Nursing Procedure: Monitoring SpO2 in the Highly Dependent or Critically Ill Infant or Child

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1. Introduction

Pulse oximetry is a non-invasive technology used to estimate arterial oxygen saturation of haemoglobin by applying light-emitting diodes to an area of the body with good local blood flow. Red and infrared light is shone through the blood-perfused tissue under the sensor and received by an opposing detector probe. The information is transmitted back to a signal-processing unit (monitor) and the calculated estimation of oxygen saturation is displayed (SpO2). Pulse oximetry is used on virtually all patients in the Paediatric Intensive Care and High Dependency Units. Therefore, it is important that the nurse caring for the critically and acutely ill infant/child in these units has a clear understanding of the principles of pulse oximetry and its benefits and limitations in use in order to correctly inform patient management.

This guideline is intended as a resource for staff involved in caring for children in the Paediatric Critical Care unit that require SpO2 monitoring (pulse oximetry). The guideline has been constructed after literature search and review of sourced textbooks, Medline and CINHAL, and external nurse expert peer review and opinion. See also recommendations and further information at end of this guideline.

2. Scope

This nursing procedural guideline is intended to be followed by nurses involved in caring for the highly dependent or critically ill infant or child requiring SpO2 monitoring (pulse oximetry) within the Paediatric Critical Care Unit at the Royal Hospital for Children, Glasgow.

3. Roles and responsibilities

All nursing staff involved in the monitoring of SpO2 (pulse oximetry) in the Paediatric Critical Care Unit should be familiar with this nursing procedural guideline.
4. BODY OF POLICY OR PROCEDURE

**Equipment:**
Monitor compatible SpO2 probe (disposable adhesive more commonly used)
E.g. Covidien Nellcor OxiMax® MAXN, MAXI or MAXP
Monitor connecting lead
Disposable apron and non-sterile gloves

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<tr>
<th>PROCEDURE</th>
<th>RATIONALE</th>
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<tr>
<td>Make sure the probe and monitoring equipment/module is clean and in good working order</td>
<td>In order to minimise the risk of cross infection and ensure that the equipment is suitable for use.</td>
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<td>Plug in monitor and probe or insert module and probe to monitoring system</td>
<td>To ensure monitor performs self calibration and checks prior to patient connection. To ensure the nurse can see which side the probe is emitting infrared light and thus help determine correct positioning of probe.</td>
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<td>The nurse should wash their hands and don apron and gloves</td>
<td>In order to minimise the risk of cross infection.</td>
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<td>Ensure correct type and size of probe is selected for the infant or child</td>
<td>Using the wrong size probe may lead to the ‘penumbra’ effect and thus give inaccurate readings.</td>
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<td>Select a suitable area for the probe to be sited ensuring probe is correct type for area and age of child.</td>
<td>Using wrong site and/or type of probe may result in inability of the sensor to track the pulse thus giving inaccurate readings. The site chosen should have a pulsatile vascular bed. For example, a finger, toe, earlobe, palm or foot. The sensor should be placed on the extremity opposite arterial lines and non-invasive blood pressure devices so that pulsatile blood flow is not impeded.</td>
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<td>Ensure site selected is clean, dry and free from discolouration.</td>
<td>In neonates preferred site is the foot or hand. In older children/adults preferred site is the index finger. If sensor-site (skin) is too thick or thin, pigmented, dirty or coloured - e.g. dark nail polish - appropriate light transmission may be affected and errors in measurement may occur.</td>
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<td>Attach sensor probe as per manufacturers’ instructions. After a few seconds ensure adequate waveform displayed and that pulse corresponds to that of the infant/child.</td>
<td>To ensure that the probe is detecting the pulse and calculating the saturation accurately. Pulse strength is equal to the fullness of the waveform. This waveform is vital in determining if the saturation recording is reliable. Sensors attached too tightly may cause erroneously low readings. Using additional tape can restrict blood flow to site and cause inaccurate readings. Additional tape can also cause damage to the sensor and to the patient’s skin.</td>
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<td>Where possible avoid using tape to secure sensor to skin.</td>
<td>To ensure audible pulse and alarm limits are set To ensure that nursing staff are given early warning of potential problems. Most saturation monitors have default alarm settings so individual patient adjustment is always required.</td>
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<tr>
<td>Ensure audible pulse and alarm limits are set</td>
<td>Check the sensor probe, placement and skin site regularly (maximum 8 hourly &amp; at least 2 hourly if patient has poor peripheral perfusion). To ensure probe is still attached correctly and not damaged. To ensure that prolonged use does not cause discomfort or pressure damage.</td>
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<td>Ensure any change in observations is documented and reported to nurse-in-charge</td>
<td>Ensure all nursing staff in Paediatric critical care have access to teaching materials on the principles and uses of To help ensure that any potential deterioration or problem is quickly identified and managed appropriately. To ensure that nursing staff are aware of the safe and unsafe limitations of pulse oximetry monitoring.</td>
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The Clinical Information System will record whatever saturation is being monitored. It will not take account of other factors which may lead to an inaccurate recording. For example, if the probe has slipped off or is incorrectly attached. It is vital that the nurse checks the saturation reading ‘recorded’ and adds comments or events where applicable.

**PRECAUTIONS:**

Pulse oximetry is a non-invasive technology used to estimate arterial haemoglobin oxygen saturation (SaO2), by measuring the absorption of light in human tissue beds. The pulse oximeter detects and calculates the absorption of light by functional haemoglobins to produce a measurement, the SpO2.

Pulse oximetry can be an extremely valuable non-invasive means of monitoring. However, it has limitations in its use and the nurse must be aware of these. Limitations include motion artefact, poor perfusion, irregular heart rhythms, electromagnetic interference, probe positioning, ambient light interference and abnormal haemoglobin states, such as carboxyhaemoglobin or methaemoglobinemia (Fouzas et al 2011).

5. Review

This nursing procedural guideline should be reviewed every two years from date of approval.

6. References


**A Communication and Implementation Plan**

R.H.S.C. Nursing Policy Group
Paediatric critical care Clinical Guidelines group
Paediatric critical care Band 7 nursing staff, Band 6 nursing staff and nursing teams

B Monitoring
Monitoring the implementation of this nursing procedural guideline should be by Lead nurse, Band 7, Band 6 and Band 5 experienced Paediatric critical care clinical nursing staff. Monitoring of any adverse events related to pulse oximetry should be documented via critical incident reporting.

C Impact Assessment
EQIA not relevant to this nursing procedural guideline as there are no discriminatory practices identified in implementing this guideline.