

# CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) INTEGRATED CARE PATHWAY PROJECT: EVALUATION OF PATIENT OUTCOMES AND SYSTEM EFFICIENCIES

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## BACKGROUND

Chronic obstructive pulmonary disease (COPD) is a chronic progressive respiratory disease with partially reversible airway obstruction and lung hyperventilation progressing to increasingly frequent and severe exacerbations. The condition is mainly caused by smoking but may result from other causes such as environmental exposure or occupational hazards. Based on Statistics Canada survey data the prevalence of COPD is approximately 4% of the general population, or about 780,000 adults in Canada with 28,000 in Manitoba.<sup>1</sup> During the past decade, mortality rates for COPD have risen, particularly in women, and it is currently the fourth leading cause of death in Canada.<sup>2</sup>

Although not curable, COPD is mostly preventable and treatable at any stage of the illness. Management is aimed at preventing disease progression. This involves reducing the frequency and severity of exacerbations, alleviating respiratory symptoms such as dyspnea, improving exercise tolerance, providing prompt treatment of exacerbations and complications, improving health status and quality of life, and reducing mortality. By achieving and maintaining these goals for COPD patients, hospital admissions can be effectively reduced. At Seven Oaks General Hospital (SOGH), a community hospital in Winnipeg, Canada, over 25 patients per month present to its emergency department (ED) with COPD exacerbations, an average of 15 of these persons require a subsequent hospital admission.

To improve COPD management for patients with more advanced disease, the northwest sector of the Winnipeg health region with an investment from Manitoba's Patient Access Network (MPAN) launched a quality improvement initiative – the

COPD Integrated Care Pathway (COPD-ICP). The principal goal of the COPD-ICP initiative was to facilitate the development and implementation of an organized, proactive, interdisciplinary approach to COPD. We describe the outcomes of the COPD-ICP project in relation to this goal, that is, development of self-management strategies, management support and linking of resources for individuals with COPD in the northwest sector of Winnipeg.

## PROJECT DESCRIPTION

The COPD-ICP project adopted components of a model for Integrated Care Pathways that have been successful in the National Health System (NHS) in the United Kingdom and British Columbia's Central South Okanagan Valley and Vancouver Hospital & Health Sciences Centre.<sup>3,4</sup> The initiative was delivered by a respiratory therapist case manager from the Seven Oaks General Hospital (SOGH) in collaboration with the hospital's acute care services and primary care providers (PCP) throughout the northwest sector of Winnipeg. Its main purpose was to supply COPD participants with the tools required to manage their condition. The respiratory therapist case manager worked with participants and provided them with education on self-management strategies to improve independence and confidence in their daily care. The education sessions reviewed proper use of medications, prevention of flare-ups, management of COPD exacerbations (including the use of an "Action Plan" prescription), and exercise and management of progressive symptoms. The respiratory therapist case manager also coordinated patient referrals to appropriate COPD care resources such as smoking cessation, the Home Care Oxygen Program, Pulmonary Rehab Program and others based on disease severity.

The project had four main sources of intake: (1) referral by a PCP, (2) referral from the emergency department (ED) at SOGH, (3) referral from acute (inpatient) care at SOGH, and (4) referrals from specialists. Patient self-referrals were also accepted upon evaluation by the case manager but were not expected to enroll a high number of participants.

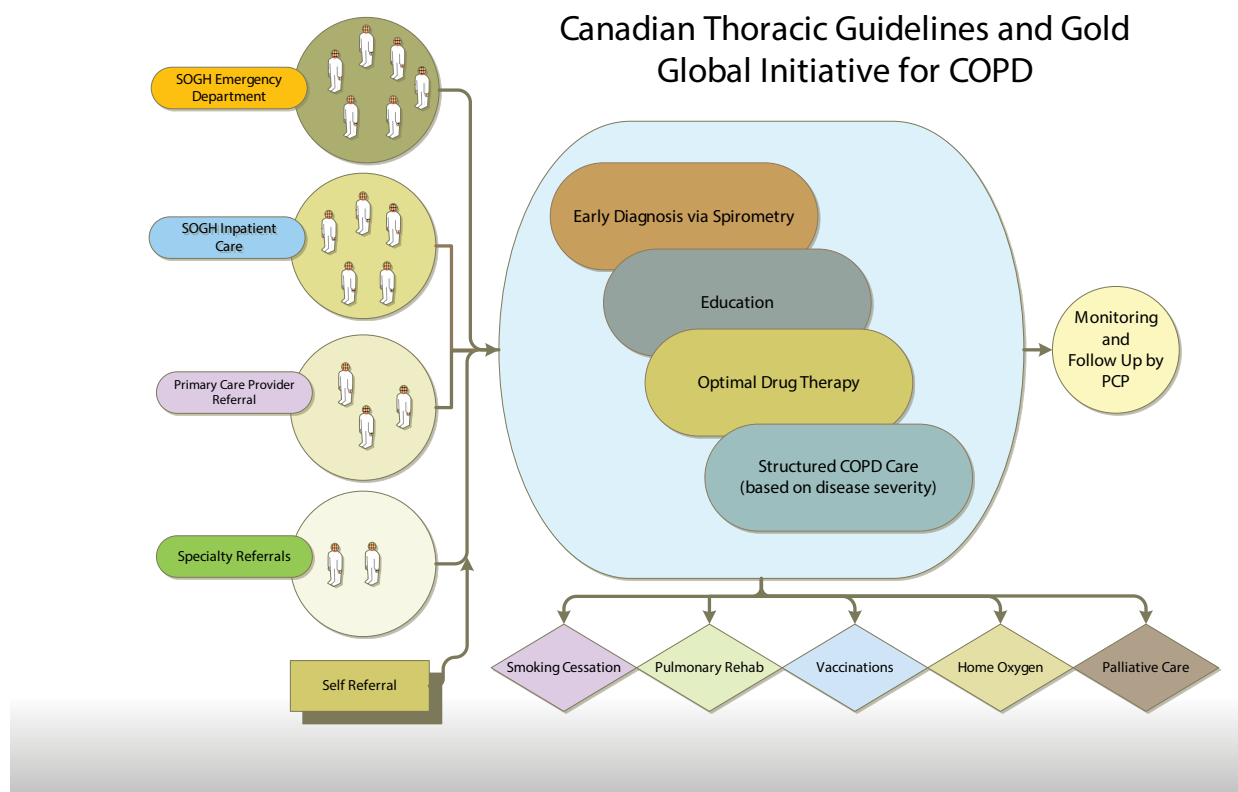
Eligibility criteria for the project included:

