

Challenging the Status Quo: Appropriate Pathology Testing in the ICU

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Case for Change

High frequency, low cost 'routine' pathology tests are performed daily as part of the management of critically ill patients in the intensive care unit (ICU). It has been suggested that between 30% - 66% of in-hospital pathology tests are unnecessary [1,2,3,4].

The problem with unnecessary pathology testing is the potential for patients to be exposed to the following risks:

1. Complications due to sample-collection procedures (discomfort, haematoma, infection);
2. Iatrogenic anaemia potentially requiring blood transfusions and their associated risks and complications [6];
3. Increased likelihood of false-positive results, over investigation, and adverse outcomes due to unwarranted additional intervention [7].

Additionally, there are costs which are more difficult to quantify including nursing hours lost to blood collection and medical staff hours associated with reviewing large volumes of pathology results that may not have contributed to the management of the patient. Furthermore, financial costs to the public health system are under ever increasing pressure to ensure sensible and cost-effective use of healthcare resources.

Aim and Objectives

To change practices around ABG testing and reduce the number of ABGs performed for non-clinical reasons thereby ensuring appropriate utilisation of this resource.

- Reduce the total number of ABG tests performed within the Nepean ICU per annum (p.a) from 11422 to 9137 by July 2019 (equal to a 20% reduction based on 2000 admissions to the Nepean ICU in 2017/18 FYE)
- Reduce the percentage of ABGs performed for non clinical reasons (inappropriate) from 29% to 9% by July 2019 (Based on Nepean ICU survey data 2018)

Method

Project design – Our Diagnostics came from retrospective data focusing on high frequency ABGs commonly performed within an adult ICU. The study period was 1st July 2017 - June 30th 2018. Ethics approval was submitted by the team for this work (**Study Reference Number:** LNR/18/NEPEAN/129)

Project settings and patients - The project was conducted in the ICU of the Nepean Hospital which is a 22-bed tertiary academic ICU operating a closed model of care. The case mix is both medical and surgical. During the day, the rostered consultant intensivist leads on-the-floor patient management. Overnight, a consultant intensivist is on-call. Registrars and JMOs have greater participation in the management of patients overnight.

Data collection – Unidentified clinical and laboratory patient data was collected from the electronic medical record during the study period. Clinical data for the study period included: number of admissions to the ICU; average age of the patient; average length of stay; admission type (medical vs surgical); number of patients requiring ionotropes; number of patients requiring ventilation/non-invasive ventilation; and average length of stay (LOS) in the ICU. The laboratory data was provided locally by Pathology NSW - NSW Health. Laboratory data included: total number of ABGs ordered within ICU during the study period and their cost; and the date and time the ABG was performed. An anonymous opt out survey for nursing staff was conducted over a two week period in Feb/March 2018. This survey was completed at the time the ABG was performed and was aimed at understanding why the ABG had been performed. Staff feedback was canvassed regarding their understanding of when ABGs are useful and clinical indications. Further and most importantly informal discussions were had with patients around their experiences when having ABGs taken.

Diagnostics

Table 1 Demographics of the Study Population

| Total Admissions | Av. Age (yrs) | Av. LOS (hrs) | Admission | No. Requiring Ionotropes | No. Requiring Invasive Ventilation | No. Requiring Non-invasive Ventilation |
|------------------|---------------|---------------|-----------------------------|--------------------------|------------------------------------|--|
| 2069 | 58.9 | 70.4 | 75% medical 25% surgical | 197 | 590 | 178 |

Current Reasons ABG's are being performed in the ICU

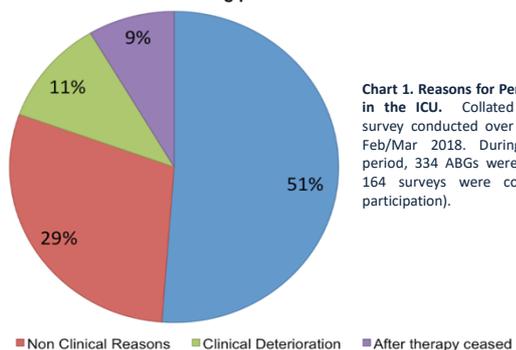
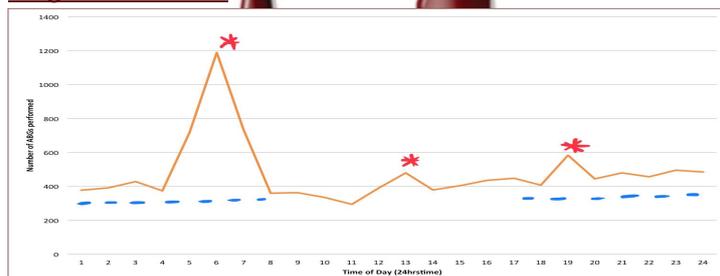


