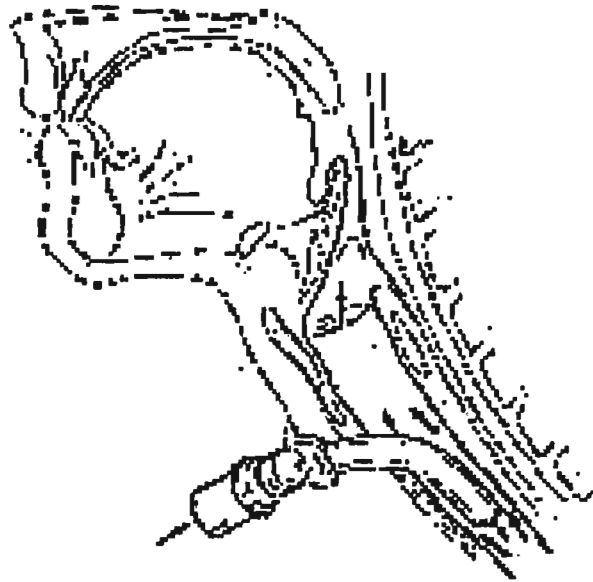


Passy-Muir Speaking Valves



Competency Resource Manual

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Who is responsible for completing this competency?

RCPs are required to review all the material and complete the PMV test and competency demonstration, including making appropriate ventilator adjustments. RNs and SLPs are required to review the material and complete the PMV test and competency demonstration with the exception of the procedures pertaining to ventilator use. All other caregivers must contact an RCP or RN for valve placement. The RCP is the resource person for questions about PMV use in general and will make the final determination about appropriateness for a specific patient. If a patient is in distress, any caregiver may remove the PMV but **MUST** report immediately to the RCP giving specifics of the situation, especially since the PMV may not be the cause of the problem.

What does the Passy-Muir Valve (PMV) do?

The Passy-Muir Valve (PMV) is a one way valve, meaning the air passes through it in one direction only. When attached to the trach tube, the tracheostomized patient inhales through the trach tube and exhales through the upper airway and vocal cords, allowing for vocalization. The PMV is not a voice prosthesis and cannot be used for complete laryngectomy patients. It is also not designed for use with an ETT tube.

When a patient has a trach tube for airway management or mechanical ventilation, the cuff around the tube is inflated and all the air passes in and out through the trach tube. The exhaled volumes can then be measured by the ventilator. No air is exhaled through the upper airways, past the vocal cords therefore the patient is unable to vocalize. If the cuff has a leak or is purposely deflated, as with a non ventilator patient, the patient will get some exhaled airflow through the upper airway and may be able to voice. The majority of the exhaled air will still follow the path of least resistance and exit through the trach tube. With the Passy-Muir Valve in place, all the air is diverted through the upper airway and there is no exhaled flow through the trach tube.

The PMV is unique in that, unlike other speaking devices, it does not require the patient to exhale against the valve diaphragm to close off exhalation through the trach tube. The valve opens with minimal inspiratory effort and as the lungs fill and inspiratory flow decreases, the valve closes and seals just before the end of inspiration. In this way, the patient does not need to expend effort to exhale against the valve in order to divert airflow through the upper airway. An additional benefit of this is that since air is trapped in the trach tube, and there is no exhalation through it, secretions will not be expelled into the valve. Because the valve closes before the end of inspiration and forms a tight seal, it is possible to use the PMV with mechanically ventilated patients.

What PMV products are available?

Passy-Muir manufactures 3 valve styles. All the valves are interchangeable for use directly on a trach tube or with the ventilator circuit, however only the aqua 007 is designed to fit securely with disposable ventilator tubing. Currently this is the only PMV that SEASH routinely has in stock.

The original white valve has been replaced with the updated version 2000 (clear and purple) series valves. These valves require non-disposable tubing (which is not available at SEASH) in order to be used with a

ventilator. Passy-Muir also makes a valve to fit with the Pilling Weck updated Jackson type metal trach tubes. This valve (2020) comes with a small silicone sleeve that fits over the hub of the metal trach tube. The PMV then fits securely over this sleeve. All the 2000 series valves come with a securing strip which attaches to the trach ties, helping to prevent loss while maintaining quick availability for patient use. Passy-Muir also makes a snap on O2 adapter for the 2000 series valves. Small bore O2 tubing is attached to the adapter and oxygen flow is titrated to the patient's SpO2 levels. Although these are currently not available at SEASH, they may be ordered if needed for a specific patient.

Each PMV comes in a color-coded, zippered package that includes both clinician and patient / family educational materials, a storage cup, trach tube pilot line warning labels, cleaning instructions and chart labels. These materials should be sent with the patient being discharged with a trach and speaking valve.

What are some of the reasons for using the PMV?

