

# Non-InvasiveETCO<sub>2</sub> Monitoring: IsIt a SurrogateforthePaCO<sub>2</sub>?

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## Published In/Presented At

Chishti, P. N., Hoffstadt, J. Krut, C. (2018, November 30th). *Non-InvasiveETCO<sub>2</sub> Monitoring: IsIt a SurrogateforthePaCO<sub>2</sub>?*. Poster presented at: LVHN Vizient/AACN Nurse Residency Program Graduation, Lehigh Valley Health Network, Allentown, PA.

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# Non-Invasive ETCO2 Monitoring: Is It a Surrogate for the PaCO2?

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## BACKGROUND

- The Joint Commission requires that all mechanically ventilated patients have End-Tidal Carbon Dioxide (ETCO2) monitoring
- A provider order determines if and when an arterial blood gas (ABG) after changes are made to a patient's mechanical ventilator. It is used to evaluate the partial pressure of carbon dioxide (PaCO2) in order to assess the patient's ventilation status
- An ABG is often an invasive procedure which can cause pain and has potential complications, including pain and the risk of infection
- LVHN has implemented a house-wide initiative to reduce invasive blood draws and utilize bedside monitoring when indicated.

## PICO

In the adult medical-surgical intensive care unit patient does an ETCO2 monitor value accurately reflect the partial pressure of carbon dioxide (PaCO2) result obtained from an arterial blood gas sample?

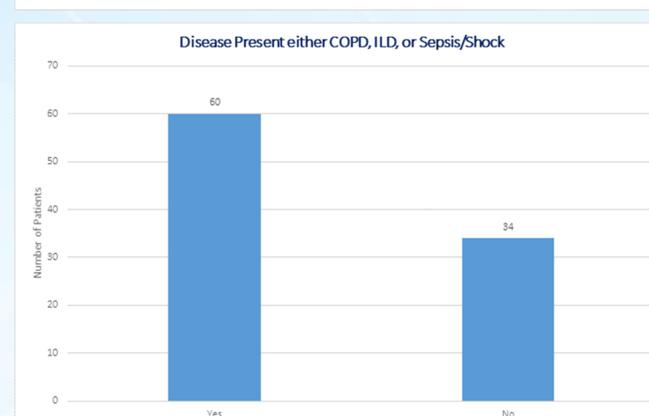
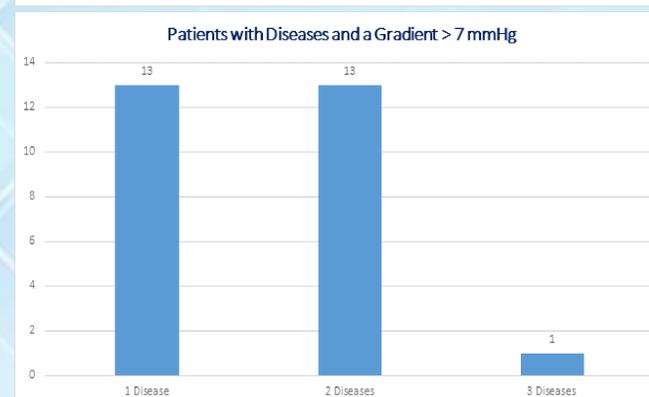
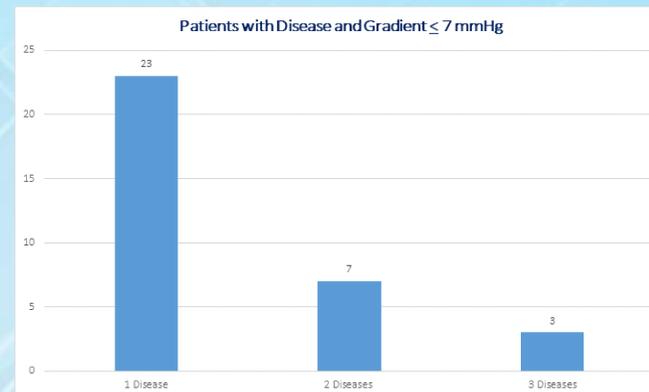
- **P:** Medical-Surgical ICU patients
- **I:** Non-invasive ETCO2
- **C:** Invasive PaCO2
- **O:** Decrease frequency of arterial needle sticks  
Decrease time between ventilator changes

## EVIDENCE

- No conclusive evidence exists in the literature whether non-invasive ETCO2 correlates with PaCO2 in mechanically ventilated ICU patients
- One study reported that non-invasive ETCO2 is a poor indicator of a patient's PaCO2 especially in the following populations: trauma patients, hemodynamically unstable patients and patients with significant lung disease
- One study supported the use of non-invasive ETCO2 as a surrogate for PaCO2 specifically in patients with neurological injury
- Prior research scholar project reported a positive correlation between ETCO2 and PaCO2

## IMPLEMENTATION

- Met with content expert Kenny Miller, Clinical Educator for Respiratory Care Services
- Clinical conditions including sepsis, COPD and ILD which might negatively effect any correlation between ETCO2 and PaCO2 were added as data points
- We performed a retrospective chart review of ventilated adult patients comparing ABG and ETCO2 monitor values.



## OUTCOMES

- While we could not conclusively answer our question we did determine the following:
- The ETCO2-PaCO2 gradient is within the range of 7 mm Hg in patients who have stable hemodynamic and respiratory systems
- Is these patient the ETCO2 can be utilized as a PaCO2 surrogate and will decrease the need for invasive ABG testing.
- In patients with unstable hemodynamic or respiratory systems the ETCO2 can be used as a PaCO2 trend but not a PaCO2 surrogate.

## LIMITATIONS/NEXT STEPS

- The success of the retrospective review was dependent on consistent documentation of an ETCO2 values at the time of ABG was obtained. We found this was not consistently completed
  - Complex patient characterizes leading to compounding variables
  - Data collection limited to two ICU units
- Next Steps:**
- Requires well designed study including the following:
  - Consistent real time data collection and documentation
  - Trending of patient ABG vs. EtCO2 throughout their hospital stay to more adequately define exclusion/inclusion criteria

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