1. INTRODUCTION

1.1. Prince Sultan Military Medical City is a Tertiary level Hospital, and the hospitalized patients receive both critical as well as non-critical type of care. Non-Invasive ventilation is provided as a rescue to the patients either preventing them from being intubated and being mechanically ventilated or following the extubation preventing them from re-intubation. This document will facilitate the effective communication among healthcare workers and ensure the optimal care of the patient is rendered.

2. PURPOSE

2.1. The application of positive pressure to facilitate ventilation without using invasive artificial airways and this incorporates using two adjusted levels of pressures, the IPAP (Inspiratory Positive Airway Pressure) and EPAP (Expiratory Positive Airway Pressure).

2.2. To decrease complications associated with Invasive mechanical ventilation and provide an alternative to treating respiratory failure.

2.3. Application of the BiPAP (Bi Level Positive Airway Pressure) system shall be performed and monitored by staff who have completed in services on its use.

2.4. Non Invasive positive pressure ventilation is intended to assist as following:

2.4.1. To decrease work of breathing.
2.4.2. To prevent intubation.
2.4.3. Post Extubation, to eliminate chances of re-intubation.

2.5. The physicians authorized to order CPAP or BiPAP are from those belonging to Intensive Care Services, Pulmonology and Emergency Department

3. APPLICABILITY

All ICS staff and Pulmonary Physician staff.

4. RESPONSIBILITIES

4.1. **All sections of this policy applies to ICS Staff and Pulmonary Physicians (Fellow and above).**

5. POLICY

5.1. Order must be initiated by the authorized physician.

5.2. It is the responsibility of RCP to set up, initiate, adjust, monitor and evaluate the effectiveness of NIV systems as indicated and per written physician order.

5.3. A Physician's order for NIV must include:

5.3.1. Indication for NIV.
5.3.2. Mode of NIV.
5.3.3. IPAP Level.
5.3.4. EPAP Level.
5.3.5. O_2 Saturation goal (acceptable range).
5.3.6. Set FiO_2 range.
5.3.7. Duration.

5.4. Procedure must be explained to the patient (by the physician and Respiratory Care Practitioner).

5.5. During initial application of NIV the patient's response must be assessed.

5.6. The RCP must inform the nursing staff of all changes made in the system.

5.7. BiPAP must be used on adult patients (> 13 years old).

5.8. BiPAP settings are manipulated based on the patient's physiologic response.

5.9. The use of ventilators (Evita XL and Carina) as NIV are applicable in the ICS department.

5.10. A ventilator check must be performed 3 hourly in the Critical Care and 4 hourly for the Non-Critical Care patient's appropriate to patient's condition.

5.11. The NIV circuit must be changed when visibly soiled with secretions.

5.12. If NIV needs to be removed, the bedside nurse must communicate with assigned RCP prior to device removal and re-application.

6. DEFINITION OF TERMS

6.1. **RCP:** Respiratory Care Practitioner

6.2. **NIV:** Non-Invasive Ventilation

6.3. **IPAP:** Inspiratory Positive Airway Pressure.

6.3.1. The pressure level that is maintained during the inspiratory phase of the S, S/T or T modes.

6.4. **EPAP:** Expiratory Positive Airway Pressure.

6.4.1. The pressure level that is maintained during the expiratory phase of the S/T or T modes.

6.5. **CPAP:** Continuous Positive Airway Pressure.

6.5.1. Maintains a constant level of pressure throughout the patient's respiratory cycle during spontaneous breathing .

6.6. **Ti:** Inspiratory Time.

6.7. **Nasal Mask:** The nasal mask should fit from the superior bridge of the nose to just below the nares above the upper lip.

6.8. **Full Mask:** A mask covering the nose and mouth. The facemask should cover the nose and the mouth and extend from the superior bridge of the nose to beneath the lower lip.

6.9. **Total Mask:** A mask covering the forehead, nose and mouth.

6.10. **Estimated Leak Flow Rate:**

6.10.1. This continuous flow level is referred to as the Estimated Leak flow Rate.

6.11. **Estimated Patient Flow Rate:**

6.11.1. The total Flow Rate is measured and the Estimated Leak Flow Rate is determined.

6.11.2. The balance of the flow is due to the instantaneous changes that occur during patient inspiration/expiration, and is referred as Estimated Patient Flow Rate.

