The similar disability and mechanisms between Chronic Obstructive Pulmonary Disease and Chronic Heart Failure

Exertional breathlessness and fatigue are common disabling symptoms for patients with Chronic Obstructive Pulmonary Disease (COPD) and Chronic Heart Failure (CHF). Typically patients become less active to avoid these symptoms leading to deconditioning and worsening symptoms. This reduction in activity can lead to loss of confidence, depression, loss of work or inability to perform hobbies and social isolation.

In both conditions, the degree of primary organ impairment was found to correlate poorly with exercise capacity (1-3) and researchers began to investigate other contributing factors. Leg fatigue was found to be a common limiting symptom to exercise in patients with cardiorespiratory diseases (4). It is now recognised that there are similar and important secondary pathological alterations in COPD and CHF including skeletal muscle dysfunction, mood disturbances, osteoporosis, hormonal alterations and anaemia many of which contribute to exercise limitation and poor prognosis (5;6). There is debate over the mechanisms behind these alterations, but inactivity, systemic inflammation, oxidative stress, poor nutrition, hypoxia and neurohumeral activation are all likely to contribute (5).

The performance, morphology and metabolism of the skeletal muscles of locomotion are affected in both diseases (7;8). Quadriceps muscle mass, strength and endurance has been shown to be reduced (9;10) and one study, directly comparing COPD and CHF, confirmed the reduced muscle strength and endurance made a significant and similar contribution to exercise intolerance (3). The muscle fibre type proportion is altered with a relative decrease in type I oxidative fibres and a reduction in oxidative enzymes (7). An early lactate rise during exercise has been shown in COPD and CHF and the muscle abnormalities are thought to be a major contributor (11;12). In addition to the negative effects on function, quadriceps weakness is also associated with a poor prognosis (13;14). There is great interest in the skeletal muscle alterations for both conditions as they can be improved with treatment: exercise training (15;16).

“...
CHAIR’S MESSAGE

What a strange feeling to be writing my first Chair’s Message for Update. It really feels like yesterday that I was a young RT joining the planning committee for a Better Breathing Conference. I have been in attendance at nearly every Better Breathing Conference since then, reconnecting with old friends, networking with many colleagues and meeting so many new people. This year’s 30th Anniversary celebrations were terrific and I look forward to the 40th and beyond!

While Better Breathing is the biggest event, we also have many other educational events coming up. In June, we have full day seminars in Ottawa and London and an evening seminar in Toronto. Several fall programs are being planned as well. Stay tuned for more information on those and plan to attend at least one ORCS seminar this year.

You may have started hearing about an initiative of the Ontario Lung Association called Patients First. We have partnered with a company called RiskAnalytica to develop models that look at the burden of lung disease and the cost of not investing in lung health. As we move into the final six months before the provincial election, the data prepared for us will be useful as we meet the candidates – at all candidates meetings or on our front porches. We can all play an important role in ensuring that lung health is not only on the election radar, but an important part of government strategy beyond October 6th as well. If you have not yet signed the on-line form to pledge your support for a Lung Health Action Plan, please visit www.on.lung.ca to add your name to the list of supporters.

Congratulations to ORCS Editorial Board member and former Chair Lawrence Jackson, winner of one of Sunnybrook Health Sciences Centre’s 2011 Schulich Awards for Clinical Excellence. Larry is a Pharmacist in the Palliative Care Unit of the Veterans Centre at Sunnybrook.

LIBBY GROFF, CHAIR, ORCS

EDITOR’S COMMENT

The long awaited summer is here. Finally the sun is shining and the snow has melted. We welcome this season with a new edition of Update. As always, there are a variety of articles including a lead article on the applicability of Pulmonary Rehabilitation programs to patients with Chronic Heart Failure by Dr. Rachael Evans, an article on Sabrina’s Law, created to increase awareness of anaphylaxis in school settings, and a case study of the use of the Novalung® on a patient with H1N1. We welcome your feedback on the articles and any suggestions for future topics.

If you read a journal article that you think would be of interest to your colleagues, I encourage you to summarize it and e-mail it to us. Our members appreciate keeping up to date.

Congratulations to Tania Janaudis-Ferreira and Carole Madeley, winners of the poster awards competition at Better Breathing. The call for poster abstracts for Better Breathing 2012 is included with this issue of Update. If you have a research project or a clinical or education program that would be of interest to your colleagues across Ontario, a poster presentation is a great way to share it. Consider submitting one this fall.

DINA BROOKS, CO-EDITOR

When you can't breathe, nothing else matters.
Better Breathing 2011 and 2012

Better Breathing 2011 was held at the Toronto Marriott Downtown Eaton Centre Hotel from January 27 - 29. About 175 people attended the ORCS sessions, which included interesting and informative lectures and workshops on a wide range of topics. Thank you to Education Committee Chair Mike Keim, RRT and the other members of the Committee for organizing a successful conference.

