Guideline for the use of nasal continuous positive Airway pressure (CPAP) in the management of bronchiolitis in infants up to age 6 months

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Key Amendments

Date	Amendment	Approved by
19th Nov 2020	Document extended for one year	Paediatric QIM/Dr J West
26th March 2021	Approved with no amendments	Paediatric QIM

Introduction

Bronchiolitis is a common seasonal viral lower respiratory tract infection that predominantly affects infants under 12 months of age. Younger infants are often more severely affected and very young infants (under 6 weeks) may present with apnoea before the classical signs and symptoms of bronchiolitis develop. Typical signs include cough, tachypnoea and increased work of breathing, with hyperinflation and widespread crepitations and wheeze on auscultation.

Most cases of bronchiolitis are minor and self-limiting, but approximately 10% of affected infants require hospital admission. In-hospital interventions that have been shown to help include avoidance of oral feeding and provision of supplementary oxygen. Administration of inhaled β2 agonists, ipratroprium, steroids and adrenaline are all unlikely to be of any benefit. Please also see the Bronchiolitis Trust Guideline for further information WAHT-PAE-089

Nasal CPAP has been shown to be of benefit in moderate and severe cases of bronchiolitis because it helps to restore functional residual capacity and corrects ventilation-perfusion mismatch by recruiting collapsed and poorly ventilated alveoli. Although there are references to its use over 20 years ago, there has been a resurgence in interest because of the ease of administration of CPAP with the infant flow driver. There is increasing but limited evidence that the bubble CPAP system, which is back to basics, is even more effective than the infant flow driver previously used.

Patients Covered

This guideline is for use on The Children's Wards; Riverbank unit at Worcestershire Royal Hospital and Ward One at The Alexandra Hospital Redditch. This guideline applies to infants up to 6 months of age. If a child who was born prematurely requires CPAP and is older than 6 months old, but is small in weight, then it is the nurse in charge who decides if this is suitable and safe practice.

It applies only to patients with moderate/severe bronchiolitis: i.e. showing signs of poor feeding, lethargy, marked respiratory distress, an oxygen requirement of 60% or more to maintain saturations or Clinical exhaustion with retention of carbon dioxide.

All babies must have a capillary or arterial blood gas analysis prior to commencing CPAP.

INFANTS WITH RECURRENT SEVERE APNOEAS OR MARKED RESPIRATORY ACIDOSIS, (pH < 7.25) WILL REQUIRE DISCUSSION WITH KIDS INTENSIVE CARE AND DECISION SUPPORT (KIDS) as intubation and ventilation may be required.

CPAP may also be instituted for recurrent apnoeas alone in infants under 6 weeks of age regardless of oxygen requirements.

Guideline

Equipment

Overall Infant Delivery System Specification

- Fisher – Paykel MR850 Respiratory Humidifier
- Fisher – Paykel MR290 Auto feed Humidification Chamber
- Fisher – Paykel low flow air-oxygen blender
- Fisher – Paykel BC110 Pressure Manifold with option to analyse O2 percentage and PEEP if needed
- Fisher – Paykel BC060 Single Heated Breathing Circuit
- Fisher - Paykel BC100 CPAP Generator with Non sterile water up to fill line
- Short piece of Green Oxygen Tubing
- Water for Irrigation

Patient Interface Product Specification

- Fisher – Paykel Nasal Tubing in two sizes – BC181 70mm Less than 2.5kg and BC182 More than 2.5kg
- Fisher – Paykel Nasal Prongs of which there are 11 sizes - measured by septal and nasal size using caterpillar tool.
- Fisher-Paykel Nasal Masks – they come in small, medium and large.
- Fisher – Paykel Infant Bonnet which is measured by head circumference and the preferred fixation
- Fisher and Paykel Headgear – this can be used if the child has a certain condition i.e. hydrocephalus or needs regular cranial scans

Always try to set up the CPAP machine in advance to allow the machine to heat to 37 degrees Celsius. The baby will then receive instant correct humidification and heat. While the machine is getting to the correct temperature, the baby can be measured for correct prong/mask and bonnet/headgear. Unfortunately in emergency situation this cannot be possible and to attach immediately is acceptable and safe practice in the best interests of the child

Fixation

- Select the appropriate size of nasal prongs/Mask using the nose guide provided
- Select the largest size prongs that will fit comfortably into the nose and connect to the generator. Always document size on HDU.
- Select the appropriate sized bonnet by measuring the head circumference. The size of the bonnet is printed on the front of the bonnet and should sit on the forehead.