Because of its positive closure design, the PMV is the only speaking valve that can be used with both ventilator and non ventilator patients, from infant to adult. The clinical benefits of the PMV include:

- A. **Voicing:** Since the patient does not lose air through the trach tube as with leak speech, and they do not have to expend energy to divert air past the trach tube to voice, they have more airflow for voicing and there is no delay in initiating sound. The patient is thus able to speak in a more normal voice.
- B. **Swallowing, trachs and aspiration:** Aspiration is defined as the penetration of materials past the level of the true vocal cords. It not only refers to oral intake but to reflux material and normal upper airway secretions. Alterations to the airway due to the placement of a trach tube can interfere with normal airway defense mechanisms placing patients at a higher risk for aspiration, whether or not they are on a ventilator. Many of the patients here at SEASH also have other complications that can contribute to dysphagia (swallowing disorders), including medications, brain injury (CVA, encephalopathy), age et al. Use of the PMV to help with swallow function can undo the physical airway changes created by the trach, but will have no impact on dysphagia due to other causes.
 - Many physicians and other caregivers believe that an inflated cuff will prevent aspiration. Since the cuff is located below the vocal cords, and aspiration occurs at the level of the vocal cords, the cuff is not able to prevent aspiration. At best, it may slow down the passage of gross aspiration into the lower lung fields.
 - An inflated cuff can actually increase the risk of aspiration. When we swallow, our airway moves up and forward, the vocal folds close and the epiglottis is folded over the airway by the swallowed material as it passes through to the esophagus. When the cuff is inflated and the trach tube is anchored to the neck by the trach ties or sutures, the airway is prevented from moving normally.
 - If the cuff is overinflated, it may press against the wall of the trachea and compress (narrow) the esophagus, hindering the passage of material through the esophagus. This in turn can allow material to back up (reflux) and spill into the airway. (Think of what happens with a clogged sink drain.) Additionally, the presence of a feeding or NG tube can affect the ability of the upper and lower esophageal sphincters to close normally, also allowing for reflux and spillage into the airway.

- When material enters the subglottic space, whether it is food, secretions or refluxed material, it is able to leak past the cuff because the inside of the airway is not smooth, cuff inflation is not symmetrical and the cuff may form vertical folds or channels. If the patient is on a ventilator, there is tracheal dilation at peak inspiratory pressure, which can also create leakage since the cuff is normally set at "minimal leak" to reduce pressure against the tracheal wall.
 - Because the trach with an inflated cuff separates the upper airway from the lower, there is a loss of normal subglottic airway pressure during the swallow. We swallow during exhalation, when there is still air in the lungs. When the vocal cords close, the air trapped below the vocal cords forms positive subglottic pressure, which is released when we exhale immediately after the swallow. This is a form of airway protection as any leaking material is pushed out with the exhaled air.
 - During a normal swallow, airflow through the upper airway helps us sense if material is going "the wrong way". A patient with a trach and an inflated cuff does not have this source of sensation and may not realize they are aspirating. This is what's known as silent aspiration. A study of ventilator dependent patients done in 1987 showed that 50% of the people studied aspirated and of these, 77% were clinically undetected, that is there were no obvious signs such as coughing or choking. If a patient shows no signs or symptoms of aspiration with the cuff inflated and no PMV, but does show signs with the cuff deflated and a valve on, it may be that they are silently aspirating, and using the PMV is allowing them to sense and attempt to clear the airway (cough). The PMV is actually helping but the patient stills needs referral to the SLP for dysphagia follow up.
 - In addition to the loss of subglottic pressure during the swallow, the inflated cuff disconnects our normal airway clearance mechanism, the cough. A normal cough is created when air in the lungs behind a closed glottis is suddenly released by opening the glottis and using the diaphragm to squeeze it out. An open trach tube eliminates the closed glottis so less cough pressure is created. Even if the patient were aware of an aspiration, they may not be able to clear the upper airway, thus allowing the material to leak past the cuff and into the lower airway.
 - Another problem for patients on the ventilator is that they may not be able to coordinate their respirations with swallowing since the swallow function occurs independent of the mechanical breath. Again, separation of the upper and lower airway is the culprit. Using the PMV allows the caregiver to reconnect the patient's normal physiology and allow for more normal airway function and protection.
 - Reconnecting normal airflow also enhances the patient's sense of smell and taste and may improve the appetite. If the patient can be successfully transitioned to oral feedings, it can improve nutrition and may offer psychological benefits as well.
- C. Secretion Management: The trach tube is a foreign object and stimulates the airway to produce additional mucus. Excess secretions can inhibit the patient's ability to wean from the ventilator or be decannulated.
- Because of the open trach tube and the disconnection from the upper airway, many trached patients cannot generate an effective cough.

- Without airflow through the upper airway, the patient may not be able to sense, let alone swallow their own saliva. This can be observed in the patient with oral pooling which is then aspirated.
- Subglottic secretions (below the vocal cords and above the trach tube cuff) cannot be suctioned tracheally or orally. These secretions can lead to tracheobronchitis, as seen in the patient with clear or white trach secretions but yellow / green stoma drainage. Reconnecting the airway even briefly and allowing an effective cough can help to clear secretions and reduce the incidence of ventilator associated pneumonia and the need for more invasive treatment.
- As the patient weans from the vent and increases PMV time, they can strengthen their cough and airway clearance mechanism, reducing the need for suctioning.
- Patients with large amounts of loose, flowing secretions may also benefit from use of Robinul to help reduce secretion production in combination with the PMV to enhance airway clearance.

