

Respiratory Therapy - Unit Practice Manual
John Dempsey Hospital - Department of Nursing
The University of Connecticut Health Center

PROCEDURE FOR: Infant Flow SiPAP - Nasal Bi-Level Continuous Positive Airway Pressure

OBJECTIVE: Nasal bi-level ventilation (Infant Flow-SiPAP) is a non-invasive ventilation mode used for the treatment of respiratory distress. This non-invasive approach is a strategy that assists infants who are spontaneously breathing yet require some respiratory assistance. It can be utilized prior to mechanical ventilatory support or as a transition from mechanical ventilatory support to NCPAP. Delivery of the blended gas is through a face mask or nasal prongs. Infant Flow-SiPAP provides two continuous positive airway pressure levels (high and low CPAP) for the spontaneously breathing infant. The pressure cycles from low CPAP pressure to high CPAP pressure simulating periodic sighs (sigh cycle) and occurs at a rate specified by the clinician. The duration time (T_i) is the time the infant is kept at the higher pressure.

RATIONALE: The sign cycle retains recruitment of the end expiratory units, stimulates surfactant release, off-loads some of the respiratory work and stimulates the respiratory center drive. The difference between the two pressure levels (P) released by the ventilator produces two different functional residual capacities. This alteration induces a small tidal volume facilitating ventilation.

PERSONNEL: Respiratory Therapist

EQUIPMENT: Infant Flow-SiPAP

- INDICATIONS:**
1. Infant Flow-SiPAP is responsive to clinical conditions listed below:
 - a. Atelectasis
 - b. Apnea of prematurity
 - c. Recent extubation
 - d. Chronic lung disease
 - e. Respiratory Distress Syndrome
 2. Infant Flow Infant Flow-SiPAP can decrease work of breathing as indicated by a decrease in respiratory rate and a decrease in the severity of retractions, nasal flaring and grunting.
 3. To achieve arterial or capillary blood gas values; the ability to maintain a $PaO_2 > 50$ torr with FiO_2 of $< .60$ while maintaining an adequate minute ventilation indicated by a $PaCO_2$ of 45-60 torr and a $pH > 7.2$.
 4. Improvement in appearance of lung as indicated by chest radiograph.
 5. Failure of NCPAP.
 6. Decrease need for intubation or reintubation.

PROCEDURE: Infant Flow-SiPAP is initiated at a low pressure level of 5-6cm H_2O and a high pressure 2-3 cm H_2O greater than the lower pressure level not to exceed 9cm H_2O . The T_i is initially set to 1.0 sec. The respiratory rate is initially set to 10 breaths/min.

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Variable Flow Generator (Infant Flow-SiPAP System):

Variable flow employs a flowing gas source. When the gas flow rate is altered the delivered pressure will change. The generator utilizes the fluidic flip mechanism which causes the direction of the gas on inspiration to be directed through the prongs and upon exhalation the gas is directed away from the prongs into the expiratory limb reducing the work of breathing.

Infant Flow-SiPAP Interface:

1. Selection of the appropriate prong/mask and bonnet should provide an adequate seal with minimal air leakage.
2. The prong size is determined by choosing one of three size prongs (small, medium or large). The mask sizes are extra small, extra large and double extra large. When the prongs are inserted inside the nares the seal is snug without blanching of the skin. There should be some space between the prong set and the infant's nose.
3. Correct bonnet size is attained through measurement of the head or weight of the infant dependent upon manufacturer's recommendation. Measurement of the head begins at the nape of the neck, across the middle of the ear and across the top of the eyebrow. The edge of the bonnet is to be placed at the eyebrow line extending over the entire skull to the nape of the neck. The ears are to be covered and lying flat.

Infant Flow-SiPAP Set-Up:

1. Attach Infant flow-SiPAP to air and oxygen sources.
2. Attach circuit to humidifier outlet and to infant flow generator.
3. The infant flow circuit and generator is threaded through the side ports of the isolette to minimize torque and pulling of the generator.
4. Insert Concha Column into humidifier and connect to the water bottle. Adjust temperature setting to maintain 35 degrees centigrade. Ensure that the infant flow is turned on before turning on the humidifier.
5. Size the infant for the appropriate prongs and bonnet.
6. Attach prongs/mask to generator.
7. Switch on the power.

Calibration and Leak Test

1. Enter oxygen calibration screen by pressing the calibration button on lower right hand corner of touch screen.
2. Turn NCPAP/Pres Low flow meter to 8 L/min.

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3. Adjust the O₂ control knob to 21% and allow the %O₂ reading to stabilize.
4. Confirm 21% calibration by touching the associated flashing "?" icon.
5. Turn the knob to 100% and allow the reading to stabilize. Confirm by touching the associated flashing "?" icon.
6. Return to the Start up screen by pressing the Exit button.
7. Occlude nasal prongs, set NCPAP/Pres low flow meter to 8 L/min and verify that the measured pressure is 5 ± 1 cm H₂O.

