Volume 10 Number 2 Spring 2015

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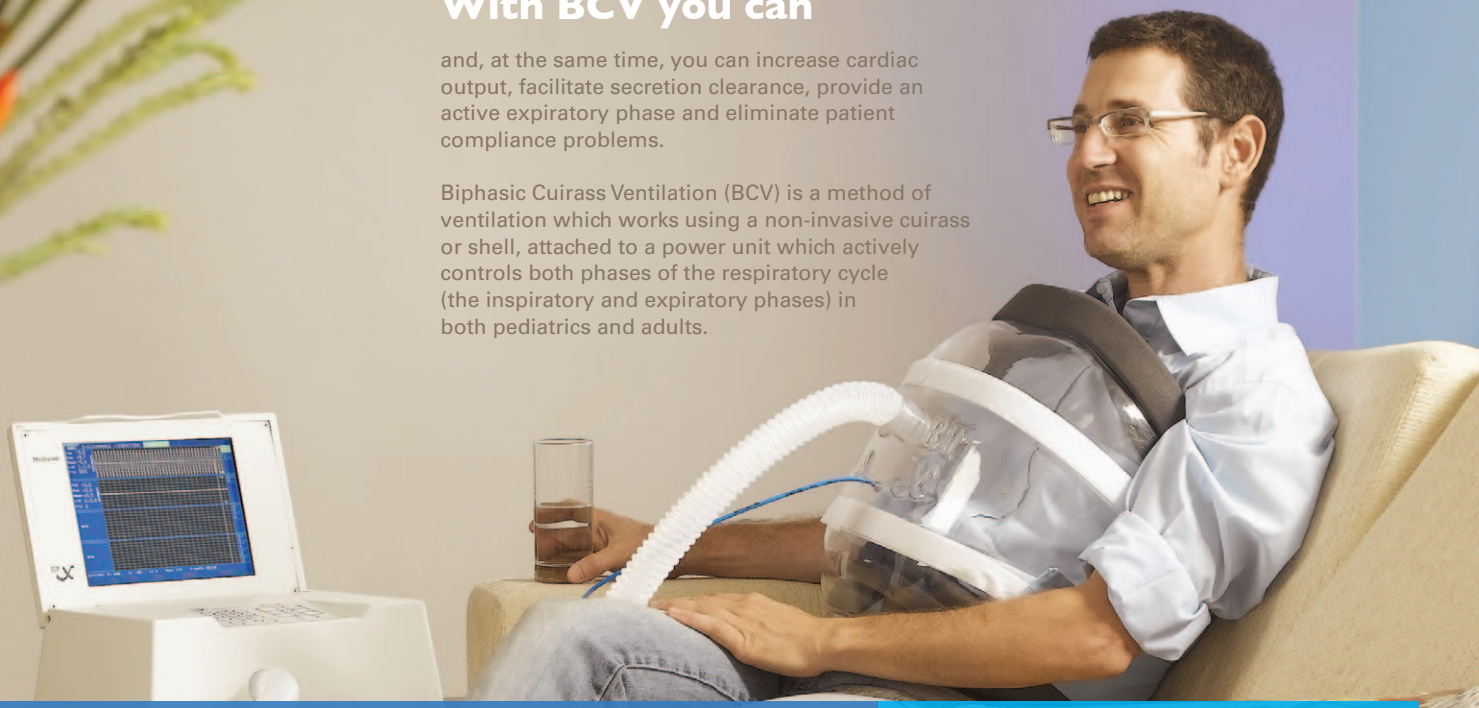

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Biphasic Cuirass Ventilation for Pulmonary Compromise Due to Neuro-Muscular Illness or Injury

Gary Mefford, RRT, Denise Fernandez, CRT

The history of ventilation via cuirass interfaces for individuals dealing with the pulmonary sequelae of illnesses that result from depression of or elimination of the communication between the brain and the skeletal muscles has a very long history. There are multiple benefits that have been able to be realized for individuals with this type of illness via this treatment. Interestingly, this type of non-invasive support had almost faded into medical history in the US and had essentially become non-existent until relatively recently. There is now a modern version of cuirass ventilator that provides better support and additional advantages over any of the previous versions. This device is the brainchild of the late Dr Zamir Hayek and is available for patients requiring support of respiratory function in the hospital, at home or essentially any care venue. This device is the Hayek RTX Biphasic Cuirass Ventilator. The type of support provided by the RTX is unique in that it is biphasic rather than previous cuirass ventilators that functioned with only negative pressure. Support provided with Biphasic Cuirass Ventilation (BCV) ventilates using negative pressure in the cuirass or shell against the chest wall and abdomen to create inspiration in the same natural fashion as the old negative pressure vents, but rather than exhalation being passive, with BCV exhalation is an active phase where exhalation is assisted with positive pressure in the cuirass. This advancement provides greater ability to produce adequate tidal volumes. Within the realm of treatment provided by the RTX is included a very comfortable, but effective means of cuirass applied high frequency chest wall oscillation for secretion mobilization and an assisted cough via the cuirass as well. In this article the basic common pulmonary deficits caused by the spectrum of illnesses referred to as neuromuscular (NM) illnesses will be discussed and how this modern generation of non-invasive support of ventilation via the extra-thoracic interface known as a BCV can help treat these pulmonary deficits. Also discussed will be how BCV offers an alternative and advantageous means for many patients with respiratory compromise due to NM illness to have an improved overall maintenance of health and quality of life. Finally we will include interview responses from a patient, patients' caregivers and two clinicians who have had experience using BCV in this population.

To begin with for the purposes of this discussion we will provide a definition of this very general and broad descriptor we will call pulmonary compromise due to Neuro-Muscular Illness or injury. We will then take a basic general look at some of the causes, the symptoms and how these symptoms can be very effectively mitigated by treatment with BCV. Also discussed will be what the clinical prognosis and expectations will be for these patients as it relates to treatment with BCV. Finally our Q&A's with experts in use of the device.

Figure 1. Hayek RTX Biphasic Cuirass Ventilator.

Definition

Pulmonary Compromise Due to Neuro-Muscular Illness or Injury: Pulmonary system deficits resulting from disease process marked by decreased skeletal muscle function. This may result from decreased production of or lack of transport of signals from the brain to skeletal muscle due to either failure of the nervous system to send or carry the signal or failure of the signals to cross the neuromuscular junction or failure of the muscles to respond to the sent signal.

This grouping encompasses a spectrum from progressive to stable and static illnesses that may be mild with slight to no initial pulmonary symptoms and rare pulmonary compromise to advanced and severe with complete disassociation between the brain and the muscles resulting in some or complete degree of pulmonary muscle paralysis with significant, frequent and severe pulmonary involvement. For the purpose of treatment with Biphasic Cuirass Ventilation including Secretion Clearance and Assisted Cough with the Hayek line of pulmonary support tools (BCV) this grouping also includes spinal cord injuries and other nervous system injuries that result in loss of pulmonary muscle function primarily injuries to the cervical spine particularly at the higher levels and injuries to the nerves servicing the pulmonary muscles particularly the diaphragm.

The authors are with United Hayek Medical Devices.

Diagnoses that fall into this category are numerous and more commonly include illnesses such as Amyotrophic Lateral Sclerosis (ALS), Muscular Dystrophy, Guillain-Barré Syndrome, Spinal Muscle Atrophy (SMA) and Poliomyelitis. The specific diagnosis is determined by multiple factors. These include in part medical history, symptoms on presentation, progression of the illness, hereditary factors, lab tests, electromyographic testing and multiple other sources of clinical information based on the presentation of the illness may go into determining accurate diagnosis.

Some of these diagnosis offer hope of resolution with time and treatment, most are either progressive in nature with little chance of reversal or settle at a static level beyond which they do not progress or reverse. Pulmonary compromise resulting from each illness and injury is unique to the particular diagnosis.

Causes: Cause of neuromuscular dissociative injury and illness can be by a myriad of sources including a wide range of hereditary, acquired or unknown sources of onset. They result from failure of the neurologic and muscular systems and their interfaces anywhere along the chain of communication from the brain to the muscle with failure to send, transport, receive or process neural stimulus resulting in degrees of weakness up to complete paralysis.

Symptoms: The pulmonary compromise often caused by the pulmonary muscle weakness or paralysis that is the result of these various sources of NM illness have a relative commonality that can benefit from treatment with BCV. These common elements of pulmonary compromise may include hypoventilation, reoccurring atelectasis, high susceptibility to and potential for frequent pneumonias, retained pulmonary secretions, weak cough with low or nonexistent cough flows, loss of chest wall mobility, and multiple subsequent additional problems that result from these listed if they are not or cannot be adequately addressed.

Treatment with BCV

(Addressed by pulmonary symptoms)

Hypoventilation: BCV provides a means of non-invasive pulmonary support of ventilation that will bring alveolar minute ventilation back up to levels that can be adjusted to meet the patient's body's needs for CO2 clearance thus providing a tool for management of hypoventilation that allows the patient to speak, eat and drink while receiving support as long as those functions remain preserved. This provides an alternative to other pulmonary support devices that might require a facial interface (pressure mask), which can be injurious or uncomfortable or an invasive interface for ventilation such as a tracheostomy, which provides an additional source of entry of infectious organisms into the respiratory tract and that comes with a large group of side effects related to having a foreign object inserted into the trachea bypassing or blocking normal pulmonary system functions. Many patients have a strong preference for this type of support that avoids the artificial airway or mask, but rather utilizes a cuirass or chest shell as the interface between the patient and the ventilator as a treatment for hypoventilation.