6.12. **Auto-Trigger:** Movement to the IPAP level in the S or S/T modes that was not caused by patient effort or the BPM control.

6.13. **Instantaneous Flow:** Changes in the flow rate through the patient circuit due to inspiration and expiration.

6.14. **%IPAP:** The percent of the respiratory cycle (the duration of which is set by the BPM control) where the unit remains at the IPAP level in the Timed mode.

6.15. **Vte:** Expiratory Tidal Volume.

6.16. **A&E:** Accident & Emergency .

6.17. **ICU:** Intensive Care Unit .

6.18. **OR:** Operating Room.

6.19. **NIPPV:** Non Invasive Positive Pressure Ventilation.

6.20. **ICS:** Intensive Care Services.

6.21. **NRM:** Non Rebreathing Mask.

6.22. **NIV:** Non Invasive Ventilation.

7. PROCEDURES

7.1. The authorized physician should give the written order for initiating NIV therapy.

7.2. Initial application of the BiPAP system:

7.2.1 The physician and/or RCP shall explain the use of the BiPAP system to the associated health care staff.

7.2.2. The physician and/or RCP shall explain the procedure to the patient, prior starting.

7.2.3. The patient should be cooperative and able to understand and follow basic instructions.

7.3. RCP verifies physician order and obtains clarification if needed regarding:

7.3.1. Mode of NIV.
7.3.2. IPAP Level.
7.3.3. EPAP Level.
7.3.4. O_2 saturation goal.
7.3.5. FiO_2 setting (Range).
7.3.6. Duration: The time frame (e.g. from 20:00 Hrs to 04:00 Hrs).

7.4. Identify patient as per the hospital approved 'Hospital Identification Guidelines'.

7.5. Review patient's medical history.

7.6. Evaluate the patient area for appropriate NIV machine/Ventilator.

7.7. Be careful not to overstress an anxious patient with attempts to place the mask.

7.8. If not initially tolerated and patient is continuing to fail, another mode of support be considered.

7.9. **EQUIPMENT'S:**

7.9.1. The head strap should be snug enough to keep the mask in place without significant leaks.

7.9.2. Appropriate size Nasal, Full or Total mask.

7.9.3. ***BiPAP Vision – Respironics.***

7.9.4. ***Drager Evita XL.***

7.9.5. ***Carina Ventilator.***

7.10. **METHOD (INITIAL SETTING):**

7.10.1. **CPAP MODE**

7.10.1.1. Start with CPAP of 5 cmH_2O.

7.10.1.2. Increase CPAP by 2 cmH_2O as needed to maintain acceptable saturation and based on X-Ray.

7.10.1.3. Set FiO_2 as it was on oxygen therapy/or on conventional ventilator.

7.10.1.4. Increase FiO_2 as needed to maintain acceptable saturation.

7.10.2. **BiPAP MODE:** Set BiPAP mode, as Clinically indicated per physician's Order.

7.10.2.1. Set IPAP 14-18 cmH2O and EPAP 6-8 cmH_2O.

7.10.2.2. Increase IPAP 2 cmH2O as needed to maintain acceptable expired TV.

7.10.2.3. Increase EPAP by 2 cmH2O as needed to maintain acceptable saturation and based on X-Ray.

7.10.2.4. Set FiO_2 as it was on oxygen therapy.

7.10.2.5. Increase FiO_2 as needed to maintain acceptable saturation.

7.10.2.6. Set the back-up rate of 14 breaths per min.

7.10.2.7. Set the TI of 1.0 sec.

7.10.3. **Custom Option:**

7.10.3.1. Select the mode.

7.10.3.2. Set the parameters (when setting the volume assist and flow assist, there will be two numbers. The larger top number is the maximum number that would be achieved if the % set is 100% and the lower number is actual setting determined by the set%).

7.10.3.3. Set the alarms.

7.10.4. **FiO2 settings:**

7.10.4.1. Match at least the current administration, for the initial settings.

7.11. Advise the patient to immediately report any unusual chest discomfort, shortness of breath or severe headache when using the BiPAP system.

7.12. Bedside nurse should contact assigned RCP and primary physician if noticed following symptom(s); i.e.

7.12.1 Hemodynamic instability.

7.12.2 Decrease level of consciousness.

7.12.3 Vomiting.

7.13 RCP would re-adjust the settings as indicated and ordered by the authorized physician.

7.14 NIV order must be re-ordered if patient is transferred to different Unit or other clinical area.

7.15 Patient Transported to OR (Operation Room) or received from OR, RCP is permitted till the receiving area.

7.15.1 Going beyond the receiving area would increase the spread of infection.

8. REFERENCES

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8.5. "Patient Transport Safety Check List".

