Mechanical Ventilation

Purpose

Mechanical Artificial Ventilation refers to any methods to deliver volumes of gas into a patient's lungs over an extended period of time to remove metabolically produced carbon dioxide. It is used to provide the pulmonary system with the mechanical power to maintain physiologic ventilation, to manipulate the ventilatory pattern and airway pressures for purposes of improving the efficiency of ventilation and/or oxygenation, and to decrease myocardial work by decreasing the work of breathing.

Scope

Outlines the procedure of instituting mechanical ventilation and monitoring.

Accountability

- Mechanical Ventilation may be instituted by a qualified licensed R.C.P.
- To be qualified the practitioner must complete a competency based check off on the ventilator to be used.
- The R.C.P. will have an understanding of the age specific requirements of the patient.

Physician's Order

Initial orders for therapy must include a mode (i.e. mandatory Ventilation/Assist/Control, pressure control etc., a rate, a tidal volume, and an oxygen concentration and should include a desired level of Positive End Expiratory Pressure, and Pressure Support if applicable. Pressure modes will include inspiratory time and level of pressure control. In the absence of a complete follow up order parameters will be maintained in compliance with last order until physician is contacted and the order is clarified.

Indications

Mechanical Ventilation is generally indicated in cases of acute alveolar hypoventilation due to any cause, acute respiratory failure due to any cause, and as a prophylactic post-op in certain patients (obesity, chronic obstructed pulmonary disease, myasthenia).

If a patient’s spontaneous ventilation is clinically adequate, mechanical ventilation may not be indicated.

Procedure

Step	Action
1	Verify physicians order.
2	Set up an appropriate ventilator for patient requirements.
3	Check ventilator for proper operation of all systems: • No leaks in circuit. • Alarms functional and audible • Refer to policy 7.4.11.

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Procedure Continued

Step	Action
3 Continued	• Humidifier/Heat Moisture Exchanger • Oxygen Analyzer
4	Make sure proper size of resuscitator bag and mask are at bedside attached to O_2 source.
5	Explain procedure to patient if possible.
6	Connect circuit to patient airway and monitor patient and ventilator to assure adequate ventilator and patient tolerance.
7	Complete a ventilator check and patient assessment and chart results.
8	Once patient is stable, assess patient and ventilator settings as per unit standard and after each parameter change.
9	Circuits will be changed every seven days.

Undesirable Side Effects

The complications of Mechanical Ventilation can be broken into four categories:

Pulmonary Barotrauma
- Tension Pneumothorax
- Pulmonary Interstitial Emphysema
- Pneumomediastinum
- Pneumopericardium
- Pneumoperitoneum

Cardiovascular Effects
- Decreased Venous Return
- Decreased Cardiac Output
- Increased Pulmonary Vascular Resistance

Removal of natural defense mechanisms with intubation:
- Contamination of ventilator circuits
- Contamination through suctioning

Psychological Effects
- Inability to communicate (See Patient Teaching)

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- Psychological dependency on ventilator

Assessment of Outcome

- Arterial and Mixed Venous Blood Gas Values
- Pulmonary Function Studies
- Chest X-Rays
- Auscultation
- Work of Breathing Evaluation
- Sputum: culture, amount, color, consistency
- Patient Temperature

Patient/ Family Teaching

Patients on mechanical ventilators require considerable emotional support.

Step	Action
1	Explain the reason that for receiving mechanical ventilation. Relate it to disease or injury state.
2	Encourage patient to relax and allow the ventilator to work for the patient.
3	Explain the alarms and their function. Reinforce to patient that the alarms do not mean that the ventilator is not working, but that the ventilator needs some readjustment so that breathing will be easier.
4	Use reality orientation technique with patient (ask what day it is, what time it is, etc. (Inform patient if not known). Try to locate a clock that patient can see.
5	Teach patient communication techniques. It is very frustrating for a patient not to be able to communicate. Have the patient answer questions yes or no by shaking/nodding head. Provide patient with a tablet and pen for writing. If patient cannot write, draw the alphabet on a piece of paper or cardboard for spelling out communication by pointing to the letters. Above all let patient know that some kind of communication will be provided.

Infection Control

Follow procedures outlined in Healthcare Epidemiology Policies and Procedures #2.24; Respiratory Care Services.
http://www.utmb.edu/policy/hcepidem/search/02-24.pdf

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Safety

- All alarms on ventilators will be activated at all times.
- Anesthesia gases will not be administered through ventilator.

Corresponding Policies

Respiratory Care Services Policy # 7.4.11; Operating Instructions For Adult Microprocessor Controlled Ventilators

References

AARC Clinical Practice Guidelines; Patient-Ventilator System Checks, Respiratory Care; 1992; 37: 882-886

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Donald F. Egan, Craig L. Scanlan, Robert L. Wilkins, James K. Stoller, Egan's Fundamentals of Respiratory Care, Eighth Edition, Mosby; June 2, 2003

Dean Hess, Robert Kacmarek, Essentials of Mechanical Ventilation, McGraw-Hill Professional; 1st edition (March 1, 1996)

Ventilator Operating Manuals