- Adults 18 years of age or older residing in Winnipeg’s northwest sector
- Diagnosis of COPD confirmed by spirometry and/or pulmonary function tests
- Functionally (mentally and physically) able to participate in the program
- No significant co-morbidities such as morbid obesity, advanced congestive heart disease, or cancer

Patient flow through the initiative had some key components applicable to all of the participants: education on prevention, proper medication use and self-management; confirmation of COPD by quality assured spirometry for those who had no record of

such testing in the past; robust assessment of patients to ensure optimal therapy based on best practice standards; immediate initiation of appropriate therapeutic agents according to patient management tools developed by the initiative (e.g., a Physician Order Set and COPD Exacerbation Care Protocol) for use by the ED in the event of an exacerbation; and referral to appropriate COPD resources as directed by disease severity. Each participant received individualized treatment dictated by their level of disability and tailored to their health care needs (Care Plan). The project maintained regular, proactive contact with patients and providers, transferring consistent information across primary and secondary care. It also delivered continual support for all participants in living daily with COPD and, in the case of a COPD exacerbation, it worked with the PCP and SOGH acute care to ensure immediate care and assistance to persons reporting a rapid worsening of their COPD symptoms. Other referrals from the project included the Home Oxygen Program and Palliative Care Program. Figure 1 illustrates the COPD patient flow pathway as facilitated by a Respiratory Therapist Case Manager.

**FIG 1** COPD-ICP patient flow algorithm as facilitated by a respiratory therapist case manager.



The COPD-ICP project evaluation followed a Plan-Do-Study-Act (PDSA) model of assessment. The PDSA model provides the means to assess project delivery and outcomes as they are evolving and it allows for continuous quality improvement. It operates on a logical sequence of four repetitive steps for ongoing improvement and learning and follows a simple spiral design: plan, try, observe the results, act on what is learned and repeat the process. During the course of project evaluation the PDSA cycle was repeated three times: at the start of COPD-ICP project (T1, 0 months); at 3 months (T2) and at 6 months (T3) into the study.

The RE-AIM framework<sup>5</sup> was used to assess the impact of the initiative's interventions on health related outcomes, and to estimate any potential economic benefits. The framework was developed to enhance the quality, speed and public health impact of knowledge translation from research to practice. It includes 5 steps: reach, effectiveness, adoption, implementation, and maintenance. These steps and the issues that were considered under each step are listed in Table 1.

