The Effectiveness of a Sequenced Multicomponent Intervention: Reducing Blood Urea Nitrogen (BUN) test ordering in Alberta Hospitals

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Edmonton Zone Medicine Quality Council
Partnerships in Action
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Background and Problem

In Alberta, ~80 million laboratory tests are ordered annually (2018-2019). A Provincial Laboratory Utilization Report (2018) identified:

- Blood Urea Nitrogen (BUN) test utilization - top 10 ordered tests for all health zones in Alberta, except Calgary.
- BUN-test ordering was higher in the hospital setting.

In a response, the Edmonton Zone Medicine Quality Council-Physician QI leadership Coalition completed 4 separate QI projects in the Edmonton zone that identified key sequenced intervention components to reduce BUN test ordering in a paper-based hospital charting process.

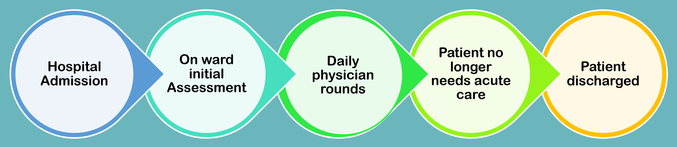

Figure 1. Multicomponent Intervention

Challenges

- COVID-19 Pandemic
- Connect Care implementation
- Move to a new hospital building

Interventions

Medicine unit paper-based intervention components could not be trialed due to the COVID-19 disruption.

The planned interventions were abridged to include:

1. **One educational presentation** from either the coalition physician leader, a coalition physician member with a local physician leader or a local medicine or ED physician leader.
2. **Paper admission form or IT system updates**
   a. RDRH-Medicine Admission paper form-2019
   b. MCH-ED IT lab panel-2020.
3. **Audit and feedback**

Results

- Monthly Bun test ordering declined for all participating hospital medicine units and emergency departments.
- Emergency departments -monthly visit count was compared to the total monthly BUN test ordered to measure a reduction.
- Hospitals that incorporated form or IT system changes where the BUN test was removed from lab panels resulted in higher reductions.
- Medicine units required to frequently switch to COVID units resulted lower BUN test reduction.
- Total cost avoidance approximation for the 3 participating hospitals is $13,300.00 per month or $160,000.00 per year

Edmonton Zone

Average Monthly BUN tests ordered
Pre-Intervention= 1905
Covid-disruption=1190
Post-Intervention=448
62% Reduction

Monthly ED Visit Volume to Monthly BUN Test ordered Ratio
Pre-Intervention=**0.45**
Post-Intervention=**0.1**

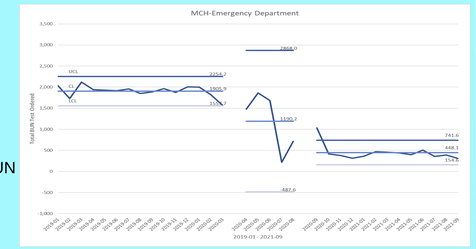

Figure 2. Misericordia Community Hospital(MCH)-Emergency Department. Pre and Post Intervention monthly Bun test ordered

South Zone

Average Monthly BUN tests ordered
Pre-Intervention=697
Covid Disruption=736
Post-Intervention=457
38% Reduction

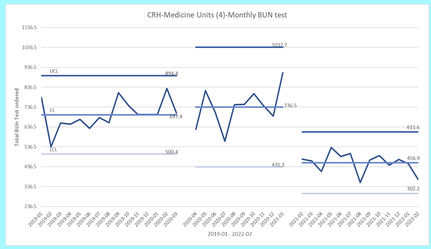

Figure 3. Chinook Regional Hospital(CRH)-Medicine 4 Units. Pre and Post Intervention monthly Bun test ordered

Central Zone

Average Monthly BUN Tests ordered
Pre-Intervention= 1635
Covid-disruption=1545
Post-Intervention=1041
67% Reduction

Monthly ED Visit Volume to Monthly BUN Test ordered Ratio
Pre-Intervention=**0.34**
Post-Intervention=**0.19**

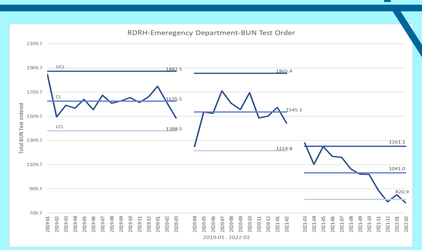

Figure 4. Red Deer Regional Hospital(RDRH)-Emergency Department Pre and Post Intervention monthly Bun test ordered

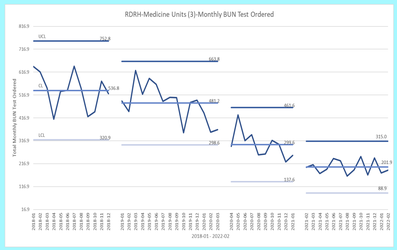

Figure 5. Red Deer Regional Hospital(RDRH)-Medicine 3 Units. Pre and Post Intervention monthly Bun test ordered

North Zone

This Zone could not participate due to competing staff demands such as the launch of Connect Care IT System, COVID-19 disruptions, small medicine physician team. The Physician champion shared with colleagues informally the importance of appropriately ordering BUN test.

Average Monthly BUN tests ordered
Pre-Intervention=481
Covid Disruption=299
Post-Intervention=201
33% Reduction

Objective

- The primary objective was to reduce the monthly BUN-testing ordering in hospital medicine units and /or emergency departments (ED) in 4 health zones (Edmonton, Central, South, and North) in Alberta.
- The expectation was a physician led initiative that provided targeted education, simple paper-based interventions along with audit & feedback would reduce BUN-testing ordering.

Methods/Approach

- Ethical approval obtained from the University of Alberta REB (study number Pro00099263, April 24, 2020).
- Pre/Post intervention interrupted time series design.
- Adapt the sequenced multicomponent intervention to the following locations:

Edmonton Zone-Misericordia Community Hospital (MCH)-Emergency Department
Central Zone- Red Deer Regional Hospital(RDRH)-Medicine Units and Emergency Department
South Zone- Chinook Regional Hospital (CRH)-Medicine Units
North Zone- Queen Elizabeth II Hospital-Medicine Units

Approach

Step 1: Coalition Physician project leader communicated with appropriate local medicine, ED, zone or hospital physician leaders.
Step 2: Coalition QI consultant and Research Assistant completed current state review(includes completion of QI tools and review of monthly BUN-test count data) to determine local processes.
Step 3: Share current process finding with local hospital physician and operational leaders.
Step 4: Develop local QI team led by a local physician champion to adapt interventions to fit local context.
Step 5: Provide audit and feedback to physician champions.
Step 6: Analysis of the monthly BUN-test count data over time.
Step 7: Annual cost avoidance approximation, calculated using a reference median of $5.00 per BUN test (Ma et al., 2019).

Conclusions

- QI projects focused on lab testing, physician QI leaders are critical for change acceptance.
- Targeting one blood test using brief education, audit and feedback supported BUN test order reductions.
- To encourage physician participation and leadership in QI activities, design interventions that require minimal effort and disruption to clinical processes along with support personnel (QI and analytics).
- For intervention sustainability – incorporate changes to order processes and IT systems, provide laboratory data access (audit and feedback) and provide physicians QI and clinical laboratory education.
- This project made recommendations to the design of Connect Care – (i.e., BUN test was removed from all order sets where appropriate to support sustained reduction.

Why this QI Work Matters

To Patients: Reduction in possible complications and illnesses as the result of repetitive blood draws.
To Clinicians: Reduction in unnecessary components of practice that do not add value to patient care. Practice focus on thoughtful ordering and mindful prescribing for patients.
To Health System: Reducing inappropriate laboratory testing would have the dual benefits of making the health system more efficient and improving patient outcomes and experience.

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Reference:
Ma I, Lau CK, Ramdas Z, Jackson R, Naugler C. Estimated costs of 51 commonly ordered laboratory tests in Canada. Clin Biochem. 2019 Mar;65:58-60. doi: 10.1016/j.clinbiochem.2018.12.013. Epub 2019 Jan 5. PMID: 30615855.