From bleep to plan: ABGs in respiratory support

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Introduction

The Mater Infirmorum Hospital (MIH) was the primary BHSCT COVID site during the COVID-19 pandemic and treated a large cohort of patients with **escalating respiratory requirements** necessitating non-invasive respiratory support i.e CPAP, BiPAP and HFNO. Junior doctors expressed **uncertainty on ABG interpretation, escalation** and practicalities of respiratory support, leading to increased ABGs and associated patient discomfort. This understanding was critical to patient safety. **Many ABGs did not have FiO_2 or respiratory support settings recorded**, impeding interpretation (1-4). Ward B was the primary ward used for patients on respiratory support and was the focus of our interventions.

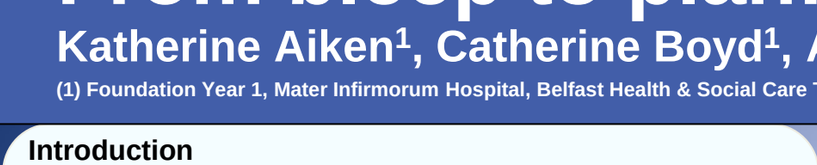
Objectives

1. Improve the number of ABGs with FiO_2 and respiratory support settings documented.
2. Increase junior doctor competence in ABG documentation and interpretation to result in timely escalation of care.
3. Increase junior doctor capabilities in the practical use of respiratory support.

Aim Statement

Improve the documentation of oxygen flow rate/FiO_2 and respiratory support settings on ABGs to 95% by April 2021

Understanding the system



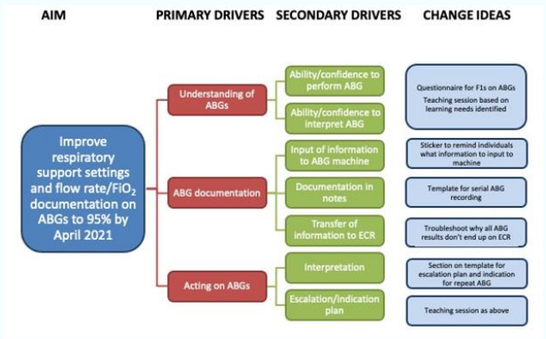


Figure 1: (top): Process map. Figure 2: driver diagram.

Efforts were made to understand the system and human behaviours surrounding ABG documentation and interpretation.

Interventions

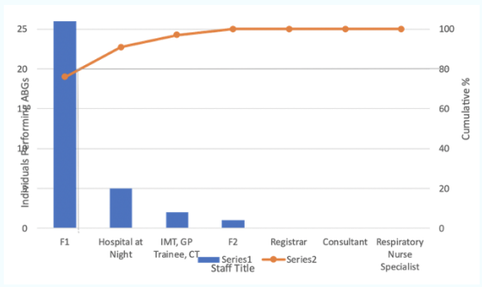


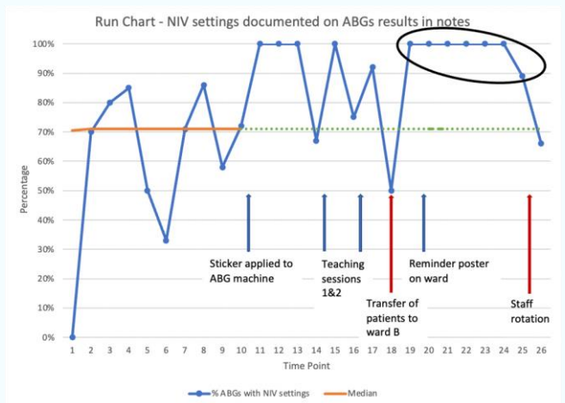
Figure 3: (above): sequential interventions. Figure 4: (left) Pareto chart for profession of those performing ABGs

