Speaking Valve Use with Tracheostomy and Mechanical Ventilation: Now, Weôre Talking!

Presented in 2025

Speaking Valve Use with Tracheostomy and Mechanical Ventilation: Now, We're Talking!

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Welcome!

- In-Person Considerations
  - Social awareness
  - Networking options
  - Presentations
  - Groups: Purple and Aqua
    - Hands-On
    - Demonstrations
    - Case studies/mock assessments
  - Panel discussions
  - Food and drink

2

Speaker Disclosures:

Financial: Full-time with Passy-Muir, Inc.
Non-financial: No relevant non-financial disclosures

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Disclosure

Portions of the information in this seminar relate to products of Passy-Muir, Inc. The content of the seminar is for your general educational information only. Information you learn cannot replace your clinical judgment or the judgment of treating physicians and other healthcare professionals working with patients. The information provided in this seminar should not be considered as medical advice.

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Seminar Overview

Fundamentals: From Tracheostomy Tubes to Mechanical Ventilation Terminology

- 7.5 hours today
- Up to 6 recorded hours
  - 1 pre-requisite webinar hour
  - 5 post-seminar recorded webinar hours
- 13.5 total hours, if all are completed.

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Pre-requisite webinar

- *Fundamentals: From Tracheostomy Tubes to Mechanical Ventilation Terminology*
- Overview of:
  - Tracheostomy tubes
  - Cuff types and management
  - Considerations as it relates to speaking valve use
  - Review of terminology related to mechanical ventilation
  - Implications for patient management

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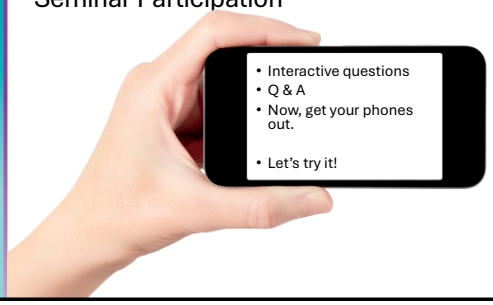
Seminar Participation



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What is the actual color of the PMV 007?

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8

Assessment and Placement: Non-Ventilator

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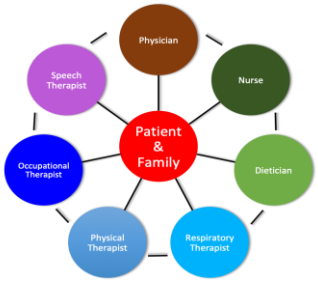
Interdisciplinary Airway Management Team



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Begins in the ICU: Effects of Bed Rest

- The negative impact of bed rest is well known
- No evidence supports efficacy of bed rest
- Disuse atrophy at the cellular level begins within 4 hours of implementing bed rest
- Healthy adults, bed rest[1]
  - Strength declined by 1 – 1.5% per day
  - Mood changes
  - Loss of coordination, balance and work tolerance
  - Casting: Strength declines by 25% in 7 day[2]

- Griffiths et al. Nutrition 1995; 11:428-432
- De Jonghe et al. CCM 2000; S309-315

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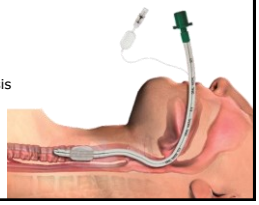
Endotracheal Tube Considerations

- Intubation
  - Why?
    - Respiratory compromise due to injury or illness
    - Potential for respiratory compromise
  - Potential side effects
    - Mucosal injury
    - Injury to the vocal folds
    - Tracheal edema, ulceration, and stenosis



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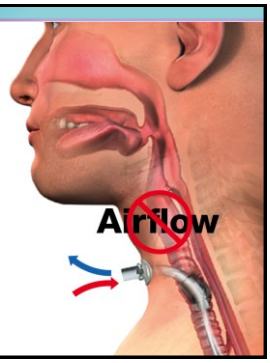
Physiologic Changes after Tracheostomy

Respiration: Patient inhales and exhales through open trach tube. No airflow past inflated cuff



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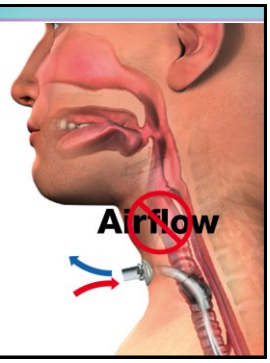
Physiologic Changes after Tracheostomy