Initial Set-Up:

1. Set NCPAP to desired level using the NCPAP/Pres Low flow meter and occluding nasal prongs. Press "?" under NCPAP screen icon to confirm.
2. Set FIO₂ to desired level and press "?" under %O₂ screen icon.
3. Set High CPAP pressure to desired level for Biphasic mode using the Pres High flow meter.
 - a. To set the desired pressure adjust Pres High flow meter to desired level and verify measured PIP is accurate. Press the "?" under Pres. High.
 - b. Set Pres High flow meter to zero in NCPAP mode.
4. Press the "?" icon under the patient transducer interface (this feature is not approved for use by the FDA).
5. Touch the NCPAP button or the Alarm/mute/reset button for 3 seconds to set alarms and begin monitoring. If either button is not touched within 2 minutes the alarms will be set automatically.
6. Select the mode NCPAP or BiPhasic. Select flashing mode to confirm.
7. To adjust the Ti or rate control in the BiPhasic mode:
 - a. Select by touching the Ti or rate button.
 - b. Adjustments are made with increase or decrease arrows.
 - c. To accept change, press the flashing Ti or rate control button again.
 - d. Set alarms by pressing the "Alarm" button and holding for 3 seconds.
8. Turn on humidifier and set to 35 degrees Centigrade.
9. Place bonnet on infant's head as described above.

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10. Gently insert the nasal prongs/mask into position while supporting the generator.
11. Velcro/tie the 2 clear tubings to the bonnet.
12. Extend exhalation tubing to outside of isolette. The exhalation tubing should **not** be attached to bonnet.
13. Adjust tie-down straps/Velcro to secure bonnet.
 - a. The neck of the infant should be in neutral position.
 - b. The nose of infant should be in normal position and not pushed upwards.
14. The screen automatically locks if changes are not made for 120 seconds. Press the unlock button to make changes in the controls.
15. Complete and document full patient assessment on respiratory flow sheet.

- MANAGEMENT:**
1. Low CPAP pressure level is selected upon standard clinical indicators for CPAP requirement; 5-6cm H₂O.
 2. The high CPAP pressure is to be set at 2-3cm H₂O above the low CPAP pressure.
 3. The maximum total pressure (PIP) not to exceed 9cm H₂O.
 4. Adjust the low CPAP pressure or high CPAP pressure (PIP) by occluding the prongs and turning the respective flow meters. **Do not adjust flow meters while the prongs are inserted in the nares of the infant.**
 5. The duration of the SiPAP cycle (Ti) is adjusted to maintain or improve oxygenation independent of the clinically set inspired oxygen. The maximum duration of the SiPAP cycle is 3 seconds.
 6. The duration time (Ti) is to improve lung recruitment and oxygenation. The Ti is to be set at 1.0 sec.
 7. The frequency of the sigh is set 10-20 breaths/min. It is adjusted to control either oxygenation or carbon dioxide levels. The more frequent cycle may recruit marginal alveoli and off-load respiratory work. Consider intubation when a rate > 20 is needed.
 8. Weaning fro SiPAP to NCPAP:
 - a. Wean High CPAP pressure after 24-48 hours by 0.5 - 1cm H₂O to minimum of 7cm H₂O.
 - b. Once High CPAP pressure is at 7cm H₂O, wean rate by 2 and maintain for 24 hours.
 - c. Then continue to wean rate by 2 every 24 hours to a minimum rate of 4.

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d. Wean to NCPAP when pressures are 7/5cm H₂O, rate is 4 and
Inspiratory Time is 1 second.

9. Examples of Nasal CPAP or SiPAP written by the advanced practitioner and physician is as follows:

SiPAP

Low CPAP pressure = 5

High CPAP pressure = 7

Ti = 1.0

Rate = 10

FiO₂ = Maintain SpO₂ according to guidelines

Nasal CPAP

Low CPAP pressure = 5

FiO₂ = Maintain SpO₂ according to guidelines

**POTENTIAL
COMPLICATIONS:**

1. Abdominal distention secondary to flow delivered to the stomach.
2. Nasal erosion may result from the prongs or mask.
3. Blockage of prongs secondary to secretions can result in impaired ventilation or oxygenation.
4. Air leak.

BENEFITS:

1. Avoidance of endotracheal placement and a reduction in the duration of endotracheal intubation.
2. Reduction in need for reintubation following extubation.
3. Reduction in apnea frequency following extubation.

APPROVAL:

EFFECTIVE DATE: 8/30/07

REVISION DATES: