The purpose is to state the policies of continuous mechanical ventilation.

II. Scope
A. Licensed Respiratory Care Practitioners
B. Adult Intensive Care Units
C. Adult Emergency Care Unit
D. Adult Specialty Care Units
E. Neonatal Intensive Care Unit
F. Pediatric Intensive Care Units
G. Pediatric Emergency Care Unit
H. Pediatric Specialty Care Unit

II. Policy
A. Continuous mechanical ventilation is indicated in cases of
   1. Apnea or respiratory arrest
   2. Acute ventilatory failure where the PaCO2 >60 mmHg with pH <7.25
   3. Impending ventilatory failure as evidenced by
      a) Increased work of breathing (f >40/min)
      b) Decreased cardiopulmonary reserves
      c) Increasing PaCO2 and decreasing pH
      d) Decreasing PaO2
   4. Hypoxemia attributable to ventilatory insufficiency evidenced by
      a) PaO2 <50 mm Hg, uncorrectable by supplemental oxygen
      b) Deleterious work of breathing or ventilatory pattern
   5. Decreased FRC and increased intrapulmonary shunting as evidenced by
      a) Persistent hypoxemia despite improved ventilatory pattern
         and elevated FIO2
      b) Radiological evidence of acute restrictive lung disease
      c) Physical evidence of decreased lung compliance
      d) Hemodynamic monitoring demonstrating intrapulmonary
         shunting (PA-aDO2 > 350 mm Hg)
   6. Inability to protect the airway
B. Expected outcomes of mechanical ventilation are:
   1. Improved minute volume
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2. Improved alveolar ventilation
3. Improved distribution of gas
4. Improved ventilation/perfusion ratio
5. Decreased work of breathing
6. Normalization of arterial blood gases

C. Continuous mechanical ventilation, when ordered by a doctor, will be initiated, maintained, and discontinued solely by the Respiratory Therapy Department unless the patient is treated in the Neonatal Intensive Care Unit.

D. Ventilator settings will be readjusted to reflect the last written order.

E. The respiratory therapist should thoroughly check the ventilators for proper and safe function prior to use.

F. Care should be given to maintain a closed patient circuit.

G. Any changes in ventilation, perfusion, airway resistance, compliance, sputum amount, color or viscosity noted during the assessment should be reported to the attending physician.

H. Patients who require mechanical ventilation must be cared for in an intensive care area or a specialty care area equipped to monitor the patient.

I. Temporary mechanical ventilation of emergently intubated patients in a non-ICU area will have to be approved by and have monitoring personnel arranged by the Hospital Administrator-On-Call, the Director of Nursing, and the Administrative Respiratory Therapist-On-Call. Efforts must be made to expediently move the patient to an intensive care unit.

J. Bilevel positive airway pressure delivery devices used primarily as ventilatory support will be treated as a ventilator, although non-invasive. All policies, procedures, and standards of mechanical ventilation will be followed.

K. Artificial airway temperatures should be maintained at 35-37 degrees Celsius.

L. An in-line suction catheter should be used when possible.

M. Mechanical ventilation monitoring should be performed not less than every six hours.

N. The patient circuit can be used without a regular change-out, however, it can be changed at the therapist's discretion.

O. A ventilator that has been in use for 30 continuous days should be removed from service for preventive maintenance.

P. Adult tidal volumes are generally initiated to equal no less than 5 ml/kg ideal body weight and no greater than 15 ml/kg of ideal body weight.

Q. Adult respiratory rates are generally initiated at 12 breaths per minute.

R. The I:E ratio is generally maintained at 1:2.

S. Adult PEEP level is generally maintained between 2.5 cmH20 and not more than 10 cmH20.

T. Patients who weigh < 6 kg, or whose tidal volume is ≤ 90ml, should be ventilated with an infant circuit.

U. Patients who weigh > 6 kg and < 30 kg, or whose tidal volume ≥ 90ml and ≤ 450ml, should be ventilated with a pediatric circuit.

V. Patients who weigh ≥ 30 kg, or whose tidal volume is > 450ml, should be ventilated with an adult circuit.

W. Documentation shall be recorded in this fashion:
   1. Upon initiation of continuous mechanical ventilation, a Mechanical Ventilator Flowsheet will be labeled with the patient's identification and kept with each ventilator.
   2. A new Mechanical Ventilator Flowsheet will be used each 24-hours beginning at 2300 hours.
   3. Each new Mechanical Ventilator Flowsheet will have the patient's identification label, date, diagnosis, endotracheal tube size, endotracheal tube placement marking,
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cuff pressure, ventilator circuit change-out date, type of ventilator and therapist's signature documented on the front page.