- Speech
- Smell
- Taste
- Sensation
- Reduced positive airway pressure
  - Poor secretion management
  - Reduced cough



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Cuff: Choices and Management

- Cuff up or down?
  - Purpose of cuff
  - Cuffs and aspiration
- Cuff pressures
  - 20 - 25 cmH_2O
  - Minimal leak
  - Minimal occlusion

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Clinical Complications of Cuff

- Esophageal impingement
- Backflow
- Necrosis and trauma
- Laryngeal tethering
- Late complications
  - Granuloma - stenosis
  - Tracheomalacia
  - Fistulae

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Application of the PMV: Non- Ventilator

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Researchers: Medical errors now third leading cause of death in United States

such as communication breakdowns when patients are handed off from one department to another.

Published: May 3, 2016

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Reminder: Passy-Muir Valve

PMV 2001 (Purple color™)

- Bias-closed
- No-leak

What are the benefits of the Valve?

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What is a benefit of using the Passy Muir Valve?

ⓘ Start presenting to display the poll results on this slide.

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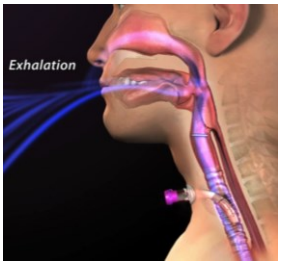
Benefits of Closing the System with PMV

- Restores normal physiology
- Reconnects the upper and lower airway
- Providing a closed system
  - Communication
  - Smell and taste
  - Secretion management
  - Sensation
  - Cough
  - Swallowing
  - Positive airway pressure
  - Quality of life



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Psychological Benefits

- Communication with family
- Participation in decision making
- Reduced sense of isolation/ anxiety
- Better sense of well-being
- Communication with caregivers

- Freeman-Sanderson, A. L., Togher, L., Elkins, M. R., & Kenny, B. (2018). Quality of life improves for tracheostomy patients with return of voice: A mixed methods evaluation of the patient experience across the care continuum. Intensive Critical Care Nursing, 46:10-16. doi:10.1016/j.iccn.2018.02.004
- Freeman-Sanderson, A. L., Togher, L., Elkins, M. R., & Phipps, P. R. (2016). An intervention to allow early speech in ventilated tracheostomy patients in an Australian intensive care unit (ICU): A randomised controlled trial. Australian Critical Care, 29(2), 114. doi:10.1016/j.aucc.2015.12.012
- Freeman-Sanderson, A. L., Togher, L., Elkins, M. R., & Phipps, P. R. (2016). Quality of life improves with return of voice in tracheostomy patients in intensive care: An observational study. Journal of Critical Care, 33, 186-191. doi:10.1016/j.jcrc.2016.01.012
- Freeman-Sanderson, A. L., Togher, L., Elkins, M. R., & Phipps, P. R. (2016). Return of voice for ventilated tracheostomy patients in ICU: A randomized, controlled trial of early-targeted intervention. Critical Care Medicine, 44(6), 1075-1081. doi:10.1097/ccm.0000000000001610

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Impact on PEEP

- Closed System vs Open
  - Improved gas exchange
  - Improved oxygen saturation levels
  - Decreased risk of atelectasis
- "My patient is not tolerating cuff deflation trials"

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Initiating the Assessment: Team Approach

- Have a plan: Who does what
- Block off the time
- Education
- Reassure the patient
- Perform good oral care
- Suctioning as needed
- Body position and posture
- Position of head, neck, and tracheostomy tube

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Patient Selection

- Awake and alert
- Medically stable
- Complete cuff deflation
- Manageable secretions
- Patent upper airway

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Checklist: Take Baseline Measurements

- Oxygenation
- Vital signs
- Breath sounds
- Color
- Work of breathing
- Patient responsiveness

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Education

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Warning Label

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Suctioning

- Competencies
- When to suction
- How often
- Oral and tracheal
- Secretions?
  - Color
  - Smell
  - Thickness

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What is the best way to determine that the cuff is fully deflated?

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Deflate Cuff

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Assess Upper Airway Patency

- Deflate cuff
- Ask patient to inhale
- Finger occlude and speak or cough on exhalation
- Transtracheal pressure measurements

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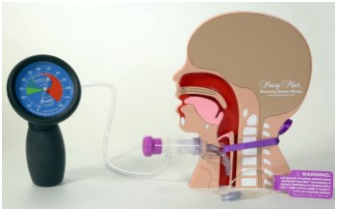
Assessment for Placement

- Transtracheal pressure measurements
  - Back pressure
  - Air trapping
  - Assessing for patent upper airway



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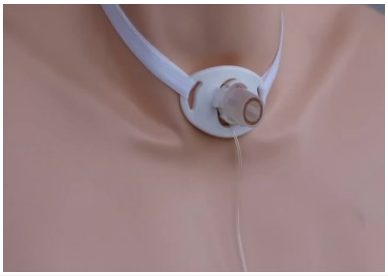
PMV Placement



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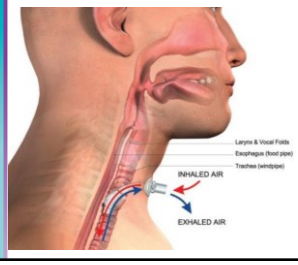
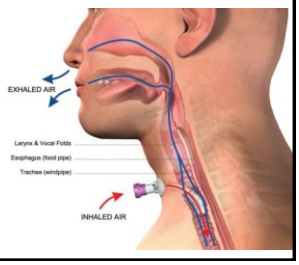
Airflow After Tracheotomy



Airflow with Closed System



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Initial Placement: Coughing

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Initial Placement: Voicing

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Advantages of a Closed Respiratory System vs Open Tracheostomy

- Open tracheostomy
  - Reduced airflow
  - Reduced positive airway pressure
  - Reduction in the pressurized system
- Closed Respiratory System
  - Allows graded exhalation and pressure regulation
    - Feeding and Swallowing
    - Posture and balance
    - Upper extremity force/strength

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Pressurized System

- Restored or improved pressurized system:
  - Intraoral
  - Subglottic pressure
  - Respiratory – PEEP
  - Esophageal ??
  - Intrathoracic
  - Respiratory
- Leads to improved:
  - Feeding and swallowing
  - Cough and throat clear
  - Trunk support and postural control
  - Respiratory function

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Wear Time

- Patient specific
  - Patient's cognitive status
  - Medical needs
- Minutes to hours
- Treatment plan

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More Education

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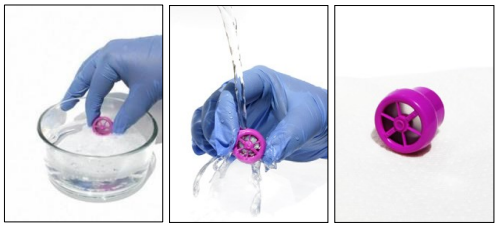
Care and Cleaning

- Average lifetime of 2 months



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Decannulation

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Pre and Post Decannulation

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In Summary: What has been accomplished?

- Early intervention:
  - Avoid disuse atrophy
- Close the system to improve:
  - Phonation: access to vocal communication
  - Sensation and secretion management: cough and throat clear
  - Taste and smell
  - Time to weaning and decannulation

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Troubleshooting and Treatment

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Cuff issue?

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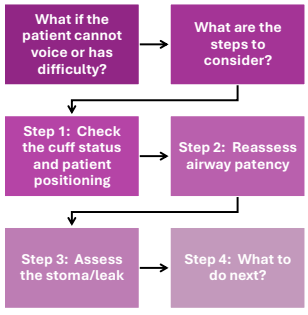
Transitioning and Troubleshooting



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No Voice

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Too Many Secretions

50

Case Study: Troubleshooting

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What were some signs of distress that the patient was showing?

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What are possible causes of back pressure?

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Factors Affecting Expiratory Air Flow

- Size or type of tracheostomy tube
- Presence and degree of obstruction
- Edema
- Secretions
- Incomplete cuff deflation
- Tube position

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Airway Obstruction

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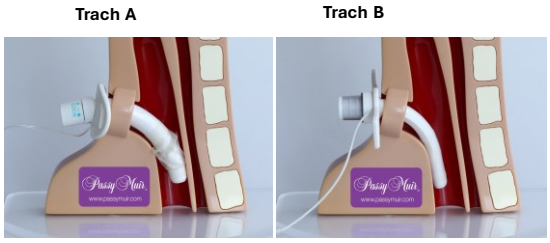
Troubleshooting:
Downsize or Different Brand Tube



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Case Study: Resolution

57

Questions to Determine Therapy

- What is diagnosis?
- Why do they have difficulty with:
  - Voice?
  - Breath support?
  - Language and/or cognition?
  - Dysarthria?
- What about swallowing?

