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Comparison of cardiac rehabilitation outcomes in individuals with respiratory, cardiac or no comorbidities: A retrospective review

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Home care in respiratory therapy

CASE REPORT

A positive methacholine challenge based on specific airway conductance: A case report

ABSTRACTS

Proceedings from the Canadian Society of Respiratory Therapists Annual Education Conference, May 26-28, 2016 • Ottawa, Ontario
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* LAMA=Long-acting muscarinic antagonist, also known as a long-acting anticholinergic (LAAC)
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MESSAGE FROM THE EDITOR-IN-CHIEF / MESSAGE DU RÉDACTEUR EN CHEF

A role for respiratory therapists in shaping Canada’s changing health policy landscape / Une place aux inhalothérapeutes pour définir le paysage politique de la santé en mutation au Canada

Jason W Nickerson

ORIGINAL ARTICLE

Comparison of cardiac rehabilitation outcomes in individuals with respiratory, cardiac or no comorbidities: A retrospective review

Mika L Nonoyama, Susan Marzolini, Dina Brooks, Paul Oh

Although currently major contributors to morbidity and mortality, cardiovascular disease (CVD) and chronic respiratory diseases, such as chronic obstructive pulmonary disease, are projected to rank among the top three in global disease burden by 2020. Multimorbidity is a common feature in CVD and chronic respiratory disease, and patients often share the same pathological characteristics including anatomical location of disease, dyspnea and fatigue, among several others. However, patients entering rehabilitation programs for either condition are functionally diverse; therefore, individuals with respiratory comorbidities may not fare as well in cardiac rehabilitation programs. This retrospective cohort study investigated several relevant functional parameters and outcomes.

EDITORIAL

Patient and family centred care in respiratory therapy: A fundamental right?

Bryan Buell, Christiane Menard

COMMENTARY

Home care in respiratory therapy

Blayne T Clarke

CASE REPORT

A positive methacholine challenge based on specific airway conductance: A case report

Jeffrey Haynes

Methacholine challenge tests only determine airway hyper-responsiveness to a nonspecific agent, and can be associated with relatively low sensitivity and specificity; therefore, they should not be used in isolation to diagnose asthma. Accordingly, alternative adjunctive measures of pulmonary function have been recommended in cases in which an individual cannot produce high-quality spirometry data. This report describes a case involving a 30-year-old man with a primary complaint of dyspnea with exercise. The ensuing discussion briefly reviews these alternative measures and the inherent limitations of the methacholine challenge test.

ABSTRACTS

Proceedings from the Canadian Society of Respiratory Therapists Annual Education Conference, May 26-28, 2016 • Ottawa, Ontario

Canadian Society of Respiratory Therapists

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Several important changes to the way health care is delivered and funded are either underway or planned in Canada: all 13 Canadian provinces and territories, and the federal government have collaborated through the pan-Canadian Pharmaceutical Alliance (pCPA) to lower the price of commonly used medicines; Canada’s federal Health Minister has signalled that a new health accord with the provinces will be negotiated to provide federal funding to provincial health services; several provinces have either indicated that they will move forward with public reimbursement schemes of pharmaceuticals, or have already implemented some form of this type of coverage; and Ontario has committed to a renewed strategy to strengthen and improve community-based care. Many other examples exist, but the fundamental point is that the landscape of health care delivery and funding is changing.

Each of these changes is occurring amid global concerns of the affordability of new health technologies, how best to care for an aging population and the poorly recognized but massive burden of noncommunicable diseases in low- and middle-income countries. The United States is currently embroiled in a contentious debate about the unaffordability of health care, generally, and of pharmaceuticals, specifically. There are growing demands for a renewed approach to biomedical research and development funding; meanwhile, emerging global health threats push resources to the limits. Each of these can and do impact respiratory care, and respiratory therapists should take note.

A common thread linking each of these issues is a call for evidence-based health systems planning and policy development. The calls for evidence-based decision making extend beyond measures of clinical effectiveness of interventions, and includes the need for evidence of programmatic effectiveness and efficiency. It is insufficient to assume that old ways of doing things will be simply be upheld regardless of whether there is evidence to support it.

There is a need for respiratory therapists to play a role in shaping this new dimension of health policy and planning for respiratory disease management, and our seat at the decision-making table is urgently filled. Discussions of health system reform and disease management, and our seat at the decision-making table for a renewed approach to biomedical research and development funding; meanwhile, emerging global health threats push resources to the limits. Each of these can and do impact respiratory care, and respiratory therapists should take note.

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Achieving this, however, requires us to have a robust grasp of the evidence guiding our role and the contexts in which we work. Although the Journal encourages work centred on the role of respiratory therapists, specifically, the profession also brings important insights into the analysis and evaluation of important health policy. Respiratory therapists have unique insight into the functioning of important health programs, ranging from the coverage of medicines (e.g., provincial reimbursement programs) and medical devices, such as ventilators, and this insight should be integrated into health policy development, research and advocacy on behalf of our patients and led from within our profession.

Canada’s health policy landscape is changing, and there are credible reasons to suspect that significant changes lie ahead. Respiratory therapists and the patients whom we serve are going to be affected by these changes, and it is incumbent on us to bring a pragmatic and evidence-based perspective to these important policy developments, rooted in everyday practice.

Jason W Nickerson RRT FCSRT PhD, Editor-in-Chief
Comparison of cardiac rehabilitation outcomes in individuals with respiratory, cardiac or no comorbidities: A retrospective review

Mika L. Nonoyama, RRT PhD, Susan Marzolini R Kin PhD, Dina Brooks BSc(PT) PhD, Paul Oh MD

OBJECTIVE: To describe the prevalence and impact of respiratory comorbidities on patients undergoing cardiac rehabilitation (CR).

METHODS: A retrospective review of a CR database (1999 to 2004) of patients with ischemic heart disease with ≥10 pack per year (ppy) smoking history and respiratory comorbidities (RC), non-respiratory comorbidities (NRC) and no comorbidities (NC) was performed. Primary outcomes at zero, six and 12 months included peak oxygen uptake (VO₂peak), maximum workload, resting heart rate, ventilatory anaerobic threshold and anthropometrics. Analyses were performed on individuals who completed the program, adjusting for age, sex and baseline VO₂peak.

RESULTS: Of 5922 patients, 1247 had ≥10 ppy smoking history; 77 (6.2%) had RC; 957 (76.7%) had NRC; and 213 (17.1%) had NC. The program completion rate for each group was similar for the RC (46.8%), NRC (55.8%) and NC groups (57.3%) (P=0.26). The RC group had the lowest baseline fitness levels (P=0.022). For VO₂peak, there were significant differences among groups (P=0.02) and improvements over program duration (P<0.001). There were no significant differences in other outcomes.

CONCLUSIONS: There was a low prevalence of patients with comorbid chronic obstructive pulmonary disease in CR when based on physician referral documentation. This is likely underestimated and/or reflects a referral bias. Diagnostic testing at CR entry would provide a more accurate measure of the prevalence and severity of disease. CR participation resulted in significant and similar improvements in most key CR outcomes in all groups including similar completion rate. A CR model was effective for patients with coexisting RCs. Strategies to improve access and diagnosis should be explored.

Key Words: Aerobic exercise; Cardiac rehabilitation; Comorbidities; COPD; Smokers

Cardiovascular and chronic respiratory disease are leading causes of morbidity and mortality in the United States and worldwide (1). In 2008, cardiovascular disease (CVD) caused 17 million deaths worldwide (48% of all noncommunicable diseases), and chronic obstructive pulmonary disease (COPD) and asthma caused 4.2 million deaths. These noncommunicable diseases, according to the World Bank/WHO, will rank in the top three of burdened diseases worldwide by 2020 (1,2).

CVD and respiratory disease share many comorbid characteristics including multimorbidity (≥2 conditions) as a common feature (3). The prevalence of multimorbidity increases with age and results in poor health outcomes (4,5), stressing the importance of effective and efficient chronic care interventions for this population (1). The specific prevalence of respiratory comorbidity (eg, COPD, asthma) in cardiac disease has varied in the literature: 9% to 39% in patients with acute or nonacute cardiac morbidities (eg, acute myocardial infarction, cardiac surgery) (6-9). The method by which respiratory disease was defined in these studies and the cohort investigated may have contributed to this high level of variability in prevalence.

Cardiac rehabilitation and pulmonary rehabilitation are common interventions for CVD and COPD (10,11). The population of patients who enter these programs share many characteristics: a common intrathoracic location of the pathology; the frequent coexistence of cardiac and pulmonary disease; and shared symptoms, such as dyspnea, fatigue, psychological disturbances, deconditioning and exercise intolerance (12-14). In addition, they share common rehabilitation goals and outcomes including improvement in exercise tolerance, which can reduce future morbidity and disability, as well as enhance quality of life (10,13,15). Although the principles of both pulmonary and cardiac rehabilitation are similar, the patients who enter these programs are functionally diverse (16). In many cardiac rehabilitation patients (without heart failure), the chief functional limitation and cause of exercise intolerance is deconditioning and, in some patients, CVD rate-limiting angina or ischemia (13-17). In many pulmonary rehabilitation patients, functional limitations are more extensive: work inefficiency due to impairment in lung mechanics; inspiratory muscle fatigue; ineffective gas exchange;
right ventricular dysfunction; alterations in peripheral muscle metabolism; acute exacerbations; and malnutrition (13,18,19). These greater limitations may place patients with respiratory comorbidities enrolled in a cardiac rehabilitation program at a disadvantage compared with those without airflow limitations.

There is currently little information regarding the prevalence and impact of respiratory comorbidities on patients who have completed a cardiac rehabilitation program. In their retrospective review, King et al (8) noted a decreased likelihood of cardiac rehabilitation attendance in patients with a history of COPD or asthma. In a cohort study, Savage et al (20) found that chronic lung disease was one of the comorbidities that significantly predicted no improvement in peak oxygen uptake that occurred in 20% of 385 cardiac rehabilitation patients. Identifying the characteristics of cardiac rehabilitation patients with respiratory comorbidities, and the impact of this comorbidity on key outcomes, is the first step toward adapting rehabilitation needs and improving care.

The present article describes the characteristics and effects of exercise training for individuals with respiratory comorbidities and enrolled in a traditional cardiac rehabilitation program. The specific objective was to compare the prevalence, demographic, aerobic and functional characteristics, and risk factor profile of individuals with: respiratory comorbidities (RCs); nonrespiratory comorbidities (NRCs); and no comorbidities (NCs) using a retrospective database review. All individuals included in the present study participated in the Cardiovascular Prevention and Rehabilitation Program at the Toronto Rehabilitation Institute/University Health Network (Toronto, Ontario) and had a ≥10 pack per year (ppy) smoking history. We hypothesized that the prevalence of respiratory comorbidities would be low in the cardiac rehabilitation program. This subgroup would also have lower cardiovascular fitness compared with the subgroups without RCs, but exhibit similar improvements after completing the program; providing support for the enrollment of these patients into standard cardiac rehabilitation programs. This is important considering the poor availability of pulmonary rehabilitation programs for individuals with chronic respiratory disease (21,22).

