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Pulmonary fibrosis is an under-diagnosed lung disease characterized by progressive lung scarring. Extracellular matrix (ECM) deposition is a key event in disease pathogenesis. ECM proteins are excessively deposited due to increased differentiation of fibroblasts into the α-smooth muscle actin(α-SMA)-expressing myofibroblasts by transforming growth factor (TGF-β1). Fibrosis may be accompanied by metabolic reprogramming from aerobic respiration to aerobic glycolysis due to extensive tissue hypoxia, which enhances fibroblast differentiation via hypoxia inducible factor (HIF-1α). We predict that TGF-β1 promotes fibrosis via human antigen R (HuR), an RNA binding protein that may increase levels of ECM proteins and a metabolic shift that stiffen the lungs.

**HYPOTHESIS:** HuR promotes the differentiation of myofibroblasts, which increases ECM proteins and a metabolic shift that stiffen the lungs.

**METHODS:** To explore the role of HuR in TGF-β1-treated human lung fibroblasts (HLFs), we examined the effect of TGF-β1 (5ng/ml) on the expression of HuR and fibrogenic (α-SMA, collagen and fibronectin) and metabolic (HIF-1α, lactate dehydrogenase A (LDH-A), hexokinase) markers. Then, HLFs were transfected with HuR siRNA or Control siRNA, treated with TGF-β1 and fibrotic/metabolic markers assessed. Actinomycin D (ActD)-chase experiments were performed to examine if HuR affects the stability of fibrogenic/metabolic transcripts. Immunofluorescence (IF) was performed to assess HuR localization in HLFs treated with TGF-β1. Seahorse XF96 used to assess metabolic activity in TGF-β1-treated HLFs. (IF) was performed to assess HuR localization in HLFs treated with TGF-β1. Seahorse XF96 used to assess metabolic activity in TGF-β1-treated HLFs.

**RESULTS:** Exposure of HLFs to TGF-β1 increased the total protein levels of HuR. The expression of metabolic and fibrogenic markers were also induced by TGF-β1 treatment. In addition, TGF-β1 caused the translocation of HuR from the nucleus to the cytoplasm—a feature consistent with HuR activation. siHuR-transfected cells showed a significant reduction in fibrogenic (α-SMA, collagen and fibronectin) and metabolic markers (HIF-1α,LDH-A) in response to TGF-β1 treatment compared to siControl. However, alterations in HuR levels did not affect mRNA stability of the markers. TGF-β1-treated HLF showed increase in acidification rate and oxygen consumption rate as compared to untreated cells.

**CONCLUSIONS:** Our preliminary data show that during fibrotic stimuli, HuR increases the protein levels of key fibrogenic and metabolic markers. Thus, HuR could be a driving factor in the pathogenesis of pulmonary fibrosis.
A common pre-clinical model in adult mice for asthma uses repeated intranasal (i.n.) challenge with house dust mite (HDM), which promotes airway inflammation and hyperresponsiveness. We performed a comprehensive analysis to monitor changes in the lung proteome in response to HDM challenge to better characterize results of pre-clinical studies. The objective of this study is to use proteomics and systems biology to characterize and quantify global protein secretion in bronchial alveolar lavage fluid (BALF) following HDM challenge, and identify central molecular pathways that define this response.

Female, BALB/c mice (6-8 weeks, n=5) were subjected to HDM i.n. challenge (25 μg protein/mouse) 5 times/week for two weeks. Lung function and responsiveness to methacholine was measured. BALF immune total and differential cell counts were performed. BALF from allergen-naive and HDM challenged mice were snap frozen, cleared of cellular debris, protein was then concentrated prior to trypsinization and HPLC-MS/MS. Protein identification and quantification (X!Tandem) along with statistical (Multiple Experiment Viewer) and pathway analysis (Ingenuity Pathway Analysis, IPA) was performed.

Compared to allergen-naive mice, we observed a 101 fold increase in BALF total inflammatory cell number, composed of -36% eosinophils and -12% neutrophils. X!Tandem analyses of BALF yielded ~585 non-redundant proteins per sample. We identified 121 proteins unique to HDM exposed mice and 12 unique to BALF from allergen-naive mice. 53 proteins were significantly up-regulated by allergen challenge, but no proteins were significantly down-regulated. Abundant protein (Figure 1) and significant pathway analysis (Figure 2) identified a prominent cytoskeletal remodelling signature. HDM-induced proteins were linked to the protein (Figure 1) and significant pathway analysis (Figure 2) identified a prominent cytoskeletal remodelling signature. HDM-induced proteins were linked to the inflammatory cell number, composed of ~36% eosinophils and ~12% neutrophils. Analysis, IPA) was performed.

Results of pre-clinical studies. The objective of this study is to use proteomics and systems biology to characterize and quantify global protein secretion in bronchial alveolar lavage fluid (BALF) following HDM challenge, and identify central molecular pathways that define this response.

Up-Down Regulated Rank Protein Name Gene Name p-value
Up 1 Calcium activated chloride channel regulator 1 CLCA1 0.0006665
Up 2 Chitinase-like protein 4 CHIL4 0.0089651
Up 3 Cathepsin D CTSD 0.021572
Up 4 Protein S100A9 S100A9 0.0047033
Down 5 alpha-1-B glycoprotein A1BG 0.0123041

Figure 1: Top-differentially regulated proteins from IPA

Figure 2: Top-differentially regulated pathways from IPA
**Exploring the Impact of Intranasal Simvastatin on the Lung Transcriptome**

Christopher D. Pascoe1,2, Aruni Jha1,2, Sujata Basu1,3, Thomas Mahood1,3, Amy Lee1, Reza Falsafi1, Sam Hinshaw1, Robert EW Hancock1, Andrew J. Halayko1,2

1University of Manitoba, Winnipeg, Canada. 2Children’s Hospital Research Institute of Manitoba, Winnipeg, Canada. 3University of British Columbia, Vancouver, Canada.

**RATIONALE:** Steroid refractoriness is a problem that affects 5-10% of people with asthma and is an enormous economic burden. Current alternatives for steroid refractive asthmatics are expensive, which creates a need for alternative therapies that are cost-effective. Our work has shown that treating house dust mite (HDM) sensitized mice with low dose intranasal simvastatin (SIN) can prevent and reverse airway inflammation and hyperresponsiveness. The mechanism by which simvastatin imparts these benefits is currently unknown.

**HYPOTHESIS:** Intranasal simvastatin treatment alters the lung transcriptome of HDM sensitized mice to promote resolution of airway inflammation.

**METHODS:** 6-8 week old female BALB/c mice received intranasal HDM (25μg) 5x per week for 2 weeks with or without concurrent SIN (6μg/kg/day). 48 hours after the last HDM challenge, lung function was measured using the FlexVent™ system. Immune cell infiltrate was measured in the bronchoalveolar lavage fluid (BALF). Lung tissue was harvested for RNA-Seq analysis. Significant results with a >1.5-fold fold change between HDM and HDM-SIN animals were used for protein-protein network analysis (Network Analyst) and gene ontology (GO) analysis (PANTHER).

**RESULTS:** SIn treatment significantly prevented immune cell infiltrate and airway dysfunction induced by HDM challenge, thus correlated with reduced abundance of numerous cytokines in BALF. Compared to HDM-only, the abundance of 2556 gene products was altered by SIn treatment: 1276 down-regulated and 1280 up-regulated. Genes that were significantly increased by SIN treatment are involved in WNT (p=5.3x10^-14), cadherin (p=8.0x10^-15), and integrin signaling (p=0.04). Genes that were significantly decreased by simvastatin were associated with GO terms for immune response (p=2.4x10^-13), cytokine mediated signaling pathway (p=1.7x10^-10), and receptor mediated endocytosis (p=0.014). Protein-protein network analysis identified T-cell acute lymphocytic leukemia protein 1 (TAL1), a key transcription factor in haematopoiesis, and RPGR-Interacting Protein 1-Like Protein (RPGRIP1L), a negative regulator of thromboxane A2 signaling, as central nodes in the response to SIN.

**CONCLUSION:** Treatment of mice with low dose SIN improves lung function and markers of inflammation in allergen-challenged mice. This effect appears to be mediated by promoting cell-cell connectivity and communication, and decreasing receptor mediated signalling events related to the immune response.
Asthma Advances

CRC2018-0067

DOES THE TYPE AND PRESENCE OF PRIMARY CARE IN ALBERTA INFLUENCE ASThma CONTROL AND SEVERITY? AN ALBERTA WIDE SURVEY

Joel Agarwal1, 2, Monette Dimitrov1, Hailey Hayplings1, 3, Maeve Smith1, Kerri Mackay1, Jillian Peters1, Carolyn Ross4, Alan Kaplan5, Donald Cockcroft4, Dilini Vethanayagam1

1Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Canada. 2Department of Biological Sciences, University of Alberta, Edmonton, Canada. 3Department of Biomedical Sciences, University of Guelph, Guelph, Canada. 4Asthma Canada Member Alliance, Edmonton, Canada. 5Faculty of Nursing, University of Alberta, Edmonton, Canada. Family Practice Airways Group of Canada, Richmond Hill, Canada. 6Faculty of Respiratory Medicine, University of Saskatchewan, Saskatoon, Canada.

INTRODUCTION: Asthma is a common chronic inflammatory disease of the airways. Primary Care Practitioners (PCPs) are integral to care coordination, enhanced through development of a strong doctor-patient relationship. Excellent continuity of care (COC) correlates with lower urgent care visits, complemented by Primary Care Networks (PCNs). Recent work notes that 40% of Albertans do not have a COC model for primary care. We aimed to evaluate impact of PCPs on asthma control in those from Northern Alberta (N-AB) as compared to Southern Alberta (S-AB).

METHODS: Population-based recruitment of adults were approached through various community venues. Those with confirmed asthma by self-report and willing to participate were asked to complete a web-based survey including the Asthma Control Questionnaire (ACQ-5), Asthma Control Test (ACT), and quality of life through the mini-Asthma Quality of Life Questionnaire (mini-AQLQ), as well as information collected on postal codes, health care utilization and primary care structure.

RESULTS: Over 1000 individuals were approached, 51 had asthma (35 surveys had complete information including postal codes): 21 from N-AB and 14 from S-AB. Most had a PCP (20 N-AB; 12 S-AB) but few indicated at least twice a year visits with their PCP (17 N-AB; 7 S-AB). ACT indicated poor control for 5 from N-AB (24%) and 3 from S-AB (27%). Average lifetime emergency visits related to asthma were 2.23 in N-AB and 4.85 S-AB. Intensive care related to asthma did not occur in any from N-AB but in 3 from S-AB. In N-AB, 6 subjects’ PCP were linked with PCN.

CONCLUSIONS: Participants having PCPs less frequently utilized this venue in S-AB, along with higher ICU visits, more with uncontrolled asthma, and less optimal quality of life scores than N-AB. Potential lack of COC access in S-AB needs further study, including rural and urban differences, and how the PCPs are chosen (i.e. walk-in clinic). Knowledge about PCNs was also poor, potentially indicating lack of patient engagement of PCNs in chronic disease management.

CRC2018-0070

VALIDATION OF PULMOSCALE FOR ESTIMATING DOES IN METERED DOSE INHALERS

Jennifer Cutting1, 2, Bhupinder Johal3, Connie Yang4

1BC Children’s Hospital, Vancouver, Canada. 2The University of British Columbia, Vancouver, Canada.

RATIONALE: The majority of patients with asthma require inhaled corticosteroids (ICS) and short acting beta agonists (SABA) to control their asthma. These medications come in meter dose inhalers (MDI) that do not come with counters. Although patients use many methods to determine how much medication is left in their MDIs, dose counting is the only accurate method. As these devices contain 120 to 200 doses of medication this is not a practical solution. Studies have shown that 70% of inhalers returned had more than 20 doses left and 15% of inhalers were actuated for more than 20 doses after the inhaler was empty. The Pulmoscale is a scale that determines the number of doses left in an MDI using a weight based measurement. No published study has validated the accuracy of the Pulmoscale with clinically available MDIs. This study aims to determine the accuracy of the Pulmoscale with the ICS and SABA inhalers available in Canada.

METHODS: The Pulmoscale was calibrated as per package instructions. Three inhalers of each type were tested using four different Pulmoscales (v1.5 and v1.518). Each inhaler was shaken for 30 seconds prior to actuation then weighed after each actuation. Reading on the pulmoscale was compared to the gold standard of dose counting. Precision between the Pulmoscales and the accuracy of the Pulmoscales compared to the gold standard was determined.

RESULTS: With few exceptions, there was little variability between the scales and between the inhalers. The accuracy of the v1.518 scale for inhalers studied thus far is summarized in the table. The pulmoscale was not accurate within 10 actuations for most medications and tended to underestimate the amount of medication.

CONCLUSIONS: Pulmoscale is precise but inaccurate for many medications. Dose counting remains the most reliable method of determining doses in MDIs; however to improve patient care all MDIs should come equipped with dose counters.

<table>
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<th>50% Empty</th>
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<tr>
<td>Ciclesonide100ug</td>
<td>-17 -13 -12</td>
<td>12</td>
</tr>
<tr>
<td>Ciclesonide200ug</td>
<td>0 -12 -10</td>
<td>10</td>
</tr>
<tr>
<td>Fluticasone50ug</td>
<td>0 -25 -27</td>
<td>27</td>
</tr>
<tr>
<td>Fluticasone125ug</td>
<td>0 -2 -5</td>
<td>5</td>
</tr>
<tr>
<td>Sinozolbutamol</td>
<td>0 0 -5</td>
<td>5</td>
</tr>
<tr>
<td>Airomir Salbutamol</td>
<td>-21 -13 -8</td>
<td>8</td>
</tr>
<tr>
<td>Apo-Salbutamol</td>
<td>-18 -8 -4</td>
<td>4</td>
</tr>
<tr>
<td>Novo-Salbutamol</td>
<td>0 -11 -16</td>
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1 Pulmoscale reading - gold standard
2 ICS have 120 doses, SABA have 200 doses
ASThma CONTROL IN PREsCHOOL YEARS: A MAJOR PREDICTOR OF SUBSEQUENT DISEASE REMISSIoN

Francine M. Ducharme1,2, Lucie Blais3, Marni Brownell4, Jacqueline Quail5, Amélie Forget1,2, Yao Nie1, Wenbin Li1, Yuxin Fan1, Robert W. Platt6
1Departments of Pediatrics and of Social and Preventive Medicine, University of Montreal, Montreal, Canada. 2CHU Sainte-Justine, Montreal, Canada. 3Department of Pharmacology, University of Montreal, Montreal, Canada. 4Department of Community Health Sciences, University of Manitoba, Winnipeg, Canada. 5Health Quality Council, Saskatoon, Canada. 6Research Centre, Hôpital du Sacré-Cœur de Montréal, Montreal, Canada.

BACKGROUND: While many preschoolers with asthma experience disease remission after the age of 6 years, it remains unclear whether asthma control, a modifiable factor, affects the rate of remission.

OBJECTIVES: To quantify the association between asthma control following the diagnostic of asthma in preschoolers and remission.

METHODS: We assembled a retrospective birth cohort of children born between 1990-2013 in three Canadian provinces (Quebec, Manitoba, Saskatchewan). Preschool asthma was defined by one hospitalisation or 2 medical visits within a 2-year period for asthma in a child <5 years. Remission was assumed after a two-year period without any asthma-related drug claims, medical visit or hospitalization. Asthma control in the 2 years following diagnosis was ascertained on the validated 4-level Pediatric Pharmacoepidemiology Asthma Control Index (PPACI), measured over 4 consecutive 6-month periods. Within each province, a Cox regression model served to estimate the strength of association between the PPACI stability over 2 years and remission, after adjusting for asthma controller use and other potential perinatal, postnatal, and secular confounders or covariates. A random-effects meta-analysis aggregated the province-specific results.

RESULTS: Of 1.2 million live births in the 3 provinces, 72,546 (6%) children <5 years met the definition of asthma; 62% were male, 71% were <3 years at diagnosis, and 49% initiated inhaled corticosteroids (ICS) prior or within 10 days of diagnosis. The pooled rate (95% CI) of remission was 8.45 (8.31, 8.60)/100 person-years. Poorer asthma control in the two years following diagnosis was associated with a lower likelihood of asthma remission. Better asthma control appears as a promising target to modify long-term outcomes of asthmatic preschoolers.

CONCLUSION: Poorer asthma control in the two years following diagnosis is associated with a lower rate of remission. Better asthma control appears as a promising target to modify long-term outcomes of asthmatic preschoolers.

<table>
<thead>
<tr>
<th>PPACI (2 years post diagnosis)</th>
<th>Remission* Adjusted Hazard ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled throughout</td>
<td>Reference</td>
</tr>
<tr>
<td>Varying control throughout</td>
<td>0.81 (0.57 - 1.14)</td>
</tr>
<tr>
<td>Controlled initially, becoming</td>
<td>0.59 (0.44 - 0.78)</td>
</tr>
<tr>
<td>Out of control in the last period</td>
<td>0.50 (0.36 - 0.70)</td>
</tr>
<tr>
<td>Out of control throughout</td>
<td>0.31 (0.23 - 0.41)</td>
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* Data from Quebec and Manitoba only.

STePPING DOWN THERAPY IN ASThma: A SURVEY OF CANADIAN FAMILY PHYSICIANS

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-8% of the population have asthma. Stepping up asthma care for poor asthma control is necessary, but how to step down therapy is rarely addressed. The Global Initiative in Asthma (GINA) recommendations in 2017 did address this topic, but clinically we observe that when asthma is controlled, physicians and patients are reluctant to wean off any medication for fear of losing control. Thus some patients wind up on more medication than they may require.

An online questionnaire was sent to Canadian Family Physicians to look at attitudes and knowledge regarding stepping down Asthma therapy. 206 respondents most with >15 years experience. Routine reassessment occurred in 57.4% (~equal between q 3, 6 and 12 months), but only when they called for concerns in 42.6%. 98.1% of physicians felt comfortable in managing asthma. Despite evidence of contradictory statements between guidelines most followed current guidelines Requested consultations with an asthma expert took >3 months in 67.5% of these doctor’s experience. 95% of physicians used ICS, 87.7% used ICS/LABA and 95% used SABA. Interestingly 22.6% used LAMA, but 15.5% used LABA/LAMA a currently unapproved medication for asthma.

Well controlled asthma was the best indicator of asthma stability. If uncontrolled, stepping up therapy would be done in two weeks by 77.4% and in three months by 19.4%.

Stepping down therapy would be considered when a patient with asthma was stable for two weeks (19.2%), three months (42.3%), six months (23.1%) and one year (10.3%).

We reviewed the stepping down of patients off various controller options including various doses of both ICS alone and ICS/LABA.

REFERENCES:
3. 3  http:/ /ginasthma.org/2017
**CRC2018-0051**

**LOWER AIRWAY IMMUNE RESPONSE TO DI-BUTYL PHthalate (DBP) AND ALLERGEN CO-EXPOSURE**

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**Rationale:** Allergic asthma is associated with an underlying Th2 cell-mediated inflammatory response resulting in airway eosinophilia and bronchial hyperresponsiveness. Phthalates are plastic softeners used widely and are considered environmental contaminants. Epidemiological studies suggest that phthalate exposure is associated with development and/or worsening of airway diseases. DBP, a type of phthalate found in indoor air, appears to have a high inflammatory potential. We hypothesize that DBP inhalation prior to allergen inhalation will affect lung function and recruit and activate immune cells in the lower airway.

**Methods:** A double-blinded, randomized, controlled crossover study enrolling allergen-sensitized volunteers was approved by UBC. Participants were exposed to DBP or control air for 3 hours followed by an inhaled allergen challenge. Subjects underwent a methacholine test the following day. Dose-response curves to methacholine were examined, the slope (DRS) was obtained and the provocative concentration that caused a 20% fall in FEV\(_1\) (PC\(_{20}\)) was calculated. Forced exhaled nitric oxide (FeNO) was measured at three time-points pre- and post-exposure. Bronchoalveolar lavage (BAL) was acquired 24 hours post-exposure and the cellular fraction was stained immediately for immunophenotyping using flow cytometry.

**Results:** Preliminary data from 4 volunteers is as follows: FeNO, a measurement of airway inflammation, increased after DBP exposure relative to control air at 20 hours post-exposure (p=0.10). The area under the curve (allergen challenge) and the DRS (methacholine challenge) trended to increase with DBP exposure, while the methacholine PC\(_{20}\) trended to decrease with DBP. In BAL, DBP exposure increased the percent of macrophages (p=0.05) and their expression of CD206 (p=0.03), a receptor that aids phagocytosis and antigen presentation. The ratios of M2/M1 macrophages and Th2/Th1 cells trended to increase with DBP (p=0.10 and p=0.19, respectively). Furthermore, the Th1 population was significantly reduced (p=0.03) as was its expression of CD183 (p=0.05), a marker of Th1 cell maturation.

**Conclusions:** DBP appears to increase airway inflammation and hyper-responsiveness and modulate the recruitment and activation of immune cells in the lung. These preliminary results will be re-examined upon study completion (n=20).

**Funding Source:** Norwegian Research Council, VCHRI, FYF (UBC).

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**CRC2018-0061**

**THE EFFECT OF BENRALIZUMAB ON ASTHMA EXACERBATION RATES IN PATIENTS WITH SEVERE ASThma: sysTEMATIC REVIEW AND META-ANALYSIS**

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**Rationale:** Asthma is a heterogeneous inflammatory airway disease; severe asthma patients require high-dose inhaled corticosteroids (ICS) plus a second controller medication to control their disease, or remain inadequately controlled despite this. Benralizumab is an afucosylated, humanized, monoclonal antibody that targets the interleukin-5 receptor alpha-chain causing depletion of eosinophils and basophils, thus reducing inflammation. The aim of this meta-analysis was to determine whether Benralizumab would effectively reduce annual asthma exacerbation rates in patients with severe asthma.

**Methods:** A double-blinded, randomized, placebo-controlled, phase 3 clinical trials that measured annual asthma exacerbation rates, and used Benralizumab as an add-on treatment for severe asthmatic patients. The primary outcome was reduction in annual exacerbation rates in severe asthma patients. Outcomes were reported as rate ratios versus placebo.

**Results:** 1211 individual articles were found in the search; three articles with a combined 2730 patients were included in the analysis. There was a significant reduction in annual asthma exacerbation rates (rate ratio vs. placebo = 0.62, 95% CI 0.49 to 0.78, p<0.0001) in severe asthma patients which is more pronounced in patients with elevated blood Eosinophil (rate ratio vs. placebo = 0.54, 95% CI 0.45 to 0.66, p<0.00001).

**Conclusions:** Benralizumab significantly reduces annual exacerbation rates in severe asthma patients as an add-on treatment with minimal adverse events.
**CRC2018-0050**

**CO-EXPOSURE TO DIESEL EXHAUST AND ALLERGEN IMPAIRS LUNG FUNCTION AND INDUCES LOCAL AND SYSTEMIC INFLAMMATION**

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**Rationale:** Traffic-related air pollution is linked to asthma development and worsening. Diesel exhaust (DE) and airborne allergen often coexist in the real-world; we have previously shown the effects of these co-exposures on the human lung using a segmental allergen challenge. This study is improved by employing an  
inhaled allergen challenge, and also includes a particle-depleted condition, to elucidate the role of the gaseous fraction of DE in these responses.

**Methods:** 14 atopic volunteers visited the lab on 4 occasions to undergo a controlled 2-hour DE exposure (PM2.5; 300ug/m3), particle-depleted diesel exhaust (PDDE), or filtered air (FA), followed by saline (S) or inhaled allergen (A). Four conditions resulted: control (FA-S) and co-exposures FA-A, DE-A and PDDE-A. Blood samples and spirometry were collected before and after exposures. 48 hours after exposure, bronchoalveolar lavage (BAL) was obtained via bronchoscopy. Samples were analyzed for inflammatory cell number and activation. The effect of exposure was assessed using a linear mixed effects model. Effects are expressed relative to FA-S (mean±SE) except where indicated.

**Results:** Co-exposures reduced FEV1 at 4h, persisting at 48h only after DE-A (8±3% decrease; p=0.05). FEV1/FVC was significantly reduced at 1h and 24h by DE-A and PDDE-A, but not FA-A. Allergen increased airway eosinophilia by 2.4±1.0%, which was enhanced by DE (1.9±0.9% further increase; p=0.05 relative to FA-A) but not PDDE (1.6±1.0% further increase; p = 0.78 relative to FA-A). DE-A (but not FA-A or PDDE-A) reduced BAL T-helper cells (p=0.05) and increased blood neutrophils (0.7±0.36 x10^9/L increase; p=0.04). All co-exposures increased blood eosinophils at 24h, remaining elevated at 48h only after DE-A (0.15±0.08 x10^9/L increase; p=0.058).

**Conclusions:** DE and allergen co-exposure leads to airflow obstruction that is not remediated by particle depletion. Conversely, increases in airway eosinophils, circulating neutrophils, and the duration of blood eosinophilia induced by DE-A co-exposure were no longer present after particle depletion. Our data suggests newer diesel engine particulate filters will not reduce all adverse effects of DE.

**Funding:** CIHR MOP 123319; AllerGen National Centre for Excellence, grant GxE4

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**CRC2018-0042**

**COMPARISON OF THE ASTHMA POPULATION OF THE SALFORD (UK) LUNG STUDY (SLS ASTHMA) AND PATIENTS WITH ASTHMA SEEN IN ROUTINE CARE IN CANADA**

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The SLS asthma study compared effectiveness and safety of initiating once-daily inhaled fluticasone furoate (FF) 100μg/vilanterol (VI) 25μg and 200μg/25μg combinations with continuing usual treatment in an asthma population intended to represent routine clinical care.1 Recruited from the Salford area (UK), patients were ≥18 years with documented diagnosis of symptomatic asthma made by a general practitioner (GP). Compared with optimized usual care after baseline assessment including Asthma Control Test, initiation of FF/VI increased the odds of improving or achieving clinically meaningful asthma control without increased risk of serious adverse events. The odds of being a responder were greater for those initiating treatment with FF/VI than in those continuing optimized usual care in the subset of patients whose intended prescription was ICS/LABA therapy; OR 1.95 (95% CI 1.60 – 2.38).

We reviewed 2 Canadian datasets to understand similarities between SLS and Canadian asthma patients seen in clinical settings based on acceptable levels of control set in the Canadian Asthma Consensus Guidelines (CACG):

- TRAC study of GPs and specialists2
- Telephone survey of asthma patients2
Similar to the symptomatic SLS population, both Canadian surveys showed most patients were not controlled. Demographic characteristics seen in everyday clinical practice in Canada appear, in general, similar to the SLS study population. Results of SLS asthma could be considered in a Canadian clinical setting.

REFERENCES:

COPD Contributions to Knowledge

CRC2018-0066

THE POTENTIAL OF DIGITAL TECHNOLOGIES IN ADDRESSING SOCIAL ISOLATION EXPERIENCED WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

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University of Victoria, Victoria, Canada.

Chronic obstructive pulmonary disease (COPD) is a fatal chronic illness characterized by decreased breathing function and acute events (exacerbations) that can contribute to increased pain, fear, anxiety and depression. When people with COPD have social supports in place, exacerbations are less severe and hospitalization rates are reduced, thereby, overall quality of life is improved. The number of COPD individuals living alone is increasing, and thus exacerbations are more likely to be an unsupported, solitary experience. Further, people with COPD are at risk of becoming more socially isolated as their illness progresses, compounding the incidence of depression and anxiety. Digital technologies (DTs), such as social media and Skype, have been proposed as a strategy for chronic disease management and social connectedness. Yet, there is dearth of research examining DTs specific for people living with COPD. Within the context of a large qualitative, narrative study, the poster presentation will provide an examination of social connectedness/isolation experienced by people living with COPD. This Canadian Institutes of Health Research (CIHR) funded, longitudinal study involved two in-depth, in-person interviews and one follow-up phone interview over a period of 18 months. Purposeful recruitment was used to connect with 16 people living with COPD and 7 family members. Informed by Reissman’s (2007) narrative inquiry methods, analysis involved team-based discussions and repeated, close reading of the transcribed interviews. Narrative analysis revealed the isolating experience of living with COPD was compounded by increased frailty, oxygen therapy and fear of influenza. Shared narratives included the challenge of sustaining friendships, while living with COPD was compounded by increased frailty, oxygen therapy and fear of influenza. Shared narratives included the challenge of sustaining friendships, while living with COPD was compounded by increased frailty, oxygen therapy and fear of influenza. Shared narratives included the challenge of sustaining friendships, while living with COPD was compounded by increased frailty, oxygen therapy and fear of influenza. Shared narratives included the challenge of sustaining friendships, while living with COPD was compounded by increased frailty, oxygen therapy and fear of influenza. Shared narratives included the challenge of sustaining friendships, while living with COPD was compounded by increased frailty, oxygen therapy and fear of influenza. Shared narratives included the challenge of sustaining friendships, while living with COPD was compounded by increased frailty, oxygen therapy and fear of influenza.

CRC2018-0043

TEST-RETEST RELIABILITY OF THE MEDUP DYNAMOMETER AND RELATIONSHIP BETWEEN ISOMETRIC QUADRICEPS MUSCLE STRENGTH AND FUNCTIONAL CAPACITY IN CANADIAN PEOPLE WITH COPD

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CONTEXT: Limb muscle dysfunction, including impaired strength, is associated with diminished health-related quality of life and functional capacity in people with chronic obstructive pulmonary disease (COPD). Despite ATS/ERS recommendations, quadriceps strength assessment is not routinely adopted in clinical practice partly because of the wide range of devices and protocols. Moreover the associations between quadriceps strength and functional capacity lacks clarity in COPD.

OBJECTIVES: 1) to determine the test-retest reliability of maximal voluntary isometric quadriceps muscle contraction (iMVCquad) force from a MedUp™ dynamometer (only Health-Canada-approved hand-held dynamometer), and 2) to examine the relationship between iMVCquad and functional capacity, measured using the Short Physical Performance Battery (SPPB) test in people with COPD.

METHODS: 54 patients with COPD (30 males/24 females; age 68.2±7.2 years old, FEV1 54.7±23.7% of predicted [mean±SD]) from 4 Canadian sites were tested on 2 separate days (>48 hours, <7 days apart). Five iMVCquad were measured following a standardized procedure using a fixed MedUp™.SPPB was administered on day 2 following standardized instructions and scoring protocol (standing balance, 4-meter gait speed and five-time sit-to-stand [5STS] components). Intraclass correlation coefficient (ICC), standard error of the measurement (SEM), and Bland-Altman plot were used for reliability analysis. Spearman correlations were used to describe the relationship between iMVCquad and functional capacity.

RESULTS: Mean iMVCquad were 106.6±53.4 (day 1) and 110.3±60.2Nm (day 2) with an associated ICC of 0.95 [95%CI 0.92-0.97, p<0.001] and SEM of 17.7Nm (16.3% of the grand mean). The Bland-Altman plot showed a mean difference of 3.1Nm between visits, and limits of agreement (95%CI) of 37.3 and -29.9Nm. Mean SPPB score was 10.9±1.4 points. There was no significant correlation between iMVCquad and a) the 5STS component (r=-0.08) and b) total SPPB score (r=0.17).

CONCLUSION: The MedUp™ is a reliable tool to assess iMVCquad allowing its implementation in clinical practice in people with COPD. The absence of association between iMVCquad and functional capacity suggests isometric contraction might not be the most representative type of contraction of quadriceps muscle’s demand in functional activities in COPD.

CRC2018-0028

RELIABILITY AND VALIDITY OF THE BRIEF PAIN INVENTORY IN PEOPLE WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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INTRODUCTION: Pain has a reported pooled prevalence of 66% in COPD patients. The Brief Pain Inventory (BPI), a well-established questionnaire, is used to assess pain magnitude and its interference with daily aspects of living. However, its reliability and validity have not been determined among COPD patients. Therefore, this study aimed to determine the test-retest reliability, internal consistency, and validity (construct, convergent, and discriminant) of the BPI in COPD patients.

METHODS: This study included two components- the prospective study (n=27) and the secondary analysis of data retrieved from two previous studies (n=87). For the prospective study, COPD patients aged 45 and older were recruited from four pulmonary rehabilitation programs in Vancouver and Whiteby. Participants completed the BPI two times one week apart. For the secondary analysis part, we retrieved the data from the following questionnaires: BPI, McGill Pain Questionnaire (MPQ), 36-item Short Form Health Survey (SF-36), and the Community Healthy Activities Model Program for Seniors Physical Activity Questionnaire.
RESULTS: The mean age of the participant (48% males and 51% females) was 71.4 ± 8.3 years old. The mean FEV1 was 46.7 ± 16.7% predicted values. The BPI demonstrated excellent internal consistency (Cronbach's α=0.95) and high test-retest reliability (ICC =0.92). Also, the convergent validity was high when compared with the MPQ (r=0.86). Factor analysis showed good construct validity, which means the items in the BPI measured the intended construct. Divergent validity was determined by calculating the correlation between the BPI and each SF-36 domain. The results indicated that the BPI and SF-36 domains showed low correlation (r=-0.23 to -0.33), with the exception of a moderate correlation with bodily pain (r=-0.57, p<0.01). Lastly, the BPI demonstrated discriminant validity among people with different levels of quality of life and different levels of physical activity.

CONCLUSIONS: The BPI showed good reliability and validity in COPD patients. It is a short questionnaire that can be administered easily and allows clinicians and researchers to be informed of the patients' symptom quickly. The responsiveness of the BPI is worthy of future investigations in order to examine symptom changes after interventions.

CRC2018-0057
THE IMPACT OF INFORMATION TECHNOLOGY ON COPD HEALTH-RELATED BEHAVIORS: PATIENTS' PERSPECTIVE
Raquel Farias, Maria Fernanda Sedeno, Meena Patel, Jean Bourbeau
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RATIONALE: An interactive phone tele-system to increase patients’ adherence to written Action Plans during COPD exacerbations was implemented at the Montreal Chest Institute. The objective of this evaluation was to assess the perceived benefits, barriers and facilitating factors related to the use of this system as a COPD self-management tool.

METHODS: During one year, patients with a diagnosis of COPD received scheduled calls from an automated phone tele-system. Patients could also contact the tele-system directly. In the event of an exacerbation, the tele-system issued alerts that were viewed by nurse case managers, who in turn followed-up patients by phone. After one year of tele-system use, patients completed phone semi-structured interviews and questionnaires to evaluate their perception of the tele-system as a tool to support COPD self-management and to communicate with healthcare professionals. Interviews were transcribed verbatim and coded into basic, organizing and global themes. Data across cases were abstracted according to global themes.

RESULTS: Twenty seven COPD patients (12M/15F; 69 ± 6.7 years) participated in the interviews. More than 50% of the patients considered that the tele-system improved their awareness and understanding of their disease. Even though less than 50% of the patients initiated contact with the tele-system, more than 70% of them were reassured by the calls made from the tele-system and considered them useful for recognizing exacerbations. Furthermore, patients found the tele-system useful to support the use of written Action Plans. The main barriers were related to the presence of lengthy questionnaires and patients’ habit of calling their nurse case managers directly. The main facilitating factors were related to the tele-system’s availability and ease of utilization. Eighty nine percent (89%) of the patients were satisfied with the tele-system and 70% of them would like to continue its use for COPD management.

CONCLUSION: Even though the great majority of patients did not actively contact the COPD tele-system, patients felt reassured when receiving regular automated calls and considered that this tool increased the awareness of their disease. The great majority of patients felt more confident by having a support system available for the management of acute exacerbations.

CRC2018-0059
INNOVATIONS IN TREATING COPD EXACERBATIONS: A PHONE INTERACTIVE TELE-SYSTEM TO IMPROVE ACTION PLAN ADHERENCE
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RATIONALE: COPD exacerbations are the first cause of preventable hospital admissions in Canada. Prompt treatment of exacerbations with the use of written Action Plans and case management improves recovery and prevents hospitalizations. Communication technologies could be used to increase patients’ adherence to COPD Action Plans. The objective of this study is to determine whether the use of a phone tele-system increases Action Plan adherence and reduces healthcare use in a real life practice of a COPD clinic.

METHODS: Initially, forty patients from the COPD clinic at the Montreal Chest Institute were enrolled in the study. Patients received automated phone calls and could initiate contact with the tele-system at any time. The tele-system issued alarms during exacerbations, after which patients received follow-up calls from both, their nurses and the tele-system. Detailed data from patients’ behaviours during exacerbations were recorded on monthly telephone evaluation by a third party, the research assistant. The tele-system was used to cover the caseload of 290 COPD patients. Healthcare utilization before and after tele-system enrollment was assessed through hospital administrative databases.

RESULTS: Thirty three patients (12 M/21F; 69±6.9 years) completed the initial study. A total of 81 exacerbations were reported. Action Plan adherence was observed for 72% of the patients. Patients that adhered to their written Action Plan had significantly reduced their exacerbation recovery time. At the end of the initial study, patients significantly increased their self-efficacy to manage COPD exacerbations. The large-scale implementation of the tele-system was followed by a significant decrease in COPD-related hospitalizations (141 before enrollment vs. 98 after enrollment, p<0.001) and in the number of days spent at the hospital for a COPD diagnosis (1399 before enrollment vs. 1325 after enrollment, p=0.046).

CONCLUSIONS: Patients enrolled in our initial study showed increased Action Plan adherence compared to what has been previously reported in the literature. Patients also improved their self-efficacy to manage COPD exacerbations. Large-scale implementation of the tele-system resulted in a significant reduction of COPD-related hospitalizations.

CRC2018-0015
CHARACTERIZING UNDIAGNOSED CHRONIC OBSTRUCTIVE PULMONARY DISEASE: A SYSTEMATIC REVIEW AND META-ANALYSIS
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BACKGROUND: A significant proportion of patients with chronic obstructive pulmonary disease (COPD) remain undiagnosed. Characterizing these patients can increase our understanding of the ‘hidden’ burden of COPD and the effectiveness of case detection interventions.

METHODS: We conducted a systematic review and meta-analysis to compare patient and disease factors between patients with undiagnosed persistent airflow limitation and those with diagnosed COPD. We searched MEDLINE and EMBASE for observational studies of adult patients meeting accepted spirometric definitions of COPD. We extracted and pooled summary data on the proportion or mean of each risk factor among diagnosed and undiagnosed patients (unadjusted analysis), and coefficients for the adjusted association between risk factors and diagnosis status (adjusted analysis).

RESULTS: 2,083 records were identified and 16 articles were used in the meta-analyses. Diagnosed patients were less likely to have mild (v. moderate to very severe) COPD (odds ratio [OR] 0.30, 95%CI 0.24-0.37, 6 studies) in unadjusted analysis. This association was attenuated in the adjusted analysis (OR 0.72, 95%CI 0.58-0.89, 2 studies). Diagnosed patients were more likely to report respiratory symptoms such as wheezing (OR 3.51, 95%CI 2.19-5.63, 3 studies), had more severe dyspnea (mean difference on the modified Medical Research Council scale 0.52, 95%CI 0.40-0.64, 3 studies) and slightly greater smoking history than undiagnosed patients. Patient age, sex, and current smoking status were not associated with a previous diagnosis.

CONCLUSIONS: Undiagnosed patients had less severe airflow obstruction and fewer respiratory symptoms than diagnosed patients. Lower disease burden in undiagnosed patients may significantly delay the diagnosis of COPD.
CRC2018-0039

NON-INVASIVE VENTILATION USE AMONG PATIENTS WITH ACUTE EXACERBATIONS OF COPD IN THE SASKATOON HEALTH REGION

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Use of bi-level non-invasive ventilation (NIV) in patients with hypercapnic respiratory failure resulting from an acute exacerbation of COPD (AECOPD) is known to significantly improve outcomes—decreasing mortality by 46% and reducing intubation rates by 65%. However, previous research at our site demonstrated that 23% of inpatients with this indication for NIV did not receive it, and that proper protocols regarding the initiation of NIV were frequently not followed. Initiatives to improve the appropriateness of NIV use have since been implemented, and the purpose of this study is to re-evaluate NIV utilization in AECOPD patients in our health region. This retrospective review contained all patients with a discharge diagnosis of AECOPD who were admitted to either of two Saskatoon hospitals from January 1, 2016 – December 31, 2016, after those initiatives had been established. 222 admissions were appropriate for inclusion in the study. 59% of the patients were male, with an average age of 71 years. 5% were admitted to the Intensive Care Unit (ICU).

An arterial blood gas (ABG) was performed in only 59% (130/222) of patients in this study, and 46% (60/130) of patients with an ABG demonstrated decompensated respiratory acidosis. Of those, 72% (43/60) received NIV whereas 28% (17/60) did not. This proportion did not differ significantly between the two hospitals studied. Overall, 25% (56/222) of patients in this study received NIV. 13 patients received NIV without documented respiratory acidosis, of which 10 had a normal ABG and 3 did not have an ABG drawn. Hence, 95% of patients on NIV received an ABG prior to its initiation.

The finding that 28% of patients in this study with an appropriate indication did not receive NIV indicates that further improvement is needed in this area, and unfortunately it does not represent progress from prior studies in this health region. Additionally, the low rate of obtained ABGs in these patients suggests the possibility that some with hypercapnic respiratory failure were not detected and therefore not offered NIV. Continued quality improvement initiatives are warranted to ensure that all appropriate patients are able to benefit from this evidence-based intervention.

CRC2018-0009

FEASIBILITY OF CUSTOMIZED CPAP MASK FOR OBSTRUCTIVE SLEEP APNEA USING 3D IMAGE CAPTURE AND PRINTING

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Obstructive sleep apnea (OSA) is a common chronic condition that has significant adverse effects on patient health and public safety. The first line treatment for OSA is continuous positive airway pressure (CPAP), which is both clinically effective and cost-effective. CPAP is applied during sleep by a nasal or full-face mask which, if not fitted well to a patient’s face, may lead to mask leaks. Such leaks prevent the delivery of adequate airway pressure to treat OSA, leading to mask adjustments that may be uncomfortable. As a result, patients may not achieve the health benefits of treatment due to inadequate treatment or non-adherence.

Adapting CPAP mask interfaces to improve fit is appealing as it could improve adherence to therapy and clinical benefit. Unfortunately, it is not possible to capture 3D models of patient faces using traditional methods. Advances in camera technology have made off-the-shelf 3D imaging available. More importantly, 3D printing allows for the construction of personalized 3D molds based on 3D images. Mask molds can be produced from pictures of patients’ faces.

We present a case of a 64 year old man with severe OSA and poor compliance with nocturnal CPAP. His past medical history included oral cancer treated with radiation and left jaw reconstruction secondary to osteorhesis of the left hemi-mandible. Due to his facial abnormalities, his CPAP had persistent leak from a poor mask fit and the patient suffered from unresolved excessive daytime sleepiness.

We captured a 3-dimensional image of the patient’s face (Kinect, Microsoft) and printed a 3D model (Lulzbot Taz 4, PLA filament) to be used as a mold for the mask. The patient’s CPAP mask was modified using the 3D-printed model and skin-safe silicone (Dragon Skin 30, Smooth-On). Clinical follow-up demonstrated improvement of air leak, clinically significant improvement in daytime sleepiness, but persistently elevated apnea-hypopnea scores due to underlying facial abnormalities.

SUMMARY: Customized CPAP masks using 3D-image capture and modelling is a feasible method of improving patient compliance and symptoms in patients with OSA.

CRC2018-0034

DISSEMINATED MYCOBACTERIUM MARINUM INFECTION IN A KIDNEY TRANSPLANT RECIPIENT: A FISHY SITUATION

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INTRODUCTION/OBJECTIVE: M. marinum is a non-tuberculous mycobacteria (NTM) that usually causes a simple skin infection in humans. Disseminated M. marinum infections in humans is extremely rare. The objective of this case report is to describe the case of a disseminated M. marinum infection in a transplant recipient with post-mortem pathology confirmation.

DESCRIPTION: A 76 year-old male kidney transplant recipient presented to his dermatologist with cutaneous ulcerated lesions on his forearm which were biopsied. He had recently cleaned a fish tank which had contained dead fish. Two weeks after his biopsy, he presented to our emergency room with altered mental status and weight loss. A diagnosis of acute kidney injury from his failing kidney transplant was made, and hemodialysis was promptly initiated. His mental status did not improve despite several hemodialysis sessions. A CT of the chest revealed new bilateral nodular densities. The tissue culture from his skin biopsy revealed NTM. He was diagnosed with disseminated NTM infection and he was empirically started on rifampin, tigecyclin, imipenem-clastatin, and azithromycin. Despite treatment, his mental status deteriorated, leading to tracheal intubation for airway protection. The patient had multiple episodes of seizures. A brain MRI revealed multiple foci of periventricular and subcortical white matter high intensity lesions. Cultures of a bronchoalveolar lavage also revealed NTM. Eventually, cultures from the skin biopsy, bronchoalveolar lavage, and blood all came positive for Mycobacterium marinum. His antibiotics were changed to rifampin and minocycline and his condition improved sufficiently to allow extubation and transfer to the medical ward. The patient then had multiple seizures followed by distributive shock of unknown etiology. The patient eventually passed away. An autopsy revealed infiltration of lung parenchyma, liver, and spleen by acid-fast bacilli, confirming the diagnosis of disseminated M. marinum infection.

DISCUSSION/CONCLUSION: M. marinum disseminated infection is a rare but serious disease. It should be considered as the cause of cutaneous lesions in transplant recipients, particularly in the context of marine or fish tank exposure. Early diagnosis and treatment may prevent systemic dissemination. More research should be conducted to clarify optimal treatment.

CRC2018-0004

PREDICTING THE LIKELIHOOD OF PULMONARY TUBERCULOSIS AMONG THE FOREIGN-BORN IN A HIGH-INCOME, LOW-INCIDENCE COUNTRY: A COHORT STUDY TO DERIVE A CLINICAL HIERARCHIC

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OBJECTIVES: To investigate 1) whether pulmonary tuberculosis among foreign-born can be predicted from features of a good medical history and, 2) to generate a useful teaching heuristic.

DESIGN: Observational cohort study. Multiple logistic regression analysis was used to derive prediction equations for pulmonary tuberculosis. Seven clinical and laboratory predictors of pulmonary TB disease were used as explanatory variables.

SETTING: Edmonton Zone Tuberculosis Clinic.

PARTICIPANTS: 391 foreign-born adult (>14 years) persons were recruited into the study: 170 had pulmonary tuberculosis and 221 did not have tuberculosis.

MAIN OUTCOME MEASURES: The influence of each predictor was tested on two main outcomes: “positive culture” and “positive smear”. Receiver operating curves were generated and the area under the curve for each logistic regression model was quantified.
RESULTS: Among PTB patients (n=170), a combination of respiratory and constitutional symptoms, a sub-acute duration of symptoms, risk factors for the reactivation of latent tuberculosis infection, and anemia were predictive of having a positive culture (odds ratios of 1.79, 2.24, 1.72, and 2.28 respectively, p-value < 0.05). Among smear-positive PTB patients (n=69), a combination of respiratory and constitutional symptoms, inappropriate prescription of broad-spectrum antibiotics, and features ‘typical’ of adult-type pulmonary tuberculosis on chest radiograph were predictive (odds ratios of 2.91, 1.55, and 12.34 respectively, p-values < 0.05).

CONCLUSIONS: In high-income, low tuberculosis incidence countries, pulmonary tuberculosis can be predicted from features of a good medical history. This should raise the threshold of suspicion to confirm the diagnosis in a more timely fashion and incline clinicians to ‘think tuberculosis’ in settings where the disease is rare.

CRC2018-0031
RATE OF PLEURODESIS AND TIME TO REMOVAL OF TUNNELED PLEURAL CATHETERS IN BENIGN PLEURAL EFFUSIONS
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RATIONAL: Tunneled pleural catheters (TPCs) are increasingly recognized as an alternative to chemical pleurodesis in the management of recurrent pleural effusions, especially in malignant pleural effusions. However, the evidence is scarcer in the setting of benign pleural effusions (BPE). Many TPCs achieve pleurodesis and can be removed. The aim of this study is to identify the rate and time to pleurodesis associated with TPCs in the management of BPE.

METHODS: We conducted a review of a prospectively collected database including clinical, radiologic and pleural fluid data in patients with non-malignant pleural effusions treated with TPCs from August 2007 to June 2017. Univariate logistic regression was used to assess rates of TPC pleurodesis, and univariate Cox regression was used to assess days to pleurodesis.

RESULTS: Data from 252 TPCs were reviewed. The most common etiology for TPC insertion was cardiac failure (31.7%), followed by non-specific pleuritis (26.2%) and liver failure (13.9%). The overall pleurodesis rate was 74% and median time to TPC removal was 42 (IQR 18-93) days. Non-specific pleuritis was the only diagnosis associated with increased rates of pleurodesis (OR 5.81, P=0.0003), with a rate of 92%. Diagnoses associated with reduced rates of pleurodesis included cardiac failure (OR 0.51, P=0.0238), liver failure (OR 0.30, P=0.0014), and renal failure (OR 0.13, P=0.0163), with rates of 65%, 51% and 29% respectively. Diagnoses associated with earlier pleurodeses were connective tissue diseases (HR 2.97, P=0.0001), tuberculosis (HR 2.85, P=0.0071), empyema (HR 4.59, P<0.0001), and non-specific pleuritis (HR 2.77, P=0.0011), with a median time of 21, 16, 14 and 28 days respectively. Diagnoses associated with longer time to pleurodesis were cardiac failure (HR 0.49, P<0.0001) and liver failure (HR 0.41, P=0.0003), with a median time of 84 and 115 days respectively.

CONCLUSIONS: Recognizing factors that impact rates of and times to pleurodesis may help clinicians guide their treatment choice when treating patients with recurrent benign pleural effusions.

CRC2018-0048
FIRST LOOK AT MINIMALLY IMPORTANT DIFFERENCE FOR PHYSICAL ACTIVITY AND VALIDITY OF THE INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE IN FIBROTIC ILD
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RATIONAL: Little is known about the validity of the International Physical Activity Questionnaire Long Form (IPAQ-LF) in fibrotic interstitial lung disease (ILD). We examined the validity and consistency of IPAQ-LF in measuring physical activity (PA) in fibrotic ILD patients, and estimate the minimally important difference (MID) for moderate-to-vigorous PA (MVPA).

METHODS: Patients were recruited from two specialized ILD clinics. Patients wore waist- and wrist-based ActiGraph wGT3X-BT activity monitors on their non-dominant side for seven consecutive days, then completed the IPAQ-LF. Data were acquired from each device with and without an added sensitivity filter. Spearman correlations were used to evaluate the IPAQ-LF validity in comparison to actigraphy and clinical outcomes. The internal consistency of the IPAQ-LF was determined using Cronbach’s alpha. We used anchor- and distribution-based methods to calculate the MID for MVPA minutes recorded by waist-worn ActiGraph without filter.

RESULTS: The 114 patients (71 male) had a mean age of 70±9 years, FVC of 77±19% predicted, and DLCO of 50±16% predicted. Respectively, the IPAQ-LF and waist-worn non-filtered activity monitor showed means of 396±194 vs. 347±125 sedentary minutes/day, 382±458 vs. 161±208 MVPA minutes/week, and 2,959±2,920 vs. 2,515±7,756 metabolic equivalent of task (MET)-minutes/week. The IPAQ-LF generally showed moderate correlations with actigraphy and clinical outcomes (Table 1). Cronbach’s alpha of the IPAQ-LF was 0.79. The MID for MVPA ranged from 29-443 minutes/week using the distribution-based method and using %FVC and daily steps for an anchor-based approach.

CONCLUSION: The IPAQ-LF had moderate to large correlations with actigraphy and clinical outcomes as well as acceptable internal consistency when measuring PA in ILD patients. Our reported MID for MVPA falls within the guidelines for older adults that recommend a minimum of 150 MVPA minutes/week to upwards of 300 MVPA minutes/week for greater health benefits. Our findings serve as pilot data for future IPAQ validation studies in ILD.

FINANCIAL SUPPORT: This study is supported by the Canadian Pulmonary Fibrosis Foundation in partnership with Hoffmann-La Roche, Inc.

CRC2018-0018
VO2 AND VCO2 DURING SPONTANEOUS BREATHING TRIAL ARE POTENTIAL PREDICTORS OF VENTILATOR LIBERATION
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RATIONAL: Indirect calorimetry (IC) remains the gold standard for measuring metabolic requirement in different phases of patient’s recovery. We hypothesized that O2 consumption (VO2) and CO2 production (VCO2) during spontaneous breathing trial (SBT) is different between patients who fail and succeed from ventilator liberation. The aim of this study was to determine whether IC readings can be predictors of patient liberation from the ventilator.

METHODS: Thirty ready-for-weaning subjects in ICU were recruited. SBT was defined as a 30 to 60-min under PSV 5 and PEEP 5 cmH2O. The mean metabolic requirement in 5-min duration after SBT started (5 VO2 and 5 VCO2), during spontaneous breathing trial (SBT) is different between patients who fail and succeed from ventilator liberation. The aim of this study was to determine whether IC readings can be predictors of patient liberation from the ventilator.

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RESULT: Twenty two subjects were successfully liberated from ventilator support, whereas 8 subjects failed it. No statistical differences were found for age and body surface area (BSA) between two groups. Statistical differences were found between successful and failed group in $5_{\text{VO}}$, and $5_{\text{VCO}}$, $224.7 \pm 82.0$ vs $164.9 \pm 22.6$ mL/min, and $171.4 \pm 54.5$ vs $121.4 \pm 15.8$ mL/min), $30_{\text{VO}}$, and $30_{\text{VCO}}$, $242.6 \pm 67.4$ vs $162.9 \pm 29.3$ mL/min, and $182.4 \pm 56.1$ vs $122.6 \pm 23.9$ mL/min), and $60_{\text{VCO}}$, $165.7 \pm 36.2$ vs $124.5 \pm 19.7$ mL/min, respectively. The area under the ROC curves of 30-min $\text{VO}$/BSA, 30-min $\text{VCO}$/BSA and 30-min RSBI were 0.85, 0.81, and 0.82, respectively.

CONCLUSION: Patients who had passed SBT but failed liberation from mechanical ventilation, had a lower $\text{VO}$ and $\text{VCO}$ during SBT. Continuous measure body’s metabolism during SBT may become potential predictors of liberation from ventilator support, to guide the clinician make the decision of liberation.

CRC2018-0022

THE EFFECT OF SENSORY-MECHANICAL RELATIONSHIPS ON DYSPNEA QUALITY IN PATIENTS WITH FIBROTIC INTERSTITIAL LUNG DISEASE

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RATIONALE: Patients with interstitial lung disease (ILD) report a sensation of unsatisfied inspiration during exercise more frequently than healthy age-matched individuals; however, the underlying physiological basis for differences in perceived dyspnea quality has not been evaluated in this population. The purpose of this study was to examine dyspnea quality and its relationship to ventilatory-mechanical constraints during exercise in patients with fibrotic ILD.

METHODS: Patients with fibrotic ILD performed incremental (15 watts/2 minutes) and constant work-rate (75% peak incremental work-rate) cycle exercise tests until symptom limitation. Tests were separated by ≥48 hours. Ventilatory responses were measured at rest, throughout exercise, and at peak exercise during both tests. At the same measurement times, patients were also asked to select the phrase that best described their breathing at that moment, compared to rest, from a list of 4 items: increased work/effort, unsatisfied inspiration, unsatisfied expiration, or that none applied. The inflection point of tidal volume (VT) relative to ventilation (VE) was determined for each test by examining Hey plots from incremental exercise, representing the point at which there was a mechanical constraint on further VT expansion.

RESULTS: This study included 16 fibrotic ILD patients (12 male) with a median age of 64 years (range 49-81), FVC 71%-predicted (44-100), and DLCO 45%-predicted (27-77). Five additional patients without identifiable VT/VE inflections were excluded from analysis. Perceived work/effort was the most common descriptor of dyspnea throughout exercise across test protocols (71% of all responses). At the VT/VE inflection, selection frequency of work/effort plateaued and the selection frequency of unsatisfied inspiration as the predominant descriptor of dyspnea markedly increased for both test protocols (5% of all responses before and 28% after the inflection point).

CONCLUSIONS: Increased work/effort was the dominant descriptor of dyspnea throughout exercise, but with a change to unsatisfied inspiration following the VT/VE inflection point, representing the mechanical constraint on further VT expansion. Interventions that delay or prevent the VT/VE inflection may reduce the perception of unsatisfied inspiration and have important implications for symptom management in ILD patients.
CRC2018-0062
PCD VS CF: THE DIAGNOSTIC OVERLAP
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Cystic Fibrosis (CF) and Primary Ciliary Dyskinesia (PCD) can present with similar pulmonary symptoms, confounding the clinical picture. The understanding of the genetic basis for these diseases continues to broaden, further complicating diagnosis.

We present the case of an 8-year-old girl referred to our academic CF center from a Community Respiriologist with a history of chronic cough starting at 3 weeks of age. She had been followed until age 7, undergoing several diagnostic tests. A sweat test in 2010 revealed a chloride of 35, which was interpreted as normal, and a CFTR panel consisting of 74 mutations was negative. Immune dysfunction was ruled out. A CT thorax in early 2011 revealed bilateral diffuse bronchiectasis with air space consolidation. Throat swab was positive for 2 morphotypes of Staphylococcus aureus. Repeat imaging in 2014 showed ongoing bronchiectasis to both upper lobes with airspace consolidation and mosaic attenuation in the left upper lobe. CT sines showed complete opacification of the maxillary sinuses with remodeling. A repeat sweat test measured a chloride of 20. At 7 years of age, given the negative sweat and mutation panel, she was referred to rule out allergic bronchopulmonary aspergillosis and PCD. At the PCD clinic at the Hospital for Sick Children, they were unable to obtain a nasal nitric oxide, and nasal scraping was not suitable for assessment. A sputum sample grew mucoid Pseudomonas aeruginosa. When DNA was sent for PCD testing, results revealed 2 pathogenic mutations in CFTR gene (P67L and R1128X1) and one PCD variant of unknown significance (D1753G). Nasal potential difference was consistent with CF. With a consistent CF phenotype, two disease-causing mutations and a positive nasal potential difference, despite the negative sweat chloride, she was diagnosed with pancreatic sufficient CF.

With the recent advances in diagnosis for PCD and CF, and the growing awareness of the variability of CF-SPID, it is our hope that the pitfalls in diagnosing CF are minimized. This case reminds us not to stop investigating CF in the face of a negative sweat test or commercial genetic panel.

CRC2018-0052
NUMBER OF ASTHMA EMERGENCY DEPARTMENT VISITS AS A PREDICTOR OF ASTHMA HOSPITALIZATIONS IN CHILDREN
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RATIONALE: Any child presenting to the emergency department (ED) with an asthma exacerbation requires re-evaluation of their asthma management. However, only 35-46% of children attend timely follow-up with their primary care providers after an ED visit. Resource limitations and lack of guidelines for discharge management post ED visit lead to significant variations in practice and currently limit the impact of ED-based preventative strategies. A mechanism to recognize the children at highest risk of future hospitalizations is needed to target ED-based discharge interventions. The primary objective of this study was to determine if the frequency of ED visits can reliably predict future asthma hospitalizations in children.

METHODS: Children aged 2-17 years with asthma ED visits at the Children’s Hospital of Eastern Ontario (CHEO) between September 2012 to August 2015 were identified through health administrative data. Kaplan Meier curves and Cox proportional hazards multivariable logistic regression analysis with time-dependent covariates were used to determine if the number of previous ED visits in the past year predicted future asthma hospitalization risk in children after adjustment for age, and the severity of the asthma visit as measured by the Canadian Triage and Acuity Scale (CTAS).

RESULTS: There were a total of 3518 patients with 4734 asthma ED visits during the study observation period. The number of previous ED visits had a dose-dependent, linear relationship with future hospitalization risk. Compared to children with zero previous ED visits, the risk of future hospital admission in children with one visit or two or more visits was 3.04 (95% confidence interval: 2.00,4.61) and 6.51 (95% confidence interval: 3.87,10.96), respectively (p<0.001). CTAS, but not age, also independently predicted future hospitalization risk.

CONCLUSIONS AND INFORMATION ON FINANCIAL SUPPORT: Frequency of previous ED visits has a direct relationship with future hospitalization risk and can be used as a practical and objective tool for ED physicians to predict which children are at highest risk for future asthma hospitalization. These findings will be used to identify the treatment group for a prospective intervention study aimed to reduce asthma hospitalizations. This project was funded by the CHEO Research Institute Resident Research Grant.

Table 1: Analysis of the effect of age, Canadian Triage Acuity Scale (CTAS), and emergency department (ED) visits on asthma hospitalizations in children

<table>
<thead>
<tr>
<th>Factor</th>
<th>Hazard Ratio</th>
<th>95% CI Lower</th>
<th>95% CI Upper</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in years)&lt;6</td>
<td>1.07</td>
<td>0.71</td>
<td>1.60</td>
<td>0.76</td>
</tr>
<tr>
<td>CTAS</td>
<td>0.61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous ED Visits Count</td>
<td>-0.0061</td>
<td></td>
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Figure 1: Kaplan Meier Plots. Canadian Triage Acuity Scale and previous emergency department visit count by proportion of patients not yet admitted over time
received PCV13, the incidence of complicated pneumonia was similar to the incidence in the pre-PCV7 era. In contrast, following introduction of PCV13, rates of complicated pneumonia in older children (who would not have received PCV13) were significantly higher than they were during the pre-PCV7 era and in comparison to children under age 4. While rates of complicated pneumonia in older children remain elevated, this may be expected to resolve with more widespread vaccine coverage with PCV13. Ongoing surveillance using molecular methods is essential to evaluate changes in the etiology of pediatric complicated pneumonia over time.

1Sickkids CFTR database, http://www.genet.sickkids.on.ca/MutationDetailPage. external?sp=678

CRC2018-0055

EFFECTS OF LUMACAFTOR/IVACAFTOR ON EXERTIONAL DYSPNEA, EXERCISE PERFORMANCE, AND VENTILATORY RESPONSES IN ADULTS WITH CYSTIC FIBROSIS

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RATIONALE: Exercise capacity is an important outcome parameter in cystic fibrosis (CF) and is a strong predictor of disease prognosis. Lumacaftor/ivacaftor (Orkambi) is a CF transmembrane conductance regulator (CFTR) corrector and potentiator combination therapy that can improve forced expiratory volume in 1-sec (FEV1). However, it is unknown if this benefit translates to improvements in exercise endurance, exertional dyspnea and leg discomfort ratings. Accordingly, the primary purpose of this study was to determine the effects of lumacaftor/ivacaftor on exercise endurance and perceptual responses to exercise.

METHODS: Seven patients, all homozygous for the F508del mutation in the CFTR gene and FEV1 <90% predicted, completed this study. Visit 1 included pulmonary function tests (PFTs) and a symptom limited incremental cycling test. Visit 2 (pre) included PFTs and a symptom limited constant load cycling test (80% peak work rate) with simultaneous assessments of dyspnea and leg discomfort ratings. Participants initiated treatment with lumacaftor/ivacaftor following visit 2. Visit 3 (post) was performed 1 month after treatment with identical procedures as visit 2.

RESULTS: Lumacaftor/ivacaftor resulted in modest but non-significant improvements in FEV1 (pre: 1.73±0.32 vs. post: 1.82±0.32 L, p=0.19) and a significant reduction in sweat chloride (pre: 106±14 vs. post: 86±15 mmol/L, p<0.001). Exercise time improved in all but one participant, but, on average, was not statistically significant (pre: 9.0±5.5 vs. post:10.4±6.3 min, p=0.51). Exertional dyspnea at iso-time did not change (pre: 4.8±1.7 vs. post: 4.5±1.8, Borg units, p=0.53) but leg discomfort ratings tended to decrease (pre: 6.2±2.7 vs. post: 5.0±2.3, Borg units, p=0.10). There was a significant correlation between changes in endurance time and leg discomfort ratings (r=-0.88, p=0.02).

CONCLUSIONS: Lumacaftor/ivacaftor did not reduce dyspnea but tended to improve leg discomfort ratings following 1 month of treatment. Decreases in leg discomfort were significantly correlated with improvements in endurance time. Future studies with more patients are needed to verify these findings and assess the long-term effects of treatment on exercise outcomes.

CRC2018-0069

HOSPITALIZATION-RELATED COSTS FOR CYSTIC FIBROSIS PATIENTS IN CANADA

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RATIONALE: Cystic fibrosis (CF) is an inherited disease affecting over 4000 Canadians. CF lung disease is marked by bronchiectasis and recurrent exacerbations that often require intravenous antibiotic therapy. Lung disease accounts for most of the morbidity and mortality in CF, however, with better treatments median CF survival has significantly improved. As the CF population increases, and treatment regimens escalate in complexity, costs related to CF care are expected to rise and could put tremendous strain on health care systems. The objective of this study was to examine the direct costs related to hospitalization for CF patients in Canada.

METHODS: The study was cross-sectional and focused on annual hospitalization costs incurred by CF patients in the 2014-2015 fiscal year using a public payer perspective. Record level data from the Canadian Institute for Health Information (CIHI) databases were used. Individuals with CF were defined based on at least one hospital admission with an ICD-10 code of EB4. Costs for services were estimated using an aggregate costing strategy (case-mix grouper x resource intensity weight). Secondary objectives included comparing trends in annual hospitalization-related costs from 2010-2014 and determining if annual hospitalization costs per patient differed by province, sex, or age. Cost estimates were determined per capita CF patient and converted to 2014 Canadian dollars. Calculations assumed a fixed cost for a treatment or service for a given year. Transplant recipients were analyzed separately.

RESULTS: Between 2010 and 2014, 4729 unique CF patients requiring hospitalization were identified and there were 8820 hospitalizations in total. Approximately 50% were female in each year. Median patient age was 21 years (IQR, 14-30) and similar across years. In 2014, Ontario accounted for 48% of CF hospitalizations across Canada, followed by Alberta (17%); this was similar across years. In 2014, CF patients had a median of 2 hospitalizations (IQR, 1-4) and a median total hospital stay of 10 days (IQR, 4-15), both consistent with preceding years. CF accounted for 70% of primary admitting diagnoses in 2014 (versus 67% in prior years). Additional analyses are in progress.

CONCLUSION: Despite the growing Canadian CF population, neither hospitalizations or total hospital days increased over a five year period. It is unclear if annual CF hospitalization costs will also remain stable across the study period.

Re-Imagining Rehabilitation

CRC2018-0020

SETTING THE STAGE FOR A MORE ACCEPTABLE INTERVENTION TO PATIENTS’ PATIENTS’ AND HEALTHCARE PROFESSIONALS’ VIEWS ON THE DELIVERY OF PULMONARY REHABILITATION POST-ACUTE EXACERBATION OF COPD

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RATIONALE: Current international guidelines for prevention of acute exacerbation of chronic obstructive pulmonary disease (AECOPD) recommend enrolment and participation in a pulmonary rehabilitation (PR) program within 4 weeks of hospital discharge. However, there is poor uptake of these programs as well as low adherence and completion rates. The objective of this study was to explore the views of patients and healthcare professionals (HCPs) on PR following AECOPD and how participation could be enhanced.

METHODS: A qualitative study was undertaken and data were analyzed using Deductive Thematic Analysis. Fourteen patients who had experienced an AECOPD in the previous 6 months and 12 HCPs experienced in the management of COPD participated in face-to-face semi-structured interviews. Patients and HCPs were recruited from both rehabilitation and acute hospital settings.

RESULTS: Four main themes were identified: 1) Uncertainty about timing of PR: Most HCPs endorsed the professional guidelines that advocate for PR programs to begin within 4 weeks of an AECOPD. Patients, however, varied drastically in their view of the ideal timing to start a PR program; anywhere from before an exacerbation (perhaps preventing one) and up to 6-8 weeks post-exacerbation. 2) Tailored, flexible PR programs: Patients and HCPs talked about individually tailored programs with a gradual introduction of exercise and teaching sessions. Some advocated allowing patients to pick and choose which elements would help them the most. 3) Education for all: Patients would like HCPs to be more informed and informative about the PR programs available in their neighbourhoods and HCPs focused on how they could educate patients about their disease and how better to manage it. And 4) Practical, disease-related and psychological barriers: Barriers to PR were discussed by both
HCPtrains and patients. These fell into two categories: a) delivery issues (i.e., transportation and location of PR); and b) patient specific issues (too sick or too well, high levels of anxiety). Strategies to mitigate these included neighbourhood programs with transport provided, and provision of anxiety reducing strategies. **CONCLUSIONS:** Our data set the stage for the development of a more flexible manner to deliver PR following an AECOPD. **FINANCIAL SUPPORT:** Canadian Respiratory Health Professionals

**CRC2018-0046**

**RELATIONSHIP BETWEEN SIMPLE MEASURES OF PHYSICAL FUNCTION AND MUSCLE STRENGTH WITH EXACERBATION, HOSPITALIZATION AND MORTALITY IN COPD: A SYSTEMATIC REVIEW**

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**RATIONALE:** There has been an increased interest in simple measures of physical function and muscle strength that can be used in all settings to assess individuals with chronic obstructive pulmonary disease (COPD) and predict their prognosis. Our objective was to systematically review studies that have examined the relationship between simple measures of physical function and muscle strength with exacerbation, hospitalization and mortality in individuals with COPD.

**METHODS:** Studies of any design that examined the relationship between simple performance-based or self-reported measures of physical function and muscle strength with exacerbation, hospitalization and mortality in COPD were identified using Cochrane, Embase and Medline. One investigator reviewed the study titles and abstracts and two reviewed the full-texts. One investigator performed the data extraction and a second one double-checked the extracted data.

**RESULTS:** A total of 6629 articles were identified and 15 met the inclusion criteria. Four articles examined the relationship between physical function measures and exacerbation with two articles finding a positive relationship. One study showed that the time up and go (TUG) test was associated with exacerbation (frequent exacerbators took longer time to perform the TUG (11.6±3.5 sec) than infrequent exacerbators (10.6±3.9 sec): p=0.001). The second study showed that patients with Gilttr test time above 4.16 minutes had five times higher risk of exacerbations compared to those who completed the test in less than 4.16 min. Only one article examined the relationship between physical function measures and hospitalization and showed that the hospitalization rate during the past year was higher among patients with a longer Gilttr test time (>416 min). Twelve articles examined the relationship between physical function measures and mortality with 10 articles finding a positive relationship. The Manchester respiratory activities of daily living questionnaire, the TUG, the sit to stand and handgrip strength tests were shown to be predictors of mortality in COPD.

**CONCLUSIONS:** Simple physical function measures can provide important information about the prognosis of individuals with COPD. It remains unclear whether following a specific rehabilitation intervention, improvements in these physical function measures can translate into improvement in patient prognosis.

**CRC2018-0024**

**EVALUATION OF QUADRICEPS MUSCLE STRENGTH AND POWER IN PEOPLE WITH COPD: A RELIABILITY AND VALIDITY STUDY**

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**BACKGROUND:** Limb muscle weakness is a common systemic complication in people with chronic obstructive pulmonary disease (COPD). Muscle strength and power are key components to the evaluation of muscle function. However, the lack of standardized protocols poses a challenge to their evaluation in clinical and research settings. **OBJECTIVES:** 1) To determine the test-retest reliability of quadriceps muscle strength and muscle power measures from Biodex dynamometer (gold-standard tool), and 2) to evaluate criterion-validity of the MedUp dynamometer for measuring quadriceps muscle strength.

**METHODS:** People with COPD were tested at four Canadian centres. Participants attended two sessions held two to seven days apart. Quadriceps strength (isometric peak torque) was assessed using the Biodex and the MedUp, which was fixed to an assessment table. Muscle power, assessed with the Biodex, was evaluated using two methods: the rate of torque development (RTD) from isometric quadriceps contraction; and from average power, peak power and peak velocity generated during isometric quadriceps contractions at 20% of peak torque. Intraclass correlation coefficient (ICC), standard error of the measurement (SEM) and Bland-Altman plots were used for statistical analysis.

**RESULTS:** A cohort of 48 patients with COPD were recruited and tested [age 69±7 years, FEV1 = 45.5±20.1% of predicted; (mean±SD)]. High test-retest reliability was found for quadriceps peak torque measured with Biodex (ICC=0.97, SEM=8.0Nm, p<0.001). Muscle power using RTD had moderate reliability (ICC=0.75, SEM=16 Nm²/sec, p<0.001) whereas isotonic power measures all showed a very high reliability (p<0.001); average power: ICC=0.98, SEM=8.2 Watts; peak power: ICC=0.99, SEM=20.0 Watts and peak velocity: ICC=0.93, SEM=7.4 degs. A high level of agreement was found between the Biodex and MedUp for quadriceps peak torque (114.4±84.3 m/s and 106±56.9 m/s; respectively; ICC=0.89, SEM=7.9 m/s, p<0.001).

**CONCLUSION:** Isotonic muscle power shows very high reliability and may be used in future studies examining the contributions of muscle power to physical function and mobility in COPD. The fixed MedUp is a valid device for assessing quadriceps muscle strength and may be more applicable to clinical settings, including pulmonary rehabilitation.
PATIENT ACTIVATION AND ENGAGEMENT IN PULMONARY REHABILITATION

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**BACKGROUND:** Pulmonary rehabilitation is an effective non-pharmacologic intervention for individuals with chronic lung disease. Patient activation (PAM-13) and patient engagement (PHE-s) tools have been developed to assess these constructs which are thought to affect health outcomes.

**AIMS:** The purpose of this study was to examine changes in patient activation and patient engagement in patients completing an outpatient pulmonary rehabilitation program. We explored associations between exercise and education sessions attended and patients’ post-program activation and engagement and explored whether a therapist’s subjective perception of activation and engagement and the measured PAM and PHE-s scores were related.

**METHODS:** We conducted this study over an eight to ten week period in three pulmonary rehabilitation programs. We administered PAM-13 and PHE-s questionnaires to eligible participants at the start and end of the rehabilitation. The demographic, clinical, functional and health-related quality of life data was collected and recorded for each participant.

**RESULTS:** The mean age of our sample of 19 participants were 67.8 years (8.9), with 68.4% being female. COPD was the most common type of chronic lung disease, n=13 (68.4%) with over 50% having moderate to severe disease severity. There was a significant improvement in PAM (mean change of 9.2±17.7, p = .037) and PHE-s (mean change 0.4±0.5, p = .005). We found no correlations between exercise and education sessions attended and patients’ post-program activation and engagement. Similarly, there was no correlation between the therapist’s perception and the actual scores measured pre-rehabilitation program.

**CONCLUSION:** Patient activation and patient engagement scores showed improvements following outpatient pulmonary rehabilitation in patients with chronic lung disease.

BEYOND THE SIX-MINUTE WALK TEST: PHYSICAL PERFORMANCE AND ACTIVITY STATUS IN ADVANCED CHRONIC LUNG DISEASE

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1University Health Network, Toronto, Canada. 2University of Toronto, Toronto, Canada. 3West Park Healthcare Centre, Toronto, Canada.

**RATIONALE:** The six-minute walk distance (6MWD) used in chronic lung disease to evaluate functional exercise capacity is influenced by respiratory limitations. This test may not reflect basic mobility, activity status and muscle function as well as other tests of physical performance and physical activity. Little is known about changes in muscle function or mobility during the wait for lung transplantation, or how these measures change with pre-transplant rehabilitation.

**OBJECTIVES:** To describe the change in mobility using the Short Physical Performance Battery (SPPB), activity level using the Duke Activity Status Instrument (DASI) and 6MWD during 6 weeks of pre-transplant rehabilitation, and explore the relationships among these measures.

**METHODS:** A retrospective study of all lung transplant candidates who were assessed, listed for transplant and underwent 6 weeks of exercise training between June 2016–September 2017. RESULTS: Forty-one lung transplant candidates were included (15 men, 58 ±13 years, 63% diagnosed with interstitial lung disease). After 6 weeks of rehabilitation, there were significant improvements in aerobic (treadmill and cycle) and resistance training volumes (p<0.001). 87% of candidates had a SPPB score of ≥10/12 at the start of rehabilitation. After 6 weeks of rehabilitation, the SPPB total score increased from a median of 11-12 (IQR 10-12) to 12 (I12), p=0.04, with improvement in the sit to stand component (10.7 ± 3 seconds vs. 9.8 ± 3 seconds, p=0.02). There were no changes in the DASI (median of 7.2 (1.8-10.0) vs. 7.4 (4.5-9.6), p=0.89) or the 6MWD (360 ± 99 m vs. 359 ± 99 m, p=0.94). The 6MWD and SPPB showed a moderate correlation at the start of rehabilitation (r=0.5, p=0.001) and after 6 weeks (r=0.4, p=0.005).

**CONCLUSIONS:** Improvements in physical functioning during pre-transplant rehabilitation may be captured more in tests of physical performance such as the SPPB than global measures of exercise capacity (6MWD) in advanced, progressive lung disease. Specifically, the sit to stand test may reflect the benefits of increased lower extremity muscle strength with rehabilitation. The impact of improved physical function on waitlist mortality and post-transplant clinical outcomes should be explored further.

OXYGEN ADMINISTRATION PRACTICES DURING EXERCISE TRAINING IN ONTARIO PULMONARY REHABILITATION PROGRAMS

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**RATIONALE:** Pulmonary rehabilitation (PR) is recommended for individuals with chronic lung disease to improve functional capacity and health-related quality of life. Individuals with moderate to severe lung disease may exhibit exertional hypoxemia. Clinical practice guidelines for oxygen administration during exercise training in PR are lacking.

**OBJECTIVE:** The purpose of this study was to describe clinical practices, facilitators and barriers of oxygen administration during exercise training during PR.

**METHODS:** A 5-item web-based survey of Ontario PR programs was conducted. PR programs were identified through an Ontario Lung Association database.

**RESULTS:** Forty-four of 81 identified PR sites responded (54%). A total of 56 eligible respondents from these sites initiated the survey resulting in 46 completed surveys and 10 partially completed surveys. Seventy percent of respondents reported oxygen administration protocols were available at their site. Common practice was to maintain oxygen saturation above a specified level with exercise, which was managed either by administering oxygen or by reducing or stopping exercise. The most common perceived facilitator was knowledge regarding the benefits of oxygen and the most common perceived barrier was oxygen administration outside professional scope of practice.

**CONCLUSIONS:** There is heterogeneity in oxygen administration practices in Ontario PR programs in regards to availability of oxygen protocols, professional training, authority to administer oxygen and methods for managing exertional hypoxemia during exercise training. Developing clinical guidelines around oxygen administration to support higher exercise training loads and maximize functional outcomes during PR is warranted.

LET’S BOOGIE: FEASIBILITY OF A DANCE INTERVENTION IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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Despite the benefits associated with individuals with COPD engaging in pulmonary rehabilitation (PR) programs, both attendance and adherence rates are poor. Following PR, the benefits diminish by 6 months. A new innovative rehabilitative approach is needed to increase motivation to exercise and to minimize diminution of effect. Dance is a fun and interactive activity, which has shown benefits in other populations, such as Parkinson’s disease and stroke. The aim of our study is to investigate the feasibility of dance intervention in individuals with COPD following PR. Twenty patients with COPD are being recruited to participate in a 1-hour dance classes delivered twice a week for 8 weeks. The classes feature different dance types (such as partnered and non-partnered) and genres (such as salsa, ballroom and jazz) with increasing complexity. The primary outcome measure of the study is the feasibility determined by enrollment rate, attendance rate, adverse events and participants satisfaction. The secondary clinical measures and outcomes of interest are functional capacity, balance, anxiety and depression, sedentary behavior and health related quality of life (HRQoL). To date, 14 participants have finished the program and other six are expected to finish it by the end of March 2018. Preliminary feedback indicates high participants’ satisfaction with the dance program. Participants who finished the program to date stated that they enjoyed the dance classes and that they would continue participating if they could. The results of this study will help guide a randomized controlled trial in the future.
Cutting Edge KT in Asthma

**CRC2018-0064**

**ARE IMPROVED GOVERNANCE MODELS NEEDED FOR ASTHMA BIOLOGICS?**

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2Department of Pediatrics, University of Alberta, Edmonton, Canada.
3Alberta Health Services, Edmonton, Canada.

**INTRODUCTION:** An adolescent female with mild asthma, atopy and autism was seen with her parents in a regional severe asthma (adult) clinic through the existing transitional asthma clinic. She also had generalized seizures and anxiety disorder. She lived on a farm. Her initial link to subspecialty respiratory care followed her move to the city, but accepting patients from another neighbouring town making it difficult for the patient to access the clinic. The PCAP educator arranged for a policy change to enable travel to the neighbouring clinic to see those patients). The results of the HEIA that were compiled by the PCAP Provincial Coordinator. A focus group was held, facilitated by the MOHLTC and the Centre for Addiction and Mental Health (CAMH), to review the results and discuss how this information can be used to make the delivery of our program more equitable across the province. During the focus group, each coordinator reviewed their own assessments and gathered information from other sites. Some sites were already across the province. During the focus group, each coordinator reviewed their own assessments and gathered information from other sites. Some sites were already aware of the impacts of the identified gaps (e.g., PCAP was only offered in one city, but accepting patients from another neighbouring town making it difficult for patients to access the clinic. The PCAP educator arranged for a policy change to travel to the neighbouring clinic to see those patients). The results of the HEIA that PCAP undertook were presented to The Lung Association – Ontario (TLA). Out of the six impacted populations identified by PCAP, TLA decided to address low literacy and language barriers by producing asthma resources that mitigated these issues. A pictorial triggers booklet was developed for educators to use with their patients with low literacy or English as a second language titled, Common Asthma Triggers: An Education Companion. TLA has also developed an asthma infographic to address these barriers as well. Using an assessment tool such as the HEIA and partnering with organizations such as CAMH and the MOHLTC, PCAP was able to identify program gaps and look at ways to improve asthma care by addressing their patient’s needs by changing policy and service on a local level and developing tools on a provincial level with TLA. As Canada moves towards a health care system looking at equitable delivery of care aligned with the National Lung Health Framework, our program will have to continually reassess delivery to provide effective care for all populations.

**CASE DESCRIPTION:** Referral to Pediatric Respiriology led to seven clinic visits over ten months confirming diagnoses, environmental allergens, and optimizing therapy with monteleukast, long-acting β-agonists, inhaled/nasal/oral corticosteroids, and antihistamines. Serial spirometry showed fixed mild airflow limitation without significant bronchoconstrictor response on therapy. Immunological assays showed elevated total and Aspergillus-specific immunoglobulin E with normal blood eosinophil levels. A biologic was suggested, and the patient met a company “therapy coordinator” to learn about their program for funding support and provision of required biologic injections. Adult transitional assessment resulted in discontinuing the above plan for biologics.

**DISCUSSION:** Concerns arose from this model of care due to direct and multiple contacts to patient and parents, particularly a vulnerable minor, after the patient declined therapy. Informed consent by the company included collection and storage of patient information outside of Canada, a stop access clause allowing the patient to no longer pay is concerning. These challenges highlight the need for improved biologics governance in Canada.

**CLINICAL IMPACT:** Although a few patients may benefit from biologics, the Canadian healthcare system must review governance policies at a government level for enrolment. Clinical recognition of conflicts of interest also requires review.

**CRC2018-0005**

**UTILIZATION OF THE HEALTH EQUITY IMPACT ASSESSMENT TO ENSURE EQUITABLE DELIVERY OF A PRIMARY CARE RESPIRATORY PROGRAM**

Sara Han, Diane Feldman, Carole Madeley

The Lung Association - Ontario, Toronto, Canada.

Ten Primary Care Asthma Program (PCAP) coordinators in Ontario completed the Ministry of Health and Long-term Care (MOHLTC) Health Equity Impact Assessment Tool and results were compiled by the PCAP Provincial Coordinator. A focus group was held, facilitated by the MOHLTC and the Centre for Addiction and Mental Health (CAMH), to review the results and discuss how this information can be used to make the delivery of our program more equitable across the province. During the focus group, each coordinator reviewed their own assessments and gathered information from other sites. Some sites were already aware of the impacts of the identified gaps (e.g., PCAP was only offered in one city, but accepting patients from another neighbouring town making it difficult for patients to access the clinic. The PCAP educator arranged for a policy change to travel to the neighbouring clinic to see those patients). The results of the HEIA that PCAP undertook were presented to The Lung Association – Ontario (TLA). Out of the six impacted populations identified by PCAP, TLA decided to address low literacy and language barriers by producing asthma resources that mitigated these issues. A pictorial triggers booklet was developed for educators to use with their patients with low literacy or English as a second language titled, Common Asthma Triggers: An Education Companion. TLA has also developed an asthma infographic to address these barriers as well. Using an assessment tool such as the HEIA and partnering with organizations such as CAMH and the MOHLTC, PCAP was able to identify program gaps and look at ways to improve asthma care by addressing their patient’s needs by changing policy and service on a local level and developing tools on a provincial level with TLA. As Canada moves towards a health care system looking at equitable delivery of care aligned with the National Lung Health Framework, our program will have to continually reassess delivery to provide effective care for all populations.

