HEALTH HOLDING

HAFER ALBATIN HEALTH CLUSTER
MATERNITY AND CHILDREN HOSPITAL

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| **Department:** | Respiratory Care Services | | |
| **Document:** | Multidisciplinary Policy and Procedure | | |
| **Title:** | Non — Invasive Ventilation in NICU and PICU | | |
| **Applies To:** | Respiratory Therap Staff, Physicians in NICU & PICU | | |
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## 1. PURPOSE:

1.1 This policy explains the management and use of Nasal Continuous Positive Airway Pressure (N-CPAP) and Noninvasive (NV) ventilation.

## 2. DEFINITONS:

2.1 Non-Invasive Ventilation - A mechanical ventilation performed without intubation or tracheostomy, usually with mask ventilation

## 3. POLICY:

3.1 Non-invasive ventilation indication includes:
- 3.1.1 Respiratory Distress:
  - 3.1.1.1 Increased respiratory rate (RR). Greater than 30% of normal.
  - 3.1.1.2 Retractions (substernal, suprasternal)
  - 3.1.1.3 Grunting
  - 3.1.1.4 Nasal flaring
  - 3.1.1.5 Pale or cyanotic skin color
  - 3.1.1.6 Agitation
- 3.1.2 Inadequate Arterial Blood Gases (ABGs):
  - 3.1.2.1 Inability to maintain partial pressure of oxygen in arteries (Pa02) greater than 50 mmHg with a fraction of inspired oxygen (Fi02) less than or equal to 30% (assumes adequate minute ventilation).
- 3.1.3 Deteriorating Chest Radiograph (CXR)
  - 31.3.1 Presence of poorly expanded and/or infiltrated lung fields.
- 3.1.4 Specific Times:
  - 3.1.4.1 Respiratory Distress Syndrome (RDS)
  - 3.1.4.2 Pulmonary Edema
  - 3.1.4.3 Atelectasis
  - 3.1.4.4 Apnea of Prematurity
  - 3.1.4.5 Recent Extubation
  - 3.1.4.6 Tracheal Malacia
- 3.1.5 Early Intervention
  - 3.1.5.1 With surfactant administration for very low birth weight (VLBW) infants.
  - 3.1.5.2 Immediately after delivery in preterm infants.
- 3.1.6 Weaning
  - 3.1.6.1 Commonly used to wean from invasive ventilation to a non-invasive continuous positive airway pressure (CPAP).
- 3.1.7 Difference Between Cardiac and Pulmonary Cyanosis
  - 3.1.7.1 Pulmonary:
    - 3.1.7.1.1 Pa02: increase by greater than 20 mmHg

3.1.7.1.2 The partial pressure of carbon dioxide in the arteries (PaC02): decreased or no change.

3.1.7.2 Persistent Pulmonary Hypertension (PPI-IN) or Congenital Heart Defects (CHD):

3.1.7.2.1 The partial pressure of carbon dioxide in the arteries (PaC02): decreased or no change.

3.1.7.2.2 PaC02: increased

3.2 Non-invasive ventilation is contraindicated for:

3.2.1 Absolute:

3.2.1.1 Diaphragmatichernia

3.2.2 Disease States (use with caution):

3.2.2.1 Cardio vascular instability

3.2.2.2 Choanal atresia

3.2.2.3 Cleft palate

3.2.2.4 inadequate respiratory drive

3.2.2.5 Tracheoesophageal (TE) fistula / Esophageal atresia

3.2.3 Progressive Respiratory Failure:

3.2.3.1 Increasing apnea (frequency, duration)

3.2.3.2 Increasing Fi02 greater than 60-700/0

3.2.3.3 Increasing work of breathing (WOB) (e.9. retractions, tachypnea, exhaustion, decreased RR, gasping)

3.2.3.4 Worsening ABCs

3.3 Hazards associated to non-invasive ventilation must be observed including:

3.3.1 Abdominal distention (may worsen with increased CPAP levels): Place naso or orogastric tube.

3.3.2 Existing cardiovascular impairment (may worsen with increased CPAP levels).

3.3.3 Carbon dioxide (C02) retention.

3.3.4 Over distention and decreased compliance (CL) (may worsen with increased CPAP levels).

3.3.5 Increase risk of air leaks.

3.3.6 May increase pulmonary vascular resistance (PVR).

3.3.7 Increase intracranial pressure (ICP).

3.4 Types of Nasal CPAP Devices:

3.4.1 Continuous Flow: delivers a relatively variable pressure; CPAP delivered may be inconsistent (e.9., Bubble CPAP).

3.4.2 Variable Flow: delivers a fairly stable pressure by altering flow (delivers more flow during inspiration, less flow during exhalation (e.g. Infant Flow SiPAP).

3.5 Clinical note: Some physicians utilize a High Flow Nasal Cannula (HFNC) for its inadvertent PEEP (higher flows may cause expiratory resistance). It is essential to understand the potential expiratory resistance that can occur. An HFNC is not a CPAP device and does not because of expiratory resistance when flows are set correctly, CPAP devices should be used when CPAP is required.

## 4. PROCEDURE:

4.1 Verify the physician's order for correctness and completeness. The physician's order should include:

4.1.1 Mode

4.1.2 Fi02

4.1.3 CPAP, positive end expiratory pressure (PEEP) level

4.1.4 Inspiratory pressure level.

4.1.5 Acceptable blood gas ranges.

4.1.6 Note: Refer to Appendix A for further NIV details.

4.2 Gather necessary equipment and supplies; ensuring calibration if applicable.

4.2.1 NIV System. The following devices can be used for NIV:

4.2.1.1 Drager VN500 ventilator

4.2.1.2 Acutronic Fabian Ventilator

4.2.1.3 Bubble CPAP

4.2.1.4 Newport E-360
4.2.1.5 Servo— I Maquet

4.2.1 NIV interface (e.g. nasal prongs, nasal mask).

4.2.1.1 NIV interface (e.g. nasal prongs, nasal mask).

4.2.1.1.1 RAM Cannula:

4.2.1.1.1.1 Can provide non-invasive ventilation

4.2.1.1.1.2 Prongs take up 60-80% of nares and does not require a tight seal.

4.2.1.1.1.3 When used as CPAP (no expiratory limb) has a high resistance to flow (delivered CPAP is approximately 2-3 cmH20 less than the set value).

4.2.1.1.1.4 Pressure manometer (if needed)

4.2.1.1.1.5 Sterile water (for chamber), if needed

4.2.1.1.1.6 Temperature probe

4.3 Ensure presence and continued relevance of current care plan

4.4 Follow relevant infection control activities (e.9. hand washing, glove, gown, mask, etc.)

4.5 Check two patient's identifiers:

4.5.1 Four names for Saudi/ complete name for the Non - Saudi.

4.5.2 Medical Record Number

4.6 Explain purpose and goals of intended activities to the patient/guardian; provide patient family education as required

4.7 Assemble necessary equipment and supplies, ensuring proper operation as per manufacturer's instructions

4.8 Perform procedure, monitoring and coaching as required

4.8.1 Perform the patient's skin inspection and prepping, with the attending nurse, as per Safeguarding Patient Skin Integrity

4.8.2 Obtain pre-procedure (baseline) vital signs (e.9. HR, RR, breath sounds, oxygen saturation measured by pulse oximeter [SpOz]).

4.8.3 Obtain arterial/capillary blood gas (per physician's order)

4.8.4 Input initial settings per physician order.

4.8.5 Connect interface to patient.

4.8.6 Ensure the interface is stable, secure and not pulling upward on the nose.

4.8.7 Check for deformation or irritation to the nose or surrounding tissue

4.8.8 Inspect the fixation device and straps for proper tension and adjust as needed to maintain a proper fit.

4.8.9 Secure interface device. Check for air leaks, adjust nasal prongs as needed.

4.8.10 Monitor patient's toleration.

4.8.11 Adjust Fi02to keep Sp02 between (90% - 95%) for full and (88% - 920/0) for pre-term patients. (Or per specific physician orders)

4.9 Make pertinent observations and measurements.

4.9.1 Abdominal distention

4.9.2 Skin color and integrity

4.9.3 ABGs or capillary blood gases (CBGs) with Sp02.

4.9.4 CXR

4.9.5 Vital signs (HR, RR, BP, temperature).

4.9.6 WOB (RR, pattern, grunting, retractions).

4.9.7 Ensure proper interface

4.9.8 Proper sizing of interface

4.8.9 Pressure levels

4.8.10 Gas temperature

410 Assess the impact of care treatment in achieving the desired outcomes.

4.10.1 Increased Pa02 (Sp02).

4.10.2 RR towards normal.

4.10.3 Decreased WOB.

4.10.4 CXR: improved aeration

4.11 Record observations and assessments as required and appropriate
- 4.11.1 Set parameters (e.9. mode, CPAP/PEEP, Flow rate, pressure, and inspiratory time).
- 4.11.2 Measured parameters (e.9. RR, CPAP/PEEP, peak inspiratory pressure, tidal volume, and gas temperature)
- 4.11.3 Interface
- 4.11.4 Vital signs (e.g. sp02, HR, RR).
- 4.11.5 Alarm settings (if applicable).

4.12 Ensure appropriate communication with other health care workers, if indicated (e.g. adverse reactions).

4.13 Clean, store, and discard any consumables and/or equipment as appropriate.

## 5. MATERIALS AND EQUIPMENT:

5.1 N/A

## 6. RESPONSIBILITIES:

6.1 Physicians in NICU & PICU

6.2 Respiratory Therapist

## 7. APPENDICES:

N/A

## 8. REFERENCES:


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8.3 King Abdullah bin Abdulaziz University Hospital, 2018.

## 9. APPROVALS:

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