

PROTOCOL FOR: Weaning: Ventilator Weaning Post-Open Heart Surgery

PURPOSE: To define the care/sequence of events required to wean post-open heart surgical patients from mechanical ventilator.

- POLICIES:
1. Patients that have demonstrated the requirement of PEEP (positive/expiratory pressure) > 5cm, should not be considered candidates for the protocol.
 2. The patient must demonstrate hemodynamic stability as evidenced by a) free of new onset dysrhythmias, b) able to maintain an adequate cardiac index (>2 L/min/m²), mean blood pressure > 60 mmHg and c) urine output (> 30cc/hr).
 3. The patient must be on a pulse oximeter with reliable readings.
 4. Once physiologic stability is established, the physician can write the order "Wean per ICU Protocol", acknowledging the RN's and therapist's ability to accomplish the protocol. Documentation of the order allows a range of 2-4 arterial blood gas (ABG's) to be drawn during weaning process.
 5. Respiratory Therapy will validate all ventilator changes.
 6. Patients that have been medically treated for COPD should be reviewed by the MD prior to enrollment in the weaning protocol.

SUPPORTIVE DATA: Collaboration between the covering physician, RN, and respiratory therapist is necessary to successfully implement this protocol. Team discussion should include the following areas:

1. Patient's pre-operation pulmonary and cardiac function
2. Specific perioperative information:
 - Anesthesia - drugs used, any complications, and airway considerations, intra-op minute ventilation (VE) and ABG result.
3. Hemodynamic stability

When the decision is made to initiate the protocol, the RN and respiratory therapist will progress the patient as his/her status warrants. Upon successfully meeting the established criteria, the patient will hopefully be extubated to ventimask or nasal cannula thereby allowing his/her own physiologic mechanisms to take over.

DESIRED

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PATIENT OUTCOME: Patient will achieve successful extubation from mechanical ventilation to ventimask or nasal cannula, therefore allowing spontaneous respirations, gas exchange, verbal communication and a means for oral nutrition to be resumed.

ASSOCIATED

STANDARDS: Intensive Care Unit Practice Manual:
Protocol for: Ventilator: Care of Patient on a Ventilator

ICU/Med-Surg Unit Practice Manual:
Protocol for: Respiratory Compromise: Assessment and Care of the Patient with a Compromised Respiratory Status Pulse Oximeter: Care of the Patient:

ASSESSMENT: 1. RN and respiratory therapist will assess the patient jointly.

2. Verify that a baseline ABG was drawn within 1st hour of arrival to the ICU.

3. Once the patient reaches an IMV of 8, no further weaning should be attempted until the patient is assessed to be:

- a. awake - open eyes, moves spontaneously and follows commands
- b. breathing spontaneously above the ventilator rate

4. If the patient has required narcotics for pain control, assess dosages and frequency, and evaluate the effect.

5. Continually assess oxygen saturation, heart rate and rhythm, respiratory rate (RR) and work of breathing. Patient should maintain an O₂ saturation of > 92% or >, and a RR > 10 but < 30/minutes throughout the weaning process.

6. At least hourly, assess breath sounds for any adventitious sounds.

7. Obtain baseline cardiac profile and vital signs.

WEANING FiO₂: 1. Wean FiO₂ until an FiO₂ of 40% is reached, and the patient is maintaining an O₂ saturation of 92% or >. During this process the patient should also:

- a. have a RR > IMV rate but < 30/min
- b. cardiac rhythm free of new onset dysrhythmia
- c. be normothermic

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- WEANING THE RATE:
1. At this point, patient assessment should focus on LOC and the amount of sedation previously administered. If narcotics are required for pain control, dosage and frequency should be evaluated. If the patient is asleep, hold sedation and evaluate hourly before proceeding with the protocol.
 2. Assess minute ventilation (RR x tidal volume) rate on current IMV setting. This parameter should be maintained between 5 - 15 liters during the wean of the IMV rate. In addition, the RR should be > 10 but < 30/min, and the cardiac rhythm free of any new dysrhythmias.
 3. Assess patient's level of wakefulness. Patient should be breathing above the ventilator rate, open eyes, move spontaneously and follow commands readily.
 4. Patient should be normothermic.
 5. Initiate IMV wean, moving 2 breathes/change to at least IMV 6 or as low as IMV of 4. Assess patient's tolerance to each rate change, noting the above stated parameters. Patient should be in an upright and comfortable position.

PREPARING FOR
EXTUBATION:

1. At this point, the patient should be on an IMV rate of 6 or 4, and awake, alert and cooperative.
2. Obtain and evaluate pulmonary function tests utilizing the following pulmonary parameters:
 - a. Minute volume (Ve) > 5 liters but < 15 liters
 - b. Tidal volume (Vt) > 5 to 7ml/kg (spontaneous)
3. Place patient on continuous positive airway pressure (CPAP) while continuing to monitor both physiologic and pulmonary parameters. Pressure support of 5cm may be used, but not if patient is very sluggish, or had an intra-op MI.
4. After 30 min. draw an ABG for evaluation of gas exchange.
5. While awaiting ABG results, assess level of comfort and tolerance of continued CPAP. If there is any change in the above parameters, or increased work of breathing is noted, the patient should be placed back on an IMV of 4 until ABG results are analyzed.
6. If the patient tolerates CPAP, proceed to extubation criteria.

