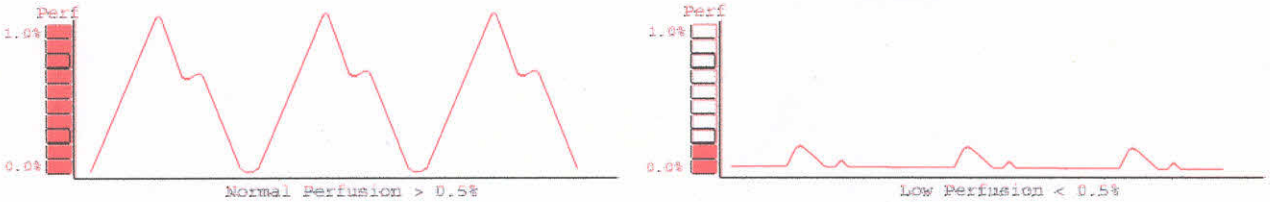
Pulse Oximetry: "Perfusion"



"Perfusion" is a term used by pulse oximeter manufacturer's to describe "Signal Strength". The term "Perfusion" is also used by healthcare providers to describe blood flow. Pulse oximeter derived perfusion is only an indirect indication of blood flow. It is useful for determining whether a particular monitoring site can provide adequate signal strength for reliable SpO2 calculation.

The image above depicts a typical pulse oximeter waveform. The large waveform on the right is what a healthcare provider would expect to see on their pulse oximeter after successful sensor placement. The perfusion "meter" next to the large waveform indicates perfusion is at least 1.0% (normal level). The smaller waveform on the left is what a healthcare provider would expect to see on their pulse oximeter after a poor sensor placement. The perfusion meter next to this waveform indicates 0.2%, which is very low. The healthcare provider can easily determine low-perfusion by observing the pulse oximeter waveform, however a perfusion meter or number is a useful indication.

Pulse oximeter perfusion is signal strength. Signal strength is a ratio: It is the portion of the light being absorbed by the pulsating blood divided by all of the light transmitted (or reflected) through the monitoring site. When a pulse oximeter reports 1.0% Perfusion, it is saying that only one percent of all the light transmitted or reflected through the monitoring site by the sensor is being absorbed by the pulsating blood.

Conventional pulse oximeters cannot provide reliable blood flow information. In Figure 1, an image of a box with waves of water is shown. The still, unmoving water is analogous to the volume of blood within a pulse oximeter monitoring site. The waves are analogous to the pulsations of blood within the monitoring site. The ratio of the "height" of the waves relative to the height of the entire body of water is small. This yields a low perfusion reading on a pulse oximeter even though the volume of blood may be large (as may be the case with a hyper-volemic patient with a weak pulse).

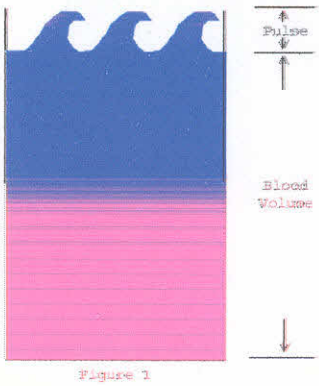


Figure 1

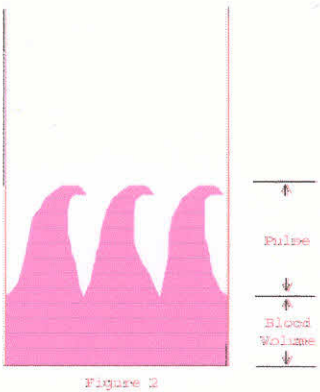


Figure 2

In Figure 2, a similar size box contains a low overall volume of water relative to the "height" of the waves within it. This yields a high perfusion reading on a pulse oximeter even though the volume of blood may be small (as may be the case with a hypo-volemic patient with a strong pulse).

Low-Perfusion Performance

A pulse oximeter's Low-Perfusion Performance is determined by the lowest signal-strength it is capable of reliably calculating SpO2 and Pulse Rate from (within specified accuracy). Typically, a "Low-Perfusion" pulse oximeter is capable of calculating SpO2 on signal-strengths much less than 0.2% Perfusion. Low-perfusion Performance combined with pulse-oximeter-displayed perfusion and waveform can improve healthcare providers' decisions.