D. Weaning / decannulation: Reinstating vocal communication has a strong effect on the patient's psychological outlook. Even if they are not able to wear the valve for long, just knowing that it is available can have a significant impact.

- Being able to communicate with visitors about life outside the hospital can offer encouragement to the patient. The communicative patient will be more likely to feel like an active participant in their care rather than a passive recipient.
- Using the PMV during Physical and Occupational therapy can give the patient better breath control and enhance the therapy experience. Being able to communicate weakness or pain with an exercise can allow the therapist to tailor the exercise to the patient's needs. For the spinal cord or neuromuscular patient, PT can institute intercostal muscle strengthening exercises.
- Breathing exercises such as pursed lip breathing do not work when the airflow bypasses the upper airway. Pursed lip breathing uses the upper airway structures to create increased expiratory pressure to slow down exhalation, allowing for better control and emptying of the lungs by "splinting" open the airways.
- Normally our upper airway structures create a small amount of expiratory pressure usually referred to as physiologic PEEP. We replace this with mechanical PEEP on the ventilator, but once we begin trach collar trials the patient loses this benefit. The PMV will restore the patient's normal physiologic airway pressures, which in turn can help reduce atelectasis during trach collar trials. Physiologic PEEP, like mechanical PEEP, helps increase FRC which keeps the airways slightly open so the patient can initiate the next breath more easily.
- When it comes time to consider decannulation, the PMV offers an excellent tool for assessing the patient's airway. Monitors such as FVC measurements can be made as well as clinical observations of the patient's ability to cough and clear secretions effectively. Using the PMV instead of capping reduces the need for multiple trach tube downsizing and is better tolerated because the patient can still inhale through the trach rather than having to breathe past the upper airway structures as well as the trach tube itself. For patients with a known or suspected airway obstruction however, it is still a good idea to cap for 24 hours prior to actual decannulation.

- E. Infection control: Finger occlusion of the trach has the potential for introducing pathogens into the airway. It also requires the patient to have the dexterity and coordination to perform. The PMV eliminates the need for finger occlusion
- F. End of life issues: For the terminal patient, the ability to speak with family members may offer significant comfort for both patient and family. When the physician needs to determine the patient's competency to make end of life decisions, lip reading and gestures can be inconclusive. Verbal communication can help the physician discern psychological issues such as depression versus a competent decision to end aggressive care. Allowing the patient to verbalize his desires to the family can help reduce their guilt and indecisiveness when considering whether or not to withdraw care.

Which patients are candidates for the PMV?

Every patient with a trach, whether or not they are on a vent, will be assessed for PMV use within 72 hours of admission. The PMV assessment form is to be completed by the RCP caring for the patient before other caregivers place the valve. When available, the SLP will participate with the initial assessment. This form is kept in the front of the gray respiratory binder and is updated as needed. All caregivers are responsible for reviewing the assessment information before placing the valve.

When would a patient NOT be a candidate for a PMV?

- A. The patient must be able to exhale easily past the trach tube and through the upper airway. Obstructions to airflow can occur as a result of excess / thick secretions, granulation tissue, stenosis, damaged vocal cords, airway / laryngeal edema, a too large trach tube et al. As part of the initial assessment, the RCP will review the patient's airway history, including the length and frequency of intubations, any self-extubations, stridor post extubation requiring steroids or tracheostomy or similar occurrences. Long term intubation or related problems can cause damage to the vocal cords and upper airway, limiting airflow. The degree of obstruction is assessed with a bedside airflow test.
- B. The trach tube cuff needs to be completely deflated. This may require changes to the ventilator settings to compensate for the leak created. Patients requiring significant ventilatory support may not be candidates for the PMV, the exception being in cases dealing with end of life communication issues. If the trach tube cuff is not deflated, the patient will not be able to exhale because the PMV blocks exhalation through the trach tube. Consequently the patient will not be able to inhale which can lead to an anoxic injury and even death.
 - **A Bivona Fome Cuff trach tube is an absolute contraindication.** This trach tube has a piece of spongy foam inside the cuff which holds the cuff inflated against the inside of the airway. Pulling the air out of the foam deflates the cuff. The spongy foam is bulky even when the cuff is deflated and it very quickly reinflates to ambient pressure. Once the cuff is deflated, capping the pilot balloon keeps the air out, but if the cap comes off it reinflates very quickly and occludes expiratory flow.

- C. Ideally, the patient should be awake and attempting to communicate however, using the PMV for communication can be helpful for reorienting encephalopathic patients. CVA, anoxic injury or closed head injury patients may have an increased cognitive response to the internal stimulation created by spontaneous coughing and moaning with the PMV on. Restoring verbal communication can help the clinicians determine the patient's level of awareness, orientation, mentation and emotional status.
- D. For patients at high risk for gross aspiration, for example the patient with known vomiting, it may be necessary to keep the cuff inflated to prevent or delay passage of foreign material into the lung fields.
- E. Severe COPD can cause a loss of lung elasticity and recoil, prolonged exhalation and air trapping. Some patients may experience an increase in air trapping because the tube itself is an airway obstruction, and will not be able to use the valve. While pursed lip breathing may be beneficial, PMV use needs to be monitored closely and keyed to the patient's baseline (pre-illness) level of dyspnea. In some cases, it may help to change to a smaller size, or cuffless or fenestrated trach tube to increase the airflow.
- F. Patients need to be medically / hemodynamically stable. The exception would be for end of life communication. For ventilator patients, this is generally someone on $\leq .60$ FiO₂, A/C or SIMV with total respiratory rate ≤ 30 , Pressure Support ≤ 24 , PEEP ≤ 12 . Pressure Control patients may use the PMV as long as they are no longer requiring critical levels of support.
- G. The PMV is not intended to be used during sleep. However, in the hospital patients will sometimes doze off with the valve on. Since they are being monitored by staff and with a pulse oximeter, if they are stable and not in respiratory distress and have been managing secretions adequately, it is not necessary to remove the valve. As a rule we will remove the PMV for nighttime sleep.