**CRC2018-0047**

**OMALIZUMAB USE IN SEVERE ASTHMA IN ALBERTA: A QUALITY ASSURANCE REVIEW**

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3Alberta Health Pharmaceutical and Health Benefits Branch, Edmonton, Canada.

**BACKGROUND:** Asthma is a chronic inflammatory airway disorder, with severe asthma (SA) accounting for 5-10% of cases. Many SA cases have immunoglobulin E (IgE)-mediated disease. Omalizumab (OM), an anti-IgE monoclonal antibody, was the first biologic introduced into Canada for SA in 2006, with demonstrated efficacy in clinical trials. However, OM is costly and long-term adverse effects are not clear. The Government of Alberta (GOA) has spent over $12 million dollars on OM drug funding from 2012 - 2017.

**METHODS:** Using administrative data from Alberta Health (including multiple disease related measures, and health system use), a retrospective review of OM use from 2012-17 from GOA data was conducted. We reviewed OM prescriber request, agency approval, and patient use from the GOA drug plan. We hypothesize that the process and special authorization in place are insufficient to determine proper effectiveness of OM for subsequent renewal.

**RESULTS:** A total of 106 individuals received OM through GOA; only 94 had a mandatory follow-up assessment. 87 individuals had a 12-months of use, with a mean increase in asthma condition and quality of life scores, as well as the mean FEV1 % predicted value (66.5 vs. 73.2 respectively). The mean days spent in hospital and Emergency Room visits due to asthma decreased (0.65 vs. 0.54, and 0.33 vs. 0.31 respectively). However, the mean number of physician and pulmonary specialist visits increased (2.68 vs. 3.19, and 4.34 vs. 5.64 respectively), as did the mean number of concurrent non-OM asthma medications (2.68 vs. 2.85 respectively).

**CONCLUSION:** OM was associated with improved asthma control, lung function, and disease-specific quality of life, and a decrease in emergency use and hospitalization. Given the observational nature of this analysis, and that other factors may account for improvements, such as interventions delivered through specialty pulmonary clinics, additional research is required to determine the clinical improvement attributable to OM.
CRC2018-0056

DETAILED UPTAKE ANALYSIS OF A TABLET-BASED ASTHMA PATIENT QUESTIONNAIRE USED IN PRIMARY CARE

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RATIONALE: Asthma is a chronic disease affecting 8.4% of Canadians and costing more than $2 billion annually. Although asthma guidelines recommend that clinicians assess asthma control at every visit, this is seldom performed in primary care settings. This study highlights the importance of continuing professional development including inter professional educational interventions to ultimately improve asthma care in the community. Financial support: This study was financially supported with education research funds from TEVA Canada.

RESULTS: A total of 234 community setting participants completed the study interview (n=43) or survey (n=190): FPs/GPs (n=87), Specialists (n=26), Nurses (n=26), Pharmacists (n=59), CREs (n=29), and non-HCPs (n=6). Nearly half (44%) of HCPs reported seeing over 51 patients with asthma/month. Six main gaps representing educational needs in asthma were identified: (1) Lack of knowledge of guidelines, (2) Lack of skills and confidence in diagnosis, (3) Misperception of the importance of spirometry, (4) Variability in skills and perceived importance of individualizing device type, (5) Lack of perceived importance of providing written action plan (6) Unclear sharing of roles and responsibilities for those providing patient education.

CONCLUSIONS: Six main educational gaps that contribute to sub-optimal asthma care in Canada were identified. Findings from this study underscore the need for greater access to and understanding of the role of spirometry, greater attention to individualized care regarding devices and action plans, and clearer roles and responsibilities for members of the healthcare team. This study highlights the importance of continuing professional development including inter professional educational interventions to ultimately improve asthma care in the community.

Table 1. Reasons tablet not provided during eligible visits and not completed when provided

<table>
<thead>
<tr>
<th>Reason tablet not provided</th>
<th>Number of visits (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient or caregiver declined</td>
<td>360 (41.5%)</td>
</tr>
<tr>
<td>Patient missed by liaison</td>
<td>303 (35.0%)</td>
</tr>
<tr>
<td>Patient claimed to not have asthma</td>
<td>55 (6.3%)</td>
</tr>
<tr>
<td>Physician indicated patient not suitable</td>
<td>47 (5.4%)</td>
</tr>
<tr>
<td>Technology issue (IT glitch, network issue)</td>
<td>50 (5.8%)</td>
</tr>
<tr>
<td>Tablet too difficult to use</td>
<td>22 (2.5%)</td>
</tr>
<tr>
<td>No reason provided</td>
<td>18 (2.1%)</td>
</tr>
<tr>
<td>Tablets in use by other patients</td>
<td>12 (1.4%)</td>
</tr>
</tbody>
</table>

CONCLUSIONS: Even with dedicated research liaisons at each site, the tablet-based questionnaire was delivered in only 50.5% of eligible visits. When successfully delivered, completion rate was high (91.4%). The most common reasons for failure to provide/complete the questionnaire were patient-related, including patient refusal, difficulty using the tablet, or not believing they have asthma. Logistical barriers included patients being missed by the liaison, patients being called in to the office before completion, and information technology issues. Future studies are required to address these barriers in order to optimize usage.

Financial declaration: AK is supported by the UofT Dawson Fellowship in Respiratory Medicine and the Thorpe Family Fellowship in Respiriology at St. Michael’s Hospital. SG is supported by the Michel and Lynne Lockie Chair in Knowledge Translation and Rare Lung Disease Research.

CRC2018-0044

THE PAN-CANADIAN RESPIRATORY STANDARDS INITIATIVE FOR ELECTRONIC HEALTH RECORDS (PRESTINE): DEVELOPMENT OF A NATIONAL DATA SET FOR ASTHMA AND COPD

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1Asthma Research Unit, Kingston General Hospital at Queen’s University, Kingston, Canada. 2Canadian Thoracic Society, Ottawa, Canada. 3University of Montreal, Montreal, Canada. 4Asthma Research Group Incorporated, Windsor, Canada. 5Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Canada. 6University of Saskatchewan, Saskatoon, Canada. 7Li Ka Shing Knowledge Institute of St. Michael’s Hospital, University of Toronto, Toronto, Canada. 8Western University, London, Canada. 9Southlake Regional Health Centre, Newmarket, Canada. 10The Lung Association of Ontario, Toronto, Canada. 11Stoney Creek Health Centre, Toronto, Canada. 12SickKids Research Institute, University of Toronto, Toronto, Canada.

RATIONALE: The goal of PRESTINE is to identify and define respiratory data elements and definitions for asthma (and related COPD and pulmonary function elements) for use in electronic health/medical records across Canada that may facilitate evidence-based clinical care, monitoring, surveillance, benchmarking and policy development.

METHODS: A Working Group (WG) panel of 12 experts in adult and pediatric respilometry focusing on asthma, COPD, pulmonary function testing, and health services/population health research was assembled. Potential elements were based upon a draft information model, a smoking cessation standards document and asthma and COPD performance indicators. Using a modified Delphi process, 4 rounds of voting were completed including a face-to-face facilitated consensus meeting. Elements were categorized as core, optional or exclude for Asthma and COPD independently. Consensus was defined as a majority of votes ≥60%.

RESULTS: Four hundred and twenty-five data elements were selected for review. After 4 rounds of voting, 149 elements were removed: 1 optional and 32 core redundant elements were collapsed and 116 excluded. The number of Core and Optional elements for asthma, COPD and elements common to both are illustrated in Figure 1. Definitions for each element are being finalized for external stakeholder review.
CONCLUSION: The PRESTINE WG identified 180 core and 42 optional elements for asthma, 124 core and 37 optional elements for COPD, and 64 asthma/COPD and smoking cessation medications. This standardization process has established an approach to defining elements for EHRs that support best practice. Implementation of these standards will enable outcomes monitoring, benchmarking and performance evaluation.

FUNDING: William M. Spear Endowment/Start Memorial Fund, Queen’s University

CRC2018-0010

USE OF AN ELECTRONIC ASTHMA MANAGEMENT AND OUTCOMES MONITORING SYSTEM (AMOMS) AND INTEGRATED ETOOLS FOR PATIENT CARE AND QUALITY IMPROVEMENT

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RATIONALE: The use of standardized data elements in Electronic Medical Records (EMRs) can support and enable asthma management and outcomes monitoring. For this project, we aim to describe how an asthma EMR system using integrated provider and patient eTools supports best practice, patient self-management, program evaluation and quality improvement.

METHODS: An Asthma Management and Outcomes Monitoring System (AMOMS) aligned with guidelines and provincial data standards was programmed and integrated into the hospital’s EMR. The system contains an Asthma Action Plan Wizard and is connected seamlessly to a patient/provider portal (AsthmaLife®), which houses asthma assessment eTools. De-identified electronic data was extracted from AMOMS for all asthma visits (January 2009 to July 2017) at Kingston General Hospital (KGH) and 7 Primary Care Asthma Program (PCAP) sites in Ontario.

RESULTS: AMOMS data were analyzed on 4485 visits made by 2210 individuals who attended the specialist clinic (8%), Asthma Education Centre (AEC)(70%), or a PCAP education appointment (22%) at which the clinician used at least one of the eTools (such as the Action Plan Wizard). Of all AEC and PCAP patients (1510 adults ≥18 years of age), 52.6 ±16.9 years [Mean±SD] and 595 children, 7.5±4.5 years of age; 60% female), their asthma diagnosis was confirmed by objective measures (18 years of age), 52.6 ±16.9 years [Mean±SD] and 595 children, 7.5±4.5 years of age; 60% female), their asthma diagnosis was confirmed by objective measures (34%) or suspected (49%). The proportion of AEC and PCAP individuals with an individualized action plan increased at each visit. In 1027 who had 2 or more visits, the number of patients with a written or electronic Asthma Action Plan increased (34%) or suspected (49%). The proportion of AEC and PCAP individuals with an individualized action plan increased at each visit. In 1027 who had 2 or more visits, the number of patients with a written or electronic Asthma Action Plan increased from 39% at Visit 1 to 68% by Visit 2 (p<0.001). The percentage whose asthma was controlled (green zone) or partly controlled (yellow zone) increased significantly (p<0.001), with corresponding reductions in the proportion with uncontrolled asthma (red zone) (Figure 1).

CONCLUSION: Asthma patient and program reporting was feasible using standardized, extractable asthma data elements entered electronically at the point of care. Collection of defined, standardized data is enabling performance measurement, benchmarking and continuous quality improvement.

FUNDING: The Government of Ontario, AllerGen NCE, SEAMO Innovation Fund

Cutting Edge KT in COPD and Ultrasound

CRC2018-0035

BEYOND DISSEMINATION: A KNOWLEDGE TRANSFER STUDY TO IMPLEMENT AND EVALUATE AECOPD-MOB, A CLINICAL DECISION-MAKING TOOL FOR HEALTH CARE PROFESSIONALS MOBILIZING HOSPITALIZED PATIENTS WITH AN ACUTE EXACERBATION OF COPD

Ori BenAri1, Gail Dechman2, Ashley Kirkham1, Alison Hoens1, Rosalyn Jones3, Agnes Black1, Frank Chung3, Preeya Dajee4, Amy Ellis5, Beena Parappilly1, Chiara Singh6, Philip Sweeney1, Pat Camp7
1University of British Columbia, Vancouver, Canada. 2Dalhousie University, Halifax, Canada. 3Vancouver Coastal Health, Vancouver, Canada. 4Providence Health Care, Vancouver, Canada. 5Fraser Health Authority, Burnaby, Canada. 6Fraser Health Authority, Surrey, Canada.

RATIONALE: Physical activity and exercise are important components in the recovery of patients with acute exacerbations of COPD (AECOPD); however, there are few guidelines for prescription of physical activity for these patients. The AECOPD-Mob is a clinical decision-making tool for safe and effective exercise prescription for hospitalized patients with AECOPD but this tool has not been disseminated and implemented in clinical practice. This knowledge translation (KT) study examines the usability of three adapted formats of the AECOPD-Mob original paper version; an interactive learning module (LM) with videos and photos; a smartphone application (app) which includes safety assessment questions and suggested exercise prescriptions; and a traditional inservice presentation.

METHODS: Newly-graduated (within 3 years) physiotherapists (PTs) and nurses from five acute care hospitals were recruited. They received the paper format and the three adapted formats of the AECOPD-Mob tool and completed a questionnaire that identified their barriers to KT. After three weeks, the participants completed a system usability questionnaire and reported on the usability and experience with the different formats of the AECOPD-Mob tool via focus groups.

RESULTS: To date, 9 PTs and 5 nurses have participated in the study. Preliminary results from the PTs are available in Table 1.

CONCLUSIONS: This KT study provides information about the usability of the different AECOPD-Mob formats. Among the physiotherapists, the paper version was the most positively received format of the tool. Future work will evaluate the long-term use of the different versions in clinical practice and the impact of AECOPD-Mob on patient outcomes.

Table 1. Preliminary Results

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Barriers to Knowledge Translation</th>
<th>Focus Group Main Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, discipline, n F, PT, 9 time</td>
<td>Insufficient time 56%</td>
<td>Paper - most versatile, needs little to use.</td>
</tr>
<tr>
<td>Age range 20-29 years</td>
<td>100% Lack of information 11%</td>
<td>App - difficult to use at the bedside</td>
</tr>
<tr>
<td>Entry level MPT 78%</td>
<td>Difficulty applying research to patients 11%</td>
<td>- exercise pictures are helpful for prescription, and show how to apply best practice</td>
</tr>
<tr>
<td>Confidence with mobilizing</td>
<td>Somewhat 78% Very 22%</td>
<td>Poor understanding of statistics 11%</td>
</tr>
<tr>
<td>- Uncontrolled (Red Zone)</td>
<td>Lack of support from colleagues 11%</td>
<td>LM - interchangeable with LM in terms of content</td>
</tr>
<tr>
<td>Inservice</td>
<td>Enables discussion amongst colleagues</td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSION: Cutting Edge KT in COPD and Ultrasound
THE INSPIRED COPD SPREAD COLLABORATIVE: AN UPDATE
Jennifer Buckley1, Jennifer Verma1, Graeme Rocker2
1Canadian Foundation for Healthcare Improvement, Ottawa, Canada. 2Nova Scotia Health Authority, Halifax, Canada.

BACKGROUND: The global prevalence of Chronic Obstructive Pulmonary Disease (COPD) is high and rising. In Canada COPD is the primary cause of an adult hospital admission. The INSPIRED COPD Outreach Program9 implemented in Halifax in 2010 is a holistic evidence-and community-based outreach program that addresses gaps in care for those with advanced COPD. Building on consistent and highly cost-effective reductions of hospital admissions, emergency room visits and lengths of stay, the Canadian Foundation for Healthcare Improvement (CFHI) delivered the “INSPIRED Approaches to COPD: Improving Care and Creating Value Collaborative” involving 19 teams in the 10 provinces. Teams implemented INSPIRED-like projects locally that provided disease self-management education, optimization of pharmacological/non-pharmacological treatments, creation of “action plans” for management of acute exacerbations, provision of psychosocial-spiritual support, and engagement of patients/family caregivers in advance care planning (ACP) discussions. Building on earlier publications related to the collaborative (1, 2) we present additional outcome data from 4 teams.

METHODS: System-related outcomes for patients meeting criteria of advanced COPD (MRC dyspnea score 4 or 5 and previous hospital admission in prior 12 months) was compared over 6 or 12 months before and after enrollment in local INSPIRED projects.

RESULTS: Table 1. 6 Months data from 4 teams (12 months for PEI).

Table 1.

<table>
<thead>
<tr>
<th></th>
<th>ER Visits</th>
<th>Admissions</th>
<th>Length of stay</th>
<th>Cost Aversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joseph Brant Hospital, Burlington, ON</td>
<td>n = 61, ↓ 30%</td>
<td>n = 61, ↓ 22%</td>
<td>Not available</td>
<td>$1,527,019</td>
</tr>
<tr>
<td>Health PEI (12 month data)</td>
<td>n = 31, ↓ 38%</td>
<td>n = 59, ↓ 37%</td>
<td>n = 59, ↓ 32%</td>
<td>$269,028</td>
</tr>
<tr>
<td>Alberta Health Services (Edmonton Zone Continuing care)</td>
<td>n = 50, ↓ 47%</td>
<td>n = 50, ↓ 54%</td>
<td>n = 50, ↓ 60%</td>
<td>$1,054,053</td>
</tr>
<tr>
<td>Horizon Health Network, NB</td>
<td>not available</td>
<td>n = 293, ↓ 57%</td>
<td>n = 293, ↓ 38% for 7 hospitals</td>
<td>$1,027,186</td>
</tr>
</tbody>
</table>

* Based on estimated local costs of ED visit and/or admission/day

CONCLUSION: Similar to previous reports, 4 additional teams in the INSPIRED spread collaborative demonstrated reduced facility reliance and associated costs. A 2nd scale collaborative will fund 6 provincial teams to extend the “INSPIRED” approach more widely.

2Verma JY et al. Chron Respir Dis 2017

CHRONIC OBSTRUCTIVE PULMONARY DISEASE QUALITY STANDARD: GUIDING EVIDENCE-BASED, HIGH-QUALITY CARE IN THE COMMUNITY FOR PEOPLE WITH COPD IN ONTARIO
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BACKGROUND: Health Quality Ontario is mandated to set provincial clinical standards and works collaboratively with clinicians, researchers, administrators, health system stakeholder organizations, patients and their families to develop quality standards on a wide range of topics. A quality standard on providing care in the community for people with chronic obstructive pulmonary disease (COPD) is currently under development.

OBJECTIVE: To develop a COPD quality standard—a concise set of statements with associated quality indicators and supports for adoption and implementation—based on the best available evidence, guided by an interdisciplinary advisory committee from across Ontario.

METHODS: Work began in late-2016 to develop a quality standard focusing on providing care in the community for people with COPD. The development process included background research and scoping, open call for recruitment of advisory committee members, identification of stakeholders, analysis of Ontario data, selection and critical appraisal of clinical practice guidelines, prioritization of outcomes and topic areas in need of improvement in the province, development of quality statements and indicators, development of recommendations for adoption, and public consultation.

Quality statements and indicators were developed based on topic areas identified through an environmental scan, a review of guideline recommendations, and an analysis of responses gathered during advisory committee member recruitment. Topic areas were prioritized as key areas for quality improvement by advisory committee members via survey. Recommendations for adoption of the quality standard were developed through an environmental scan and extensive stakeholder engagement in the health care system.

RESULTS: Based on the topic area prioritization process, the 24-member advisory committee, co-chaired by a respiratory specialist and a primary care physician with expertise in respiratory care, developed 13 quality statements addressing care in the community for people with COPD related to: diagnosis, comprehensive assessment, multidisciplinary care and specialized respiratory care, self-management intervention, smoking cessation, pharmacological management, vaccinations, pulmonary rehabilitation, long-term oxygen therapy, management of acute exacerbations of COPD, and follow-up after hospitalization.

CONCLUSIONS: The COPD Quality Standard provides an evidence-based resource outlining what high-quality care looks like to help clinicians and health care organizations prioritize improvement efforts and measure success.
**CRC2018-0060**

**ADDRESSING UNMET EDUCATION NEEDS IN COPD AND ALPHA-1 ANTITRYPSIN DEFICIENCY: A CANADIAN SURVEY**

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**RATIONALE:** There are many unmet needs in the diagnosis and treatment of Alpha-1 antitrypsin deficiency (AATD), the only known genetic cause of COPD. The Canadian Thoracic Society recommends that everyone with AATD diagnosed before 65 years of age or with a smoking history of <20 pack-years be tested for AATD, but this is rarely done. Even when a patient has been diagnosed with AATD, proper non-pharmacological and pharmacological treatment (non-specific and specific, i.e., augmentation therapy) is not granted. The existing Living Well with COPD program would like to improve awareness of AATD amongst people living with COPD and the healthcare professionals caring for them.

**METHODS:** An online survey was developed by a panel of clinicians, academics and one patient, working in the field of AATD. The survey’s objective was to determine patient experiences with the disease and the healthcare system, and to identify unmet educational needs. The online survey was sent via e-mail to people enrolled with Alpha-1 Canada (irrespective of their disease status).

**RESULTS:** A total of 94 people diagnosed with AATD responded the survey between September 29 and October 20, 2017. In 34% of the cases, it took > 5 years to receive a diagnosis from the time patients reported symptoms to their treating physician. An exercise program was recommended in only 40% of the cases. The participants identified disease impacts on their quality of life (72.5%), on their work (42.5%) and on their family (48.75%). The majority knew about other resources available such as the Alpha-1 Canadian registry (92.5%) and AlphaNet Canada (80%). Finally, only 46% of the respondents were treated with augmentation therapy.

**CONCLUSIONS:** This study identified care gaps in the patient experience with respect to diagnosis and treatment of AATD. This information will be used to provide improved education and support to Canadians affected by AATD (via organizations such as Alpha-1 Canada, the Alpha-1 Canadian registry and AlphaNet Canada) and to people living with COPD (via resources such as the Living Well with COPD program).

**FINANCIAL SUPPORT:** Educational grant by Grifols provided to RESPIPLUS, a non-profit organization.

**CRC2018-0027**

**AN INNOVATIVE POINT-OF-CARE TOOL TO IMPLEMENT THE 2017 GOLD REPORT IN PRACTICE**

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**RATIONALE:** Updated guidelines for the optimal treatment of chronic obstructive pulmonary disease (COPD) were outlined in the Global Initiative for COPD (GOLD) 2017 report. The report emphasized a personalized treatment approach based on respiratory symptoms measured by the COPD Assessment Test (CAT) or mMRC scale, and exacerbation history. Further, the report introduced strategies for escalation and de-escalation of pharmacotherapy, including combination inhaler use (LAMA/LABA) and appropriate use of ICS. The purpose of this study was to assess Canadian COPD management practices and evaluate the effectiveness of the online point-of-care (PoC) tool to increase adherence to the GOLD 2017 recommendations.

**METHODS:** Canadian respirologists (n=42) and family physicians (FPs, n=102) used Vivomap®, a Web-based application, to input COPD management practices for 10 eligible patients (n = 1,089). Inclusion criteria included a diagnosis of COPD and ≥35 years old. The application consisted of (1) a pre-assessment survey regarding physicians’ baseline knowledge of the GOLD recommendations, (2) a patient-completed iPad form assessing CAT, mMRC, and exacerbation history, and (3) a physician-completed PoC assessment, which provided GOLD treatment recommendations, reinforced by prompts triggered at treatment decision points.

**RESULTS:** In the pre-assessment survey, physicians’ average knowledge of the GOLD recommendations was rated as 41.5%. Despite this high score, reported CAT and mMRC usage was low (25% and 43% of physicians reported regular use, respectively) with 59% of patients having persistent symptoms. Further, physicians and patients reported different frequencies of exacerbations in 28% of cases (10% physician underestimation; 7% physician overestimation; 11% patient responded “I don’t know”). Following the PoC assessment, 54% of physicians indicated they would change their treatment regimen to adhere to GOLD recommendations.

**CONCLUSIONS:** Adoption of the GOLD 2017 recommendations into practice was made evident by changes in treatment regimens after use of the CAT and review of exacerbation history. Changes in treatment included the increased use of combination inhalers in appropriate patients, and the decreased use of ICS in stable patients. This study suggests PoC feedback was effective at optimizing the treatment of Canadian COPD patients.

**FUNDING:** This program was supported in part by an educational grant from Boehringer Ingelheim.

**CRC2018-0011**

**WATCH, COACH, REPEAT. EVALUATING METERED DOSE INHALER TECHNIQUE IN PATIENTS ADMITTED WITH EXACERBATIONS OF CHRONIC OBSTRUCTIVE LUNG DISEASE IN A COMMUNITY TEACHING HOSPITAL**

Laura Istanboulian, Dr. Ian Fraser, Irene Andress, Sarah Copping, Carolina San Jose, James Callahan

Michael Garron Hospital, Toronto, Canada.

Inhaled bronchodilators are the mainstay of treatment for chronic obstructive lung disease (COPD). The metered dose inhaler (MDI) is a common device used to deliver inhaled bronchodilators. Correct technique is imperative to deliver this treatment to the targeted site of action and provide relief of symptoms. Hospital-based education can decrease MDI misuse and contribute to overall improvement in patient symptoms (De Tratro et al., 2014). Despite the availability of numerous coaching tools and online videos, studies continue to show that patients misuse the MDI, and consequently are not getting the medicine they are prescribed and require to breathe (Sanchis et al., 2016).

Michael Garron Hospital is a community teaching hospital located in Toronto, Ontario, with approximately 400 patient admissions per year for treatment of COPD exacerbations. To better understand the nature of MDI misuse we evaluated 35 patients admitted with a COPD exacerbation over a 2 month period using the Lung Association’s (LA) 5-point coaching tool for the MDI. Patients were also asked about their satisfaction with previous instruction, confidence in technique. The most common errors in inhaler technique included: not exhaling prior to taking an inhalation, deploying multiple doses at once, and not waiting between doses. Patients who use a spacer had a higher overall score than those who do not (65% vs. 53%). Less than half of the patients surveyed felt satisfied that they had adequate previous instruction, and only 63% reported that they felt confident in their technique. Patients requested more frequent demonstrations of how to correctly use the MDI, with simple and consistent instructions. Coaching sessions were on average 3.3 minutes long, making the LA 5-point checklist a feasible tool to use at the bedside.

This study shows that patients admitted to hospital with COPD exacerbations are not using the MDI correctly, and feel neither satisfied nor confident in their technique. Through this study we were able to better understand the nature of MDI misuse, and our patients’ needs, which can inform our future education initiatives and improve MDI technique and medication delivery.

Education and Innovation Development Grant, Michael Garron Hospital.
CRC2018-0032
A QUALITY IMPROVEMENT INITIATIVE TO STANDARDIZE THORACIC ULTRASOUND TRAINING FOR RESPIROLOGY HEALTHCARE PROVIDERS

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BACKGROUND: The favorable performance characteristics of thoracic ultrasound (TUS) has enabled it to become the standard of practice in many institutions for pleural procedures. Despite the growing adoption of TUS by respirologists, an absence of standardized training may lead to inconsistency in application and interpretation. Our group examined the efficacy of a one-day quality improvement (QI) initiative in TUS. Our main objective is to ensure that respirology practitioners at the University of Alberta are able to recognize common findings as established by the North American guidelines.

METHODS: Participants received one half-day of training through a combination of didactic teaching and hands-on practice led by 3 TUS experts. Topics covered included basic knotology, lung ultrasound (A-lines, B-lines, evaluation for a pneumothorax), and identifying/characterizing pleural effusions. A total of 9 participants attended the workshop, including 12 respirologists, 2 palliative care physicians, 2 respiratory fellows, and 2 thoracic oncology nurse practitioners. The workshop was evaluated through a pre- and post-intervention assessment, which included nine standardized knowledge-based questions with images and video clips. A brief poll was also conducted before and after the course.

RESULTS: Most participants received previous TUS training through residency training (7/19) and weekend workshops (5/19). Common barriers to TUS use cited by participants included a lack of experience or training and ultrasound accessibility. Average participant rating in their comfort level with TUS was 4.7/10 before and 4.7/10 after the course. The average score for the knowledge portion (nine questions) was 77.2% (pretest) and improved to 93.6% (post-test) after the course.

CONCLUSIONS: Our study demonstrates that a brief QI initiative with blended didactic and hands-on training in thoracic ultrasound, delivered to healthcare providers in respirology, can improve both operator confidence and basic interpretative skills. A 6-month follow-up survey to assess sustainability of knowledge and skill acquisition will be performed to inform future TUS training initiatives.

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Canadian Respiratory Conference

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Ottawa, Canada

Westin Ottawa
SHE’S BREATHLESS AND IT’S NOT ASTHMA OR HEART FAILURE.

IF SHE’S EXPERIENCING UNEXPLAINED DIFFICULTY BREATHING, IT COULD BE PULMONARY ARTERIAL HYPERTENSION (PAH).

- Initial symptoms are typically induced by exertion and include:¹
  - Shortness of breath
  - Fatigue
  - Weakness
  - Angina
  - Syncope
- If PAH is suspected, echocardiography should always be performed
- If echocardiography results are suggestive of PAH, refer the patient to a local Pulmonary Hypertension (PH) centre
  - A list of Canadian PH centres is available at: http://www.phacanada.ca/clinical-directory.

Reference: