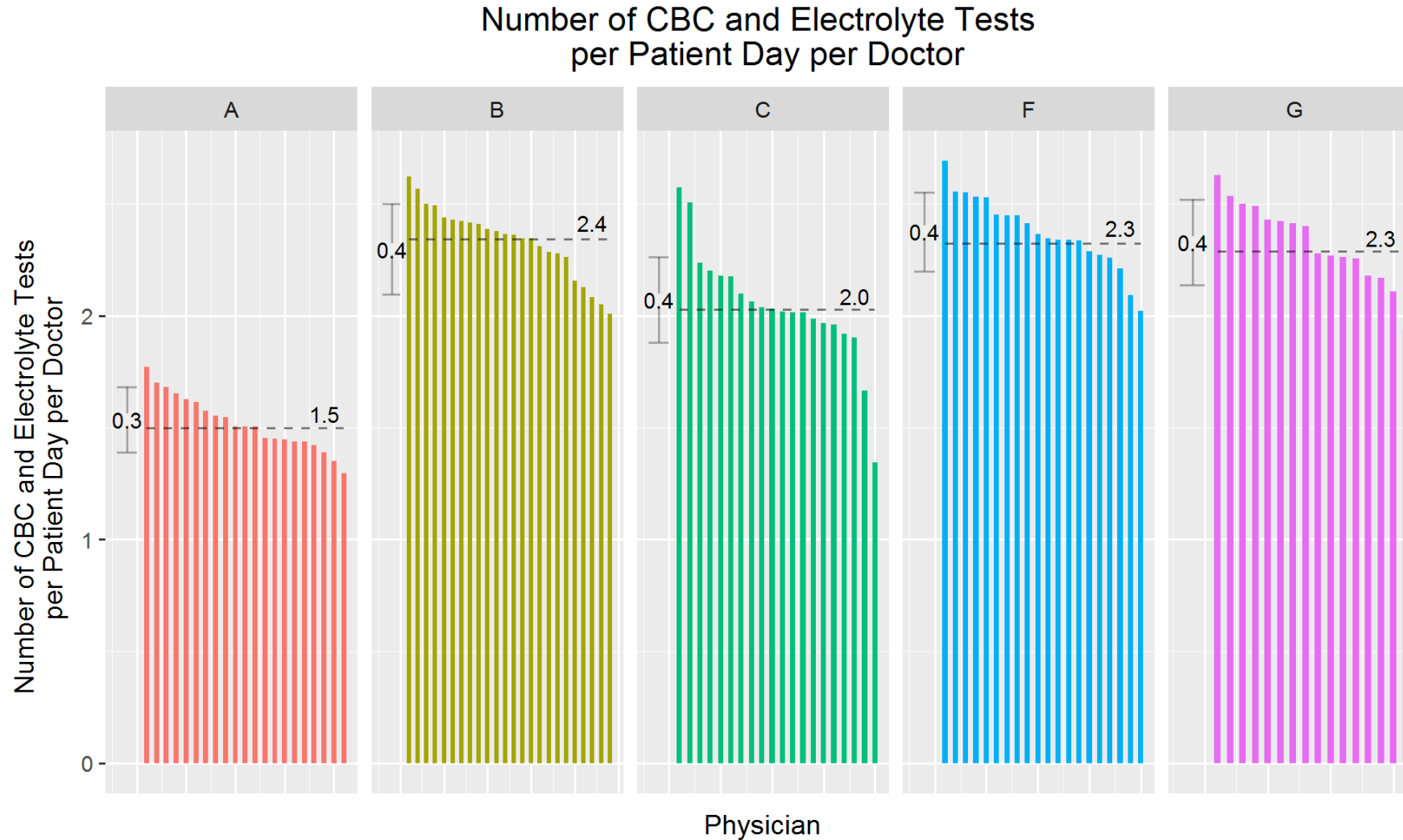
1. Forcing Functions & Constraints
2. Automation and Computerization
3. Simplification and Standardization
4. Reminders, Checklists and Double-checks
5. Rules and Policies
6. Training and Education

Modified from the Institute For Safe Medication Practices.

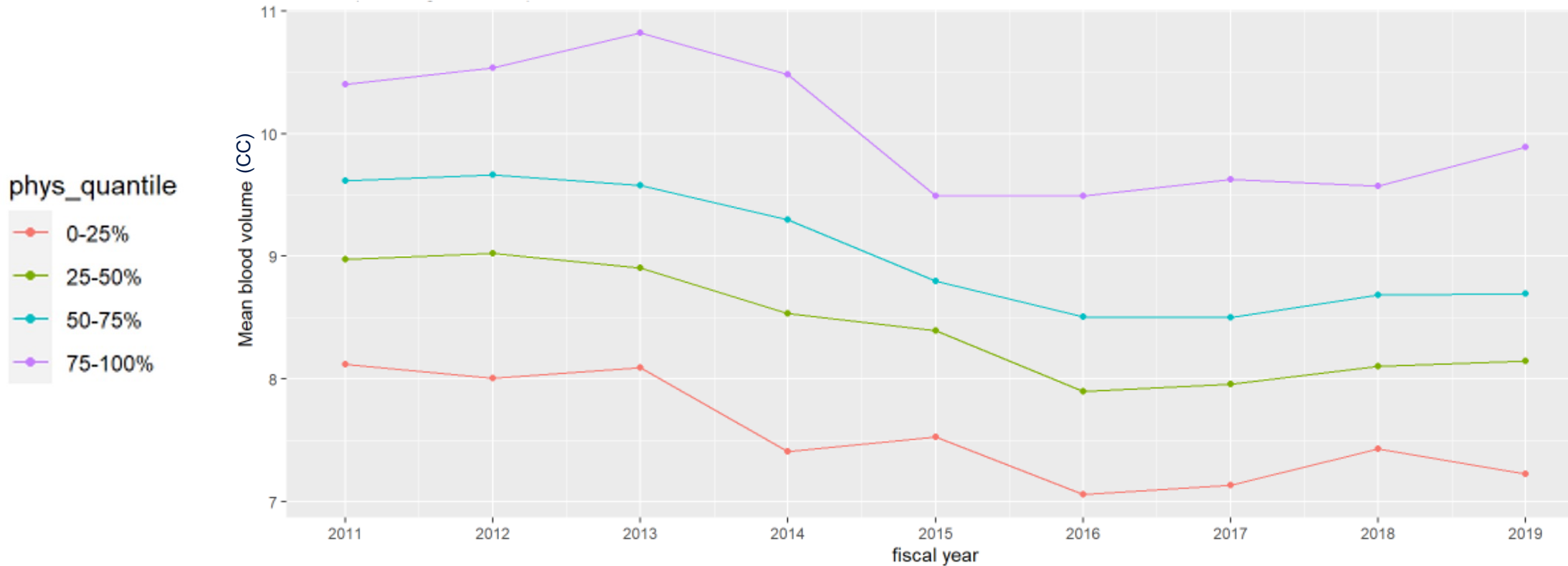
Educational Initiatives

- Helpful when knowledge gap is present
(e.g. AST, ESR, thrombophilia testing)
- National comparisons may have educational values
(e.g. hospital x that does CVSx eliminated CK-MB)
- Audit and Feedback
 - Decide on target (everyone v. subset)

Hospital and Physician-Level Differences in Routine Bloodwork



Physician Level Blood Volume Percentiles



CW USA



CW Canada

ROUTINE BLOODWORK TESTS

Reporting Period: November 2017–February 2020

6.2 tests

My Patients (Mean)

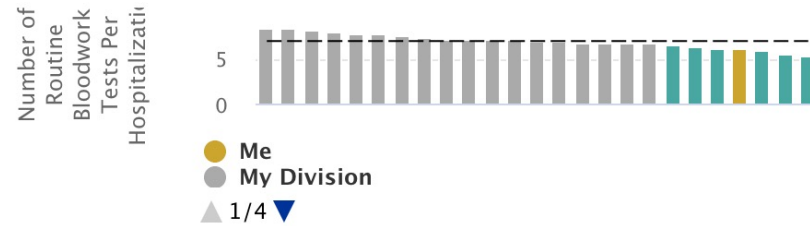
7.1 tests

50th Percentile Physician Patients (Mean)

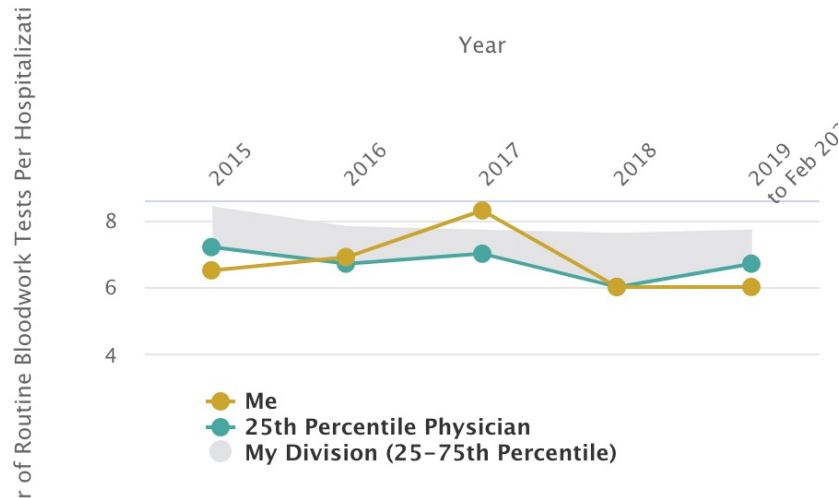
6.7 tests

25th Percentile Physician Patients (Mean)