Procedure for performing a bedside airflow assessment:

A bedside airflow assessment is completed by the RCP and / or SLP as part of the initial admission assessment. The patient should be ≥ 48 hours post surgical tracheostomy; ≥ 24 hours post percutaneous placement. The patient may need to wait and be reassessed for use after a trach change as well. All caregivers are responsible for verifying adequate airflow each and every time the valve is placed, by observing the patient's cough, vocalization and respiratory pattern before leaving them unattended.

- A. Suction tracheally and orally.
- B. Slowly deflate the trach cuff.
- C. Have the patient inhale.
- D. Manually occlude the trach as the patient exhales and says "ahhh", counts or blows at a tissue, etc.
- E. For the ventilator patient, keep the patient on the ventilator and listen for an air leak or the patient's ability to cough or vocalize with the cuff deflated. Note the amount (in cc's) of air removed from the cuff. The less air required to seal the cuff, the smaller the passageway around the trach tube.

- F. Assess the patient for use of accessory muscles or "forced" exhalation; exhalation should appear to be passive, not work.
- G. Listen for the patient's ability to create sound. The patient may not be able to vocalize initially; this does not preclude use of the PMV. A weak or whispery voice may be due to a lack of use of the vocal cords or damaged or paralyzed cords. If uncertain, proceed slowly and monitor the patient closely. The SLP can assess, initiate voice exercises when appropriate. If the voice does not get stronger within a few days, the patient may need an ENT consult to further assess for airway obstruction or damage.

Procedure for Placing the PMV:

NOTE: Only the RCP can place the valve for a ventilator patient. (RCP licensure is required to manipulate the ventilator. Exception: Patients going home on a vent; see discharge instruction section.)

- A. Obtain baseline vital signs, SpO₂ / HR, RR and pattern, breath sounds and work of breathing.
- B. Explain the procedure to the patient / family.
- C. Position the patient comfortably. Make sure the ventilator circuit or trach collar tubing is not tugging on trach tube.
- D. Suction tracheally and orally.
- E. Slowly deflate the trach tube cuff completely. Monitor the amount of air removed from the cuff. Some patients, particularly those with a spinal cord injury or neuromuscular disease, are particularly sensitive to cuff deflation and experience an uncomfortable sensation of hypoventilation. These patients may require more time (days, weeks) to get used to having the cuff deflated before they can tolerate a PMV. Spinal cord injury patients are also prone to episodes of autonomic dysreflexia (including blood pressure changes) with sudden changes in sensation.
- F. Repeat suction if necessary.
- G. Place the PMV in line with vent circuit (between the HME flex and the suction tee piece) or directly onto the trach tube hub. Use a ¼ twist for a friction tight fit to trach tube. (Make sure the trach tube hub is clean before placing the valve.)
- H. Adjust vent settings (restricted to licensed RCPs):
 - Adjust set VT to compensate for volume lost. Measure the PIP before deflating the cuff. Increase the set VT until the PIP with the cuff deflated is similar to the PIP with the cuff inflated. This step is not necessary with Pressure Control or Pressure Support ventilation.
 - Turn the PEEP off. This will reduce or eliminate the excessive flow and autocycling created by the vent trying to maintain the PEEP level with the cuff leak. If the patient is on ≥ 12 cm PEEP, they may not be able to use the PMV since the loss of positive pressure may increase the work of

breathing due to airway collapse. Observe the patient closely for an increased WOB or negative pressure during inspiration. Increasing the peak flow may offset some of this extra work.

- Patients on pressure support may need to have the pressure setting decreased to allow the vent to cycle into exhalation. In Pressure Support, inspiration continues until flow decreases to 25% of the initial flow or 3 seconds. At higher PS levels ("high" varies with each patient), flow may not decrease because of the leak, giving the patient a long inspiration. Some of the newer Tbirds have an adjustment for Terminal Sensitivity: increase the % to allow the inspiratory cycle to end at a higher flow. This is not necessary in Pressure Control because there is a set inspiratory time. Return to 25% after PMV use. (Earlier breath termination results in shallower spontaneous VTs.) Another option is to change to AC mode during PMV use.
- After Flow Calling at the present Bias Flow setting, increase the setting by 2 - 5 lpm to create a false return volume. Do not recal at the new setting. This will compensate for those ventilators that do not have an "off" setting. Do not increase by more than 5 lpm. Increasing the bias without recalling increases the amount of flow the patient needs to move in order to trigger a breath, making the machine less sensitive to the patient's effort. Watch for increased WOB to trigger a breath. The decreased sensitivity also helps decrease autocycling.

