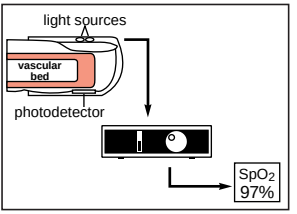
NELLCOR

The 5th Vital Sign™

Oxygen Saturation: The Fifth Vital Sign™

Pulse Oximetry

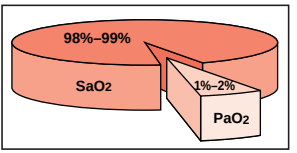
Pulse oximetry works by applying a sensor to a pulsating arteriolar vascular bed. The sensor contains a dual light source and photodetector.



Bone, tissue, pigmentation and venous vessels normally absorb a constant amount of light over time. The arteriolar bed normally pulsates and absorbs variable amounts of light during systole and diastole, as blood volume increases and decreases. The ratio of light absorbed at systole and diastole is translated into an oxygen saturation measurement. An oxygen saturation measurement provided by a pulse oximeter is commonly referred to as SpO_2.

Oxygen Content in Arterial Blood

Normally, 98% to 99% of the oxygen present in the blood is combined with the hemoglobin molecule:



SaO_2 indicates oxygen carried on arterial hemoglobin.

PaO_2 indicates oxygen dissolved in arterial plasma.

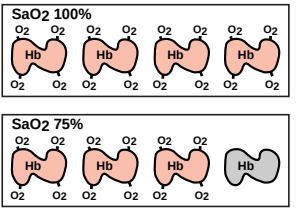
Total arterial oxygen content is comprised of oxygen carried on arterial hemoglobin and oxygen dissolved in plasma.

Whenever SaO_2 falls, arterial oxygen content decreases and the risk of tissue hypoxia may increase.

Arterial Oxygen Saturation

Arterial hemoglobin oxygen saturation may be determined by a measurement of an arterial blood sample (SaO_2) or by a pulse oximeter (SpO_2). The normal range is 95% to 99%.

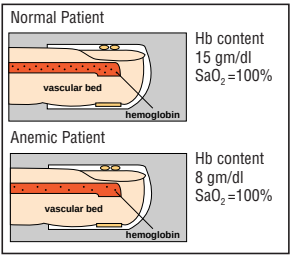
Examples of Arterial Oxygen Saturation:



Hb = functional hemoglobin

Anemia

Hemoglobin values must be considered when assessing the adequacy of arterial oxygen content. The anemic patient has fewer hemoglobin molecules than a normal patient. Consider an anemic patient and a normal patient who both have an SpO_2 close to 100%. Although all of the hemoglobin molecules in both patients are carrying oxygen, the total arterial oxygen content for the anemic patient is lower because there are fewer hemoglobin molecules to carry oxygen. This patient is at greater risk whenever oxygen demand increases or oxygen supply decreases.



tyco Healthcare

Nellcor Sensors: Basic Principles

Adhesive and reusable sensors are available. The following considerations should be evaluated when choosing a sensor for your patient:

- Patient's body weight
- Duration of use (long-term, short-term, spot-check)
- Patient activity
- Infection control concerns

Tips for use:

- Ensure that the optical components of the sensor are properly aligned as outlined in the directions for use.
- Check adhesive sensor sites at least every 8 hours and move to a new site if necessary. Move reusable sensors to a new site at least every 4 hours.
- Reuse adhesive digit sensors on the same patient if the adhesive tape attaches without slipping. Replace the sensor whenever the adhesive quality is depleted.
- When selecting a sensor site, give priority to an extremity free of an arterial catheter, blood pressure cuff or intravascular infusion line.
- Clean reusable sensors between patients. Refer to directions for use.

Pulse Oximetry: Clinical Considerations and Recommendations

Certain conditions may result in pulse oximetry readings that are unreliable, incorrect or less informative, as described below:

Consideration	Recommendation
Motion	Move sensor to a less active site or replace adhesive. Place a reflectance sensor on the forehead if the patient is not on a ventilator or in a Trendelenburg or supine position. Adjust averaging time on pulse oximeter if possible. Use Nellcor *Oxismart*® *XL* or *Oximsmart* pulse oximetry technology if available.
Nuisance Alarms	Nuisance alarms may be caused by short, clinically insignificant desaturations that cross the alarm threshold for very brief periods. Initiate *SatSeconds*™ Alarm Management feature, if available, to reduce these alarms. Use Nellcor *Oximsart XL* or *Oximsart* technology to reduce false alarms caused from motion artifact.
Poor Perfusion	Use an adhesive digit sensor or apply an R-15 nasal sensor if the patient is immobile. Protect sensor site from heat loss or rewarm sensor site as permitted by hospital policy. Use Nellcor *Oximsart XL* or *Oximsart* technology if available.
Venous Pulsation	Position digit sensor at heart level. Avoid restrictive taping. Use care when interpreting SpO_2 values in patients with elevated venous pressure.
Edema	Position the sensor on nonedematous application sites. Otherwise, the fluid in the edematous tissue may cause the light from the LEDs to scatter and affect the SpO_2 readings.
Light Interference	Cover the sensor with an opaque material in the presence of bright light sources, including direct sunlight, surgical lamps, infrared warming lamps and phototherapy lights.
Nail Polish	Remove nail polish (especially browns, blue, green) or apply sensor to unpolished site.
Intravascular Dyes	Use care when interpreting SpO_2 values after injection of intravascular dyes, which may affect the reading.
Dyshemoglobins	Dysfunctional hemoglobins such as carboxyhemoglobin or methemoglobin are unable to carry oxygen. SpO_2 readings may appear normal; however, a patient may be hypoxic because less hemoglobin is available to carry oxygen. Further assessment of oxygenation beyond pulse oximetry is recommended.
Anemia	Anemia causes decreased arterial oxygen content. Although SpO_2 readings may appear normal, an anemic patient may be hypoxic. The pulse oximeter may fail to provide an SpO_2 if hemoglobin levels fall below 5 gm/dl. Correcting anemia can improve arterial oxygen content.