HEALTH HOLDING

HAFER ALBATIN HEALTH CLUSTER
MATERNITY AND CHILDREN HOSPITAL

Department:	Neonatal Intensive Care Unit (NICU)		
Document:	Multidisciplinary Policy and Procedure		
Title:	Use of Pulse Oximetry in Neonates		
Applies To:	All NICU Staff and Biomedical engineers		
Preparation Date:	January 05, 2025	**Index No:**	NICU-MPP-006
Approval Date:	January 19, 2025	**Version :**	2
Effective Date:	February 19, 2025	**Replacement No.:**	NICU-DPP-006 (1)
Review Date:	February 19, 2028	**No. of Pages:**	4

1. PURPOSE:

1.1 To monitor hemoglobin oxygen saturation of all neonates admitted to neonatology department units on admission and regularly all through their stay.
1.2 To monitor all infants receiving oxygen therapy in order to guide selection of the appropriate FiO_2.
1.3 To monitor response to therapy e.g. during resuscitation, mechanical ventilation.
1.4 To monitor oxygenation during procedures.
1.5 During neonatal resuscitation immediately after birth when positive pressure ventilation is administered for more than few breaths, cyanosis is persistent or when oxygen is administered.

2. DEFINITIONS:

2.1 **Pulse Oximetry** is one of the vital signs that are continuously monitored for admitted neonates to the neonatology department units. It is documented routinely every 2 hours in the intensive care and every 4 hours in the intermediate care neonatology units and more frequently if needed.

3. POLICY:

3.1 The assigned nurse records SpO_2 every 2 hours and as needed in the patient's NICU Daily Flow Sheet.
3.2 Written physician order of accepted SpO_2 is required for all cases especially infants with congenital cyanotic heart disease.
3.3 Acceptable saturation for infants receiving oxygen:
  3.3.1 For preterm infants less than 36 weeks post-conceptional age:
    3.3.1.1 Keep SpO_2 between 91 – 95% (Upper limit of monitor; 95% and lower limit of monitor; 89%)
    3.3.1.2 Note that in preterm infants; at PaO_2 80 mmHg (~97%) Retinopathy of Prematurity was detected.
    3.3.1.3 Several studies have shown that SpO_2 > 92% can be associated with $PaO_2 \geq 80$ mmHg.
    3.1.1.4 The goal is to maintain adequate tissue O_2 delivery without harm to other organs. This can be accomplished by PaO_2 of 50-70 mmHg, results in SpO_2 of 89 -95%. Preferably the upper limit not to exceed 92%.
  3.3.2 For infants 36 or more weeks post-conceptional age:
    3.3.2.1 Keep SpO_2 between92 -95% (Upper limit of monitor; 97% and lower limit of monitor 90%)
    3.3.2.2 Note that at SpO_2 98% or more, in oxygen treated infants, the PaO_2 can be well above 100 mmHg (toxic range).
3.4 For infants in room air SpO_2 may reach 100%
  3.4.1 For preterm infants less than 36 weeks post-conceptional age:
    3.4.1.1 Acceptable SpO_2 91-100% (Upper limit of monitor 100% and lower limit of monitor 91%).
  3.4.2 For infants 36 or more weeks post-conceptional age:

Acceptable SpO_2 92 - 100% (Upper limit of monitor 100% and lower limit of monitor 92%)

3.5 Targeted pre-ductal (right hand) SpO2 of infants at birth are:
At 1 minutes of age: 60-65%
At 2 minutes of age: 65-70%
At 3 minutes of age: 70-75%
At 4 minutes of age: 75-80%
At 5 minutes of age: 80-85%
At l0 minutes of age: 85-95%

3.6 Screening apparently healthy neonates for early detection of CCHD at the age of 24 hours or as late as possible if early discharge is planned to reduce the number of false positive results

3.6.1 SpO_2 in the right hand or foot should be > 95% and < 3%difference between right hand and foot

3.6.2 If SpO_2 in right hand or foot is < 90% repeat after one hour twice. If still < 90% consult cardiologist for echocardiogram

3.6.3 If SpO_2, is 90 - < 95% in the right hand and foot or SpO_2 > 3% difference between right hand and foot, repeat after 1 hour twice. If still the same, it is a positive test, consult cardiologist for echocardiogram

3.7 Episodes of hypoxia-hyperoxia should be avoided:

3.7.1 High alarm limit:
-If the baby's SpO_2 exceeds the target saturation for ≥ 3 minutes, FiO_2 may be decreased in increments of 2-3% every 5 minutes. Continue reducing inspired oxygen by 2-3%every 3-5 minutes until saturation is stable in targeted range.

3.7.2 Low alarm limit:

3.7.2.1 If the baby's SpO_2 drops below 89% for preterm or 90% for term infants, or if associated with bradycardia, check if the baby has apnea. Babies having apneas need to breath to oxygenate: it may be more appropriate to stimulate, ambu bag or change ventilation settings rather than increase FiO_2. Many preterm neonates respond to stimulation.

