### Purpose and Intent:

1.1 To provide a process for the therapeutic use of oxygen for neonates in the neonatal units (includes Neonatal Intensive Care Units and Intermediate Care Nursery).

### Practice Outcome

2.1 Oxygen is a drug with potentially significant dangerous side effects. Avoiding hypoxia is important, but prolonged hyperoxia leads to oxidative stress and injury. There is no evidence that very low birth weight infants need to be managed with an FIO2 that leads to surface oxygen saturation levels (SpO2) of 95% to 100%. These levels are harmful.

*Note: All recommendations are approximate guidelines only and practitioners must take into account individual patient characteristics and situation. Concerns regarding appropriate treatment must be discussed with the attending neonatologist.*

### Guidelines

3.1 Provide therapeutic oxygen at < 100% to neonates requiring resuscitation at the time of delivery or shortly after according to the guidelines found in the Neonatal Resuscitation Program (NRP) from the Canadian Pediatric Society.

3.2 For all newly born infants who require resuscitation with positive pressure ventilation begin using room air.

*Exception:* In infants with a high risk of underlying lung disease it is acceptable to start with an increased oxygen concentration at the discretion of the resuscitating physician. Usually this should not exceed an FIO2 of 0.40

3.3 In the delivery area, if supplemental oxygen is required after 15 minutes of age, initiate nasal prongs or nasal continuous positive pressure and maintain as defined in the General Guidelines contained in this document. Determine the exact oxygen requirements using the "Low Flow Oxygen FiO2 calculator", or consult a Respiratory Therapist.

3.4 For neonates requiring positive pressure ventilation (PPV) or resuscitation in newborn areas, provide oxygen during PPV/resuscitation according to the following guidelines:

3.4.1 **Presently on room air:** initiate PPV/resuscitation with positive pressure ventilation using room air (FIO2: 0.21). Increase oxygen as needed as defined in section 2.4.

3.4.2 **Presently receiving oxygen therapy:** initiate resuscitation with positive pressure ventilation using the FIO2 the patient is presently on (ordered oxygen therapy). Increase oxygen as needed as defined in section 2.4.

3.4.3 **Mechanical ventilation:** initiate resuscitation with positive pressure ventilation using the FIO2 the patient is presently on (ordered oxygen therapy). Increase oxygen as needed as defined in section 2.4.

3.5 Initiate O2 saturation monitoring within the first minute after birth.

3.6 Adjust inspired Oxygen concentration used during resuscitation according to the following guidelines:

3.6.1 If using a flow inflating bag (i.e. Jackson Reese):
If heart rate <100 after 60 seconds of PPV at the starting FiO\textsubscript{2} increase the FiO\textsubscript{2} by 0.2 every 60 seconds until the heart rate is >100. I.E. oxygen starting at room air would then jump to 0.4 - 0.6 - 0.8 – 1.0 with an increase every 60 seconds of poor response. Once heart rate is >100, FiO\textsubscript{2} should be adjusted according to O\textsubscript{2} saturation.

3.6.2 If using a self-inflating bag without blended oxygen (i.e. Laerdal):
Increase the FiO\textsubscript{2} to 1.00 by turning on oxygen. Remove the reservoir to attain approximately 40% oxygen.

3.7 Initiate O\textsubscript{2} saturation monitoring for all infants receiving supplemental O\textsubscript{2}.

3.8 For patients on oxygen with a Masimo\textsuperscript{®} monitor, report the histogram obtained from the monitor daily during morning rounds and as requested by attending physician. The goal for the histogram is for the infant to spend 80% of time in the target range.

3.9 Deliver nasal prong O\textsubscript{2} using a low-flow meter / O\textsubscript{2} blender

3.10 Assess nasal prongs for patency at least once a shift and prn when there is suspicion of blocked prongs from copious nasal secretions or there is unexplained need for increased flow. Assess patency using the “bubble test” where the prongs are removed from the patient and placed under the surface distilled water in a cup.

3.11 Ensure a resuscitation bag is available at the bedside at all times.
3.11.1 For patients requiring respiratory support connect a Jackson Reese bag to the blender with a “Y-type” connector in order to deliver O\textsubscript{2} at the same level as the nasal prongs are set.
3.11.2 For patients not requiring respiratory support use a Laerdal bag with reservoir connected to a flow meter.

3.12 When initiating nasal prongs on infants previously intubated or on nasal CPAP, set the O\textsubscript{2} blender to the same percentage as was set on the previous mode of support.