Settings

- **The standard Pressure delivered is usually set between 5-8cm H20 for bubble CPAP** These parameters are suggested for safety reasons, although individual cases may need discussion with the consultant on-call, regarding increasing the pressures to avoid/reduce the need for full ventilation.
- Set the CPAP pressure by moving the plastic probe into the water in the generator. There can only be whole numbers set for the CPAP, no half number i.e. 6.5. The probe only goes up in whole numbers by the indentations on the probe.
- **A PEEP of 8cm or more must be discussed with the Consultant on call, who will then needs to physically assess the patient and have a discussion with the nurse in charge**.

Any Child on a PEEP of 8cm H20 or more is classed as very sick. They will have very little reserve and collapse quickly. There needs to be a clear, documented plan of care in the medical notes by the Consultant on call. The KIDS retrieval team also need contacting for advice regarding treatment and possible transfer to a PICU.

- The CPAP generator is the device that creates CPAP with pressure oscillations. This is the container with water where the end expiratory limb is immersed. The number which sits above the line is the CPAP pressure reading. The pressure can be checked by occluding the prongs and seeing the CPAP generator bubbling. Continuous bubbling is necessary to attain the optimum effect of bubble CPAP.
- **Always set the litres of 02 as the same as the CPAP pressure**
- Set the oxygen and air blender to the percentage of Oxygen that the individual patient requires.
- The respiratory humidifier should be automatically set to invasive ventilation mode (which is the top right hand corner button). The other setting is non invasive if you were administering CPAP via face mask or using High flow. By selecting the invasive mode, the machine automatically sets the temperature to 37 degrees Celsius. The temperature on the display is the temperature that the baby is receiving.

Connecting CPAP

- Position bonnet/head gear on the infant's head , ensuring that the ears are in normal position
- Gently insert the prongs into the nostrils to create a seal and deliver required CPAP. The CPAP prongs are anatomically correct and need to be face down. The CPAP generator will start to bubble if the seal is correct and there are no leaks in the circuit. Ensure the prongs are not pressed against the nose.
- Attach the nasal masks in the same way, ensuring there is a seal around the whole of the nose. **There must not be a Naso Gastric Tube insitu.**
- Attach the prongs/Mask to the bonnet by the Velcro strapping. Remove section of foam if needed to keep the tubing parallel with the baby's head. Attach the small white hooks on either side of the blue glider. The blue glider ensures the baby can move freely, without pulling on the nose.

Nursing care

At the start of each shift, and on commencing CPAP, checks and record:

- oxygen requirements
- CPAP pressure
- nasal skin, septum and mucosa for signs of irritation or pressure damage
- most recent blood gas result

***Each hour check and record**:*

- Oxygen requirements
- Oxygen saturation
- Respiratory rate
- Heart rate
- Skin colour
- Degree of chest recession
- Position of nasal prongs
- Condition of the nostrils and nasal septum
- Paediatric Early Warning Score (PEWS)
- Care and Comfort Intentional Rounding
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PEWS recorded hourly will ensure early signs of deterioration are not missed. Extra scoring should be used for oxygen requirement and worrying condition. The medical team should be informed of any change to the child's condition. Please use SBAR as your referring tool for consistency in practice. Children who deteriorate are likely to require further intervention and possible intubation. This is better done in a controlled way electively, than because of a respiratory arrest.

Every 4 hours check and record:

- A full assessment by loosening the generator straps and tubing
- That the nasal skin is clean and dry with no evidence of tissue damage – Suction should also be performed to keep an optimal patent airway. Secretions in the airway will cause the patient to increase their work of breathing. Always wear gloves and an apron when a patient is having suction and use a new catheter each time in accordance with universal precautions to help prevent the spread of infection. These patient will always be cared for in a High Dependency Cubicle.
- A size 8 catheter should be used as the secretions are too thick to be cleared by a smaller bore catheter.
- If the child is unstable or has an oxygen requirement over 40%, then pre-oxygenate before giving suction is required for a short period.
- Be aware that fragile, very sick children may respond to suction, with apnoea's, bradycardia's or destauration's. Therefore, full resuscitation equipment needs to be readily available. In these children it is advisable to have another member of staff present.
- If the secretions are dry, ensure saline nasal drops are prescribed to help loosen dry secretions. Thickening of secretions indicates the need for increased inspired gas/humidity or heat.
- That the prongs and bonnet fit correctly

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