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Goals

- Wear time
  - Patient will wear the speaking Valve:
    - For ____ minutes to improve communication.
    - During ___-minute therapy session without need for Valve removal.
    - For ____-hour periods of time while awake.
- Other goal areas that impact wear time
  - Participate in conversation with audible voicing on _____ out of _____ sentences.
  - Complete _____ number of RMT tasks while wearing the speaking Valve.

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Break: 15 Minutes

60

Basics of Ventilator Application of the No-leak Valve

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Indications for Invasive Mechanical Ventilation

- Can no longer support with NIV
- Airway protection
- Hypercapnic respiratory failure
- Hypoxemic respiratory failure
- Cardiovascular distress
- Anticipated patient decline or impending transfer

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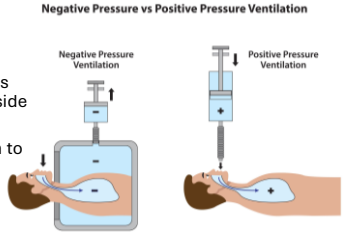
Positive Pressure Ventilation

- The primary approach to mechanical ventilation is positive pressure
- The flow's driving pressure is higher than the pressure inside the lungs
- The pressure is high enough to overcome resistance



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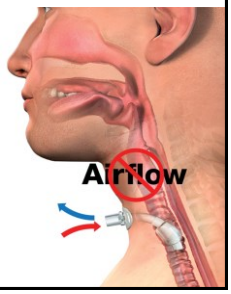
Invasive Ventilation

- Usually requires airway to be sealed with little to no leak present.
- Seal is achieved with a cuff at the end of the artificial airway.



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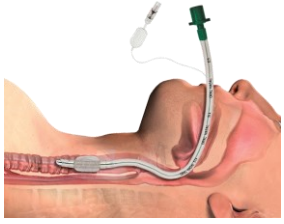
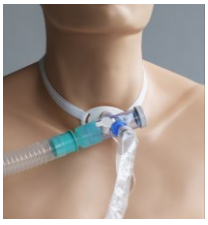
Invasive Ventilation

- Endotracheal Tube



- Tracheostomy Tube



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Modes of Ventilation

- Control Modes
  - Continuous Mandatory Ventilation (CMV)
    - Assist Control (A/C)
- Spontaneous Modes
  - Pressure Support (PS)
  - Continuous Positive Airway Pressure (CPAP)
- Combination Mode
  - Synchronized Intermittent Mandatory Ventilation (SIMV)

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Ventilator Settings

Requiring physician order:

- Mode (A/C, SIMV)
- Breath Type:
  - Pressure Control (PC)
  - Volume Control(VC)
  - Pressure Support (PS)
  - Pressure Regulate Volume Control(PRVC)
- Frequency(f)/Respiratory Rate(RR)
- Positive End-Expiratory Pressure (PEEP)

Therapist driven:

- FiO_2
- Flow rate
- Trigger sensitivity
- Inspiratory time/flow limits
- Alarm settings

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Measured Ventilator Parameters

- Exhaled Tidal Volume
- Exhaled Minute Volume
- Peak Inspiratory Pressure (PIP)
- Total Respiratory Rate
- Mean Airway Pressure
- PEEP

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Steps For In-line Valve Placement

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Why use a Passy-Muir Valve with patients who are mechanically ventilated?

- Verbal communication
- Improved lung recruitment and diaphragm involvement
- More rapid weaning from the ventilator
  - Rehabilitation tool
- Improved secretion management
  - More effective cough
  - Reduces need for suctioning
- Improves quality of life

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Step 1: Assessment

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Patient Selection Criteria

- Awake and alert
- Hemodynamically stable
- Able to manage complete cuff deflation
- Manageable secretions
- Patent Airway

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Establish Baseline: Assess Vital Signs and Work of Breathing

- Oxygenation
- Vital Signs
- Breath sounds
- Color
- Work of breathing
- Patient responsiveness

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Assess Ventilator Parameters

Three parameters that give you the general state of your patient's respiratory status:

1. FiO_2
2. PEEP
3. PIP

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Assess Ventilator Parameters

