Determining Key Intervention Components to Reduce Laboratory Test Ordering Overuse in General Internal Medicine Wards

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Background, Problem and Aim

Laboratory tests are by far the most common medical activity performed in the Canadian healthcare system (Naugler & Wyonch 2019). For lab test ordering, an overused test is defined as a test that would not change the care management regardless of its results (Sedrak, et al, 2016). Laboratory test ordering overuse (LTOO) in the inpatient hospital setting is often initiated at hospital admission and the ordering of a standard panel of blood tests without regard to clinical indication has been entrenched as a norm, with minimal distinction made among admitted patients which has several negative downstream effects (Faulkner, Reidy, & McGowan, 2017; Thavendiranathan, Bagai, Ebidia, Detsky, & Choudhry, 2005).

Studies that use a singular intervention reported minimal to no impact on reducing LTOO (Melendez-Rosado et al., 2017). In contrast, initiatives that combine multiple intervention components reported higher sustained laboratory test reductions (Vidyarthi, et al., 2015; Yarbrough, et al., 2016; Zhi, Ding, Theisen-Toupla, Whelan, & Arnaout, 2013).

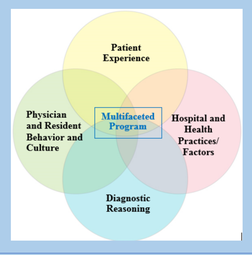
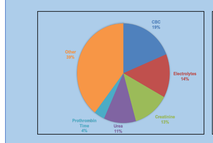


Figure 1. Venn Diagram of Evidence Based Domains for LTOO
Based on a literature review of peer reviewed journal from the last 10 years (2009-2019) identified that intervention strategies aligned to 4 domains (patient experience, physicians/ resident behavior and culture and diagnostic reasoning and hospital/health system factors

In the Edmonton zone (EZ) in Alberta, Canada laboratory testing has increased by 1.4 million tests in the last 4 years (2014 to 2018) which is the highest annual increase in the province. Additionally, approximately $3.6 million dollars were spent on Urea testing which is about 48% of the provincial urea total (AHS Annual Report, 2016-17 and Provincial Laboratory Services) and urea ordering is higher in the hospital setting.

In response to the steady growth in lab testing, 4 separate quality improvement (QI) studies were undertaken (started Feb. 2017) by the Edmonton Zone Medicine Quality Council (EZMQC) to explore the phenomenon of laboratory test ordering overuse (LTOO) in a paper based ordering process to identify salient intervention components in various EZ Alberta Health Services(AHS) and Covenant Health (CH) teaching hospitals (University of Alberta Hospital (UAH), Royal Alexandra Hospital (RAH) and the Misericordia Community Hospital(MCH)) general internal medicine (GIM) wards.

Baseline data: Where is the opportunity?



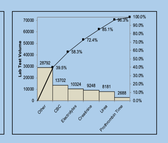


Figure 1 and 2. Analysis based of 6 months of data from UAH 5 GIM wards (February 1 – July 31, 2016)
Similar findings were observed at the other intervention hospital GIM wards.

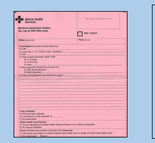


Figure 3. EZ Medicine Admission Order Set Laboratory tests are bundled

Core Internal Medicine Resident Survey (n=38/100)
- 97% of residents admit to ordering CBC daily at admission in >75% of patients
- 68% of residents always review lab orders when accepting a patient on the ward
- Fewer than 30% of residents always review lab orders on daily rounding
- 95% of residents order unnecessary lab tests at least once per week
- 92% feel inappropriate lab testing is a problem

Figure 4. Survey of Core Internal Medicine Residents
Within the EZ these residents train in all intervention hospitals

Aim:
By Dec 31, 2018:
Identify key intervention components from hospital admission to discharge that support a reduction in LTOO for CBC, CBCd, urea, creatinine and lytes along with laboratory test order frequency