I. Adjust Alarms:

- Turn the low volume exhaled alarms to the minimal or off setting. Adjusting the Bias Flow setting as noted above will help with false low volume alarms.
- Maintain the current low and high pressure alarm settings and an appropriate high breath rate alarm setting.
- The low pressure alarm should be set no more than 10 cm below the patient's ventilating pressure, and on a setting of no less than 10 cmH₂O. The high pressure should remain at the normal acceptable limit for that patient, and no more than 60 cm H₂O.
- An excessively high breath rate can be an indication the patient is not controlling glottic closure (passive respirations) or is tiring out. It can also occur if the PEEP is not turned off and the ventilator is attempting to compensate for the cuff leak (auto cycling). The alarm should remain set at the usual setting, and no higher than 40. If the vent settings have been adjusted and the patient continues to have a high rate (> 30) the patient cannot be left unattended and PMV use should be limited. The SLP can also help with exercises to help the patient relearn to glottic control.
- **The low pressure and high breath rate alarms are not to be defeated under any circumstances. These are your only disconnect / patient distress alarms.**

J. Continue to monitor the patient parameters (VS, WOB, HR, RR, SpO₂ et al) for undesirable changes.

K. Assess the patient's ability to cough and clear secretions. Most patients will cough spontaneously when the valve is first placed.

L. Once the PMV is in place and the patient's breathing is relaxed, establish speech and assess vocal quality, etc. Encourage ventilator patients to speak during the expiratory cycle only.

- M. Ventilator patients must have someone at the bedside when using the PMV. If the caregiver leaves the patient's room to allow the patient privacy with visitors, they must remain close and look in on the patient frequently. In addition, visitors must be told to tell a caregiver when they are leaving so the PMV can be removed. (If the visitors do not follow this requirement, the patient cannot be left without a professional caregiver in the room.) Non ventilator patients must also be monitored carefully but may be allowed to wear the valve for secretion management, meals et al even when unattended, once they've demonstrated safe tolerance.
- N. When finished, remove the PMV and reinflate the trach tube cuff. Reset all ventilator settings and alarms.
- O. RCPs: document use, airflow, ability to cough and clear secretions, time worn, etc on the ventilator record in the shift summary. Document the PMV as a supply item on the front of the sheet when initiated or replaced and charge for the PMV according to the Respiratory Charges procedure. Other caregivers document on the appropriate form with other care being performed.
- P. Some patients may only tolerate short periods of time initially and tolerance may vary from one day to the next. Increase use as tolerated until weaned / decannulated or able to tolerate during waking hours. Appropriately trained licensed professionals can utilize the PMV when working with the non-ventilator patient, but are responsible for following all procedures and monitoring for safe use.
- Q. **Use with home vents:** Follow the same assessment and placement guidelines. Some home care companies do not use in-line catheters, so the PMV will need to be placed directly on the hub of the trach or on the distal end of an elbow piece. In this case, the PMV has to be removed to suction the patient. For vent changes:
- The PEEP valve is a removable device so a leak does not create an increase in flow. Adjust the setting as needed to maintain the desired PEEP. Sensitivity should remain set 1 - 2 cmH₂O below the set PEEP level. Verify actual PEEP on the manometer.
 - Volume compensation is calculated the same.
 - There is no low volume alarm to turn off. High and low pressure alarms should remain set as they are when the PMV is not in use.

What if the patient says "I don't like it"?

- A. If the patient complains he/she can't breathe, their chest is tight, they're unable to cough or coughs continuously, has no voice, and /or no breath sounds are heard, look for evidence of an airway obstruction or air trapping:
- Auscultate over the trachea to assess for airway stridor. (Possible causes include edema, secretions, vocal cord damage, stenosis, et al.)
 - The PMV opens with minimal effort and does not cause a significantly measurable increase in inspiratory resistance however, since the patient now senses airflow through the nose and mouth,

they may subjectively interpret this as difficulty breathing. Some patients may experience a sense of dryness as well.

- If the patient is unable to exhale adequately (air trapping) they will not be able to take a breath in and will complain they cannot catch their breath. Be particularly alert to this possibility with COPD patients.
- If a "whoosh" is heard upon removing the valve and / or pressure is sensed behind the valve (pushing it off), the patient does not have adequate airflow and should not be using the PMV.
- Corrective measures:
 1. Recheck cuff deflation. Consider a smaller size or uncuffed trach tube. For vent patients, measure the patient's airway resistance (PIP minus PalvD) prior to changing the trach. If airway resistance is high, it may not be possible to downsize without compromising ventilation.
 2. Reassess secretions; treat with humidity or mucolytics if necessary. If secretion consistency is OK, reassess the patient's ability (cough strength) to clear. Since the in-line suction is not removed, it is possible to suction vent patients while the PMV is on.
 3. If the patient coughs hard enough to "pop" a corner of the diaphragm through the valve body, reassess for adequate airflow around the tube. Recheck cuff deflation, secretion quantity / consistency. The patient normally will not exhale through the tube, but if they do not have adequate flow and cough hard enough, they may be able to cough through the tube and pop the diaphragm. Does the patient need a smaller trach or are they ready for decannulation?
 4. If the patient has severe COPD, the problem may be physiological (air trapping). The patient may not be able to use the PMV or may need to limit use to communicating needs only. In some cases, it may be beneficial to change to a fenestrated trach tube to increase the airflow.
 5. If all causes are eliminated, and airflow is not improved with a smaller trach, it may be necessary to request an ENT consult to scope the airway above the trach.

