BRONCHOPULMONARY DYSPLASIA

Introduction

- Bronchopulmonary dysplasia (BPD) is a clinical diagnosis defined by oxygen dependence for a specified time period after birth accompanied by characteristic radiological findings.
- The diagnosis is based on the above with an appropriate antecedent history in the absence of infection.
- Infants with birth weight <1250g account for 97% all BPD. The risk of BPD rises with decreasing birth weight. Incidence rates vary depending on diagnostic criteria used.
- Some very low birth weight preterm infants (23-28 weeks and <1250g) can develop an increasing oxygen requirement 1-2 weeks (wks) after birth without obvious preceding lung disease this can be considered as atypical BPD and is likely to be mild and resolve more rapidly.

Definitions

- Various definitions exist. The two most widely used are an abnormal CXR associated with either:
  - The need for supplemental oxygen at 36 weeks corrected gestational age (CGA)
  - The need for supplemental oxygen at 28 days of life
- The term chronic lung disease (CLD) is often used instead of BPD to denote oxygen requirement beyond 36 weeks CGA.
- A useful working definition of BPD is an oxygen requirement at 28 days of life which is then classified into three severity groups: mild, moderate or severe (see table 1):

Gestational age at birth (wks)	**Mild**	**Moderate**	**Severe**
<32	Supplemental O_2 at 28 days of age but in air at 36wks CGA or at discharge	Supplemental O_2 at 28 days of age and <0.3 FiO2 at 36wks CGA or at discharge	Supplemental O_2 at 28 days and FiO2 >0.3 or positive pressure support at 36 wk CGA or discharge
>32	Room air by postnatal day 56 (8 wks) or at discharge	<0.3 FiO_2 by postnatal day 56 (8 wks) or at discharge	>0.3 FiO_2 with or without positive pressure support by postnatal day 56 or at discharge

Table1. Severity of BPD

Prevention BPD

Antenatal

- Antenatal corticosteroids should be given to any pregnant women at 23+0-34+6 wks gestation at risk of preterm delivery to aid fetal lung maturation.

- One repeat course should be given to preterm infants <29 wks who had their first course >2wks ago.

Postnatal prevention/treatment:

- Many therapies in common use have very poor evidence base for their use. Treatments of proven benefit include:
  - Avoidance of ventilation
  - Early administration of surfactant if intubated
  - Caffeine for apnoea of prematurity from birth
  - Postnatal corticosteroids also reduce the incidence of BPD but increase the risk of an abnormal neurological outcome especially when used in the first week of life
  - Parenteral Vitamin A supplementation

General Management Principles for ELBW Infants at Risk of BPD:

- Careful fluid balance and avoidance of excessive water and sodium intake in the first week of life should be observed to decrease the likelihood of BPD.
- Nutrition should be provided to meet the increased total energy needs of infants with BPD (20-40% higher calorie requirement vs infants without BPD) to ensure appropriate growth (see nutrition guidelines).
- All preterm infants should be monitored and treated for jaundice as soon as possible because aggressive phototherapy in ELBW might contribute to a reduction of BPD (see jaundice guidelines).