Recurrent atelectasis, retained pulmonary secretions due to weak cough with low or nonexistent cough flows with high susceptibility to pneumonia: Impaired function of pulmonary muscles, being primarily bed bound, and respirations at low tidal volumes are all risk factors for atelectasis or alveolar derecruitment. These are also symptoms in many cases of neuromuscular illnesses. Since retained secretions and subsequent potential mucous plugging of airways can result, atelectasis is also likely to develop due to blockage of air entry into effected lung regions. This combination of lack of ability to breathe deeply, cough effectively, alveolar collapse, and secretion retention can greatly increase the likelihood of development of pneumonia. This primary pulmonary infection can and often does lead to greater compromise with systemic infective and inflammatory processes that are for these patients a primary source of fatality. Utilizing BCV to support ventilation provides a means of keeping atelectasis at bay and maintaining full lung volumes. This is achieved by virtue of the fact that for equal tidal volume exchange compared to positive pressure types of support the lung inflation is provided very evenly to both healthy and sick lung units. The more even and complete inflation is due to the more natural pull of gas into the lungs from across the chest and from below the diaphragm, thus distributing the inspired gas volume more evenly throughout the lungs. This is unlike inflation with positive pressure which typically inflates the more compliant healthy lung units quite readily even to the point of over inflation and potential damage, particularly in the face of lung volume loss with atelectasis, while not expanding those alveoli that have collapsed and are less compliant. As a treatment tool to provide airway clearance and assistance of cough, BCV is able to provide an intense yet comfortable high frequency chest wall oscillation that breaks up and thins pulmonary secretions while also providing facilitation of transport of the secretions from the distal lung regions up to the trachea.

The effect of this portion of the treatment cycle is assisting the natural mucocilliary escalator system and results in a highly effective secretion mobilization strategy. Following the oscillation phase of the Secretion Clearance mode treatment cycle the RTX switches to the part of the mode that provides a comfortable but strong negative pull on the chest wall and diaphragm creating a full deep breath. This is followed by a short strong positive phase that causes high exhaled flows and assists expectoration of the secretions that were thinned and brought to the large airways. The rate and duration of the cycles are tailored specifically to the patient's needs and best effect.

This secretion clearance treatment mode is unique among all ventilators and is part of the way that BCV can reverse and prevent atelectasis, decrease the incidence of pneumonias dramatically and minimize hospitalizations due to pulmonary issues for patients with respiratory compromise of any source including neuro-muscular.

This is all very comfortable versus other devices that shake while they squeeze to provide chest wall oscillation or require mask pressure to inflate and deflate the lungs to extract secretions for airway clearance and works using the same interface to provide non-invasive support of ventilation.

Decreased Chest Wall Mobility or Loss of Chest Wall Range of Motion: One of the possibly lesser considered, but very important changes to the pulmonary system that can occur over time for individuals with neuromuscular illness is a restrictive

effect caused by decreased range of motion of the bony and cartilaginous structures that comprise the thorax. As a single tidal volume is utilized with positive pressure or a pressure applied that does not offer the lungs and chest wall a regular opportunity to fully expand, the articulations of the thorax that allow the ribs to expand and allow full inflation become stiff and ultimately rigid. This ability to fully expand the thorax is known as chest wall mobility or chest wall range of motion is a very important part of the pulmonary reserves and greatly contributes to airway clearance ability and keeping lungs free of atelectasis and secretion stasis. With routine use of BCV for support and/or secretion clearance with assistance of cough regular full lung expansion is achieved and chest wall range of motion is maintained and over time increased resulting in a greater level of health and wellness for patients with neuromuscular related pulmonary compromise.

Expectations/Prognosis

Because of the broad range of causes and sources, prognosis for each of the different diagnoses that make up this group of illnesses each have a range of their own unique long term prognosis. With some, if the most acute phase is survived, and adequate support is provided for affected systems then some individuals will experience full recovery from their neuromuscular compromise. Guillain-Barré Syndrome or Botulinum Toxicity patients often experience full recovery from their paralysis. Other neuromuscular illnesses are progressive and irreversible with few to no cases of recovery of function having been previously recorded. Research offers great hope with many brilliant scientists working very hard to generate new treatments or even cures.

Regardless of the prognosis the commonality of these illnesses effect on the pulmonary system and the elements required for treatment means that the expectation should be that as long as the patient wishes to seek their greatest level of health these ongoing issues need to be addressed and addressed as aggressively as possible. The fullest possible spectrum of treatment options should always be part of the patient's education on their illness and all of these options should be made available to patients when making decisions regarding their treatment. If the person who is prone to or experiencing pulmonary compromise resulting from a neuromuscular illness or injury is seeking a comfortable means of non-invasive pulmonary support, airway clearance with assistance of cough and an excellent way to maintain chest wall mobility while providing a means to keep their self out of the hospital or shorten their stay if inpatient then Biphasic Cuirass Ventilation with its built in Secretion Clearance and Assist Cough modes must and should always be considered.