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- B. If a ventilator patient complains of "burning" or their throat hurting, being dry, it is most likely due to the sensation of excess airflow from the ventilator. Recheck the PEEP, peak flow and pressure support settings.
- C. Some patients will complain that the speaking valve has a bad taste. The valve has no taste. What the patient is experiencing is his or her own bad breath. This is NOT due to poor oral care but rather the lack of airflow through the oral cavity and the pooling of oral secretions in the oropharyngeal area. Usually as the patient uses the valve more and keep the airway clear, this problem clears up.
- D. At times a patient will not tolerate the PMV although there is no physical reason such as obstruction. Other issues to look at include:
 - Patient motivation
 - Anxiety and fear; depression.
 - Staff motivation

Discharge Instructions:

- A. Patients being discharged with a trach and PMV must be given complete instruction on its use and safety issues, including cuff deflation, placement, monitoring work of breathing, cleaning. The patient manual included with the valve should be sent home with the patient.
- B. Patients and families of patients who will use the valve with a home vent must also be instructed in making appropriate vent changes for valve use, including volume compensation and alarm response.
- C. Patients or their families must demonstrate correct placement and monitoring before they are allowed to apply the valve while the patient is in the hospital regardless of whether or not they are on a vent.
- D. Patient / family instruction is documented in the PMV section of the Ventilator Education Form.
- E. Patients being discharge with a PMV should have the plan for use documented on the discharge instruction form. The patient will also need a prescription in order to obtain replacements. Patients discharging directly to home should have 2 valves in case of loss or failure of one.

Care of the PMV:

- A. The PMV should be cleaned daily by washing in soap and warm water. Rinse thoroughly with cool water. Set aside to air dry. Place the PMV in the lidded cup and store it with the ventilator or respiratory supplies.
- B. CAUTION: **DO NOT** USE hot water, peroxide, bleach, vinegar or alcohol, as they can damage the membrane. **DO NOT** wipe or brush. Thoroughly rinse all residue to prevent sticking.
- C. Each PMV is single patient use ONLY. With proper care, valves are warranted to last 2 months.
- D. The valve needs to be removed during respiratory medication treatments to prevent the membrane from becoming gummy. Bland aerosol / oxygen will not affect the valve.
- E. Patients being discharge with a PMV should have the plan for use documented on the discharge instruction form. The patient will also need a prescription in order to obtain replacements.

Appropriate outcomes for use of the PMV:

- A. Patient is able to tolerate the Passy-Muir Valve without breathing compromise.
- B. Patient is able to verbalize thoughts and participate in social situations and care giving decisions.
- C. Patient is able to cough and clear secretions.
- D. Patient is able to tolerate oral intake with reduced risk for aspiration.

Passy-Muir Competency Test

- T F With the PMV on, the patient breathes in and out through the trach tube.
- T F Since the patient doesn't have to exhale to close the valve diaphragm, they are able to use more air for vocalization.
- T F If the patient coughs when drinking with the PMV on but does not cough without the valve, it means the PMV is causing them to aspirate and they should remove it to drink.
- T F The lack of airflow through the upper airway can lead to secretion pooling because without airflow the patient doesn't sense the secretions are there.
- T F Patients with a trach do not need a PMV to do effective pursed lip (exercise) breathing.
- T F When the patient is on a ventilator, the trach tube cuff should be left inflated even during PMV use to prevent a loss of volume.

In the following patient scenarios, choose "A" if you agree with the action or "D" if the action taken was incorrect:

- A D Your patient has a history of stridor immediately post extubation, requiring reintubation and tracheostomy. She is currently on IV Solumedrol. This is an indication that the patient may still have an airway obstruction so you proceed cautiously with the PMV and monitor the work of breathing.
- A D A patient with COPD complains of dyspnea with the PMV on. He says he normally is dyspneic at rest but this is worse. He has an uncuffed tube and was just downsized from an 8 to a 7. You determine he is air trapping due to his disease and decide to limit PMV use to when he needs to communicate (not continuous). You document this as well.
- A D You have just placed the PMV on a trached (non vent) patient. He complains of shortness of breath and exhibits increased use of accessory muscles to breathe. When you remove the valve you hear a "whoosh" sound. You put the valve back on because the patient is just being lazy and needs to work a little to develop his muscle strength.
- A D The patient has a very hard cough and you hear an air leak through the valve. It appears one corner of the diaphragm has been coughed through and there are secretions in the valve. You remove the valve and reassess the patient for adequate airflow. The patient is able to breathe OK with finger occlusion so you clean the valve with soap and warm water, carefully push the corner back through, suction the patient and place the PMV back on. If the patient continues to do this you will consider (or talk to RT about) downsizing the tube.