8.6. Joint Commission International Accreditation Standards for Hospitals; 6th Edition 1 July 2017 Access to Care and Continuity of Care (ACC)

8.7. Policy: "Transporting Ventilated Patients at PSMMC".

9. APPENDICES

9.1. FORMS "CRITICAL PATIENT SAFETY PRE & POST TRANSPORT CHECKLIST".

9.2. ***Appendix A:*** Non-Invasive Ventilation for Adult Patients at PSMMC: Definitions, Applicability, Equipment's, Additional Mode & FiO_2 Setting.

9.3. ***Appendix B:*** Non-Invasive Ventilation for Adult Patients at PSMMC: Indications, Contraindications and Relative Contraindications.

9.4. ***Appendix C:*** Non-Invasive Ventilation for Adult Patients at PSMMC: MONITORING.

9.5. ***Appendix D:*** Non-Invasive Ventilation for Adult Patients at PSMMC: DISCONTINUING NIPPV.

9.6. ***Appendix E:*** Non-Invasive Ventilation for Adult Patients at PSMMC: Transporting Patient on NIV.

10. ORIGINATING DEPARTMENT

Respiratory Care Department under Intensive Care Services.

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Reviewed by: **Dr. Muhammad Kashif Malik** **Head, CQI&PS Division, Intensive Care Services**	**Signature:**	**Date:** 24/1/2021
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Approved by: **Maj. Gen. Dr. Saud Othman Al Shlash** **General Executive Director of Prince Sultan Military Medical City**	**Signature:**	**Date:** 11.2.2021
Date Reviewed 27 January 2021	**Date of Next Review**	10 February 2024

Appendix A

RCD POLICY: Non-Invasive Ventilation for Adult Patients at PSMMC: Definitions, Applicability, Equipment's, Additional Mode & FiO_2 Setting.

1. DEFINITIONS

1.1 NPPV:

Defined as the application of positive pressure via the upper respiratory tract for the purpose of augmenting alveolar ventilation.

2. NPPV with a critical care ventilator:

1.2 Generally performed in the Pressure Support Mode; and PEEP, pressure support, and FiO_2 are set for desired support.

1.2 The patient must "trigger" on the inspiratory valve mechanism for pressure support to be delivered, and the expiratory valve must be opened for exhalation to occur.

1.3 **The "BiPAP" ventilator or similar device:**

1.3.1 It is a flow generator designed to regulate flow as needed to maintain desired pressures.

1.3.2 This flow changes as needed to compensate for leaks, different size exhalation ports, and patient efforts.

1.3.3 No inspiratory or expiratory valves are present.

1.3.4 A single limb circuit with expiratory gases escaping through a small exhalation port in the mask or through an expiratory port attached close to the mask.

1.3.5 With "BiPAP" ventilation an IPAP (inspiratory pressure) and an EPAP (expiratory pressure) are set to correspond with a desired pressure support and PEEP level.

3. **IPAP:** Inspiratory Positive Airway Pressure

3.1 The pressure level that is maintained during the inspiratory phase of the S, S/T or T modes.

3.2 The pressure level that is maintained continuously with the Function Selector Knob in the IPAP position.

4. **EPAP:** Expiratory Positive Airway Pressure

4.1 The pressure level that is maintained during the expiratory phase of the S/T or T modes.

4.2 The pressure level that is maintained continuously with the Function Selector Knob in the EPAP position.

5. **CPAP:** Continuous Positive Airway Pressure

5.5.1 The mode that is delivered when the function selector is in either the IPAP or the EPAP position.

5.5.2 Maintains a constant level of pressure throughout the patient's respiratory cycle during spontaneous breathing

6. **PAV:** Proportional Assist Ventilation

7. **Ti:** Inspiratory Time

8. **Nasal Mask:** The nasal mask should fit from the superior bridge of the nose to just below the nares above the upper lip.