FiO_2

- Fraction of inspired Oxygen
- Room Air 21%
- Supplemental O_2 > 21%

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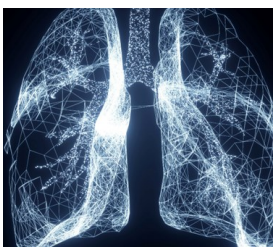
Assess Ventilator Parameters



PEEP

- Positive End-Expiratory Pressure
- Resistance to exhaled volume that creates back flow and pressure that stents the alveoli open
- PEEP and FiO_2 work together to improve oxygenation

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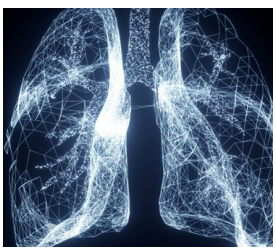
Assess Ventilator Parameters



PIP (Peak Inspiratory Pressure)

- The max amount of pressure to deliver volume
- Sum of the inspiratory pressure required to deliver volume + PEEP
- PIP indicates the compliance of the lungs

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Suggested Ventilator Parameters

- $FiO_2 \leq .50$
- PEEP ≤ 10 cmH_2O
- PIP ≤ 40 cmH_2O
- Any conventional mode of ventilation is compatible with the Valve.

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Step 2: Patient Preparation and Education

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Team Approach

- Timing and tube selection
- Introducing a speaking valve
- When to downsize
- Plan of care
- Decannulation
- Impacts continuity of care
- Impacts safety, length of stay, and cost

81

Patient Preparation

- Body position and posture.
- Position of head, neck, and tracheostomy tube.

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Pre-Placement, General Observations, and other Considerations

- Have a plan and block time
  - Pick a good time of the day
  - Reduce noise and interference
- Education
  - Reassure the patient
- Address pain issues
- Position the patient

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Step 3: Assess For Airway Patency

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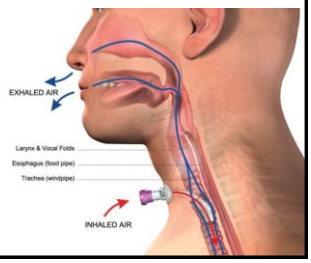
Airway Patency Assessment with Mechanical Ventilation

- Requires complete cuff deflation
- Assess the leak or airflow into the upper airway
- Use vent parameters to determine airway patency
- The type of breath matters



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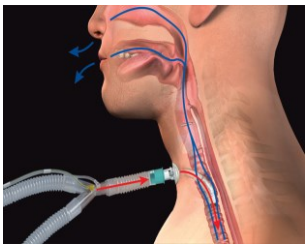
Cuff Deflation and Mechanical Ventilation

1. Set parameters do not change when cuff is deflated.
2. Cuff deflation generates less resistance to flow.
3. Ventilatory system is no longer sealed, there is a leak.



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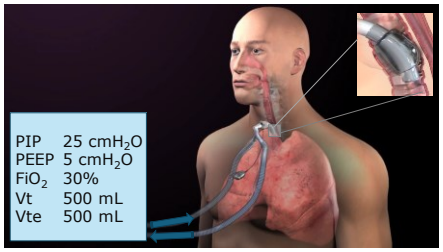
VC: Patient Assessment



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Ventilator Assessment

- Note Vent Settings:
  - Set Vt
  - PEEP
  - RR/f
  - FiO_2
- Note Vent Measurements
  - PIP
  - Exhaled Vt (Vte)
  - Total RR
  - MV

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Upper Airway Patency Assessment

- Turn Down PEEP
  - PEEP down by 5
- Then,
  - Slow cuff Deflation

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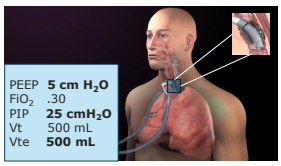
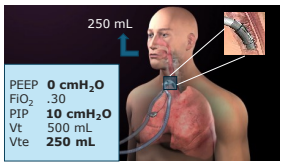
Upper Airway Patency

Cuff Inflated-Closed Circuit



Cuff Deflated-Open Circuit



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Upper Airway Patency Assessment

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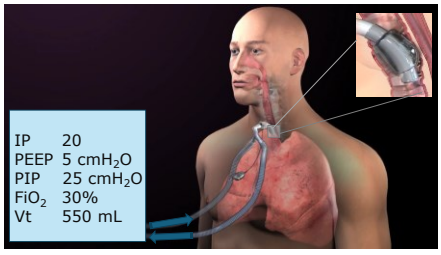
PC: Patient Assessment



