Name of Policy:	Adverse reaction to mechanical ventilation	THE UNIVERSITY OF TOLEDO
Policy Number:	3364-136-05-01	
Department:	Pulmonary Services	
Approving Officer:	Senior Hospital Administrator	
Responsible Agent:	Director, Pulmonary Services	
Scope:	The University of Toledo Medical Center Pulmonary Services Department	Effective Date: June 1, 2023 Initial Effective Date: July 1, 1979
New policy proposal Minor/technical recent rece		l revision of existing policy f existing policy

## (A) Policy Statement

All persons in the Respiratory Care Department who are responsible for the operation and monitoring of mechanical ventilators shall adhere to established criteria for identification and treatment of adverse reactions such as: pneumothorax, hyperventilation, hypoventilation, and hypotension associated with mechanical ventilation. If any adverse reactions do occur, the responsible physician must be notified, and physician orders appropriately given to make the changes recommended in this policy.

## (B) Purpose of Policy

To ensure the proper and safe use of mechanical ventilation.

## (C) **Procedure**

- I. Pulmonary Barotrauma:
- A. A mechanically ventilated patient with barotrauma may be identified by one or more of the following signs:
  - 1. An abnormal increase in peak airway pressure.
  - 2. A drop in PaO2 and an increase in PaCO2 in arterial blood gases.

3. An insufficient chest rising with each positive pressure breath accompanied by diminished breath sounds.

- 4. Increased radiolucent areas in the chest x-ray.
- 5. A significant decrease in oxygen saturation via pulse oximetry.
- B. The procedure by the practitioner for a patient suspected of having a pneumothorax while receiving mechanical ventilation is:
- 1. Notify the responsible physician and assigned nurse.

2. Monitor peak airway pressures and the return volumes closely until the pneumothorax is corrected.

3. Manually ventilate the patient until the pneumothorax is corrected, or until the physician requests that the patient be mechanically ventilated again.

4. Monitor oxygen saturation by pulse oximetry.

- II. Hyperventilation and Respiratory alkalosis:
- A. The mechanically ventilated patient experiencing hyperventilation may be identified by one or more of the following signs:

1. A decrease in the PaCO2 in the arterial blood gases accompanied by an increase in pH.

2. The exhaled minute volume is abnormally larger than either the predicted or the set minute volume for that patient.

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3. The exhaled tidal volume is abnormally larger than either the predicted or the set tidal volume (TV) for that patient.

4. The measured end-tidal CO2 is abnormally low.

B. The procedure by the practitioner for a patient experiencing hyperventilation due to

mechanical ventilation is:

- 1. Notify the responsible physician and assigned nurse.
- 2. Recommend a decrease in the minute volume by either decreasing the respiratory rate, decreasing the tidal volume, or decreasing the flow rate, if appropriate.
- 3. Monitor arterial blood gases.
- 4. Monitor end-tidal CO2.
- 5. Decrease the sensitivity on the ventilator.
- III. Hypoventilation:
- A. The mechanically ventilated patient experiencing hypoventilation may be identified by one or more of the following signs:
  - 1. A decrease in PaO2 and/or increase in the PaCO2 accompanied by a decrease in arterial pH.
  - 2. The exhaled minute volume is abnormally smaller than either the predicted or the set minute volume for that patient.

3. The exhaled tidal volume is abnormally smaller than either the predicted or the set tidal volume for that patient.

- 4. A significant increase in measured end-tidal CO2.
- 5. A significant decrease in peak airway pressures.
- 6. An insufficient rise in the patient's chest with each positive pressure breath accompanied by diminished breath sounds.
- 7. Low volume or low-pressure alarm on ventilator sounds due to a leak in the ventilator circuit.
- 8. Bradycardia.
- B. The procedure by the practitioner for patients experiencing hypoventilation due to mechanical ventilation is:
  - 1. If patient is experiencing bradycardia, cyanosis, or any other signs of respiratory distress,
  - immediately disconnect from ventilator and manually ventilate.
  - 2. Notify the responsible physician and assigned nurse.
  - 3. Recommend an increase in minute volume by increasing respiratory rate or increasing TV, if appropriate.
  - 4. Monitor arterial blood gases, and oxygen saturation.
  - 5. Correct all leaks that may be present in the ventilator circuit
- IV. Hypotension:
- A. The mechanically ventilated patient experiencing hypotension may be identified by one or more of the following signs:
  - 1. A decrease in systolic blood pressure.
  - 2. A decrease in heart rate.
  - 3. A decrease in arterial PaO2.
  - 4. A decrease in oxygen saturation.

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B. The procedure by the practitioner for patients experiencing hypotension due to mechanical ventilation:

1. If patient is experiencing bradycardia, cyanosis or any other signs of respiratory distress immediately disconnect from ventilator and manually ventilate.

- 2. Notify the responsible physician and assigned nurse.
- 3. Recommend an increase in FiO2 or minute volume by increasing respiratory rate or

increasing tidal volume, if appropriate.

- 4. Recommend a reduction in peak airway pressure by a decrease in either flow rate or TV.
- 5. Recommend a decrease in the Positive End Expiratory Pressure.
- 6. Monitor arterial blood gases and oxygen saturation.
- 7. Correct all leaks that may be present in the ventilator circuit.
- V. If a patient should present with any of the above adverse reactions, the practitioner is responsible for proper documentation in the EMR as to his/her involvement.
- VI. If a patient should present with any of the above adverse reactions due to practitioner error or mechanical malfunction, the Respiratory Manager, nurse, and physician should be notified and an occurrence report generated.

Approved by:		Review/Revision Date:
i i v		05/07/1993
		06/27/1996
/s/	06/22/2023	08/10/1998
Michael Taylor	Date	10/04/1999
Director, Pulmonary Services		08/23/2001
		12/02/2004
		08/29/2007
/s/	08/01/2023	08/01/2010
Shahnaz Rehman, M.D.	Date	08/09/2012
Medical Director		12/01/2015
		04/08/2019
		06/01/2023
/s/	06/29/2023	
Russell Smith	Date	
Senior Hospital Administrator		
Review/Revision Completed By:		
Director, Pulmonary Services		Next Keview Date: June 1, 2026
Policies Superseded by This Policy:		

It is the responsibility of the reader to verify with the responsible agent that this is the most current version of the policy.