The Coalition Chronicle

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Spotlight Article

CANISIUS COLLEGE

Master of Science in Respiratory Care

by Arthur A. Taft, PhD, RRT, FAARC, Program Director

The College

Consistently ranked among the top regional institutions in the Northeast, Canisius College is the premier private university in Western New York and one of 28 Jesuit, Catholic colleges in the nation. Founded in 1870 by German Jesuits, Canisius is named for St. Peter Canisius, a renowned Dutch educator and one of the original members of the Society of Jesus. Canisius is a masters-level, comprehensive university offering outstanding undergraduate, graduate and professional programs distinguished by transformative learning experiences that engage students in the classroom and beyond. Canisius fosters in its students a commitment to excellence, service and leadership in a global society.

Canisius offers more than 100 undergraduate majors, minors and special programs and more than 30 master's and certificate programs. Canisius alumni are more than 50,000 strong and are making a difference in every state and 58 countries.

The Program

Respiratory care is rapidly developing and advancing medically, technologically, and sociologically. Much has been discussed and written about the evolving roles of respiratory therapists in 2015 and beyond as well as the need for expanded skills and education. In response to this need for developing new skills, the Master of Respiratory Care Program was started in 2012 at Canisius College, in beautiful Buffalo, New York.

The online Master of Science in Respiratory Care (MSRC) Program at Canisius College is a post-professional graduate degree designed for registered respiratory therapists who already possess a baccalaureate degree. The MSRC Program is multidisciplinary in that some courses are solely for RRTs in the program and some are shared by students in other disciplines enabling students to discuss ideas and concepts that cross disciplinary boundaries. In this way students are exposed to different ways of approaching problems deepening their learning experience.

The program is offered in a fully online format, structured to fit the busy lifestyle of working therapists. Course are run in an asynchronous manner, allowing students to complete their work at whatever time of day is convenient for them. Admissions are on a rolling basis, and contingent upon course availability, students may begin the program during the Fall, Spring or Summer semesters.

Students in the online MSRC program can expect to enhance knowledge to improve clinical practice, undergo training in management, supervision, education and research, develop skills to formulate appropriate questions, organize and test hypotheses, and apply research results to practice, among other acquired skills. More information can be found at the Respiratory Care Program Website: (https://www.canisius.edu/academics/programs/respiratory-care)

Curriculum

The MSRC Program at Canisius College entails a total of 33 credit hours. Every student must complete all core courses (21 credits) and all courses in one of the two specialty tracks (12 credits), respiratory therapeutics and respiratory care education.

Most courses are eight weeks in length so by necessity they are quite intense. Canisius College maintains traditional semesters at 16 weeks, so by completing one course every eight weeks students can easily complete two courses during each semester. Many students find this advantageous to minimize interference with work and family life, while some students choose to enroll in two courses during each eight-week period to complete the program quickly.

Project courses (ALH 689 & 699) are designed to showcase the skills students have developed during their time in the program. Identification of acceptable projects is the responsibility of the student who will work with the program director to identify an acceptable project. Once a project idea has been approved, the project shall be developed independently by the student, with guidance from a project advisor.

Students who choose the respiratory therapeutics track will complete a 16-week capstone project allowing the student to demonstrate the ability to develop a graduate-level project using skills enhanced while enrolled in the MSRC Program. Acceptable projects include an evidence based review of a current topic of interest, community or professional service projects, training programs, continuing education programs, as well as other options of interest to the student.

Students choosing the respiratory care education track will perform a two-semester thesis project. Acceptable projects include an original study that involves generating data about an issue that has not yet been studied or is unclear due to conflicting reports in the literature, or an education project that involves the development of a unique educational product associated with developing baccalaureate or graduate RC programs.

Here is a listing of current Core and Specialty Track Courses:

Core Courses

Course	Title	Credits
ALH 501	Health Promotion and Disease Prevention	3
RES 512	Pulmonary Function Testing	3
RES 618	Pulmonary and Cardiac Rehabilitation	3
ALH 602	Cardiopulmonary Pathophysiology	3
ALH 621	Cardiopulmonary Pharmacodynamics	3
ALH 631	Research Methods in Allied Health	3
ALH 632	Data Analysis and Statistics	3
	Total Credits	21

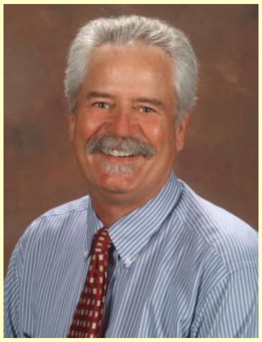
Specialty Track 1: Respiratory Therapeutics

Course	Title	Credits
ALH 503	Medical Nutrition Therapy	3
RES 612	Advanced Cardiopulmonary Monitoring	3
RES 615	Advanced Topics in Ventilatory Support	3
ALH 689	Master's Project	3
	Total Credits	12

Specialty Track 2: Respiratory Care Education

Course	Title	Credits
RES 522	Adult Learning Theory	3
ALH 645	Teaching Technology for Health Leaders	3
ALH 689	Master's Project	3
ALH 699	Master's Project II	3
	Total Credits	12

Faculty



Arthur Taft, PhD, RRT, FAARC is Program Director of Canisius College's Master of Respiratory Care Program, a position he has held since 2015. In addition to his role as program director he assists students with identifying appropriate master's projects, advises student projects in ALH 689 and ALH 699, and teaches ALH 602: Cardiopulmonary Pathophysiology and RES 612: Advanced Cardiopulmonary Monitoring. Dr. Taft is an Emeritus Associate Professor of Respiratory Therapy at Augusta University where he served as Clinical Director, Program Director and Chairman of the Department. He began teaching at Armstrong State College. Dr. Taft is a member of the Coalition for Baccalaureate and Graduate Respiratory Therapy Education (CoBGRTE) Board of Directors and has served the Georgia Society for

Respiratory Care as President, Vice-president, and Program Committee Chair. Over his career, Dr. Taft has made many presentations regionally, nationally, and internationally to a variety of professional audiences. He was a regular presenter at the AARC open forum and has published numerous abstracts, manuscripts, and book chapters. In 2009 he received the Respironics Fellowship in Mechanical Ventilation from the ARCF. His research interests include airway care, respiratory therapy education, and non-invasive monitoring. In his most interesting research endeavor, he was invited by researchers from Cornell University to go to Etosha National Park in Namibia, Africa, where he studied the effects of posture on ventilatory function in the anesthetized African black rhinoceros.

Claire Aloan, MS, RRT-NPS, FAARC is an Adjunct Professor in the MSRC Program at Canisius College and an Associate Professor and Interim Program Director of the Department of Respiratory Therapy Education at SUNY Upstate Medical University. At Canisius she teaches RES 618: Pulmonary and Cardiac Rehabilitation and serves as a project advisor for ALH 689 and ALH 699. Ms. Aloan has held positions of Director of Respiratory Care services at Rochester Regional Heath, Clinical Specialist for Masimo Corporation, Manager of Clinical Services Division at St. Joseph's Hospital Health Center, and Director of Cardiopulmonary Services at Samaritan Health System. She has also held faculty positions at Onondaga Community College, and Hudson Valley Community College. Ms. Aloan has received several professional awards including the AARC Management Section Practitioner of the year in 2007. Ms. Aloan has been active in the AARC and has held numerous elected positions in the NYSSRC, including President, AARC Delegate, and member of the Board of Directors.

Christina Weatherby MS, RRT, is an Adjunct Professor for the MSRC Program at Canisius College where she teaches RES 615: Advanced Topics in Ventilator Support and serves as a project advisor for ALH 689 and ALH 699. Ms. Weatherby obtained her bachelors and master degree in respiratory care from Georgia State University in Atlanta, Georgia. She has worked in all aspects of Pediatric Respiratory Care for 15 years, starting her career at Johns Hopkins Hospital in Baltimore, Maryland before returning to Atlanta, Georgia to join the Respiratory Care team at Children's Healthcare of Atlanta-Egleston. She then spent two years as the Supervisor of Pulmonary Diagnostics for Egleston, Scottish Rite, and physician practices and was recently promoted to Manager of Respiratory Care at Children's Healthcare of Atlanta-Scottish Rite. Academically, she has served as Adjunct Faculty and Clinical Preceptor for Georgia State University's Division of Respiratory Care from 2008-2015. Christina is a strong advocate for the Respiratory Care profession with a love for leadership and education.