3.7.2.2 If not responding, FiO_2 may be increased in increments of 5% every 1-2 minute, not to exceed the acceptable range of SpO_2. Sick babies must be immediately assessed by the assigned physician.

3.7.2.3 Check the following:

3.7.2.3.1 Ventilator function and settings: to determine if it is the infant or a mechanical problem, manually ventilate the baby

3.7.2.3.2 Position and patency of endotracheal tube or other oxygen delivery device e.g. nasal prongs or mask, and consider suctioning or repositioning.

3.7.2.3.3 Lung problem; pneumonia, collapse, pneumothorax, hyperinflation

3.7.2.3.4 Apnea; obstructive or central

3.7.2.3.5 Seizures,

3.7.2.3.6 Assess for sepsis.

3.7.2.3.7 Metabolic or electrolyte abnormalities e.g. hypoglycemia, hypokalemia, hyponatremia, hypo- or hypercalcemia, hypo- or hypermagnesemia and acid-base disturbances.

3.7.2.3.8 Infant's temperature; hypothermia or hyperthermia.

3.8 The assigned nurse should inform physician if it is necessary to increase and maintain the FiO2 > l0% above the previous stable FiO_2 to maintain the saturation target.

4. PROCEDURE:

4.1 Select the appropriate sensor and apply it to:

4.1.1 The palm or anterior part of a foot for infants weighing 500gm to 3kg.

4.1.2 Palm, thumb, great toe or index finger for infants weighing >3kg.

4.1.3 Whenever possible the sensor should not be on the same extremity as the blood pressure cuff.

4.2 Align the light emitting source and the photo detector so they are directly opposite each other.

4.3 Tighten sensor snugly to the skin but not so as to impede circulation.

4.4 Attach the sensor to the pulse oximeter's interconnecting cable and turn the monitor ON. If the pulse level is adequate, the monitor will display SpO_2 and pulse rate.

4.5 Set the high and low alarm limits as indicated above.

4.6 Assess the sensor site every I hour to be certain that the adherent bandage is not constricting the site and that the skin is intact and shows no signs of burn. Change the sensor site every 8 hours.

4.7 Note that tense peripheral edema, hypothermia, low tissue perfusion secondary to shock or hypovolemia and peripheral vasoconstriction may interfere with obtaining accurate readings.

5. MATERIAL AND EQUIPMENT:

5.1 Pulse oximeter

5.2 Connecting probes

6. RESPONSIBILITIES:

6.1 Physician

6.2 Nurse

6.3 Biomedical engineers to ensure monitors maintenance

7. APPENDICES:

N/A

8. REFERENCES:

8.1 American Academy of pediatrics. Clinical Report. Oxygen Targeting in Extremely Low Birth Weight Infants. Pediatrics. Vol.l 38, No.2, August 2016.

8.2 Saugstad OD et al, Optimal oxygenation of extremely low birth weight infants: A Meta-Analysis and Systematic Review ofthe oxygen saturation target studies. Neonatolog,2014;105; 55-63

8.3 Oxygen Saturation and Outcomes in Preterm Infants. The BOOST II United Kingdom, Australia and New Zealand Collaborative Groups. N Engl J Med 2013; 368:2094-2104.

8.4 AAP Policy statement. Endorsement of Health and Human Services Recommendation for Pulse Oximetry Screening for Critical Congenital Heart Disease. Pediatrics.2012, 129: 190-192

8.5 Center for Disease Control and Prevention. Newbom Screening for Critical Congenital Heart Disease: Potential Roles of Birth Defects Surveillance Programs-United States, 2010-2011 Morbidity and Mortality Weekly Report. Vol.6 . No 42. 2012.

8.6 Brian A et al.: Randomized Controlled Trial of Oxygen Saturation Targets in Very Preterm Infants: Two Year Outcomes. Benefits Of Oxygen Saturation Targeting-New Zealand (BOOSTNZ) Collaborative Group. Joumal of Pediatrics; 2014; 165:30-35

8.7 Schmidt B. et al Canadian Oxygen Trial (COT) group. Effects of targeting higher vs lower arterial oxygen saturations on death or disability in extremely preterm infants: a randomized clinical trial. JAMA, 2013 May 22 :309(20):2tt t-2t20.

9. APPROVALS:

	Name	Title	Signature	Date
Prepared by:	Ms. Afrah Saud Al Shammari	NICU Head Nurse		January 05, 2025
Prepared by:	Dr. Falah Nabhan Al Shammari	NICU Quality Coordinator		January 05, 2025
Reviewed by:	Mr. Sabah Turayhib Al - Harbi	Director of Nursing		January 07, 2025
Reviewed by:	Dr. Sarhan Hamdan Al Shammari	NICU Head of the Department		January 08, 2025
Reviewed by:	Engr. Wafi Abdoo Elgaleel	Head of Biomedical Department		January 09, 2025
Reviewed by:	Mr. Abdulellah Ayed Al Mutairi	QM&PS Director		January 09, 2025
Reviewed by:	Dr. Tamer Mohamed Naguib	Medical Director		January 12, 2025
Approved by:	Mr. Fahad Hazam Al - Shammari	Hospital Director		January 19, 2025