Denise Fernandez CRT is Lead Clinical Educator for Hayek Medical and has developed a unique and close relationship with many of the patient and clinician users of BCV. She presented questions to several individuals who have had significant experience using BCV. She developed two sets of questions one for clinicians and another for patients or their caregivers to answer. These questions and their responses follow:

Dr Frank Austan DH Sc., LRCP (RRT) is Director, Respiratory Care/Pulmonary Services Philadelphia VA Medical Center. Dr Austan recently presented a poster at the 2014 AARC Congress "A Case Study: Use of Biphasic Cuirass Ventilation Upon Diagnosis of Amyotrophic Lateral Sclerosis" and had a corresponding abstract published in the October issue of Respiratory Care Journal. It is cited with the references for this article. Dr Austan is a leader in the VA health system, but he also provides care at the bedside as a Respiratory Therapist. He fielded both sets of questions based on his role as clinician and patient advocate offering answers from his observation of their perspective and his as care provider.

Clinician Interview Dr Frank Austan

DF: What originally attracted you and your team to BCV as a therapy for your patients?
Dr Austan: The potential of BCV to provide:

a. greater comfort by supporting the normal "Thoracic Pump" breathing
b. Increasing the length of time in avoiding the application of BIPAP (positive breathing ventilation) that often requires wearing a full face BIPAP mask that prevents verbal communication as well as increasing the risk of facial tissue breakdown and,
c. Postponing (Increasing the length of time until the inevitable decision re. the need for a tracheostomy tube is required and mechanical ventilation

DF: What observations have you made as to how this has benefitted the patients that you have used it with?
Dr Austan:

a. BCV delayed the inevitable need for a tracheostomy and conventional mechanical ventilation.
b. Less respiratory therapy equipment is required; CPT Percussor; Coughalator etc.

DF: Do you find patients generally have fewer hospitalizations when they utilize BCV at home?
Dr Austan: BCV has the potential to reduce hospitalizations by providing the following therapies:

a. Deep Breathing Exercise
b. Airway Clearance via cough assist and oscillatory therapy (CPT)
c. Preventing a decrease in functional residual capacity (FRC) during the hours of sleep
d. Supports the "Thoracic Pump Mechanism" as a mechanical diaphragm that supports ventilation

DF: When BCV is used for acute pulmonary exacerbations what have been your observations as to how length of stay is affected?
Dr Austan: No experience with acute exacerbation.

DF: Do you find the patients adapt well to this type of support and can it be a good long term option for the right patients?
Dr Austan: Considering the terminal nature of ALS and associated eventual respiratory failure, the early introduction of BCV assists in establishing a segue that "bridges" improvement in the patient's compliance and tolerance of the device.

DF: What are some of the challenges you have encountered to providing your NM patients with BCV?
Dr Austan: Non familiarity of BCV by the pulmonary/respiratory care establishment of the fact that a "State of the Art" non-invasive negative pressure ventilation system now available in the medical market place.

DF: What have you found presents the greatest challenge to patients using BCV?
Dr Austan: Last minute care planning and application when

a state of exacerbation ensues. Patients require a period of "training" gradual acclimation to BCV.

DF: Has it been an advantage for your patients that recruitment, support and airway clearance are all provided in one device with the Hayek and how so?
Dr Austan: BCV provided multiple therapeutic modalities ie Cough assist; Deep breathing exercise via negative pressure assist; Vibrational Chest Physical Therapy.

DF: There are twelve sizes of cuirass, what might you offer as to the best way to provide accurate fitment for each individual patient?
Dr Austan: Chest measurement.

DF: What are some tips you might offer to other clinicians who are beginning to explore use of BCV for their NM populations?
Dr Austan:

a. BCV is driven by the respiratory therapist ("Champions" for BCV)/physician.
b. Develop rapport with the physician staff in the setting where BCV will be of benefit to the their patient's ie ALS Clinic.

DF: What do you envision as to how you might further develop BCV with your NM population in the future?
Dr Austan: I envision BCV following algorithm for ALS cases: Diagnosis > BCV > BCV and BIPAP in combination > BIPAP > Tracheostomy > Mechanical Ventilation.

DF: Any additional comments you would like to make?
Dr Austan: An "old" technology (Iron Lung; Chest Cuirass) that has been significantly innovated eliminating the need to purchase separate pieces of therapy equipment such as: Mechanical Chest Percussor, CPAP machine, Coughalator, Non-invasive negative pressure ventilation.

Dr Amanda Dove is a Pediatric Pulmonologist who sees patients in and around the San Antonio Texas area. She has been prescribing BCV for NM patients referred to her practice for several years.

Clinician Interview Dr Amanda Dove

DF: What originally attracted you and your team to BCV as a therapy for your patients?
Dr Dove: The potential to provide via BCV a more normal assistance with respirations and simulation of normal breathing cycle. We felt that by being able to support patients with a more normal thoracic Pump/Bellows assistance of breathing we would see increasing length of time before our patients would be getting trached and being put on a ventilator, which is what we have seen.