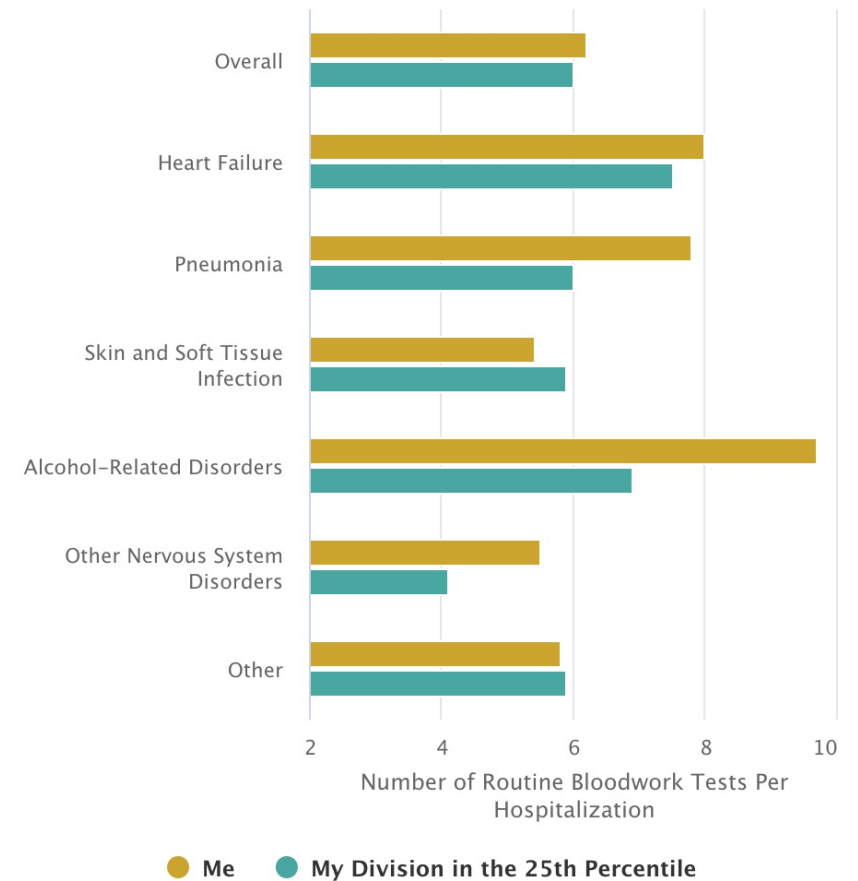
How does the average number of routine bloodwork tests for my patients compare to that of my division?



How has my practice changed over time?



How many routine bloodwork tests do my patients have (top conditions)?



Definition

Routine bloodwork is defined as the number of electrolytes and complete blood count (CBC) tests performed. The physician-level indicator is defined as the average number of routine bloodwork tests per hospitalization.

Quality Improvement Tips

RBC folate

- Historically part of the panel for anemia
- Number of assays performed at Sunnybrook laboratory in 2010?
- 6,833
- Number of folate deficiency detected?
- Zero
- Stopped testing in 2013

AST (as of 2017)

- Top prescribers
- Who isn't on the list?
Gastroenterologists!

MD	AST	AST/ALT Ratio
Oncologist	2,911	55
MEDICAL DIRECTIVE (ED)	2,292	18
Oncologist	1,385	72
Infectious disease	1,348	91
Oncologist	1,248	48
Oncologist	917	63
Oncologist	684	39
General Surgeon	632	51
General Surgeon	574	40
ICU MD	507	53
Nephrologist	504	102
ICU MD	487	50
Oncologist	487	82
ICU MD	475	49
ICU MD	462	52
General Surgeon	424	53
ICU MD	421	53
Infectious disease	406	90
General Surgeon	379	47
Nephrologist	370	54

Ordering Initiatives

- Medical Directives/Non-Physician Orders
 - Review what they include and if they remain appropriate
 - Remove certain tests (e.g. Urea)
 - Uncouple other tests (e.g. INR/PTT)
- Order Sets
 - Review order sets remove and/or uncouple tests
 - Work with specialists for specialized order sets
 - e.g. CK-MB on cardiology or CVSx order sets

AST (as of 2017)

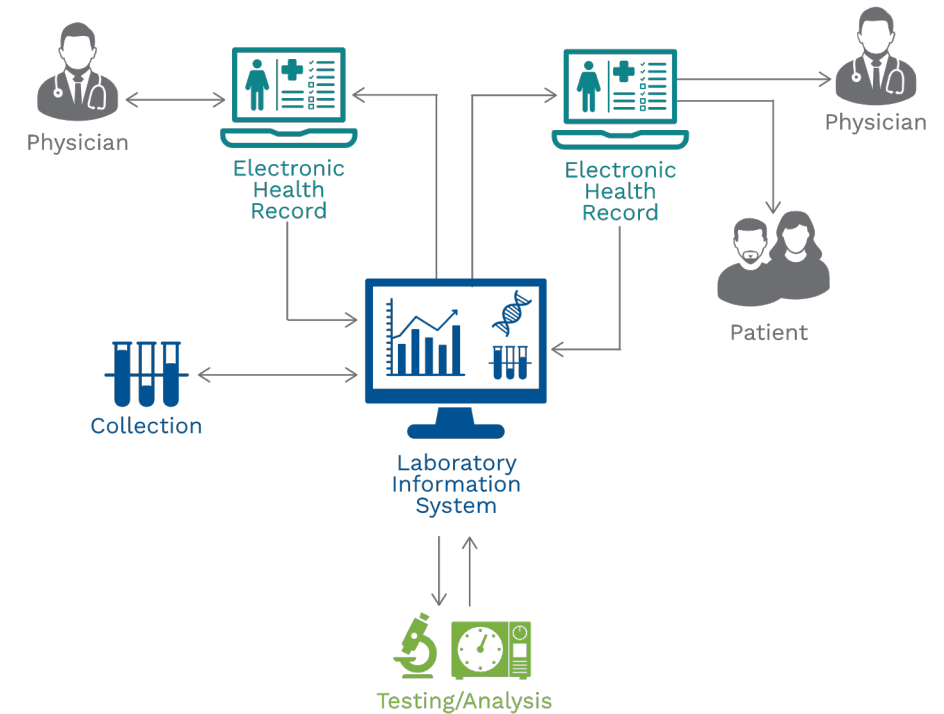
- Top prescribers

Clear role of medical directive

MD	AST	AST/ALT Ratio
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Lab Based Initiatives

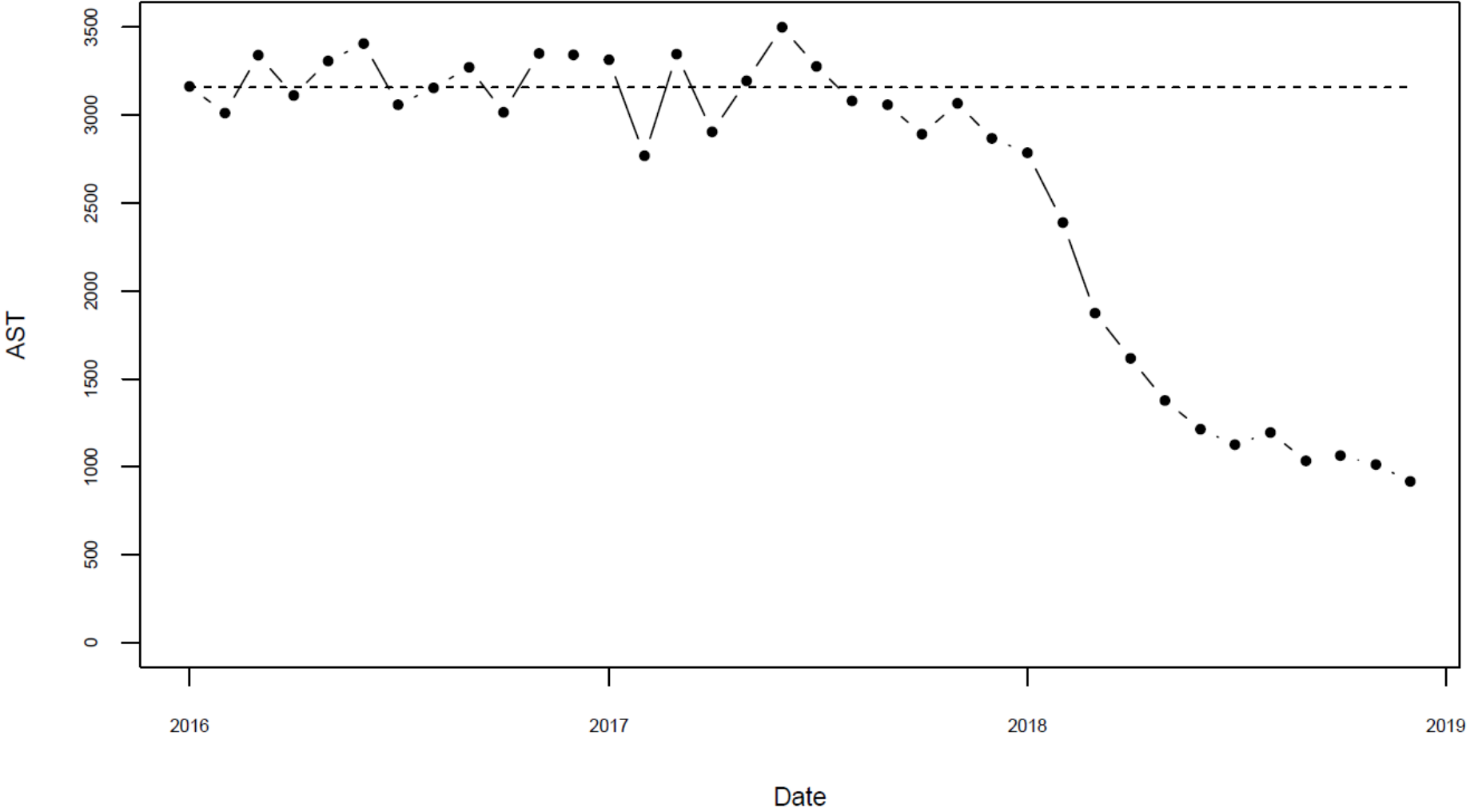
- Unpackaging/Unbundling
- Auto-cancellation rules
(e.g. minimal retesting intervals)
- Approval required
- Lab-orderable only
- Reflex testing



