

## Pregnancy: CO<sub>2</sub>

Pregnancy is associated with a host of important physiologic changes, and not understanding these can result in patient harm if we only look for abnormal labs. Notably, increased O<sub>2</sub> demand and CO<sub>2</sub> production by the growing uterus and fetus results in a significant increase in minute ventilation, 45-50% above baseline, starting in the first trimester. This increase in minute ventilation is achieved primarily via an increase in tidal volume while respiratory rate increases only slightly. Progesterone is thought to be the primary mediator of hyperventilation by increasing the respiratory center's sensitivity to carbon dioxide. PaCO<sub>2</sub> falls as a result of this increase in minute ventilation to around 30 mmHg. pH only mildly increases (7.40-7.45) due to a compensatory fall in bicarbonate. During labor, pain further increases minute ventilation causing PaCO<sub>2</sub> to fall even further with an expected rise in pH (because bicarbonate levels have not had enough time to compensate)

Understanding that 40 mmHg is not a normal PaCO<sub>2</sub> is critical to the safe care of our patients. Many electronic medical records (including EPIC) do not adjust the normal range on lab values for patients who are pregnant and therefore a PaCO<sub>2</sub> of 40 mmHg will not get flagged as abnormal. However, this could represent a patient who has sleep apnea, altered mental status, or pending respiratory collapse from exhaustion during an asthma attack. Careful and thoughtful consideration must be given to all lab values, and we should not let ourselves simply look for the red labs.

Bonus question: PaO<sub>2</sub> typically rises in early pregnancy, why? First one to answer correctly gets an approving nod.

Further reading: Sharpe EE, Arendt KW. "Chapter 62: Anesthesia for Obstetrics" Miller's Anesthesia. 9<sup>th</sup> edition. Pg 2006-2041. Elsevier, 2020.