DF: What observations have you made as to how this has benefitted the patients that you have used it with?
Dr Dove: I have seen an increase in cardiac output and renal perfusion decreasing the amount of Lasix being given to patients. The increase in cardiac output has helped them and we have observed decrease in the sound of wet lungs.

DF: Do you find patients generally have fewer hospitalizations when they utilize BCV at home?
Dr Dove: Yes, when well supported, fewer events of atelectasis and subsequent pneumonia due to poor airway clearance.

DF: When BCV is used for acute pulmonary exacerbations what have been your observations as to how length of stay is affected?
Dr Dove: LOS similar to patients without BCV due to length of antibiotic therapy.

DF: Do you find the patients adapt well to this type of support and can it be a good long term option for the right patients?
Dr Dove: The patients do adapt well, often without the ability to lie on stomach. They prefer to utilize rather than BiPAP as face is free and they are able to talk. Enhanced cardiac output as noted. Better urine output.

DF: What are some of the challenges you have encountered to providing your NM patients with BCV?
Dr Dove: Lack of easy availability in hospital, has to be brought in; poor support from hospital, not readily available to reach inpatients, and family. Also admitting is difficult because hospital staff can't support care without the system being on site when needed, they rely on patients and their family to bring in their systems.

DF: What have you found presents the greatest challenge to patients using BCV?
Dr Dove: Lack of portability; patients cannot use current model in vehicle while traveling. Poor planning for smooth transition of these patients into hospital, using BCV inpatient and off of BCV, advancing to conventional vent with acute illness if needed and back to BCV when ready. It is difficult to listen to breath sounds while in use, but it can be quite easily removed and placed back on. Use post surgery is a challenge still with certain procedures and it must be removed to obtain EKG or adjust leads.

DF: Has it been an advantage for your patients that recruitment, support and airway clearance are all provided in one device with the Hayek and how so?
Dr Dove: Yes, allow us to see discontinued need for other devices.

DF: There are twelve sizes of cuirass, what might you offer as to the best way to provide accurate fitment for each individual patient?
Dr Dove: Tape measure, and trial fitting with different sizes for best result.

DF: What are some tips you might offer to other clinicians who are beginning to explore use of BCV for their NM populations?
Dr Dove: Involve well trained and BCV versed Respiratory Therapists to assist with enlightening physicians new to the therapy and patient education.

DF: What do you envision as to how you might further develop BCV with your NM population in the future?
Dr Dove: I am actively working to develop better hospital support. Will continue relationship with Hayek Representative and seek greater agreement with algorithm proposed for SMA, MD patients.

DF: Any additional comments you would like to make?
Dr Dove: The increase in cardiac output is a real positive with using this for ventilation.

Patient/Caregiver Interview Dr Frank Austan

DF: How has using BCV changed your respiratory treatment

regimen?
Dr Austan:

a. Improves ability to cough (Patient)
b. Improved ability to breathe deeper (Patient)
c. Treatment of shortness of breath due to respiratory failure (Provider)

DF: What have your patients said that they feel when using BCV?
Dr Austan: Able to breathe easier; feel less short of breath (Patient).

DF: Is it difficult to talk while using BCV?
Dr Austan: The voice intensity improved with a "deep breath" (Patient), increase in VT (Provider).

DF: Would you say that the cuirass is comfortable to wear?
Dr Austan: Initially a little uncomfortable but able to adapt and became comfortable with greater use (Patient).

DF: Can you eat while being ventilated with BCV?
Dr Austan: Comfortable (Patient); Swallowing was not affected (Provider).

DF: How long can you wear the Cuirass?
Dr Austan: Initial startup was to use as deep breathing exercises. As cough became weaker, added cough assist. Use during the hours of sleep to assist in resting the respiratory muscles; as breathing became more difficult was on for longer periods of time during the day (Patient & Provider).

DF: What are some of the benefits that you have experienced by using BCV (clinical outcomes)?
Dr Austan: Improved exhalation of carbon dioxide by improving alveolar ventilation (Provider), and improved the patients cough (Patient & Provider).

DF: Is it hard to use the cuirass and the Hayek system?
Dr Austan: Was not difficult to apply by the nursing staff in an extended rehab facility; patients often weak and unable to apply BCV on their own (Provider).

DF: What benefits has BCV brought to your patients' quality of life?
Dr Austan: Improves quality of life by not impeding speech, eating, or drinking. Provides effective treatment for shortness of breath secondary to hypoventilation. It delayed the inevitable application of BIPAP Ventilation; tracheostomy, and tracheal suctioning.

DF: What is the one thing you would say is the main benefit of using BCV and why?
Dr Austan: Assists in supporting normal "Thoracic Pump" breathing. It treats hypercarbia as measured by end-tidal CO2 Monitoring.

DF: What considerations would you offer to other individuals needing the benefits provided by BCV?
Dr Austan: The clinician must have a complete understanding of BCV technology and its use as therapy in order to effectively introduce BCV to the physician as well as ability to present it in a positive light embracing BCV which in turn helps with patient attitude towards the treatment.