## METHODS

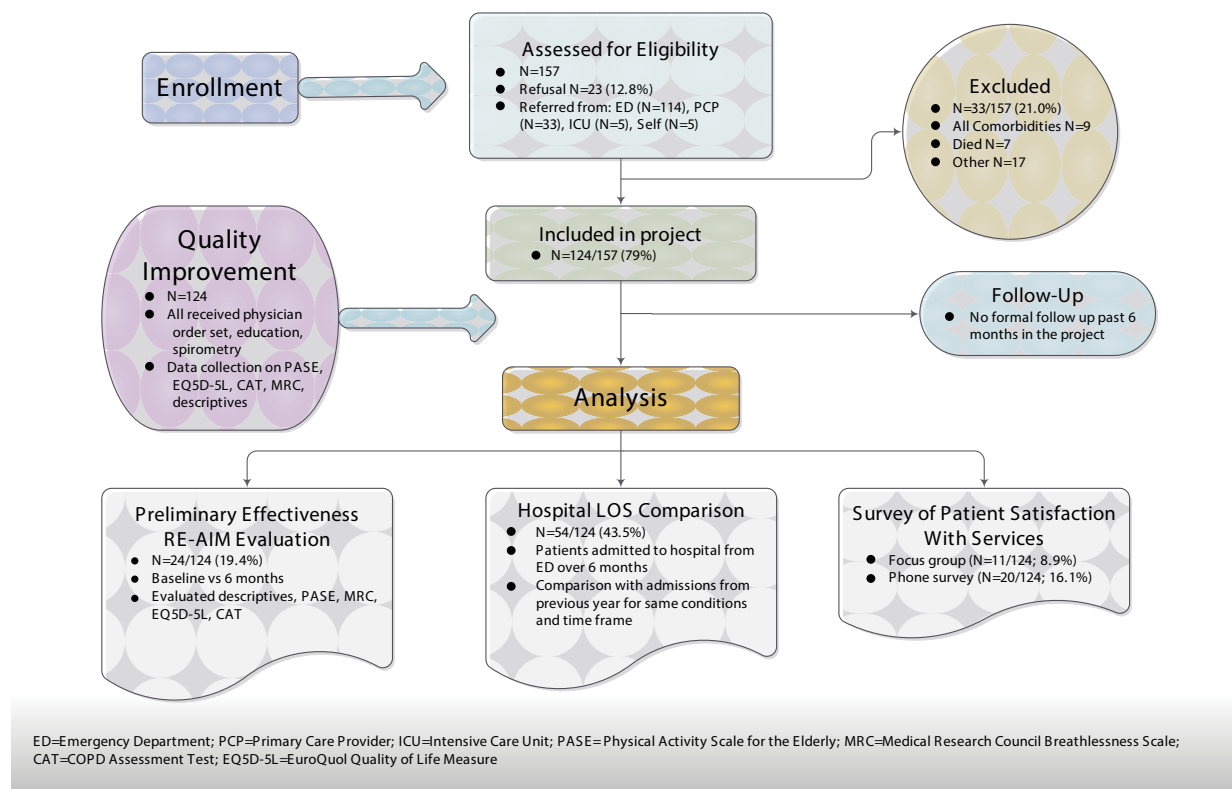
A schematic diagram of the project design is presented in Figure 2.<sup>6</sup> Descriptive statistics were used to report on the representativeness of the project's participants. These findings are summarized in the results section below.

The project's effectiveness on patient outcomes was evaluated for participants who completed a full 6 months in the program ( $n=24$ ). These individuals were evaluated based on a descriptive before and after analysis as well as a more formal repeated measures multivariate analysis. Parameters evaluated using descriptive methods were smoking cessation, COPD exacerbation management (symptom recognition, participant confidence, frequency of flare-ups), vaccinations (influenza, pneumococcal), use of a formal Action Plan, Medical Research Council (MRC) breathlessness scale,<sup>7</sup> and EQ5D-5L™ descriptive system (5 health dimensions).<sup>8</sup> Project outcome measures entered in the repeated measures

**TABLE 1** RE-AIM Framework and Questions Addressed During the COPD-ICP Evaluation

RE-AIM Element	Guidelines and Questions Asked
<i>Reach – Percent and representativeness of participants</i>	<ul style="list-style-type: none"> <li>• How many clients are enrolled/using the program?</li> <li>• How many clients were discontinued?</li> <li>• What are the clients' characteristics (disease and socio-economic where applicable)?</li> </ul>
<i>Effectiveness – Impact on key outcomes, quality of life, unanticipated outcomes and subgroups</i>	<ul style="list-style-type: none"> <li>• What is the program's impact on clinical parameters (pre- and post-intervention)?</li> <li>• What is the impact of program on client knowledge (pre- and post-intervention)?</li> <li>• What is the impact of the program on clients' behavior?</li> <li>• What are the effects of the program on clients' health?</li> <li>• How does the program impact on emergency department (ED) use by persons enrolled in the program?</li> </ul>
<i>Adoption – Percent and representativeness of settings and staff that participate</i>	<ul style="list-style-type: none"> <li>• How well has the program enhanced linkage, coordination, and integration across services for clients with COPD?</li> <li>• What were the barriers/facilitators to adoption of the COPD-ICP program?</li> </ul>
<i>Implementation – Consistency and cost of delivering program and adaptations made</i>	<ul style="list-style-type: none"> <li>• Were there any cost savings from program implementation?</li> </ul>
<i>Maintenance – Long-term effects at individual and setting levels, modifications made</i>	<ul style="list-style-type: none"> <li>• Can the settings sustain the program over time without added resources and leadership?</li> <li>• Project lessons learned.</li> <li>• Areas/gaps identified for improvement.</li> </ul>

**FIG 2** Flow diagram of the progress through the COPD-ICP initiative: enrollment, project inclusion, quality improvement and data analysis



multivariate analysis included the COPD Assessment Test (CAT) score,<sup>9</sup> EQ5D-5L™ -VAS (a quantitative general health measure) score and Physical Activity Scale for the Elderly (PASE) score.<sup>10</sup>

Parameters evaluated under adoption were information transfer/continuity of care, patient satisfaction, provider satisfaction, and program staff satisfaction. Patient satisfaction scores were obtained through administration of a patient satisfaction survey with questions in the following 10 domains: accessibility, availability of resources, continuity of care, outcomes of care, financial impact, humanness, information gathering, information giving, pleasantness of surroundings, quality, and competence. These domains were derived from a patient focus group conducted prior to the survey's design. Provider satisfaction was measured by a provider satisfaction survey developed in a similar manner. Staff satisfaction

was obtained through informal/unstructured interviews.