4. All ordered changes should be noted and circled in red ink on the Mechanical Ventilator Flowsheet.

5. Upon discontinuation of the ventilator, the ventilator flowsheet will be stored in the patient's chart.

6. The following data will be recorded on the Mechanical Ventilation Flowsheet with every ventilator check:
   a. Time of ventilatory check
   b. Mode of ventilation
   c. Spontaneous tidal volume
   d. Controlled tidal volume
   e. Spontaneous respiratory rate
   f. Ventilator respiratory rate
   g. Minute volume
   h. Peak inspiratory flow rate
   i. Pause pressure
   j. Trigger sensitivity
   k. Inspiratory time
   l. Pause time
   m. Ordered pressure levels
   n. Peak inspiratory pressure
   o. Positive end expiratory pressure
   p. Static compliance
   q. Dynamic compliance
   r. Fraction of inspired oxygen
   s. Inspired gas temperature or type of humidity therapy delivered
   t. High/low pressure settings
   u. High/low volume settings
   v. High/low FIO2 settings
   w. Note of breath sounds, sputum characteristics, and delivered therapy

III. General Equipment
   A. Ventilator
   B. Appropriately sized patient circuit
   C. Humidification system
   D. Oxygen flowmeter with nipple adapter
   E. Self-inflating manual resuscitator with connecting tube
   F. PEEP valve if order PEEP is >= 5 cmH2O
   G. Oxygen double outlet adapter
   H. Test lung
   I. Cuff pressure manometer
   J. In-line suction catheter
   K. Respiratory Therapy Department Mechanical Ventilator Flowsheet

IV. General Procedure
   A. Prerequisite Skills
      1. Handwashing
      2. Patient Assessment and Classification
      3. Patient Interaction and Therapy Application
      4. Airway Care: Artificial Airway
      5. Pulmonary Mechanics
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B. Instituting Mechanical Ventilation
   1. Perform Preclinical Assessment Skills:
      a) Handwashing
      b) Patient Assessment and Classification
      c) Patient Interaction and Therapy Application
   2. Don personal protective equipment
   3. Assemble circuit
   4. Attach the power cord to an “emergency” electrical outlet
   5. Connect the oxygen high pressure hose to a 50 psi oxygen outlet
   6. Connect the air high pressure hose to a 50 psi air outlet
   7. Turn the ventilator on
   8. Turn the heater on
   9. Pre-set the required ventilator parameters
  10. Set and check all alarms
  11. Check the ventilator for proper function
  12. Attach an in-line suction catheter
  13. Connect the ventilator to the patient
  14. Alert patients should be reassured and instructed in the procedures as needed
  15. Assess the adequacy of ventilation
  16. Readjust ventilator controls as necessary
  17. Notify the physician of any inappropriate responses to the ventilator
  18. Make recommendations to the physician if warranted
  19. Wash hands
  20. Complete the Mechanical Ventilation Flow Sheet

C. Monitoring Mechanical Ventilation
   1. Perform Preclinical Assessment Skills:
      a. Handwashing
      b. Patient Assessment and Classification
      c. Patient Interaction and Therapy Application
   2. Don personal protective equipment
   3. Drain all condensation away from the patient and humidifier
   4. Check the ventilator for proper function including:
      a. ventilator settings
      b. exhaled tidal volume
      c. static compliance
      d. alarm
   5. Assess the patient for adequacy of ventilation by:
      a. Noting blood gas values
      b. Calculating static compliance
      c. Calculating dynamic compliance
      d. Auscultation
      e. Skin color
   6. Note vital signs to include
      a. Pulse
      b. Blood pressure
      c. Central venous pressure
      d. Rate and depth of any spontaneous respirations
   7. Auscultate breath sounds; perform airway care if warranted
   8. Wash hands
   9. Notify the Physician and/or Supervisor of any problems noted during the ventilator monitor
  10. Complete the Mechanical Ventilation Flow Sheet
  11. Chart pertinent data in Medlinks charting system
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D. Procedures for Discontinuing Mechanical Ventilation
   1. Perform Preclinical Assessment Skills:
      a. Handwashing
      b. Patient Assessment and Classification
      c. Patient Interaction and Therapy Application
   2. Don personal protective equipment
   3. Obtain bedside ventilatory mechanics on the patient to include vital capacity, tidal volume and negative inspiratory force
   4. Set up and test the appropriate aerosol or oxygen equipment prior to discontinuing the mechanical ventilator
   5. Adjust the oxygen percentage on the nebulizer as prescribed in the physician's order
   6. Auscultate breath sounds; perform airway care if warranted
   7. Disconnect the ventilator and apply the prescribed therapy to the patient's airway
   8. Instruct the patient to take periodic deep breaths
   9. Wash hands
   10. Complete the Mechanical Ventilation Flow Sheet
   11. Chart pertinent data in the patient's Respiratory Therapy Treatment Record
   12. Chart ventilator monitor summary in the Respiratory Therapy Treatment Record
   13. Remove the ventilator after the acceptable blood gas values have been obtained or patient shows ventilatory stability.

V. Ventilator Specific Procedure
   Please see Appendix A for specific clinical skill procedures for the following pieces of equipment:
   A. AVEA Ventilator
   B. BiPAP S/TD 30
   C. Siemens 300
   D. Siemens 300
   E. Siemens Servo I
   F. VIP Bird Ventilator
   G. SiPAP
   H. Infant Flow System
   I. Sensor Medics 3100A High Frequency Oscillator
   J. Sensor Medics 3100B High Frequency Oscillator
   K. BiPAP Vision
   L. Pulmonetics Series Ventilators