

### Who should undergo oxygen saturation testing?

- All infants who remain in supplementary oxygen when they are otherwise ready for home
- Infants born at <32 weeks gestation, with a diagnosis of BPD, who have discontinued oxygen therapy within 2 weeks of the expected date of discharge OR who have significant respiratory symptomatology at that time
- Infants of any gestation who required > 28d of respiratory support who have discontinued supplementary oxygen, within 2 weeks of the expected date of discharge
- Suitability for LTOT should be assessed by the Neonatal team including senior medical representative (Consultant, Associate Specialist), senior nursing representative and community nursing team.

### When should testing occur?

Saturation testing for babies with BPD should occur when the infant has met the following criteria

- They are 36wks corrected gestational age (CGA) or greater
- Medically stable.
- Have satisfactory growth.
- Have an O<sub>2</sub> dependency of no more than 0.5 L/min via nasal cannula.
- Can maintain a mean SpO<sub>2</sub> of 93% or greater, during most activities, without frequent or prolonged desaturation episodes, *as assessed by bedside saturation monitoring.*
- They have had stable O<sub>2</sub> requirements for the preceding week.
- Systemic steroids, where prescribed, have been discontinued at least 1 week prior to testing.
- They have had no recent changes to other medications that may affect respiratory function *e.g. diuretics, inhaled steroids.*
- Feeding orally by breast/bottle for at least 48 hours.  
*Unless home nasogastric feeds are part of the discharge plan.*
- Free of apnoeic episodes and off caffeine citrate therapy for >7days

### Testing Description:

- Duration: 12 – 24 hours – must include periods of sleep, wakefulness and feeding.
- Minimum equipment: Saturation monitor capable of data download and analysis
- Location: in one of the SCBU nurseries.
- Oxygen flow during test:
  - In air if O<sub>2</sub> recently discontinued
  - An increment of 0.1 L/min equal to, or higher, than the most recent flow rate required as judged by bedside testing. If ideal flow is unclear use 2 different flow rates for periods of 12h each. E.g. 0.1 L/min and 0.2 L/min

Clinical evaluation:

1. Inform nurses in room that oxygenation study ongoing
2. Record any change to position, feeding or cares in an activity diary

3. Document background (e.g. Handling / choking spell) if any significant desaturation events
- An "Air Challenge" must also be carried out (must maintain sats  $\geq 80$  for 30 mins in air)
  - Car seat challenge-use parents seat, monitor for 1 hour, no concerning desaturations with sats  $\geq 93\%$  in set oxygen or air. Consider repositioning if any difficulties.

### Interpretation of results

Infants who are in air or a fixed oxygen level would pass their oxygen study if:

1. Mean SpO<sub>2</sub>  $\geq 93\%$  in air, or chosen fixed oxygen level.
2. SpO<sub>2</sub> does not fall below 90 % for more than 5% of the total oxygen study time.
3. There are no significant<sup>†</sup> desaturation/bradycardia episodes  
*<sup>†</sup>Deep (>10%) or prolonged (>3min) episodes unrelated to movement or technical artefacts*

Where these criteria are not met:

1. If mean saturation < 93%, consider repeating test in 0.1 L/min higher oxygen flow
2. If there an unacceptable number or severity of desaturations, consider and treat other diagnosis (GORD, immaturity, central apnoeas, airway control etc). Repeat test after incidents settle
3. Repeat studies: After suboptimal results but no need for supplemental oxygen, a repeat study should be made 5-7days later if deemed necessary, and after any changes (increase /decrease flow, changes to feeds, etc) are made. All babies qualified for repeat oxygenation study will be discussed on the Ward Round.

### Discharge Planning for Home oxygen

#### -Medical

(discharge checklist to be filled in by community nursing team)

- **Check parental view and understanding of Home oxygen**
- **Answer any parental questions**
- **Perform an "air challenge"** – 30 mins breathing air. Ensure SpO<sub>2</sub> does not fall <80%
- **Perform Car seat challenge-**
- **Offer Vaccination** – 1<sup>st</sup> dose Palivizumab (if criteria met). Influenza if > 6 months old
- **Routine investigations**
  - CXR-within 2 weeks of discharge
  - Capillary PCO<sub>2</sub>
- **Consider additional Investigations – If in high levels of Oxygen (>0.1 L/min) OR if there are significant respiratory symptoms.**
  - CXR,
  - Capillary gas,
  - ECG/ECHO (for pulmonary hypertension)
  - FBC (for anaemia – top up if Hb < 85g/l)