**Table 1**
Baseline characteristics of subgroups that completed the Toronto Rehabilitation Institute Cardiac Rehabilitation and Secondary Prevention Program (Toronto, Ontario), January 1999 to May 2004

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Respiratory (n=36)</th>
<th>Non-respiratory (n=534)</th>
<th>None (n=122)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female sex</td>
<td>8 (22.2)</td>
<td>58 (10.9)</td>
<td>5 (4.1)</td>
<td>0.004</td>
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<tr>
<td>Age, years</td>
<td>67.2±10.1</td>
<td>61.1±10.1</td>
<td>60.5±8.3</td>
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<tr>
<td>Smoking status</td>
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<td>0.78</td>
</tr>
<tr>
<td>Quit</td>
<td>33 (91.7)</td>
<td>484 (90.6)</td>
<td>113 (92.6)</td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>3 (8.3)</td>
<td>50 (9.4)</td>
<td>9 (7.4)</td>
<td></td>
</tr>
<tr>
<td>Pack per year smoked</td>
<td>48.3 (32.4)</td>
<td>37.0 (27.1)</td>
<td>36.3 (29.9)</td>
<td>0.06</td>
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<tr>
<td>Occupational status</td>
<td></td>
<td></td>
<td></td>
<td>0.0002</td>
</tr>
<tr>
<td>Employed</td>
<td>5 (14.3)</td>
<td>211 (39.5)</td>
<td>52 (42.6)</td>
<td></td>
</tr>
<tr>
<td>Retired</td>
<td>22 (62.9)</td>
<td>198 (37.1)</td>
<td>39 (32.0)</td>
<td></td>
</tr>
<tr>
<td>Disability pension</td>
<td>4 (11.4)</td>
<td>9 (1.7)</td>
<td>2 (1.6)</td>
<td></td>
</tr>
<tr>
<td>Sick leave</td>
<td>2 (5.7)</td>
<td>96 (18.0)</td>
<td>24 (19.7)</td>
<td></td>
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<tr>
<td>Unemployed</td>
<td>2 (5.7)</td>
<td>17 (3.2)</td>
<td>3 (2.5)</td>
<td></td>
</tr>
<tr>
<td>Body mass index, kg/m²</td>
<td>27.3±3.6</td>
<td>28.4±4.2</td>
<td>28.2±3.9</td>
<td>0.48</td>
</tr>
<tr>
<td>Waist circumference, cm</td>
<td>95.2±10.9</td>
<td>98.4±11.7</td>
<td>99.3±10.8</td>
<td>0.18</td>
</tr>
<tr>
<td>Body fat percentage</td>
<td>24.6±8.0</td>
<td>23.7±5.8</td>
<td>23.3±8.5</td>
<td>0.72</td>
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<tr>
<td>Resting heart rate, beats/min</td>
<td>70.5±13.1</td>
<td>67.2±12.6</td>
<td>66.7±12.2</td>
<td>0.28</td>
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<tr>
<td>Resting systolic blood pressure, mmHg</td>
<td>145.0±18.7</td>
<td>139.8±21.9</td>
<td>138.8±20.7</td>
<td>0.31</td>
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<tr>
<td>Resting diastolic blood pressure, mmHg</td>
<td>77.5±11.6</td>
<td>75.7±12.2</td>
<td>75.5±11.3</td>
<td>0.68</td>
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<td>Maximum heart rate, beats/min</td>
<td>115.9±22.2</td>
<td>119.0±21.7</td>
<td>121.4±22.0</td>
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<tr>
<td>Maximum systolic blood pressure, mmHg</td>
<td>190.2±27.3</td>
<td>187.1±27.5</td>
<td>186.8±26.0</td>
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<tr>
<td>Maximum diastolic blood pressure, mmHg</td>
<td>83.6±12.7</td>
<td>83.7±12.9</td>
<td>83.0±12.1</td>
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<tr>
<td>Maximum workload, W</td>
<td>99.9±38.7</td>
<td>124.6±39.6</td>
<td>133.8±37.8</td>
<td>0.00004</td>
</tr>
<tr>
<td>Peak oxygen uptake (VO2peak), mL/kg/min</td>
<td>16.0±3.8</td>
<td>18.3±4.9</td>
<td>19.2±5.2</td>
<td>0.002</td>
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<tr>
<td>Ventilatory anaerobic threshold, mL/kg/min</td>
<td>11.4±2.3</td>
<td>12.3±2.7</td>
<td>12.6±2.8</td>
<td>0.08</td>
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<tr>
<td>Angina</td>
<td>1 (2.9)</td>
<td>19 (3.6)</td>
<td>1 (0.8)</td>
<td>0.56</td>
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<tr>
<td>Symptoms during cardiopulmonary exercise test</td>
<td>8 (23.5)</td>
<td>160 (30.0)</td>
<td>38 (31.1)</td>
<td>0.85</td>
</tr>
<tr>
<td>Exercise at home</td>
<td>31 (91.2)</td>
<td>384 (72.0)</td>
<td>89 (73.0)</td>
<td>0.29</td>
</tr>
<tr>
<td>Primary diagnosis</td>
<td></td>
<td></td>
<td></td>
<td>0.0002</td>
</tr>
<tr>
<td>Coronary artery bypass graft surgery</td>
<td>15 (41.7)</td>
<td>213 (39.9)</td>
<td>73 (59.8)</td>
<td></td>
</tr>
<tr>
<td>Percutaneous coronary intervention</td>
<td>2 (5.6)</td>
<td>97 (18.2)</td>
<td>9 (7.4)</td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>11 (30.6)</td>
<td>158 (29.6)</td>
<td>23 (18.9)</td>
<td></td>
</tr>
<tr>
<td>Ischemic heart disease (no intervention)</td>
<td>8 (22.2)</td>
<td>66 (12.4)</td>
<td>17 (13.9)</td>
<td></td>
</tr>
<tr>
<td>Medications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory</td>
<td>18 (50.0)</td>
<td>279 (52.2)</td>
<td>69 (56.6)</td>
<td>0.65</td>
</tr>
<tr>
<td>β-blockers</td>
<td>14 (38.9)</td>
<td>424 (79.4)</td>
<td>96 (78.7)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Lipid-lowering agent</td>
<td>26 (72.2)</td>
<td>407 (76.2)</td>
<td>98 (80.3)</td>
<td>0.17</td>
</tr>
<tr>
<td>Platelet inhibitor</td>
<td>34 (94.4)</td>
<td>488 (91.4)</td>
<td>109 (89.3)</td>
<td>0.60</td>
</tr>
<tr>
<td>Anti-anxiolytics</td>
<td>6 (16.7)</td>
<td>67 (12.5)</td>
<td>20 (16.4)</td>
<td>0.45</td>
</tr>
<tr>
<td>Wait time to program entry, days</td>
<td>51.4±40.6</td>
<td>42.2±21.6</td>
<td>41.7±22.2</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Data presented as n (%) or mean ± SD unless otherwise indicated. Bolded values indicate statistical significance (ie, P<0.05)
METHODS

Study design
The present study was a retrospective review of a database found in the Cardiac Rehabilitation and Secondary Prevention Program at Toronto Rehabilitation Institute. The program admits 1800 patients annually, with the majority of admissions for percutaneous coronary intervention, coronary artery bypass graft (CARG) surgery and myocardial infarction. Data were extracted from all available cases from January 1999 to May 2004. The present study was approved by the Toronto Rehabilitation Research Ethics Board.

Patients
The entire cohort of cardiac rehabilitation patients from January 1999 to May 2004 was initially reviewed. Only patients with a primary cardiac diagnosis and a ≥10 pack per year (ppy) smoking history were analyzed comparing the following three groups: RC, NRC and NC. Identifying comorbidities was based on physician referral information; formal pulmonary function testing was not conducted. Although there is no consensus or standardized ppy smoking history associated with COPD to increase the likelihood of identifying true cases, both the label of ‘COPD’ (or other chronic respiratory disease such as interstitial lung disease or asthma) based on physician referral and a smoking history of at least 10 ppy (23,24), was required. Physician referrals were used to identify COPD because other standard measures (25) of diagnoses, such as spirometry and clinical assessment (including dyspnea), were not collected as part of the program.

Cardiac rehabilitation intervention
Participants were referred to the cardiac rehabilitation program by their family physicians, surgeon or other health care provider. The program was led by an interprofessional team of physicians, physiotherapists, nurses, kinesiologists, psychologists and dietitians. Each participant was assigned to a case manager. Participants attended 90 min classes once per week for six to 12 months, and monthly classes for four to 12 months. Cardiopulmonary exercise tests (CPETs) were conducted in all participants at baseline, six and 12 months, except in those who prematurely discontinued the program. Classes included aerobic training, resistance training, education sessions, as well as psychosocial and dietary counselling. One exercise session was conducted in the facility each week, with the balance of the exercise being completed in the home/community. Exercise sessions, both at the facility and home/community, were tracked via diaries. The initial walking prescription was set at a distance of approximately 1.6 km per day and an intensity equivalent to the ventilatory anaerobic threshold (VAT) and/or 60% to 80% oxygen uptake (VO2peak). Prescriptions were progressed every two weeks, increasing distance to a maximum of 6.4 km and then increasing intensity to a maximum of 80% of VO2peak (maximum duration of 60 min). Thereafter, training intensity was adjusted to maintain a pace equivalent to 80% of VO2peak. Resistance training exercises were initiated eight weeks after aerobic training and included lower body, upper body and trunk-stabilizing exercises. Participants were advised to gradually progress from 10 to 15 repetitions and then to increase resistance by 5 kg, or one exercise band level and reduce the number of repetitions to 10.

Outcomes
Baseline variables were compared among the three groups and included age, sex, smoking history, presence of angina, occupational status, whether the patient completed the program (completed all diagnostic testing at baseline, six and 12 months, and attended classes over 12 months), anthropometrics (body mass index [BMI], waist circumference, body fat percentage) and cardiorespiratory status at rest and during CPET (heart rate [HR], blood pressure [BP], workload, oxygen uptake [VO2peak], VAT and presence of symptoms).

The following variables were compared among groups and over three different time points (baseline, immediately after discharge [six months] and 12 months after the program): anthropometrics (BMI, waist circumference, body fat percentage), cardiorespiratory status at rest and during cardiopulmonary exercise testing (HR, BP, workload, VO2peak, VAT and presence of symptoms).