John Rutkowski, MBA, MPA, RRT, FACHE, FAARC is the Director of the Respiratory Therapy Program at the County College of Morris in Randolph, NJ. His career in respiratory care includes over 45 years of clinical, managerial, and community outreach experience. In addition to day to day operations of respiratory care, invasive cardiology and non-invasive cardiology, he has been responsible for the implementation of arterial blood, pulmonary function testing, cardiopulmonary exercise testing, and bronchoscopy labs and pulmonary rehabilitation. He received his formal respiratory therapy training and certificate from St. Joseph Hospital School of Respiratory Therapy in Lancaster, Pennsylvania, along with an associate of science degree from York College of Pennsylvania. He has also earned an undergraduate degree in chemistry from Jersey City State College (now NJ City University), a Master of Business Administration from Fairleigh Dickinson University, and a master of public administration from Seton Hall University. In addition to his work as a respiratory therapist, he remains active in the AARC and has served the NJ affiliate as president, board member and on numerous committees. He has also served as the New Jersey delegate to the AARC - House of Delegates. He is a member of the American College of Health Care Executives and its New Jersey Affiliate, the Association of Healthcare Executives of NJ. Throughout his career, he has been and remains active in the American Lung Association (ALA). He has served on the ALA's Nationwide Assembly, a number of nationwide committees, as a board member and chairman of the ALA in the Mid-Atlantic, Advisory Board member and past-chair of the ALA in New Jersey. He has provided testimony on behalf of the ALA to the United States Environmental Protection Agency and is a member of the Pediatric and Adult Asthma Coalition of New Jersey. He is a contributing author for several books and has authored many articles published in professional journals and newsletters. Most recently he was appointed by Gov. Christie to the NJ Chronic Obstructive Disease (COPD) Task Force.

Kenneth A. Wyka, MS, RRT, AE-C, FAARC, is an Adjunct Professor in the MSRC program at Canisius College and has been the Program Director and Dean, School of Healthcare-Respiratory Therapy at Independence University in Salt Lake City, UT since September 2015. He has also been the Director of Clinical Education at the University of Medicine & Dentistry in Newark, NJ; Director of Respiratory Care at the Valley Hospital in Ridgewood, NJ and Program Director for the Respiratory Care Program at Passaic Community College in Paterson, NJ. Ken has been involved with many home care companies in NJ and NY as cardiopulmonary clinical specialist. Mr. Wyka advises student projects at Canisius in ALH 689 and ALH 699. He has authored several respiratory care texts including *Foundations of Respiratory Care, Respiratory Care in Alternate Sites and Respiratory Home Care - On Onsite Reference Guide* that he authored with his wife, Kathy Wyka, and Dana Oakes. Ken has also authored chapters on pulmonary rehabilitation in the 5th to 11th chapters in *Egan's Fundamentals of Respiratory Care*. Professionally, he has been the president of the NJSRC and NYSSRC and was a delegate in the AARC HOD for the NJSRC. His overall experience includes education, critical care, RT department management, pulmonary rehabilitation and home care. He has been an active member of the AARC since 1971.

Kathleen Smith-Wenning, MA, RRT-NPS, CPFT has been Adjunct Professor at Canisius College for 2 years and serves as a project advisor for ALH 689 and ALH 699. Ms. Smith-Wenning has more than 20 years of experience working within multi-cultural communities and is devoted to the care of the medically underserved. Her diverse experience spans both the health and social sciences. Ms. Smith-Wenning was Program Director for the Respiratory Care Programs at Rutgers School of Health Professions, Newark and currently teaches courses in anthropology at Middlesex County College and Monmouth University. Blending both of her worlds, Kathy is working on a Zapoteco language awareness project for healthcare providers in New Brunswick, NJ. Ms. Smith-Wenning is an active volunteer and member of the U.S. Board of Oaxaca Streetchildren Grassroots, an organization dedicated to the education of 600 of the poorest children in the City of Oaxaca, México. She is also a volunteer child advocate for refugee children at the Young Center for Immigrant Children's Rights, NYC.

George Dungan, M.Phil.Med is an Adjunct Professor for Canisius College, facilitating graduate project work for the completion of student theses, supervising ALH 689 and ALH 699. George was the Head of Technology Research and Chief Operating Officer for the Woolcock Institute of Medical Research, Sydney Australia. His own research has focused primarily on sleep disordered breathing (SDB) diagnosis and treatment, and the relationship between SDB and metabolic disease. Mr. Dungan also serves as Vice President of Science & Innovation for Vapotherm, Inc. In that role, he is responsible for both the scientific and clinical research for the company. George has recently presented at the Society for Academic Emergency Medicine, and currently participates in research projects around the globe. George's memberships have included the American Academy of Sleep Medicine, the American Federation for Medical Research, European Respiratory Society, the American Thoracic Society, Society for Anesthesia and Sleep Medicine (founding member), American Chemical Society, Institute of Electrical and Electronic Engineers, IEEE Engineering in Medicine and Biology Society. Mr. Dungan was the 44^{th} registered polysomnographic technologist.

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How to Use Graphic Waveforms on the Cough Assist Device to Improve Clearance

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Introduction

Graphic Analysis has been used to improve patient ventilator synchrony since the early nineties, but until now has not been used to optimize clearance when using a cough assist device (CAD). Different versions of the CAD have been around since the original versions developed in the early fifties. One of the forerunners was a device developed by Smith in 1951 using an Eureka Hand Vacuum Cleaner to create negative pressure supporting exsufflation and later marketed by OEM as the Cof-Flator®. This was the first commercially available device to provide insufflation combined with active exsufflation.[1] Since that time several other devices have been developed, however these devices while finding acceptance in the European market were not widely available in the United States until clinical studies released in 2012 affirmed their effectiveness.[2] The current version of the Phillips/Respironics Device (T-70) was approved for release by the FDA in December of 2012. Prior devices had aneroid type monometers, so it wasn't until the release of the T-70 using more advanced sensors and digital monitoring that the ability to download and view the graphic waveforms was made available. These devices are used predominantly to assist patients with neuromuscular disorders by improving their cough peak flow and thus supporting lung clearance. The focus of this article is to describe a step wise process for evaluating the flow and pressure waveforms downloaded from the CAD and how to recognize and improve characteristics of the cough maneuver.

Review of the Cough Maneuver

From a physiologic standpoint the cough maneuver includes the following four phases: **1) deep inspiration**-for maximal benefit this represents a forced inspiratory vital capacity; **2) glottic closure** –for most people and patients this is automatic, however there is a subset of neuromuscular patients (bulbar ALS) that are unable to achieve this as a result of loss of the voluntary control of their upper airway; even these patients however can still use their expiratory muscles to "Huff" cough even though they cannot close their glottis;
3) rapid compression of gas in the thoracic cavity, this is dependent on individual effort and is negatively impacted in patients with developing muscle weakness; **4) expulsion** –the important feature here is the peak cough flow (PCF). From both bench level studies using models with mucous tracers, and from patient clinical studies, a PCF above 160 L/min is necessary to move mucous. For patients unable to achieve this they frequently end up in the hospital with pneumonia and are either intubated or have a tracheotomy.

The objective of a cough assist device is to assist the patient in producing PCFs that are **greater than 160 L/min**.[3] For patients that are able to create PCF greater than 270 L/min on their own, the CAD is not indicated. However, once their flows begin to drop below 270 L/min and there are other collaborating signs of a reduction in pulmonary function, insurance companies will help pay for the device, e.g. reduction in FVC and corresponding reductions in sniff nasal inspiratory pressure (SNIP), MIP and MEP. So now we have a clinical range of PCFs between 160 and 270, and the device is used to keep the patients PCF as much above 160 as possible.

How the CAD Functions

The cough assist device functions by providing inspiratory positive pressure assist, and subsequently the application of negative pressure during the expiratory phase of the cough. The addition of the negative pressure creates a larger than normal delta pressure between peak inspiratory pressure and the negative expiratory pressure supporting expiratory flow. This is just another application of Poiseuille's law where greater pressure differences at the two ends of a tube create greater flow. In this application the two ends of the airway are the alveolar inflation pressure (positive end) and the face mask pressure or mouth pressure connected to cough assist tubing. In general, there are four settings on the device: 1) target inspiratory pressure (PI); 2) inspiratory time (TI); 3) target negative pressure PE (or acuum) and 4) expiratory time (TE). During the inspiratory phase, the device functions just like a pressure control ventilator and uses the same algorithm or logic to control the flow during inspiration. The valve (in this case the **blower motor in the CAD**) is controlled by a logic sequence or "algorithm" that determines the amount of flow into the lung:

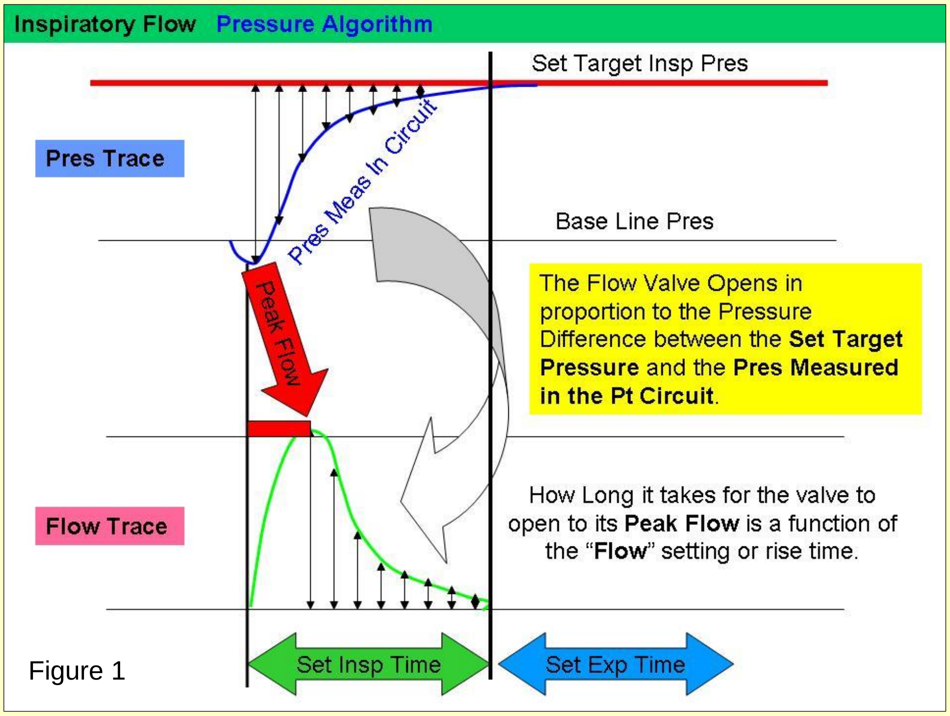


Figure 1

1a) A target inspiratory pressure is set on the device;
1b) The valve (blower motor) starts or opens based on the trigger function (cough track, or time if cough track setting is off), 1c) During the period of gas flow the valve (blower motor) is controlled by pressure sensors. The valve (blower motor) turns on according to the **pressure difference** between the **set inspiratory pressure** and

the **pressure measured in the patient circuit** or tubing. The larger the pressure difference the more the inspiratory gas valve is open (or the faster the blower motor spins) and vice versa. The device measures pressure in milliseconds (a function of the digital era) so it can very precisely control inspiratory flow. Initially the pressure difference is large so the gas flow to the patient rapidly increases, but as the patient's lung inflate, pressure in the circuit increases so the pressure difference becomes smaller and the value gradually closes or **the blower motor slows down**. 1d) If during the inspiratory time the pressure in the circuit reaches the target pressure then gas flow stops because the pressure difference is now zero, and based on the logic or algorithm, then the valve is basically closed (or the blower motor stops). The other point at which the valve closes automatically (blower motor stops) is when the inspiratory time has elapsed (based on the inspiratory time setting (TI) identical to the same setting on a mechanical ventilator. The above graphic was used to teach the pressure control algorithm during standard mechanical ventilation; as such the inspiratory gas flow is displayed in an upward or positive direction. On the CA graphics, the flow is reversed so that **inspiratory flow is plotted in a downward direction** and expiratory flow is upward –emphasizing the importance of the peak cough flow (PCF).

Characteristics of a Cough Assisted Breath:

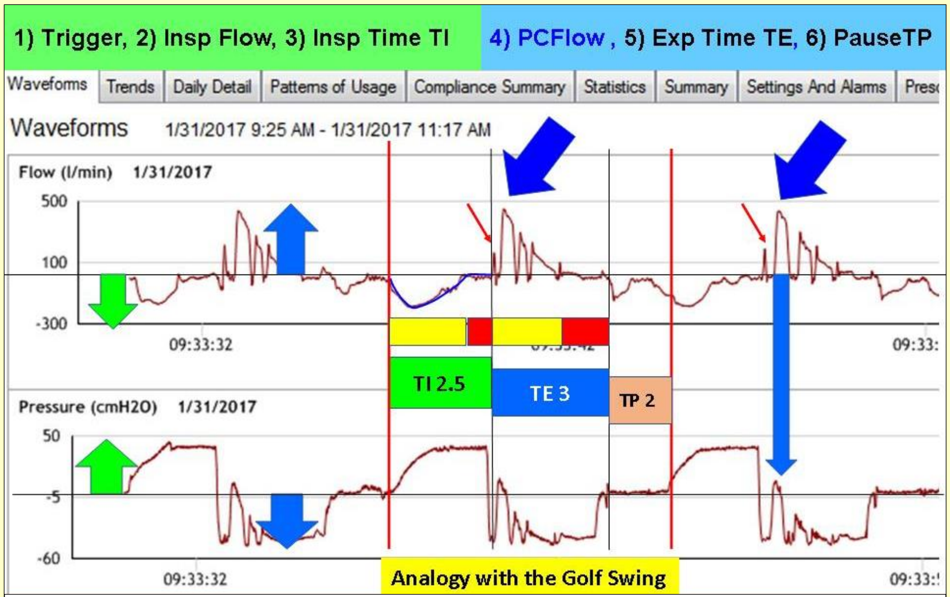


Figure 2. Characteristics of a Cough Assisted Breath

Figure 2 introduces the flow and pressure traces associated with a cough effort from a normal subject that has been supported by the cough assist device. The graphic is similar in many respects to the graphic display on a mechanical ventilator. Only this time the focus of the graphic shifts some. During mechanical ventilation we are often focused on the inspiratory side of the traces and specifically the pressure wave form to reduce inspiratory pressures as much as possible to protect the lung. With that in mind the first graphic in the ventilator wave form analysis is frequently the pressure graphic.

With the CAD this focus changes to draw our attention to the importance of the expiratory side of the flow graphic – specifically the Peak Cough Flow (heavy blue arrows). As a result, the first trace to be displayed in the graphic is usually the flow trace. The trace has another curve ball associated with it since the expiratory flow is in the positive or upward direction rather than downward as in mechanical ventilation.

The inspiratory pressure trace, displayed on the lower portion of figure 2, has the same shape and appearance as the pressure trace during pressure control. With the onset of expiration, you see the appearance of the negative pressure and some pressure fluctuations that result from the patient cough efforts, and are pressure equivalents of the cough flows seen in the *positive flow trace*. The pressure fluctuations are a good sign in neuromuscular patients, because they signify that there is substantial flow returning during the cough - enough that the blower motor is not able to keep up with the set negative pressure - or the patients expiratory flow is overwhelming the blower motor. As these negative pressure oscillations begin to disappear, patients are losing their ability to generate an adequate cough.

In the middle portion of figure 2 are several vertical lines used to identify the different phases of the breath - inspiratory, expiratory and pause. In the center of the trace are also some yellow and red bars. Inspiratory Time was set at 2.5 seconds, but the inspiratory flow trace (yellow bar) indicates that the flow into the patient's lung has stopped and the TI is set too long (width of red bar), similarly during expiration TE is set to 3 seconds and the yellow bar indicates that the patient has completed their exhalation (cough) and the expiratory time is also set too long (red bar).

There is one more important piece of information in the normal trace shown in figure 2: the thin red arrow that coincides with the onset of expiration (in all three breaths) is flow generated **by gas decompressing from the circuit.** At the moment before the device flips from positive pressure to negative pressure, the tubing is pressurized to the target pressure. Once the valve flips, the gas in the tubing is the first gas to return thru the flow sensor inside the device. This gas flow creates a small spike that is always located exactly at the transition from inspiratory positive pressure to expiratory negative pressure. This same feature is common (and well documented) during standard mechanical ventilation. As part of training patients how to use their CAD effectively, they need to be instructed to follow a pie shaped dial on the front of the screen that shows them exactly when the inspiratory phase is going to stop. When the pie shape reaches the 12 O'clock position, they should cough. Without this visual assistance patients (even normal subjects including respiratory therapists) often have difficulty synchronizing their cough effort with the onset of negative pressure. As we will see later, asynchrony with their effort reduces the peak cough flow.

Steps used in Graphics Analysis

Following in the footsteps of graphic analysis on ventilators,[4] we have used a similar approach to the Cough Assist Graphics. For completeness I have listed six steps in the graphic sequence: It may be easier, however, to just think of them as either: **inspiratory** (trigger, flow and time), or expiratory (peak flow, expiratory time, and pause time). There are physiologic equivalents for most of these in your normal breathing pattern or control of ventilation.