- **Monitoring** – Apnoea monitor only at consultant request

**-Nursing/ community team**

- **Under take teaching package for home oxygen for neonates**
- **Get parents to watch Bliss Resus video**
- **Give them Dolby home leaflet**
- **Rooming in** - for 1-2 days before discharge
- **Decide on discharge date**-send SHOOF form via email to order long –term oxygen therapy (LTOC) 0.1 to 0.5 l/min and ambulatory oxygen cylinders.
- **Illness following discharge** – Ensure parents understand when and where to seek help if infant becomes unwell
- All babies on home Oxygen will have routine follow up with Neonatal Community Team and their progress will be discussed weekly on Consultant Ward Round with Neonatal Community Team.

**Weaning/follow up protocol**

- See Chart 1 below
- All babies on home Oxygen will have routine follow up with Neonatal Community Team and their progress will be discussed weekly on Consultant Ward Round with Neonatal Community Team.
- Clinical review at intervals of  $\leq 4$  weeks should determine that the patient is well, achieving adequate growth, and does not have significantly increased work of breathing.
- Apply a saturation monitor and observe saturation values in a resting state for  $> 30$  mins. If the mean saturation values are  $\geq 93\%$  the baby should be observed for the remainder of the visit (at least 30 min preferably 1 hour) with the oxygen flow rate reduced by 0.1L/min. If the baby was previously in 0.1L/min then they should be observed in room air.
- If the baby remains well saturated in the reduced flow rate (mean saturation  $\geq 93\%$ ) then the baby should remain on this flow rate for the duration of a 12-24 hour saturation recording. Parents should be given instructions to resume the previous oxygen flow rate if they have concerns about their baby's breathing or if saturation levels fall consistently below 90%
- If the pulse oximetry study is satisfactory during wakefulness but less so at other times at consultant discretion and extra step can be undertaken where by the oxygen can be discontinued during the day when the child is awake and restarted for periods of sleep. This approach may be more acceptable for parents, who have come to depend on the oxygen.
- Once Oxygen is discontinued a further pulse oximetry study should be performed a month later.

- Once in air day and night, oxygen equipment should be left in the home for 2 months or till the end of winter, then inform O2 supplier to remove equipment. Parents to contact community team post wean if any concerns regarding babies health.

