Implementation of an Arterial Blood Gas Indication Algorithm in Cardiac Surgery

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Problem Statement

- The overutilization of laboratory testing was identified as a national problem by the "Choosing Wisely" campaign, advocating for judicious use of testing in intensive care units (ICUs).
- **Arterial blood gasses (ABGs) account for 10-20% of all costs during an ICU stay**
- Non-clinically indicated ABGs can lead to:
  - Increased costs of care
  - Increased length of stays
  - Increased ventilator days
  - Increased line days
  - Increased risk of adverse events
- **In a large, urban academic medical center, the cardiac surgery intensive care unit (CSICU) accounted for nearly 1/3rd of the entire institution's ABGs between 2018-2019, an annual cost of >$829k**
- Primarily due to inappropriate ordering practices

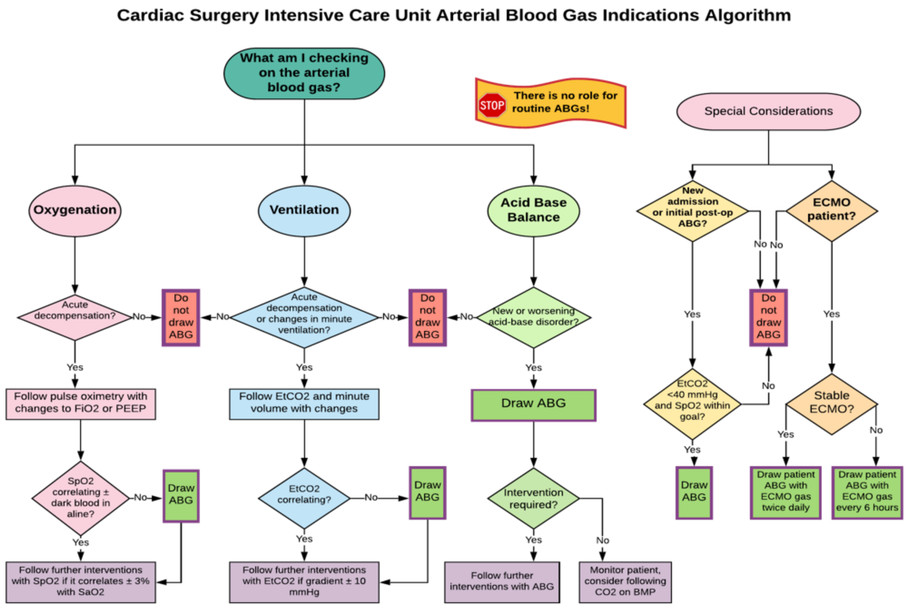
Purpose of Project

- To implement an evidence-based algorithm that identifies appropriate standardized clinical indications for ABGs and to reduce non-clinically indicated ABG orders within the CSICU.
  - **Short Term Goals:** decrease the total volume of ABGs sent, decrease non-indicated ABGs, reduce the costs of care
  - **Long Term Goals:** reduce length of stay, and improve patient morbidity and mortality rates.

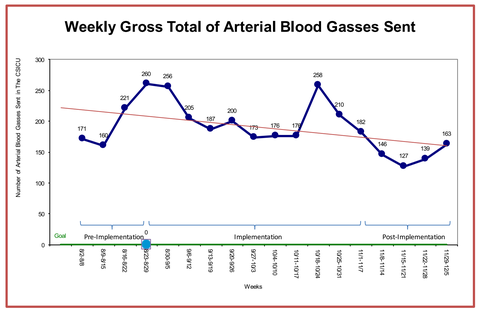
Methods

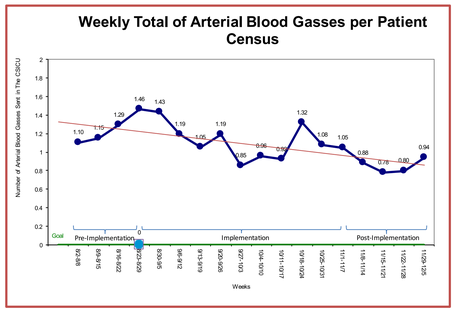
- **Setting:**
  - 30 bed CSICU in an urban academic medical center
- **Inclusion Criteria:**
  - All patients admitted ≥18 years of age during project period
- **Exclusion Criteria:**
  - Venous blood gasses, ECMO blood gasses
- **Implementation Framework:**
  - Mobilize, Assess, Plan, Implement, Track (MAP-IT)
- **Interventions:**
  - Create algorithm, staff & provider education, compliance tracking
- **Implementation Strategies:**
  - Nursing staff and provider education, use of unit champions
- **Data Collection:**
  - Pre- and post-surveys on unit culture regarding ABG usage, weekly gross ABGs, and indications audits

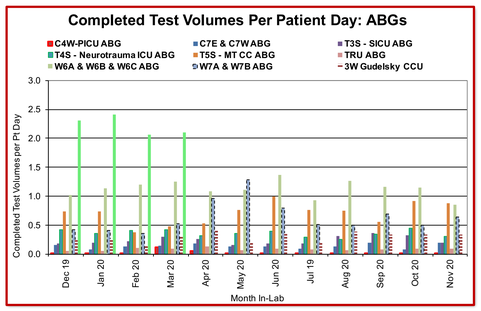
Figures

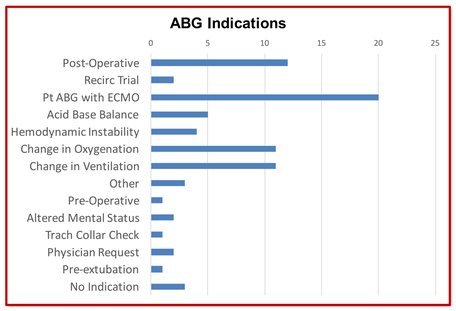


Results









Discussion

- 8.8% decrease in total ABGs sent
- 32% decrease in ABGs per patient day
- Top indications were ECMO-correlated ABGs, post-operative, and changes in oxygenation and/or ventilation (n= 42 patients, 64 observations)
- Excluding the unit's special considerations, **the top indications were consistent with literature: acute changes in oxygenation, ventilation, and/or acid base balance.**
- Cost-savings:
  - $20,697/mo. from August baseline to November.
  - $5809/mo. from baseline monthly average to completion
  - $5116/mo. from 2018-209 monthly average to completion
  - **$61-69k/year potential estimated cost-savings**
- Indications results limited by small sample size, random sampling, and repetition of same patients.

Conclusions

- Implementation of an ABG indication algorithm:
  - resulted in fewer ABGs sent, mostly due to a reduction in routine monitoring.
  - showed ABGs were more likely to be clinically indicated in response to an acute concern.
  - is safe, feasible, and can lead to significant cost reductions for the institution.
- Future goals to include selection of indication while ordering in electronic health record.

References

Full reference list available with QR code

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