

Using the PRVC Mode at Home with the iVent 101



Kathleen Garwick

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I have been a homecare respiratory therapist (RT) for 17 years, working mainly with home ventilator patients for the past 11 years. I have worked with many different kinds of patients, but for some reason I have always felt a very special connection to ventilator users and their caregivers. We work well together – from navigating the difficult maze of getting home for the first time after receiving a tracheostomy and being placed on mechanical ventilation to everyday living with equipment, disposable supplies, staffing, training, etc.

Last year one of my young adult patients was no longer tolerating the synchronized intermittent mandatory ventilation (SIMV) mode of ventilation due to high airway pressures (30-50 cmH₂O). The high pressure setting was being reached too often, and this would make the tidal volume too small. The reason for this was that the patient had very stiff lungs (low compliance) due to chronic obstructive pulmonary disease (COPD), although patients' lungs can become stiff for other reasons such as pneumonia.

This patient had been placed on mechanical ventilation in 2004 (for progressive neuromuscular disease with COPD that was causing respiratory failure) but had been trached for a few years before that. The ventilator was set on the SIMV mode at night, and heated aerosol (humidification that goes through a tube and trach mask to the trach tube) was used during the day if possible.

Lung compliance gradually worsened over the years until spring of 2010 when the ventilator began constantly alarming at night from high pressure. This was making the patient too tired to go on the heated aerosol during the day. He was hospitalized and placed on the ICU vent in the pressure-regulated volume control (PRVC) ventilation mode used regularly by our ICU and showed improvement almost immediately.

After about a week on intravenous antibiotics and rest on the PRVC mode ventilator, I was called in to begin the transition to the home ventilator. When I tried placing the patient back on the home vent with the SIMV mode (or any mode), it became obvious that the high pressure alarming was going to continue. This patient's lungs were just not the same anymore; they were going to remain stiff (less elastic).

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From Around the Network

Judith R. Fischer, MSLS, IVUN Information Specialist, info@ventusers.org

International Ventilator Users Network's mission is to enhance the lives and independence of home mechanical ventilator users and polio survivors through education, advocacy, research and networking.

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Budget Cuts May Affect Vent Users

Families USA published a special report in April 2011, "House Republicans Propose to Slash Funding For Medicaid, Medicare, and Other Health Coverage Programs," that details the harmful impact the budget would have on low-income families and seniors. Families USA's website is an excellent resource that provides additional reports and information on Medicare and Medicaid. www.familiesusa.org/budget-battle/House-Republicans-Slash-Health-Coverage-Funding.pdf



Muscular Dystrophy

The Transitions Resource Center is a new section on the Muscular Dystrophy Association (MDA) website, dedicated to providing resources for young people with pediatric-onset neuromuscular diseases who are "transitioning" from childhood to adulthood.

The Transitions Resource Center offers links, information and support on such topics as college planning, financial aid, getting a job, connecting with mentors, living independently, volunteering with MDA and more. www.mda.org/transitions/

Parent Project Muscular Dystrophy announces the Clinic Services Resource web page for patients and families of those affected by Duchenne and Becker muscular dystrophy. This is an expansion of the DuchenneConnect Registry for those who receive care in the United States. The Clinic Services Resource features a web-based directory that will link patients, families and healthcare providers. www.DuchenneConnect.com ▲



Linda Chlan

Music Helps Reduce Stress and Anxiety

Linda Chlan, PhD, RN, Associate Professor, School of Nursing, University of Minnesota

I have conducted research for 12 years focusing on interventions to promote relaxation in patients in the intensive care unit (ICU) receiving mechanical ventilation. I have learned a great deal over the years from patients and family members about how to improve outcomes and experiences and how to reduce anxiety and stress in these patients. Much of what I have learned from the participants in my studies can be applied to home ventilator users.

Receiving mechanical ventilation in the ICU is a stressful experience both physiologically and psychologically. In response to stress, the body releases substances into the blood resulting in the “fight or flight” response. This response is geared towards mobilizing blood and energy components to those body systems and organs essential for survival. While stress is not inherently bad, sustained or prolonged stress can cause damage and tissue injury.

Sources of stress include fear of the unknown and of dying, thirst, sleeplessness, agitation, pain, frustration of being restrained, inability to speak, immobility, noise, confusion, loneliness, powerlessness, sensory deprivation and overload, inability to match one’s own breathing pattern with the ventilator and suctioning of the endotracheal tube. Anxiety also results from the many sources of stress experienced in the ICU.

My research program tests non-drug, complementary interventions that might be effective in reducing anxiety and promoting a more relaxed state for ICU patients on mechanical ventilators.

So why is music effective? Music perceived as pleasant and soothing can enhance relaxation by interrupting or reducing the body’s response to stress. Music also can be used to focus one’s attention upon familiar, pleasing sounds, while serving as a powerful distractor to stressful or anxiety-producing

thoughts, sounds or noise in the ICU environment. Music is thought to produce impulses in the brain that can reduce the stress response by dampening the arousability of the central nervous system through the release of certain transmitters in the brain.