The conference opened with a video presentation to celebrate the 30th anniversary of the Better Breathing conference. The video highlighted milestones in lung health during the past three decades. It can be viewed at www.on.lung.ca. The ORCS Annual General Meeting was held on Friday, January 28, 2011. The ORCS Chair, Cathy Relf, presented a summary of the year’s activities and highlights of ORCS development over the past 30 years. She expressed appreciation to the members of the Provincial Committee and many other members who volunteered for the ORCS during the previous year.

Research and Fellowship Committee and an ORCS member and an active volunteer for more than 15 years, was congratulated and presented with The Lung Association’s Meritorious Service Award for outstanding volunteer service by Kelly Muñoz, Chair of the Ontario Lung Association. A number of ORCS members were honoured for their long service with presentations of 5, 10, 15 and 20 year ORCS Member pins.

Eighteen posters were submitted to the annual poster competition and were presented at a Friday evening reception. Congratulations to Carole Madeley and Tania Janaudis-Ferreira, the two winners of the competition, featured in our In the Spotlight column. Friday evening also featured Just What the Doctor Ordered, a lively reception for all delegates featuring great food and a live band (The Tectonics renamed Thoracic Park for the evening). Thank you to ProResp for sponsoring this enjoyable event.

Thank you to all of our conference sponsors and exhibitors for their support of Better Breathing 2011.

Planning is underway for Better Breathing 2012, scheduled for January 26 - 28 at the same location. Watch the web site at www.on.lung.ca/orcs for information and a copy of the Call for Poster Abstracts. Suggestions of topics and speakers are welcome and may be submitted by e-mail to orcs@on.lung.ca.

Libby Groff, RRT, BHA, CRE, who has volunteered for the ORCS in many capacities for the past 20 years, was elected ORCS Chair for a two-year term beginning April 1, 2011. Appreciation was expressed to Cathy Relf, who completed her term as Chair and remains on the Provincial Committee as Past Chair for one more year, for her outstanding contributions to the work of the ORCS.

Dr. Judy King, the Chair of the ORCS Research and Fellowship Committee and an ORCS member and an active volunteer for more than 15 years, was congratulated and presented with The Lung Association’s Meritorious Service Award at Better Breathing 2011.

Comining Events

May 13–18, 2011

June 9–12, 2011
The Canadian Society of Respiratory Therapy National Conference and Trade Show will be held in Quebec City. www.csrt.com.

June 14, 2011*
The ORCS Eastern Ontario Region presents Inspiration through Education...Learn more, Breathe better at Algonquin College, Woodroffe Campus in Ottawa. Topics include TB, Tobacco & COPD: Colliding Epidemics, The Basics of Chronic Disease Self-Management, The Lung Association’s SOB Maintenance Exercise Program, New Modes of Mechanical Ventilation, New Medications for Asthma & COPD and Diagnosis and Management of Dyspnea.

June 16, 2011* - 5:00–8:00 p.m.
The ORCS Greater Toronto Region presents an Educational Evening and its AGM at Toronto General Hospital. Presenters are Dr. Eddy Fan, Intensivist, UHN on Wake Up, Get Up and Get Out Early: Physical Medicine & Rehab in the ICU and Dr. Sunita Mathur, Physiotherapy Department, University of Toronto on Skeletal Muscle Dysfunction in COPD.

June 23, 2011*
The ORCS Southwestern Ontario Region presents Spring Inspirations at the Best Western Lamplighter Inn, London. Topics include Impact of Asynchrony on Patients Requiring Mechanical Ventilation, Challenges of Critical Care Transport, Management of Dyspnea in Advanced COPD, Chronic Respiratory Disease Management in the Community, Rapid CT Chest Interpretation, The Emerging Role of Inflammation in COPD and Ventilation Outside of the ICU.

Continued on page 11
Exercise training as a strategy for CHF

Historically bed rest was recommended for patients with CHF as a result of small observational studies (17) and concerns over safety probably slowed the development of exercise training as a useful therapy. One of the earliest studies was a home based training study (18). There were no adverse events with training and both peak exercise capacity and symptoms improved. The first randomised controlled trial (RCT) of exercise training vs. usual care confirmed increased peak exercise capacity and health status with training, but also showed a reduction in hospitalisation and mortality (19).

There is now a body of evidence demonstrating that a period of exercise training is beneficial for patients with CHF (20;21) and may reduce mortality (22;23). A further trial to highlight was a large (n=2331) multi-centre, randomised controlled trial (HF-ACTION) of three months of exercise training followed by home based training vs. usual care with three year follow up (23). The results are reported to have a trend towards a reduction in mortality, but the improvements in walking distance and exercise capacity were small (24). It is noteworthy that education and self management were not included in the protocol.

Few studies for CHF have involved a practical service involving exercise training and multi-disciplinary education. Exercise therapy for CHF is recommended in guidelines (25;26), but they are not as detailed as for COPD (27). Despite the supportive evidence for exercise training, many patients with CHF may not have access to this as part of a comprehensive service.