Measurements
Body fat percentage was assessed using bioelectrical impedance for patients referred after 1999 (Tanita TBF-300A, Japan) and, before this, by skin fold measurements (26). Waist circumference was measured at the narrowest part of the torso between the iliac crest and xiphoid process, or at the level of the iliac crest after normal exhalation (27). CPET was performed on either an upright cycle ergometer (Ergoselect 20P, Germany) or a treadmill (same modality pre- and post-training) depending on patient balance and comfort. On the cycle, workload was increased by either 8.3 Watts or 16.7 Watts every minute, maintaining a pedalling rate of 60 rpm. On the treadmill, the Bruce or Modified Bruce protocol was selected (27). Gas samples were collected via calibrated metabolic cart (SensorMedics Vmax Encore, USA) with continuous monitoring of 12-lead electrocardiography (ECC) (Marquette Case 80, GE Healthcare, USA) and BP. The test was terminated at peak volitional effort (unable to maintain treadmill speed or pedalling rate) if a physiological maximum was achieved, or if the patient exhibited adverse clinical signs or symptoms. VAT was determined using a combination of the V-slope and ventilatory equivalents methods (28,29) by agreement between the supervising physician and technologist.

Data analysis
Descriptive statistics (mean ±SD, frequencies and counts) were used to describe all groups. A one-way ANOVA (continuous) and χ2 test (categorical) were used to compare baseline characteristics among groups. To evaluate the effects of the cardiac rehabilitation intervention, mixed factorial ANOVA (continuous variables) and logistic regression (categorical variables) was used for the between-subject, between-group and within-subject effects at each time point (zero, six and 12 months), adjusted for age, sex and baseline VO2peak. Pairwise post hoc tests were performed for the cardiac rehabilitation intervention outcomes if there were significant findings (with Bonferroni adjustment). An alpha level ≤0.05 was considered to be statistically significant (SAS version 9.3 [SAS, USA] and SPSS version 20 [IBM Corporation, USA]).
RESULTS

There were a total of 5922 patients in the database from January 1999 to May 2004, in whom 266 (4.5%) had respiratory comorbidities (only COPD, no other chronic respiratory diseases were identified). The number of patients with ischemic heart disease and a smoking history of >10 ppy was 1247 (and the focus for the present analysis). Of this cohort, 77 (6.2%) had an RC; 957 (76.7%) had at least one NRC and 213 (17.1%) had no NC. NRCs included diabetes, cardiac conduction deficits (eg, atrial fibrillation), cancer, cardiomyopathy, congestive heart failure, cerebrovascular disease, hypertension, peripheral vascular disease, pericarditis and thyroid abnormalities. The proportion of patients from this smoking cohort who completed the program did not significantly differ among groups (RC: n=36 [46.8%]); NRC: n=534 [55.8%]) and NC: n=122 [57.3%]) (P=0.26) (Figure 1).

Baseline characteristics of comparative groups

The RC group was older compared with the other two groups (mean ± SD) of 67.2±10.1 years of age versus 61.2±10.1 NRC and 60.5±8.3 NC (P=0.001), and had more female patients (eight of 36 [22%] versus 58 of 534 [11%] NRC and five of 122 [4%] NC; P=0.004). The RC group had the lowest fitness levels at baseline compared with the other two groups: VO2peak 16.0±3.8 mL/kg/min versus 18.3±4.9 NRC and 19.2±5.2 mL/kg/min NC (P=0.002). Table 1 summarizes details regarding other significantly different outcomes among the three subgroups at baseline.

Cardiac rehabilitation outcomes for comparative groups

For VO2peak, there were significant differences among groups, adjusted for age and sex (P=0.02). The NC group (over all three time points) had significantly greater VO2peak (21.3±6.0 mL/kg/min) compared with the RC group (16.7±3.8 mL/kg/min). There were also significant improvements over time (P<0.0001), adjusted for age and sex. Overall (ie, all groups together) VO2peak was significantly greater at six (20.6±5.9 mL/kg/min) and 12 months (21.0±6.2 mL/kg/min) versus baseline (18.3±4.9 mL/kg/min) (both P<0.0001). There was no significant group × time interaction (Table 2, Figure 2).

There were no significant differences among the three groups or over time (adjusted for age, sex and baseline VO2peak) for: HR, resting systolic or diastolic BP, BMI, waist circumference, body fat percentage, angina or symptoms during exercise (leg fatigue or shortness of breath) (Table 2).

DISCUSSION

In the present retrospective review of a cardiac rehabilitation program database, there was an overall 4.5% prevalence of respiratory comorbidities (presumed COPD). For all groups, there were significant improvements in VO2peak over the 12-month program. The respiratory group had significantly worse VO2peak compared with the NC group. There were no differences among the groups in the other outcomes. Patients enrolled in a cardiac rehabilitation program significantly improved their fitness level over time, despite the presence or absence of comorbidities (when considering age, sex and baseline VO2peak).

The prevalence of COPD was low. This was likely underestimated because diagnoses were based on physician referrals. Systematic spirometry and clinical assessment (that includes assessment of dyspnea) at entry to cardiac rehabilitation, according to standard criteria, such as Global Initiative for Obstructive Lung Disease (GOLD) (25), would have yielded a more accurate number and provided a breakdown of different severity levels (7,9,30). Studies using spirometry and clinical symptoms have shown the highest levels of prevalence. Fuster et al (7) and Soriano et al (9) found clinical assessment and the GOLD (1) spirometric criteria for COPD. Fuster et al (7) found 39% of patients undergoing CABG (n=1412) had COPD. Soriano et al (9) found differences among groups (P=0.02) (adjusted for age and sex): VO2peak significantly greater at six and 12 months versus baseline (both P<0.0001). There was no significant group × time interaction. NC No comorbidity.
### Table 2
Comparison of body composition, resting and maximal exercise test outcomes for three groups at baseline, six and 12 months (respiratory comorbidity [RC, n=36]; non-respiratory comorbidity [NRC, n=534]; no comorbidity [NC, n=122])

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Time, months</th>
<th>P</th>
<th>Group</th>
<th>Time</th>
<th>Group × time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak oxygen uptake (VO2peak), mL/kg/min</td>
<td>0</td>
<td>15.9±3.9</td>
<td>17.0±3.9</td>
<td>17.1±3.9</td>
<td>16.7±3.8</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>18.2±4.9</td>
<td>20.5±5.9</td>
<td>20.8±6.2</td>
<td>19.9±5.8</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>19.4±5.1</td>
<td>22.1±5.9</td>
<td>22.6±6.2</td>
<td>21.3±6.0</td>
</tr>
<tr>
<td>Mean (all time periods)</td>
<td>18.3±4.9</td>
<td>20.6±5.9</td>
<td>21.0±6.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum workload, W</td>
<td>0</td>
<td>100.5±39.2</td>
<td>110.0±38.7</td>
<td>111.6±37.4</td>
<td>107.9±38.0</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>121.6±36.2</td>
<td>137.8±41.2</td>
<td>140.5±45.4</td>
<td>134.1±43.2</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>131.4±32.5</td>
<td>147.8±35.8</td>
<td>151.1±39.7</td>
<td>143.5±38.8</td>
</tr>
<tr>
<td>Mean (all time periods)</td>
<td>122.2±36.2</td>
<td>138.2±40.8</td>
<td>140.8±44.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilatory anaerobic threshold, mL/kg/min</td>
<td>0</td>
<td>11.8±2.0</td>
<td>12.0±2.3</td>
<td>12.1±2.8</td>
<td>11.8±2.1</td>
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<tr>
<td></td>
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<td>13.8±3.4</td>
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<td>12</td>
<td>12.6±2.8</td>
<td>14.3±3.7</td>
<td>14.8±4.6</td>
<td>13.9±3.9</td>
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<tr>
<td>Mean (all time periods)</td>
<td>12.4±2.6</td>
<td>13.8±3.5</td>
<td>14.2±3.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resting heart rate, beats/min</td>
<td>0</td>
<td>70.2±13.2</td>
<td>65.2±9.4</td>
<td>65.7±10.3</td>
<td>67.3±11.2</td>
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<tr>
<td></td>
<td>6</td>
<td>67.3±12.6</td>
<td>64.2±11.2</td>
<td>65.0±11.8</td>
<td>65.4±11.9</td>
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<td></td>
<td>12</td>
<td>66.6±12.2</td>
<td>63.3±10.3</td>
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<td>64.6±11.3</td>
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<td>64.1±11.0</td>
<td>64.8±11.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resting systolic blood pressure, mmHg</td>
<td>0</td>
<td>144.9±19.0</td>
<td>140.9±16.9</td>
<td>145.1±15.2</td>
<td>143.6±16.9</td>
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<tr>
<td></td>
<td>6</td>
<td>139.7±21.9</td>
<td>140.5±20.6</td>
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<td>140.6±20.9</td>
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<td></td>
<td>12</td>
<td>138.9±20.8</td>
<td>140.2±19.0</td>
<td>138.6±17.4</td>
<td>139.1±19.2</td>
</tr>
<tr>
<td>Mean (all time periods)</td>
<td>139.8±21.6</td>
<td>140.5±20.1</td>
<td>141.2±19.3</td>
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<td></td>
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<tr>
<td>Resting diastolic blood pressure, mmHg</td>
<td>0</td>
<td>77.2±11.6</td>
<td>72.1±10.8</td>
<td>76.0±9.6</td>
<td>75.0±10.8</td>
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<tr>
<td></td>
<td>6</td>
<td>75.7±12.2</td>
<td>74.4±11.8</td>
<td>76.2±11.1</td>
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Data presented as mean ± SD or n (%) unless otherwise indicated. All analyses adjusted for age, sex and baseline VO2peak (except VO2peak, which was adjusted only for age and sex). *Statistically significant (bold) pairwise post-hoc tests (Bonferroni adjustment) at P=0.05 level: NC>RC; **Statistically significant (bold) pairwise post-hoc tests (Bonferroni adjustment) at P=0.05 level: six-month > baseline; 12 month > baseline; ***Leg fatigue or shortness of breath.
with CVD. Currently, the accessibility of cardiac and pulmonary rehabilitation programs fall below need (21,22,44,45). Pack et al (45) surveyed cardiac rehabilitation program directors in the American Association of Cardiovascular and Pulmonary Rehabilitation database and found only 28% of eligible patients utilized cardiac rehabilitation programs. They suggested modest expansion of all programs operating at capacity would meet, at most, 47% of eligible patients in the United States. Although cardiac rehabilitation utilization is low compared with the number of individuals who need it, pulmonary rehabilitation fares significantly worse. In a systematic review comparing pulmonary rehabilitation programs internationally, Desveaux et al (22) found that the availability of pulmonary rehabilitation services accommodated ≤1.2% of individuals with COPD. In a recent survey of Canadian pulm-o-ry rehabilitation programs, Camp et al (21) found that only 0.4% of all Canadians with COPD (0.8% with moderate to severe) have access to these programs. Having both cardiac and respiratory programs available may increase rehabilitation accessibility for these patients. One potential solution may be to have cardiac and pulmonary rehabilita-tion programs in one institution or location, such as at Duke Regional Hospital (Durham, North Carolina, USA <www.dukeregional.org/services/cardiac-and-pulmonary-rehabilitation/cardiac-and-pulmonary-rehabilitation/servicepage_view>). Although the two programs at this hospital operate separately, they are likely to be more cost effective and efficient because they share common infrastructure and, presumably, have cross-trained health care professionals. Similar programs can be found in Canada. An alternative rehabilitation model is one that combines COPD and heart failure patients in one program. Evans et al (46,47) completed a study of an exercise rehabilitation program for patients with congestive heart failure and COPD. This combined training program was not only feasible but also significantly improved functional and health status for both groups. Future research may include evaluating combination or adapted rehabilitation training programs for cardiac and respiratory patients and determining the type of COPD patient (eg, severity level) who may benefit.

