Pulse Oximetry Artifacts

Anesthetic Pearls: Anesthetic Implications and Management of PulseOx Artifacts

- Pulse oximetry uses spectrophotometry to measure changes in light absorption in blood with two different wavelengths (one infrared (940 nm) and one visible red (660 nm)).
- The absorption spectra of oxygenated and reduced hemoglobin differ so that arterial blood appears red while venous blood appears "blue." When two compounds with differing absorption spectra are together in solution, the ratio of their concentrations can be determined from the ratio of the light absorbed at two different wavelengths. Deoxygenated hemoglobin preferentially reflects the light at 940 nm (infrared / blue) and oxygenated hemoglobin (HbO2) at 660 nm (red).
- Requires pulsatile flow
- Flows as low as 9% of normal can still generate an oximeter reading
- Ear probes are slightly more accurate than finger probes & desaturation response time is less
- Accurate to within 5% of in vitro oximeters in the Sp02 range of ~70-100%
- Potential inaccuracy with Sp02 of <70% (little clinical importance; either a little or a lot desaturated and needs to be corrected)

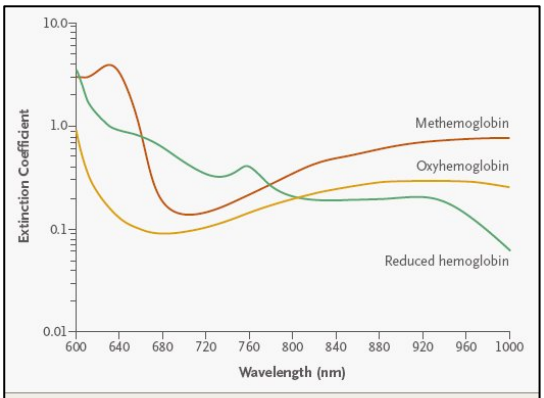

Figure 1. Extinction Curves for Various Hemoglobin Species.
Oxyhemoglobin and reduced hemoglobin have different absorptions at 660 and 940 nm, whereas methemoglobin has similar absorption at the two wavelengths. The extinction coefficient is shown on a logarithmic scale.

Cause	Result
Inadequate perfusion Hypothermia Cold extremities	Underestimate or unreadable
Abnormal Hemoglobins **MetHb**	**SpO2 ≈85%** as ↑ Met Hgb irrespective of actual PaO2 or SaO2
Carboxy/sulfhemoglobin	**Overestimates SpO2** (smokers, CO poisoning)
Injectable **Dyes** **Methylene Blue** Indocyanine green Indigo carmine	**Desaturation** artifact especially methylene blue
Venous Congestion Tourniquet on arm	Desaturation
Absence of pulsatile flow Nonpulsatile CPB	No reading
Patient Movement	SpO2 ≈85%, HR discrepancy between sat monitor and ECG
Electrical Interference Cautery	Decrease SpO2
Overhead **bright lights** Neonate	**Falsely elevate SpO2** (cover probe with towel)
Skin or fingernail pigmentation Blue, black and green especially	Decrease SpO2
Peaked T wave	Falsely double the heart rate