An analysis of the hospital length of stay (LOS) was done to determine any cost savings (system efficiencies) from implementation. Data on 54 participants who were recruited into the COPD-ICP project from the SOGH emergency department (after having attended the ED and being admitted to the hospital) were collected and analyzed. The average LOS for COPD-ICP participants was compared to the average LOS for COPD related conditions for the same time period from the previous year. Specifically, the combined average LOS value for COPD/Pneumonia (code 138) and COPD Exacerbation (code 139) was obtained from hospital records and used in an independent sample t-test to compare with the combined average hospital LOS for project's participants for the same conditions.

Finally, the maintenance/sustainability section of the evaluation describes the extent to which the initiative

becomes part of routine organizational practices and policies at the setting and individual level. Challenges, lessons learned and recommendations from undertaking the project are included in this section.

### RESULTS (Reach [N=157])

Between November 01, 2012 and May 31, 2013 a total of 157 patients were enrolled in the project (approximately 30 individuals were enrolled each month). SOGH averages approximately 400 admissions through the ED per year for COPD related conditions (COPD Exacerbation/Pneumonia/COPD with Respiratory Infection etc.) The program capacity was estimated at approximately 200 individuals with majority of referrals expected to come from the ED department. In total, 114 people were referred by ED, 33 by their PCP, and 5 referrals were obtained from SOGH inpatient care (ICU). Although specialist referrals were promoted as one of the major routes of participant recruitment, no specialist referrals were received. Five patients were enrolled through self-referral.

Out of the 157 individuals 33 persons discontinued their participation. Reasons for discontinuation are listed in Table 2.

Under the "Other" category, the reasons for discontinuation included misdiagnosis of COPD (as confirmed by spirometry;  $N=2$ ), death ( $N=7$ ), severe and complicated medical issues (other than obesity, palliative or severe cardiac disease;  $N=6$ ), not residing in the catchment area (northwest Winnipeg;  $N=7$ ), and inability/unwillingness to participate ( $N=5$ ).

The remaining 124 COPD patients were actively followed up for the duration of the project. Twenty four individuals (enrolled in November 2012) were followed for a full 6 months. Outcomes data for these 24 individuals was used

in the preliminary effectiveness evaluation of this project at 6 months.

The participant baseline characteristics upon enrollment were the following ( $N=157$ ): seventy nine participants were male (average age 71.0 years [SD 11.2]) and 78 were female (average age 71.4 years [SD 11.4]). The average duration of COPD since diagnosis in the entire group was 5.3 (SD 5.1) years. Segregated by gender, it was 4.4 (SD 5.5) years for males and 6.3 (SD 4.7) years for females.

The majority of the participants resided in postal code areas R2V (22.5%), R2W (14.8%), and R2X (14.8%), corresponding to the Garden City and North End community areas of Winnipeg. Twenty five (15.9%) participants continued to be employed outside of their home for the duration of the project.

The presence of co-morbid conditions was recorded during a thorough medical history taken for each participant. The most prevalent co-morbid conditions were arthritis (18.8%), hypertension (15.0%), and heart disease (9.4%). Patient medical history also included collection of information on risk factors such as allergies, family history, and environmental/occupational exposure. Seven individuals reported suffering from allergies to common environmental allergens such as tree pollen, dust, and animal hair and dander. Six participants suffered from allergies to medications. Fifteen participants reported a family history of lung problems and 6 had lung problems during childhood. Sixteen participants (10.2%) suffered from environmental/occupational exposure including smoke, coal dust, and other occupational hazards. None of the subjects had  $\alpha$ -1-antitrypsin deficiency. The average forced expiratory volume (FEV) was 53.7% (SD 20.3%) of predicted normal value. FEV measures how much air a person can

**TABLE 2** Reasons for Program Discontinuation

Reason for Study Exclusion	Number (N) of Discontinuations	Percent of Total (%)
<i>Language Barrier</i>	2	6.1
<i>Morbid Obesity</i>	1	3.0
<i>Palliative</i>	1	3.0
<i>Significant Primary Cardiac Disease</i>	1	3.0
<i>Other</i>	27	81.8
<i>Missing</i>	1	3.0
<i>Total</i>	33	100



exhale during a forced breath. Individuals with obstructive lung diseases typically cannot exhale as much air as a healthy person.

Select baseline characteristics of all participants enrolled in the program ( $N=157$ ) and the first 24 participants who completed the full 6 months (whose data was used for the effectiveness analysis below) are presented in Table 3.

EFFECTIVENESS ( $N=24/124$ )

## Descriptive Statistics

**Smoking**

Smoking history and status was collected at the beginning of enrollment. Eight participants self-identified themselves as current smokers and 13 participants as former smokers. The average duration of smoking was 46.2 pack years (1 pack year = 1

TABLE 3 Baseline Demographics of Participants

	All Participants $N=157$	Participants Who Completed 6 Months In Program $N=24$
<b>Mean Age Years (SD)</b>	71.2 (11.3)	72.3 (8.9)
<i>Male</i>	71.0 (11.2)	76.5 (8.3)
<i>Female</i>	71.4 (11.4)	70.0 (8.6)
<b>Sex <math>N(\%)</math></b>		
<i>Male</i>	79 (50.3)	10 (41.7)
<i>Female</i>	78 (49.7)	14 (58.3)
<b>Number of Comorbid Conditions*</b>	160	85
<i>Average per person in program (SD)</i>	1.0 (1.9)	3.5 (2.4)
<b>Smoking Status <math>N(\%)</math></b>		
<i>Current Smoker</i>	47 (29.9)	8 (33.3)
<i>Past Smoker</i>	98 (62.4)	13 (54.2)
<i>Non-Smoker</i>	11 (7.0)	2 (8.3)
<i>Missing</i>	1 (0.6)	1 (4.2)
<b>Average Years of COPD since diagnosis (SD)</b>	5.3 (5.1)	6.2 (5.1)
<i>Male</i>	4.4 (5.4)	6.3 (5.4)
<i>Female</i>	6.3 (4.7)	6.1 (5.2)
<b>Number of Allergies (%)*</b>	13 (8.3)	6 (25.0)
<b>Mean FEV1% (SD)</b>	53.7 (20.3)	60.1 (18.1)
<b>MRC</b>		
<i>Mean (SD)</i>	2.84 (1.0)	2.75 (0.74)
<i>Median</i>	3	3
<b>Number of ED Admissions**</b>	295	32
<i>Average per person in program (SD)</i>	1.9 (2.8)	1.3 (2.3)
<b>Most frequent FSA (<math>N</math>;%)</b>	R2V (32;22.5)	R2G (5;20.8)
	R2W (21;14.8)	R2V (4;16.7)
	R2X (21;14.8)	R2X (4;16.7)
<b>Employed Outside Home <math>N(\%)</math></b>	25 (15.9)	9 (37.5)
<b>Intake Method <math>N(\%)</math></b>		
<i>ED</i>	114 (72.6)	1 (4.2)
<i>PCP</i>	33 (21.0)	23 (95.8)
<i>ICU</i>	5 (3.2)	0
<i>Specialist</i>	0	0
<i>Self</i>	5 (3.2)	0

\*One person may have more than one co-morbid condition or allergy

\*\* For 12 months before enrollment in COPD-ICP project

pack of cigarettes per day per year). For the current smokers, the average amount smoked was 19.5 cigarettes per person per day. At the end of 6 months two smokers (20%) had quit and maintained their lifestyle change for the duration of their enrollment in the initiative (6 months).

#### ***COPD Exacerbation Management***

Three parameters of COPD exacerbation were measured: self-recognition of COPD exacerbation symptoms, confidence in being able to take action to prevent or minimize some symptoms or problems associated with COPD and participant application of their new COPD knowledge, which was measured via prevention of flare-ups, self-reported visits to the ED and length (in days) of self-reported hospital admissions.

Data analysis for this section shows that recognition of COPD exacerbation symptoms increased from 45.8% participants recorded at the baseline interview to 100% of participants after 6 months of enrollment in the program. Participant confidence in being able to take action and prevent symptoms/minimize problems of their condition increased from 5.2 to 8.2 (on a scale of 0=not at all confident to 10=completely confident) after 6 months in the program. Finally, self-reported frequency of flare-ups decreased from 41 flare-ups in the 6 months preceding entry to the project to 5 flare-ups during 6 months of continuous enrollment; self-reported ED visits decreased from 9 visits for 6 months prior to the project's start date to 5 ED visits after 6 months of enrollment – a 44% decrease in ED visits; hospital admissions were self-reported by 3 individuals within 6 months prior to the project's start date and none were reported during enrollment for an estimated saving of 33 hospital days.

#### ***Vaccinations***

Yearly influenza vaccinations and pneumococcal vaccinations every 5 years are recommended for individuals 65 and older as preventive measures for morbidity and mortality from these illnesses. Seventeen individuals reported getting their flu shot before joining the program and an additional 3 while in the program. Pneumococcal vaccines were received by 17 program recipients before the start of

the project and an additional four persons received the vaccine during the course of the project.

#### ***Action Plan (AP) Form***

The AP form includes a prophylactic prescription for antibiotics and corticosteroids signed by the patient's attending physician and filed at their pharmacy for use in case of a COPD exacerbation. Five participants completed the form with their physicians during the course of the program as compared to none before the project's start date. In general, the AP form was the most problematic component of the initiative. It had poor uptake from the attending physicians and pharmacies as well as some lack of confidence in its use by participants. When asked about the AP some participants indicated that they wanted confirmation from a person with authority (PCP, pharmacist, case manager, etc.) that it was appropriate to use the form and fill the prescription. They were hesitant to act on their own even when their COPD symptoms worsened.

#### ***MRC Breathlessness Scale***

Breathlessness is a multifactorial subjective symptom of respiratory disease. The MRC (Medical Research Council) Breathlessness Scale comprises 5 statements that define almost the entire range of respiratory disability from none (Grade 1) to almost complete incapacity (Grade 5). It quantifies the disability associated with breathlessness (rather than breathlessness itself) by identifying that breathlessness occurs when it should not (Grades 1 and 2) or by quantifying the associated exercise limitation (Grades 3–5). This scale was chosen for the project because it is widely used in the literature and provides a quick and accurate measure of participants' functionality, although it is not sensitive to change. It is uncommon for individuals to either improve or deteriorate by an entire grade over a short period of time.<sup>7</sup>

During their first interview all participants were asked to complete the MRC scale to grade the severity of their COPD symptoms. Upon entering the program the average MRC scale grade was 2.88 (SD 0.9). After 6 months participation in the COPD-ICP project this average decreased to 2.58 (SD 1.1). This finding did not reach statistical significance. These results are reported in Table 4.