So, if you think of how you breathe. The breath starts with:

Inspiratory Components: (1) trigger or what initiates the breath, (2) how much flow do you want –slow flow of fast flow; 3) when do you stop the breath –termination or the end of inspiratory time; followed by the

Expiratory Components: 4) Peak expiratory flow –passive of active; (5) how long is the expiratory time –the main difference here is that negative pressure is now being applied by the device during the expiratory phase; and (6) pause time during which the negative pressure is no longer applied and returns to ambient.

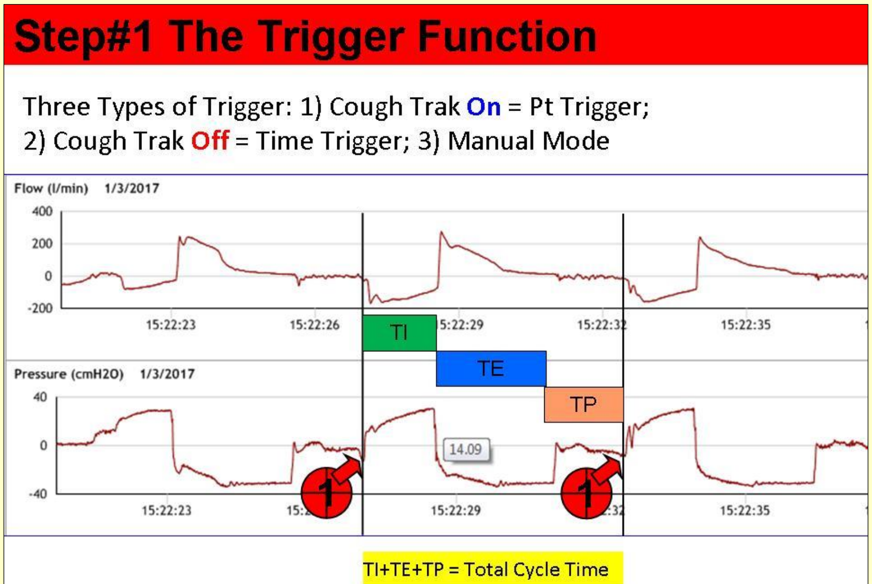


Figure 3

Step#1 The Trigger Function: There are three possible trigger mechanisms on the CAD: 1) **Cough track on**: this is a sensitivity feature that allows the device to initiate a breath in response to patient effort –very similar in function to the "assist" function on a mechanical ventilator. 2) **Auto mode** with cough track off: in this mode the clinician or therapist must set all three time portions of the breath: inspiratory tine, expiratory time and pause time (TI + TE+ TP = Total Cycle Time or Ttot.). This would be like the "Control Mode" on a mechanical ventilator where a frequency is set.; 3) **Manual mode** where the clinician or patient care giver actuates a toggle switch to initiate breaths. Of the three trigger the majority of patients using the CAD (90% or more) use the first mechanism (cough track on) which allows them to initiate the breath when they want to.

Step#2 Inspiratory flow: As described above, the device functions as a pressure control ventilator where the inspiratory flow trace is determined by the pressure algorithm. In addition to setting the target pressure, the primary feature of pressure ventilation is that the flow responds to patient effort or demand. Higher target pressure and more patient demand both result in increased flow and resultant tidal volume. The device also has three flow settings (low, mid, high) that act to control how rapidly the flow valve opens –a function identical to the pressure slope setting on a mechanical ventilator.

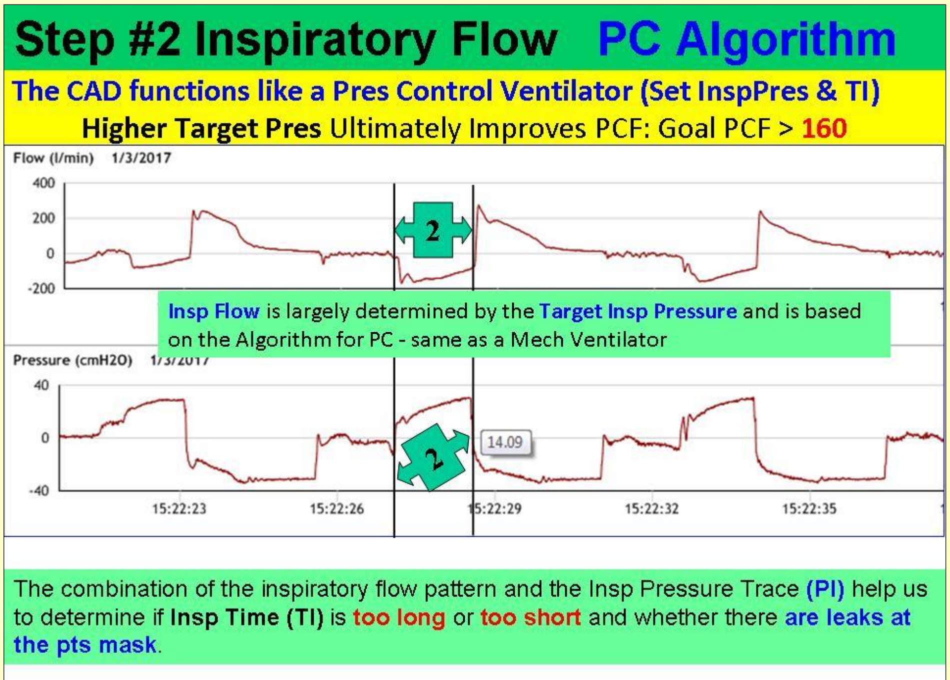


Figure 4

In evaluating the flow trace during a cough assist breath there are two very important features to consider: the presence of leaks, and correctly setting the inspiratory time.

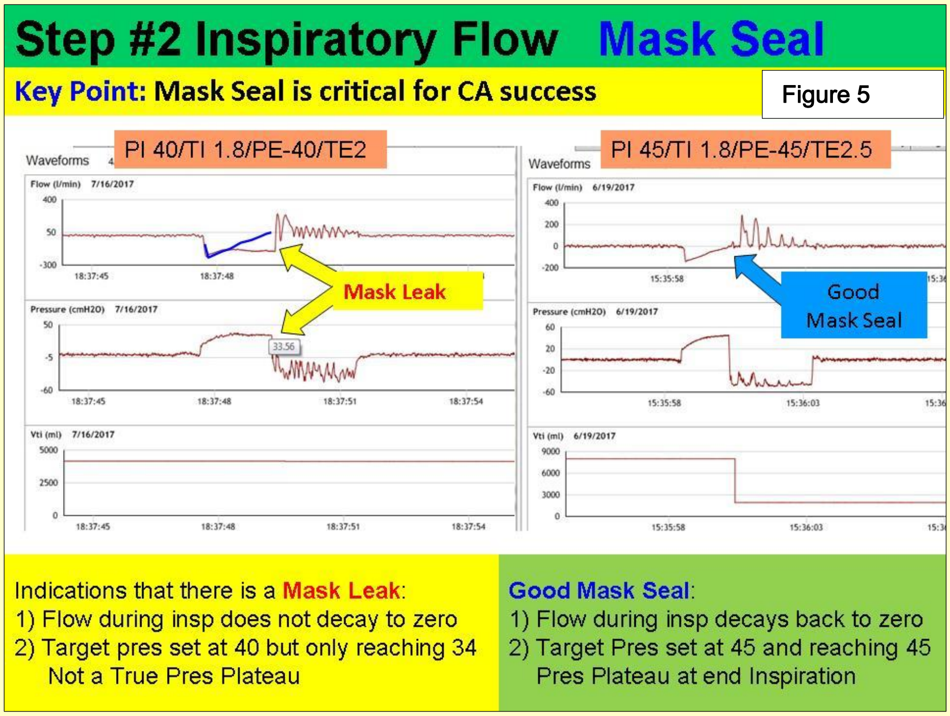


Figure 5

Mask seal is essential or critical in order to achieve success. Without a good seal patients are unable to get adequate volumes to support successful cough efforts. Unfortunately, approximately 70% of neuromuscular patients have difficulty with mask seal and require assistance from a care giver to help hold the mask during the therapy. In Figure 6 above (left hand portion), the inspiratory flow trace starts in a downward direction as it should, but at some point, rather than returning back to baseline, it falls off to the right indicating a continuous leak. For comparison, on the right half of the figure is a breath indicating good seal (following the pressure algorithm) and a complete inspiratory breath.

Step#3 Setting inspiratory time: The third consideration during the inspiratory portion of the breath is correctly setting inspiratory time. As you might expect patients require adjustment of the inspiratory time to match the characteristics of their specific lung mechanics. In general, inspiratory times range from 1.5 to 2.5 seconds and are to a great degree dependent on the patient's height, in many ways similar to predicting FVC in pulmonary functions. So taller patients require longer inspiratory times because they have larger lung volumes, and vice versa for shorter patients.