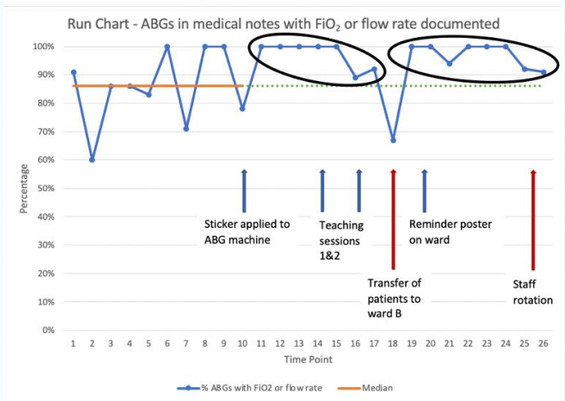
Data was collected and a Pareto chart constructed which showed that FY1 doctors were responsible for over 80% of ABGs performed.

Results

Two run charts were constructed: the percentage of ABGs in medical notes on ward B with (1) FiO_2/flow rate or (2) settings documented against time. Due to COVID-19 pressures it was not possible to collect data uniformly but from December to April data was collected on discrete patients at 26 time points. Initially, both charts show **random variation** around a median line. After 10 data points, this median line was frozen and extended as a dashed line. **Sequential interventions are indicated by arrows and captions. Special variation** (shifts) are indicated by black circles. **The new median for both charts, calculated on post intervention data, is 100%.**

Figure 5: (top): Run chart for FiO_2/flow rate. Figure 6: Run chart for NIV pressure settings





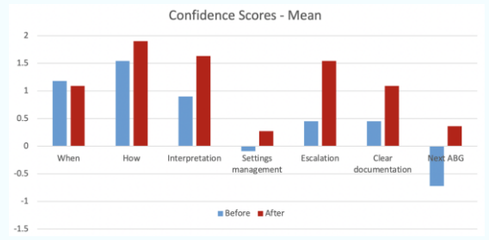


Figure 7: Mean scores for questionnaires completed before and after training are presented above, with 2 correlating to strongly agree and -2 to strongly disagree with positive confidence statements.

Most categories showed an improvement in self rated confidence in issues related to the process and interpretation of ABGs.

Discussion

This project identified **poor documentation and subsequent ABG interpretation for patients on respiratory support as a patient safety issue** and made it a focus for improvement.

1. Efforts to understand the system informed sequential interventions and relevant staff groups to prioritise for training.
2. Interventions made at multiple steps in the process were effective.
3. Reinforcement and reminders at the time of completing the task were useful in ensuring good practice was followed.
4. Junior doctors were those most frequently carrying out this task.

Pre-questionnaires identified areas for targeted teaching and post-questionnaires revealed improvement in their self rated confidence and competence to perform this task.

This project has met its aim, with the new median documentation rate of FiO_2/flow rate and respiratory support settings being 100%.

Undertaking this project has provided practical insights into the challenges and rewards of quality improvement. Doing so alongside clinical work during a period of high service pressure undoubtedly presented hurdles, but through multi- disciplinary team work and troubleshooting the team are gratified to have helped make a change to clinical practice which upholds patient safety.

Next steps

An outstanding area for action is the location of ABGs in medical notes. It is recognised that in an emergency a 'quick reference' page with all recent results, trends, respiratory support indication and escalation plan if this treatment fails would be beneficial. **A proforma for respiratory support documentation** has been developed and discussed with respiratory nurse specialist colleagues, with plans for its introduction soon.

Acknowledgements

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References

(1) Verma AK, Roach P. The interpretation of arterial blood gases. Aust Prescr. 2010 Aug 1;33(4):124-9

(2) Jones R, Berry R. Mechanisms of hypoxaemia and the interpretation of arterial blood gases. Surgery (Oxford). 2015 Oct 1;33(10):461-6.

(3) Smith M, Elkheir N. Improving non-invasive ventilation documentation. BMJ Open Quality. 2014 Jan 1;3(1).

(4) Sood P, Paul G, Puri S. Interpretation of arterial blood gas. Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine. 2010 Apr;14(2):57.