### Outcomes

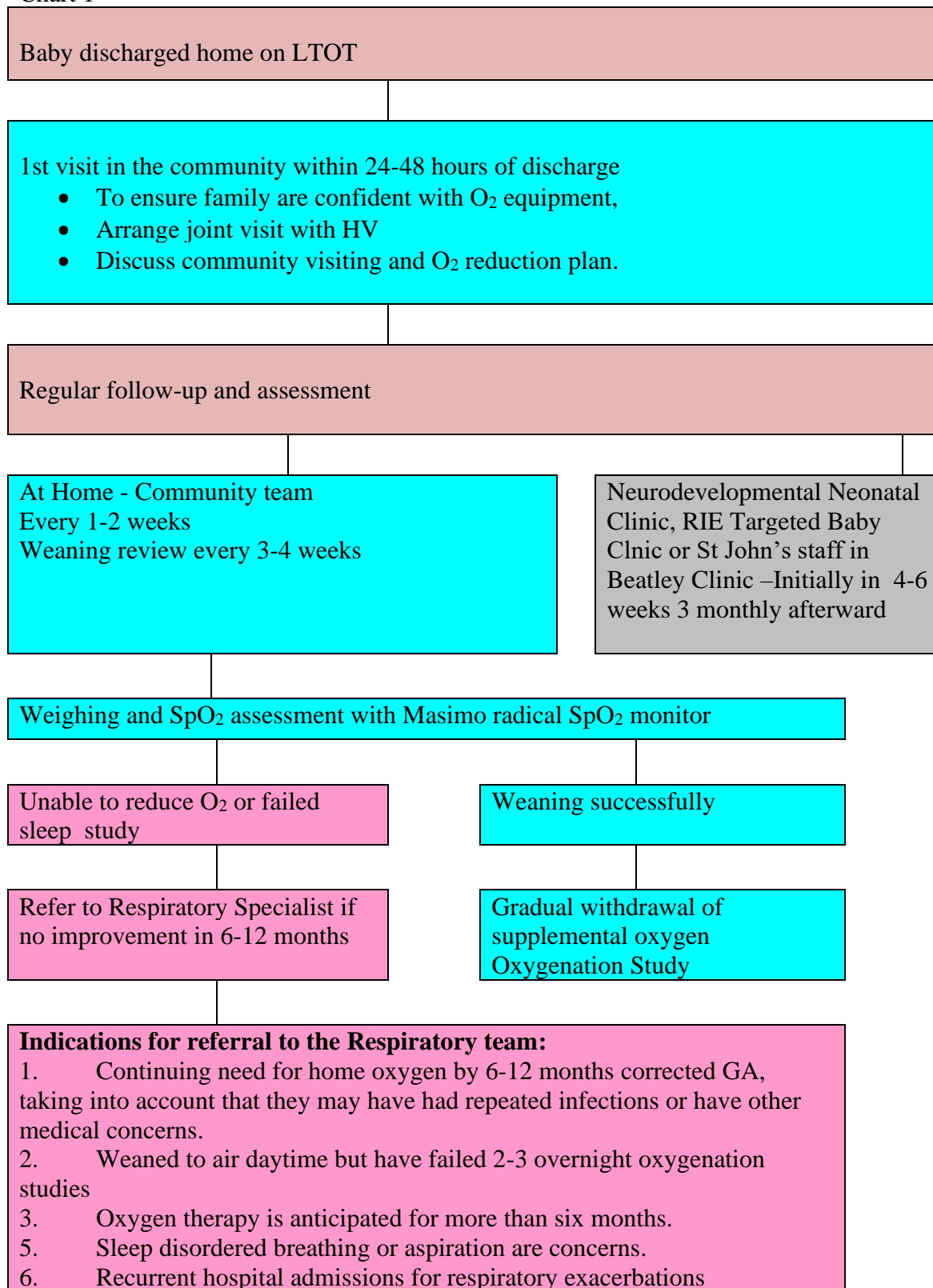
- **Satisfactory recording** - The mean SpO<sub>2</sub> during the recording is  $\geq 93\%$ , with  $< 5\%$  of the artefact free recording being below 90 %, and with no significant desaturation episodes.  
**Action - The patient should remain on the reduced oxygen flow rate and be reviewed within 4 weeks**
- **Evidence of potential hyperoxia** – The mean saturation during the recording is  $\geq 96\%$  with no significant desaturation episodes.  
**Action - The patient should remain on the reduced oxygen flow rate and consideration given to an early reassessment with a further reduction in the oxygen prescription**
- **Inadequate saturation during sleep** - Satisfactory daytime recording but Mean saturations falling to  $< 93\%$  during sleep, or  $> 5\%$  of recording is below 90 %, or there are prolonged or frequent desaturation episodes.  
**Action - The patients should be returned to the previous oxygen flow rate during sleep OR for 24h per day, at the discretion of the clinical team. Further reassessment within 4 weeks**
- **Unsatisfactory recording** – The mean saturation on the reduced oxygen flow rate is  $< 93\%$  OR  $> 5\%$  of the recording is below baseline OR there are prolonged or frequent desaturation episodes.
- **Action - The patient should be returned to their original oxygen flow rate and arrangements made for reassessment within 4 weeks**

**N.B.** – repeated failure to be able to wean the oxygen prescription over a 6 month period may require further investigation or discussion with the respiratory team and referral to community childrens nursing team.

## Long term Oxygen therapy for Neonates discharged from NNU

Follow up at home:

Chart 1



## Appendix A Background

### **Long term oxygen therapy (LTOT) may have the following benefits:**

- Preferable to a prolonged hospital stay for both quality of life and psychological impact for the infant, parents and family;
- Reduces hospital stay due to earlier discharge (despite a significant readmission rate).
- Reduces / prevents pulmonary hypertension, intermittent desaturations, may reduce the associated risk of sudden unexplained death in infancy;

Infants with impaired oxygenation due to other conditions such as meconium aspiration syndrome (MAS), persistent pulmonary hypertension of the newborn (PPHN), congenital pulmonary abnormalities, congenital lungs problems etc might also be considered for this pathway after careful multidisciplinary discussion.

### **Further background**

- The normal SpO<sub>2</sub> is around 96% or higher.
- The optimal SpO<sub>2</sub> target for balancing benefits and risks in convalescent preterm infants is uncertain. Maintaining average SpO<sub>2</sub> below 90% may be harmful. In infants who are being discharged, a margin of safety is advisable.
- A target SpO<sub>2</sub> > 92% may help prevent potential complications of hypoxia, while avoiding the potential complications of unrestricted oxygen use.