Name: _____

Passy-Muir Competency Test – Answer Key

- T F With the PMV on, the patient breathes in and out through the trach tube.
The patient breathes in through the tube and out through the upper airway (nose & mouth).
- T F Since the patient doesn't have to exhale to close the valve diaphragm, they are able to use more air for vocalization.
- T F If the patient coughs when drinking with the PMV on but does not cough without the valve, it means the PMV is causing them to aspirate and they should remove it to drink.
This is actually an indication that the patient is silently aspirating (no obvious signs) without the PMV and the PMV is allowing for the patient to cough (a sign of aspiration) and attempt to clear the airway. The patient should be NPO until seen by SLP for dysphagia assessment.
- T F The lack of airflow through the upper airway can lead to secretion pooling because without airflow the patient doesn't sense the secretions are there.
- T F Patients with a trach do not need a PMV to do effective pursed lip (exercise) breathing.
Pursed lip breathing utilizes the upper airway structures to slow down exhalation and create increased physiologic PEEP. With an open trach the air exits the trach tube and the patient cannot control the breath.
- T F When the patient is on a ventilator, the trach tube cuff should be left inflated even during PMV use to prevent a loss of volume.
If the cuff is inflated, the patient cannot exhale which means they cannot inhale either. This will lead to anoxia and death. When the patient is on a vent, it also means the machine will continue to attempt to ventilate and the patient's lungs will be constantly inflated at the level of the set pressure limit, which can cause barotrauma.

In the following patient scenarios, choose "A" if you agree with the action or "D" if the action taken was incorrect:

- A D Your patient has a history of stridor immediately post extubation, requiring reintubation and tracheostomy. She is currently on IV Solumedrol. This is an indication that the patient may still have an airway obstruction so you proceed cautiously with the PMV and monitor the work of breathing.
The key is to be aware of the potential obstruction and to proceed cautiously.

Name: _____

Passy-Muir Competency Test – Answer Key

- A D A patient with COPD complains of dyspnea with the PMV on. He says he normally is dyspneic at rest but this is worse. He has an uncuffed tube and was just downsized from an 8 to a 7. You determine he is air trapping due to his disease and decide to limit PMV use to when he needs to communicate (not continuous). You document this as well.
You may also want to consider downsizing to a 6 or trying a fenestrated uncuffed tube if the patient will not be decannulated soon and is off the ventilator.
- A D You have just placed the PMV on a trached (non vent) patient. He complains of shortness of breath and exhibits increased use of accessory muscles to breathe. When you remove the valve you hear a “whoosh” sound. You put the valve back on because the patient is just being lazy and needs to work a little to develop his muscle strength.
The patient should not have to “work” to exhale. This is a sign of airway obstruction. The increased work of breathing will fatigue the patient, possibly requiring greater respiratory intervention. Consider downsizing the tube or changing to an uncuffed tube.
- A D The patient has a very hard cough and you hear an air leak through the valve. It appears one corner of the diaphragm has been coughed through and there are secretions in the valve. You remove the valve and reassess the patient for adequate airflow. The patient is able to breathe OK with finger occlusion so you clean the valve with soap and warm water, carefully push the corner back through, suction the patient and place the PMV back on. If the patient continues to do this you will consider (or talk to RT about) downsizing the tube.
It is also acceptable to replace the valve in case it is faulty, but it is very likely that since the patient has a hard cough, there may just be inadequate space around the tube when he coughs, or the deflated cuff may be in the way. Another thing to look at is whether the secretions are too thick or too copious to expel past the tube, but if airflow at rest is OK, you would not want to withhold the PMV.

Name: _____

Passy-Muir Competency Test Ventilator Issues – Respiratory Therapists

- T F The low pressure alarm should be turned off when the valve is in use.
- T F Increasing the Bias Flow without recal'ing makes the ventilator think the patient is exhaling volume through the circuit. (For Tbirds when the low vol alarm cannot be turned off)
- T F The high breath rate alarm should not be set > 40 during valve use.
- T F Airway resistance is measured by subtracting the PEEP from the pause pressure.

Patient scenarios:

- A D When assessing a patient for PMV use, you note that it takes 4cc of air to inflate the cuff. With the cuff deflated, the patient coughs secretions into the in-line suction "T" piece. You determine this patient can use a PMV.
- A D Your C3-4 fx patient complains he can't breathe when you deflate the cuff on the trach tube. He has good chest expansion so you determine that he is being ventilated adequately with the cuff deflated and proceed to place the PMV in spite of his objections.
- A D Your patient's set tidal volume is 700. The PIP before deflating the cuff is 32. When you deflate the cuff and place the PMV, the PIP is 20. You do not need to make a volume adjustment for this patient.
- A D Your assessment indicates your vent patient does not have adequate flow for a PMV. He currently has a size 9 Portex XL trach. He is on A/C 14, 700, .30, 5P. PIP is 38, Palvd is 30, MAP is 10, compliance in the 30s. There is no known history of airway obstruction. You suggest downsizing to a size 8 XL.

$$\text{AIRWAY RESISTANCE} = \text{PIP} - \text{PAUSE PIP}$$

$$= 38 - 20$$

$$= 18 \text{ cmH}_2\text{O}$$

Multiple choice (choose all that apply)

The patient complains the air hurts his throat when the valve is in use. Which of the following settings may need to be adjusted?