Figures 6 and 7 below illustrate cases in which inspiratory time was set too short, and too long.

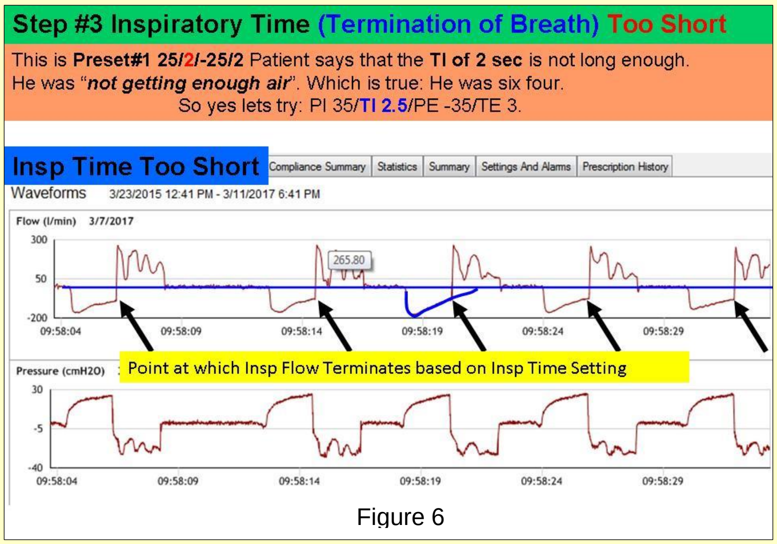


Figure 6

The black arrows in the Figure 6, indicate that the patient has not yet completed inspiration when inspiratory time was up. And indeed, this patient was 6 feet 4 inches tall with a very large vital capacity, and needed a longer inspiratory time.

Figure 7, Insp-Time -Too-Long) represents the opposite result where inspiratory time was set too long. For this patient the inspiratory flow trace had already decayed back to the zero long before inspiratory time was up.

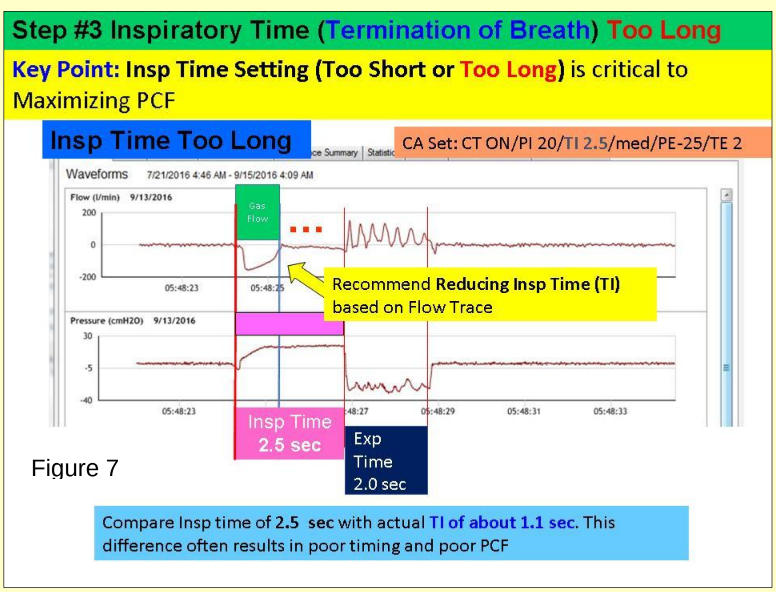
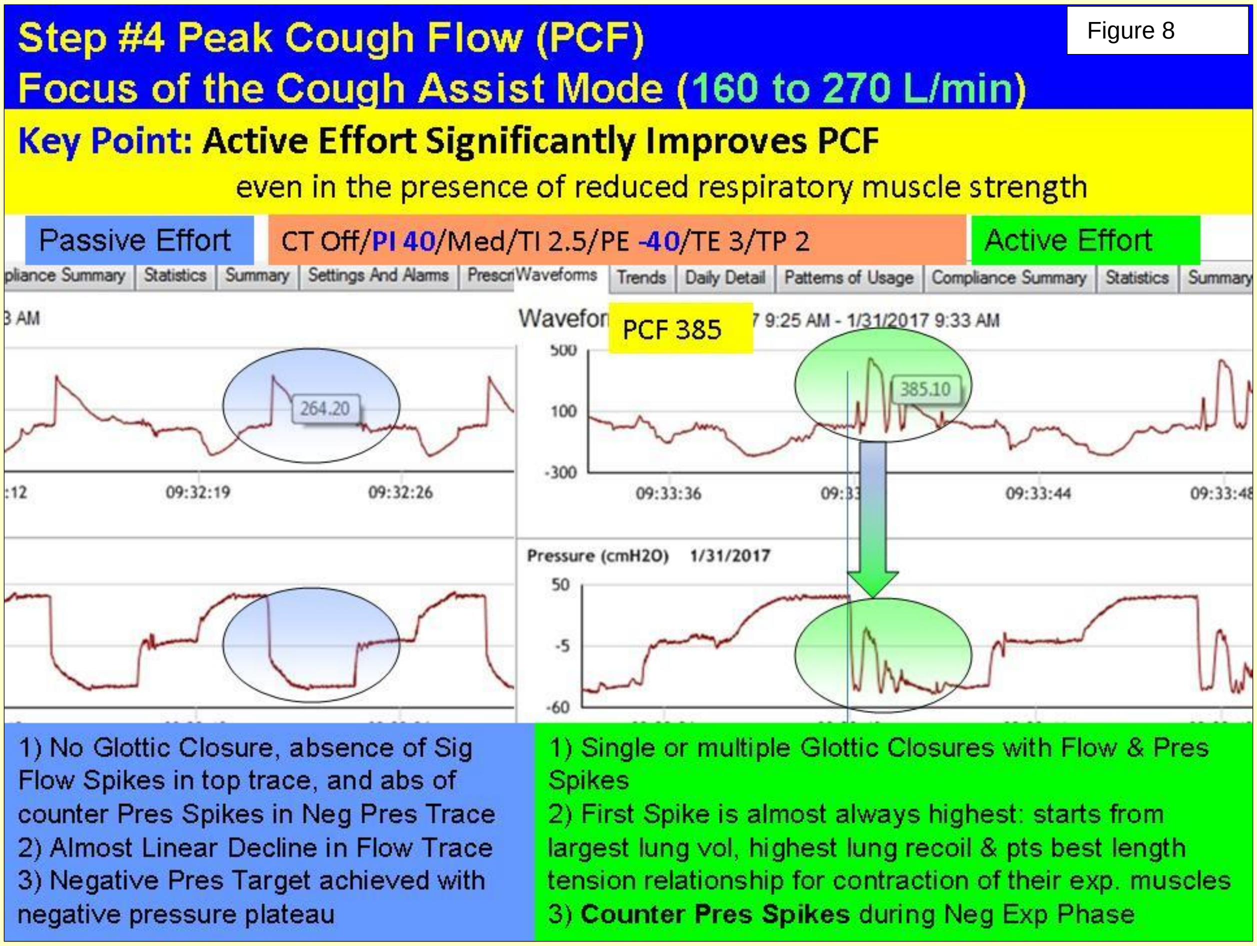


Figure 7

Inspiratory times both too short and too long represent some of the most frequently missed-set parameters and have a negative impact on cough peak flows. Perhaps a simple way to think of this is the analogy to the professional golf swing. When the golfer steps up to the tee, if the back swing is cut short, it will significantly reduce the result of the drive. So, if the patient's inspiratory breath is cut short their inspiratory capacity is reduced and the resulting cough will be much less effective. Similarly, if the golfer holds the club at the top of the swing, rather than having an instant transition to the downward swing, the result will also be diminished. In this case prolonged inspiratory times prevent the patient from having an optimum cough.

This leads up to the three items for consideration during the expiratory phase or step four in the graphic analysis.

Step#4 Active Effort vs. Passive Effort



The difference between active effort and passive effort is perhaps obvious, but for neuromuscular patients that are already struggling with muscle weakness, asking them to cough with maximal effort is not always welcome. However, the difference in peak cough flow with active effort is significant, even in bulbar patients that cannot close their glottis. For this group of patients, use of their expiratory muscles to “huff” results in significant improvements in their PCF and many times represents the difference in being able to clear secretions vs. not clearing secretions and ending up in the hospital with pneumonia.