**TABLE 4** Descriptive Comparison between Visit 1 (baseline) and Visit 2 (at 6 months) for EQ-5D-5L™, MRC, PASE and CAT Evaluation Tools (N=24/124)

<i>EQ5D-5L™ Component</i>	<b>Visit 1 (baseline)</b>		<b>Visit 2 (at 6 months)</b>	
	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>
<i>Mobility</i>	2.00	0.93	2.04	0.91
<i>Self-Care</i>	1.08	0.28	1.04	0.20
<i>Usual Activities</i>	1.79	1.02	1.96	1.04
<i>Pain/Discomfort</i>	2.21	0.98	2.67	0.92
<i>Anxiety/Depression</i>	1.75	1.07	2.04	1.00
<i>Summed Average Mobility to Anxiety Scores</i>	<b>1.77</b>	0.58	<b>1.95</b>	0.61
<b><i>EQ-5D-5L™ Visual Analog Scale (VAS) Score</i></b>	<b>69.21</b>	<b>17.93</b>	<b>73.79</b>	<b>12.81</b>
<b><i>MRC Component</i></b>	<b>2.88</b>	<b>0.85</b>	<b>2.58</b>	<b>1.06</b>
<b><i>PASE Score</i></b>	<b>105.21</b>	<b>69.1</b>	<b>106.38</b>	<b>58.87</b>
<b><i>CAT Score</i></b>	<b>18.00</b>	<b>6.3</b>	<b>14.63</b>	<b>5.9</b>

Note: Mobility, Self-Care, Usual Activities, Pain/Discomfort, Anxiety/Depression, MRC and CAT lower value is better; VAS and PASE higher value is better.

### ***Descriptive Analysis of Outcome Measures***

Three main patient outcome measures were selected to determine effectiveness of the project, the CAT, EQ5D-5L™ and PASE. The descriptive results for these measures (on the 24 participants who completed 6 months in the project) are summarized below:

- **CAT** – The COPD Assessment Test is a patient-completed questionnaire that assesses the impact of COPD (cough, sputum, dyspnea, and chest tightness) on the health status of people with this condition. It is designed to measure the impact of COPD on a person's life, and how this changes over time. The average CAT score decreased from 18.00 (SD 6.3) to 14.63 (SD 5.9) during the course of the project.
- **EQ5D-5L™** is a standardized instrument for measuring patient's general quality of life (QoL) and health outcomes. The EQ5D-5L™ descriptive system consists of five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. The instrument also includes a 20-centimeter visual analog scale (i.e., EQ-VAS) for the self-assessment of current overall general health (measured as percent out of 100). The average scores for each of the five dimensions of the EQ5D-5L™ were compared at visit 1 (baseline) versus visit 2 (after 6 months in the

project). The summed and averaged scores of individual dimensions stayed approximately the same after six months, 1.77 to 1.95 (–0.18 unit change). Using the VAS (a quantitative measure), participants rated their overall health as slightly better (4.6%) after 6 months participation in the project. The descriptive results for each domain and the VAS score are reported in Table 4.

- **PASE** – The PASE consists of 12 questions on physical activities undertaken within the last week. These activities are divided into leisure time activities and household activities. Each activity is weighed and then multiplied by the duration of time spent on the activity. A final score is calculated to reflect the amount of activity performed during a given week. Higher scores reflect more activity. The PASE scores were approximately the same for both visits, with a 1.17 unit improvement at the end of 6 months. Means for the first and last visit are reported in Table 4.

### **Repeated Measures Multivariate Analysis**

The repeated measures multivariate analysis was done with N=24 participants who completed 6 full months in the project. This analysis was conducted to determine if there was a significant difference between visit 1 (baseline) and visit 2 (6 month program enrollment) for CAT, EQ5D-5L VAS and PASE. The results of the overall multivariate



test were significant ( $p=0.021$ ). Examination of the univariate tests for significant differences was conducted with improvement in CAT scores being statistically significant ( $p=0.006$ ). The changes in the other two patient outcome measures did not reach statistical significance (EQ5D-5L™ VAS [ $p=0.158$ ] and PASE [ $p=0.932$ ]).

### Adoption

Adoption describes the transfer of knowledge between the project and its partners and participants as well as the feasibility of the initiative being adopted in other real world settings.

Forty five physicians ( $n=45$ ) were recruited to refer to the project from five medical clinics. However, only 25 physicians actually referred their patients. Other patient referrals came from a number of sources – the most common one being emergency department admissions (114/157, 72.6%). Primary care providers (PCPs) accounted for 33/157 or 21.0% of the referrals. Program staff ensured frequent communication between patients, providers and other health care resources. The most common specialty referral from the COPD-ICP project was to the Pulmonary Rehab Program (55/157, 35.0%).

Patient satisfaction with services provided by the program was measured via a focus group held with project participants ( $N=11/124$ ) and a telephone patient satisfaction survey ( $N=20/124$ ) based on the information obtained during the focus group. A copy of this satisfaction survey is provided in Appendix 1. Detailed results for each question of the survey are reported in Table 5.

