Guideline for the Prevention and Reduction in Incidence of Retinopathy of Prematurity (ROP)

Background

ROP is a preventable cause of childhood blindness affecting preterm infants. Babies born at < 32 weeks and/or ≤ 1500g at birth are screened.

The prevalence of severe ROP (stage >2) in Wales is around 8% compared to the UK average of around 6% (Vermont Oxford Network data).

The stages of ROP and its progression are illustrated below:

ROP is potentially blinding. The ophthalmic outcomes for preterm babies who develop mild ROP (stages 1 & 2), are not functionally disabling, although treatment to correct a refractive error, strabismus or amblyopia may be required. The outcome for children who have severe ROP (stages 3–5 and prethreshold) can be severely disabling and even blinding.

Many prevention strategies have been shown in various clinical trials. The role of oxygen therapy is the most important independent risk factor in the development of ROP.
ROP. Other risk factors are well documented and include sepsis and blood transfusion. Human milk is known to be protective.

This guideline sets out primary prevention strategies by means of improved neonatal care through a team approach involving nurses, ophthalmologists and neonatologists.

**Primary Prevention Strategies**

**Delivery Room Resuscitation of Preterm Babies:**

Resuscitation of preterm infants born < 32 weeks gestation should be initiated in air or up to 30% oxygen. Pulse oximetry should be used to avoid excessive use of oxygen. The supplemental oxygen administered should be titrated according to the pre-ductal saturation targets.

*Neonatal Oxygen Saturation Targets*

<table>
<thead>
<tr>
<th>Time After Delivery</th>
<th>Preductal* SpO₂</th>
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</thead>
<tbody>
<tr>
<td>1min</td>
<td>60-65%</td>
</tr>
<tr>
<td>2min</td>
<td>65-70%</td>
</tr>
<tr>
<td>3 min</td>
<td>70-75%</td>
</tr>
<tr>
<td>4min</td>
<td>75-80%</td>
</tr>
<tr>
<td>5min</td>
<td>80-85%</td>
</tr>
<tr>
<td>10 min</td>
<td>90%</td>
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</tbody>
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*The right upper extremity receives preductal blood.

**Maintaining Appropriate Oxygen Saturation Levels**

Oxygen should be treated as a medication. For any supplemental oxygen given to infants on the neonatal unit, make judicious adjustments to stay within the range limits according to the corrected gestational age of the baby. Strict control of oxygen fluctuations is necessary.

<table>
<thead>
<tr>
<th>Age Limits</th>
<th>Saturation Targets</th>
<th>Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;36 weeks</td>
<td>91- 94 %</td>
<td>90- 95%</td>
</tr>
<tr>
<td>36 CGA</td>
<td>94- 97%</td>
<td>93- 98%</td>
</tr>
</tbody>
</table>

**Check- Act- Check Cycle**

Alarms must be operative always and checked at the beginning of each nursing shift.
High Oxygen Saturation

If $\text{SpO}_2 > 95\%$ consider decrease in $\text{FiO}_2$ by 5% every 3 minutes
If $\text{SpO}_2 > 98\%$ consider decrease in $\text{FiO}_2$ by 10% every 3 minutes

Low Oxygen Saturation

Patient should be examined within 30 seconds checking that airway is patent and any respiratory support is being adequately delivered. Fluctuations in oxygen saturations are to be avoided, and the following is a guide only:

* If $\text{SpO}_2$ rising then no action needed
* If $\text{SpO}_2 < 85\%$ consider increase in $\text{FiO}_2$ by 5% every 2 minutes
* If $\text{SpO}_2 < 80\%$ consider increase in $\text{FiO}_2$ by 10% every 2 minutes
* If $\text{SpO}_2 < 75\%$ consider increase in $\text{FiO}_2$ by 20% every 2 minutes

* In case of persistent bradycardia (<80bpm) consider increase in $\text{FiO}_2$ by up to 40% every 2 minutes
* When $\text{SpO}_2$ is back in target range decrease $\text{FiO}_2$ until baseline $\text{FiO}_2$

Use bedside cards to act as reminders of saturation targets as well as help in weaning of oxygen.

For babies receiving low flow oxygen, see network guideline on chronic lung disease for advice with oxygen saturation targets and management.

Human Milk Feeds

Human milk has many antioxidants which includes Inositol, vitamin E and beta carotene. These provide protection against the development of ROP.
Nutrition

Attention to nutrition to promote optimal growth during the first weeks of postnatal life in high risk infants has been shown to reduce the incidence of ROP.

Sepsis and Blood Transfusion

Though a recent meta-analysis does not show a significant reduction in the rates of severe ROP by treating infection and restrictive blood transfusion, infection has been implicated in the higher incidence of ROP and blood transfusion increases the oxygen carrying capacity and higher delivery of oxygen to the tissues leading to adverse effect on the retinal tissue.

References

UK Retinopathy of Prematurity Guideline
Royal College of Paediatrics and Child Health
Royal College of Ophthalmologists
British Association of Perinatal Medicine

Outcomes of a Quality Improvement Project to Reduce the Incidence of Severe Retinopathy of Prematurity Secondary to Hyperoxia or Hypoxia relative to Post-Conceptual Age
Gabrielle Boodoo, MD PGY2, Tammy Smoak, RT, Edward Cheeseman Jr., MD, Sharon Emory, RN, Laura Basile, MD

Resuscitation and support of transition of babies at birth

Preventative Strategies in the Management of ROP: A Review of Literature
Irina Livshitz
University Hospitals Case Medical Center, Cleveland, USA

Interventions To Prevent Retinopathy of Prematurity: A Meta-analysis
Jennifer L. Fang, MD, a Atsushi Sorita, MD, b William A. Carey, MD, a Christopher E. Colby, MD, a M. Hassan Murad, MD, c Fares Alahdab, MDc

Ann Hellström*, Lois E H Smith*, Olaf Dammann

Oxygen Therapy and Saturation Monitoring of the Neonate - Clinical Guideline
Royal Cornwall Hospital NHS trust

Maintaining Optimal Oxygen Saturation in Premature Infants Permanente Journal, 2011
Yoke Yen Lau, RN, BHSN, Yih Yann Tay, RN, BHSN, Varsha Atul Shah, MD, MBBS, MRCP, Pisun Chang, RN, and Khuan Tai Loh, PEN