Step #5 Importance of synchrony: Figure 9 below illustrates an often overlooked aspect of the cough assist maneuver –namely synchronizing the patient cough effort with the switch from positive inspiratory pressure to negative expiratory pressure. On the graphic, asynchrony is easy

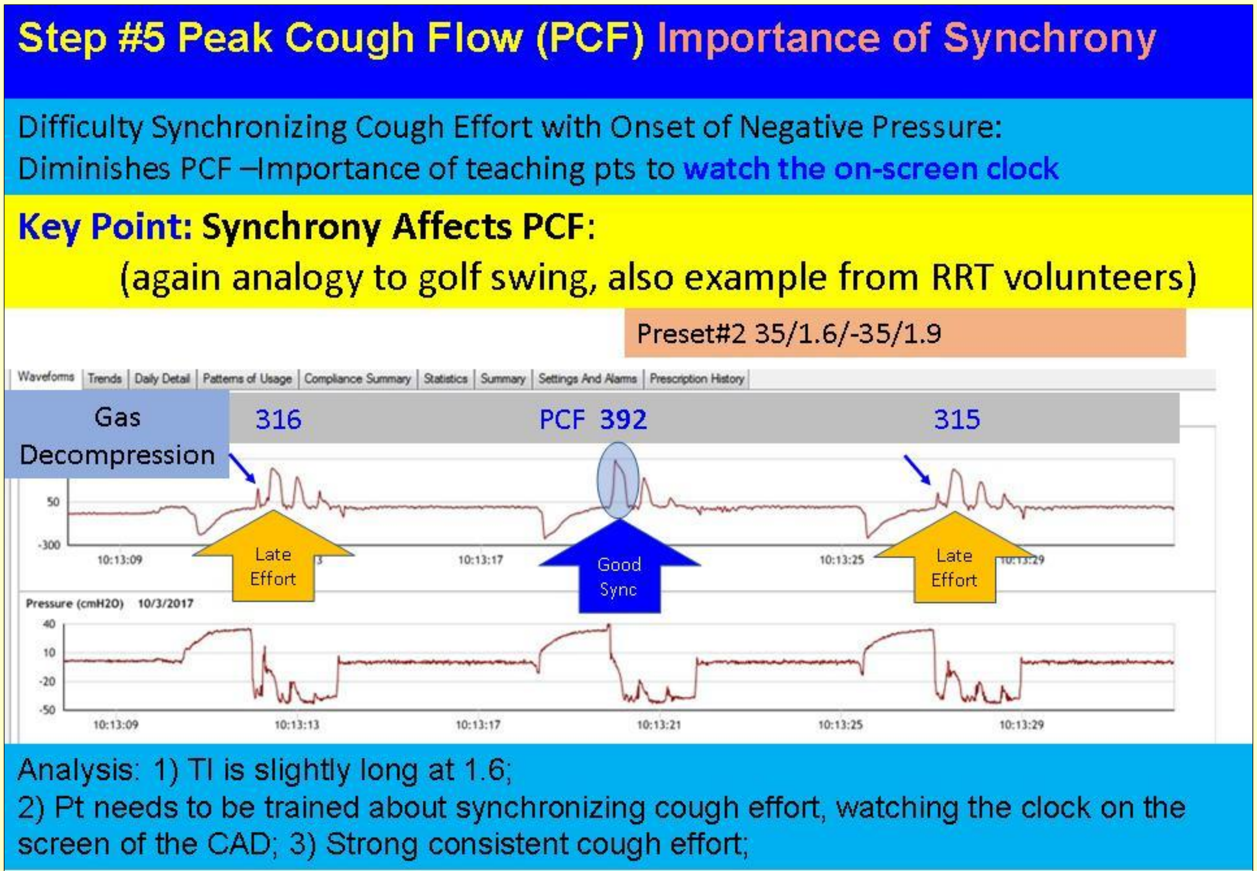


Figure 9

to spot as a result of the separation in the graphic between the initial gas decompression spike and the subsequent cough effort. The gas decompression spike is first and is characterized by a very narrow spike (small amount of gas), whereas the patient's cough is a wider flow pattern and usually a higher peak flow. In some bulbar patients, however, as they lose their ability to close their glottis, the PCF becomes less than the gas decompression spike and indicates that they need special assistance or may be at point where they will need to consider tracheostomy. When the cough effort is timed correctly the patient's expiratory gas flow overshadows or buries the gas decompression spike. As illustrated on the graphic when the patient synchronized their effort the resulting peak flow was significantly higher. This effect is also analogous to the golf swing, when the effort is one continuous motion from upswing to downswing or inspiratory to expiratory the result is much improved.

Step#6 Expiratory time: For most patients setting expiratory time is less of an issue, meaning that small changes have less impact on outcome than with the other settings. Balancing the expiratory time with the inspiratory time is usually sufficient, so for example TI =2 sec and TE = 2 sec (a common setting). Setting TE with unusually long times, however, can have negative effects on the patient. In Figure 11, expiratory time was set considerably longer than normal –I presume because the clinician thought that longer application of negative pressure would result in better secretion movement. This is a common misconception possibly brought about by the experience clinicians have with suction catheters. In any case, application of negative pressure beyond the time needed by the patient to complete 1 or 2 good cough efforts results in potential lung de-recruitment. After the patient has exhaled down to their FRC, expiratory time should be terminated. Further application of negative pressure beyond this point frequently causes upper airway to collapse in bulbar patients, and in all patients runs the risk of alveolar de-recruitment.

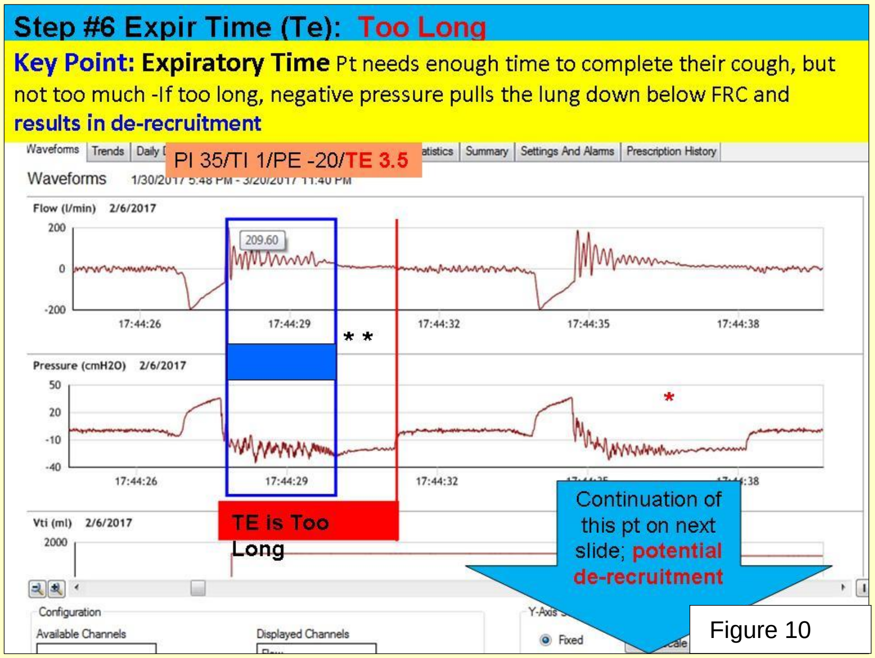


Figure 10

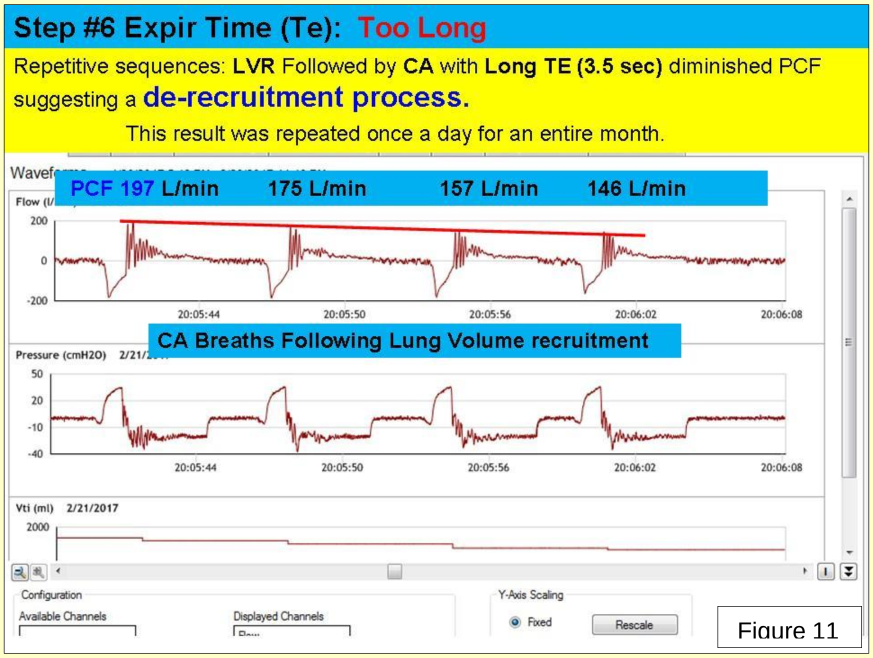


Figure 11

In support of this adverse effect, Figure 11-De-recruitment, demonstrates the result of prolonged expiratory times. This patient was very diligent in completing their daily cough assist therapy. In addition, they started their therapy each day with several lung volume recruitment breaths to open up their lung. They followed this with 20 or more consecutive cough assist breaths. The graphics indicated that during each subsequent breath the PCF was slightly reduced. The fact that this sequence was repeated for nearly 30 days in a row was strong evidence that the prolonged expiratory times were resulting in lung de-recruitment.