DF: Any additional comments you would like to make?
Dr Austan: In long term care of the patient with gradual inevitable respiratory failure due to wasting respiratory muscles, patient experience improved quality of life using non-invasive BCV as compared to patients receiving non-invasive Bi-Level Positive Pressure Breathing (BIPAP) .

Jamie Quist has been using BCV at home almost since it began to be offered in the US. He may well have the most experience with BCV of anyone in the country.

DF: How has using BCV changed your respiratory treatment regimen?
Mr Quist: Using BCV has greatly impacted my treatment regimen, specifically its excellent cough assist mode. Prior to BCV I used an airway clearance vest that, while effective, did not help bring mucus up after loosening it. The problem with airway clearance vests is that once mucus is loose the wearer has to contend with both getting the mucus up as well as the squeezing pressures of the vest. This can cause a lot of stress to the patient, both physically and mentally. The beauty of BCV and the cough assist mode is that the negative pressure pulls your chest and diaphragm out, making it easy and less stressful to cough mucus up Add the varying vibration frequencies and cough mode into the mix and BCV becomes my go to tool for daily breathing treatments.

DF: How do would you say that you feel when using BCV?
Mr Quist: In terms of how I feel when wearing the BCV I would say I'm extremely relaxed. The reason why BCV is so much more comfortable than any positive airway device is that the BCV's mechanics work the same the way the body is physiologically designed to breathe. Often wearers of CPAP and BiPAP machines complain of feeling suffocated and claustrophobic while wearing masks and that's because air is being shoved into the lungs rather than going in passively. Since all the BCV machine is doing is pulling the diaphragm and rib cage out and open, air goes into the lungs passively and efficiently.

DF: Is it difficult to talk while using BCV?
Mr Quist: Talking on the machine is extremely simple. Again, since air goes into the lungs the same way it would in a person not wearing the machine the patient doesn't have to struggle to speak.

DF: Would you say that the cuirass is comfortable to wear?
Mr Quist: The cuirass is comfortable to wear. Padding can always be customized with various foams and the mechanics of the machine are quite relaxing once you get used to the rhythm.

DF: Can you eat while being ventilated with BCV?
Mr Quist: Eating on the BCV can be done, but it's important to be careful when doing so. Always eat sitting up and make sure you're not trying to swallow when air is going into your lungs. It's also crucial to not over eat since that can cause reflux or stomach discomfort.

DF: How long can you wear the Cuirass?
Mr Quist: As long as the wearer's skin isn't getting too dry and having pressure sores form from an improper cuirass fitting, the it can be worn as much as they want. When I'm feeling good I'll come off during the day and then go back on for bed. I have worn it for extremely long periods when sick and was fine.

DF: What are some of the benefits that you have experienced by using BCV (clinical outcomes)?

Mr Quist: The best outcome I've had from using the BCV was being able to come off my trach. I had a tracheostomy for 6 years and towards the end of that time my lungs were having a lot of problems from the positive airway pressures. I was continually getting pneumothoraces all over my lungs and was stuck in the hospital for an accumulative period of about 3 months. Once I was able to switch over to the BCV machine I no longer had to worry about the pneumothoraces and thankfully haven't had any since.

DF: Is it hard to use the cuirass and the Hayek system?
Mr Quist: The cuirass and Hayek system are both extremely easy to use. Once the patient's settings are determined there's not much they need to do. Navigating between modes is easy and intuitive.

DF: What benefits has BCV brought to your quality of life?
Mr Quist: BCV has given me a lot of my freedom back. I'm able to shower now and go out more. My lungs also don't produce as much mucus as they did with the trach, which is very relieving.

DF: What is the one thing you would say is the main benefit of using BCV and why?
Mr Quist: The main benefit to the device is the obvious one, breathing. People with compromised lungs know the harsh reality of what it's like to not be able to breathe and it's something that is truly terrifying. BCV allows me to keep breathing and in turn helps me fulfill my goals in life.

DF: What considerations would you offer to other individuals needing the benefits provided by BCV?
Mr Quist: Anyone looking for airway assistance should definitely try BCV. Give it some time, make sure you get proper settings and a proper fit and you'll be happy with the device.

DF: Any additional comments you would like to make?
Mr Quist: I just want to take the opportunity to thank United Hayek in their continued support and dedication to their customers as well as to bettering respiratory aid in general. They're doing some great work that will continue to benefit many people from all over.

L-R: Denise Fernandez, Marco Gayton, Dr Amanda Dove.

Marco A. Gaytan, Jr. is an adolescent patient who is followed by Dr Amanda Dove and to whom Denise Fernandez introduced BCV nearly three years ago.

DF: How has using BCV changed your respiratory treatment regimen?
Mr Gaytan: I have a better quality of life and am certain it has extended my life since I have had fewer hospitalizations. I use the respiratory treatments with the cuirass. I feel that utilizing the Cuirass has cleared my secretions a lot better than any other CPT out there that I have used. I feel the medicine with the cuirass takes a better effect.

