

Pediatric Ventilator Application

Course Outline

- Review Benefits of the Passy Muir® Valve
- Identify Proper Pt and Assess Candidacy for In-Line Valve Placement
- Understand Common Ventilator Setting Changes and Safe Alarm Practice
- Step Through Case Studies and Learn By Examples
- The Passy Muir Tracheostomy & Ventilator Swallowing and Speaking Valve
- Physiological Benefits of Passy Muir valve
 - Restores voice and communication
 - Improves swallowing
 - Restores physiological PEEP
 - Improves secretion management
 - Improves oxygenation
 - Promotes weaning and decannulation
 - May decrease risk of aspiration
 - Improves smell and taste

PASSY MUIR VALVE Assessment and Placement “Set Yourself and your Patient up for Success!”

- Patient Selection
 - Cognitive status-awake, responsive
 - Pick a happy time of day
 - Medically stable
 - Able to manage secretions orally
 - Swallow status/risk for aspiration
- *Play, Play, Play!*
 - Best in a play-like environment (bubbles, singing, whistles, etc.)
 - Best in an environment of trust, very perceptive
 - Easily distracted, use this to your advantage!
 - Enjoy lots of positive feedback, a sense of accomplishment
- Placement Guidelines
 - Peer education- team approach!
 - Body position and posture- semi-Fowler's
 - Position of head and neck
- Tube Position is Important!
- Cuffs Versus Non-Cuffed Airways
 - Pediatric artificial airways are typically cuffless
 - If a cuff is present, 100% deflation is mandatory prior to Passy Muir valve placement

- Leak Speech/Ventilator Patient
 - Cuff deflation to allow airflow via upper airway during inspiration
 - Some loss of ventilation- adjust to compensate
 - Can vocalize during inspiration
 - Why is this not optimal?
- Ventilators That are Passy Muir Valve Compatible
- Ventilator Criteria Suggestions
 - Patient on $<.60$ FiO_2
 - PEEP requirements of <15 cm H_2O
 - PIP less than 40cm H_2O
- Assessment Criteria
 - Observe pre-Passy Muir valve PIP
 - Observe pre-Passy Muir valve exhaled V_t
 - If cuffed, achieve cuff deflation – slowly over 1-2 minutes – assess volume loss
 - Listen for tracheal BS and assess leak
- Assessment Criteria
 - Determine if leak is present:
 - Patient can exhale around the properly sized trach tube
 - Airway above the cuff must be patent
 - Direct visualization to evaluate/assess Passy Muir valve candidacy in pediatric patients
- Assessment Criteria
 - 100% cuff deflation is mandatory!
 - Patient must be able to exhale past the tracheostomy tube and through upper airway
 - Assess air leak/decreased ventilation?
 - Compensate with ventilator changes
- Cuff Inflated-Closed Circuit
- Cuff Deflated-Open Circuit
- Passy Muir Valve In-line
- Ventilator Adjustments
- Ventilator Assessment and Adjustments
 - PEEP on/off
 - Consider turning PEEP down by $\frac{1}{2}$ as a starting point
- Ventilator Assessment and Adjustments
 - Pressure versus flow trigger
 - Make sure vent is not auto-cycling
- Ventilator Assessment and Adjustments
 - Volume compensation during cuff deflation
 - Increase V_t in small increments to achieve pre-cuff deflation pressures (PIP)
- Pressure Assessment and Adjustments

- Pressure compensation during cuff deflation
 - Seldom increase PC (sometimes decrease) in small increments to achieve audible voice and adequate ventilation
- Ventilator Assessment and Adjustments
 - Pressure Support
 - Use exp % sensitivity, inspiratory cycle off to time limit PS breath, or set I-time
 - Pressure Control
 - Set I-Time
- Alarm Assessment and Adjustments
 - Use low pressure alarm as disconnect/indirect low exhaled Vt Alarm (set above 10cm H2O and best if set 5-10 cm below PIP)
 - Set high pressure limit appropriately (set 10-15cm H2O above PIP)
- Ventilator Assessment and Adjustments
 - Consider NIPPV mode
- Recapping
 - Adjust PEEP
 - Slow cuff deflation
 - Monitor pressure/volume loss
 - Place Passy Muir valve
 - Compensate for volume or pressure loss
 - Time limit PS breaths
 - Set alarms appropriately
- Humidification
 - Use with Heat/Moisture Exchanger (HME) is Ineffective
 - Use with Heated Humidified Systems
 - Remove Passy Muir valve for medicated treatment
- Ventilator Connections
- Let's Pick a Patient
- Team Approach
- Patient from Peoria Eating
- Step Through the Process
 - Age appropriate education for patient and family
 - Educate staff
 - Place warning labels provided
 - Position body and neck/trach
 - Note PIP and inhaled and exhaled Vt
 - Pulmonary Toilet – oral care
 - If present, S L O W cuff deflation re-assess airflow – Vt and PIP
- Patient Assessment
 - Oxygenation
 - Vital Signs

