OXYGEN THERAPY AND SATURATION MONITORING OF THE NEONATE - CLINICAL GUIDELINE V3.0
1. **Aim/Purpose of this Guideline**

1.1 To provide guidance on the assessment and management of infants requiring oxygen therapy and oxygen saturation monitoring

All involved will benefit from the improvement in service and timing.

2. **The Guidance**

2.1 Background

Oxygen therapy may be essential in the neonatal period and beyond, but may also be harmful.

Babies born below 28 weeks gestation have a higher risk of mortality if oxygen therapy is targeted at 85 – 89% Oxygen Saturations rather than 91 -95%. Hypoxia in babies with Chronic Lung Disease (CLD) may lead to pulmonary hypertension, impaired growth and development, and higher risk of sudden unexplained death in infancy.

However there is no evidence that (SaO2) above 95% benefits babies born preterm. The STOP-ROP trial randomised babies to 95 to 99% versus 89-94% SaO2 targets when they developed pre-threshold Retinopathy of Prematurity (ROP). Median enrolment was at 35 weeks post-menstrual age (corrected gestational age, CGA). BOOST randomised babies to 95-98% versus 91-94% SaO2 target when they reached 32 weeks CGA. STOP-ROP found no difference in retinopathy progression rates, and Boost found that higher saO2 targeting did not improve health or development. Both studies showed that babies in the higher SaO2 target groups received oxygen for longer, with a greater likelihood of home oxygen therapy and greater levels of healthcare dependency.

A literature review in December 2017 did not find any new randomised controlled trial publications that suggest any change our guidance. A publication in 2016 combining the Australian and UK Boost-2 data (N Engl J Med 2016; 374:749-760), and a sub-analysis of a randomised controlled trial published in 2017 (J Pediatr 2017; 186: 49-56), support our currently recommended alarm settings in preterms..
2.2 Oxygen saturation Alarm Limits

Oxygen Saturation Alarm Limits on Neonatal Unit*

- Born below 36 weeks
  - In oxygen
    - Below 36 wks CGA
      - Lower 90% Upper 96%
    - At or above 36 wks CGA
      - Lower 92% Upper 96%
- Born at or above 36 weeks
  - After 1st 24 hours
    - In air
      - Lower 90% Upper 100%
    - In oxygen
      - Lower 92% Upper 98%
- First 24 hours, whether in air or oxygen
  - Lower 94% Upper 100%

* Babies with suspected persistent pulmonary hypertension or congenital heart disease should have their alarm limits set by the responsible consultant.

These guideline alarm limits do not take the place of individual clinical assessment and management based on observed SaO2 and trend in the individual baby’s clinical context.

Special cases: Babies with persistent pulmonary hypertension, congenital heart disease or other special cases should have their alarm limits set by the responsible consultant.

2.3 Adjusting oxygen supply

- Fully monitored babies should have their oxygen adjusted according to observations and clinical assessment. Oxygen supply should be adjusted cautiously to avoid rapid increases and decreases.
- Babies can cease continuous Oxygen Saturation monitoring once they have been stable in air for at least 24 hours, remain clinically well and are considered to be at low risk of de-saturations
A baby who is planned to be discharged in oxygen and has a stable oxygen requirement should have saturation monitoring discontinued in the week preceding hospital discharge. An overnight Oxygen Saturation trace should be performed as a baseline and to inform the discharge oxygen prescription.

Responding to SaO2 alarms – babies in percentage – adjusted FiO2

**High alarm**
- Silence alarm and observe baby
- Reassess after 2 minutes
- Still above alarm limit: Decrease FiO2 by 5%. Silence alarm
- Re-check and reduce FiO2 by 5% each minute until within limits
- Do not leave cot side until stable and all alarms functional again

**Low alarm**
- Silence alarm
- Check readout accurate
- Assess baby before changing FiO2
- Re-assess after 2 minutes
- SaO2 at or above 70%
- Increase FiO2 by 5% each minute until within range
- Increase baseline O2 by 25%
- When SaO2 above 90% wean back rapidly to baseline

**Check alarm settings correct and alarm silence time set at 2 mins**

Document all changes
Responding to SaO2 alarms – babies in low-flow oxygen

High alarm

Silence alarm and observe baby

Reassess after 30 minutes

High alarm still ringing repeatedly:
Decrease FiO2 by 1 increment (notch on flow meter).

Silence alarm

Re-check and reduce FiO2 by 1 increment each 30 minutes until within limits

Low alarm

Silence alarm

Check readout accurate
Assess baby before changing FiO2

Re-assess after 2 minutes

SaO2 at or above 70%

Increase FiO2 by 1 increment each minute until within range

SaO2 below 70%

Give face mask oxygen by Neopuff

When SaO2 above 90% wean back rapidly to baseline

Do not leave cot side until stable and all alarms functional again

Document all changes
2.4 Oxygen saturation profiling (Oxygen “downloads”)

- Oxygen saturation downloads can help to identify inadequate or unstable oxygenation resulting from an airway or lung problem.
- Oxygen saturation downloads are not useful for identifying whether a baby is receiving a higher level of oxygen therapy than they need. Therefore oxygen saturation downloads are of limited use as a tool to guide weaning of oxygen therapy.
- Overnight oxygen saturation downloads should be used in neonatal inpatients to provide evidence of stability in a prescribed amount of oxygen when a baby is planned for discharge home in oxygen. This download also provides a baseline for comparison with later downloads completed post-discharge. It also allows an assessment as to whether it is necessary to initiate or increase oxygen therapy where this is clinically uncertainty.
- A download should run for a minimum of 6 hours, wherever possible in a stable amount of oxygen, since variable oxygen delivery during the download limits interpretation of the data.
- The following parameters should be used to interpret the downloaded data:
  1. SaO2 should not fall below 92% for more than 5% of artefact-free recording period.
  2. Mean SaO2 should be above >92%, and without frequent episodes of desaturations.

2.5 Other assessments pre-discharge of babies with Chronic Lung Disease

- Babies with Chronic Lung Disease who remain in oxygen should have a 12-lead Electrocardiogram pre-discharge.
- There should be no other clinical conditions precluding discharge, and the baby must be medically stable with satisfactory weight gain and no clinical cyanotic or apnoeic episodes in the preceding 2 weeks.
- Palivizumab should be considered at the appropriate time of year for infants with CNLD requiring home oxygen.
3. Monitoring compliance and effectiveness

<table>
<thead>
<tr>
<th>Element to be monitored</th>
<th>Adherence to guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>Andrew Collinson, Consultant Paediatrician and Neonatologist Sally Vaughan, Neonatal Outreach Nurse</td>
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<tr>
<td>Tool</td>
<td>Audit</td>
</tr>
<tr>
<td>Frequency</td>
<td>As dictated by audit findings</td>
</tr>
<tr>
<td>Reporting arrangements</td>
<td>Child Health Directorate Audit and Clinical Guidelines meetings</td>
</tr>
<tr>
<td>Acting on recommendations and Lead(s)</td>
<td>Andrew Collinson, Consultant Paediatrician and Neonatologist Sally Vaughan, Neonatal Outreach Nurse Paul Munyard, Consultant Paediatrician and Neonatologist</td>
</tr>
<tr>
<td>Change in practice and lessons to be shared</td>
<td>Guideline review found no significant new evidence – no change in current guidance or practice required. Two new references added.</td>
</tr>
</tbody>
</table>

4. Equality and Diversity

4.1. This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the 'Equality, Diversity & Human Rights Policy' or the Equality and Diversity website.

4.2. Equality Impact Assessment

The Initial Equality Impact Assessment Screening Form is at Appendix 2.
### Appendix 1. Governance Information

<table>
<thead>
<tr>
<th>Document Title</th>
<th>OXYGEN THERAPY AND SATURATION MONITORING OF THE NEONATE - CLINICAL GUIDELINE V3.0</th>
</tr>
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<tbody>
<tr>
<td>Date Issued/Approved:</td>
<td>28th November 2017</td>
</tr>
<tr>
<td>Date Valid From:</td>
<td>28th November 2017</td>
</tr>
<tr>
<td>Date Valid To:</td>
<td>28th November 2020</td>
</tr>
<tr>
<td>Directorate / Department responsible (author/owner):</td>
<td>Andrew Collinson, Consultant Paediatrician and Neonatologist Sally Vaughan, Neonatal Outreach Nurse Child Health Directorate. Neonatal Unit.</td>
</tr>
<tr>
<td>Contact details:</td>
<td>(01872) 252997</td>
</tr>
<tr>
<td>Brief summary of contents</td>
<td>This guideline is designed to ensure the implementation of a standardised approach to the care of infants requiring oxygen therapy and oxygen saturation monitoring and their subsequent management</td>
</tr>
<tr>
<td>Suggested Keywords:</td>
<td>Neonate. Oxygen therapy. Oxygen saturation monitoring.</td>
</tr>
<tr>
<td>Target Audience</td>
<td>RCHT</td>
</tr>
<tr>
<td>Executive Director responsible for Policy:</td>
<td>Medical Director</td>
</tr>
<tr>
<td>Date revised:</td>
<td>28th November 2017</td>
</tr>
<tr>
<td>This document replaces (exact title of previous version):</td>
<td>OXYGEN THERAPY AND SATURATION MONITORING OF THE NEONATE - CLINICAL GUIDELINE V2.0</td>
</tr>
<tr>
<td>Approval route (names of committees)/consultation:</td>
<td>Paediatric consultants Neonatal outreach Nurses Child health Audit and Guidelines meeting</td>
</tr>
<tr>
<td>Divisional Manager confirming approval processes</td>
<td>David Smith</td>
</tr>
<tr>
<td>Name and Post Title of additional signatories</td>
<td>Not Required</td>
</tr>
<tr>
<td>Name and Signature of Divisional/Directorate Governance</td>
<td>{Original Copy Signed}</td>
</tr>
<tr>
<td>Lead confirming approval by specialty and divisional management meetings</td>
<td>Name: Caroline Amukusana</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Signature of Executive Director giving approval</td>
<td>{Original Copy Signed}</td>
</tr>
<tr>
<td>Publication Location (refer to Policy on Policies – Approvals and Ratification):</td>
<td>Internet &amp; Intranet ✓ Intranet Only</td>
</tr>
<tr>
<td>Document Library Folder/Sub Folder</td>
<td>Clinical / Neonatal</td>
</tr>
<tr>
<td>Links to key external standards</td>
<td>none</td>
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**Related Documents:**


**Training Need Identified?**

Electrocardiogram training and interpretation may be required by some junior medical staff accessing this guideline.
## Version Control Table

<table>
<thead>
<tr>
<th>Date</th>
<th>Version No</th>
<th>Summary of Changes</th>
<th>Changes Made by (Name and Job Title)</th>
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</table>
| June 2014      | V1.0       | Initial Issue              | Dr.A.Collinson pediatric and neonatal consultant  
Sally Vaughan. Neonatal outreach Nurse                                                    |
| November 2014  | V2.0       | Review and formatted       | Reviewed by:  
Dr.A.Collinson Paediatric and Neonatal Consultant  
Dr. Paul Munyard Paediatric and Neonatal Consultant  
Sally Vaughan Neonatal outreach Nurse  
Formatted by Kim Smith. Staff Nurse                                                       |
| November 2017  | V3.0       | Reviewed and re–formatted  | Literature review – no changes needed                                                             |

All or part of this document can be released under the Freedom of Information Act 2000

This document is to be retained for 10 years from the date of expiry.
This document is only valid on the day of printing

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Appendix 2. Initial Equality Impact Assessment Form

This assessment will need to be completed in stages to allow for adequate consultation with the relevant groups.

<table>
<thead>
<tr>
<th>Name of the strategy / policy / proposal / service function to be assessed</th>
<th>Directorate and service area: Child Health Directorate, Neonatal Unit</th>
<th>Is this a new or existing Policy?</th>
<th>Telephone:</th>
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</thead>
<tbody>
<tr>
<td>OXYGEN THERAPY AND SATURATION MONITORING OF THE NEONATE - CLINICAL GUIDELINE V3.0</td>
<td></td>
<td>Existing</td>
<td>(01872) 252997 (01872) 252667</td>
</tr>
<tr>
<td>Name of individual completing assessment: Andrew Collinson Sally Vaughan</td>
<td></td>
<td></td>
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</table>

1. Policy Aim*
   Who is the strategy / policy / proposal / service function aimed at?
   To provide guidance on the assessment and management of neonates receiving oxygen therapy and oxygen saturation monitoring on the neonatal unit.
   The guideline is aimed at hospital based staff responsible for neonatal care

2. Policy Objectives* As above

3. Policy – intended Outcomes* Evidence based and standardised practice

4. *How will you measure the outcome? Audit

5. Who is intended to benefit from the policy? Neonatal Medical and Nursing Staff Neonatal patients

6a Who did you consult with Workforce Patients Local groups External organisations Other

   x

b). Please identify the groups who have been consulted about this procedure.

   Please record specific names of groups
   Neonatal Guidelines Group consultant Child Health Directorate
Are there concerns that the policy **could** have differential impact on:

<table>
<thead>
<tr>
<th>Equality Strands:</th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
<th>Rationale for Assessment / Existing Evidence</th>
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<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
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<tr>
<td>Sex (male, female, trans-gender / gender reassignment)</td>
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<td>Race / Ethnic communities /groups</td>
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<tr>
<td>Disability - Learning disability, physical impairment, sensory impairment, mental health conditions and some long term health conditions.</td>
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<tr>
<td>Religion / other beliefs</td>
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<tr>
<td>Marriage and Civil partnership</td>
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<tr>
<td>Pregnancy and maternity</td>
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<tr>
<td>Sexual Orientation, Bisexual, Gay, heterosexual, Lesbian</td>
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</table>

You will need to continue to a full Equality Impact Assessment if the following have been highlighted:

- You have ticked “Yes” in any column above and
- No consultation or evidence of there being consultation - this excludes any policies which have been identified as not requiring consultation. or
- Major this relates to service redesign or development
8. Please indicate if a full equality analysis is recommended. | Yes | No | X |
--- | --- | --- |

9. If you are **not** recommending a Full Impact assessment please explain why.

No areas indicated

<table>
<thead>
<tr>
<th>Signature of policy developer / lead manager / director</th>
<th>Date of completion and submission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kim Smith</td>
<td>28/11/17</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Names and signatures of members carrying out the Screening Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kim Smith</td>
</tr>
<tr>
<td>2. Human Rights, Equality &amp; Inclusion Lead</td>
</tr>
</tbody>
</table>

**Keep one copy and send a copy to the Human Rights, Equality and Inclusion Lead**
c/o Royal Cornwall Hospitals NHS Trust, Human Resources Department, Knowledge Spa, Truro, Cornwall, TR1 3HD

**This EIA will not be uploaded to the Trust website without the signature of the Human Rights, Equality & Inclusion Lead.**

A summary of the results will be published on the Trust’s web site.

Signed _Kim Smith_ ________________

Date __28/11/17______________