DF: How do would you say that you feel when using BCV?
Mr Gaytan: Using BCV, has changed my life and my family's life since I am able to communicate and able to breathe better. I never thought at first by looking at it that it would be such an awesome piece of respiratory equipment.

DF: Is it difficult to talk while using BCV?
Mr Gaytan: Not at all. I felt my voice projected and it gave me the strength to talk louder.

DF: Would you say that the cuirass is comfortable to wear?
Mr Gaytan: The cuirass is very comfortable. I even rest my phone and tv remote on my cuirass. I am able to talk to my family and I do not get sores as I did by wearing a mask on my face.

DF: Can you eat while being ventilated with BCV?
Mr Gaytan: I can eat while be ventilated and able to play my games and play with my brothers and sisters. Talking all the time.

DF: How long can you wear the Cuirass?
Mr Gaytan: I wear the cuirass at night and for my respiratory treatment regimens. The longest I wore the cuirass was for 21 days straight with an hour break during the day.

DF: What are some of the benefits that you have experienced by using BCV (clinical outcomes)?
Mr Gaytan: I had less hospitalizations and has helped me avoid getting trached.

DF: Is it hard to use the cuirass and the Hayek system?
Mr Gaytan: It is not at all hard to use and very easy to work with. The representatives are there to help the families and are available at all times like Denise Fernandez.

DF: What benefits has BCV brought to your quality of life?
Mr Gaytan: My life was improved and I received the strength to need ventilation less during the day. I do not get short winded during the day and my facial scars healed.

DF: What is the one thing you would say is the main benefit of using BCV and why?
Mr Gaytan: It helps me get better rest at night while sleeping, I know this because the next day I am able to be more active. I feel energized the next day. I have the energy to get out of bed.

DF: What considerations would you offer to other individuals needing the benefits provided by BCV?
Mr Gaytan: I remember the first time I tried the cuirass. I was scared because of the cuirass on my chest. I told my mom that I would not like it. Denise Fernandez spoke to me and placed it on herself for a while and showed me that it did not hurt at all. She asked me to sleep with it for the night and she would spend the night with me to make sure I got a good rest with it. When I woke up in the morning she looked at me and asked how I felt. I told her I felt like I could run and that I had a dream of running. I was wearing oxygen for 3 days before I got the cuirass and when I placed the cuirass on I did not

need my oxygen any more. Denise told me that my heart rate went down, my respirations, blood pressure all went down, my saturations went up and she told me how my cardiac output may have increased as well. I wanted to go home with this. Denise said she would work with Dr Dove to get it prescribed for me. My hospitalizations decreased, because I was going to the hospital at least once a month. I love my cuirass.

DF: Any additional comments you would like to make?
Mr Gaytan: Thank you to Denise Fernandez for introducing BCV to my family. You are awesome.

To learn more about how to obtain BCV for your patients, yourself or your loved one visit www.hayekmedical.com, call 855 2 GETBCV, or email gary.mefford@hayekmedical.com.

References

1 Tsukamoto K, Minimiya R, Nishihara T, Kawamata M, Kotani T. An example of the critical muscle helpless symptom Respiratory Assisted by Biphasic Cuirass Ventilation in Myasthenia Gravis child. Japanese Society of Anesthesiologists 2006 June P2-50-06

2 Toyoshima M, Maeoka Y, Kawahara H, Maegaki Y, Ohno K Pulmonary atelectasis in patients with neurological or muscular disease; gravity-related lung compression by the heart and intra-abdominal organs on persistant supine position No To Hattatsu 2006 Nov;38(6):419-424

3 Rathbone, Phillip; Stuart-Smith, Karen Use of the Medivent RTX Respirator, A Biphasic Non-Invasive Cuirass Ventilator, in Neurological Disease Complicated by Acute Respiratory Failure Critical Care Medicine: Volume 34(12) December 2006

4 Yorimoto K, Tamada Y, Ohkubo H, Masagaki A, Hatsuse N Challenge of non-invasive ventilation management in amyotrophic lateral sclerosis patients who suffer from carbon dioxide narcosis Motor Neurone Disease Association – 19th International Symposium on ALS/MND, Birmingham, UK 3-5 November 2008

5 Furasawa, Y. et al Treatment of subcutaneous and mediastinal emphysema with cuirass ventilation in a patient with Pompe disease undergoing non-invasive positive pressure ventilation Clinical Neurology 2010, 50 (5):306-310

6 Kameyama Y1, Wagatsuma T, Nakamura M, Kurosawa S, Saito K, Hoshi K. A case of congenital central hypoventilation syndrome. J Anesth. 2012 Dec;26(6):922-4. doi: 10.1007/s00540-012-1451-1. Epub 2012 Jul 12.