3.13 For nasal prongs set the low flow meter at 0.5 lpm unless otherwise ordered by the physician.

3.14 Follow the target oxygen saturation range and alarm limits as outlined in APPENDIX A.

3.15 For infants with frequent, non-clinically significant low saturation alarms, set the lower alarm limit lower with a physician’s order. The lowest setting is 80. The target range remains the same.

3.16 When adjusting oxygen to meet target O\textsubscript{2} saturation range do not exceed .05, or 5% above or below previous level. (ie. If O\textsubscript{2} set at 30%, adjust up to 35% or down to 25%). Adjustments may be smaller than .05.
3.16.1 When the saturation levels drop below the target range, assess ventilation before adjusting oxygen
3.16.2 Observe O\textsubscript{2} saturation every 1-2 minutes and make O\textsubscript{2} adjustments until the saturation level is stable for 3-5 minutes.
3.16.3 If O\textsubscript{2} is increased wean back down as early as possible after adequate oxygenation is established.

3.17 When the O\textsubscript{2} blender is set at FiO\textsubscript{2} 1.0 and the infant’s O\textsubscript{2} saturation remains below the target range increase the flow from the flowmeter by 0.1 lpm every 1-2 minutes until it reaches 1.0 lpm or the O\textsubscript{2} saturation is within the target range for that infant and notify physician/NNP/CA.

3.18 If the O\textsubscript{2} saturation does not reach the target range with an increase in 10% with respiratory support, or 20% if on nasal prongs, notify physician/NNP/CA.

3.19 For infants who fluctuate frequently between room air and small amounts of oxygen set the alarm limits as outlined in 3.8 if the infant requires oxygen for longer than 30 minutes.

3.20 Attempt weaning oxygen when saturation levels are within the target range.
3.21 Discontinue nasal prongs when the flow meter is at 0.5 lpm and the FiO₂ is 0.21 with the O₂ saturation stable within the target range.

4.0 PRIMARY AUTHORS

6.1 Respiratory Therapy Clinical Specialists: John Minski (HSC), Joe Millar (SBH)
6.2 Neonatal Intensive Care Unit, Assistant Medical Directors: Dr. John Baier (HSC), Dr. Ruben Alvaro (SBH)
6.3 Neonatal Intensive Care Unit, Clinical Nurse Specialists: Barbara Wheeler (SBH), Doris Sawatzky-Dickson (HSC)
6.4 Neonatal Intensive Care Unit, Nurse Educators: Karen Bodnaryk (HSC) Tanya Tichon (HSC), Ceceile Porter (SBH)

5.0 REFERENCES

### APPENDIX A

**Oxygen Saturation Goal Range and Alarm Limits**

**Health Sciences Centre:**

<table>
<thead>
<tr>
<th>Infant Description</th>
<th>O₂ Saturation Range</th>
<th>Alarm Limits (low-high)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term and Preterm</td>
<td>88-92%</td>
<td>85 - 94</td>
</tr>
<tr>
<td>Chronic Respiratory Disease &gt;37 weeks PMA</td>
<td>88-92% or as per physician/NNP/CA order</td>
<td>85 - 94</td>
</tr>
<tr>
<td>Infant with Pulmonary Hypertension</td>
<td>88-92% or as per physician/NNP/CA order</td>
<td>85 – 94 (usually preductal)</td>
</tr>
<tr>
<td>Cyanotic congenital heart disease</td>
<td>per physician/NNP/CA order</td>
<td>per physician/NNP/CA order</td>
</tr>
<tr>
<td>Any infant on room air</td>
<td>N/A</td>
<td>85 - 101</td>
</tr>
</tbody>
</table>

**St. Boniface Hospital**

<table>
<thead>
<tr>
<th>Infant Description</th>
<th>O₂ Saturation Range</th>
<th>Alarm Limits (low-high)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term and Preterm &gt; 32 wks</td>
<td>90 - 94%</td>
<td>87 – 95</td>
</tr>
<tr>
<td>Acute Preterm ≤ 32 wks</td>
<td>88-92%</td>
<td>85 - 95</td>
</tr>
<tr>
<td>Chronic Preterm &gt; 32 wks PCA</td>
<td>90-94%</td>
<td>87 - 95</td>
</tr>
<tr>
<td>Infant with Pulmonary Hypertension</td>
<td>As per physician/NNP order</td>
<td></td>
</tr>
<tr>
<td>Any infant on room air</td>
<td>N/A</td>
<td>No need for high alarm</td>
</tr>
<tr>
<td>Cyanotic congenital heart disease</td>
<td>per physician/NNP/CA order</td>
<td>per physician/NNP/CA order</td>
</tr>
</tbody>
</table>