The model of pulmonary rehabilitation

Pulmonary rehabilitation (PR) is a therapy targeted at the secondary alterations of COPD, aiming to improve the functional and psychosocial aspects of an individual. The key components of a PR programme are symptom directed and include individually prescribed exercise training, multi-disciplinary patient education, psychological support and self management (28). PR is an integral part of the clinical management of patients with COPD and has a strong, supportive evidence base demonstrating a reduction in dyspnoea, and improvements in exercise tolerance and health related quality of life (29;30). There is increasing evidence that the benefit extends to other chronic respiratory diseases, e.g., interstitial lung disease, bronchiectasis, asthma, with a similar rationale at targeting exertional dyspnoea and activity limitation (28) and therefore moving away from a disease specific approach seems logical.

It may seem reasonable to include patients with CHF in the existing service of cardiac rehabilitation (CR). However, the CR service is primarily centred around secondary prevention. The traditional CR patients, those having experienced acute events such as post myocardial infarction, post coronary artery bypass surgery or percutaneous angioplasty, have little limitation in functional status and are unlike patients with CHF, who share more in common with the pulmonary rehabilitation population (31). Currently, many CR programmes still exclude patients with CHF.

So far COPD and CHF have been discussed as separate diseases, but there is increasing evidence that they often coexist (over 30% in some series) (32;33) associated with increased symptoms, further exercise intolerance and a worse prognosis (34;35). Patients with combined disease are currently undertaking CR and PR (36;37); furthering a rationale for a combined service that has the expertise necessary for both conditions.

A potential strategy is to organise exercise-focused rehabilitation services around a common disability (symptom-based) rather than around the primary organ disease.

Safety and practical considerations for exercise training patients with CHF

Evidence supports exercise training as a safe therapy in CHF in stable disease. Fears of worsening left ventricular function have not been founded and beneficial left ventricular remodelling is more likely to occur (38). An RCT reported no increase in adverse events with exercise training (39), supported by the findings of the Cochrane review (21). The HF-ACTION trial included patients in New York Heart Association (NYHA) class IV and with implantable cardioverter-defibrillators (ICDs), and reported no increase in adverse events.

Similarly to COPD, patients with CHF should be optimally medically managed prior to entry to exercise rehabilitation. The underlying cause of the heart failure should be addressed and pharmacological management optimised. There should be specific investigation and management of the secondary alterations and co-morbidities such as COPD, diabetes and renal dysfunction. Patients with moderate to severe aortic stenosis, a recent myocardial infarction, unstable angina, uncontrolled blood pressure, uncontrolled atrial or ventricular dysrhythmias (40) should be excluded from exercise training until stabilised.

As part of the rehabilitation assessment, a maximal exercise test should be performed with an exercise ECG. Commonly this is undertaken by a full cardiopulmonary exercise test with expiratory gas analysis, but an incremental shuttle walking test with ECG telemetry could be used. The American College of Sports Medicine advice regarding safety parameters for when to discontinue exercise should be consulted (40).

Is combined exercise rehabilitation for COPD and CHF feasible and effective?

In order to implement combined programs, the complete process of pulmonary rehabilitation (assessment, outcome measures and the programme components) needs to be applied to CHF. The Medical Research Council (MRC) dyspnoea scale is commonly used to screen for referral to PR, usually grades III-V. The scale was successfully applied to patients with CHF, demonstrating decreasing exercise performance and health status with worsening (increasing) MRC grade. The MRC dyspnoea scale had similar discriminative properties in CHF to COPD (41).

Field testing has been validated in COPD and CHF. Both the six minute walk test and the incremental shuttle walking tests are reproducible, valid and responsive after a familiarisation test (42;43). Health status is recognised as an important outcome measure in both diseases and both generic questionnaires such as the Medical Outcomes Short Form 36 (SF-36) and disease specific questionnaires such as the Minnesota Living with Heart Failure questionnaire (MLWHFQ) or Kansas City Cardiomyopathy Questionnaire (KCCQ) have been used to obtain this information. The Chronic Heart Questionnaire (CHQ) (44) was developed by the same group as the Chronic...
Respiratory Questionnaire (CRQ) (45) and is almost identical in composition. It has been found to be reproducible, valid and responsive in stable heart failure.

The model of PR was successfully applied to patients with CHF in a randomised controlled trial of PR vs. usual care (46). Patients undergoing PR made significant improvements in exercise tolerance and health status. A parallel, comparative observational study of PR was conducted between COPD and CHF (46). Both groups could be trained together, at the same time and location, by the same therapists. The significant improvements with PR, in exercise tolerance and health status, were similar between the groups.

Potential adaptations for PR
• The exercise assessment with an exercise ECG is a prerequisite for entry to exercise rehabilitation for CHF.
• The PR team have considerable and valuable skills in dealing with the severely dyspnoeic patients, but some additional education maybe necessary. Therapists are equally responsible for understanding the symptoms and signs of an episode of decompensated heart failure as they are for an exacerbation of COPD.
• Much of the education in PR is generic and relevant to CHF. Further work is needed to assess sustainability and to assess whether the strategy offers cost effectiveness for both populations.