7 Headly, Joan L. Biphasic Cuirass Ventilation and the United Hayek RTX Ventilator Ventilator Assisted Living Vol. 27 No. 6 December 2013 http://www.ventusers.org/edu/valnews/val_27-6dec13p3-4.pdf http://www.ventusers.org/edu/Call-Hayektakealook.pdf

8 Mefford G. Biphasic Cuirass Ventilation for the Chronic Lung Disease Patient Respiratory Therapy Vol. 8 No. 5 October-November 2013 pp. 50-52 Reversal of sleep-induced hypoventilation and chronic respiratory failure by nocturnal negative pressure ventilation in patients with restrictive ventilatory impairment Am Rev Respir Dis. 1987 May;135(5):1049-55

9 Lupe Martinez BSRC, RRT, RCP Kaine Rodriguez Thrives Thanks to Biphasic Cuirass Ventilation Ventilator-Assisted Living October 2010 Vol. 24, No. 5 Stephen R. Marrone, EdD, RN-BC, CTN-A, Julie Eason, BS, RRT-NPS, Claudette McLeod, MSN, RN, Collette Marriott, BSN, RN, Jocelyn Alleyne, MHA, RN, Dornalee Walker, RN, & Charlyn Bish, RN Weaning the 'Unweanable' ADVANCE FOR RESPIRATORY CARE AND SLEEP MEDICINE Posted online March 1 2012 http://respiratory-care-sleep-medicine.advanceweb.com/Features/Articles/Weaning-the-Unweanable.aspx Accompanying video: http://respiratory-care-sleep-medicine.advanceweb.com/Multimedia/Videos/biphasic-cuirass-ventilation.aspx

10 Klonin H., Peters, M. et al The Use Of Negative Pressure Ventilation To Improve Secretion Clearance In Two Patients Failing Conventional Therapies Respiratory Care • October '98 Vol 43 No 10. pp 853

11 Joanna M Keating, Nicola Collins, Andrew Bush MD PhD, and Michelle Chatwin PhD High-Frequency Chest-Wall Oscillation in a Noninvasive-Ventilation-Dependent Patient With Type 1 Spinal Muscular Atrophy Respiratory Care • November 2011 Vol 56 No 11. pp 1840-1843

12 H Hartmann, M H Jawad, J Noyes, M P Samuels, D P Southall Negative extrathoracic pressure ventilation in central hypoventilation syndrome Archives of Disease in Childhood 1994; 70: 418-423

13 A G Driver, B B Blackburn, S P Marcuard and E H Austin, Jr Bilateral Diaphragm Paralysis Treated with Cuirass Ventilation Chest 1987;92;683-685

14 Koji Kato, Naoki Sato, Shinhiro Takeda, Takeshi Yamamoto, Ryo Munakata, Masafumi Tsurumi, Daigo Suzuki, Kaori Yagi, Keiji Tanaka and Kyoichi Mizuno Marked Improvement of Extensive Atelectasis by Unilateral Application of the RTX Respirator in Elderly Patients Internal Medicine 48:1419-1423,2009 DOI:10.2169/internalmedicine.48.1988

15 Yorimoto K, Tamada Y, Ohkubo H, Masagaki A, Hatsuse N Challenge of non-invasive ventilation management in amyotrophic lateral sclerosis patients who suffer from carbon dioxide narcosis Motor Neurone Disease Association – 19th International Symposium on ALS/MND, Birmingham, UK 3-5 November 2008

16 Akash Deep, Claudine De Munter and Ajay Desai Negative Pressure Ventilation in Pediatric Critical Care Setting Indian Journal of Pediatrics, Volume 74 – May, 2007 Rathbone, Phillip; Stuart-Smith, Karen Use of the Medivent RTX Respirator, A Biphasic Non-Invasive Cuirass Ventilator, in Neurological Disease Complicated by Acute Respiratory Failure Critical Care Medicine: Volume 34(12) December 2006 p A170

17 Leonard R., Mefford G. Biphasic Cuirass Ventilation-An Approach Based on Normal Ventilation Respiratory Therapy Vol. 9 No. 5 Oct.-Nov. 2014 pp. 24-28

18 Weido G., Young J., Deshpande S. Case Report for Chest Cuirass in Toddler with Diaphragm Weakness Post Heart Transplant Respiratory Care Oct. 2014 Vol 59 No 10 AARC Open Forum Poster 2006727

19 Washam M., Burke L., White C., Gurbani N., Sawnani H. The Unique Application of Negative Pressure Cuirass Ventilation in a Pediatric Patient Respiratory Care Oct. 2014 Vol 59 No 10 AARC Open Forum Poster 2022018

20 Austan, F., Domanski J. A Case Study: Use of Biphasic Cuirass Ventilation Upon Diagnosis of Amyotrophic Lateral Sclerosis Respiratory Care Oct. 2014 Vol 59 No 10 AARC Open Forum Poster 2025306

21 Mefford G. Biphasic Cuirass Ventilation Personal Perspectives Respiratory Therapy Vol. 9 No. 6 December 2014-January 2015 pp 36-39