

Pulse Oximeter Accuracy -Reply

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Some comments on Pulse Oximetry accuracy.

1. Pulse Oximeters are affected by hemoglobin type.
2. Methemoglobin, carboxyhemoglobin and fetalhemoglobin and many other less common abnormal hemoglobins will affect the SaO₂ value read by a pulse oximeter.
3. Pulse oximeters are calibrated for a standard mix of hemoglobin types. The gold standard for SaO₂ values is a device called a co-oximeter. Drawing an arterial blood sample and running it on a co-oximeter is the only practical method of calibrating a pulse oximeter to a particular patient.
4. Most operator manuals for pulse oximeters include correction factors and cautions about reading SaO₂ values on a newborn.
5. Most clinicians are interested in CHANGES in SaO₂ values with time rather than an absolute value. As pointed out above, you need to use a co-oximeter if you want an absolute value.
6. Based upon the above facts, a more important specification for a pulse oximeter than absolute accuracy is stability.

All of the discussion about the accuracy of pulse oximeters reminds me of the 10 year debate during the 1960's and 70's about transcutaneous O₂ and CO₂ measurements. The debate went beyond reason and generated a great deal of heat while producing very little light.

Finally most realized that a blood gas measurement is a direct measurement of the partial pressures of O₂ & CO₂ in the blood and that a transcutaneous device measures the diffusion of the gases through the skin. While the values are related, they are not the same. It also became apparent that the best way to use a transcutaneous measuring instrument was to look for changes in value rather than absolute values. The normal practice is to occasionally perform an arterial blood gas measurement to establish actual values at some point in time and to serve as a baseline for the TC measurements. Again stability is the more important parameter for TC measurements. You need to know that an indicated change in the TC measurement is due to actual changes in the blood.

I hope this information sheds the light of reason upon the subject.

One other comment. If the specified accuracy is $\pm 2\%$ and the 95% confidence level is $\pm 4\%$, then the number stated as the accuracy is NOT ACCURACY. It is the standard deviation of the accuracy measurements. Only approximately 2/3 of the patients will fall within $\pm 2\%$ of the true value. This is assuming that there are no excess amounts of abnormal hemoglobins present.

<http://www.nor.com.au/lists/BmElist/0601.html>

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As an illustration, a smoker has carboxyhemoglobin present. The amount is related to how many cigarettes per day are smoked.

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