Music used to reduce stress and anxiety usually has not more than 80 beats per minute, has fluid melodic movement, pleasing harmonies, regular rhythm without sudden changes and tones that include strings, flute, piano or specially synthesized music.

Music with steady, slow and repetitive rhythm is thought to exert a hypnotic effect contributing to relaxation and anxiety reduction via quieting the brain and inducing a more relaxed state in the brain, altering perceived levels of anxiety and facilitating a more relaxed state.

In our studies over the past 12 years with ICU patients on mechanical ventilators, my research team and I have found a generalized relaxation response (decreased heart rate, respiratory rate and blood pressure) and reduced anxiety in response to listening to relaxing music through headphones for 30 minutes. We have also measured stress levels in the blood, and while not significant, they show a pattern of stress reduction over 60 minutes of listening to music through headphones.

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Ask The Experts

QUESTION: I am on a vent users' listserv, and periodically the group discusses cuffed vs. uncuffed trach tubes. Can someone explain when and why a cuffed trach tube is preferable? When is it not? If a cuffed trach tube is used, when should it be inflated?

ANSWER: Linda Dean, RRT, Clinical Specialist, Passy-Muir, Inc.

There are numerous types and brands of tracheostomy tubes and three primary types of cuffs. Each cuff is filled with a different medium – air, water or foam. Regardless of what it is filled with, the cuff has one purpose, and that is to seal the airway to control mechanical ventilation. During the acute disease process, when a patient is in critical care, it may be necessary to keep the cuff inflated so that all of the air delivered from the ventilator goes to the lungs and then back to the ventilator on exhalation to be measured and monitored. As the patient becomes more stable, a deflated cuff or cuffless tube may be introduced.



Cuff inflated

Patients who require full-time ventilation may prefer the cuff deflated to enable speech, either through “leak speech” or

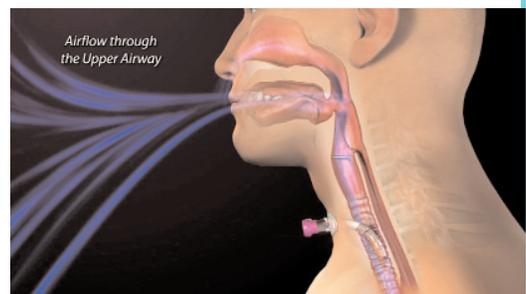
the use of a Passy-Muir® Speaking Valve. At nighttime, there are some patients who still need the cuff inflated because they fall so deeply asleep and the throat muscles relax so much that large amounts of air leak out of the mouth and nose.



Cuff deflated

It is a common misconception that the inflated cuff of a tracheostomy tube will protect the airway and prevent aspiration. This is simply not so. The definition of aspiration is any material that falls below the level of the vocal cords. The material that has reached an inflated cuff is already aspirated. A cuff can actually make it more difficult to swallow and increase the risk of aspiration.

Some research has shown that a tracheostomy with an inflated cuff impairs laryngeal movement during the swallow, decreases sensation in the oral pharynx, decreases the normal pressures in the airway during swallow and renders the natural cough (protective mechanism) ineffective. Therefore, if a patient does not need the cuff for ventilation, the tracheostomy tube cuff should be deflated or the patient should be evaluated for a cuffless tube.

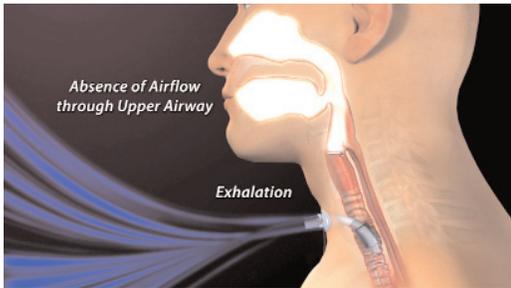


Airflow with cuff deflated and Passy-Muir Valve



On rare occasions, for the patient with a very severe swallow impairment and no ability to protect the airway (e.g. a patient at the end stage of ALS), an inflated cuff is the only way to minimize aspirated material from entering the lower airways.

In summary, there are many tubes and cuff options for the tracheostomy patient. It is best to consult with the health care team to determine which option best meets an individual's ventilation, communication and swallowing needs. ▲



Airflow with cuff inflated

Are you a ventilator user or health professional with a question about home mechanical ventilation?

Send it to info@ventusers.org, and IVUN will find experts to answer it.

Music Helps Reduce Stress and Anxiety

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We are currently finishing a 4.5 year study testing whether music is effective for anxiety self-management for patients throughout the duration of receiving mechanical ventilation in the ICU and if these patients have lower stress levels when encouraged to listen to preferred music whenever they like for as long as they like each day they are on a ventilator in the ICU.