- Breath Sounds
 - Color
 - WOB - abdominals
 - Patient Responsiveness
 - Assess for back pressure (PSSH sound)
- Distress... Signs and Symptoms
 - Increased RR, HR
 - Anxiety and fear
 - Restlessness
 - Increased irritability
 - Stridor
 - Grunting (infants)
 - Retractions
 - Nasal flaring
 - Head bobbing
 - Sniffing position
 - Decreased BS during auscultation
 - Decreased chest movement
 - Decreased LOC
 - Decreased PaO₂ (SaO₂)
 - Increased PaCo₂
 - Paleness or cyanosis
 - Decreased perfusion/mottling
 - Bradycardia/hypotension (this is a late sign)
- Case Study #1 – 15 mo old BPD Pressure Ventilating
- Vent Settings
 - SIMV 12
 - PC 18cm
 - PEEP 8cm
 - PIP 26cm
 - FiO₂ .24
 - PS 12 cm
- Step Through the Process
 - Age appropriate education for pt and family
 - Educate staff
 - Place warning labels provided
 - Position body and neck/trach
 - Note PIP and inhaled and exhaled Vt Pulmonary Toilet – oral care
 - If present, S L O W cuff deflation
 - Re-assess airflow – Vt and PIP
- Passy Muir Valve Placement Assessment
 - PC set at 18cm (we did not change it)
 - PEEP decreased to 4cm
 - Place Passy Muir valve

- PIP now 22cm (not fluctuating)
 - Pt has great cough! (closed glottis)
 - Pt may begin to make sounds
 - Successful???
- Patient from Peoria on Vent
- What if... Troubleshooting
 - EXAMPLE:
 - Let's say with each breath the PIP climbed 3-6 cm at a time. Pt begins to have increased abdominal WOB. Pressure limit alarms.
 - What is wrong?
 - You are not sure, so you remove the circuit and hear a "hiss" sound come from the trach.
 - What is this telling you?
- Case Study #2 Volume ventilation
- Servo I
 - Vent Settings: SIMV 10
 - Vt 250 cc (PIP 28 cm)
 - PEEP 8 cm
 - FiO2 24%
 - PS 15 cm
 - Servo i when in ICU
 - Trach X 2 weeks w #5.0 peds tube
- Step Through the Process
 - Educate pt and staff
 - Place warning labels
 - Position body and neck/trach
 - 1/2 PEEP
 - Note PIP and exhaled Vt
 - Pulmonary Toilet – oral care
 - S L O W cuff deflation
 - Re-assess airflow – Vt and PIP changes
- Cuff Deflation Assessment
 - Exhaled Vt is now 175cc (was 250)
 - PIP is now 23cm (was 28 cm)
 - Pt has poor cough
 - Pt is not making any sounds
 - Would you place a Passy Muir valve?
- Valve is Not Placed In-Line
 - Why not?
 - What are your recommendations?
- Trach tube #4 Shiley
 - You changed to # 4.0 Peds tube and your assessment is now:

- Exhaled Vt 80cc (was 250)
- PIP is now 8 cm (was 28)
- Pt is coughing
- Pt is verbalizing, but seems to be able to produce speech on inspiration and expiration– continuous flow in circuit?
- What 2 things should you troubleshoot?
- Troubleshooting
 - Is the PEEP continuous flow? (½ ?)
 - Can you time limit PS on your ventilator?
 - Inspiratory Cycle off – Servo I (up to 70%)
 - Exp % Sensitivity on other vents
 - Set an inspiratory time for PS breath
 - Consider NIV mode
- Add An External Low Pressure Alarm
 - Safety back-up systems to alert practitioners to disconnects and low pressures are MANDATORY if you eliminate low volume alarms!
- Add An External Low Pressure Alarm
 - Connect tubing to the back of this particular external low pressure alarm box
- Add An External Low Pressure Alarm
 - Now this external low pressure alarm should also be set above 10cmH₂O, and preferably 5-10cm below PIP
- Toby Tracheasaurus
- Care, Cleaning and Lifetime of the Passy Muir Speaking Valves
 - Swish in mild soapy warm water, rinse in clear water, allow to air dry
 - Average lifetime of 2 months

Educational Opportunities

WEBINARS or **SELF STUDY COURSES**

Application of Passy Muir Swallowing and Speaking Valves Interdisciplinary

Tracheostomy Team: Where Do I Start?

Ventilator Basics for the Non-RT

Ventilator Application of the Passy Muir Valve

Pediatric Tracheostomy and Use of the Passy Muir Valve

Pediatric Ventilator Application of Passy Muir Valve

Swallow Function: Passy Muir Valve Use for Evaluation & Rehabilitation

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