9. **Full Mask:** A mask covering the nose and mouth. The facemask should cover the nose and the mouth and extend from the superior bridge of the nose to beneath the lower lip.
10. **Total Mask:** A mask covering the forehead, nose and mouth
1.1 **ILV:** Independent Lung Ventilation
12. **BiPAP:** Bi-Level Positive Airway Pressure;
    12.1 A mode of therapy utilizing a low pressure, electrically driven unit with electronic pressure control.
    12.2 BiPAP provides ventilatory assistance at suitable flow rates and pressures.
    12.3 BiPAP is intended to augment patient ventilation by supplying positive pressure via mask
13. **BPM:** Breaths per minute.
    13.1 The rate at which the unit will cycle to the IPAP level in the S/T mode if the patient does not initiate a spontaneous trigger.
    13.2 The rate at which the unit will cycle to IPAP in the T mode
14. **Estimated Leak Flow Rate:**
    14.1 The total flow rate is analyzed to determine what portion of the flow through the circuit is due to intentional (i.e. Whisper Swivel) and un-intentional (mask fit) leaks.
    14.2 This continuous flow level is referred to as the Estimated Leak flow Rate.
15. **Estimated Patient Flow Rate:**
    15.1 The total Flow Rate is measured and the Estimated Leak Flow Rate is determined.
    5.15.2 The balance of the flow is due to the instantaneous changes that occur during patient inspiration/expiration, and is referred as Estimated Patient Flow Rate.
16. **Auto-Trigger:** Movement to the IPAP level in the S or S/T modes that was not caused by patient effort or the BPM control
17. **Instantaneous Flow:** Changes in the flow rate through the patient circuit due to inspiration and expiration
18. **%IPAP:** The percent of the respiratory cycle (the duration of which is set by the BPM control) where the unit remains at the IPAP level in the Timed mode.
19. **S mode:** Spontaneous mode.
    19.1 The patient triggers all movement from the EPAP to the IPAP level.
    19.2 Movement from the IPAP to the EPAP level is triggered by the Spontaneous Expiratory Threshold, patient effort, or by the integrated maximum spontaneous IPAP time limit.
20. **S/T:** Spontaneous mode with Time backup.
    20.1 The minimum frequency of movement to IPAP is predetermined by the BPM control, Spontaneous Expiratory threshold, by patient effort, or by the integrated maximum spontaneous IPAP time limit.
21. **T-timed mode:**
    21.1 The frequency of cycling is predetermined by the BiPAP unit according to a preset pattern.
    21.2 All movement from EPAP to IPAP is controlled by the BPM timer.
    21.3 All movement from IPAP to EPAP is controlled by the %IPAP control.

22. **Total Flow Rate:**
    22.1 All flow through the blower outlet is continuously measured by an internal flow transducer that is in series with the blower outlet.
    22.2 This flow is comprised of the continuous flow present due to leak and the instantaneous flow that occurs during patient tidal breathing.
    22.3 These combined flows are referred to as the Total Flow Rate.
23. **V-Flow:** Volume per unit of time.
24. **Vest Out-put:** Estimated Patient Flow Rate signal is transmitted to a recorder to provide a trace of the patient's tidal flow in liters per minute (l/min).
25. **Vleak:**
    25.1 Calculated component of Vtot.
    25.2 Comprised of intentional (Whisper swivel) and unintentional (mask) leaks.
26. **Vtot Output:**
    26.1 Total Flow Rate.
    26.2 Date from the internal flow transducer is transmitted to a recorder, providing a trace of the total flow from the unit.
27. **Vt Output:**
    27.1 Estimated Tidal Volume in liters.
    27.2 Vest is converted to a volume reading and transmitted to a recorder, providing a trace of the patient's tidal volume.
28. **Vte:** Expiratory Tidal Volume
29. **A&E:** Accident & Emergency
30. **ICU:** Intensive Care Unit
31. **OR:** Operating Room
32. **NIPPV:** Non Invasive Positive Pressure Ventilation
33. **ICS:** Intensive Care Services
34. **NRM:** Non Rebreathing Mask

APPLICABILITY

Mask Fit

1. Appropriate size Nasal, Full or Total mask and carefully fit the mask:
2. For complete fitting information, refer instructions included with the mask & head strap.
3. Proper mask sizing has been shown one of the crucial components to the success of NIV.
    3.1 Mask comfort is often the limiting factor to continuous use of mask ventilatory support.
    3.2 Select the smallest sized mask to comfortably fit the patient
    3.3 The mask should fit from the end of the nasal bone to just below the nares. Be careful to ensure that the mask rests above the upper lip.
    3.4 A mask that rests on the lip, or in the area immediately above the lip:
    3.5 May increase the likelihood for leaks,
        3.5.1 Be uncomfortable for the patient
        3.5.2 Can cause the gums to become irritated
4. To prevent abrasion, place a patch of wound dressing on the bridge of the nose.