Limitations
There were a few limitations to our study, the first of which was those common to retrospective cohort designs (48). Identification of respiratory and other comorbidities were based on physician referrals, and may have underestimated specific diagnoses. In addition, we could not delineate the severity of the individuals with COPD. Significant differences in baseline characteristics (i.e., occupational status, respiratory medication, β-blockers, BMI and waist circumference) and external factors beyond the database may have contributed to the results. Second, the present study described outcomes from one cardiac rehabilitation and secondary prevention program in Toronto, Ontario; therefore, the results may not be generalizable to areas with different cultures, practices and policies. Finally, significant results from the numerous post hoc analyses performed may have occurred due to random chance.

CONCLUSIONS
The prevalence of patients with COPD in a cardiac rehabilitation program was low, and likely due to the method for which diagnosis was made (physician referrals). It is recommended that spirometry and clinical assessment according to standard criteria be used to yield more accurate diagnoses and enable individualized programming. Patients with RCs had the poorest fitness level compared with those with NRCs or NCs. However, all groups improved after cardiac rehabilitation and the number of patients who completed the program were similar. Cardiac rehabilitation and pulmonary rehabilita-tion program accessibility is limited for the CVD and COPD populations. Individuals with COPD may benefit from cardiac rehabilitation programs; individuals with CVD may benefit from pul-mo-nary rehabilitation programs. Adaptation and/or combinations may optimize their accessibility.

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REFERENCES
Patient and family centred care in respiratory therapy: A fundamental right?

Bryan Buell RRT BGS¹, Christiane Menard²

Registered respiratory therapists (RRTs) have long understood that the concept of patient and family centred care is an important element of respiratory therapy practice. RRTs understand the distress of the patient and their family during their interactions with the health care system, and strive to improve how patients experience respiratory care. As a result, quality of care and safety is woven into the approach of every RRT/patient encounter, and ensures that their goals are aligned with the needs of the patient and their family.

For many years, there has been substantial consultation with stakeholders on how to define patient and family centred care. Building on the consultation dialogue, the College and Association of Respiratory Therapists (CARTA) and the Canadian Society of Respiratory Therapists (CSRT) embarked in January of 2015 on a collaborative initiative to build on the dialogue and create a consensus statement that is specific to RRTs. The hundreds of RRT stakeholders involved were generous in sharing their experiences and suggestions about how all of us in the respiratory therapy profession may collaborate toward improving patient and family centred respiratory care as the central core and focus of our practice.

Placing patients at the forefront of care requires a respect for core concepts including: dignity and respect in care; physical care and comfort; emotional support and responsiveness according to individual patient and family preferences, needs, values and beliefs; utilizing patient values to guide clinical decisions; encouraging patient participation in decision making; and, most importantly, cooperation among care providers to provide a seamless experience for the patient and their family.

There have been numerous research initiatives that provide clear evidence that, when the perspective of the patient and their family are included directly in the planning, delivery and evaluation of health care, the quality and safety of health care improves, costs of care are reduced, and provider and patient satisfaction increases.

Despite the mountain of evidence that a patient and family centred approach to care results in clear benefits, this is not implemented consistently across the health care system. Despite the numerous initiatives implemented throughout the country, patients and their family often encounter a provider-centric system that is hierarchical based on the medical expert model, in which the medical expert tells other providers and patients what to do and all are expected to comply. There is no question that there has been some progress over the past 10 years, where we now encounter medical experts who value the collaboration of other providers and the patient in the development and execution of the care plan.

The health care system frequently appears to be at a crossroads with the integration of patient and family centred care. Given the complexities of the Canadian health care system, it will take the greatest minds in government and the integral collaboration of all levels of the health care system to implement meaningful change – not an easy feat!

For RRTs to effectively implement the patient and family centred approach, there must be a shift in practice from the traditional hierarchical relationship toward a focus on creating an equal partnership among all health care providers involved with the patient and their family. We have started experiencing this shift in practice patterns with the integration of the RRT in family health teams and collaborative care models. It is the integration of the patient and their family as an equal partner in health care delivery that is the essential element of an effective patient and family centred care model.

What the respiratory therapy profession must continue to achieve is a collaborative respiratory care environment in which the RRT is seamlessly included in the health care team, where the patient and family are always informed participants actively included in a collaborative decision-making process. Given the passion RRTs have for their patients, patient and family centred care is a concept that resonates strongly with the profession. There is no doubt that the respiratory therapy profession is ready to move away from the concept of providing care to/for patients and collaborating with the patient within a collaborative health care team.

To learn more about the key elements of patient and family-centred respiratory care, please consult the CARTA/CSRT Consensus Statement (www.carta.ca) (www.csrt.com).

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Home care in respiratory therapy

Blayne T Clarke BHSc

Home care is the provision of equipment and services in the residences of clients and families who require rehabilitation for their acute or chronic needs (1). Home care can include residential care, community care and hospice/palliative care. Generally, the mission of providing home care to clients with respiratory disease is to improve survival, decrease morbidity, encourage independence and self-management, and improve quality of life. For clients with terminal respiratory disease, the focus of care is on pain management and psychological comfort, making dying as comfortable as possible. Overall, the goal of home health care services is to mitigate total health care expenditures, primarily by reducing acute care hospital stays (2).

The most common patient group with respiratory illness that requires home health care services are individuals with chronic obstructive pulmonary disease (COPD). Patients with paralytic syndromes also have significant respiratory care needs. Studies show the need for home health care services in patients with cystic fibrosis as it pertains to receiving home oxygen therapy. Traditionally, home care services in respiratory therapy mostly included oxygen therapy and airway management/tracheostomy care (3). Over the past 20 years, however, there has been an increase in the rate in which other respiratory therapy interventions are being used in the home, including mechanical ventilation or continuous positive airway pressure therapy for the treatment of obstructive sleep apnea (3).

All patients with COPD or paralytic syndromes are not necessarily suitable candidates for home care services. Patients who are discharged requiring home health care must demonstrate complex medical needs or have comorbidities of COPD and chronic heart failure (4). Each organization should have clinical practice guidelines for assessing patient readiness for hospital discharge. Included in the assessment is an analysis of individual patient respiratory needs and the suitability of the home environment. The best way to address the needs of home care individuals requiring respiratory therapy services is to approach it using a patient-centred and family oriented model (2). Using this design, the provision of care starts within the context of the patient as the focus, and the home care service provider, such as the respiratory therapist, as the visitor in that environment.

Individuals managed in the home require a variety of specialists to be involved in their care, and a patient requiring home health services for respiratory care will have an interdisciplinary team involved in the management plan. Generally, the expectation is that home health care services are able to assist patients with daily treatment of respiratory disease, identify and understand complications and educate the patient on the safe use of respiratory equipment. Jeppesen et al (5) provide additional information regarding provincial Ministry of Health eligibility criteria for home oxygen therapy. Respiratory care services provided in the home setting are not traditional, and there are several advantages and disadvantages. Improvements to quality of life, positive behavioural changes and reduction in hospital stays are all advantages to home health care. Some of the disadvantages are related to burden of care, home setting suitability and the availability of funding.

There is an assumption that patients living with chronic respiratory disease gain an advantage when being managed in the community or from their own homes. The ingrained general belief of health care providers is that discharging a patient from a hospital setting to a community or their home is beneficial (6). Patients with COPD receiving home care have reported improvements in health-related quality of life, which includes functional status, symptoms and overall health perceptions. There has also been evidence supporting positive health behavioural changes that arise as a result of home care respiratory therapy (2). After only a modest amount of education in disease pathology and medication, patients receiving regular visits from a respiratory therapist have a greater rate of smoking cessation compared with patients not receiving home respiratory therapy (2). Other lifestyle changes that have been documented as a result of COPD management using home care services include energy conservation strategies, which help cope with exacerbations, relaxation and breathing techniques, and regular exercise (7).

Hospitals are very expensive health care settings, and an important goal of home care programs is to reduce the number of patient hospital stays and acute care admissions (6). Interventional studies and randomized control trials have reported a reduction in total hospital days with home care models when treating patients with respiratory disease, except for those being treated for lung cancer (2). The reduction was based on the type of respiratory impairment that was affecting the patient. Although results are mixed when determining the reduction of hospitalizations and length of hospital stays, the majority of cases showed a reduction in hospital length of stay (2).

Although the positive aspects of respiratory therapy in a home care setting appear obvious, there are still insufficient data showing the efficacy of home care being useful or even cost effective (8). The disadvantages of home care may not be extensive, but they exist and certainly are worth mentioning. Home care costs have been rising over the past 40 years and the increase is indicative of an augmented focus on home care services (3). Although home care costs have been rising, hospital costs have not been falling, as one would assume. In Canada, there is a significant variation in the funding allocated toward home care (3). There exists a need to request funding from provincial and federal initiatives to examine the financial disparities. The differences result in access inequalities to home care services throughout the country.

The home is a place where one can choose to live comfortably, safely and healthily. If an individual qualifies for home care services, then he or she is entitled to be granted the ability to utilize the services as required. Home care involves a complex range of services and professionals. Patients and family members are also important members of the health care team, and this must be taken into account when considering the care plan of patients being treated outside the hospital environment. There is significant concern regarding the possible burden placed on family and friends involved in the supportive network and care team of the patient (9). Although the degree to which strain placed on the informal care providers varies, little information...
is available regarding the measure to which burden of care is distributed from the hospital to the patient, family and community (9). The standard modern home was not designed with the intention of creating an environment that would enable safe and effective health care. Therefore, the home setting can actually become an unsafe or hazardous place for both the client and any providers involved, including the health professional or family members (2).

To prevent dangerous incidents or events, respiratory therapists play a vital role in educating patients and family members in the safe use of oxygen therapy equipment and medications. It takes a full understanding of respiratory therapy to facilitate a smooth transition between care in hospital to that of management in the home. There is a call for more dedicated and passionate respiratory therapists who are willing to undertake the task of being involved in the community setting. Supporting the heart and pulmonary health of patients with respiratory disease and ensuring cardiorespiratory stability is highly gratifying. Working in the home care setting requires solid patient assessment skills and expert knowledge in oxygen therapy and equipment. Critical care skills are truly applied in a home environment where less-invasive patient monitors are available.

