CATHOLIC HEALTH CRITICAL PATIENT SAFETY ALERT

The Hypoxic Drive

September, 2020

- Hypoxia: Decrease in oxygenation at the tissue level; oxygen alone may or may not correct tissue hypoxia
- Hypoxemia: A below normal level of O2 in the blood. A normal PaO2 alone does not guarantee adequate tissue oxygenation

Normal Respiration

- Under normal conditions, breathing maintains homeostasis within the body by maintaining a normal level of oxygen, carbon dioxide, and acid-base balance. A person's breathing pattern is modified by differentiations in the blood PaO2, PaCO2, and pH.
- The major factor responsible for changes in ventilation is the PaCO2. Small elevations in blood CO_2 tell the medullary centers to increase ventilation (breathe deeper or faster).
- The peripheral receptors adjust breathing in response to hypoxia. However, the response to hypoxia requires a much greater deviation from normal to stimulate increases in ventilation. Ventilation is not stimulated significantly until the PaO2 is about 50 to 60 mm Hg.
- Thus, the peripheral chemoreceptors only play a minor role in breathing unless….

The Hypoxic Drive

Let's discuss the COPD patient.

- Over time, some COPD patients PaCO2 slowly climbs as their disease progresses. When hypoxemia exists with chronic hypercapnia, the central response to PaCO2 is blunted and the primary stimulus to breathe is through hypoxic stimulation- aka hypoxic drive.

Facts:

- Not all COPD patients are chronic CO2 retainers, in fact, the retainers are the minority.
- How can I tell is my COPD patient's drive to breathe is hypoxia? You need an Arterial Blood Gas (ABG). Results will show high PaCO2 with a normal pH.
- What does this all mean?

  - Recommend an ABG to the provider to evaluate the $PaCO_2$ and pH of a COPD patient

  -We need to provide supplemental oxygen judiciously with a patient with COPD, but not withhold when needed.

  -Oxygen therapy to achieve saturations of 88% to 92% is recommended in patients with chronic respiratory acidosis (COPD) to avoid hypoxemia and reduce the risk of oxygen-induced hypercapnia."

	ABG Results of Normal Patient	ABG Results of COPD Patient with Hypoxic Drive
PH	7.40	7.39
CO_2	40	55
PO_2	90	60
HCO_3	24	30
O_2 Sat	98%	90%

- References: Elsevier "Understanding Hypoxic Drive and the Release of Hypoxic Vasoconstriction" Jon C. Inkrott RRT, RRT-ACCS. Air Medical Journal, 2016-07-01, Volume 35, Issue 4, Pages 210-211, Copyright © 2016 Air Medical Journal Associates
- Crit Care. 2012; 16(5): 323. Published online 2012 Oct 29. Oxygen-induced hypercapnia in COPD: myths and facts Wilson F Abdo[corresponding] and Leo MA Heunks[1]

If you have additional questions please contact your site QPS Department

Catholic Health System

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