



# Use of Pulse Oximetry (SpO<sub>2</sub>)

Promise Hospital – Competency Presentation

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# What is pulse oximetry?

- ▶ Procedure used to measure percentage of oxygen carried in blood and delivered to peripheral tissues

## **Pulse oximetry is useful to assess:**

- ▶ ...the severity of disease.
- ▶ ...the need for supplemental oxygen.
- ▶ ...the effectiveness of therapeutic interventions.



# What is normal?

- ▶ Normal = more than 89%
- ▶ Low level of oxygen can cause damage to cells, place strain on the heart and lungs, and cause the body to work improperly

## Clinical effects of hypoxia range from:

- ▶ ...Nausea, Incoordination, Vertigo, and Impaired athletic performance...
- ▶ ...to Neurological deficits and Death.



# Pulse oximetry alone is not a reliable predictor of the patient's status.

- ▶ The entire clinical picture is necessary for an accurate and reliable predictor of the patient's status.
- ▶ Place (2000): "...the technology is a valuable contributor to nurses' assessment skills, though...it (is not) to be a replacement for it."
- ▶ Jevon and Ewens (2000): "...it is simply an aid to observation and holistic care, and not a substitute."
- ▶ Harrahill (1991): "...peripheral oxygen saturation (SpO<sub>2</sub>) is only one aspect of the assessment process."
- ▶ Jensen et al. (1998): "...the technology can only be considered valuable if combined with an insight to its operation and limitation."



# Limitations of pulse oximetry include:

- ▶ Internal (to the client) factors:

- ▶ Low peripheral vascular perfusion
- ▶ Venous congestion
- ▶ Vasoconstriction from hypothermia
- ▶ Hypovolemia

- ▶ External (to the client) factors:

- ▶ Motion artifact
- ▶ Interference by electrical energy
- ▶ Interference by stray light

- ▶ Cardiogenic shock

- ▶ Anemia

- ▶ Abnormal hemoglobin

- ▶ Skin pigmentation

- ▶ Interpretation of pulse ox reading

- ▶ Intravascular dyes

- ▶ Nail polish



# Oximeters respond to carboxyhemoglobin as if it were oxyhemoglobin.

- ▶ If a patient has significant elevation of HbCO, their oxygen content may be overestimated when in fact oxygen delivery to tissues is too low.
  - ▶ Cigarette smokers
  - ▶ Fire fighters

## Instantaneous changes in readings:

- ▶ It is physiologically impossible for the human body to experience extreme fluctuations in SpO<sub>2</sub>.
- ▶ For example, a quick drop from 99% to 85% should not be a major cause for concern.



# Accuracy and Reliability

- ▶ The predictive accuracy of pulse oximetry tends to be overstated.
- ▶ Most manufacturers specify that their oximeter readings can be expected to have a 2-3% standard deviation in the 70-100% saturation range.
  - ▶ For example, there is a 95% probability that a pulse oximeter reading of 90% corresponds to an arterial blood saturation reading between 84% and 96%.
  - ▶ Note: Oximeters have been proven to reliably indicate the development of hypoxemia before harm comes to the patient.
- ▶ Accuracy of pulse oximetry readings diminishes the further it is from the norm.
  - ▶ Therapists should be wary of readings less than or equal to 68% - 78%, unless the reading is validated by arterial blood sampling.



# For best results with use of pulse oximetry, therapists should follow these steps:

- ▶ Secure the probe.
- ▶ Monitor signal strength.
- ▶ Be aware of whether the patient smokes.
- ▶ Validate pulse oximetry readings with arterial blood sampling.



# Conclusions and Recommendations

- ▶ Increasing cost of health care today makes the use of noninvasive pulse oximetry attractive.
- ▶ Despite being less sensitive to developing ventilation-perfusion mismatching than arterial blood gas determination, it is offset by the ability of pulse oximetry to provide continuous, rather than intermittent, data.
- ▶ Clinicians cannot rely entirely on the pulse oximetry reading. We must always verify results by looking at the whole clinical picture, including:
  - ▶ Skin pallor
  - ▶ Presence of cyanosis (to rule out circulation problems)
  - ▶ Arterial blood gas reading.



# References

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