In summary, I offer the following items for consideration when using a cough assist device:

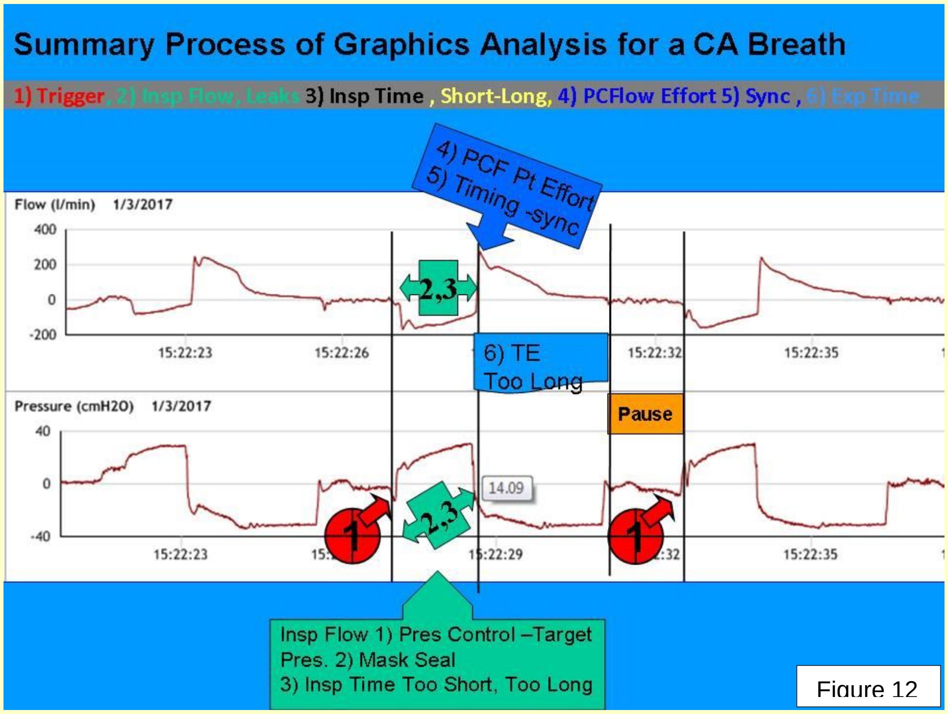


Figure 12

A) Use of **graphics analysis on the CAD is essential for maximizing the benefit** of the device for secretion clearance. Correctly adjusting the settings has a significant impact in improving Peak Cough Flow (PCF).

B) The graphics sequence on the cough assist device is altered to emphasize the importance of the expiratory gas flow **(PCF),** so gas flow is graphed on the top line (inspiratory flow in the downward direction and expiratory flow in the upward direction) and pressure (both inspiratory & expiratory) is graphed on the second line.

C) In analyzing the graphics there are several key features that should be considered (see Figure 12), 1) Mask seal is essential for an effective cough and can be identified by evaluating the inspiratory flow trace; 2&3) Setting inspiratory time correctly; both TI=too Short and TI=too long have negative impact; 4) Active expiratory effort is important for all patients, 5) Timing or synchrony affects the PCF; and 6) Expiratory time too long results in lung de-recruitment. I suppose you could have expiratory time too short, but I have not yet seen a clinical example of that, the tendency being for therapists to set TE too long.

D) The only true objective measure guiding these settings is the use of graphic analysis. Unfortunately, at this point in time there do not appear to be any clinical studies in the literature that have addressed the use of graphics analysis as applied to the Cough Assist Device.

E) We have had graphics capabilities since the early nineties, but we desperately need **on screen graphic tools** for clinicians to make smart decisions at the bedside; and finally

F) Therapists and Clinicians need to be trained to interpret the cough assist graphics. Most respiratory therapy schools have some sort of training related to graphics analysis on mechanical ventilators; but it is also true that most RT, nursing, and medical schools do not have Cough Assist Devices and as of the moment do not have curricular components related to the effective use of the devise.[5]

Note from the Author: I wrote this article following the initial presentation at the 28th International Symposium on ALS/Motor Neuron Disease in December of 2017. My hope is that faculty at respiratory therapy schools will use the information as a teaching resource. To that end, if you have an interest in this topic feel free to send me an email at jnilsest@utmb.edu. I would be happy to share the more detailed and animated PowerPoint presentation suitable for classroom presentation.

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"Suit up and show up."

An Interview with David C. Shelledy, PhD, RRT, FAARC, FASAHP

Dean and Professor, School of Health Professions
University of Texas Health Science Center
CoBGRTE President (2018-2019)

Interviewed by Karsten Roberts, MS, RRT, RRT-ACCS
CoBGRTE Social Media Committee Chair

Q. Tell us about your early days as a respiratory therapist. What brought you to the field?

A. I started in respiratory care as part of an on-the-job training program offered at Holy Cross Hospital in Fort Lauderdale, Florida, back in the early 1970s. At that time, I was going to school as a pre-med major. I became fascinated with respiratory physiology, critical care, and mechanical ventilation. I did some research, and respiratory care looked like a great option to complete my B.S. degree while finishing my pre-med prerequisites. At the time, there were only about three B.S. degree respiratory care programs in the country and one of these was in Orlando, under the leadership of Bob Rogers and Easton Smith. Easton was a past president of AARC and Bob was his star pupil. I transferred to Florida Tech in Orlando — now the University of Central Florida — and completed my B.S. in respiratory therapy/cardiopulmonary sciences.

Those were exciting times back then, and Orange Memorial Hospital (now Orlando Regional), under Easton Smith's leadership provided an incredible clinical education. New modes of ventilation were coming out and the introduction of new ventilators and technology was constant. Therapists in Orlando performed an amazing range of procedures, and were allowed a great deal of freedom to manage their patients.

Q. Who were your mentors? What did they contribute to your career?

A. Early on, people in Orlando such as Bob Rogers, Easton Smith, and Lynn Capraun served as mentors to all of us then young respiratory therapists. These folks were role models in terms of what respiratory therapists should be and could do. Early in my career, Easton Smith encouraged me to get involved with the Florida Society for Respiratory Care, and then run for FSRC president.

Having graduated from one of the few B.S. degree respiratory care programs in the country at that time, and having had several years of clinical experience, I landed a job as a supervisor at the James A. Haley VA Medical Center in Tampa. The University of South Florida had recently started its medical school, and the VA Medical Center was the home of the school's division of pulmonary and critical care medicine. Dr. Allan Goldman was chief of pulmonary medicine and Dr. Ross Kory (a legend in the pulmonary function world) was chief of staff. Don Kersting ran the pulmonary lab, and later played an important role in the NBRC. This experience exposed me to the world of academic medicine and research.

Q. What prompted you to move into a leadership/education position?

A. While working in Tampa, I got the opportunity to teach a number of in-service classes and short courses to respiratory care personnel, nurses, and physicians and I really enjoyed teaching. A position came open at St. Petersburg College which gave me the opportunity to teach full-time. I then went on to become the chair of the respiratory care program at St. Petersburg College and then on to serve as director of clinical education and interim chair in the department of cardiopulmonary sciences at Georgia State University. At Georgia State, I was privileged to work with some of the very best people in our field, including Joe Rau, Vijay Deshpande, Sue Pilbeam, Lynda Goodfellow and John Youtsey. I learned something from each of them, and will be forever grateful for the experience.

Next up was service as founding chair of the department of respiratory care at the University of Texas Health Science Center at San Antonio (UT Health), a position I held for over 10 years.