EXTUBATION

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CRITERIA

- EVALUATION:
1. Assessment of the total clinical picture should be made at this point by the RN, MD and respiratory therapist.
 2. In order for the patient to be considered a candidate for extubation, the following criteria needs to be met:
 - a. RR > 10°/min. but < 30/min.
 - b. minute volume > 5 liters but < 15 liters
 - c. negative inspiratory force > -20
 - d. cardiac rhythm free of new onset dysrhythmias
 - e. ABG analysis criteria:
 - pH = 7.30 - 7.45
 - PaO₂ \geq 70mm Hg
 - PCO₂ < 50mm Hg
 - f. patient awake and alert, cooperative
 3. If all team members agree that the above criteria are adequately met, then the extubation should be carried out.

- EXTUBATION:
1. A minimum of 2 people should be present to complete extubation. The physician need not be present during the actual extubation.
 2. The following equipment should be available at the bedside:
 - a. oxygen administration set-up (see chart)
 - b. wall suction set-up with Yankaur
 - c. 10cc syringe
 - d. sterile suction tubing, gloves
 - e. ambu bag with face mask
 - f. intubation tray readily available on the unit
 3. Explain the extubation process to the patient while pre-oxygenating him/her on 100% FiO₂ for 5 min.
 4. Proceed with the extubation:
 - a. Make sure patient is in an upright, comfortable position.
 - b. Suction the ETT until clear, then the oral cavity.

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- c. Loosen ties or tape and remove air from the cuff.
 - d. Assess patient's ability to move air around the tube by asking patient to cough around ETT.
 - e. Ask the patient to take a deep breath, and at the beginning of expiration, withdraw the ETT.
 - f. Clear patient's oral cavity as needed, and place on appropriate oxygen therapy.
5. An ABG should be drawn 30 min. after extubation.
6. If extubation is tolerated, i.e.:
- a. RR > 10 but < 30/min.
 - b. O₂ saturation > 90%
 - c. cardiac rhythm free of new dysrhythmias
 - d. acceptable ABG

Then proceed with post-extubation care.

POST-EXTUBATION

ASSESSMENT:

1. The RN and respiratory therapist are encouraged to collaborate on this aspect of the extubated patient care.
2. Assess, at least hourly x 8 hours, the following:
 - a. ability to maintain SaO₂ > 90%
 - b. ability to maintain a RR > 10 but < 30/min.
 - c. change in work of breathing:
 - 1) use of accessory muscles and/or splinting, with an increase in RR
 - d. ability to cough and raise secretions
 - e. breath sounds, noting any new adventitious sounds
3. Assess vital signs q 1 hour, noting any increase in HR or BP. Assess LOC and pain scale frequently.

NURSING

INTERVENTIONS/

POST EXTUBATION:

1. Promote comfort - administer analgesics consistent with patient's perceived need.
2. Provide guidance on how to cough and deep breathe, use incentive spirometry q 2 hours while awake.

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3. Plan rest periods between exercises to avoid fatigue and promote comfort.
4. Mobilize the patient per MD orders.
5. Provide chest physical therapy as ordered.

DOCUMENTATION: 1. Document ventilator changes and ABG results on ICU flowsheet, and Respiratory Therapy sheets.

2. Document patient response to ventilator changes and extubation in progress notes, per unit standards.

APPROVAL: ICU Nursing Standards Committee
ICU Coordinating Committee
Respiratory Therapy Department

CREDENTIALS: RN

EFFECTIVE DATE:

REVISION DATES: 10/03

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FiO₂ CHART

Patient PaO ₂	Actions Post Extubation
PaO ₂ > 100	Place on nasal O ₂ - keep SaO ₂ > 92%. If SaO ₂ falls to < 92%, increase nasal O ₂ up to a maximum of 6 liters. If on 6 liters SaO ₂ falls below 92%, move to ventimask at 40%.
PaO ₂ < 100	Use ventimask at 40% - keep SaO ₂ > 92%. If SaO ₂ falls to < 92%, increase FiO ₂ to 50%. If SaO ₂ falls to below 92% on 50%, move to CPAP mask or high flow.
PaO ₂ < 100 and Hx: of thick secretions or intubated greater than 24 hours.	Use 40% > Neb - keep SaO ₂ > 92%. If SaO ₂ < 92% increase FiO ₂ to 50%. If SaO ₂ < 92% on 50% then draw ABG and move to high flow/CPAP mask.
PaO ₂ < 100 with VE > 15.0 L	Extubate to high flow at 40% FiO ₂ - keep SaO ₂ > 92%. If SaO ₂ falls > 92%, increase FiO ₂ to 50%. If SaO ₂ falls < 92% on 50%, draw ABG and consider re-intubation.