Perhaps you have heard about the Passy-Muir Valve since it became the first device to promote speech in ventilator-dependent patients almost 20 years ago. But, did you know that recent research has found that use of the Passy-Muir Valve may impact other physiologic functions besides speech production, including swallowing ability, weaning from mechanical ventilation and improved oxygenation? Today, the valves are also used on neonates and infants to promote normal developmental behaviors of babbling and cooing, which are instrumental in normal language development. In addition, they are the only speaking valves with FDA approval to be used in-line with the ventilator. These patient benefits translate into enhanced care from health care professionals because of improved communication, reduced time on ventilators, quicker recovery times, and for the tiniest respiratory-challenged patients, an increased chance of developing normal speech patterns after treatment.

David Muir created a unique type of one-way valve that would allow him to speak while on the ventilator. David’s original intent was to facilitate communication for himself and others like him who were ventilator dependent and who wanted to communicate as well as breathe. When David passed away in 1990 at the age of 23, he saw just the beginning of the impact his invention would have on the lives of others. If David were alive today, he would likely be surprised by the other physiologic benefits that researchers have discovered can be facilitated by the valve. Certainly he knew his invention would help those who knew how to speak but were simply unable to produce voice, but did he foresee this valve would help the youngest of patients actually learn how to communicate by using it?

Infants and children who are tracheostomized and/or ventilator dependent lose their ability to make sounds, produce differentiated cries and form words, which are all critical to language development. The earliest vocalizations made by infants in the form of babbling, cooing and crying not only allow them to interact with their world and bond with their caregivers, but it also lays the crucial neurodevelopmental foundation for learning language and communication. Wearing the Passy-Muir Valve restores the ability for the infant or child to vocalize, thereby allowing them to perform these important vocal behaviors. In addition to allowing vocalization, this valve may also improve swallowing ability in the pediatric as well as the adult patient.1

It is well established in scientific literature that in addition to impeding one’s ability to vocalize, the tracheostomy tube can also affect one’s ability to swallow.2, 3, 4, 5, 7, 8, 9 This, in part, has been attributed to the desensitization of the larynx and upper airway due to the lack of airflow through those structures and to the loss of subglottic air pressure (air pressure below the vocal cords) caused by the tra-
The physiologic benefits of wearing this particular device are due to its bias-closed valve feature. Its concept and design are quite simple. It consists of a hard plastic outer shell that is open on one end to fit on the 15 mm hub of a tracheostomy tube. The other end houses a thin, pliable plastic (silastic) diaphragm that attaches at its center to a set of “crossbars” on the most distal end of the device. This diaphragm remains closed until the patient actively breathes in. At the peak of inhalation, the patient is no longer actively drawing air into the lungs, the valve automatically closes. This is referred to as a bias-closed design. After this diaphragm closes, the patient exhales. This exhaled air is directed past the tracheostomy tube (with cuff deflated, if present) and up through the vocal cords and upper airways. Because of the bias-closed feature, a column of air is trapped inside the tracheostomy tube when the diaphragm of the Passy-Muir Valve alone has eliminated and/or reduced aspiration.  

Whenever a patient is tracheostomized or placed on mechanical ventilation, one of the main goals is usually to get the patient weaned as soon as possible. The Passy-Muir Valve may also help expedite that goal. By maintaining tracheostomy occlusion except during active inhalation, the valve helps restore the natural backpressures normally present in the lungs, which has been noted to increase oxygenation. This physiologic change may also decrease positive end-expiratory pressure (PEEP) and pressure setting requirements of mechanical ventilation. By restoring subglottic air pressure and reintroducing the vocal cords into the coughing process, the valve provides a means for increased cough strength and effectiveness, thereby decreasing the need for suctioning. Increasing the patient’s ability to breathe with less reliance on mechanical ventilation and with less assistance for secretion management are instrumental in the weaning process, which is why many facilities have instituted the use of the Passy-Muir Valve in their weaning protocols.

The original, simpler version of the Passy-Muir Valve, which is still in use and available today.

PMV 007: In 1991, Passy-Muir introduced this version of the Passy-Muir Valve, which is tapered to fit in-line with disposable ventilator equipment that is most often used at bedside. In addition to its tapered outer diameter, it is a bright aqua color so that it can be easily detected in the ventilator circuitry.

PMV 2000 and 2001: In 1997, the 2000-series Passy-Muir Valves were introduced, which featured slight design modifications. These versions are somewhat lower in profile than the original design, causing the diaphragm of the valve to open with slightly less pressure required upon inhalation. The portion of the valve that connects to the tracheostomy hub is tapered in comparison to the original valve. An oxygen adapter is available that snaps onto this tapered neck, shunting supplemental oxygen delivery directly to the front of the valve, precisely where it needs to be during inhalation (PMA2000). This provides more direct oxygen delivery that moves with the patient. This is an attractive feature and an improvement over traditional trach mask oxygen delivery, which frequently shifts with patients’ movements and ends up oxygenating air other than that which the patient is breathing. These newer valves also have a design feature that allows an optional tethering device (Secure-It) to be connected to the side of the valve with the opposite end attaching to the trach tie. This allows the valve to hang by a tether from the trach tie so that it will not be lost when it needs to be removed for trach care, or if the patient coughs it off. Each of these two new-generation valves is a different color that serves a purpose beyond making a fashion statement. The clear valve (PMV 2000) is most appropriate for those who may be returning to work or the community and do not want attention drawn toward their tracheostomy. The clear valve is much less conspicuous than the original version that is hospital-white. The PMV 2001 is bright purple, which makes it more difficult to lose amongst the bed linens, not to mention it is much more interesting to pediatric users.

PMV 2020: To meet the needs of those who have metal tracheostomies, which do not have a universal 15-mm hub, the PMV 2020 was introduced. This is a modified version of the PMV 2000, which comes with a rubber adapter for the smaller-diameter hub of the metal tubes. With this adapter on the hub of the metal tracheostomy tube (designed to fit the new metal Jackson tracheostomies, sizes 4, 5, and 6), the PMV 2020 fits easily and securely onto the hub over the rubber adapter. This valve also has the design feature that allows the Secure-It to be attached.
valve closes, preventing secretions from entering the tracheostomy tube and clogging the valve.

When taking stock of the benefits of using the Passy-Muir Valve beyond voice production, one must not simply set aside the power of human communication. Health care professionals are able to provide better care, performing their duties more efficiently to patients who can communicate their wants, needs and desires more effectively. Simply mouthing words is not effective or efficient communication. Nodding “yes” and “no” to questions that others think to ask does not necessarily communicate the intended message. Certain concepts cannot be easily gestured. Some patients cannot move in order to gesture or write. Some patients, particularly the smallest ones, cannot write. Some patients need the comfort that comes with hearing the familiarity of their own voice. Sometimes patients need to actually say their last good-byes.

Communication is a significant benefit to wearing a Passy-Muir Valve and the intent of its origin; however, there are many physiologic benefits as well. When assessing a patient’s candidacy for valve placement, vocalization may or may not be the main purpose for placement. The best way to determine a patient’s candidacy for placement and the valve’s application for addressing other physiologic problems in swallowing, oxygenation or weaning in tracheostomized children and adults is to employ a team approach (typically consisting of a respiratory therapist, speech-language pathologist, nurse, and physician). The expertise of each team member contributes to the appropriate assessment and ongoing intervention using the Passy-Muir Valve to achieve the greatest outcomes in addressing speech production and beyond. VS

REFERENCES