Newborn Critical Care Center (NCCC) Clinical Guidelines

Bubble CPAP Guidelines

INTRODUCTION

Continuous positive airway pressure (CPAP) is a non-invasive technique of administering pressurized heated and humidified air and/or oxygen to the airways of a spontaneously breathing patient. The end expiratory pressure generated during CPAP deters alveolar collapse, increases end-expiratory lung volumes (EELV), and maintains functional residual capacity (FRC). CPAP is a respiratory therapy that is typically utilized in newborns with respiratory distress syndrome and other causes of pulmonary dysfunction that result in decreased FRC. CPAP is also sometimes used to treat apnea of prematurity and to assist in preventing small airway collapse.

EQUIPMENT

Bubble continuous positive airway pressure (BCPAP) is the adopted technique of administering CPAP in the NCCC. Care and maintenance of BCPAP, including ensuring appropriate bubbling, is the interdisciplinary responsibility of nursing, respiratory therapy and physicians. The components of the BCPAP system include:

- A heated and humidified gas source with flow rates between 8-10 L/min
- A nasal interface (nasal prongs or mask and FlexiTrunk™ interface) that connects the patient to the CPAP circuit and pressure generator
- An expiratory limb of corrugated respiratory tubing submerged into a bottle of 0.25% acetic acid
- A water seal canister in which the expiratory limb of the circuit is immersed to a depth in centimeters that equals the desired CPAP pressure (e.g.,1 cm of depth produces 1 cm of H_2O pressure)
- BCPAP is typically maintained between 5-8 cm of H_2O pressure

INITIATING BCPAP

1. All infants born < 30 weeks (i.e. infants 22 through 29 6/7 weeks) should be automatically placed on CPAP at ≥ 5 cm H_2O starting in the delivery room or as soon as possible.

   (**Note**: ELBW guideline recommends starting at +6 for ELBW infants.)

   a. Do not wean CPAP pressure below 5 cm H_2O or interrupt CPAP within the first 24 hours of therapy.

2. Infants < 34 weeks CGA who require noninvasive respiratory support should be started on CPAP at ≥ 5 cm H_2O.

WEANING FROM BCPAP

The first trial off of CPAP for infants with RDS born at <30 weeks GA (with a postmenstrual age of <34 weeks) should occur when the following clinical criteria are met:

1. Currently on bCPAP at 5 cm H_2O with FiO2 0.21 for at least 48 hours.
2. A respiratory rate not greater than 60 bpm for more than two hours.
3. Absence of significant retractions on physical exam.
4. Less than or equal to 2 apneas with bradycardia or desaturations in the past 24 hours, all of which must be self-limiting.
5. Maintains oxygen saturations ≥ 90%.
6. Not currently being treated for PDA or sepsis.
7. Tolerates at least 15 minutes off CPAP during care times.

Once all of these criteria are met, infants should be weaned off of CPAP to room air. The use of nasal cannula (either low flow or high flow) should not be used as a first line weaning device in this situation.

An infant will be deemed unsuccessful during a wean trial off positive pressure if any of the following criteria are met:

1. Respiratory rate greater than 60 bpm for more than 2 hours.
2. Marked retractions on exam.
3. More than 2 apnea events with bradycardia or desaturation in a 24 hour period OR any event requiring positive pressure ventilation (PPV).
4. Failure to maintain oxygen saturations above 90%.

If an infant is unsuccessful based on any of the above criteria, the infant should be placed back on bCPAP. The infant should have another trial after a period of 1 week has elapsed AND all stability criteria are met.

OTHER BCPAP CONSIDERATIONS

1. CPAP device (Argyle™ nasal prongs or face mask) should be taken to all deliveries of infants < 30 weeks to provide positive pressure via Neopuff.
2. Ensure appropriate oxygen is administered to achieve target oxygen saturation ranges.
3. No interruption of CPAP should occur in the first 24 hours of life.
4. If infant with RDS exceeds CPAP 6 cm H_2O and Fi02 > 0.3, surfactant should be considered (in and out).
5. A protective barrier dressing should be applied routinely to all babies on CPAP. There should be a small space maintained between the columella (bottom portion of nasal septum) and the prongs.
    - Any patient <1000g will use the thin Duoderm® *and* Mepilex®
    - Any patient >1000g will use *either* thin Duoderm® *or* Mepilex®

6. Routine suctioning should NOT be performed if there is appropriate bubbling when auscultating the baby's chest, as the aim is to avoid trauma and nasal swelling which can result in upper airway obstruction.
7. To help reduce the risk of pressure injury, RT may alternate approximately every six hours between mask and prongs.
8. Routinely monitor for any signs of skin breakdown, including discoloration, scabbing, or indentations, particularly at the nasal septum. If any signs are noted, a plan of care should be made with nurse, respiratory therapist and medical team to determine extent of injury, as well as potential need for wound care and/or plastic surgery consult. Consider increasing frequency of alternating mask and nasal prongs to every three hours if signs of skin breakdown are present.

INDICATIONS FOR HIGH-FLOW NASAL CANNULA (HFNC)

Consider a transition from bCPAP to high-flow nasal cannula when it will benefit the developmental status of the infant. To be considered for this transition, the infant must be on bCPAP 5 cm H_2O and FiO2 ≤ 0.30 and either of the following:

1. Greater than or equal to 34 weeks corrected gestational age AND feeding cues

OR

2. Greater than 35 weeks corrected gestational age without signs of feeding cues

The RT will transition infants who meet these criteria to 4 L/min on high-flow nasal cannula. The respiratory therapist will wean the infant by 1 L/min of flow no faster than every 12 hours as long as they continue to have a normal work of breathing and FiO2 ≤ 0.30. Once the infant reaches 2 L/min, the infant may start working on feeds PO.