

<b>Title:</b> Oxygen Therapy for Newborns in NICU			
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**1. Purpose of procedure:**

To provide oxygen therapy for newborns cared for in the neonatal unit

**2. Definitions:**

The provision of varying levels of supplemental oxygen is a frequent and necessary requirement in the management of sick neonates. The use of oxygen requires an understanding of the fine balance which must be sought between the dangers of tissue hypoxia on the one hand, the oxygen toxicity on the other.

The smaller the baby the greater the risk. All babies under 30 weeks are at high risk and monitoring must be intensive such that hypo/hyperoxia is avoided.

**3. Procedure:**
**1. Delivery Suite**

Resuscitation is with air and oxygen blend (see NICU protocol 76: "Newborn Resuscitation Oxygenation").

**2. Initiation of Oxygen Therapy/Ventilation in baby <36 weeks gestation**

 Monitor by oximetry. This is a high priority in initial manoeuvres, and oximetry along with cardiac monitoring should be instituted before other procedures such as umbilical catheterisation and elective naso-tracheal intubation. Aim for the appropriate saturation target and find the necessary FiO<sub>2</sub> to achieve this. Do not allow the saturation to remain at 100% unless the baby is in air.

**3. Early Ventilation in babies <1250 grams or <30 weeks gestation**

 Do frequent arterial blood gas estimations to define the ventilatory requirement. Restrict the saturation to within the target limit by adjusting the required FiO<sub>2</sub> and adjust the ventilatory setting to achieve the optimum PaCO<sub>2</sub>
**4. Arterial Blood Gases**

 These should be seen predominantly as evaluating pH and PaCO<sub>2</sub>. The oxygen status of the small babies is better monitored by continuous pulse oximetry. In infants with persistent pulmonary hypertension, the PaO<sub>2</sub> assumes greater importance.

**5. Transcutaneous Pulse Oximeters**

Results from these machines can only be useful if the heart rate display matches with that seen on the cardiac monitor, and if the pulse wave is being reliably and consistently detected over the preceding few seconds. Given these circumstances they are reliable, and oxygen therapy can be adjusted accordingly. However, they give no indication of the acid base status, and arterial blood gas sampling is still required.

**6. Target Oxygen Levels**

These are determined by postmenstrual age.

**Oxygen Saturation (SpO<sub>2</sub>) Target Levels while still in the Unit**

Postmenstrual Age	Target saturations	Monitor alarm limits
< 36 weeks	90 – 94	89-95
36 weeks and more	93-97	92-98

**7. Nasal Flow Air or Oxygen**

Nasal flow options are available where there are indications to use this as an alternative to CPAP, such as CPAP discomfort, advancing gestation and suckle feeding. The standard flow rate for blended gas is up to 2 l/min. The standard flow rate for 100% wall oxygen is up to 500ml/min. Greater flows can be used at SMO direction. Humidification is indicated for flows greater than 500ml/min.

**8. Bagging**

In babies less than 1250 grams the resuscitation bag/Neopuff must be linked with a blender delivering the same amount of oxygen that the baby receives from its ventilator. Obviously this can be adjusted during resuscitation if more oxygen is required.

**9. Suction and Physiotherapy**

The usual practice is to increase the inspired oxygen during these procedures by 10%. The situation should never arise where the baby is inadvertently left in a higher than prescribed amount of oxygen. Please see separate protocol entitled "Suctioning".

**10. Oxygen Index (OI)**

This parameter is a useful calculation in infants with Persistent Pulmonary Hypertension and should be assessed with each blood gas.

$$OI = \frac{FiO_2 (21-100) \times MAP \text{ (cm H}_2\text{O)}}{PaO_2 \text{ (mm Hg)}}$$

**11. Home Oxygen Therapy**

For all Infants with a clinical diagnosis of CLD and needing oxygen or infants with any form of respiratory support, beyond 35 weeks corrected gestation and when ready for discharge.

Infants suitable for home oxygen therapy will:

1. Be clinically stable or improving – no significant cyanotic or apnoeic episodes in the preceding two weeks
2. Have no other significant cardio-respiratory co-morbidity contributing to their oxygen requirement (should have a clinical & ECG/ECHO screening to assess for pulmonary hypertension status)
3. Demonstrate appropriate weight gain on current management
4. Meet the oxygen targets at flows of  $\leq 0.5$  L/min nasal cannula oxygen
5. Have competent caregivers and appropriate home environment

6. Have undergone multi-disciplinary discharge planning including discussion of oxygen therapy goals, safety issues (smoking, open fires, etc), and implications for flying.
7. Have completed ROP screening, and be judged as no longer at risk.
8. An 'air challenge', aiming for a minimum SpO<sub>2</sub> of  $\geq 80\%$  is maintained for 30 minutes off oxygen before discharge.

Infants meeting the above criteria should be assessed by means of a 12 hour oximetry run before discharge (should cover periods awake & sleep) in order to evaluate their need for home oxygen.

Normal expected range on 12 hour oximetry analysis, after clearing of artefact.

Parameter	Target
Mean SpO <sub>2</sub> %	$\geq 93\%^*$
% time less than 90%	< 5%
Desaturations	Minor/Infrequent

\* Aim for mean SpO<sub>2</sub> > 94%, if there is pulmonary hypertension and/or evidence of right ventricular hypertrophy

## References

1. Fitzgerald DA et al, TSANZ position statement: Infants with chronic neonatal lung disease: recommendations for the use of the home oxygen therapy.
2. Balfour-Lynn IM et al, BTS guidelines for home oxygen in children, Thorax 2009;64 (suppl II): ii1-ii26.
3. Newborn Clinical Network Guideline: accessed 19/8/2015.

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