Average participant rating of the project was 4.73 out of 5, a 94.6% satisfaction rating. Open ended questions were asked about facilitators and barriers of participation in the project. Facilitators included: (1) feeling less alone due to the opportunity to socialize with other people affected by COPD, (2) learning how to properly use inhalers (puffers), (3) learning and practicing breathing techniques, (4) smoking cessation (including help from project staff to maintain change – i.e., to stay smoke free), (5) interaction with project staff and undertaking an exercise program. Project barriers identified by survey respondents consisted mostly of challenges to maintain lifestyle changes such as smoking cessation

**TABLE 5** Mean Values for Patient Satisfaction with Services Phone Survey (Scores 1-5, Higher Is Better;  $N=20$ )

Domain	Question Number	Mean	Std. Deviation
<i>Accessibility</i>	1	4.80	0.83
	2	4.55	0.41
<i>Availability of Resources</i>	3	4.53	0.82
	4	4.38	0.70
<i>Continuity of Care</i>	5	4.53	1.19
	6	4.40	0.80
<i>Outcome of Care</i>	7	4.50	0.94
	8	4.60	0.89
	9	4.35	0.89
	10	4.58	0.79
	11	4.63	0.75
<i>Finances</i>	12	4.70	0.93
	13	4.85	0.73
<i>Humanness</i>	14	4.70	0.49
	15	4.85	0.57
	16	4.90	0.49
<i>Information Gathering</i>	17	4.84	0.31
	18	4.95	0.50
<i>Information Giving</i>	19	4.70	0.22
	20	4.84	0.57
	21	4.95	0.37
<i>Pleasantness of Surroundings</i>	22	4.95	0.22
	23	4.90	0.22
	24	4.95	0.31
	25	5.00	0.22
	26	4.95	0.00
<i>Quality and/or Competence</i>	27	4.50	0.22
	28	4.70	0.69
	29	4.80	0.47
	30	4.80	0.52

Note: Mobility, Self-Care, Usual Activities, Pain/Discomfort, Anxiety/Depression, MRC and CAT lower value is better; VAS and PASE higher value is better.

and an exercise regimen. Suggestions on how to improve the initiative centered on having it continued or offering it for a longer duration (including the offering of refresher courses), making the program more widely available to more people (convenience of location) and increasing the exercise component within the program.

Informal staff interviews were conducted at 6 months into the project's operations to elicit their feedback. The staff liked using the tools developed for

the project, specifically the Order Set for Emergency Department visits and the COPD Protocol used on the acute care units. They felt that the tools promoted patient centered practice. Limited participation by PCPs and the restricted geographical location for access posed some challenges in administration of the initiative. Feedback on health outcomes included satisfaction with improvements in the care patients received while in the project and development of patient relationships with care providers to facilitate patient trust, empowerment and self-management. Improvements listed expansion of the initiative to other sites, expansion of the project's registry and further development of palliative care support in this patient group.

Positive physician feedback on the project ( $N=6$ , a 24% response rate) addressed the immediate involvement and assessment of patients identified with COPD, patient education, confirmation of diagnosis via spirometry, ease of getting home oxygen monitoring for patients and a reduction in hospital LOS because of guided patient management. The project was seen as providing very good inter-professional care. The overall physician satisfaction with the project was 4.23 out of 5 (84.6%). Expansion of the program to other sites, increasing staffing, and increasing staff education about the initiative were suggested as future improvements to the program.

#### Implementation ( $N=54/124$ )

Fifty four participants were recruited into the COPD Integrated Care Pathway (COPD-ICP) project

from the SOGH emergency department (after having attended the ED and being admitted to the hospital) for Case Mix Group™ (CMG) codes COPD/Pneumonia (code 138) and COPD Exacerbation (code 139) from Nov 01/2012 to May 31/2013. Data on the hospital length of stay (LOS) of these individuals was collected and analyzed. The average combined LOS for both codes was 8.9 days (SD 4.8) per admission.

Length of stay for hospital admissions through the ED ( $N=225$ ) for 6 months from the previous year (Nov 01/2011 to May 31/2012) was obtained from hospital records for the same CMG codes (138 and 139). The average combined hospital LOS for the previous year was 13.8 days (SD 17.8). Table 6 outlines the descriptive statistics (means) for both groups.

An independent samples t-test was used to compare means between the project LOS and the hospital LOS for the same time period from the previous year. The test was highly significant ( $p<0.0001$ ), indicating that there was a substantial reduction in the hospital length of stay for individuals who participated in the COPD-ICP project. This amounted to an estimated 4.9 days saved per hospital admission and a total of 265 hospital days saved over the course of the project (4.9 days  $\times$  54 patients). Based on cost estimates for an average COPD admission per day the cost avoidance for the project was \$264,600.<sup>11</sup> Extrapolated to all SOGH ED admissions for CMG codes 138 and 139 for an average year the project had the potential of saving 1960 patient days (4.9 days  $\times$  400 admissions) and

**TABLE 6** Hospital Length of Stay Means for COPD-ICP Project (Nov 01/2012 to May 31/2013) versus All Hospital Admissions (Nov 01/2011 to May 31/2012) for CMG Codes 138 (COPD/Pneumonia) and 139 (COPD Exacerbation)