Summary
The model of PR can be successfully applied to patients with CHF. Combined symptom-directed exercise rehabilitation is feasible and effective. Further work is needed to assess sustainability and to assess whether the strategy offers cost effectiveness for both populations.

References

Contact the author at: Rachael.Evans@westpark.org

West Park Healthcare Centre
82 Bungalow Avenue, Toronto ON M6M 2J5

For lung health information and resources, call 1-888-343-1956

UPDATE 5
Sabrina’s Law: Increasing Anaphylaxis Awareness in Schools

By Lauren Solar, a freelance writer and editor, who has worked with Anaphylaxis Canada on a number of projects.

In September 2003, Sabrina Shannon was a bright, vibrant teenager who had just started high school. Only thirteen years old, she was well educated about her allergies and asthma. In 2001, Sabrina and her aunt, Kathleen Whelan, a Toronto-based writer, created a documentary on anaphylaxis for CBC Radio called “A Nutty Tale”. Being allergic to peanuts, milk and soy, Sabrina had to be extremely careful at all times and she knew this. Sadly, she died following an anaphylactic reaction which took place at school during the first month of the school year.

To help protect other families from this kind of tragedy, Sabrina’s mother Sara Shannon and father Mike Shannon – with the help of many others – worked tirelessly until Bill 3: An Act to protect anaphylactic students was passed in 2005. It was named “Sabrina’s Law” in their daughter’s memory.

Background
Sabrina’s Law became effective in January 2006 and required that every public school in Ontario create an anaphylaxis policy that includes the following:

- Strategies to reduce the risk of exposure to allergens in classrooms and common areas,
- A communication plan for the dissemination of information on life-threatening allergies to parents, pupils and employees,
- Regular training for employees and others who are in direct contact with pupils,
- A request by the school principal for information on life-threatening allergies at the time of registration, and the maintenance of a file for each pupil, and
- The development of an individual plan for each pupil at risk of anaphylaxis.

To view the law in its entirety, go to www.ontla.on.ca (enter “Bill 3, Sabrina’s Law, 2005” in the search box).

With food allergy on the rise, it is important that anaphylaxis policies help keep individuals with life-threatening allergies safe. Prevalence studies estimate that up to 6% of children are affected by food allergies. Peanut allergy affects about 2-in-100 of school age children.1

Anaphylaxis is a serious allergic reaction that is rapid in onset and may cause death.2 There is no cure; therefore avoidance of allergens is essential. Food allergy can be triggered by almost any food, but 90% of reactions result from those identified by Health Canada as “priority allergens”: milk, eggs, peanuts, tree nuts (e.g. almond, cashew, hazelnut, pistachio), fish, shellfish (e.g. scallops, clams, lobster, shrimp), wheat, soy, sesame seeds and mustard. Sulphites are food additives used as preservatives to maintain food colour and prolong shelf-life. Sulphite-sensitive individuals may experience similar reactions as those with food allergy. Sulphites can also cause asthma symptoms in a small proportion of asthmatics. Insect stings and medications are the most common non-food triggers. Anaphylaxis triggered by latex or exercise is less common.

Sabrina’s Law requires that schools develop strategies to reduce the risk of accidental exposure. With this many possible allergens to consider, the variables can seem overwhelming. The schools were in need of guidance to help protect allergic students.

Implementing the Law
In 2006, several resources were created to provide educators with the necessary information to act in accordance with the law. The Ontario Ministry of Education collaborated with Anaphylaxis Canada to develop Anaphylaxis Resource Kits. The kits included a copy of the guidelines Anaphylaxis in Schools & Other Settings4, epinephrine auto-injector training devices (EpiPen® and Twinject®), instructional DVDs, awareness posters and information pamphlets. These were sent to all publicly-funded schools and public health units across the province. An updated version of the kit was distributed in 2009. The Ministry also partnered with TVOntario and Anaphylaxis Canada to create an online anaphylaxis training e-learning module, Prevention First: For the Protection of Pupils with Life-Threatening Allergies which is available at www.eworkshop.on.ca/allergies.

With almost 5,000 schools geographically dispersed across a large province and a limited number of people to offer training, consistency and quality of services were huge challenges. In some areas of the province, training was delivered by public health nurses; however, the nurses are not mandated to cover anaphylaxis or asthma as part of school staff training. In other areas, the training was provided by first aid organizations which tended to focus more on emergency response rather than allergen avoidance strategies to prevent exposure. In many cases, parents of allergic children were being asked to do staff training.

To help address some of these gaps, Anaphylaxis Canada began working with the Ontario Lung Association to train certified respiratory educators, nurses, certified asthma educators, and others. The program focused on providing these individuals with the information and tools needed to train others about anaphylaxis. “These healthcare professionals are an excellent resource that schools can call on and we’ve been very glad to work with them,” says Laurie Harada, Executive Director of Anaphylaxis Canada.

This partnership is especially appropriate as there is a strong

Continued on page 7

1. Prevalence studies estimate that up to 6% of children are affected by food allergies.
2. Anaphylaxis is a serious allergic reaction that is rapid in onset and may cause death.
3. There is no cure; therefore avoidance of allergens is essential.
4. Anaphylaxis in Schools & Other Settings
link between asthma and anaphylaxis. For example, asthma and anaphylaxis have some similar symptoms, and the avoidance of triggers is a necessity for managing both conditions. Sabrina had asthma as well as multiple food allergies. Her death was caused by cross-contamination of food served in the school cafeteria. At first, both she and the school staff thought she was having an asthma attack.

Studies have shown that children with asthma and life-threatening allergies are more susceptible to severe breathing problems when experiencing an anaphylactic reaction. Dr. Susan Waserman, an allergist and Professor of Medicine at McMaster University, says “Asthma is a significant risk factor for patients with anaphylaxis. A recent study from the UK showed that allergic patients with asthma appear twice as likely to have episodes of anaphylaxis as those without. Not only are the episodes more frequent, they appear to be more severe, and these risks increase with the underlying asthma severity. It is extremely important to keep the asthma well-controlled. This is something that healthcare professionals can help school personnel better understand.”

Dr. Lisa Cicutto of National Jewish Health, Denver and an affiliate of the University of Toronto, along with a group of Canadian researchers, completed a study comparing provinces with anaphylaxis legislation to those without. Final results are not yet available, however, she does say that preliminary findings indicate a great deal of confusion about the roles of each of the stakeholders. “Educators are challenged with the demands of providing a quality education to a growing number of students with food allergy and other types of health conditions. Parents may know a law is in place, but not fully understand its requirements.” Anaphylaxis management is a shared responsibility. For example, allergic students should take age-appropriate measures to self-protect. “ORCS members and other healthcare professionals can assist these children by reviewing preventative measures and safety steps,” says Cicutto.

If you are interested in learning more about training programs, contact the Anaphylaxis Canada office at 1-866-785-5660 or info@anaphylaxis.ca

**The Awareness Continues to Grow**

Anaphylaxis training has increased awareness in schools. Deb L., an elementary teacher in Newmarket, is confident that her school is living up to the spirit of Sabrina’s Law. The entire staff meets before the beginning of each term and a key part of the agenda involves a review of every allergic student’s file. “The principal makes sure we get any new information as soon as possible, if a child changes classrooms or transfers in mid-term.” As one of the coaches who travels with the school’s sports teams, she is in charge of ensuring that epinephrine auto-injectors are carried on field trips.

Bob Ryan, Staff Developer with the Professional Learning, Training and Leadership Development Unit of the Toronto District School Board, is also positive about Sabrina’s Law and its role in contributing to the improvement of allergen safety in Toronto’s public schools. Currently, they offer a “train the trainer” program for principals three times per year. Ryan follows up afterwards to ensure that they have circulated the training and information to their staff, and that these are appropriate to their needs. “In the late fall, we will hopefully launch an online learning program called”

**References**


3 Anaphylaxis in Schools & Other Settings, 2005, the national guidelines for the management and treatment of anaphylaxis developed by five Canadian allergy associations including the Canadian Society of Allergy and Clinical Immunology (CSACI); Canadian Allergy, Asthma and Immunology Foundation (CAAIF); Anaphylaxis Canada; the Allergy Asthma Information Association (AAIA); and the Quebec Food Allergy Association (AQAA).
Successful Use of the Novalung® in a Serious H1N1 Influenza Infection: A Case Report

Todd Mortimer, RRT, Respiratory Therapy Clinical Service Leader, Child and Women's Health Program, Children's Hospital, Health Sciences Centre, Winnipeg

This report describes an interesting case of a post-partum, 76kg, 14.5 year old girl (“Hattie”) who presented in the emergency department of The Children’s Hospital in Winnipeg, Manitoba with H1N1 influenza. Her medical management included traditional and innovative forms of mechanical ventilation. Of particular interest is that of the Novalung® interventional lung assist (iLA) membrane ventilator. It is a pumpless arterio-venous filter that allows gas exchange by simple diffusion across a membrane. The membrane sits between a cannulated femoral artery and a cannulated femoral vein. The membrane is made of hollow fibres woven together. A “sweep gas” of oxygen flows inside the fibres while the blood flows around the fibres and never comes in contact with the gas. The carbon dioxide (CO2) and oxygen (O2) in the blood are exchanged across this artificial membrane as it would cross the alveolar capillary membrane. The primary outcomes are CO2 removal and the ability to reduce ventilatory support requirements and the potential iatrogenic injury. This device had been used approximately 1000 times in Europe as a bridge to lung transplantation. This was the first time the device was used in a pediatric patient for something other than a bridge to transplantation in North America and was the first pediatric application in Canada.

Day 1, June 5/09
Hattie arrived in the emergency department with flu-like symptoms and a history of deteriorating respiratory status (later diagnosed as H1N1 influenza). She was found to be in respiratory failure and was intubated and transferred to the pediatric intensive care unit. Hattie was pharmacologically paralyzed, and placed on conventional ventilation with the following settings: pressure regulated volume control (PRVC), respiratory frequency (f) of 20, tidal volume (Vt) 0.4 L, positive end expiratory pressure (PEEP) 12 cmH2O, peak inspiratory pressure (PIP) 34 cmH2O, mean airway pressure (MAP) 18 cmH2O and a fractional inspired oxygen concentration (FiO2) of 0.67 to maintain an oxygen saturation between 92 and 94%. Arterial blood gas (ABG) analysis reported a PaO2 = 67 mmHg, PaCO2 = 33 mmHg, pH = 7.35, plasma HCO3 = 17.7 mmol/L, Base Deficit (BD) = -6.7, Lactate = 0.4 and an oxygen index (OI) = 16. The OI is used to indicate severity of illness with a higher number being associated with a poorer outcome. The formula for OI = (MAP x FiO2 x 100)/PaO2. Hattie’s chest x-ray (CXR) showed right middle lobe collapse and bilateral diffuse infiltrates throughout. Her ventilation was stable on these parameters for the next 24 hours; however she deteriorated further later the following day.

Day 2, June 6/09
Hattie remained on PRVC with f still at 20, Vt decreased to 0.28L, PEEP increased to 20 cmH2O, PIP decreased to 32 cmH2O, MAP increased to 24 cmH2O and FiO2 increased to 0.77. ABG analysis reported a PaO2 = 72 mmHg, PaCO2 = 65 mmHg, pH = 7.14, plasma HCO3 = 21.2 mmol/L, BD = -7.9, Lactate = 0.6 and an OI of 26. Due to her increasing pressure requirements and the potential for air leak, and her deteriorating status, Hattie was placed on high frequency oscillatory ventilation (HFOV) using the Sensormedics 3100B and a filtered circuit with the following parameters prescribed: hertz (Hz) of 5, amplitude (Amp) 70 cmH2O, MAP 32 cmH2O and FiO2 of 1.0. Over the next 18 hours the oscillator settings remained constant other than the FiO2, which was decreased to 0.46. The ABG analysis reported a PaO2 = 115 mmHg, PaCO2 = 39, pH = 7.26, plasma HCO3 mmol/L = 17.2, BD = -8.7, Lactate = 0.7 and an improvement (reduction) in the OI to 13. This improvement was expected as we continued to ventilate using HFOV with the intention of preventing further iatrogenic injury and the inflammatory cascade.

Day 3 to 11, June 7 to 16/09
Increasing Hattie’s oscillator support was required to maintain an acceptable pH. It continued to escalate until the beginning of day 11 when her HFOV settings included a Hz = 4, Amp = 135 cmH2O, MAP = 26 cmH2O and FiO2 = 0.68, resulting in an ABG PaO2 = 65 mmHg, PaCO2 = 76 mmHg, pH = 7.24, plasma HCO3 = 31.4, Base Excess (BE) = +2.9, lactate of 0.7 and OI escalating to 27. Her CXR showed a large right pneumothorax, right middle lobe collapse and bilateral infiltrates throughout.

Day 13 to 14, June 18 to 19/09
As a result of a new left pneumothorax, deteriorating ventilation status and near maximal oscillator settings, alternative ventilation options were discussed and the Novalung® adjunct was pursued. Oscillator settings prior to application of the Novalung® were Hz = 4, Amp = 120 cmH2O, MAP = 26 cmH2O, FiO2 = 0.86 resulting in an ABG reporting a PaO2 = 81 mmHg, PaCO2 = 93 mmHg, pH = 7.26, plasma HCO3 = 40.7 cmH2O, BE = +11.0 and an OI climbing to 44. Hattie was cannulated early on day 14 and an ABG one hour post cannulation with a Novalung® sweep gas of 4 Lpm reported a PaO2 = 51 mmHg, PaCO2 = 54 mmHg, pH = 7.45, plasma HCO3 = 36.9 and a BE = +11.8. Four hours after initiating the Novalung® and escalating the sweep gas to 10 Lpm, ABGs remained stable and the oscillator amplitude was decreased to 75 cmH2O.

Continued on page 9
from 120 cmH₂O. This same day nitric oxide was initiated at 40 parts per million resulting a mild increase in her PaO₂.

Day 18 to 25, June 22 to 29/09
Hattie remained on HFOV, nitric oxide and the Novalung® and continued to have many challenges. On day 18, hemodynamic stability was challenging as both intravascular volume and vasopressors were required and a massive hemothorax drained from both right and left chest tubes. On day 20 the Novalung® was exchanged due to clotting in the membrane. The next day Hattie's left pneumothorax re-accumulated so two additional chest tubes were placed in the left thorax. The Novalung® sweep gas increased to 12 Lpm. On day 24, a fourth chest tube was added to the left thorax. On day 25 the Novalung® was once again exchanged due to clotting in the membrane.

Day 27, July 1/09
Despite the multiple complications such as air leak, we were able to continue weaning the ventilatory support on HFOV. HFOV settings were as follows: Hz = 8, Amp = 20 cmH₂O, MAP = 17 cmH₂O, FiO₂ = 0.49 resulting in an ABG reporting a PaO₂ = 107 mmHg, PaCO₂ = 70 mmHg, pH = 7.40, plasma HCO₃ = 42.3, BE = +15.2 and an OI of 8. Hattie was eventually able to transition to conventional pressure support ventilation (PSV), spontaneous f = 30, Vt = 0.250 L, PEEP = 12 cmH₂O, PIP = 22 cmH₂O, MAP = 15 cmH₂O, FiO₂ = 0.50 and an ABG reporting a PaO₂ = 55 mmHg, PaCO₂ = 69 mmHg, pH = 7.42, plasma HCO₃ = 43.5, BE = +17.0, Lactate = 0.8 and an OI of 14.

As we transitioned back to conventional ventilation we also began weaning the nitric oxide and the Novalung® sweep gas.

Day 29, July 3/09 and beyond
The Novalung® sweep gas had been weaned to 0 and it was removed less than 4 hours later, resulting in the following ABG reporting a PaO₂ = 98 mmHg, PaCO₂ = 56 mmHg, pH = 7.38, plasma HCO₃ = 32.8, BE = +7.1, Lactate = 0.8 and an OI of 5. Hattie continued to receive mechanical ventilatory support until July 13, 2009 and was decannulated on July 18, 2009. Fortunately she did not require supplemental oxygen and had no central nervous system impairment as a result of the illness and recovery.

This article has described the clinical course and successful outcome of a 14.5 year old girl with a serious case of H1N1 influenza who received conventional and innovative forms of mechanical ventilation. Her eventual recovery can be attributed to the bold initiative taken by her health care team to implement these treatments. Their willingness to start Novalung® treatment despite its limited use in North America, in conjunction with conventional ventilation methods, may have saved her life. To read more about Novalung® please refer to www.novalung.com.

THE LUNG ASSOCIATION
Ontario

Pledge your Support for an Ontario Lung Health Action Plan!

According to the World Health Organization, lung diseases will soon be the third leading cause of death in the world. Lung diseases have a major effect on millions of people of all ages living in Ontario. Despite progress achieved over the years in both prevention and treatment, respiratory diseases continue to take a huge toll in lost lives, lost economic productivity and costs to the health care system. But perhaps the most significant impact is on the long-term quality of life for individuals and families who are affected by lung disease.

Join The Lung Association’s advocacy campaign to make the need for a Lung Health Action Plan an issue in the upcoming provincial election campaign. Sign the on-line petition at www.on.lung.ca. If you would like to be a lung health champion in your own community, please contact Sherry Zarins at szarins@on.lung.ca.

Better Breathing 2012
January 26-28
Toronto Marriott Downtown Eaton Centre

Save the Date!
ORCS Provincial Committee & Staff, 2011-2012

In the Spotlight:
Congratulations!

Carole Madeley, RRT, MAsc, CRE, Director, Respiratory Health Services at the Ontario Lung Association, was awarded the Margaret Fitch Award for Best Poster by an Investigator at the Better Breathing 2011 conference for her poster: Perspectives of End Users of Asthma Action Plans.

Tania Janaudis-Ferreira, BSc, MSc, PhD, a researcher at West Park Healthcare Centre, who recently completed her PhD in Pulmonary Rehabilitation at Umea University, Sweden, was awarded the Lisa Cicutto Award for Best Poster by a Student Investigator for her poster: Resistance Arm Training in Patients with Chronic Obstructive Pulmonary Disease: A Randomized Controlled Trial.

Public Events in support of lung health

HAMILTON
Phyllis Gretzky Memorial Golf Tournament, June 15, 2011, Willow Valley Golf Course

LONDON
Cruising for Murder, June 11, 2011, The Carousel Room at The Windsor Fair
Stayin’ Alive, June 23, 2011, Lamplighter Inn
One Man Scramble, September 21, 2011, West Haven Golf & Country Club

STRATFORD
The Wild Ride, June 18, 2011, Wildwood Conservation Area

WINDSOR
Bike Trek, May 28 & 29, 2011, through Windsor and Essex County

BELLEVILLE, HAMILTON, LONDON, STRATFORD, TORONTO, WINDSOR
The Amazing Pace, October 29, 2011

www.on.lung.ca

Left to right: Bruce Cooke, Cathy Relf, Dilshad Moosa, Gillian Hueniken, Judy King, Shelley Prevost, Mika Nonoyama, Sheila Gordon-Dillane, Lorelei Samis, Karen Martindale, Libby Groff, Mike Keim, Heather Wood, Christina McMillan Boyles
Absent: Andrew Bagnall, Dina Brooks, Jennifer Olajos-Clow, Miriam Turnbull

Chair
Libby Groff, RRT, BHA, CRE

Past Chair
Cathy Relf, BScPT

Chair, Research & Fellowship Committee
Judy King, BHScPT, MHSc(HCP), PhD

Co-Chairs, Editorial Board
Dina Brooks, BScPT, MSc, PhD
Mika Nonoyama, RRT, PhD

Chair, Education Committee
Michael Keim, RRT, MA(c)

Chair, Membership & Program Promotion Committee
Miriam Turnbull, RRT, MBA

Regional Representatives
Eastern Ontario
Jennifer Olajos-Clow, RN, MSc, CAE
Gillian Hueniken, BScPT

Essex/Kent
Dilshad Moosa, BSc, RRT, CRE, MAsc(Resp)(c)

Greater Toronto
Christina McMillan Boyles, RN, MScN
Shelley Prevost, RRT, MAsc(Resp)

North Western Ontario
Karen Martindale, RRT, BA, BusDip

South Central Ontario
Andrew Bagnall, BSc, RRT

Respiratory Health Educators Interest Group Representative
Lorelei Samis, BScPT

Ontario Lung Association Board of Directors Representative
Bruce Cooke

Director
Sheila Gordon-Dillane, BA, MPA

Administrative Assistant
Heather Wood, BA
Respiratory Articles of Interest

Roflumilast is an oral, selective phosphodiesterase 4 (PDE4) inhibitor with broad anti-inflammatory properties. Inhibition of PDE4 suppresses the recruitment and activation of several anti-inflammatory cells in the airways - neutrophils, CD8 T lymphocytes, macrophages and eosinophils.

Patients with severe COPD (FEV₁ <50% predicted, chronic cough and sputum, and at least one exacerbation requiring hospitalization or systemic corticosteroids in the previous year) were randomized to receive roflumilast 500 mcg or placebo daily for 52 weeks. Patients were allowed long-acting beta-receptor agonists, short-acting beta-receptor agonists, and short-acting anticholinergics, but not inhaled corticosteroids, tiotropium or theophylline. The mean changes in pre-bronchodilator FEV₁ were significantly higher in roflumilast than placebo groups (40 vs -9 mL p<0.0001). There was a 17 percent lower COPD exacerbation rate in roflumilast than placebo groups (p=0.0003). The median time to first exacerbation did not differ between groups, but the time to the second exacerbation was significantly longer in roflumilast than placebo recipients (172 vs 159 days, p=0.0290). Adverse events were more common with roflumilast, 14% of patients in the roflumilast group and 12% in the placebo group discontinued because of adverse events. The difference in weight change during the study between the roflumilast and placebo groups was -2.17 kg.

The effect of roflumilast on lung function in patients with COPD that is moderate to severe who are already being treated with salmeterol or tiotropium was investigated. Patients received roflumilast 500 mcg or placebo once daily for 24 weeks, in addition to salmeterol (M2-127) or tiotropium (M2-128). Compared to placebo, roflumilast consistently improved mean prebronchodilator FEV₁ by 49 mL (p<0.0001) in patients treated with salmeterol and 80 mL (p<0.0001) in those treated with tiotropium. Roflumilast had beneficial effects on other lung function measurements and on selected patient-reported outcomes in both groups. Nausea, diarrhea, weight loss, and, to a lesser extent, headache were more frequent in patients in the roflumilast groups. These adverse events were associated with increased patient withdrawal. Roflumilast improves lung function in patients with COPD treated with salmeterol or tiotropium, and could become an important treatment for these patients.

Some patients in respiratory failure can be ventilated effectively with Non-invasive Ventilation (NIV). In many acute care settings, NIV is a standard of care for the treatment of exacerbations of chronic obstructive pulmonary disease and respiratory failure from other causes, to prevent intubation and reduce morbidity and mortality. The need for humidification and the amount of heat and moisture that should be delivered with NIV remains an area of debate. Although this article is not meant to answer this question, it provides a good summary of the pros and cons of humidification of gas in NIV:

• Long-term versus short-term non-invasive ventilation
• Cost versus benefit patient comfort
• Airways resistance, secretion retention and removal
• Success of non-invasive ventilation of humidification during non-invasive ventilation.

Compiled by Larry Jackson and Yvonne Drasovean

Follow Ontario Lung Association on Facebook and Twitter @OntarioLung

Spring/Summer 2011 Update
Home Oxygen Programs

VitalAire provides all portable oxygen modalities to meet all clinical and lifestyle needs

Sleep Apnea? Need CPAP?
VitalAire provides Home Oxygen, CPAP Therapy and Sleep Apnea Programs across Canada.
Over 30 offices in Ontario to serve you.

Contact us at
1-800-567-0202

Standard Clinical Program
> Clinical assessment
> Education on COPD
> Safety instruction
> Oxygen saturation (rest, exercise, nocturnal)
> Review of respiratory medications
> 24/7 on call

The VitalAire Difference
> National Accreditation
> Home Safety Assessment
> Innovative education methods
> Current and potential activity levels
> Walking Diary and ambulation goals
> Provide all portable options
> Highest standards of quality and safety
> National and International travel needs
> Cutting edge products (tele-monitoring trial)