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Ventilator Assessment

- Note Vent Settings:
  - Set IP
  - PEEP
  - RR/f
  - FiO_2
- Note Vent Measurements
  - PIP
  - Exhaled Vt (Vte)
  - Total RR
  - MV

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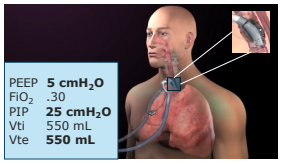
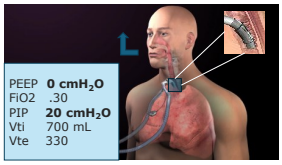
94

Upper Airway Patency

Cuff Inflated-Closed Circuit



Cuff Deflated-Open Circuit



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Step 4: Assemble the Necessary Parts & Pieces

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Ventilator Connections

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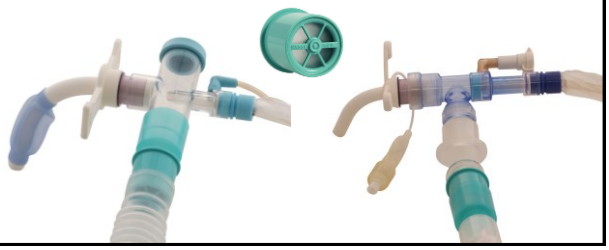
In-line Placement of the PMV® 2001 (Purple color™)

98

In-line Placement of the PMV® 007 (Aqua color™)



99

Step 5: Place the Valve In-line and Assess the Patient

100

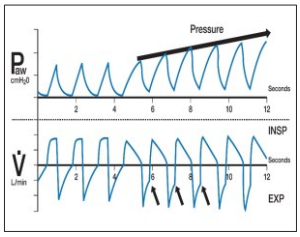
Vital Signs and Work of Breathing

- Oxygenation
- Vital Signs
- Breath sounds
- Color
- Work of breathing
- Patient responsiveness

101

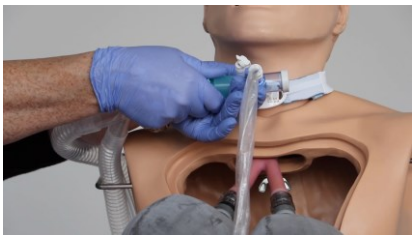
Troubleshooting

- PIP increases with each breath
  - Increased WOB is observed
  - High pressure limit alarms
- Valve is removed
  - A loud whooshing sound heard from the tracheostomy tube
- What could cause this?
- Recommendations?



102

Listen for Back Pressure



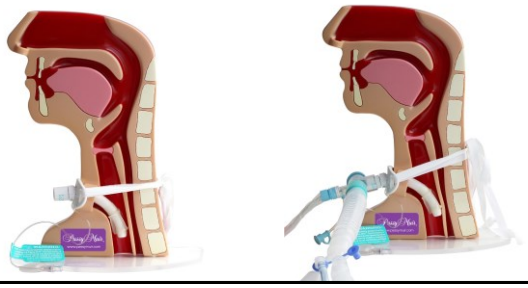
103

Factors Affecting Airway Patency

- Tracheostomy tube
- Cuff issues
- Airway obstruction

104

Importance of Tube Position



105

FOME-Cuff®

Self-sealing

CONTRAINDICATED For Passy-Muir Valve USE

106

Step 6: Adjust the Vent as Necessary

107

Consider Switching to NIV

- Approach to breath delivery is very similar to invasive ventilation.
- Difference is, there is almost always a leak present.

108

NIV

- Almost always a leak present.
- Flow loss makes it difficult to measure pressures and volumes.
- Most parameters are calculated instead of measured.

109

Considerations with NIV

- Airway patency assessment should not be done in NIV.
- Uses the same settings or as close as possible.
- Maybe necessary to do a trial prior to cuff deflation and Valve placement.