Measurement:
Outcome measure: Number of CBC, CBCd, urea, creatinine and lytes per month and cost per test/ month
Process measure: Number of auto-substitution labels used per month, Number of Urea justification labels used per month, Number of ALC stickers used per month
and the Number of resident/physicians trained per month
Balancing measure: Percentage of stat lab tests ordered post admission per month (tracked in Lab services), In-hospital mortality rate, ALOS/ELOS ratio and 30 day readmission

MANAGE CHANGE

QI Team and Study Structure:
Each project was sponsored by a dyad partnership (medicine site operational leader/executive director and physician leader), led by a frontline QI physician champion, and the QI team members includes a resident, medical student, patient care manager, unit manager, nurse, unit clerk and a quality consultant. Each project aligned to the EZMQC and to the appropriate site or medicine program quality council ensuring communication flows through the AHS quality management framework

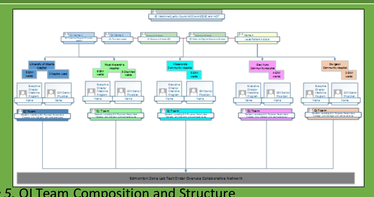


Figure 5. QI Team Composition and Structure
This diagram outlines the QI teams for each hospital in the Edmonton Zone and the link to senior hospital, Laboratory, physician leaders and the link to AHS quality management framework and quality departments.

Methodology and Methods

All QI studies employed the model of improvement framework, Donabedian conceptual model, and to support the people side of change both the Transtheoretical behavioral change framework with the ADKAR (Awareness Desire Knowledge Action Reinforcement) model were used. A literature review, QI tools, questionnaires and prospective chart audits were conducted to determine variable relationships and to develop causal inferences supporting intervention adaptation to each hospital local context. Results were analyzed using descriptive statistics and an estimated cost calculation (reference median cost multiplied by total test volume count).

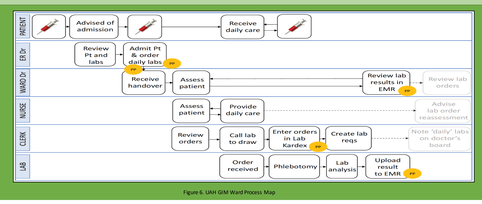


Figure 6. UAH GIM Ward Process Map

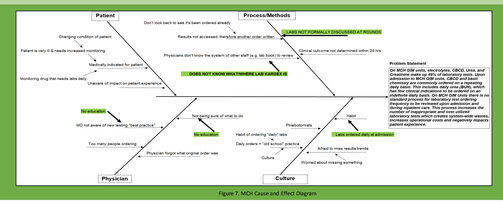


Figure 7. MCH Cause and Effect Diagram

Key Sequenced Intervention Components Identified

Figure 8. EZ Updated Medicine Admission Form

1. Updated admission order form by unbundling lab tests, added frequency limits, removed urea and added an area for any test to be written (not restricting lab test ordering)

2.Resident and Attending LTOO educational presentation and handout
Encourage-No daily ordering upon admission

3. Prompt ward laboratory test frequency adjustment-auto-substitution label , 4. physician urea justification, 5. Diagnostic aides posted on the ward

Figure 9. Auto-sub Label

Figure 10. Urea Justification Label

Figure 11. Urea Diagnostic Aide

6. Ward Lab Kardex highlighted and given to physician team and 7. Lab test frequency formally added to rounding conversation.

8. Alternate Level of Care (ALC) label, triggers further laboratory test frequency reductions to patient discharge

Figure 12. ALC label

Discussion:
- Each QI project identified different intervention components that aligned to the 4 evidence based domains resulting in the proposed sequenced multifaceted intervention. A dyad leadership approach between a physician and an operational leader that views LTOO as a strategic priority and actively supports frontline QI teams is critical to sustained success.
- As a QI project was completed, we continued to adapt and develop the intervention components as we progressed from one hospital to the next determining individual intervention component effect. Also, the ALC label was tested at the RAH prior to this project defining ALC sticker effect.
- Next steps, to determine the patient specific intervention component(s) and to determine the effectiveness of this multifaceted sequenced intervention on reducing specifically urea utilization and laboratory test order frequency in hospital Medicine wards.

RESULTS

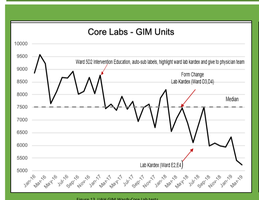


Figure 13. UAH GIM Wards-Core Lab tests

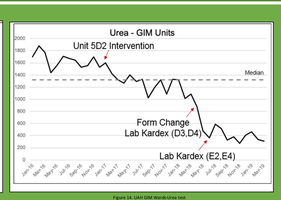


Figure 14. UAH GIM Wards-Urea test

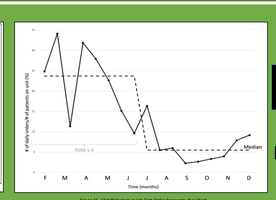


Figure 15. UAH Reduction in Lab Test Order Frequency Run Chart

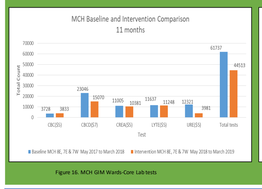


Figure 16. MCH GIM Wards-Core Lab tests

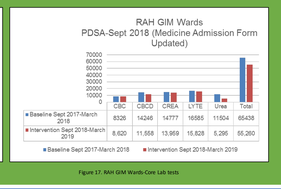


Figure 17. RAH GIM Wards-Core Lab tests

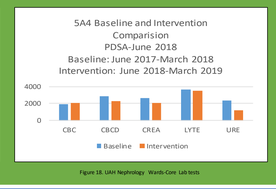


Figure 18. UAH Nephrology Wards-Core Lab tests

Note: All other GIM wards had similar run charts indicating a reduction in laboratory test order frequency from 'daily' to a lower order frequency- i.e.-'daily x3)

Findings Post ~12 Months:

Volume of test reduced to: ~45,000
Estimated future test reduction: ~2000 fewer tests per GIM ward

No observed negative effect to any balancing measures

Cumulative Cost Avoidance:
Over $200,000.00 (Ma, 2018)
Estimated future cost/test avoidance: Est. ~$10,000.00 per GIM ward

Lessons Learned

System changes:
- Order sets, unbundle blood test panels with frequency clearly indicated-i.e. once, daily x3, etc.
- Prevent blood tests ordered upon admission as indefinite (daily)
- Remove low value blood tests (urea) from the Medicine admission order form
- Multicomponent intervention increases effect on reducing lab test order frequency and volume. Intervention sequencing supports change management/acceptance

People Changes:
- Involve Ward staff- increase ward communication /collaboration
- Ensure blood test order frequency is known to ALL staff
- Targeted educational sessions explaining *why* change is important for ALL staff
- Support diagnostic reasoning using simple algorithms or guidelines.
- Changing physician cultural ordering practice is difficult; requires frontline QI physician champions, operational leaders and a clinical interdisciplinary QI team
- Shared accountability!

Limitations:
- Allocation concealment at the QI team level is not possible, as residents and physicians rotate between hospital GIM wards and other hospitals within the EZ. Contamination arising from this approach will be inevitable.
- Costs are estimates **only**
- Impacting physician ordering practices and culture is complex because it intertwines clinical decision making, patient safety, effectiveness and health costs; as such change acceptance is difficult and slow

Choosing Wisely: Our findings align to several Choosing wisely recommendations and to the 2019 publication- *Diving into Overuse in Hospitals*

WHY THIS QUALITY IMPROVEMENT MATTERS

…TO PATIENTS
Reducing laboratory testing saves patients the pain and discomfort of needle draws, while also reducing the risk of infections, irritation, bruising and iatrogenic anemia

…TO THE HEALTHCARE SYSTEM
Reducing LTOO reduces the healthcare cost delivery burden which supports funding other areas/programs to further enhance patient care.

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