While we are awaiting the final results, patients who have participated in the study have conveyed that they indeed feel relaxed and enjoy listening to music they prefer, including the

benefits of wearing headphones to reduce some of the noise in the ICU, which also assists with sleep.

The overall goal of my work is to provide a complementary intervention to the medical plan of care to bring some comfort and relaxation to patients receiving mechanical ventilation in the ICU. I am extremely grateful to those patients and family members who have participated in my many studies over the years. ▲

Using the PRVC Mode at Home with the iVent 101

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Interestingly, as soon as the patient was placed back on the ICU ventilator, he visibly calmed down and became comfortable again. This was going to be a real problem because no home care vent from any company had the PRVC mode available, and this was clearly what this patient needed. So it was time to get creative. We ended up alternating between the SIMV mode for two hours (with a lot of high pressure alarming) and then straight pressure support mode for two hours (to rest from high pressures and anxiety).

The patient was discharged – with some very nervous caregivers – on these settings because the only other option was to stay with the PRVC vent in the ICU, and for this patient and family that was not an option.

The family and I looked online for any new ventilator that could come close to offering the PRVC mode. Instead we found one with PRVC: the VersaMed iVent 101® Expert model from GE Healthcare. www.gehealthcare.com/respiratorycare.

My first step was to explain all of this to my manager to obtain permission to move forward. The next step was to get the information to the patient's doctor and review the ventilator specifications together.

The doctor asked me to bring the vent to him as soon as it arrived. GE flew a clinical specialist out within two days, and after my in-service training, we brought the iVent 101 to the doctor's office where he looked it over and wrote the orders.

The patient was placed on the iVent 101 on the PRVC SIMV mode, and within two or three minutes he looked up and started to smile from ear to ear! Breathing was easy. No more alarms! The clinical specialist and I also shared a knowing smile. It is moment



iVent 101

that I will always remember. That patient's quality of life went from barely tolerable to really living again in less than three minutes.

One very important benefit of the iVent 101 is that it can be used in the earliest stages of neuromuscular disease because it can be used noninvasively as well as invasively so that patients do not need a new machine for every stage of their disease. This means less training for the patient and caregivers.

The iVent 101 provides many modes: CPAP, bilevel with adaptive flow, pressure support, volume control, pressure control, assist control and, last but certainly not least, PRVC. PRVC is not needed for every patient, but for this patient it provided a better quality of life and a way to stay in his own home.

It was helpful that my employer, Mercy Health System, actually lives by its mission statement and gives me the opportunity to work with cutting-edge technology when it is needed. It was easy with this ventilator because the cost involved was also not prohibitive.

Every day I am witness to the hard work and tenacity that living at home with a ventilator requires. I know that I am, indeed, very lucky to be able to work with these individuals and the people who stand by them. ▲

What is PRVC and how does it work?

Pressure Regulated Volume Control ventilation (PRVC) is a dual ventilation mode that combines the best features of pressure control ventilation and volume control ventilation. Breaths are delivered mandatorily to assure target volumes, with an inspiratory pressure continuously adapting to the patient's condition. The breaths can either be ventilator initiated or patient initiated. With this patient, the PRVC mode of ventilation decreased the patient's work of breathing and was a gentler way to ventilate stiff (non-compliant) lungs.

October 21-23. ALS/MND Nursing Symposium. Chicago, Illinois. www.lesturnerals.org

October 22-27. CHEST, American College of Chest Physicians Annual Conference. Honolulu, Hawaii. www.chestnet.org

“Neuromuscular Respiratory Medicine: Theory, Practice, and Hands-on Demonstrations”

CHEST is offering a special course on neuromuscular disorders and assisted ventilation on Saturday, October 22, in Honolulu.

The course is a state-of-the-art review of the foundations of neuromuscular respiratory medicine, including pulmonary function testing, sleep medicine, mucus clearance and assisted ventilation techniques. Morning lectures will include a discussion of devising respiratory management strategies for a challenging pediatric disorder (Type 1 spinal muscular atrophy) and a challenging adult disorder (amyotrophic lateral sclerosis). There will be additional talks on pulmonary function phenotypic variability in muscular dystrophy and discussion of the studies, therapies, infrastructures and perspectives that can advance neuromuscular respiratory medicine.

In the afternoon, the course provides an opportunity for pulmonologists and respiratory nurses and therapists to see and touch portable ventilators, masks and other interfaces, and assisted cough devices.

For information, go to <http://2011.accpmeeting.org/program/additional-saturday-courses>.

November 5-8. AARC International Respiratory Congress. Tampa, Florida. www.aarc.org

November 28-December 2. Annual Meeting and International Symposium on ALS/MND. Sydney, Australia. International Alliance of ALS/MND Associations. www.alsmndalliance.org

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