**POLICY**

Non-invasive ventilation (NIV) is a ventilation methodology where respiratory support is achieved without the use of an artificial airway such as an endotracheal tube or tracheostomy tube. NIV is initiated by the NICU Registered Respiratory Therapist (RRT) in collaboration with the medical team. It is the responsibility of the RRT to select the most appropriate patient/ventilator interface to facilitate this mode of ventilation.

Non-invasive ventilation on the Draeger VN500 ventilator can be administered by choosing its NIV mode.

Indications/Contraindications for Non-Invasive Respiratory Support see *CPAP Management for RDS Guideline* and *Non Invasive Ventilation Support Decision and Care Management Bedside Tool*.

**PURPOSE**

To provide NIV to patients who require respiratory support when invasive ventilation is not medically indicated.

**APPLICABILITY**

Neonatal Intensive Care Unit (NICU), Neonatal Program

**ROLES & COMPETENCIES**

Registered Respiratory Therapist (RRT)

RRTs are qualified in all aspects of NIV as outlined in the Respiratory Therapy National Competency Profile.

NIV care includes but is not limited to:
1. Selection of appropriate equipment
2. Initiation of NIV
3. Ongoing monitoring of patient and equipment
4. Escalation of care
5. Trouble shooting
6. Weaning of NIV
7. Discontinuation of NIV

**PROCEDURE**

Equipment Required:
- VN500 ventilator with Fisher & Paykel (F&P) humidifier
- F&P dual heated infant ventilator circuit
- Temperature probe
- 1000 mL bag of sterile water
- Nasal tubing interface
- Appropriate size patient/ventilator interface(s)
- Appropriate size bonnet/head gear
- Or appropriate size RAM-Cannula
- Tender grip cannula fixation device to secure RAM-cannula if indicated.
<table>
<thead>
<tr>
<th><strong>PROCEDURE</strong></th>
<th><strong>Respiratory Therapist:</strong></th>
<th><strong>Notes</strong></th>
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<tbody>
<tr>
<td>1.</td>
<td>Gather equipment.</td>
<td>See equipment list above</td>
</tr>
<tr>
<td>2.</td>
<td>Remove the patient wye and flow sensor from the ventilator circuit</td>
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<tr>
<td>3.</td>
<td>Attach one end of the nasal tubing interface to the inspiratory limb and the other end of the interface to the expiratory limb of the ventilator circuit</td>
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</table>
| 4. | Select NIV application mode on VN500 ventilator by:  
- Selecting Start/Standby  
- Selecting Tube/NIV tab  
- Selecting NIV and confirm with rotary knob |  
- Orange display window indicates NIV mode  
- Flow sensor monitoring is deactivated |
| 5. | Set flow max at 30 L/min; this flow is variable and will increase or decrease to maintain the set NIV pressure(s). |  
- This ensures adequate leak compensation in NIV  
- In the presence of a large leak or patient disconnect the delivered flow will be reduced until after the patient has been reconnected or the leak has been resolved. |
| 6. | Select either nasal continuous positive pressure (N-CPAP) or non-invasive positive pressure ventilation (NIPPV). On the VN500 NIPPV is called pressure control continuous mandatory ventilation (PC-CMV mode) combining NIPPV breaths with N-CPAP |  
- NIPPV may prevent post extubation failures, minimize ventilated days and potentially decrease onset of bronchopulmonary dyspasia (BPD)  
- If PC-CMV mode is selected, determine dual CPAP (slower RR and longer Ti) or NIPPV (higher RR and shorter Ti)  
** Decision to choose PC-CMV will be made in collaboration with the medical staff based upon the patient’s physiological disease process.  
Select initial parameters (see initial parameters below) |
## NON-INVASIVE VENTILATION ON THE VN500 VENTILATOR