Specific Management Principles according to Phase of Illness

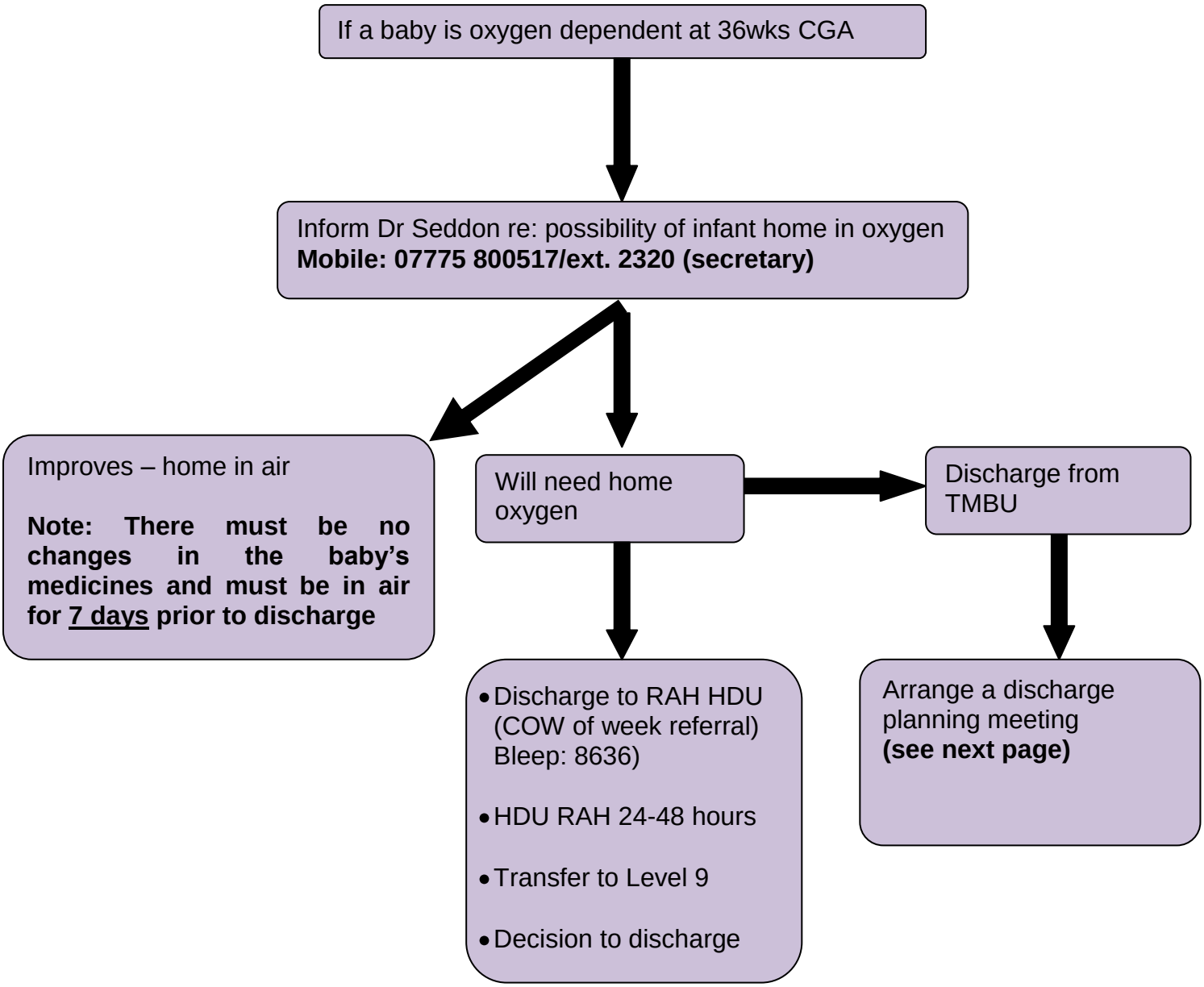
	Early (up to 1wk postnatal age)	**Evolving (>1wk postnatal age to 36wks CGA)**	**Established (>36wks CGA)**
Ventilation strategy	• Avoid intubation • If intubated, give Surfactant within 4 hours of birth • Use short inspiratory time (0.24-0.35s), rapid rates (≥60/min) and low PIP (14-20cmH_2O), moderate PEEP (4-6cmH_2O), and tidal volumes (3-6mL/kg) • Extubate early to NCPAP • Blood gas targets: o pH 7.20-7.35 o PaO_2: 5.3-8.0kPa o $PaCO_2$: 6-8.5kPa • HFOV for 'rescue' if conventional ventilation fails to prevent volutrauma	• Avoid endotracheal intubation • Maximise non-invasive ventilation with CPAP/SIPAP/Opti-Flow • Blood gas targets: o pH 7.20–7.35 o PaO2: 6.7-9.3kPa o PacO2: 6.7-8.5kPa	
Oxygen support	• Keep oxygen saturations 85-93% in <34wks	Keep oxygen saturations 85-93% <34wks or 90-95% >28days	Keep oxygen saturations >94% >36 wks

Methylxanthines (Caffeine)	• Administer to all infants at birth <1250g or <32wks to increase rate of succesful extubation, treat apnoea of prematurity, reduce risk of BPD and adverse neurodevelopmental outcome • Consider extending therapy in BPD up to 35wks	
Vitamin A	Consider using 5000 IU administered I.M. 3x/wk for 4wks in infants <1000g **OR** early ABIDEC/TPN	
Steroids	• Early phase inhaled or systemic steroids are not recommended	• Systemic corticosteroid therapy should only be used for the exceptional infant with severe BPD who cannot be weaned from ventilatory support or to avoid re-intubation (see formulary) • Inhaled corticosteroid therapy maybe used as a short-term therapy in ventilator dependent patients with severe BPD for extubation
Diuretics	• Not indicated	• Diuretic therapy should be reserved for patients who are ventilator dependent despite modest fluid restriction or who cannot be weaned from ventilatory support or to avoid re-intubation (see formulary for dosing regimen) • Start with a Thiazide diuretic, e.g. Chlorthiazide rather than a loop diuretic because of increased complications • Loop diuretics can be used intermittently in episodes of acute pulmonary decompensation in severe BPD
Bronchodilators	• Routine administration of bronchodilatators is not indicated • Bronchodilators should be reserved for episodes of acute pulmonary decompensation due to severe airway reactivity • Atrovent may be more effective than Salbutamol	
Sildenafil	• Not indicated	• Consider use in infants with ECHO diagnosis of pulmonary hypertension • Start at 0.5mg/kg tds increase to 2mg/kg 6-8hrly as tolerated. Watch for systemic hypotension
Nitric oxide	• Not indicated	• Nitric oxide at 5–20ppm in infants who are ventilator dependent will improve oxygenation in the short term

<u>Preparing for Discharge and Home Oxygen</u>

- RSV vaccination (see RSV guideline)
- Discharge planning (see algorithm below)

Home Oxygen Chronic Lung Disease of Prematurity
Part I



Home Oxygen Chronic Lung Disease of Prematurity
Part II

How to arrange a discharge planning meeting

Complete pre-meeting checklist:

- Check baby registered with GP to ensure Health Visitor in place ☐
- Simplify medicines if possible ☐
- Choose level of oxygen in which to perform sleep study – this is chosen by max FiO_2 in last week (note minimum deliverable at home 0.1L/min) ☐
- Leave the baby in this amount of set oxygen ☐
- Perform sleep study ☐
- Step down monitoring e.g. time off sat monitoring between feeds ☐
- Check if any social issues ☐

Arrange discharge planning meeting with:

- Dr Seddon (07775800571/ext. 2320 (sec.)
- Health Visitor
- Community Paediatric Nurse
- Social Services if necessary
- Neonatal Consultant
- If patient lives out of area, contact the local team inviting them to the meeting
- Meetings will likely to be on a Tuesday morning 1-2 weeks after request for meeting

- Set date of discharge at discharge planning meeting (Monday – Wednesday if possible)

- Confirm RSV vaccination given pre-discharge. Co-ordinate with monthly CASU vaccination programme wherever possible (see RSV protocol)
- Prepare summary: Include doses of medications/kg and actual dose

Note: There must be NO changes in FiO_2 or medications 7 days before discharge

Follow-Up for patients outside region

- Local CPN team and local follow up
- Baby may be discharged to local unit first but if not, local team must be contacted regarding attending discharge planning meeting.

Follow-up for Brighton & Hove/Mid-Sussex patients

- To attend Dr Seddon's clinic approximately 6-8 wks post discharge (aim to co-ordinate with 2nd RSV vaccination appointment)
- Then review eight weekly