4.1 This has shown to be very successful in eliminating pressure sensitivity and increasing patient comfort

5. Attach head straps to mask: Apply mask and head strap to the patient.
   5.1 Adjust straps until all significant leaks are eliminated.
   5.2 Do not over-tighten:
      5.2.1 This will cause patient discomfort.
      5.2.2 May cause leaks due to distortion of the mask cushion
   5.3 If possible, have the patient move his/her head to confirm mask seal during normal range of motion.
   5.4 If using a full face mask (Nasal/oral), advise patient not to eat or drink two- three (2-3) Hours prior bed time (especially applicable to home care setting, & Nocturnal NIV usage)
6. If skin irritation or breakdown develops due to the mask:
   6.1 Consider changing the mask from nasal to full-face, or vice versa, as appropriate
   6.2 Place a patch of wound care dressing on the bridge of the nose to provide a cushion between the bridge and the mask. This may be helpful in preventing abrasion of the skin.
   6.3 Skin irritation may be due to an allergy to the mask material. Consider using a skin barrier, such as DuoDerm or Micropore tape. These barriers prevent the mask surface from contacting the skin.
   6.4 Verify the mask spacer is being used. Check spacer size. If skin irritation develops under the spacer, it may be due to excessive pressure or a skin reaction. Consider using a skin barrier, such as DuoDerm or Micropore tape.
   6.5 Check head strap adjustment
   6.6 Assess patient for development of ear discomfort and/or conjunctivitis
7. The head strap should be snug enough to keep the mask in place without significant leaks.

EQUIPMENT'S:

1. ***BiPAP Vision – Respironics***
   1.1 Bacterial filter
   1.2 Single circuit tubing
   1.3 Proximal pressure line
   1.4 Exhalation Port Valve
   1.5 Proper patient interface
   1.6 Proper humidification system if indicated
2. ***Drager Evita XL***
   2.1 Bacterial filter
   2.2 Double circuit tubing
   2.3 Proper patient interface
   2.4 Proper humidification system if indicated
3 ***Carina Ventilator***
   3.1 Single limb circuit
   3.2 Proximal pressure line

3.3 Assure the switch to leak valve
3.4 Adjust configuration of ventilation to mask
3.5 Proper humidification system if indicated

ADDITIONAL MODE:

1. PAV/T-MODE

1.1 Quick –Start Option:
1.1.1 Obstructive Disorder: Volume Assist Mode: 15 cmH_2O; Flow Assist= 12 cmH_2O/L/sec; % Set = 30%
1.1.2 Restrictive Disorder: Volume Assist Mode: 25 cmH_2O; Flow Assist = 4 cmH_2O/L/sec; % Set = 30%
1.1.3 Mixed Disorder (Obstructive & Restrictive combined): Volume Assist Mode: 25 cmH_2O; Flow Assist = 12 cmH_2O/L/sec; % Set = 30%
1.1.4 Normal Type: Volume Assist Mode: 15 cmH_2O; Flow Assist= 4 cmH_2O/L/sec; % Set = 30%

Fio2 SETTING:

1. FiO2 settings:

1.1 Match at least the current administration, for the initial settings
1.2 For certain machines, precise control of FiO2 is difficult to achieve with the BiPAP system.
1.2.1 Bleed in oxygen at the mask port
1.2.2 Start with 2 to 5 Liters per minute
1.2.3 Monitor the patient for adequate oxygenation
1.2.4 Adjust liters flow as necessary
1.3 When the IPAP and EPAP settings are adjusted, the oxygen flow shall be evaluated.
1.4 Use of an in-line oxygen analyzer may not adequately reflect the delivered FiO_2 due to analyzer response time and gas mixing in the patient circuit. Therefore, the patient's oxygenation should be evaluated to determine supplemental oxygen requirements.
1.5 Supplement Oxygen:
1.5.1 An oxygen flow delivered should maintain, the clinically acceptable arterial oxygen tension (PaO_2).
1.5.2 Optimal BiPAP modality and pressures may reduce the FiO_2 necessary to achieve this result

RCD POLICY: Non-Invasive Ventilation for Adult Patients at PSMMC

Appendix B

INDICATIONS:

Noninvasive ventilation (NIV) is indicated in adults patients as following:

1. Obstructive sleep apnea syndrome
2. Respiratory Failure (prevent intubation)
3. Chronic obstructive pulmonary disease with exacerbation
4. Bilateral pneumonia
5. Acute congestive heart failure with pulmonary edema
6. Neuromuscular disorders
7. Acute lung injury

CONTRAINDICATIONS:

Absolute contraindications to noninvasive ventilation are as following:

1. Respiratory arrest or unstable cardiorespiratory status
2. Uncooperative patients
3. Inability to protect airway (impaired swallowing and cough)
4. Trauma or burns involving the face
5. Facial, esophageal, or gastric surgery
6. Decrease Level of Consciousness or Apnea (poor respiratory drive)
7. Air leak syndrome
8. Patients who are at risk for vomiting
   - 8.1 Caution should be used in applying a snug or tight-fitting full mask (nasal/oral) because of the increased possibility of aspirating gastric contents.
   - 8.2 Placement of a nasogastric tube to suction may be needed prior to the application of a full face mask.
9. Patients with or susceptible to pneumothorax or pneumomediastinum shall be monitored closely when applying positive pressure.
   - 9.1 Pre-existing bullous lung disease may represent a relative contraindication to NIPPV
10. Patient hemodynamically unstable
    - 10.1 Hypotension induced by positive pressure ventilation
    - 10.2 Patient on Vasopressors
11. Allergy or hypersensitivity to the material the mask is made of, where the allergic reaction outweighs the benefits of ventilatory assistance.

RELATIVE CONTRAINDICATIONS:

1. Extreme anxiety
2. Morbid obesity
3. Need for continuous or nearly continuous ventilatory assistance
4. Patient with copious secretions and requiring frequent airway suctioning

RCD POLICY: Non-Invasive Ventilation for Adult Patients at PSMMC

Appendix C

MONITORING:

1 Monitor clinical and physiological parameters during wakefulness and sleep.

2 The adequacy of the IPAP and EPAP settings shall be re-evaluated when there is clinical and/or physiological changes in the patient's condition.

3 Perform a vent check every three (3) hours in the critical care.

4 The routine vent check in the general care (i.e. for non-critical patients) is 4 hourly.

5 Record the vent check on the mechanical ventilation flow sheet.

6 The flow sheet will remain at the bedside for immediate reference.

7 After initiation of NIPPV (from established baseline values on initial application), monitoring and clinical evaluation of the patient should include, but not limited to:

- 7.1 Assessment of patient's comfort, by Inspection and auscultation, look listen and feel
- 7.2 Conscious level,
- 7.3 Chest wall motion,
- 7.4 Use of accessory muscles of ventilation,
- 7.5 Coordination of respiratory effort with the ventilator,
- 7.6 SpO2, Respiratory rate and heart rate.
- 7.7 Systemic arterial blood pressure
- 7.8 Skin color and temperature
- 7.9 Paradoxical movement of the chest wall which may reflect impending or ventilatory muscle fatigue
- 7.10 Patients on NIV should be assessed:
  - 7.10.1 Within 30 minutes initially after patient is connected to NIV
  - 7.10.2 Every hourly between next 30 minutes to 3 hours being at NIV
  - 7.10.3 Every 3 hourly after initial 3 hours being at NIV, considering the patient is stable and responding the NIV ventilator settings appropriately.

8 The need for arterial blood gas analysis will be governed by the patient's clinical progress but should be measured:

- 8.1 In most patients after 1–2 hours of NIV
- 8.2 After 4–6 hours if the earlier sample showed little improvement.
- 8.3 If there has been no improvement in $PaCO_2$ and pH after this period, despite optimal ventilator settings, NIV should be discontinued and invasive ventilation considered.

9 Breaks from NIV should be avoided and performed ONLY for emergency drugs. Breaks from NIPPV could be done (for activities/procedures such as: physiotherapy, meals, etc.) as long as it doesn't impact oxygenation or ventilation adversely to the patient.

10 Patients who show benefit from NIV in the first few hours should be ventilated for as much as possible during the first 24 hours, or until improving.

11 The mode of weaning is to reduce periods of ventilation according to clinical response, reducing to diurnal ventilation before nocturnal.