Comfortable death may be a valuable area for future study (10). Respiratory therapists are often among the final health care professional in contact with a terminally ill patient, and much of the support not only pertains to physical comfort, but also to psychosocial management. Further efforts may be invested into training registered respiratory therapists how to recognize symptoms of psychosocial distress in the final stages of a patient’s life and how to make a referral to the most responsible physician.

In conclusion, it is recommended that respiratory therapist-based home health care services be expanded. Alternatively, provincial reimbursement/coverage of these services should be increased. In time, it becomes clear that the level of trust developed between the home care service client and the respiratory therapist is invaluable. A strong bond can be formed... and it is worth it.

REFERENCES
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A positive methacholine challenge based on specific airway conductance: A case report

Jeffrey Haynes RRT RPFT

A 30-year-old Caucasian man presented to the pulmonary function laboratory for a methacholine challenge test. Following inhalation of the final dose of methacholine, the forced expiratory volume in 1 s (FEV₁) was 8% below baseline. However, the patient complained of chest tightness and dyspnea, similar to the symptoms he experienced after running. Repeat specific airway conductance was found to be 73% below baseline, indicating marked airway hyper-responsiveness. Because the reduction in specific airway conductance was accompanied by familiar symptoms, the post-test probability of asthma increases, even in the absence of a 20% reduction in FEV₁.

Key Words: Airway responsiveness; Bronchoprovocation; Methacholine; Specific conductance

Following baseline testing, a methacholine challenge test was performed using the five-breath dosimeter technique (2). Following inhalation of the final dose of methacholine (20 mg/mL), the forced expiratory volume in 1 s (FEV₁) was 8% below baseline. Such a modest reduction in FEV₁ would typically be regarded as a "negative" methacholine challenge test; however, the patient complained of chest tightness and dyspnea. He reported that these symptoms were similar to the symptoms he experienced after running. There were no stridor or indications of inducible laryngeal obstruction. The patient’s symptoms in the absence of a significant decline in FEV₁ prompted repeat measurement of specific airway conductance (sGaw) as an alternative method to assess the airway response to methacholine inhalation. The sGaw was found to be 73% below baseline, indicating marked airway hyper-responsiveness.

Because the reduction in specific airway conductance was accompanied by familiar symptoms, the post-test probability of asthma increases, even in the absence of a 20% reduction in FEV₁.

Key Words: Airway responsiveness; Bronchoprovocation; Methacholine; Specific conductance

TABLE 1
Baseline pulmonary function data

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<tr>
<th>Parameter</th>
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FEV₁ Forced expiratory volume in 1 s; FVC Forced vital capacity; LLN Lower limit of normal; NR Not reported; Pred Predicted value; RV Residual volume; RV/TLC Ratio of RV to total lung capacity (TLC); sGaw Specific airway conductance; TLC<br>PLETH TLC via plethysmography

Figure 1) Baseline flow-volume loop and volume-time curve. FEV₁ Forced expiratory volume in 1 s (L); FEV₃ Forced expiratory volume after 3 s (L)

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found to be 73% below baseline, indicating significant airway narrowing compatible with marked airway hyper-responsiveness. Following bronchodilator administration (2.5 mg albuterol via small volume nebulizer) both the FEV₁ and sGaw values were larger than those recorded during baseline testing, suggesting a degree of pretest bronchoconstriction (Table 2, Figure 2).

**DISCUSSION**

The 1999 ATS guideline for methacholine challenge testing states that FEV₁ should be the primary outcome measure for the discovery of airway hyper-responsiveness (2). The guideline recognizes that alternative measures of pulmonary function (eg, sGaw, impulse oscillometry) may be used during a methacholine challenge test; however, these measures are recommended only when the patient cannot produce high-quality spirometry data. A whole-body plethysmograph (often called a ‘body box’) is required to measure sGaw. The patient is asked to breathe small volumes at a rate of 1.5 breaths/s to 2.5 breaths/s. Flow at the mouth is plotted against the pressure inside the plethysmograph (ie, ‘box pressure’). After the collection of several breaths, a shutter or valve is closed so that mouth (alveolar) pressure can be plotted against box pressure. This is accomplished by having the patient continue shallow breathing at a rate of approximately 1 breath/s. Following open and closed shutter breathing, mouth pressure can be divided by flow to calculate airway resistance. The reciprocal of resistance is conductance.

Conductance values provide limited information because conductance reflects large airway function (7), the authors speculated that this may, in part, be related to the site of aerosol deposition. Given the complexity of pulmonary structure and function in the realm of nonspecific airway challenge testing (eg, methacholine, histamine), Larbanois et al (6) reported that 13% of patients undergoing specific inhalation challenge had a 50% decline in sGaw without a ≥20% decline in FEV₁ (5.75). Methacholine challenge tests simply determine the presence of airway hyper-responsiveness only increases the probability of asthma in patients with an intermediate or high pretest probability of asthma (10). Therefore, methacholine challenge tests should not be used in isolation to diagnose asthma. It would also be incorrect to suggest by the ATS. A remarkable finding was that 32 patients with an FEV₁ decline <20% exhibited a reduction in sGaw >50%.

In a similar study, Parker and McCool (4) measured FEV₁ and sGaw following methacholine challenge testing in 248 consecutive patients with asthma-like symptoms. Forty patients showed a response to methacholine as assessed by sGaw (≥40% reduction) without a significant decline in FEV₁ (<20%). The obvious question that arises from these observations is whether using FEV₁ as the sole outcome measure during methacholine challenge testing results in false-negative tests in some patients. In other words, does the positive sGaw/negative FEV₁ response indicate asthma or an expected response in some nonasthmatic patients or both? Parker and McCool (4) found that subjects with this response had a higher baseline sGaw and forced expiratory flow between 25% and 75% of the forced vital capacity (FEF25-75) to forced vital capacity ratio, suggesting that dysanapsis (large tracheobronchial tree compared with lung size) may be causal. The authors offered other possible mechanisms for the positive sGaw/negative FEV₁ response including disproportionate proximal airway narrowing, differences in airway compliance and airway smooth muscle distribution.

Both studies used the five-breath dosimeter technique with inhalation of aerosol to total lung capacity. Cockcroft and Davis (5) showed that this technique results in false-negative methacholine challenge tests as judged by FEV₁ in patients with mild asthma. It is not clear whether sGaw and FEV₁ are equally affected by the bronchodilatory and bronchoprotective effects of deep inhalation.

In addition to nonspecific airway challenge testing (eg, methacholine, histamine), Larbanois et al (6) reported that 13% of patients undergoing specific inhalation challenge had a ≥50% decline in sGaw without a ≥20% decline in FEV₁. Because sGaw is believed to be more reflective of large airway function (7), the authors speculated that this pattern may, in part, be related to the site of aerosol deposition. Given the complexity of pulmonary structure and function in the realm of airway hyper-responsiveness (8), the etiology of the positive sGaw/ negative FEV₁ response is likely multifactorial.

Whether one chooses to follow FEV₁, sGaw or both, the inherent limitations of bronchial challenge tests must be appreciated to avoid misinterpretation and misdiagnosis. Methacholine challenge tests are not perfect, the sensitivity and specificity can be <60% and 70%, respectively (9). Methacholine challenge tests simply determine the presence of airway hyper-responsiveness to a nonspecific agent. The presence of airway hyper-responsiveness only increases the probability of asthma in patients with an intermediate or high pretest probability of asthma (10). Therefore, methacholine challenge tests should not be used in isolation to diagnose asthma. It would also be incorrect to

**TABLE 2**

| Forced expiratory volume in 1s (FEV₁) and Specific airway conductance (sGaw) before and after methacholine challenge testing (MCT) |
|-----------------|-----------------|-----------------|-----------------|-----------------|
|                  | Baseline | Post MCT | Δ, % | Post BD | Δ, % |
| FEV₁, L         | 2.93     | 2.70     | −8   | 3.14     | +7   |
| sGaw, L/s/cm H₂O/L | 0.26    | 0.07     | −73  | 0.33     | +27  |

**Figure 2** Open-shutter breathing during plethysmography testing. A Baseline testing before methacholine challenge test (MCT). B Post MCT. C Post bronchodilator administration. BD Bronchodilator; FEV₁ Forced expiratory volume in 1 s (L); sGaw Specific airway conductance (L/s/cm H₂O/L)
assume that every patient with a positive sGaw/negative FEV\textsubscript{1} response to methacholine challenge testing has asthma. This would be especially suspect in patients with a low pretest probability of asthma. In the present case, however, the patient had an intermediate pretest probability of asthma due to his asthma-like symptoms and family history. The fact that the large reduction in sGaw during methacholine challenge testing was accompanied by familiar symptoms that he had experienced after exercise increases the post-test probability of asthma, even in the absence of a 20% reduction in FEV\textsubscript{1}.

DISCLOSURES: The author is a consultant for Morgan Scientific Inc, USA. The has no financial disclosures or conflicts of interest to declare relating to this article.

Proceedings from the
Canadian Society of Respiratory Therapists
Annual Education Conference

May 26 – 28, 2016 • Ottawa, Ontario

We are pleased to present a select number of abstracts from the proceedings of the CSRT Annual Education Conference. Held in Ottawa, Ontario, May 26 to 28, 2016, this conference included topics delivered by international, national and regional individuals with expertise in various areas of respiratory therapy practice, including quality assurance, patient safety, evidence-based practice, patient and family centred care, research and innovation. As evidenced by the following abstracts, the work of our colleagues in 2016 highlighted current research and practice innovations led by RTs. We have made every effort to include all abstracts accepted by the Program Committee before the publication deadline; however, please note that this collection does not represent the entire program (available at www.csrt.com).

The editorial board looks forward to receiving manuscripts from this conference for consideration for publication in the Canadian Journal of Respiratory Therapy in order to continue building the body of knowledge specific to our profession. Please note these abstracts have not been peer reviewed.

Keynote Speakers

01
OPIOID-INDUCED RESPIRATORY DEPRESSION
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Opioid-induced respiratory depression, commonly defined as a respiratory rate of less than 8 breaths per minute with a lowered blood oxygen saturation in the context of opioid administration, has been feared since the first days of opioid use in clinics. Mediated by the same μ-receptors responsible for opioid analgesia, this relatively low (0.5%) but highly preventable source of morbidity and mortality is always a risk. While the administration route of the opioid is not related to the incidence of respiratory depression, very potent, long-acting preparations and infusions put the patient at risk, as does the co-administration of certain drugs—especially sedatives or drugs having a significant impact on opioids metabolism through CYP450 or change in renal function. Relatively healthy patients are rarely victims of opioid respiratory depression. However, the “very” patients (very young, very old, very obese and very sick) and patients with sleep apnea, are more susceptible. They should be closely evaluated / monitored to ensure adequate pain control without respiratory depression. In the setting of opioid-induced respiratory depression, one could try non-pharmacological approaches, such as non-opioid pain control (pharmacological or other) and verbal/physical stimuli, while carefully monitoring the patient. Should opioid reversal be needed, naloxone should be given by any trained health professional, in small boluses of 40-100 mcg every 2 minutes, titrated to respiratory drive, not awakening nor pain control.