- | | |
|--------------------|---------------------|
| a) PEEP | d) Peak flow |
| b) Tidal Volume | e) Bias flow |
| c) Pressure limits | f) Respiratory rate |

Name: _____

Passy-Muir Competency Test Ventilator Issues – Respiratory Therapists

What are some of the reasons for using the PMV with vent weaning?

- a) Psychological benefits
- b) Restores physiologic PEEP during trach collar trials
- c) Eliminates the need for lab work
- d) Secretion management, cough retraining
- e) Breathing control during PT/OT
- f) Assessing the patient for decannulation
- g) Less work for the RT staff

Name: _____

Passy-Muir Competency Test – Answer Key Ventilator Issues – Respiratory Therapists

- T F The low pressure alarm should be turned off when the valve is in use.
The low pressure alarm is your disconnect alarm and needs to remain on.
- T F Increasing the Bias Flow without recal'ing makes the ventilator think the patient is exhaling volume through the circuit. (For Tbirds when the low vol alarm cannot be turned off)
- T F The high breath rate alarm should not be set > 40 during valve use.
- T F Airway resistance is measured by subtracting the PEEP from the pause pressure.
It is measured by subtracting pause (PalvD) from peak inspiratory (PIP)

Patient scenarios:

- A D When assessing a patient for PMV use, you note that it takes 4cc of air to inflate the cuff. With the cuff deflated, the patient coughs secretions into the in-line suction "T" piece. You determine this patient can use a PMV.
Needing only 4 cc's air suggests only a small space around the trach for exhaling. This is also demonstrated by the patient coughing secretions into the suction T piece rather than around and out the mouth. This patient most likely does not have enough airflow to safely use a PMV. Check airway resistance and consider downsizing. If dealing with end of life or similar necessary communications, you may be able to use the valve for very short periods.
- A D Your C3-4 fx patient complains he can't breathe when you deflate the cuff on the trach tube. He has good chest expansion so you determine that he is being ventilated adequately with the cuff deflated and proceed to place the PMV in spite of his objections.
Spinal cord injury patients tend to subjectively sense they cannot breathe even though measured parameters are acceptable. In any case you would not force a patient to wear the valve but rather continue to work slowly, over days or even weeks, to develop confidence in tolerating cuff deflation and then the PMV.
- A D Your patient's set tidal volume is 700. The PIP before deflating the cuff is 32. When you deflate the cuff and place the PMV, the PIP is 20. You do not need to make a volume adjustment for this patient.
The drop in PIP from 32 to 20 indicates volume is lost around the trach tube. You would compensate by increasing the set tidal volume until PIP with the PMV on is approximately 32.

Name: _____

Passy-Muir Competency Test – Answer Key Ventilator Issues – Respiratory Therapists

- A D Your assessment indicates your vent patient does not have adequate flow for a PMV. He currently has a size 9 Portex XL trach. He is on A/C 14, 700, .30, 5P. PIP is 38, Palvd is 30, MAP is 10, compliance in the 30s. There is no known history of airway obstruction. You suggest downsizing to a size 8 XL.
The quick airway resistance measurement is 8 cm so downsizing should be acceptable.

Multiple choice (choose all that apply)

The patient complains the air hurts his throat when the valve is in use. Which of the following settings may need to be adjusted?

- | | |
|--------------------|---------------------|
| a) PEEP | d) Peak flow |
| b) Tidal Volume | e) Bias flow |
| c) Pressure limits | f) Respiratory rate |

What are some of the reasons for using the PMV with vent weaning?

- a) **Psychological benefits**
- b) **Restores physiologic PEEP during trach collar trials**
- c) Eliminates the need for lab work
- d) **Secretion management, cough retraining**
- e) **Breathing control during PT/OT**
- f) **Assessing the patient for decannulation**
- g) **Less work for the RT staff (*this is also acceptable since, although not a primary goal, benefits such as reduced secretions / reducing need for suction, will reduce the RT's work*)**

Name: _____

III. PMV PLACEMENT DATA

Date	Time of Day	O₂ SAT / HR	Resp Rate
Accessory Muscles ___ Yes ___ No	Cough ___ Strong ___ Guarded ___ Weak	Clears Secretions ___ Yes ___ No	Anxiety ___ Yes ___ No Explain:
Vocal Intensity ___ Strong ___ Weak	Speech ___ Intelligible ___ Unintelligible ___ Aphasic	Vocal Quality ___ Whispery ___ Clear ___ Raspy	Back Pressure air release on removal ___ Yes ___ No

Comments (including limitations to use):

PMV not appropriate, reason

Follow-up Recommendations (mark all that apply and describe reason):

- ENT Consult: _____
- Trach Downsizing: _____
- Reassess in 24-48 hours _____
- Other: _____

Goals for PMV Use:

- Communciation
- Swallowing
- Airway Strengthening
- Cognitive Reorientation
- Secretion Management
- End of Life Issues

Reassessment (Attach a Progress Notes sheet for additional comments):

Date	Signature	Date	Signature