| Insert prongs/mask into the nasal tubing interface | ▪ The prongs SHOULD NOT be flush with the nasal septum and not rest further than the nasal vestibule. They should sit approximately ½ way into the nares to prevent pressure injuries to the nasal septum.  
▪ Use of a nasal prong CPAP seal, i.e. NeoSeal, may be necessary.  
▪ If the prongs are inserted too deep they may occlude against the walls of the nasal cavity.  
▪ Prongs/mask should fit into the nasal tubing interface securely. If fit is too loose, prongs/mask may slip out or deliver insufficient pressure |
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<tr>
<td>11. Attach the straps of the bonnet/head gear to the interface and secure nasal tubing interface in the Velcro strap at the front of the bonnet/head gear</td>
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<tr>
<td>12. Start NIV</td>
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</table>
| 13. Place the prongs/mask on the patient’s nose. | ▪ Gently tighten the straps and attach them to the back of the bonnet/head gear using the Velcro ends of the straps.  
▪ Ensure a good seal is established and that the patient fit/placement is appropriate. |
| 14. Settle and reposition patient and ensure orogastric tube is in-situ. | ▪ Orogastric tubes are preferred as they do not occupy a nare and interfere with the nasal tubing interface and NIV application.  
▪ Prone positioning may work best for patients newly receiving NIV as it may help splint the chest wall and decrease respiratory distress. |
| 15. Ensure alarms are appropriately set | 15. Ensure alarms are appropriately set |
| 16. Monitor Q3H for maintenance and routine care | ▪ Regular monitoring of the patient’s respiratory status, gastric distension, and comfort is essential to patient care. |
| 17. Observe positioning of nasal tubing interface and inspect nares | ▪ See Guidelines for Maintaining Non-Invasive Ventilation (NIV) |
| 18. Suction PRN | ▪ Suction nares and oropharynx as required; lack of humidification due to high flows may cause blockage of prongs/nares with secretions hindering NIV. |
| 19. Changing between or trialling off any non-invasive respiratory support should be done in consultation with the inter-professional team. A physician order MUST be obtained. | ▪ When trialling off NIV, equipment may be kept at the patient bedside for up to 6 hours to facilitate re-initiation of the therapy if required. |
| 20. RAM Cannula should be considered if patient requires:  
1. NIPPV  
2. Nasal breakdown is present  
3. Unable to deliver NIPPV with interface/bonnet | ▪ Cannula sizes:  
| Preemie | < 1000g  
Infant | 1000g-2500g  
Newborn | >2500g |
NON-INVASIVE VENTILATION ON THE VN500 VENTILATOR

- Remove flow sensor from ventilator circuit.
- Attach appropriate size RAM Cannula to end of F&P ventilator circuit at wye.
- Secure RAM cannula to patients’ skin using tender grip cannula fixation device

Follow steps 5 -19

<table>
<thead>
<tr>
<th>Initial Parameters for PC-CMV Dual CPAP</th>
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<tbody>
<tr>
<td>Respiratory Rate (RR)</td>
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<td>Inspiratory time (Ti)</td>
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<tr>
<td>Low CPAP</td>
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<tr>
<td>High CPAP</td>
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<tr>
<td>Slope</td>
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<td>FiO2</td>
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<table>
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<tr>
<th>Initial Parameters for PC-CMV NIPPV</th>
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</table>
* Look at what the ventilation settings were before the baby was extubated
| Respiratory Rate (RR)               | 30 - 50 bpm (consider matching the baby’s own spontaneous efforts) |
| Inspiratory Time (Ti)               | 0.3 - 0.5 seconds (based on patient size and ensure set PIP is achieved) |
| PEEP                                 | 5 - 8 cmH2O (may need to go higher, max PEEP 10 cmH2O) |
| Peak Inspiratory Pressure (PIP)     | < 20 cmH2O (A decision to go higher will require discussion with the physician) |
| Slope                                | 0 – 0.10 (set based on patient comfort and ensure set PIP is achieved) |
| FiO2                                 | to maintain SpO2 goals           |

**Weaning PC-CMV Dual CPAP and NIPPV:**

*See Non-Invasive Ventilation Support Decision and Care Management Bedside Tool for weaning NIV*

Criteria:
- GREEN status
- Medical decision to wean

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<tr>
<th>PC-CMV Dual CPAP</th>
<th>NIPPV</th>
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<tr>
<td>wean PC-CMV PIP by 1-2 cmH2O first and maintain rate</td>
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<td>When PC-CMV PIP is 1-2 cmH2O above PEEP consider switching to N-CPAP</td>
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</tr>
<tr>
<td>Wean CPAP level to 5-6 cmH2O before discontinuation of CPAP</td>
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Refer to online version – Print copy may not be current – Discard after use
DOCUMENTATION

RRT
Document the ventilator settings, alarms, and humidifier temperature Q3H on the respiratory flow sheet. Document minimum q shift the patient’s status as Green-Yellow-Red based upon the respiratory assessment (Non-Invasive Respiratory Support Guidelines) on the respiratory flow sheet.

RN
Document the ventilator settings, and humidifier temperature Q1H on the nursing flow sheet

REFERENCES


