Understanding CO-Oximetry

Hemoglobin functions as a bus on the road that is the bloodstream, picking up oxygen and then carting it around the body. In ideal conditions, these oxygen-loaded buses (oxyhemoglobin) are nearly full. Problems occur when oxygen-unloaded hemoglobins (dyshemoglobins) crowd the roadway, limiting hemoglobin’s ability to bind and release oxygen. The two most common dyshemoglobins are carboxyhemoglobin (hemoglobin saturated with carbon monoxide) and methemoglobin (hemoglobin that can’t carry oxygen due to complications with iron oxidation).

Although dyshemoglobins are usually OK in small amounts, the effects of untreated dyshemoglobin can range from dizziness and tiredness to more serious complications like carbon monoxide (CO) poisoning and tissue hypoxia (oxygen starvation).

A CO-oximeter is a small monitor that can accurately measure carboxyhemoglobin and methemoglobin noninvasively at a patient’s bedside. The technology uses a probe that is usually placed over a patient’s finger or earlobe. No patient cooperation is required.

Light-emitting diodes shine eight wavelengths of light simultaneously through the skin. Each type of dyshemoglobin absorbs the light differently, and the CO-oximeter software analyzes this information. Additionally, pulse CO-oximetry measures the amount of oxygen in the blood and pulse rate, offering clinicians a better understanding of a patient’s oxygenation status so they can make accurate, timely assessments and improve patient care.

Why CO-oximetry is helpful
The most common use for CO-oximetry is as a screening tool in hospitals’ emergency departments to diagnose CO poisoning. More than 20,000 Americans visit the ER each year, and more than 4,000 are hospitalized due to CO poisoning, according to the Centers for Disease Control and Prevention. However, many times the early symptoms of shortness of breath, mild nausea, and mild headaches are confused with the flu.

CO-oximetry can expedite the treatment of other potentially life-threatening conditions such as anemia and blood loss resulting from medical treatments. In some cases, CO-oximetry may reduce the need for arterial blood tests to determine CO levels.

Another major advantage of CO-oximetry is its ability to determine fluid volume noninvasively and immediately. Determining fluid volume status is a major challenge in many operating rooms throughout the country, and it often can require time-consuming, invasive procedures.

CO-oximeters can do this with the pleth variability index (PVI), a continuous measurement of changes in perfusion index (pulse strength at monitoring site) that can reduce postoperative risks associated with extreme fluid levels.

Wound healing, cardiac function, and systematic circulation are just a few of the areas that are negatively affected by excesses or shortages of hydration. Having continuous, real-time knowledge of fluid volume at the bedside enables quick and precise treatments to avoid these complications.

A relatively new addition to the pulmonary tool chest, pulse CO-oximetry enables doctors to assess a vast array of measurements, from total hemoglobin to fluid volume, and thus allows for a more complete noninvasive outlook of a patient’s status.

Information adapted from Foundations of Respiratory Care by K.A. Wyka and associates.

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