110

Ventilator Assessment and Adjustments

- Adjust PEEP
- Evaluate sensitivity
  - Pressure vs. Flow Trigger

111

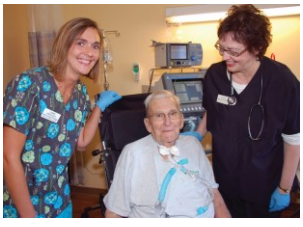
Ventilator Assessment and Adjustments

- Volume compensation
  - Increase V_T in small increments to achieve pre-cuff deflation PIP

112

Ventilator Assessment and Adjustments

- Pressure Ventilation
  - May adjust to achieve audible voice and adequate ventilation



113

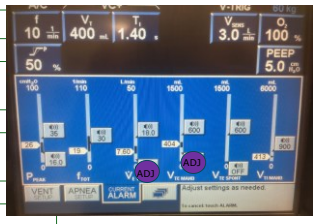
Ventilator Assessment and Adjustments

- Flow limit
  - Increase the % flow deceleration
  - Ranges 20 to 80%
- Time limit
  - Set I-time
  - 1 second for most adults

114

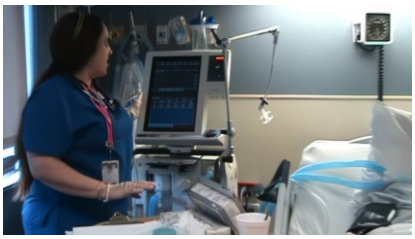
Alarm Settings – Safe Practice

- Low exhaled Vt and Ve alarms
- Low pressure alarm
  - Set 5 to 10 cmH_2O below PIP
- High pressure alarm
  - Set 10 cmH_2O above PIP
- High respiratory rate
  - 10 to 15 above baseline



115

Ventilator Settings and Alarm Management



116

Case Study: Vent

117

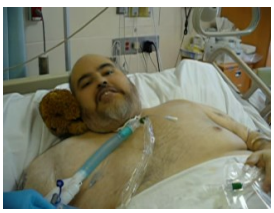
Gil

- Ventilator settings:
  - A/C RR 8
  - V_T 700 mL
  - PIP 25 cmH_2O
  - PEEP 5 cmH_2O
  - F_IO_2 .28
- Tracheostomy
  - 1 month
  - Size 8 Shiley XLT

118

Cuff Deflation Assessment

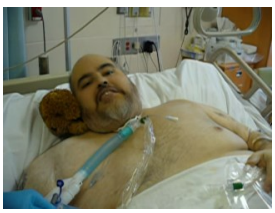
- Adjust PEEP
- Slow cuff deflation
- Ventilator:
  - Exhaled V_T 300 mL
  - PIP 12 cmH_2O
- Patient:
  - Weak cough
  - Voicing
- Should the Valve be placed in-line?



119

Vent Changes Increase Success

- Valve is placed in-line
- Assessment reveals:
  - Whispers only
  - Poor chest expansion
  - Increased RR
- What ventilator change could be made?



120

Vent Changes Increase Success

- Vent change:
  - Increase V_T to meet but not exceed pre-cuff deflation PIP

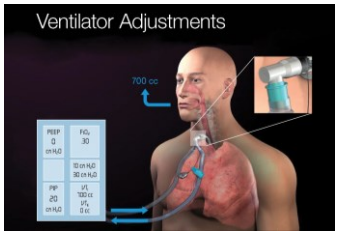
121

Gil

122

123

Ventilator Demonstration

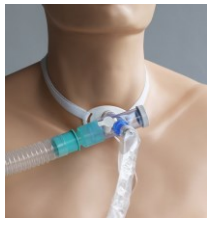


124

Breakout Sessions: Tracheostomy Tubes and PMVs, Cuff Management, Vent Application, and Mock Assessments

125

Placing a Valve In-Line



126

Tracheostomy Tubes and PMVs: Purple Team

127

Cuff Management: Aqua Team

128

Mock Assessments: Purple and Aqua Teams

129

Case Study #1: Non-Vent

- 68 y/o male
- Admitted for complications related to OSA
- PMH: obstructive sleep apnea, hypertension, type II diabetes, hypercapnia, chronic pain, BMI > 40, peripheral neuropathy, GERD, nocturnal CPAP with full face mask, depression
- Surgical history:
  - Prior admission: Patient had tonsillectomy to improve airflow through the upper airway with full face CPAP mask.
  - Current: Surgical tracheotomy performed 4 days ago. Patient received #8 Shiley XLT, cuffed.
- Patient is awake and alert, communicating with finger occlusion and nonverbal communication (gestures and writing) during the day. Patient demonstrates frequent coughing and is suctioned regularly.
- Consult received for PMV assessment.

130

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What other information would you like to know?

ⓘ Start presenting to display the poll results on this slide.

131

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Does this patient meet the criteria for PMV assessment?