Plenary Sessions

02
MAKING A DIFFERENCE: NOT JUST RESPIRATORY CARE
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Becoming a respiratory therapist was an easy decision. The fast-paced environment, high adrenaline situations and ever-changing technology is intensely attractive. Treating many patients every day, working against strict time constraints, and helping the healthcare team manage a disease is exciting. Our healthcare system is fantastic at managing disease. The problem is just that. “Disease management” is only one part of the patient’s care. Related to a unique personal experience, one teenage girl’s devastating diagnosis forced the staff at BC Children’s Hospital to open its eyes to the true meaning of holistic patient care. With many road blocks along the way, we were given no option but to make her life in hospital the most enjoyable we could. Taking her out to the mall for her craved poutine snack, to her high school graduation dance, and to the fabric store to buy her favorite patterns were just a few of the items we helped to check off her bucket list. Working together in a multidisciplinary team with the support of the patient, her family, and local community, we were able to help make her last days the most memorable and enjoyable days possible. After becoming such an integral part of this patient case, I now know what complete patient care truly means. Becoming a therapeutic partner with individuals, families, and communities, I, along with many of my respiratory therapist colleagues, were able to achieve the most rewarding experience of our careers to date.
03 PREPARING FOR CLINICAL
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This retrospective review of personal clinical experience is aimed at helping SRTs entering their clinical year better understand what is expected of them and help with their transition from classroom to clinical. The transition can be difficult for some, and my goal is to try to bridge the gap between knowledge and practice. As a recent grad, I will share my experience throughout my 8-month clinical; the good, the bad, the ugly. I will talk about what to expect during different rotations, focus on a couple pathologies and ventilation strategies, and when and how to start looking for a job. I am by no means an expert, but hopefully some of my experiences will not only help the SRTs in their clinical year, but also give them hope and encouragement on their paths as they join this wonderful career.

04 CLASSROOM TO CLINICAL: MORAL & TRAUMATIC CHALLENGES
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Throughout your classroom years as student, you will be warned about the challenges you may encounter in your clinical year. However, it is not until you are put in that trauma bay or moral dilemma that you are ultimately forced to face the inevitable. For some, an easy task—but for others, it’s difficult to cope or isolate themselves from overwhelming emotions. The expectation of what students may encounter clinically in terms of moral, ethical, and traumatic cases is touched upon in the classroom, but the reality of being put in that position is understated. For a young student to see a child at the bedside of their deceased father may hit closer to home than they would expect. Or for a student, who is also a mother, discontinuing care on a newborn may ultimately be too much to cope with. Or when a decision is made in a patient’s care plan that you disagree with—as a student, how do you stand up to or handle this ethical dilemma? The expectation versus reality of situations such as these are examples that students need to be enlightened about. This will allow them to be more prepared with tools and coping mechanisms when expectation becomes reality in their practicum year.

05 COPING WITH SHIFT WORK AND SLEEP DEPRIVATION
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Shift work and extended working hours is common practice amongst many healthcare professionals, including respiratory therapists (RTs). They respond around-the-clock to high stress situations, which can lead to major consequences if the worker is not getting an adequate amount of sleep. Working within an ever-changing schedule, such as the day/night/day/night rotation that RTs’ work, can change a person’s natural circadian rhythm, leading to sleep deprivation. This, in turn, can lead to safety concerns for both the worker and their patients. Sleep deprivation also presents a major concern to both healthcare workers and their employers, resulting in millions of dollars per year in lost income, absenteeism, reduced productivity, compensation costs and attrition due to disability, death, or employee relocation. Safety of the worker and the patient is of utmost concern. The worker must be cognizant and alert to be able to fulfill their duties in a safe and effective manner. This can be statistically proven by the increase in needle stick injuries, which double when a worker is severely sleep deprived. There is an increase of 28% in general incidences over the course of a night shift, all attributed to sleep deprivation of healthcare workers. Education is an important key to bringing awareness of what sleep deprivation is, its effect on the human body, safety concerns, and ways to cope with working within a changing schedule in order to avoid some of the associated pitfalls.

06 DEALING WITH DEATH
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At the 2015 CSRT conference in Calgary, a question was posed to new grads during the student forum: “What do you feel like school hadn’t prepared you for?” All former students in the panel agreed that they felt the least prepared to deal with death. At the 2016 CSRT conference, I plan to assist new students as they prepare to deal with death, dying, and the families of those who have just passed through personal stories and experiences. My goal is to help students be better prepared for the transition from simulation, where a “patient” doesn’t make it, to a hospital setting where a live person is in front of you, rather than a plastic doll. Hopefully this talk can open up channels to allow students to share their experiences and gain support from others. This talk can hopefully empower students to feel more confident going into their clinical placement and provide them with a better understanding of what to expect in terms of end-of-life.

07 CLINICAL EVALUATION OF STUDENT PRECEPTOR RELATIONSHIPS
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Student preceptor relationships are a vital component to how a student respiratory therapist develops their clinical knowledge and skill set, interpersonal skills, attitude, and overall clinical competence. Conflicts within this relationship pertaining to communication, interpersonal conflict, and attitude can be a deterrent to the student and may affect their performance as a respiratory therapist. Currently, there is no evaluation of this relationship for respiratory therapy students across Canada. By conducting a national evaluation and comparison of this relationship via an online survey sent to students and preceptors, supported with a literature review on student preceptor relationships, problem areas will be identified with suggestions for improvement as to better future student preceptor relationships.

08 PRECEPTORS: GROWING THE NEXT GENERATION
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Preceptoring is the basis of how the RT profession is propagated. It has been demonstrated in the literature that graduates integrate into their practice the knowledge, skills and attitudes role-modeled by their preceptor. As such, quality preceptoring is crucial to maintaining and increasing the importance of our profession in healthcare. A review of the literature also reveals the student-preceptor relationship is a key component to ensuring a quality graduate and the delivery of quality patient-care—both by the preceptor-student pair and in future graduate. In short, strong preceptors create strong students, who in turn create strong professionals in the workplace. So when is the best time to instill the core skills of preceptoring? As many RT students begin in the preceptor role shortly after graduation the SAIT RT program has targeted preceptoring to be introduced at this key moment—the final week of the RT program prior to graduation. In a novel approach combining small workshops with

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simulation, core preceptoring skills are developed. This presentation will outline how preceptor training was integrated into the SAIT RT program and how simulation was used as a key tool to solidify essential preceptoring skills. Student feedback on this experience will be used to explore the success of this approach.

09 PLASTIC TO PEOPLE: A STUDENT’S TRANSITION
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As students, one of the most uncomfortable moments on our first day is when we walk into a patient’s room and they acknowledge our presence. As strange as that may sound, until this moment we’ve spoken to nothing more than plastic – so a real, breathing human being can come as quite a shock. Of course, as students we know that the patients we care for are just like us, but until we step into that room, the whole picture hasn’t really come into focus. The goal of this presentation is to provide the educators a better understanding of that switch that students have to deal with continually throughout the clinical year. Each interaction, like each patient, can be very different than the last, and can cause a continuous shift in thinking and understanding of patient care. Educators need to understand that no matter how advanced a simulation lab is, until you place a real patient with real problems in front of a student they can never fully see it as you do. This presentation will cover a broad range of not only patients – from end-of-life to newborns – but also clinical experiences that I have found myself in as a student and felt overwhelmed in. The goals for the presentation are to not only help the educators run a more effective simulation, but to also educate the clinical RTs who are working one-on-one with students, on how to guide students through these new experiences.

10 EVOLVING RT CLINICAL EDUCATION: PEER LEARNING
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BACKGROUND: Increasingly, many health professions are exploring the use of peer learning models in clinical education. Peer learning can be defined as students learning from and with each other in both formal and informal ways. Traditionally, at University Health Network (UHN), respiratory therapy (RT) clinical education has been provided using a 1:1 student-to-preceptor ratio. However, with recent clinical placement demands exceeding supply, the UHN RT department has implemented a 2:1 student-to-preceptor model where a focus on peer learning becomes a key component of program success. The benefits of peer learning commonly discussed in the literature include an increased depth of knowledge gained from peer discussions, student leadership development, competence, critical thinking, teamwork, and communication skills.1 The shift towards facilitative student directed models have become apparent worldwide, particularly in the disciplines of occupational and physiotherpay.2 As the ways in which successful peer learning is understood and enabled may vary between different professions, a RT specific exploration of peer learning is a necessary step in the development of this model.

OBJECTIVE: We aim to study how successful peer learning is defined by the preceptor and students in the RT clinical environment, in order to understand how it is enabled in practice based education.

METHODS: A qualitative descriptive study using a demographic questionnaire and single episode semi-structured interviews with preceptors and students (estimated n=20) will be conducted during the 2015/16 RT student clinical year.

EXPECTED RESULTS: Through a greater understanding of what successful peer learning is, the results of this study will assist us in developing a framework to facilitate successful peer learning in the RT clinical setting.

IMPACT: This study will aid in the development of the 2:1 model in a way that is specific to the profession of RT although the strategies utilized may prove insightful for other professions.

REFERENCES

11 RAM CANNULA IN A 3D-PRINTED NEONATAL NOSE MODEL
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A new interface, the Neotech RAM Cannula, is now available to use as a non-invasive nasal interface for the neonatal population. The simplicity of its design does not require the use of head gears and other facial adjuncts to stabilize the interface, making it ideal in the prevention of pressure damage to the face and allowing for cranial development. However, a 20-40% leak must be present when using this interface to allow for exhalation, resulting in loss of set pressures when providing non-invasive respiratory support. Interestingly, there have been many centers trialing the Neotech RAM Cannula, with limited evidence supporting this therapy. The current study uses a 3D printed model of a nose to mimic the 20-40% leak when using the RAM cannula to provide CPAP and Bilevel ventilation on a variety of neonatal ventilators. The results show that the premie-sized RAM cannula exhibits significant pressure loss, which is likely due to the tapering of the inner diameter of the opening of the prongs. The inner diameter of the tubing is 4.0 mm, while the inner diameter of the prongs is 3.5 mm, creating a significant loss of flow and thus generating a loss of pressure compensating the loss of pressure from the leak. The newborn-sized prong was consistently able to conserve most of the set pressure when a 20% leak was present when used in conjunction with the Servo-i and theBabylog VN500. The research team suspect that this may be due to the position of the pressure sensor within the ventilator circuit, or the algorithm that these companies decide to use to generate non-invasive ventilator pressures, or a combination of the two.

12 MAN-IKIN ON THE RUN: IN SITU SIMULATION
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In situ simulation allows teams to practice together in their genuine working environment while providing innovative opportunities to identify areas for quality improvement. Simulation education in general has gained a substantial positive presence in education literature over the last decade. While there is literature highlighting the benefits of in situ simulation over simulation laboratory education sessions, its adoption into curriculum and ongoing education remains limited. In addition to traditional uses for in situ simulation (mainly education and team training), this workshop will focus on expanding the role of in situ simulation to identify latent safety hazards (LSTs) with the goal of ultimately providing better quality healthcare to the patients. By identifying the potential challenges and barriers and discussing the application of evidence-based practice tips for a successful in situ simulation program in their institutions, participants will have the opportunity to apply knowledge gained from this workshop into their own practice environment.

13 OPTIMIZING EVALUATION IN HIGH FIDELITY SIMULATION
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The purpose of high fidelity simulation in respiratory therapy education is to help learners combine knowledge and practical skills gained in previous courses in preparation for real world clinical practice. The intent of this action research project was to investigate the effectiveness and objectiveness of learner evaluation methods used in the high fidelity simulation course offered as part of the curriculum of a three-year Respiratory Therapy
advanced diploma program. A comprehensive literature review supported the theoretical framework of this project. A mixed-method approach to data collection was used. One paper-based questionnaire was completed by 47 participants to identify learner satisfaction with the simulation experience. An online questionnaire was completed by 16 participants to identify learner satisfaction with the evaluation methods and to gather suggestions for improvement. The qualitative component of the project involved two focus groups exploring 7 participants’ impressions of how evaluation practice in the course affected their learning process and competence in preparation for formal assessment. Data analysis found that the majority of participants were generally satisfied with the current evaluation process and considered the practice objective and effective in helping learners achieve their learning goals. Areas for improvement have been identified, and practice improvements such as team and communication skills assessment, student self-reflection assessment, and changing the grading system from a numerical grade system to a pass/fail system were suggested. The project offers suggestions for future research, including the development of a standard evaluation rubric in high fidelity simulation in respiratory therapy in Canada based on the national competency profile for entry to practice.

14 LEADERSHIP SKILLS BEYOND RESPIRATORY THERAPY
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Respiratory therapists are born leaders. In all areas of clinical and private practice, they are frequently forced to make critical decisions in team based and independent situations. The core of their learning and ongoing development is largely based in communication and critical thinking strategies. This presentation will review the essential competencies that enable respiratory therapists to be leaders beyond their realm of clinical proficiency. It will discuss the attitudes, skills and knowledge that are required to move clinicians into leadership positions within and outside of healthcare. Using case study reviews from respiratory therapists who have evolved their careers in varied pathways, traits and competencies will be revealed to assist emerging leaders in considering their leadership development.

15 LANGUAGE EFFECTS ON QUALITY HEALTH SERVICES
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In healthcare, there are many important aspects that play a part in the quality of care a patient receives. As our population continues to diversify, we are more frequently providing care for patients that may not speak English as a first language, or at all. Identified as language barriers, this has become especially evident recently. Respiratory therapists, as members of the healthcare team, are frequently forced to make decisions about the quality of care for these patients. This presentation will review the major competencies of a competent respiratory therapist to manage this particular patient population and the potential outcomes of a competent or incompetent respiratory therapist in this arena.

16 INTO THE FIRE: AN RT IN EBOLA COUNTRY
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In the spring of 2013, Ebola struck West Africa for the first time. Within a few months, the outbreak was spiralling out of control. I travelled to Sierra Leone to work in an Ebola treatment centre run by Save the Children. In this talk, we will look at the history of this dangerous virus, the social and political factors that played a part in the severity of this particular outbreak, how I became involved, the inner workings of the hospital, and some stories from personal experiences and those of my colleagues while fighting this disease on the front lines. For anyone who has considered relief work in a low resource environment, this will be an inside look at what it’s really like to put yourself in harm’s way in a foreign land.

17 MENTORSHIP: SUPPORTING NEW STAFF
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Transitioning from a student to a professional role can be challenging and stressful without a standardized orientation and mentorship process. Fraser Health Authority became aware of these challenges and developed a mentorship process to overcome these issues. This presentation will outline how Fraser Health Authority has implemented the mentorship process for new hires, along with the specific tools used to help orientate staff in the workplace. Implementation of the mentorship process will be discussed, including an outline of the process itself, which consists of mentee/mentor roles and responsibilities, different learning and teaching styles, and stages of mentorship. We will discuss the challenges that the new hires and staff faced prior to implementation, followed by the differences after a standardized mentorship process was initiated. Specific examples of challenges and successes before and after the mentorship process was implemented will be discussed. The mentorship process has helped new hires in Fraser Health Authority gain experience, build confidence, and improve competency, which ultimately allows new hires to optimize successful entry into their role in order to provide exceptional patient care.

18 USING GAMIFICATION TO ENGAGE AND MOTIVATE
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Gamification is the use of game elements and design in non-gaming contexts, and is rapidly spreading internationally as an exciting way to change established patterns of behaviour. This session is designed to provide participants with an understanding of how motivational theory and game design can engage patients, families, and those working within the health system to improve quality of care. Participants will be able to articulate the rationale for using gamification in a health improvement context; consider strategies to shift behaviour using extrinsic and intrinsic motivators; and explain the basic elements of games and how they can be applied in health improvement initiatives.
19 BUILDING THE NEW OAKVILLE HOSPITAL: SHOW ME THE RT!
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The build of a new 1.6 million square foot hospital in Oakville, Ontario, from the ground up was an undertaking of magnificent proportions. It brought together a myriad of individuals from many fields, each with a unique and important contribution to the project. Within the healthcare organization, an interdisciplinary approach was required to identify specific hospital requirements for a state-of-the-art facility while providing vision and clarity to new and transferable processes. Externally, collaboration with builders, architects and consultants was essential for the design development process to ensure that patient care was nothing less than perfect once the building was fully functional. This presentation will demonstrate how respiratory therapists (RTs) played an integral role in the design and decision-making processes involved in the building and opening of a new facility. It will highlight the stages involved in this ambitious and massive project, along with the successes and challenges from an RT perspective. It will demonstrate how the direct appointment of RTs into redevelopment specialist and operational readiness roles played a major part in the successful transition to the new Oakville Hospital and future redevelopment projects. Additionally, there will be emphasis on how both the clinical expertise and leadership skills of RTs have contributed to the acquisition of nontraditional RT roles at Halton Healthcare.

20 RESPIRATORY THERAPISTS WITHOUT BORDERS: HOW RESPIRATORY THERAPISTS GIVE BACK GENERALLY
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There is a growing interest in respiratory therapy professionals who wish to give back globally and make strategic and sustainable contributions to improving respiratory health by sharing expert skills, knowledge and experience. Respiratory Therapists Without Borders (RTWB) exists to improve respiratory health through education advancement of local healthcare providers worldwide. RTWB balances on 3 pillars: Healthcare Education Partners (HEPs) that drive the existence of RTWB by identifying respiratory education gaps worldwide; the Professional Network (PN), which is a conglomerate of respiratory care professionals with a unified passion to advance respiratory health; and deployment teams that are formed to support the HEP with on-site training. Collectively, these 3 pillars enable RTWB to fill specific gaps in respiratory education for individual HEPs, enhance the professional network by sharing knowledge and experiences, and provide volunteers with enriching and impactful experiences abroad. The developing HEP network consists of 11 sites across 3 continents from reputed teaching hospitals to research groups. The growing PN is 215 volunteers strong from both public and private sectors, bringing bedside and managerial experience from around the globe to meet HEP needs. Since Canadian charity registration (July 2014), there have been 7 deployments. This presentation will outline the projects undertaken in each deployment, highlighting the successes achieved.
24 CHLOROHEXIDINE-BASED TRACHEOSTOMY CARE

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BACKGROUND: The use of chlorhexidine as an antiseptic cleaning agent has been proven in wound care, invasive procedures and dental use. Thus, the use of chlorhexidine as an antiseptic in tracheostomy care may decrease the amount of infection and promote tissue healing in early tracheostomies and developed stoma sites.

OBJECTIVE: To assess the application of chlorhexidine in tracheostomy care.

METHODS: A literature review of research on the application of chlorhexidine to tracheostomies showed no harmful outcomes. Chlorhexidine showed the ability to kill gram positive, gram negative bacteria and some strains of MRSA. The use of chlorhexidine is now being trialed and compared to standard tracheostomy care with normal saline. Therapists will judge how they like it, and a retrospective chart review will be performed. The ongoing results will be presented at the Canadian Society of Respiratory Therapy.

CONCLUSION: Currently, the only research available for chlorhexidine-based tracheostomy care concerns insertion. Based on the current literature about using chlorhexidine-based solutions as the standard in ostomy and wound care, one can infer the benefits for tracheostomy care; however, further research is still required for the routine use of chlorhexidine. In summary, the practical application of chlorhexidine in tracheostomy care is safe, efficient, and cost effective.

25 TRANSITION OF THE PEDIATRIC PATIENT TO THE COMMUNITY

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The continuum of care for medically fragile children, many of whom are technology dependent, requires the careful allocation of resources, respiratory supplies, equipment and/or oxygen. Balancing clinical care and the stability of a pediatric patient with quality of life opportunities is important. However, this brings tremendous responsibility and accountability to the respiratory therapists (RRTs) involved with this unique population. RRTs demonstrate advanced leadership in preparing for these transitions to the community to ensure that the children are not only stable when discharged from the hospital, but are able to be safely cared for by their caregivers and community care providers at home. This presentation showcases the diligence and extraordinary efforts of RRTs from an acute care hospital (SickKids) and from a long-term care rehabilitation hospital (Holland Bloorview Kids Rehabilitation Hospital), focusing on care pathways: models of care delivery that are geared towards rehabilitation and habilitation for the final discharge at home. Approaches that combine a model of family centered care, cultural sensitivity, use of interpreters and creative strategies will be illustrated. Case studies of children and their caregivers are presented to highlight the methods and approaches to overcoming the challenges faced when transitioning these patients into the community.

26 TRACH SIMULATION COORDINATOR: A NEW ROLE

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In 2013, the Alberta Children’s Hospital (ACH) in Calgary identified improving care coordination for children with complex airway needs (i.e., tracheostomies with or without mechanical ventilation) as a site-wide priority. A quality improvement project was initiated to enhance service integration across the continuum of care, from PICU to community care. Gaps and challenges identified within the current system included: no integrated education curriculum or process to support families caring for children with complex airway needs in the community; acute care and hospice/respite care staff with limited awareness of community care standards and a lack of chronic ventilation expertise; and challenges in staff maintaining expertise given low patient volumes. To address these gaps, a new role was created to bring home respiratory and ventilation management and education expertise into the hospital and hospice/respite environments. The Trach Simulation Coordinator is responsible for leading development of a best practice educational suite for tracheostomy care and chronic home ventilation, tailored to each child and the caregivers involved in their care. Families will be supported by education, simulation, and navigation throughout the in-patient process so they are prepared to care for their child in their home and community. This role will act as the resource and support for both families and staff to address the unique airway needs of these complex children, so they can get home quickly, stay home with the services and supports they need, and be supported when they require hospital or hospice/respite readmission.

27 NEONATAL EMERGENCIES AND THE RESPIRATORY THERAPIST ROLE

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This narrative reviews how the knowledge, skills and judgment of the respiratory therapist can be applied to the management of neonatal emergencies. The mnemonic “THE MISFITS” represents Trauma, Heart Disease, Endocrine, Metabolic, Inborn Errors, Sepsis, Formula Mishaps, Intestinal Catastrophes, Toxins, and Seizures. These categories represent broad differentials and a systematic approach to the recognition, emergency stabilization, and management of the common newborn emergencies. In each of these categories, there are areas where the core knowledge, skills and judgment of the respiratory therapist can be applied. This includes, but is not limited to, physical assessments, interpretation of diagnostic testing, and performance of invasive procedures that can be applied to the stabilization and management and reduce morbidity and mortality. Similarly, it is shown how using “THE MISFITS” mnemonic can be applied to undifferentiated case studies to determine possible differentials.

REFERENCES

28 COULD NON-INVASIVE NAVA BE MORE EFFECTIVE THAN CPAP FOR THE TREATMENT OF INFANTS 28-32 WEEKS GA WITH RDS?

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A 20-patient NICU pilot study was completed, comparing CPAP to non-invasive NAVA in infants 28-32 GA with RDS. The objective of the pilot study was to determine the adherence to the protocol. Infants with RDS are successfully being supported with CPAP. Non-invasive NAVA might present a strategy that improves outcomes with both synchrony and respiratory offloading compared to CPAP. Clinical outcomes were similar between groups and there were no adverse events. Adherence to the protocol was high, indicating that an RCT can be developed to assess if non-invasive NAVA can be used as a primary modality of respiratory support for infants 28-32 weeks GA. As clinicians well-known for the ability to respond and adapt to rapid changes in healthcare and technology, RTs are positioned well to critically examine and challenge EBUS assist practices. We believe we can translate this research to advance this area of practice in respiratory therapy.
29 CHRONIC NOCTURNAL NON-INVASIVE VENTILATION IN COPD: WHERE DOES THE LITERATURE LEAD US?
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Severe COPD is associated with chronic hypercapnia, reduced functional capacity and quality of life, frequent hospitalizations and high mortality. A subset of patients will develop chronic hypercapnic respiratory failure. Non-Invasive Ventilation (NIV) has been well-established as a beneficial intervention in the acute setting in severe hypercapnic COPD exacerbations. However, data demonstrating the clinical benefit of long-term nocturnal NIV in COPD have been less convincing, and often conflicting. Despite this lack of evidence, chronic NIV use is high in some parts of the world. New evidence suggests that NIV may confer a mortality benefit in chronically hypercapnic patients. Controversy remains regarding issues such as use of “high-intensity” NIV, physiologic goals of NIV, patient selection, and timing of initiation.

30 OVERVIEW OF PROVINCIAL HOME VENTILATION MODELS: QC PNAVD / ON VEP
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The evolution of home mechanical ventilation over the last couple of decades has seen clinical practice change to meet the complex and unique respiratory needs of this patient population. There is an increased demand for home ventilation due to available technologies that support an expanding number of diagnoses. New and emerging specialized services and technologies for supporting the ventilator-assisted individual (VAI) at home will be discussed. An overview of two distinct provincial programs, Quebec’s PNAVD and Ontario’s Ventilator Equipment Pool (VEP) will be presented, with an emphasis on how each program is rising to meet the needs of VAI’s, their caregivers, and clinicians. The participants will also have an opportunity to hear first-hand testimony from a ventilator-assisted patient.

31 USING RESEARCH TO EFFECT CHANGE IN THE COMMUNITY: A CASE-BASED APPROACH
J Sorge RRT MPH
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Observational research is an alternative to the gold standard of randomized controlled trials within healthcare research, and its application to healthcare issues are warranted when interventional studies are unethical or impractical. While frequentist methods of analysis are well-suited to interventional medicine, their application to subjectively-collected observational data have been brought into question. Exploring alternative forms of methodology and analysis open avenues for the researcher to derive more appropriate inference from observational studies. Bayesian analysis has been presented as a more flexible method of analysis in modeling subjective data by incorporating prior information. Additionally, Respondent Driven Sampling (RDS) has been offered as a means of sampling and analyzing hard-to-reach populations in an unbiased manner. Using data collected from two large observational studies in British Columbia, the presenter will provide practical examples of the application of Bayesian analysis in comparison to frequentist analysis in the context of subjective data, as well as RDS methodology and analysis to derive unbiased estimation from a non-probability sample. With the acceptance and application of these methods and analysis to observational data, the presenter hopes respiratory therapists may expand their contribution to evidence-based healthcare research.

32 DROP THE NEEDLE: RT ROLES AND EXPERIENCES IN ENDOBRONCHIAL ULTRASOUND ASSIST
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Endobronchial ultrasound (EBUS) is a minimally invasive bronchoscopic procedure used for the diagnosis of lung lesions. When paired with transbronchial needle aspiration of the mediastinal lymph nodes, EBUS allows for the detection and staging of lung cancer. Although a relatively new procedure, it is now performed by bronchoscopists across Canada, generally assisted by nurses and respiratory therapists (RTs). EBUS is a largely undocumented area of practice for RTs in Canada. Without formal training programs or recommendations for competency, RTs assisting with EBUS are relying on their knowledge and skills in acute airway management and conventional bronchoscopy to develop this role. Providence Health Care’s St. Paul’s Hospital in Vancouver has been performing the two types of EBUS, linear and radial, for over six years. As RTs working in the area, we have been setting our own practice standards and self-monitoring for quality. With the number of EBUS cases performed rising annually, we have been challenged to routinely evaluate our processes and alter our practices to continue providing safe patient care. Examples of quality improvement initiatives implemented at our site include a pre-procedure checklist, enhanced patient monitoring with the use of end-tidal CO₂, and changes to scheduling and staffing to improve patient flow. Owing to the specialized nature of this role, seeking out the experiences of other RTs assisting with EBUS procedures was recognized as an important way to evaluate processes and improve quality of care. We designed a web-based questionnaire querying the general processes, staffing models, and training procedures occurring at the other eight EBUS sites across British Columbia. We will be sharing the responses to provide an exciting first snapshot of RT practice in EBUS assist. We further intend to use these shared experiences to open a dialogue on standardizing practice in this new and specialized field of practice.

33 THE EP LAB AND TEE RELATED PATHOPHYSIOLOGY: A REVIEW OF CASES
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Anesthesia Assistants performing procedural sedation and analgesia in the Cardiac Catheterization Lab can be very fulfilling and, at times, very challenging. Patients present with interesting medical histories and current cardiac status; decisions regarding minimal sedation vs deeper sedation have to be made. Length and type of procedure vary, and surprises could arise at any time. In this presentation, the learner will review a wide variety of information on cases which involve pacemakers, ICD’s, EP mapping and Ablation therapies, as well as transesophageal echo (TEE) anatomy and pathophysiology.
34 MASSIVE TRANSFUSION PROTOCOL AND THE AA: HOW TO STOP THE BLEEDING
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We have all been there: a sudden snip, a post-partum hemorrhage, an ER trauma, a ruptured AAA. All of a sudden you are scrambling to cope with massive blood loss in an environment of escalating panic; tension is rising, vitals are falling, alarms are ringing. Though everyone wants to help, no one is quite sure of his or her role, or what exactly needs to be done. In this confusion, precious life-saving seconds are wasted, and the likelihood of survival decreases. At Halton Healthcare, we recognize that as a growing community hospital, we are caring for an ever-expanding patient population, and are offering healthcare services in larger settings than we ever had before. Our introduction of a vascular surgical program, as well as an expanding labour and delivery program, made us realize we needed to implement a massive transfusion protocol to best avoid the scenario described above. This presentation will provide the basics on massive blood loss, and what is meant by a massive transfusion protocol. It will identify the key staff members necessary to carry out such a protocol, and highlight in particular the role of the Anesthesia Assistant. Lastly, it will discuss how the protocol went from concept to reality within Halton Health Services, and hopefully will inspire those listeners who do not have such a protocol to take the lead in their own institutions to make theirs a reality as well.

35 ANESTHESIA ASSISTANTS YESTERDAY, TODAY AND TOMORROW
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It has been well established that an anesthesia care team (ACT) provides safer, more effective and more efficient care than an anesthesiologist working alone. Although the incidence of direct anesthesia mortality in uncomplicated cases is low (estimated to be 1/200,000) the incidence increases with the complexity of the patient or the complexity of the procedure. An ACT directed by an anesthesiologist may consist of physician residents, fellows or non-physician certified nurse anesthetists or technicians. In Canada, the Canadian Anesthesiologists Society (CAS) has endorsed the Anesthesiologists/Technician model. The traditional role of the operating room respiratory therapist (RRT) included providing technical support to the anesthesiologist for the proper use and maintenance of the anesthetic gas machine. The role of the Anesthesia Assistant (AA) is relatively new, and although there is variation in scope of practice and regulations between provinces, the most common roles include providing technical support to the Anesthesiologist for complex anesthesia equipment; providing airway management assistance; and monitoring the patient’s hemodynamic status, blood, fluid and pharmacological therapy. The AA provides physiologic surveillance of the stable patient under general anesthesia, regional anesthesia and for procedural sedation. The role of the AA is evolving and expanding—training requirements are becoming more rigorous, and there is demand for specialty credentialing. As patient care becomes increasingly complex, the demand for AA will continue to increase.

36 THORACIC SURGERY CASE AND OTHER POTENTIAL IATROGENIC COMPLICATIONS IN THE OR & ICU
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Anesthesia Assistants see a wide variety of cases every day. Thoracic surgery cases usually present with interesting preoperative diagnostic workup and testing, which we don’t get to see 10 minutes before the patient enters the OR. In this presentation, the learner will go back in time and review how this patient got to us and how our actions could have caused some major issues. When working in the OR and ICU, we hopefully all realize that the simple actions we perform may have detrimental consequences. A review of other iatrogenic cases will be also be discussed.

37 AA CERTIFICATION PROCESS: AN OVERVIEW
J Cox RRT AA-CSRT FCSRT
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CSRT’s Blueprint of the Profession demonstrated that certification of advanced formalized education is a priority of respiratory therapists. As such, Anesthesia Assistants are respiratory therapists, nurses and other appropriately qualified healthcare professionals that enter an area of practice known as Anesthesia Assistant after completing a recognized educational program. This session is designed to provide participants with an understanding of why the Anesthesia Assistant Certification Workgroup was formed, who are the working group members, and what unique perspectives they bring to the working group. There will also be discussion on the implementation of national standards for anesthesia assistants including the AA Educational Framework, the validation of the competency framework, the implementation of a national exam and a process for the accreditation of schools that offer the AA program.

PROGRAMME FRANCOÎNHE
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