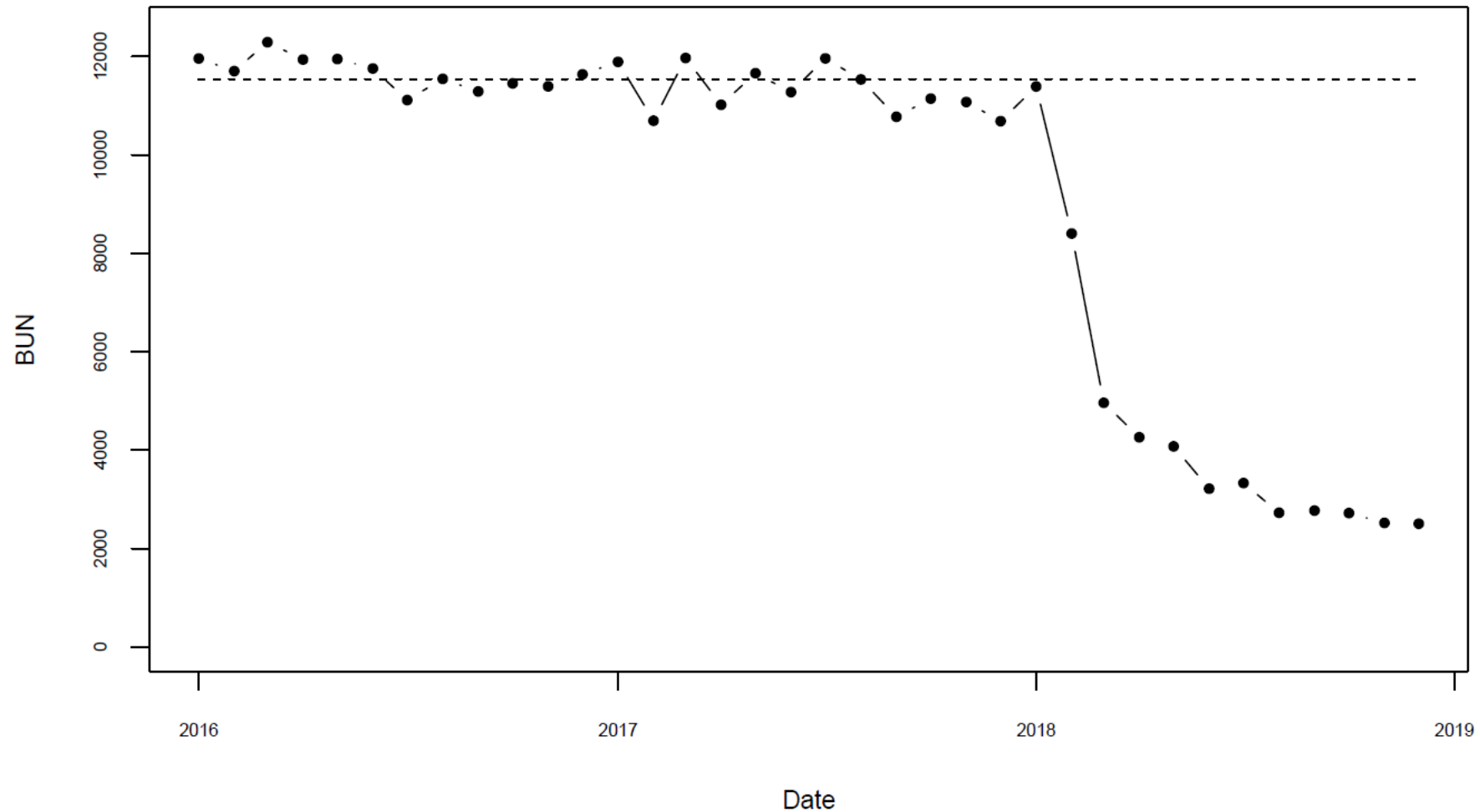
Pre- and Post

Test	Sept 2017 Pre-Test	July 2019 Post-Test
AST	3,024	781

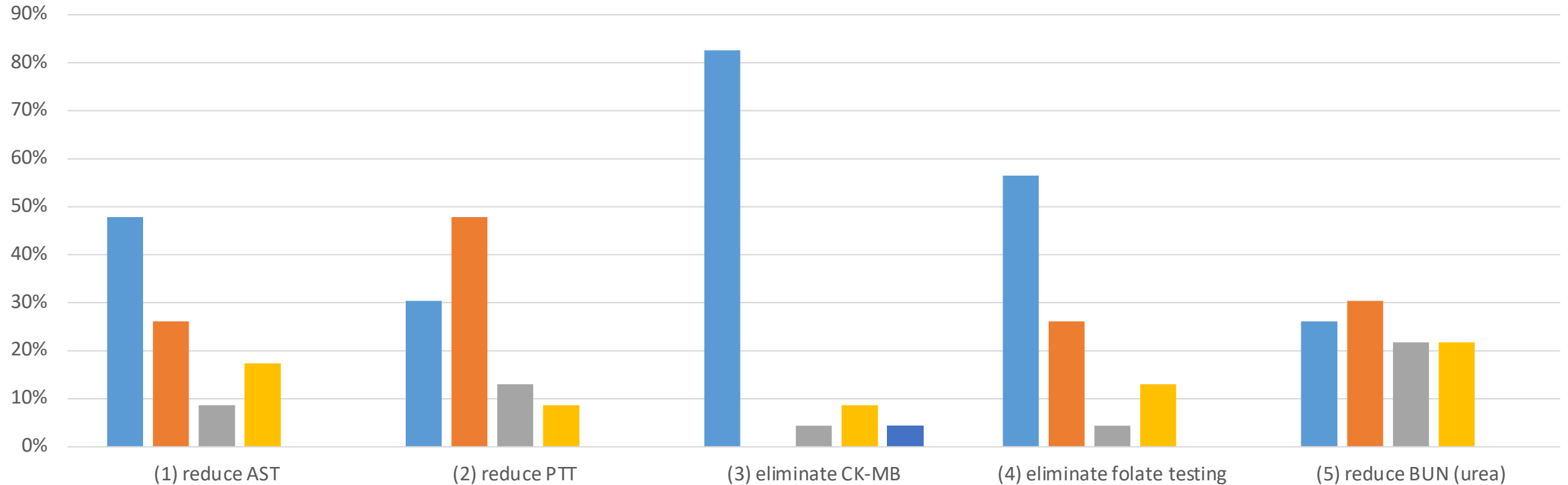
AST Run Chart



Urea Run Chart



5 “Quick Wins” (AST, PTT, CK-MB, Folate, BUN)



- We have already implemented an intervention to address this lab target and it was sustained.
- We have already implemented an intervention, but there is room for improvement.
- We tried to address this lab stewardship target previously but encountered challenges.
- We plan to address this lab stewardship target as part of this collaborative.
- We are not interested in addressing this lab stewardship target at this time.

Examples of Change- Quality Improvement Plans

- Reviewed CPOE order sets (150 changes in 70+ order sets)
- 11% reduction in AST:ALT
- Uncoupling AST/ALT, PT/INR, Urea/Cr (regional level) and repeat testing for HBA1c, Vitamin D via hard and soft stops (pop-ups)
- ‘Hard stop’ to FOB requests- reduced by 71% (FOB test positivity rate increased from 3.3% in pre-utilization period to 3.9% in post-utilization, suggesting enhanced appropriateness of requests)
- Reduction in coagulation testing in ED
- Reduction in Vitamin D testing in renal patients to once every six months without impact on patient care
- Implemented new lab specimen collection algorithm and the average specimens without sign-off dropped by a day (3 per day to 2 per day)

Hierarchy of Effectiveness

Increasing Effectiveness



1. Forcing Functions & Constraints
2. Automation and Computerization
3. Simplification and Standardization

Design-Oriented

-
4. Reminders, Checklists and Double-checks
 5. Rules and Policies
 6. Training and Education

