

CAPITAL HEALTH RESEARCH *focus*

Respirology researchers at Capital Health are finding ways to help people with lung disease breathe easier and live longer, more active, and satisfying lives.

Teamwork paves the way to lung disease solutions

For people with lung disease, the simple act of breathing is not to be taken for granted. Whether they have COPD (chronic obstructive pulmonary disease), cystic fibrosis, severe asthma, or some other lung condition, there are times when every breath is a struggle.

Researchers at Capital Health and Dalhousie University in Halifax, NS, are determined to improve the health and wellbeing of people with respiratory illness. Clinicians in the Division of Respirology have teamed up with colleagues in physiotherapy, nursing, biomedical engineering, palliative care and psychology to find better ways to diagnose, treat and support people living with lung disease.

The research includes large national studies as well as local studies funded by the Canadian Institutes of Health Research (CIHR), Nova Scotia Lung Association, Atlantic Canada Opportunities Agency (ACOA), Cystic Fibrosis Foundation, Natural Sciences and Engineering Research Council (NSERC), and Social Sciences and Humanities Research Council.

People with COPD reap rewards of exercise

Fatigue and shortness of breath may lead some people with COPD to avoid physical exercise, yet if they can

stick with a program, they will have more energy and find it easier to breathe.

“We want to help people with COPD be physically active by making pulmonary rehabilitation programs more effective and accessible,” says Dr. Paul Hernandez, director of research in the Division of Respirology. “Physical fitness improves not just their breathing but their mental health and ability to manage the tasks of daily living. It also reduces their risk of falling.”

Dr. Hernandez has already taken part in a national study that showed home-based pulmonary rehabilitation exercise programs are just as effective for COPD patients as hospital-based programs. Now he is working with psychologist Dr. Chris Blanchard and physiotherapist Dr. Gail Dechman to learn what factors help people with COPD stay active, and what barriers prevent them from continuing to exercise, after completing a pulmonary rehab program.

At the same time, Drs. Hernandez and Dechman are taking a close look at just how physically demanding the tasks of daily living are for people returning home from hospital after a COPD flare-up (exacerbation). Often involving pneumonia, flare-ups can leave these people exhausted.

“We’re measuring our participants’ heart rate, oxygen saturation and speed as they complete ten activities that mimic household tasks, such as loading laundry into the dryer and putting groceries on shelves,” Dr. Dechman says. “This will reveal what tasks are most difficult, and why, so we can intervene in the most helpful ways. Perhaps they need to develop muscle strength or aerobic capacity, or maybe they need outside help with certain tasks.”

In the past year, the Division of Respirology has made its pulmonary rehabilitation program more accessible by moving it to a community-based clinic at the West End Mall. “We typically get people with COPD walking, riding stationary bikes, and doing resistance training with weights and rubber bands,” notes Dr. Dechman. “We build the intensity over time, so their bodies become more efficient at using oxygen and they don’t tire as easily.”

Ultimately, helping people with COPD increase their physical fitness will help them live more active, independent and fulfilling lives—with less distressing symptoms and fewer flare-ups—for as long as possible.



Respirologist Dr. Paul Hernandez and physiotherapist Dr. Gail Dechman help people with COPD improve their physical fitness at the ‘Cardiac and Pulmonary Health in Motion’ facility, in the Mumford Professional Centre at Halifax’s West End Mall.

respirology

CAPITAL HEALTH RESEARCH focus on respirology

IMPACT study supports people with COPD

Many people with advanced COPD live in isolation and distress—struggling to breathe, fearing the next ‘flare-up,’ and wondering how to manage their symptoms, their daily lives and their futures.

The IMPACT study is gathering evidence researchers hope will change the lives of people with COPD for the better. Short for ‘Intervention with a Modular educational Program and an Advanced Care Team,’ IMPACT is a CIHR-funded collaboration between the Division of Respirology and Capital Health’s Palliative Care program that aims to inform, guide and support COPD patients and their caregivers.

“We start with an eight-module educational program, delivered by trained COPD educators in people’s homes,” says lead investigator Dr. Graeme Rocker. “This helps patients understand their disease and how to live with it better. For example, they learn how to control symptoms with medications, conserve energy, manage stress, and respond to the warning signs of a flare-up to avoid hospitalization. And, we talk to them about the future and how they can plan for health care decisions.”

The researchers also survey study participants, including caregivers, to gain a better sense of COPD’s impact on people with the disease and on those who care for them. This will help in the design of more effective supports.

After the education phase, Capital Health palliative care staff visit patients over a period of time to ensure they’re receiving the support they need. “Some patients may need an occupational therapist to help them solve practical problems of daily living; some may need spiritual and emotional support,” notes Dr. Rocker. “Others may need a medication change to manage distressing symptoms.”

The research team also wants to know if low doses of morphine can help people cope with shortness of breath that hasn’t responded to conventional therapies. Dr. Rocker says early results of this CIHR-funded study are positive: “Patients are telling us they’re less anxious, less breathless, and more able to get out and do things.”

After completing the IMPACT and morphine studies, many patients transition to INSPIRED, a new pilot program that puts the IMPACT principles into action.

“People with COPD currently receive these supports through highly competitive research funding,” notes Dr. Rocker. “When the studies are complete, it will be important to support patients and families through longer-term funding of effective, evidence-based clinical programs.” Dr. Rocker has received the Roger C. Bone Advances in End-of-Life Care Award from the American College of Chest Physicians for his work developing INSPIRED.



Jean Smaggus appreciates home visits from Dr. Graeme Rocker and other members of the IMPACT study team. “I used to feel so alone with my illness,” says Jean who, diagnosed with COPD in 1999, has a genetic disorder that makes her lungs highly susceptible to damage. “Now, people check on me and I know there’s someone I can call if I’m having a problem. I would feel so much more isolated, frustrated and apprehensive without this support.” Even though Jean is on oxygen all the time, tires easily, and rarely leaves her home, she chooses to focus on what she can do instead of what she can’t: “You’ve got to have a positive attitude and find ways to give back.”

About COPD

- COPD includes emphysema and chronic bronchitis. Affecting more than one million Canadians, it is the country’s fourth-leading cause of death.
- In COPD, the airways become inflamed and narrowed, and the tiny air sacs in the lungs (alveoli) lose their elasticity. People with COPD cannot fully exhale and struggle to fill their lungs with fresh air.
- COPD can be prevented and symptoms can be treated, but it cannot be cured.
- People with COPD have frequent lung infections that further reduce their ability to breathe.
- COPD causes increasing disability, discomfort and distress.
- Smoking is the most common cause of COPD; other causes include an inherited disorder that leaves lungs unprotected from pollutants in the air.

New device makes measuring airway function easier, more revealing

Clinicians will soon have an easier-to-use, more sensitive tool for measuring the health of patients' airway function. Called the *tremoFlo Oscillation Spirometer*, this new handheld device reveals precisely how relaxed and open—or twitchy and narrowed—the airways of the lungs are during normal breathing. This allows clinicians to accurately diagnose asthma or other lung diseases and monitor how well medications are working to soothe and expand the airways.

Dalhousie biomedical engineer Dr. Geoff Maksym leads the team that's developing the *tremoFlo* device through Halifax-based spin-off company, Thorasys Inc., and its sister company, Montreal-based SCIREQ Inc. The team is testing the device on patients in collaboration with Capital Health respirologists Dr. Paul Hernandez and Dr. Colm McParland, IWK allergist Dr. Wade Watson and colleagues at the Mayo Clinic. "We're testing a third-generation proto-

type to see how much information the *tremoFlo* can give us—not only about lung function in people with asthma but also in those with COPD," says Dr. Maksym. "We're seeing how sensitive it is and what it can show us about airway resistance and reactivity compared to traditional spirometry, which is the standard technique for testing lung function."

Ease of use is one of the *tremoFlo*'s most obvious advantages. "The *tremoFlo* measures changes in tiny airwaves—or oscillations—as a person breathes normally. It's very easy for patients of any age to simply breathe into the device," Dr. Maksym explains. "On the other hand, traditional spirometry measures the volume of airflow and requires the person to take a deep breath and blow hard. It's difficult to get young children to do this properly... so it's difficult to tell if they have asthma or not."

Asthma tends to develop in early childhood. The earlier it's recognized and treated, the easier it is to control. The

tremoFlo, therefore, has the potential to make a major impact on the early diagnosis and effective management of asthma in young children. It also has the potential to teach researchers and clinicians more about what's happening inside the lungs in asthma and COPD—making it an important research tool.

The *tremoFlo* team received \$2 million from ACOA in 2008, to develop their concepts into a commercially viable medical device. In 2010, Thorasys won a \$100,000 Emerging Medical Technology Award from InnovaCorp toward manufacturing and marketing the *tremoFlo*. This promising technology has also received funding support from NSERC, Springboard Atlantic, the Nova Scotia Lung Association and Dalhousie University's Industry Liaison and Innovation Office.



Respiratory therapist/research coordinator Scott Fulton (left) demonstrates how to use the *tremoFlo Oscillation Spirometer* to asthma patient Amanda Walker (right). Biomedical engineer Dr. Geoff Maksym (centre) is working with the Division of Respirology to learn what the new device can tell them about patients' lung function and response to treatment.

Respirology Research Team

Respiratory specialists have joined forces with researchers in other fields to address the complex issues faced by people with lung disease. The respiratory research team includes:

Respirologists: Graeme Rucker, Paul Hernandez, Colm McParland, Nancy Morrison, Roger Michael, Debra Morrison, Dennis Bowie

Research coordinators: Wendy Conrad, Andrea Dale, Scott Fulton, Joanne Young (all respiratory therapists); Jillian Demmons (spiritual care)

Collaborators: Gail Dechman and Deanna Landry (physiotherapy), Christopher Blanchard (psychology), Margaret Donahue (qualitative analysis), Robert Horton (palliative care), Geoff Maksym (biomedical engineering), Gredi Patrick (nursing), Cathy Simpson (spiritual care).

National study sheds light on important issues in COPD

Capital Health researchers are key players in Health Canada's Can-COLD study (Canadian Cohort of Obstructive Lung Disease). Investigators across the country will collect/analyze data until 2023, to shed light on how COPD affects Canadians and what factors other than smoking put people at risk. Results will inform policy for preventing, diagnosing and treating COPD.

CAPITAL HEALTH RESEARCH focus on *respirology*

Treatment advances give cystic fibrosis patients a new outlook on life

Medications developed over the past few decades have dramatically changed the outlook for people born with cystic fibrosis (CF). In the 1960s and 70s, CF patients commonly died before age 20... yet today's young people with CF can optimistically make plans for the future. "We now see people with CF living full and productive lives well into their 40s, 50s and beyond," says Capital Health respirologist Dr. Nancy Morrison. "New drugs and new approaches to giving medication have made a huge impact on life expectancy."



Dr. Morrison and her colleague, Dr. Roger Michael, are heavily involved in national and multi-national clinical trials that continue to improve the health and survival of people with CF. The test drugs are designed to target three key issues: thick mucous, chronic lung infections, and the underlying genetic defects that lead to the disease.

"A person with CF inherits one CF gene mutation from each parent but there are more than 1,600 variations of the CF gene," Dr. Morrison explains. "While the mutations are different, they lead to similar problems—thick and sticky mucous that makes breathing difficult, while providing a breeding ground for bacterial infections that further damage the lungs."

Drs. Morrison and Michael involve patients across the Maritimes in clinical trials, providing them with early access to promising new therapies. These include antibiotic inhalers that deliver the drugs directly to the lung, where they can fight the infection without toxic effects on the rest of the body. Some of the most exciting new drugs are those that compensate for the effects of genetic mutations. "We've had tremendous results with a drug that corrects one of the rarer mutations... and new drugs are coming along to treat the more common ones," notes Dr. Morrison, adding that she and her colleagues also contribute to large-scale genetics and clinical outcomes studies.

"Our clinics have changed so much over the years," Dr. Morrison says. "With new medications and careful attention to optimal nutrition, exercise, and diabetes management, our patients are surviving much longer, in much better health. They're flourishing... pursuing careers and starting families. It's incredible to see."



Respiratory therapist/research coordinator Andrea Dale (left) follows Amy Baillie's progress, to see how she's responding to a new medication designed to correct the genetic defect behind her cystic fibrosis. "I feel like I have a new set of lungs," says Amy of her experience with the drug. "I have no problem keeping up with my friends when we're snowboarding anymore, and I want to jog on the treadmill, when before I could only walk." Married last year, the 28-year-old massage therapist plans to continue to get the most out of life.

Clinical trials help patients breathe easier

Researchers in the Capital Health/Dalhousie Medical School Division of Respirology are involved in a wide range of clinical trials. These trials are leading to the approval of new drugs for lung disease, and to new uses and ways of delivering existing drugs. Recent and current trials aim to improve the health and wellbeing of patients with asthma, COPD, cystic fibrosis, pulmonary hypertension, and interstitial fibrosis.

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