During my time at UT Health, I had the opportunity to work with faculty in physical therapy, occupational therapy, emergency medical sciences, physician assistant studies, and with faculty in the department of medicine, division of pulmonary disease and critical care and department of anesthesiology. I became interested in academic leadership, and aspired to someday become a dean. Department chairs who wish to prepare for a deanship often first serve as an associate dean. Such an opportunity came up at the University of Arkansas for Medical Sciences (UAMS), which is the academic medical center for the State of Arkansas. Working at UAMS in their school of health professions, I had the opportunity to work closely with colleagues across 10 academic departments offering programs in 17 different allied health professional areas.

I then went on to become dean of the College of Health Sciences at Rush University Medical Center in Chicago. Rush is an extraordinary academic medical center, with colleges of medicine, nursing, biomedical sciences, and health professions. At Rush, I had the privilege of starting six new academic programs, including a new entry-to-practice, first professional master of science (MS) degree in respiratory care and a PhD program in health sciences to prepare future faculty and researchers.

While in Chicago, I was recruited back to San Antonio to lead the School of Health Professions at the University of Texas Health Science Center. At UT Health, I was given the opportunity to help start another successful entry-to-practice, first professional MS degree in respiratory care, as well as new programs in medical laboratory sciences (MS-MLS), speechlanguage pathology (MS-SLP) and a new occupational therapy doctoral program which will begin in May of 2018.

Along the way, I strove to serve the profession, starting as a Florida Society for Respiratory Care (FSRC) chapter director, and later becoming FSRC president and delegate. My professional service continued with the Georgia Society for Respiratory Care and eventually culminated with service on the AARC Board of Directors and election as AARC president. AARC provides an outstanding path for career development, and allowed me to work with some of the most influential leaders in our profession, including Tom Barnes, Sam Giordano, Peg Traband, Kerry George, Gary Kauffman, Carl Wiezalis, Mike Runge, Toni Rodriquez, John Hiser, Tim Meyers, Karen Stewart and many, many others.

Q. How did furthering your education contribute to your career path?

A. The BS degree in respiratory care from a great program allowed me to develop a clear idea of what respiratory therapists can be. I went on complete a master's degree and PhD, which would prepare me for a leadership role in an academic medical center.

Q. What are some key leadership lessons you have learned?

A. Suit up and show up. Treat others as you would like to be treated. Have a clear vision of what you would like to accomplish. Volunteer for your state professional society and the AARC. Serve on committees, and when you get more experience, volunteer to chair committees and/or run for office. The Coalition for Baccalaureate and Graduate Respiratory Therapy Education offers excellent opportunities for leadership roles in our profession, and I would highly encourage people to participate.

Q. What would you recommend to new graduate therapists just beginning their career?

A. I would encourage aspiring new graduates to complete the BS degree in respiratory care and go on and complete one of the emerging MS degree programs that are becoming more and more available across the country. For those with no experience in respiratory care, but a strong science background and a desire to work in an amazing healthcare profession, I would encourage prospective therapists to explore one of the entry–to-practice respiratory care MS degree programs, such as are available at Rush University Medical Center, Georgia State University, Samford University, Bellarmine University, St. Alexius Medical Center & The University of Mary and UT Health.

We also need many more respiratory therapists prepared to teach, perform research and fill other professional leadership roles. There are now several MS in respiratory care and PhD programs in health sciences, which will provide the training and education needed for these leadership positions.

Keeping Assignments Current: Using the CoBGRTE Web Site and *The Coalition Chronicle* for Assignments

by Christy Kane, PhD, RRT-NPS, RRT-ACCS, AE-C, FAARC
CoBGRTE President-Elect and Membership Chair

Is it just me or are we all busier than ever before? As I prepare my classes, I continue to look for new ideas – assignments that are relevant and application-based. *The Coalition Chronicle* and CoBGRTE's web site can be used to help keep my (and your) assignments current. Here are a few suggestions:

- In the past six months, *The Coalition Chronicle* has published several interviews with prominent RT leaders. Ask students to read one or two of these interviews and answer questions related to course topics (such as leadership skills, goal setting, etc.).
- Have each student identify one potential program where he or she can further his or her education. Ask the student to discuss why the program is a good fit. Each edition of *The Coalition Chronicle* highlights a program or health science center.
- Ask each student to develop his or her own list of "Reasons Why I Should Continue as a CoBGRTE Member" (see "Reasons Why You Should Be a CoBGRTE Member" in each edition of the *Coalition Chronicle).* Help them personalize the importance of professional society membership.
- Ask each student to develop a resume and cover letter specific to a professional position listed on CoBGRTE's web site (found at http://www.cobgrte.org/professionalpositions.html).

CoBGRTE wants to engage your students. They are the future of our profession! Please send me a note (ckane@bellarmine.edu) about how you are using *The Coalition Chronicle* and CoBGRTE web site in your classroom. These students can join CoBGRTE for only $5 per year. Many programs pay for their students to join. I would be happy to send you an invoice to facilitate payment. As a CoBGRTE member, students can access current and back issues of *The Coalition Chronicle*. In addition, student members are eligible for CoBGRTE Scholarships!

DeYoung Wins iPad Mini in CoBGRTE Membership Renewal Drawing

Dawn DeYoung, MS, RRT, Las Vegas, Nevada was randomly chosen among all active members renewing for 2018 (by 12/31/17). She has been an active member since 2015 and states the following reasons: 1) I am proud to be part of an organization that focuses on increasing the educational level for respiratory therapists; 2) I can connect and expand my own network among like-minded professionals with similar goals; 3) I enjoy reading about baccalaureate and graduate level programs that are featured in the CoBGRTE Chronicle; and 4) I have the option to join or lead CoBGRTE committees that will help move the respiratory care profession forward.

CoBGRTE Institutional Members

Indiana Respiratory Therapy Consortium
Georgia State University
Weber State University
Boise State University
Bellarmine University
Rush University
Salisbury University
University of Toledo
The Ohio State University
State University of New York Upstate Medical University
Northeastern University
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University of Texas Health Science Center – San Antonio
University of Hartford
University of Kansas Medical Center
College of Southern Nevada
Highline College
University of Akron
Oregon Institute of Technology
Augusta University
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Valencia College

CoBGRTE Institutional Members – Continued

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Shenandoah University

Middle Georgia

State University

York College of Pennsylvania

Respiratory Care Board of California

Texas Southern University

St. Catherine University

Armstrong State University

University of Virginia Medical Center

Iman Abdulrahman Bin Faisal University

Seattle Central College

Florida Southwestern State College

Utah Society for Respiratory Care

Intermountain Healthcare

Southern Connecticut State University

Washington Adventist University

Northern Kentucky University

Boston Children's Hospital

California Society for Respiratory Care

Respiratory Care Society of Washington

Samford University

Canisius College

Carlow University

University of Washington Medical Center

Jacksonville State University

Modesto College

Newberry College

Eastern Tennessee State University

University of Cincinnati

University of Michigan – Flint

Liberty University

Ozarks Technical College

North Carolina Respiratory Care Board

Skyline College

If you haven't already decided to become a CoBGRTE member after visiting www.cobgrte.org, the following are 14 reasons why you should join the coalition.

Reasons Why You Should Become a CoBGRTE Member

1. Award scholarships to baccalaureate and graduate respiratory therapy students.
2. Assist in the development of ASRT to BSRT Bridge Programs.
3. Collectively work towards the day when all respiratory therapists enter the profession with a baccalaureate or graduate degree in respiratory care.
4. Support a national association, representing the 63 colleges/universities awarding baccalaureate and graduate degrees in respiratory care, to move forward the recommendations of the third 2015 conference.
5. Help start new baccalaureate and graduate RT programs thus leading to a higher quality of respiratory therapist entering the workforce.
6. Work to change the image of the RT profession from technical-vocational-associate degree education to professional education at the baccalaureate and graduate degree level.
7. Mentoring program for new graduates as well as new faculty members.
8. Join colleagues to collectively develop standards for baccalaureate and graduate respiratory therapist education.
9. Develop public relations programs to make potential students aware of baccalaureate and graduate respiratory therapist programs.
10. Help to publicize, among department directors/managers, the differences between respiratory therapists with associate, baccalaureate and graduate degrees.
11. Access to over 45 Spotlight articles on BSRT and RT graduate programs, and major medical centers.
12. Round table discussion dinners and Meet & Greet member receptions held in conjunction with the AARC Summer Forum and the International Congress.
13. Help to support maintaining a roster and web site for all baccalaureate and graduate respiratory therapist programs.
14. Collaborate with CoARC and AARC to improve respiratory therapy education.

Become a CoBGRTE member by completing the application on the Membership Page: http://www.cobgrte.org/membership.html

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