1.0 Aim of Guideline

- To target oxygen saturations associated with best outcome based on the currently available evidence
- To aid identification of infants who have respiratory/cardiac pathology
- To provide consistency of practice across region regarding delivery of oxygen therapy

2.0 Scope of Guideline

The guideline applies to all neonates who require oxygen saturation monitoring beyond the initial resuscitation period in neonatal units and maternity units covered by South Central North Neonatal Networks. This includes the following hospitals:

North Network
Milton Keynes General Hospital, MK
John Radcliffe Hospital, Oxford
Horton General Hospital, Banbury
Stoke Mandeville Hospital, Aylesbury
Royal Berkshire Hospital, Reading
Wexham Park Hospital, Slough
3.0 Introduction
Oxygen is a drug. Whilst it is essential for metabolism, free radicals and reactive oxygen species are produced as by-products. These are produced in larger quantities both if arterial oxygenation is too high and during reoxygenation following hypoxia.

**Term Infants**
Saturation levels in normal term infants range from 88-100% (1,2). The median value at 20-24 hours of life (97.8%) is similar to that for healthy full term infants between 2 and 7 days of age (97.6%) (2).

In normal term infants, SpO$_2$ rates of >95% are reached 12 minutes (2-55 min) preductally and 14 minutes (3-55 min) postductally after birth (3).

**Preterm Infants**
There are competing risks which have to be considered when setting oxygen saturation targets in preterm infants; ROP blindness, mortality and neurodisability, and chronic lung disease (4-8). While optimal saturation targeting is not fully known a number of randomised trials have helped to improve our understanding of what oxygen saturations might be considered safe.

The **SUPPORT study** compared target range of 85-89% oxygen saturations with 91-95% in 1316 infants born between 24-28 weeks (this trial was designed as a 2-by-2 factorial trial and also compared CPAP in delivery suite with intubation and surfactant). The rate of severe ROP and BPD was lower in the lower saturation group but there was some evidence (p=0.04) of an increased death rate before discharge in this group. (9)

Meta-analysis of three trials (**BOOST-II UK, BOOST 2 Aust/NZ and COT**) demonstrated a clear increase in death before 36 weeks gestation in infants targeted to oxygen saturations 85-89% compared with targeting 91-95% and consequently these trials have been stopped prematurely. These results have not yet been published and therefore full evaluation of risks and benefits is not known. (communication from P Brocklehurst {Chief Investigator BOOST-II UK} to all BOOST-II Principle Investigators).

The **BOOST study** (10) demonstrated that maintaining oxygen saturations between 91-94% after 32 wks CGA, in infants born at <30 wks gestation, was associated with the same growth and development as infants whose saturations were targeted at 95-98%. There was significantly less chronic lung disease in the low saturation arm and there were less pulmonary deaths in the low saturation arm although this did not reach statistical significance.

The **STOP-ROP study** (11) looked at infants <31wks or <1500g who were more than 1 month old and had reached threshold ROP. Saturations were maintained at 88-94% or 96-99%. There was no difference in outcome for eye disease, but there were significantly more pulmonary sequelae (pneumonia, chronic lung disease) in the higher saturation group.
4.0 Guideline

<table>
<thead>
<tr>
<th>Category</th>
<th>Gestation</th>
<th>Target saturations</th>
<th>Alarm limits</th>
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<tbody>
<tr>
<td>Infants requiring Oxygen and/or respiratory support.</td>
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<tr>
<td>&lt;36/40</td>
<td>90-95%</td>
<td>90-95%</td>
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<tr>
<td>≥36/40</td>
<td>94-98%</td>
<td>94-98%</td>
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<tr>
<td>Infants who are in room air and require no respiratory support</td>
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<tr>
<td>&lt;36/40</td>
<td>90-100%</td>
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<tr>
<td>≥36/40</td>
<td>94-100%</td>
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<tr>
<td>All infants with or at risk of pulmonary hypertension</td>
<td>Discuss with neonatologist</td>
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<tr>
<td>Ex-preterm infants who are still in oxygen at 36 weeks</td>
<td>Discuss with neonatologist</td>
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<tr>
<td>Babies with structurally abnormal hearts</td>
<td>Discuss with cardiologist</td>
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</tbody>
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4.0 References

3) B Toth et al. Oxygen saturation in healthy newborn infants immediately after birth measured by pulse oximetry. *Arch Gynecol Obst.* 2002;226(2) 105-7