12 **Chest X-Ray**:

12.1 Have baseline chest X-ray prior starting the NIPPV, this would be a key tool to compare and evaluate the effectiveness of NIPPV

12.2 Perform initial chest X-ray immediately (within 30 minutes to hours) after starting NIPPV, to monitor for the development of barotrauma (I.e. pneumothorax or pneumomediastinum)

12.3 Follow-up chest x-ray performed at least once every 24 Hrs, if patient is stable.

12.4 If patient gets hemodynamically unstable with absent or decreased chest rise, perform a chest x-ray, immediately to rule out complications like pneumothorax or pneumomediastinum.

RCD POLICY: Non-Invasive Ventilation for Adult Patients at PSMMC

Appendix D

DISCONTINUING NIPPV

1 If a satisfactory degree of patient comfort is not achieved or the patient's medical management with this ventilatory technique is not adequate, NIPPV administration shall be discontinued and alternative therapy should be considered.

2 If patient has been ventilated Non-Invasively for the duration of 48 Hrs, discontinue NIPPV and consider intubation and invasive ventilation, as long as patient is 'Full Code Status'.

3 If patient develops abdominal distention, (with or without using gravity dependent open nasogastric tube):

- 3.1 It would increase chances of aspiration, which could lead to pneumonitis and thus the incidence of VAP (Ventilator Associated Pneumonia)
- 3.2 It would also impair ventilation, due to restricted diaphragmatic moment.

RCD POLICY: Non-Invasive Ventilation for Adult Patients at PSMMC

Appendix E

TRANSPORTING THE PATIENT ON NIV:

1 If patient is on NIPPV and requires transporting the patient (for urgent or life-saving procedures) assess the patient's stability and appropriateness for transport to OR.

2 If patient could tolerate disconnection from NIPPV and is hemodynamically stable, then patient should be considered for transport, under supervision of Physician

3 The need of transport over weighs continuous usage of NIPPV; i.e. procedure could be:
- 3.1 Transporting patient to OR for surgical procedure, or for difficult intubation
- 3.2 All patients who are on NIPPV and are managed and intubated in OR must be transported and companied by OR team when transported back to ICU

4 Unstable patient(s) (e.g. Severely Hypoxemic, Hypotensive or during the code situation) should not be transported and must be stabilized in the referring area (A&E/ICU/OR) prior to transportation, unless the reason is the extreme need of the surgery to manage the underlying cause of such instability.

5 Place the patient on transport ventilator with same settings as in the unit, if using Transport ventilator

6 While transporting the patient can be placed at NRM, (12 to 15) L/min flow of O2 (if tolerates).

7 Patient is transported with skilled medical team, which includes Physician, Nurse and RCP, as acuity is considered parallel as ventilated patient.

8 Complete the Form, "Patient Transport Safety Check List" Pre transport section.

9 Confirm the readiness of the receiving team or area to accept patient immediately.

10 Take all necessary emergency equipment's such as:
- 10.1 RCP is responsible for portable suction device and appropriate suction catheters
- 10.2 Nursing staff is responsible for medication box with adequate medication supply.
- 10.3 Take the patient's chart including flow sheet and medication sheet.
- 10.4 RCP is responsible to prepare intubation box with all appropriate size and type of equipment's, and also functional Manual Resuscitation Bag/AMBU Bag and appropriate size mask.

11 Assess the patient's condition and vital signs during transport, immediately upon arrival and then at the same frequency of monitoring is continued in the referring area until patient is handed over.

12 Make the necessary medical decisions needed during transportation, i.e.
- 12.1 If patient deteriorates, (e.g. Patient has hemodynamic instability or even Cardiac arrest, etc.).
- 12.2 Call ICU Team Leader immediately for full assessment and management decisions in case of deterioration in the patient clinical status.

13 Upon return from transport:
- 13.1 Place the patient on previous settings
- 13.2 Perform the patient assessment and monitor the vital signs
- 13.3 Document the details related transport, including but not limiting to side effects.

14 Transporting patients who are extremely difficult to intubate and whose plan is that they will be intubated in OR, then RCP (charge, senior or Team leader) must accompany the patient along with the transporting team to OR, as the patient is considered ventilated or near code.

15 Upon arrival to OR, patient must be received by OR team within 15 minutes from the time of arrival.

16 Patient Transported to OR (Operation Room) or received from OR, RCP is permitted till the receiving area.

16.1 Going beyond the receiving area would increase the spread of infection.