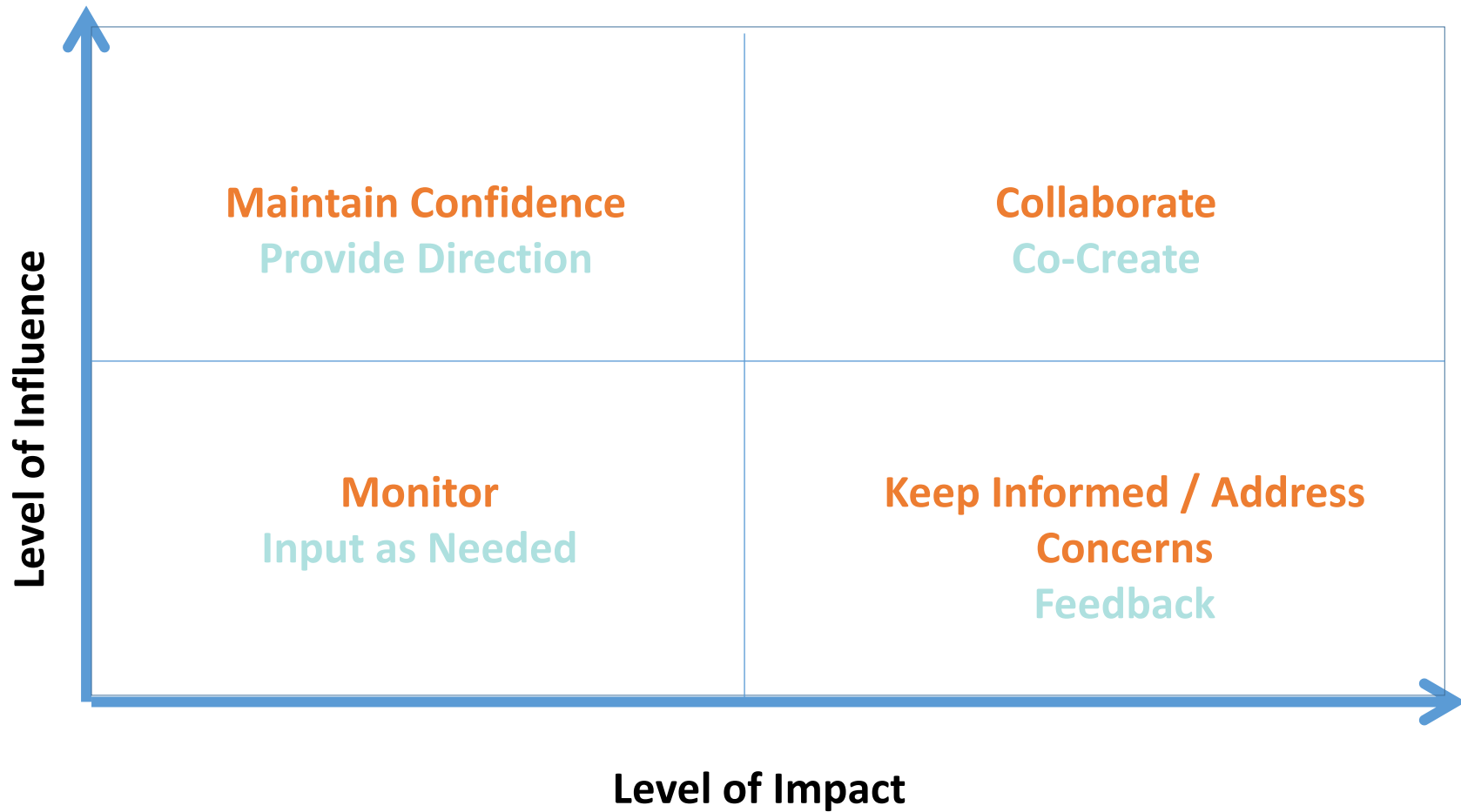
Person-Oriented

Modified from the Institute For Safe Medication Practices.

People Side of Change = Stakeholders



Stakeholder strategies



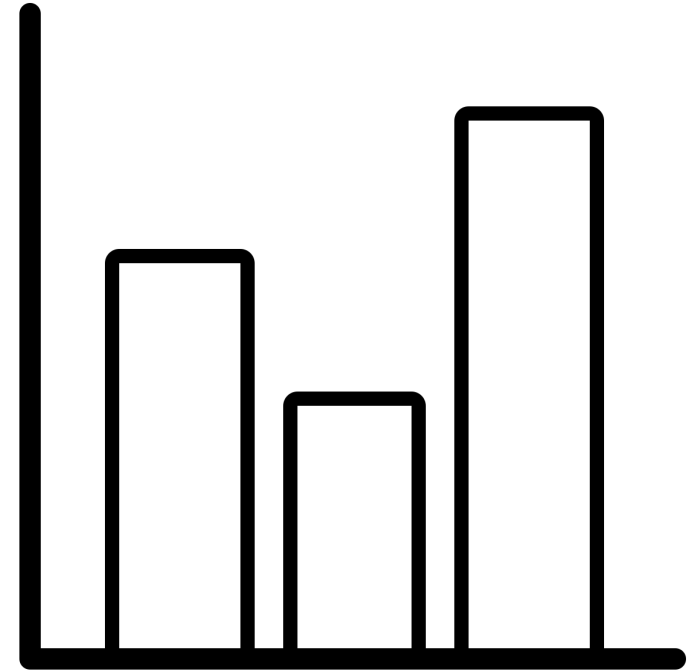
**What You Can Do for
Your Stakeholders**

What Your Stakeholders
Can Do for You

3

Share Data

- Submit aggregated data on a standard set of lab tests (i.e. folate, CK-MB, urea:Cr, PTT:INR, and AST:ALT)
- Receive comparative reports on your hospital's performance compared to peers in the program.
- Contribute to the creation of a national reporting system for appropriate lab utilization in Canada.

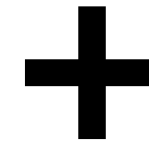


Using Labs Wisely: Areas of Focus

STANDARD INDICATORS (DATASET SENT TO GEMINI)

- Eliminate Folate
- Eliminate CK-MB

- Reduce PTT (compared to PT/INR)
- Reduce AST (compared to ALT)
- Reduce Urea (compared to Cr)



ADDITIONAL LAB PRIORITY AREAS (QIP)

- Other hospital-directed lab test priorities (e.g., daily labs, ESR, Vitamin D, etc.)

Reporting period: January 1, 2018 to December 31, 2022

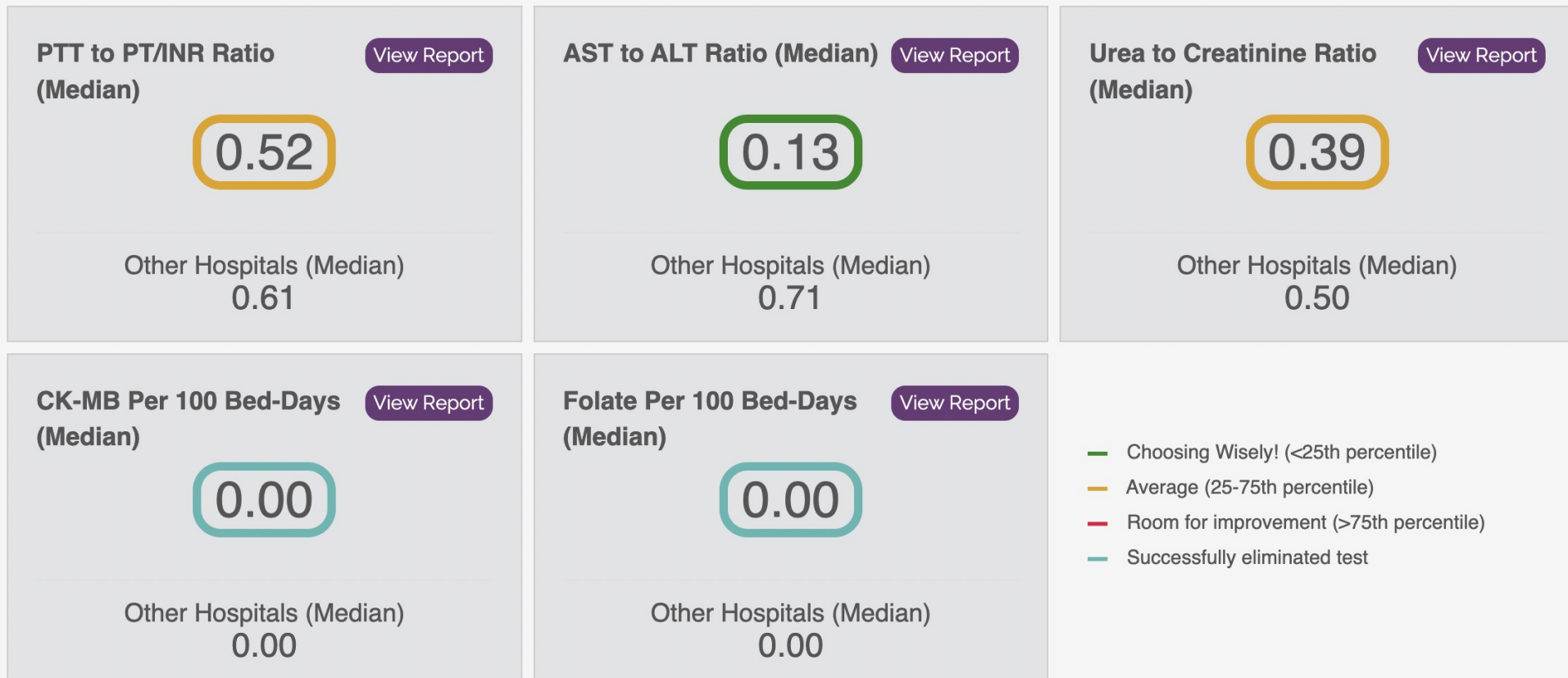
Release Date: May 8, 2023

Version: 1.0

Indicator Interpretation

For ratio measures, a **ratio closer to 0** indicates greater success in reducing the test compared to the coupled test. A **ratio closer to 1** indicates the test is still often ordered with the coupled test.

For measures calculated per 100 bed-days, this reflects the frequency of test ordering for every 100 patient days in hospital; a **value closer to 0** indicates greater success in reducing the test.

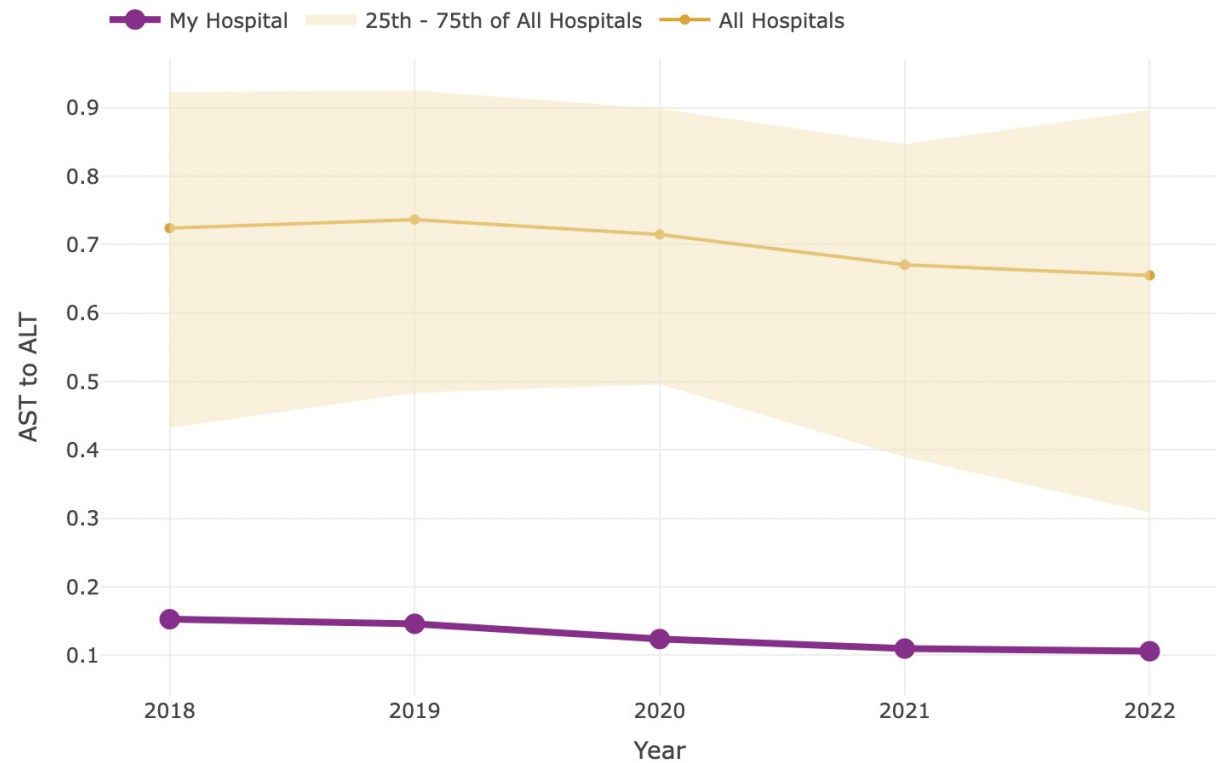




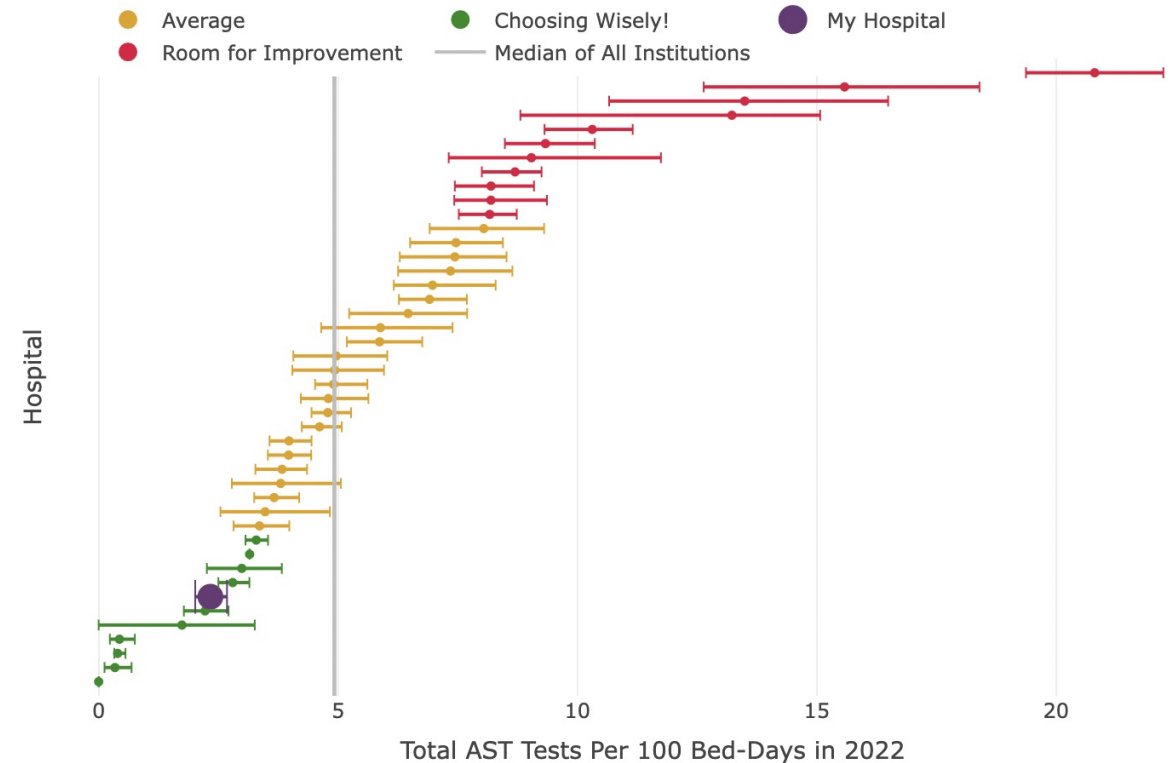
Uncoupling AST/ALT Tests

Reporting period: January 1, 2018 to December 31, 2022

Ratio of AST to ALT Tests Over Time



Total AST Tests Per 100 Bed-Days in 2022



A ratio closer to 0 indicates greater success in reducing the test compared to the coupled test.

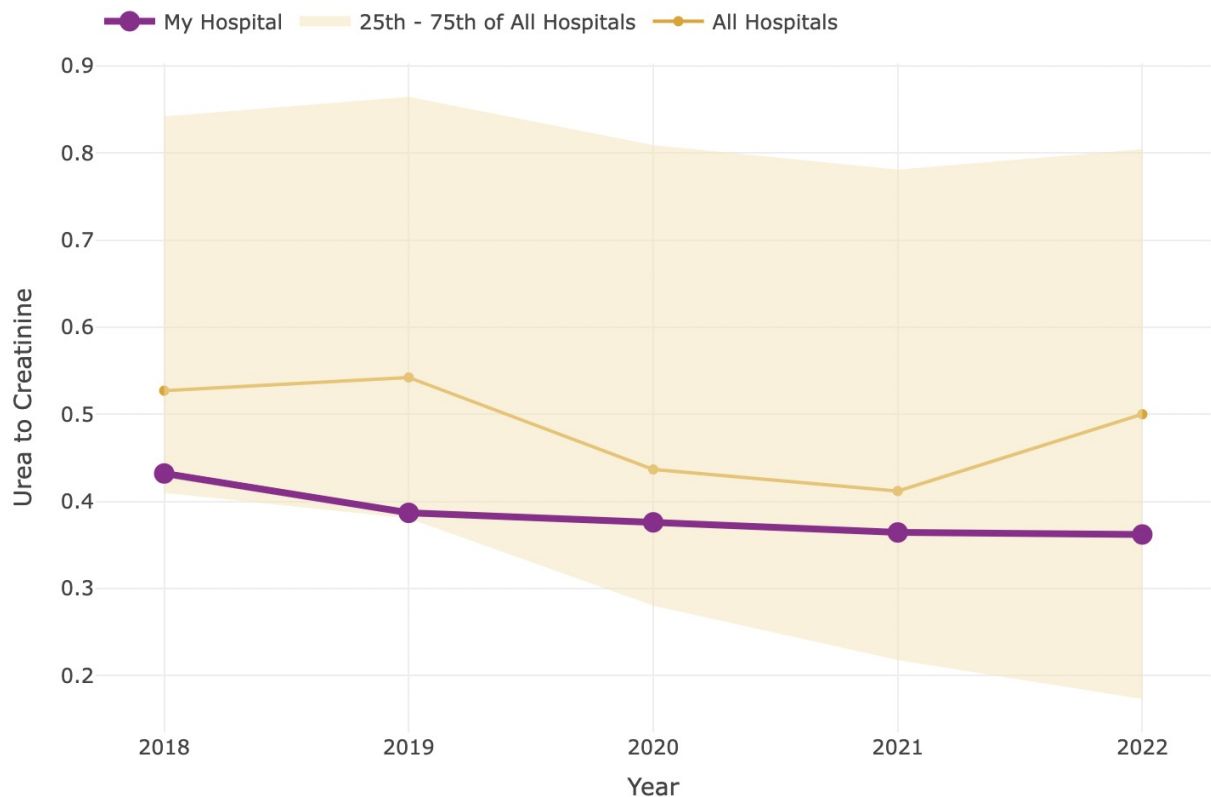
A ratio closer to 1 indicates the test is still often ordered with the coupled test.

Aspartate aminotransferase (AST) is frequently ordered along with alanine aminotransferase (ALT) as a part of standard liver enzyme panels. ALT is more specific than AST for hepatocellular injury, and AST offers little to no additional clinical information.³

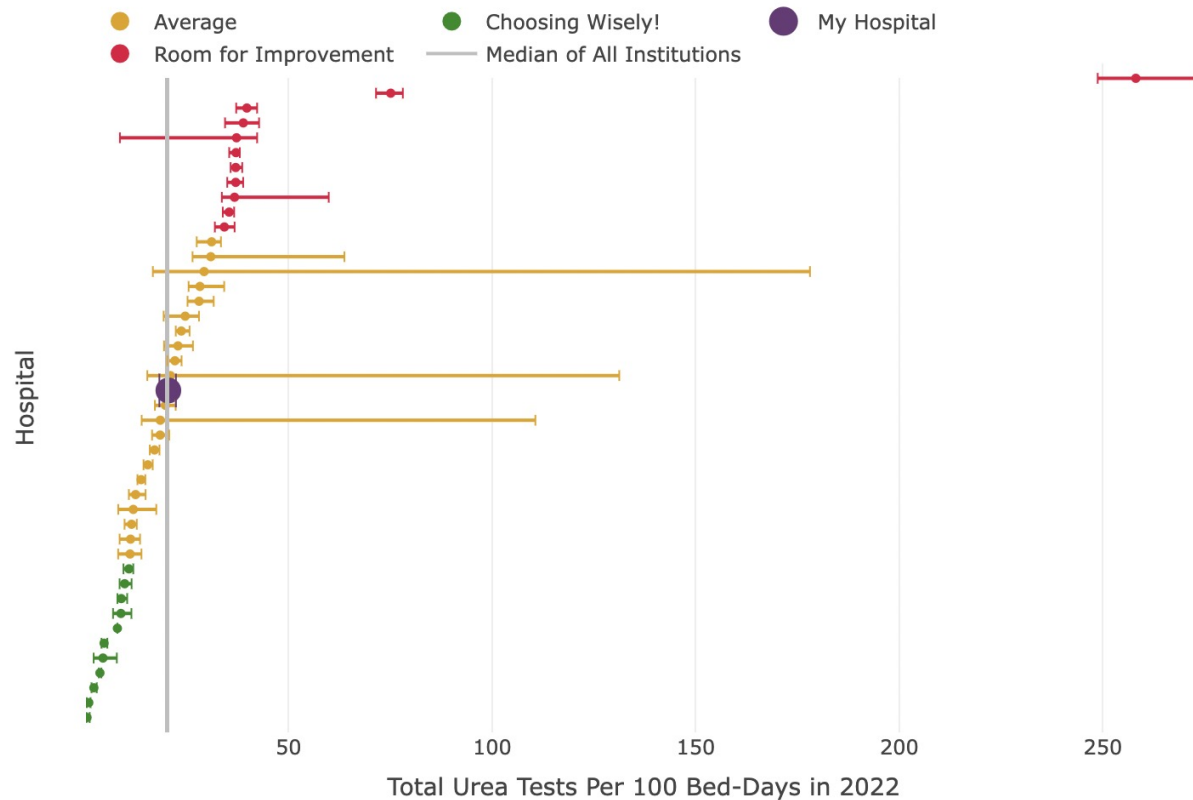
Uncoupling Urea and Creatinine Tests

Reporting period: January 1, 2018 to December 31, 2022

Trend of Urea to Creatinine Tests Over Time



Total Urea Tests Per 100 Bed-Days in 2022



A ratio closer to 0 indicates greater success in reducing the test compared to the coupled test.

A ratio closer to 1 indicates the test is still often ordered with the coupled test.

Creatinine alone provides information on renal function, and the routine addition of urea does not add clinical value. Urea is recommended only for specific clinical situations.

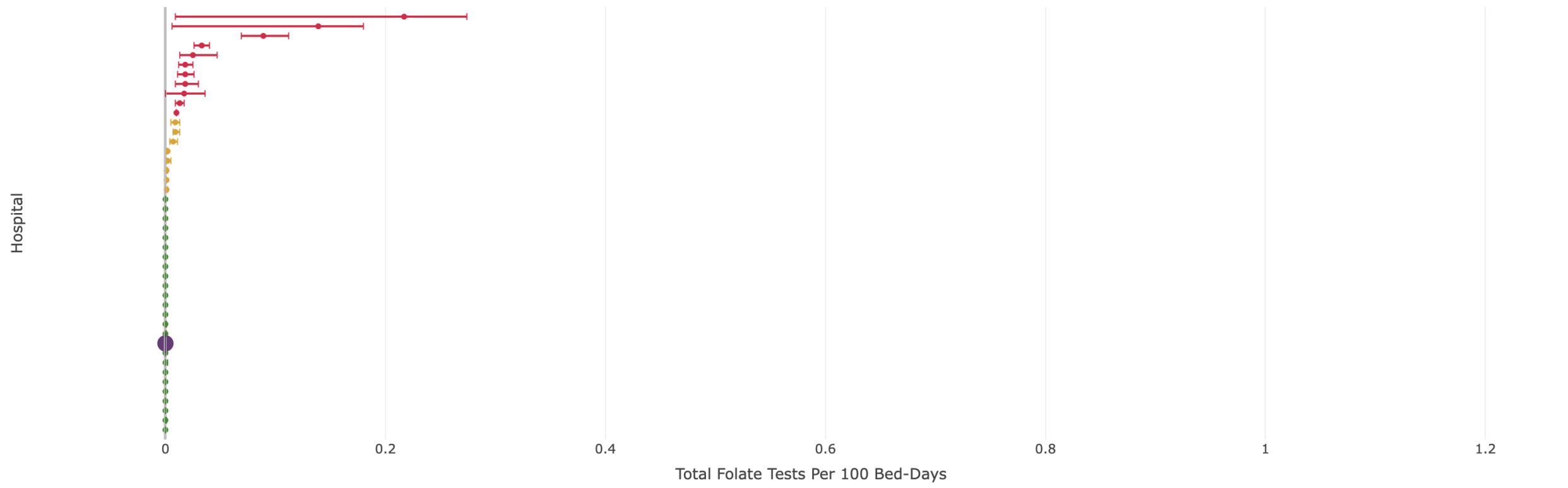


Eliminating Serum Folate Testing

Reporting period: January 1, 2018 to December 31, 2022

Total Folate Tests Per 100 Bed-Days

● Average ● Choosing Wisely! ● My Hospital ● Room for Improvement — Median of All Institutions



Since fortifying grain products became mandatory in the 1990s, folate deficiency is virtually nonexistent in Canada. In the context of extremely low prevalence of folate deficiency, measuring serum folate, even in the presence of clinical findings (e.g., anemia, dementia, etc.) is not helpful in identifying folate deficient patients.⁶

Of the 44 participating hospitals in the Using Labs Wisely program, 12 hospitals have successfully eliminated the test (3 hospitals did not provide data).



Canada's Drug and
Health Technology Agency

Minimum Retesting Intervals for Lab Tests

A partnership project to support CWC's Using Labs Wisely Consortium

Tasha Narain, Elizabeth Carson

April 15, 2024

Disclosure

- CADTH is funded by contributions from the Canadian federal, provincial, and territorial ministries of health, with the exception of Quebec.
- CADTH receives application fees from the pharmaceutical industry for:
 - CADTH Reimbursement Review processes, including those used for:
 - oncology drugs
 - non-oncology drugs
 - plasma protein and related products reviewed through the interim process
 - CADTH Scientific Advice

Overview



Introduction

An overview of the organization and our history of partnership with CWC



Minimum Retesting Intervals

A panel to develop recommendations in support of CWC's Using Labs Wisely



HbA1c

A sneak peek at the draft HbA1c recommendations and the Advisory Panel's discussion



Lessons Learned

Stronger together - a reflection on partnership



Next Steps

An opportunity to review the draft report & anticipated publication date

About Us



We are an independent, not-for-profit organization responsible for providing health care decision-makers with objective evidence to help make informed decisions about the optimal use of health technologies.

A history of partnership on major CWC initiatives



2021

Using Health Care Resources Wisely After the COVID-19 Pandemic

2022

CADTH Webinar: Using Labs Wisely

2023

Identifying Overused Lab Tests in Hospital Settings: A Delphi Study

2024

Minimum Retesting Intervals for Lab Tests

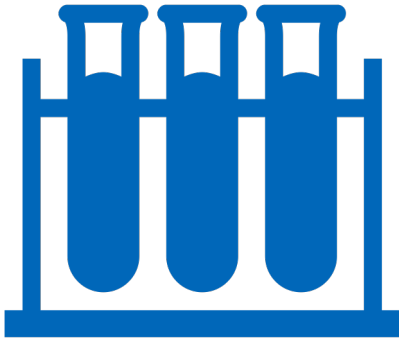
A history of partnership on major CWC initiatives



What's the Issue?



22% of lab tests in Canada may be overused



Lab test overuse



- Unnecessary follow-up and testing
- Negative patient experiences and unnecessary burden of testing (e.g., travel)
- Inappropriate treatments
- Inefficient use of health care resources prevents them from being used by those who need it most

What's the Solution?



22% of lab tests in Canada may be overused



Minimum retesting intervals for lab tests

The minimum time before a test should be repeated, based on the biochemical properties of the test and the clinical situation in which it is used

Recognizing an Unmet Need for Labs



Participating hospitals in Using Labs Wisely identified a need for **guidance** on the **minimum retesting intervals for lab tests** to support decision making

- Guidance is inconsistent or unavailable
- A sample of hospital labs in Canada showed heterogeneity in the minimum retesting intervals used

Objective



To develop a **guidance document** based on consensus recommendations from a multi-disciplinary, time-limited panel on the **minimum retesting intervals for lab tests** in specific clinical scenarios

Approach: Lab Tests & Clinical Scenarios



- ANA
- BNP and NT-proBNP
- HbA1c
- Lipase
- Lipid panel
- SPEP
- TSH

- Using Labs Wisely participants identified lab tests of interest
- Clinical scenarios associated with each lab test were refined by CWC & clinicians (lab experts, internist) where there is the greatest potential to reduce unnecessary repeat testing
 - E.g., Clinical scenario for HbA1c = Monitoring patients with an established diagnosis of type 1 or type 2 diabetes who are on either lifestyle modification, glucose lowering agents, or insulin

