

## Abstract

**Introduction:** Laboratory tests make up a large portion of medical procedures and several previous reports suggest that instances of inappropriate laboratory testing is not uncommon. It has been shown that physician ordering behaviour can be influenced by education, lab order form design and electronic systems, to reduce laboratory test over ordering and promote resource stewardship. Preliminary analysis identified high monthly urea blood test order volume in our hospital's emergency department (ER) requiring a quality improvement investigation.

**Aim/Method:** Educational presentations were conducted for staff physicians and unit clerks regarding the indications for urea blood tests along with sharing past monthly urea order utilization data. Indications for urea testing was developed after literature review and consultation with local experts to help guide thoughtful urea ordering. The ER electronic ordering system was also updated to remove urea from a lab order panel including creatinine, sodium, potassium, chloride, glucose and bicarbonate and to create a separate urea option that could be added when required.

**Results:** Proportion of presenting patients receiving urea blood work in ER reduced to 0.18 in 2020/2021 from 0.461 in 2019/2020 in the four months measured post intervention vs the previous year.

**Conclusions:** Successful reduction in urea blood tests in the emergency department reveal that even in a clinical setting where diagnostic tests are a major contributor to the clinical care plan and decision making process, simple physician led interventions are capable of influencing physician ordering behaviour toward resource stewardship.

## Introduction

### Problem

Medical organizations in Canada are tasked with providing equivalent health care access to the entire population. This necessitates efficiency and stewardship in a system that is limited by resource availability. Laboratory testing is a particularly high volume medical procedure that accounts for up to 4% of the Canadian healthcare budget and continues to increase rapidly.<sup>1</sup> Because of this large proportion of the healthcare system it makes for a strong target for quality improvement modifications, particularly when focused on stewardship.<sup>1-3</sup>

### Available Knowledge

Laboratory ordering behaviours have been shown to be influenced by education/awareness, redesigns of electronic and paper ordering systems as well as a combination of these interventions.<sup>4,5</sup>

### Rationale

A preliminary chart review corroborated the perception that the monthly total of urea blood tests ordered for a majority of patients presenting to the emergency department was part of outdated laboratory panels, thus inflating test order utilization. The common indications for urea blood tests were developed through literature review and later revised by multiple specialists including GIM, Nephrologists, Hematologists as well as a lab biochemist team<sup>6,7,8</sup>. Based on the developed list it was likely that the number of Urea tests ordered were potentially unnecessary compared to the prevalence of indications in the population.

### Specific Aims

With the understanding that the emergency department is highly diagnostic in nature, a conservative goal of 30% urea test order reduction was set for this QI project.

## Methods

### Interventions

Education presentations were given to the staff physicians and unit clerks provided by a general internal medicine and ER physicians. These presentations included past urea test utilization data and clinical indications for urea blood test ordering. Infographics outlining the clinical indications and ordering information were also developed and placed at the doctor's desk as well as at triage in the ER. Additionally, the electronic ordering system was updated to replace the traditional 'P7' option which included sodium, potassium, chloride, bicarbonate, urea, creatinine, and glucose to a 'P6' option which removed urea from this grouping. Instead Urea tests would have to be separately added to the order when clinically indicated to do so.

### Measures

**Outcome Measures:** The monthly amount of urea blood tests ordered by the ER and the proportion of urea blood tests ordered in the ER for the number of ER visits.

**Process measures:** The number of single urea tests ordered per month

**Balancing measures:** The number of stat Urea or add-on Urea tests ordered post initial laboratory order per month.

## Results

Total monthly Urea orders for the target hospital ER were reduced by 73% in the four months post-intervention compared to the same 4 months a year prior. It was important to note that the difference in ER visits was decreased in the post-intervention period compared to the same four months a year prior by 33.7%. Therefore the proportion of urea blood tests ordered to the number of visits to the hospitals emergency department, was reviewed to provide a more accurate account of the reduction in orders achieved.

Proportion of orders reduced from 0.461 from the same four months in 2019 to 0.185 in the four months post intervention. This is a corrected reduction of 60% in urea blood test ordering at this Western Canadian teaching hospitals ER following the alteration of the electronic order set and educational sessions with the physicians and unit clerks.

The laboratory did not report a rise in stat or add on urea tests from the ER during this intervention.

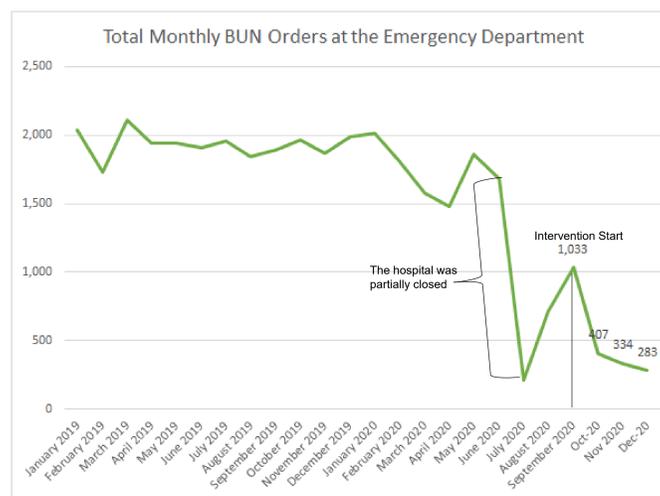


Figure 1 - Total monthly urea blood test orders at the Emergency Department of a Western Canada teaching hospital. It should be noted that July-August 2020 data is disrupted due to partial closure of the department during COVID-19 outbreak. This studies interventions occurred on September 15th, 2020.



Figure 2 - Proportion of Urea blood tests ordered vs ER visits at a Western Canada teaching hospital. Interventions described above were in place beginning on September 15th, 2020.

## Conclusions

The reduction in proportion of urea tests ordered in this Western teaching hospital ER supports the concept that physician ordering behaviour can be influenced towards a more sustainable practice with a combination of educational and order system organizational interventions. The results exceeded our target goal of a 30% reduction during the three month intervention period. The ER is a clinical location that often requires extensive diagnostic and broad testing to identify and support patient care delivery. As such, this simple physician led intervention offers insight and encouragement that a 60% reduction can be achieved by altering order panels and providing educational infographics/sessions on appropriate urea blood test ordering.

This study occurred during the COVID-19 pandemic and thus it required more close monitoring of usage rates and extraneous variables such as the number of patients presenting to the emergency department. A limitation of the study was the inability to isolate single urea blood tests ordered from the laboratory IT system. This study has shown that physician led interventions are effective at reducing the laboratory ordering of unnecessary urea blood tests although these interventions could be further tested for in other inpatient and outpatient contexts. Other laboratory investigations could also be reviewed for possible quality improvement studies in the future as well.

## References

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