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132

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Put the following steps in order for this patient's assessment.

ⓘ Start presenting to display the poll results on this slide.

133

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What additional recommendations should be considered?

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134

Case Study #2: Non-Vent

- 59 y/o male
- Admitted for surgical management of laryngotracheal stenosis
- PMH: laryngotracheal stenosis, lupus, HTN, GERD, depression, CAD, lupus nephritis
- Surgical history:
- Laryngotracheal reconstruction
  - Suprastomal stent
  - Tracheotomy with #6 cuffless Shiley
- Patient is awake and alert, medically stable, demonstrating desire to communicate
- Consult received for PMV assessment

135

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What do you need to know more about to complete an assessment of this patient?

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What considerations would you have with a history of laryngotracheal reconstruction?

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What factors do you want more information about?

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Please download and install the Slido app on all computers you use

Does the position (suprastomal) of the stent make a difference?

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139

Case Study #3: Non-Vent

- 52 y/o female
- Admitted for SOB
- PMH: hypertension, type II diabetes, chronic kidney disease, SARS-CoV-2, dyspnea, airway stenosis
- Previous hospitalization: SARS-CoV-2, intubated for 26 days, discharged 1 week ago to inpatient rehabilitation
- Patient continued to complain of shortness of breath with rest and exertion, occasional stridor noted, crackling breath sounds
- Surgical history:
  - Laryngoscopy: airway stenosis
  - Surgical tracheotomy: # 6 Bivona TTS
- Chest X-ray: RLL pna, aspirates
- MBSS: open tracheostomy tube, pharyngeal dysphagia with aspiration of thin liquids
- Supplemental oxygen at 3L via trach mask
- Consult received for PMV assessment.

140

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Do you have enough information to proceed with this assessment?

ⓘ Start presenting to display the poll results on this slide.

141

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Put the following steps for this patient's assessment in the proper order.

ⓘ Start presenting to display the poll results on this slide.

142

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Which instrumental assessment would you consider for this patient?

ⓘ Start presenting to display the poll results on this slide.

143

Case Study #1: Vent

Patient history:
- Admitted to ICU s/p pneumonia w/ 2 failed extubations
- h/o smoking, HBP, mild COPD
- Trached 2 weeks earlier
- Shiley #7 cuffed

Clinical findings:
- Awake, alert, following commands
- HR and SpO_2 are normal
- Hemodynamically stable

Pre-Cuff Deflation:

Settings:			Measurements:		
AC/VC			PIP	=	25 cmH_2O
RR	=	16 bpm	RR	=	18 bpm
Vt	=	500 mL	Vte	=	500 mL
PEEP	=	5 cmH_2O			
FIO_2	=	40			

Post-Cuff Deflation:

Settings:			Measurements:		
AC/VC			PIP	=	17 cmH_2O
RR	=	16 bpm	RR	=	18 bpm
Vt	=	500 mL	Vte	=	
PEEP	=	0 cmH_2O			
FIO_2	=	.40			

144

Are the patient's vent parameters stable?

145

What should you adjust on the vent to avoid auto-triggering?

146

Case Study #2: Vent

Patient history:	• 62 y/o male. s/p intubation for COVID for 45 days; no significant PMH; bedside/perc trach 2 weeks ago. • Admitted to step-down ICU 3 days earlier. • Bivona #6, Fome-Cuff	
Clinical plan and findings:	• Weaning from the vent • Trial PMV • SpO_2 = 96% • Hemodynamically stable • No s/s of respiratory distress	
Pre-Cuff Deflation:	**Settings:** AC/VC RR = 16 bpm Vt = 500 mL PEEP = 5 cmH_2O FiO_2 = .48	**Measurements:** PIP = 25 cmH_2O RR = 18 bpm Vte = 499 mL

147

What vent adjustment is recommended before cuff deflation?

148

Will the PIP drop?

149

Trachlore, Barriers, and More

- Panel Discussion – starting point:
  - You have to wait until a patient is weaned from the ventilator.
  - Our patients are too sick to use a Valve.
  - You need a fenestrated tracheostomy tube.
  - We have to keep the cuff inflated due to aspiration.
  - My patient cannot tolerate cuff deflation trials, so they are not ready for a Valve.
  - My patient speaks with a leak, so a Valve is not needed.
- What have you heard?

150

Audience Q&A

151

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  - Upper righthand corner
  - Labeled "Enter Meeting Code Here"
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