Project Scope

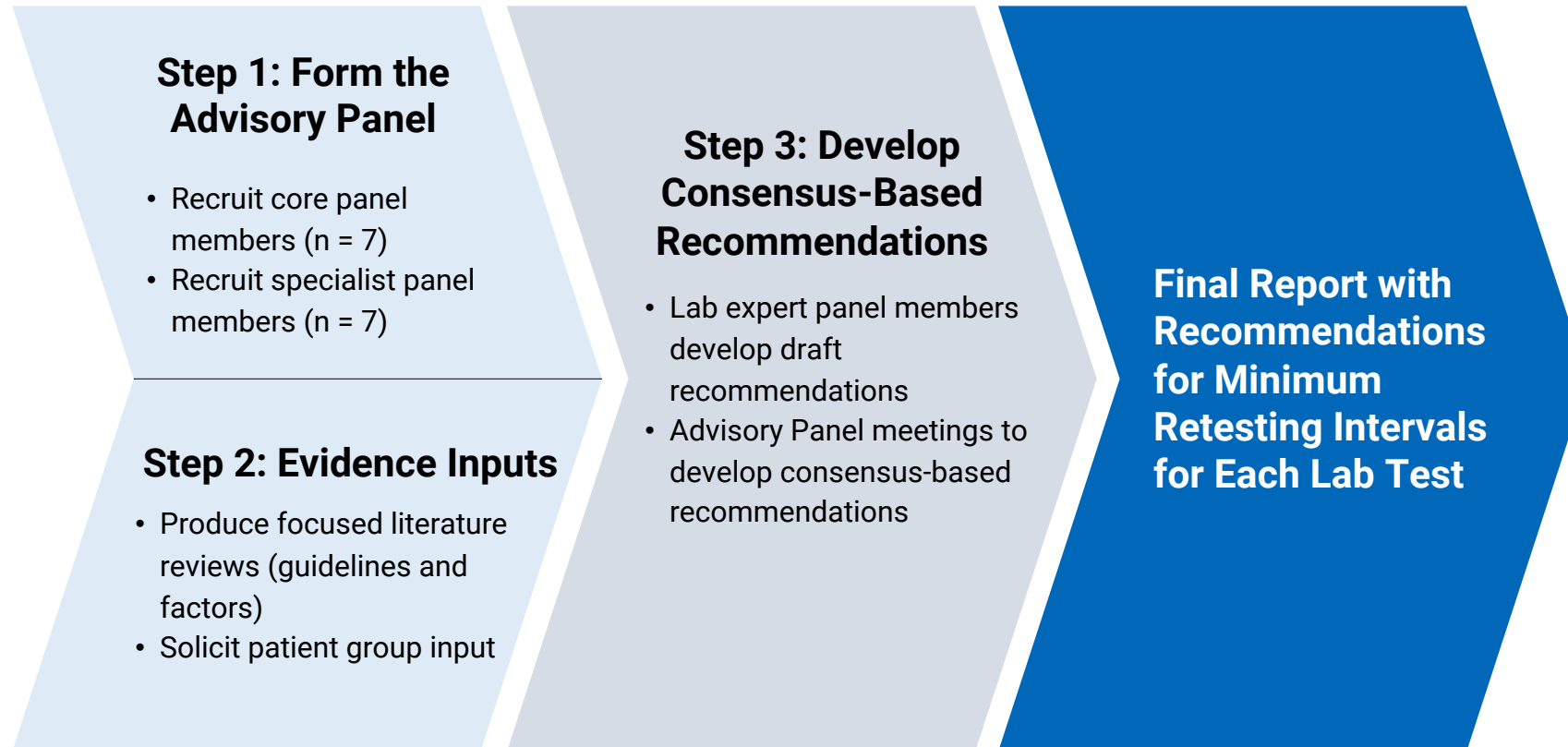


- **Minimum retesting intervals** (i.e., the minimum time before a test should be repeated, based on the properties of the test and the clinical situation in which it is used)
- Pre-specified lab tests
- Pre-specified clinical scenarios
- Considerations for equity-deserving populations
- No restriction on lab type (e.g., hospital, community)

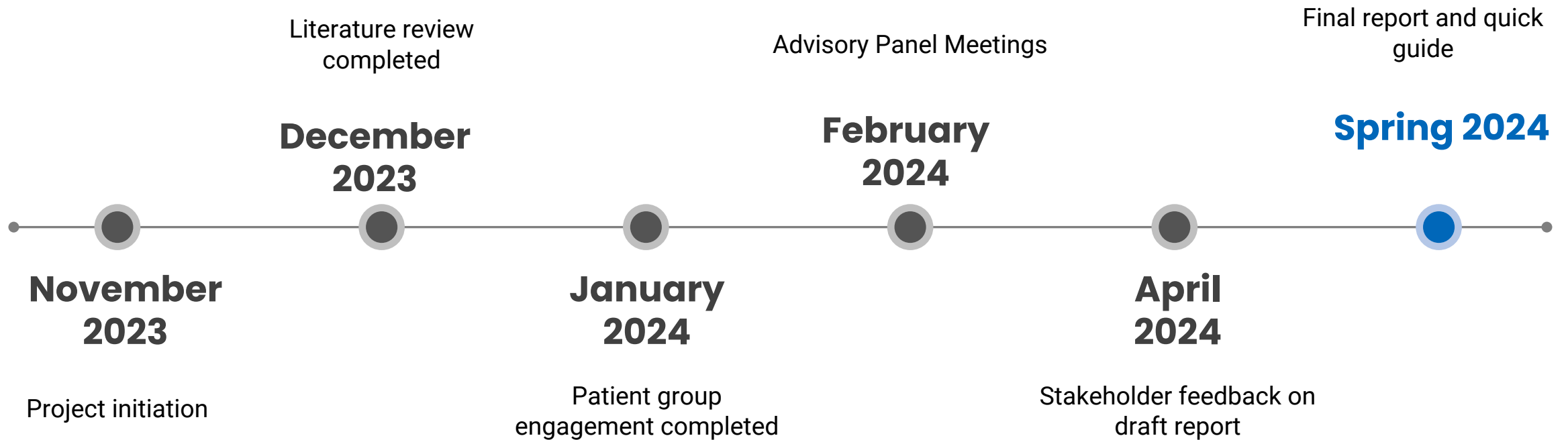


- **Testing frequency** (i.e., the suggested time frame for patient monitoring to support overall health)
- Other lab tests
- Other conditions or scenarios (e.g., screening)
- Other test initiation or selection criteria (e.g., when to initiate test, use of test A over test B)

Approach: Overview



Approach: Overview



Step 1 – The Advisory Panel



Advisory Panel

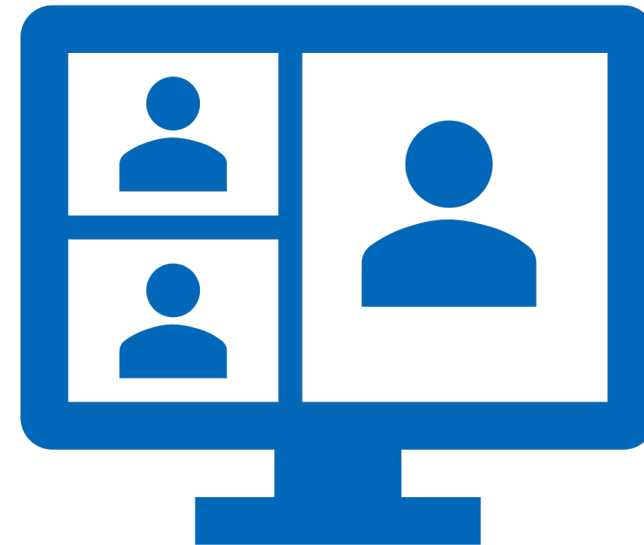
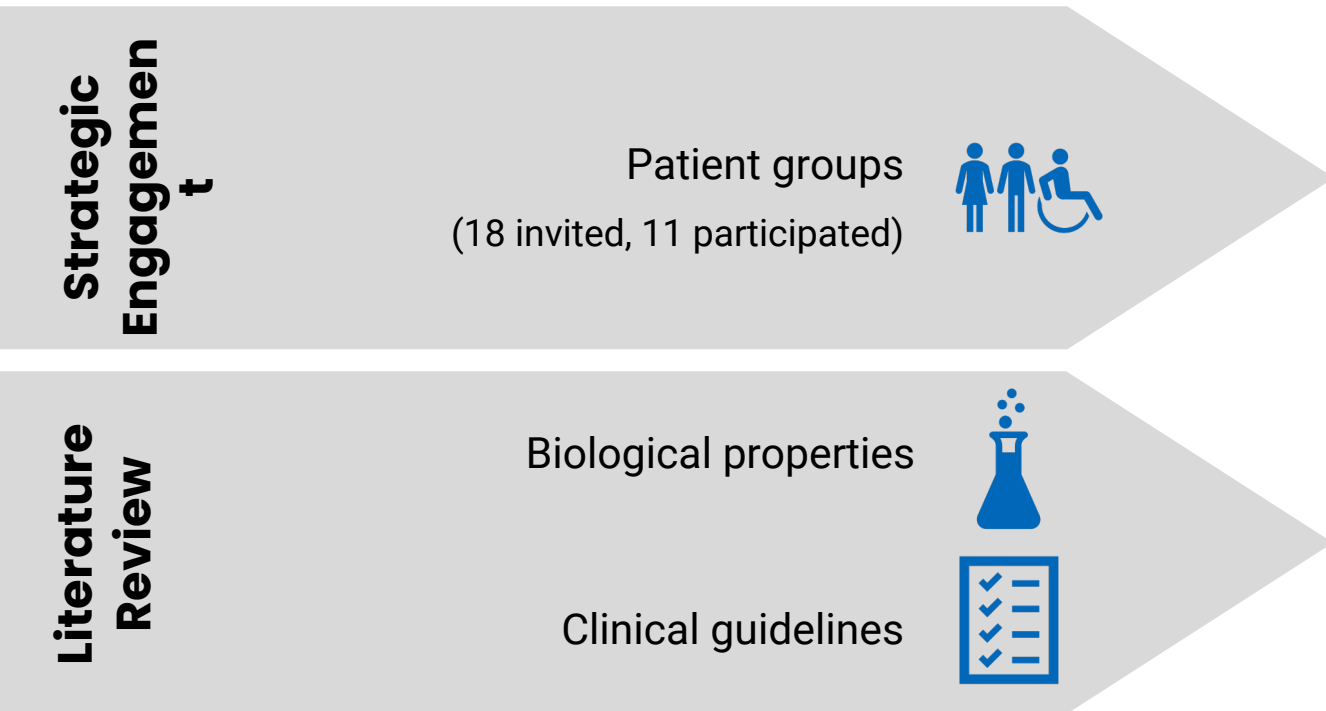
Core Members

- ✓ 4 lab specialists
- ✓ 2 family doctors
- ✓ 1 patient member

Specialist Physician Members

- ✓ Endocrinologist
- ✓ Cardiologist
- ✓ Pediatric Cardiologist
- ✓ Rheumatologist
- ✓ Hematology oncologist
- ✓ Gastroenterologist
- ✓ Internist

Step 2 – Evidence Inputs



Advisory Panel

Step 3 – Developing Recommendations



1

Draft recommendations by **4 lab specialists**
for use by Advisory Panel

2

Consensus recommendations by the **Advisory Panel** for publication and
use by Using Labs Wisely

Step 3 – Developing Recommendations



1

Draft recommendations by 4 lab specialists
for use by Advisory Panel

Literature reviews



Patient groups



Discussion guide



2-hour virtual meeting
January 31, 2024



DRAFT

Step 3 – Developing Recommendations



2

Consensus recommendations by the **Advisory Panel** for publication and use by Using Labs Wisely

Literature reviews



Patient groups



Discussion guide



DRAFT



7 x 1-hour virtual meetings
February 20 to 22, 2024

Results: Advisory Panel Guidance



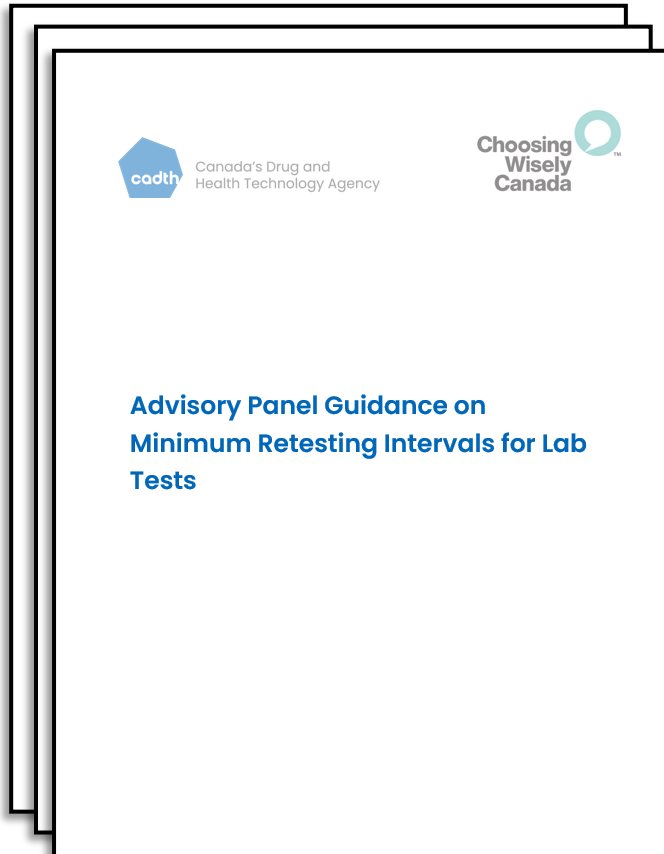
Minimum retesting interval recommendations (8)

- Exceptions
- Implementation advice (e.g., hard stops)

“Do not reorder” recommendations (6)

- Exceptions
- Implementation advice (e.g., hard stops)

Advisory Panel Discussion Themes



General Guidance

- The importance of access to prior test results
- The importance of education
- The importance of communication

Discussion and Future Considerations

- The value of reducing unnecessary lab testing
- Reflecting on equity considerations and who is affected by minimum retesting intervals
- The need for guidance on screening tests




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Sneak Peek

Draft Hemoglobin A1c Recommendations

Sneak Peek: HbA1c



The HbA1c test measures chronic glycemia and is useful for diagnosing diabetes and monitoring the overall effectiveness of treatment for diabetes.



HbA1c is relatively unaffected by acute changes in blood glucose levels and is used to evaluate a person's overall level of glucose control over time.

Clinical Scenario: Use of **HbA1c** to **monitor** patients with an established diagnosis of type 1 or type 2 diabetes who are on either lifestyle modification, glucose lowering agents, or insulin

Sneak Peek: Draft HbA1c Recommendations



Draft Recommendations

Implementation Advice

1

The recommended minimum retesting intervals for HbA1c in patients who are being treated for diabetes are:

- 3 months for patients who have not yet achieved stable glycemic targets.
- 6 months for patients who have achieved stable glycemic control.

Exceptions to this recommendation that may warrant more frequent testing include pediatric patients with type 1 diabetes, patients with diabetes who are planning to become pregnant, and patients with rapidly changing blood glucose levels due to significant recent changes to lifestyle and/or medications.

2

Do not reorder HbA1c tests for assessing glycemic control in patients with diabetes who have conditions that alter red blood cell turnover (e.g., iron deficiency anemia) or for pregnant patients with diabetes who are in their second or third trimester.

To support reductions in unnecessary retesting, labs may consider implementing a 60 to 86 day hard stop minimum retesting interval.

Clinical Scenario: Use of HbA1c to monitor patients with an established diagnosis of type 1 or type 2 diabetes who are on either lifestyle modification, glucose lowering agents, or insulin

Sneak Peek: HbA1c Discussion Points



Key Discussion Points

- Published evidence from the literature review
- Patient experiences & perspectives from patient group input
- Exceptions (e.g., rapid changes)
- Equity (e.g., access to continuous glucose monitoring technologies)
- Conditions impacting the rate of red blood cell turnover that invalidate results
- Implementation considerations (e.g., pediatric and adult patients, hard stop)

Clinical Scenario: Use of HbA1c to monitor patients with an established diagnosis of type 1 or type 2 diabetes who are on either lifestyle modification, glucose lowering agents, or insulin



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Lessons Learned

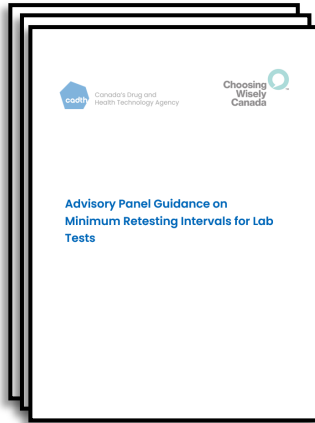
Lessons Learned



Harnessing the value of partnership

- ✓ **Stronger together** – we built on the strengths of each organization
- ✓ **Intentional engagement** – we connected with the right expertise throughout the project to bring together a variety of voices and perspectives
- ✓ **Innovation** – we created an open space for innovation and developing a novel approach to working together
- ✓ **Timely** – we're more efficiently supporting decision makers when we work together
- ✓ **Knowledge translation** – we crafted a range of thoughtful products to best support our end users

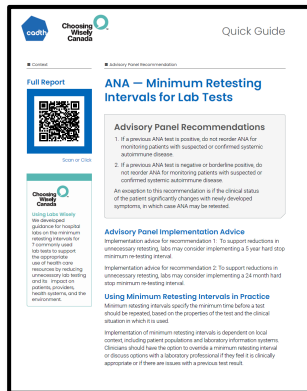
Deliverables & Next Steps



April 15, 2024 (today)

Draft report (includes draft recommendations for all 7 tests) is available April 15 – 26 on our website for feedback:

<https://www.cadth.ca/stakeholder-feedback>



Spring 2024

Final report and quick guides will be available through the CWC and CADTH websites



Building on the strengths of our organizations, an Advisory Panel developed recommendations to help address overuse of repeat testing and improve the quality of care.

Acknowledgements



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Patient Groups

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Canadian Arthritis Patient Alliance
Cassie and Friends Society for the Children with Juvenile Arthritis
Diabetes Canada
Gastrointestinal (GI) Society
JDRF Canada
Lupus Canada
Myeloma Canada
Pulmonary Hypertension Association Canada
Thyroid Foundation of Canada
Thyroid Patients Canada



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Thank You





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Additional Slides

Clinical Scenarios



Lab Test	Scenario
Serum antinuclear antibody testing	Monitoring patients with suspected or confirmed systemic autoimmune disease Primary populations of interest: <ul style="list-style-type: none"> - systemic lupus erythematosus (SLE) - scleroderma/systemic sclerosis - rheumatoid arthritis - Raynaud phenomenon
Plasma Brain Natriuretic Peptide (BNP) test N-terminal pro b-type natriuretic peptide (NT-proBNP)	Monitoring patients who are being treated for congestive heart failure or pulmonary arterial hypertension
Hemoglobin A1c	Monitoring patients with an established diagnosis of type 1 or type 2 diabetes who are on either lifestyle modification, glucose lowering agents, or insulin
Serum lipase	Monitoring patients with acute or chronic pancreatitis
Lipid panel	Monitoring patients who are being treated with oral lipid-lowering therapy Primary populations of interest: <ul style="list-style-type: none"> - dyslipidemia - hypertriglyceridemia - hypercholesterolemia - familial lipid disorders
Serum Protein Electrophoresis (SPEP) test	Monitoring patients with confirmed plasma cell dyscrasias
Serum Thyroid stimulating hormone (TSH) concentration	Monitoring patients who are being treated with thyroid replacement therapy for hypothyroidism; Monitoring patients who are being treated for hyperthyroidism