CLINICAL GUIDELINE

Airway Pressure Release Ventilation

A. EFFECTIVE DATE:

June 20, 2023

B. PURPOSE:

To prevent Acute Respiratory Distress Syndrome (ARDS) associated lung collapse/atelectasis. Decrease ventilator dependence. Decrease pulmonary shunt. Improve partial pressure of oxygen (PaO2). Improve cardiac output. Patients must be spontaneously breathing; mild sedation may be used. Must be ordered with the approval of the attending.

C. GUIDELINE:

This guideline should be followed for patients with acute respiratory distress syndrome (ARDS).

Airway Pressure Release Ventilation (APRV): APPLYING FROM CONVENTIONAL VENTILATION

1. Positive End Expiratory Pressure (PEEP) high: start low (typically 2-3 centimeter of water (cm H_2O) above patient's mean airway pressure)
   a. If improvement in patient synchrony or ventilatory status is desired, consider increasing Positive End Expiratory Pressure (PEEP) High to decrease spontaneous respiratory rate.
   b. Adjustments in Positive End Expiratory Pressure (PEEP) High will also result in changes of lung compliance and tidal volume.
   c. Positive End Expiratory Pressure (PEEP) High is excessive if tidal volume and respiratory rate deteriorate.
2. Positive End Expiratory Pressure (PEEP) Low: typically, 3-5 centimeter of water (cm H_20)
3. Fraction of inspired oxygen ($FiO_{2)}$ same as in previous mode
4. Frequency Respiratory Rate (RR): 6-14 breaths per minute (bpm)
   a. Frequency can be increased to decrease Partial pressure of carbon dioxide (PaCO2) but keep Time Low less than or equal to 0.8 second (sec). The frequency should allow for a 4:1 ratio of inspiratory and expiratory phases (I:E) ratio or greater, in order to be considered Airway Pressure Release Ventilation (APRV).
5. Time Low: less than or equal to 0.8 second (sec) keeping Time Low CONSTANT
   a. Patient should not be triggering a breath on Time Low.
   b. On flow versus time graph: look for flow at end of exhalation, should not rise to baseline.
6. Tubing compensation or Pressure Support Ventilation (PSV): can be added to make patient more comfortable and to decrease partial pressure of carbon dioxide ($PaCO_2$.)
7. Pressure Support Ventilation (PSV) must be set greater than Positive End Expiratory Pressure (PEEP) High – Positive End Expiratory Pressure (PEEP) Low.

Airway Pressure Release Ventilation (APRV): ADJUSTMENTS

1. To increase oxygenation:
   a. Increase time at Positive End Expiratory Pressure (PEEP) High by lowering respiratory rate
   b. Increase Positive End Expiratory Pressure (PEEP) High
   c. Increase fraction of inspired oxygen ($FiO_{2.}$)
2. To increase ventilation:
   a. Increase rate
   b. Assess patient to ensure appropriate spontaneous breathing
   c. Although it has been shown to provide minimal support to increase ventilation, another option is to add up to 5 Pressure Support Ventilation (PSV) to Positive End Expiratory Pressure (PEEP) High with goal of increasing spontaneous minute volume.

BILEVEL/APRV VENTILATION-CRITERIA FOR TERMINATION

1. Spontaneous respiratory rate (RR) greater than 35
2. Minute ventilation greater than 15 liters (L)
3. Oxygen Saturation ($SpO_{2)}$ less than 88 percent (%)
4. Patient requires increased sedation because of agitation.
5. Apnea
6. Patient with increased work of breathing
7. Inability to correct acidotic or hypoxic Arterial Blood Gas (ABG,) pH less than 7.25, or partial pressure of oxygen ($PaO_{2)}$ less than 55.

D. SCOPE:

All inpatient John Dempsey locations that are serviced by Respiratory Therapists.

E. DEFINITIONS:

Bi-level offers more opportunity for patient/ventilator synchrony because it allows spontaneous breathing with periodic switching between two levels of Positive End Expiratory Pressure (PEEP). Since the respiratory pump remains active, there is less risk of cardiac output compromise.

There are three methods of delivering pressure ventilation which are described in this guideline:

1. Pressure Control Ventilation (PCV) with Synchronized Intermittent Mandatory Ventilation (SIMV)
2. Bi-level: spontaneous breathing at two levels of Positive End Expiratory Pressure (PEEP)
3. Airway Pressure Release Ventilation (APRV): spontaneous breathing at high level of Positive End Expiratory Pressure (PEEP) with short periodic drops in pressure

F. MATERIAL(S) NEEDED:

Ventilator

G. ATTACHMENTS:

None

H. REFERENCES:

None

I. SEARCH WORDS:

None

J. STAKEHOLDER APPROVALS:
On File

K. COMMITTEE APPROVALS:
None

L. FINAL APPROVAL:

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M. REVISION HISTORY :
Date Issued: 06/07/2011
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