Chart 1. Reasons for Performing an ABG in the ICU. Collated results from a survey conducted over 2 weeks during Feb/Mar 2018. During the 2 week period, 334 ABGs were performed and 164 surveys were completed (~49% participation).

Diagnostics Cont'd



Graph 1. Examining the Time of Day ABGs were Performed in the ICU. All ABGs performed during the 2017/18 financial year were plotted against the time that they were performed to understand fluctuation in ordering throughout the day. The red star denotes a change-over in nursing staffing during a usual work day. Consultant intensivists were 'on the floor' from 0800 - 1700hrs. The blue dashed line denotes the period of time the consultant intensivist were on-call overnight.

Table 2 Summary of Number of ABGs Performed in the ICU during 2017/18 Financial year

| Total No of ABGs Performed | Estimated Total Cost | Total Amount of Patients Blood (L) | Staff Time Required to Run ABGs (FTE weeks) | No. ABGs per Patient |
|----------------------------|----------------------|------------------------------------|---|----------------------|
| 11422 | \$487,864.30 | 34.27 | 54.4 | 5.5 |

Table 3 Summary of Key Issues, Root Causes and Solutions identified

| Key Issue | Root causes (each of which impact all key issues) | Solutions (each of which impact all root causes) |
|--|---|---|
| #1 ABGs performed for non clinical reasons | Fear that staff will be viewed negatively/lazy if they don't perform ABGs each shift | 1. Update out-dated protocols to reflect what current practices around ABG testing should like like 2. Clinical Pathway regarding ABG testing for all members of the ICU 3. Signage in the ICU covering awareness and update RE project progress/targets/success |
| #2 ABGs performed just before shift change or non consultant times (5pm - 8am) | Fear of being judged Reliance that a number/protocol is more definitive than a person's clinical judgement | 4. Education and workshops at the start of rotations RE the "when where and why" of ABG testing 5. During AM ward round Consultant lead discussion RE blood results/ABG performed in the past 24 hrs 6. Consultant lead PM ward round with directive re ABGs ordering for the following day |
| #3 ABGs being performed based on a protocol despite stable patient and non invasive alternatives | Long standing culture of "this is what we do and have always done" | 7. Consultants, NUM, Clinical NUM Nurse Educators agreement around non punitive response to errors 8. Reprogram the ABG to include specific clinical reason for ABG (deterioration, dialysis, electrolyte disturbance, sepsis, etc). |

Results

We are in the early phase of implementation with all solutions except solution 8 implemented. Solutions were implemented in February 2019. At this point in time we are conducting surveys and audits to access the efficacy of the solutions thus far.

Table 4 Number of ABGs ordered pre and post intervention for March 2018 vs March 2019

| | March 2018 | March 2019 | Reduction in ABGs |
|---------------------------------------|------------|------------|----------------------|
| Total No of ABGs performed per pt day | 0.42 | 0.29 | 30% reduction |

Sustaining Change

- Top down support for the change
- New business practices that are designed to be reinforced as they have become part of the daily running of the unit.
- Audits of new processes
- Staff surveys

Conclusions

- The results of the study demonstrate that there were a total of 11422 ABGs performed within the ICU during the 2017/2018 financial year, costing \$487,864.40, utilising 54.4 FTE weeks and requiring 34.27 L of patient blood.
- The pre-intervention survey data suggests that approximately 30% of all ABGs were performed for non-clinical reasons and highlights this as an area for significant change.
- Fluctuations in the number of ABGs performed at specific times within a 24hr period were observed, notably when nursing staff change shifts and when consultants are on-call overnight.
- This project aligns with the internationally recognised "Choosing Wisely" campaign [9]. Choosing Wisely encourages health care providers, patients and their families to discuss how investigations such as blood tests will contribute to the patient's management.
- This study will inform future quality improvement projects operated under the principals of clinical redesign. Currently other high frequency pathology tests are under consideration as a QI project based on this project with Nepean Hospital.



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