Length of Stay				
CMG Code	Group	Mean	Std. Deviation	N
COPD/Pneumonia (code 138)	COPD-ICP (Year 2012/2013)	10.12	5.36	26
	Previous Year Admission (2011/2012)	13.98	18.96	120
	Total	13.29	17.38	146
COPD Exacerbation (code 139)	COPD-ICP (Year 2012/2013)	7.86	4.06	28
	Previous Year Admission (2011/2012)	13.63	16.48	105
	Total	12.41	14.93	133
Total	COPD-ICP (Year 2012/2013)	8.94	4.82	54
	Previous Year Admission (2011/2012)	13.81	17.80	225
	Total	12.87	16.24	279

generating a cost avoidance of projected \$1,960,000. These resources could be reinvested in other areas of the health care system.

### **Maintenance**

This element of the RE-AIM framework describes the extent to which an initiative becomes part of routine organizational practices and policies at the setting and individual level. The COPD-ICP project was successful in improving patient outcomes and generating potential cost savings to the health care system that could be re-invested in other areas of care or in other areas of the Winnipeg health region. The project tools and management were transferred to site (SOGH) operations upon completion of the project. Several gaps in care were identified which could affect how routine the COPD-ICP program becomes including:

- Lack of COPD resources in community and poor linkages between health care sectors/ programs
- Need for earlier diagnosis and prevention
- Inconsistent use of electronic patient records and incomplete identification of patients at risk
- Lack of specialist leadership for COPD in the northwest sector of Winnipeg

The lessons learned during the project include:

- The largest gap in COPD care appears to be among PCPs (mostly family physicians). Patients presenting to SOGH with a diagnosis of pneumonia or congestive heart failure, often had underlying undiagnosed COPD contributing to the presenting illness. These individuals had rarely been referred to a respirologist and frequently remained untreated for their underlying COPD; this resulted in frequent recurring visits to the ED with pneumonia and heart failure.
- Participation in the Pulmonary Rehab program was often limited by the availability of its programs, parking costs, timing and length of program (for patients who were still employed) and transportation issues for elderly and/or oxygen dependent patients. Anecdotal reports indicate that further education is needed for family & caregivers in proper use and administration of COPD

medications and devices in addition to what is currently provided in the Pulmonary Rehab program. Also, consideration should be given to providing payment for oxygen cylinders as they are lifesaving for the persons with COPD.

- Although lack of a primary care provider (PCP) was identified as a potential risk, of the over 100 COPD patients that presented to the ED, only one did not have a primary care provider. The patient was referred to the onsite medical clinic at SOGH, and was accepted by one of the PCPs in this clinic.
- Communication, ongoing monitoring, attendance at Emergency Department rounds and huddles as well as review and identification of COPD patients by the COPD case manager (respiratory therapist) was needed to ensure all inpatient COPD patients were identified and followed appropriately. These processes were integral to the success of the project.
- Discharge planning tools and instructions for COPD patients need to be incorporated into existing discharge tools to prevent redundancy and ensure appropriate use.
- COPD tools and processes developed during the COPD-ICP project were helpful for acute care respiratory therapists by providing treatment guidelines.
- Staff feedback indicate that chronic disease self-management programs “Get Better Together” and “Hans Kai” (both operating in Winnipeg) have seen an increased level of participation as a result of referrals from patients involved in the COPD-ICP initiative
- The project has increased awareness of the impact of COPD on patients and health systems within the northwest sector of Winnipeg.

Finally, the following recommendations are made based on project experience and findings:

- Focused promotion of formal Action Plans may help to further reduce hospital admissions and LOS, further education and hands-on workshops may be beneficial for staff and patients alike.
- Linkages between health care services for

management of COPD need to be developed (Primary Care, PCPs, the Chronic Disease Collaborative, Home Oxygen program, Palliative Care, Home Care etc.)

- The initiative should be continued and expanded to other WRHA sectors (including its database and after hours services)
- Patient records should be linked to all services electronically for easier and earlier patient identification
- Standard for COPD diagnosis needs to be generated by PCPs for universal application (including spirometry)
- Telecare (telephonic support by qualified health care professionals) links should be further pursued for home-bound individuals and potentially for ongoing calls to maintain self-management

### CONCLUSION

Use of an integrated model of care for COPD self-management simplified the patient's journey through the health care system and helped to decrease variation in care of COPD patients presenting to Seven Oaks General Hospital in the northwest sector of Winnipeg. The simplified journey included the utilization of a respiratory therapist care manager and care paths, which are easily scalable and which helped divert COPD patients from acute care to alternate levels of community based care. Participation in the project resulted in an estimated \$264,000 cost avoidance from continuing care for COPD patients. Immediate patient management as per project protocols resulted in a decreased length of stay (LOS) of 4.9 days less per admission. In summary, the COPD-ICP initiative improved patient outcomes and provided significant cost avoidance in resources that could be re-allocated elsewhere in the health care system.

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**Appendix 1** Patient Satisfaction with Services Survey Tool

Patient Phone number \_\_\_\_\_

Date \_\_\_\_\_

			Rating 1 to 5 1= do not agree at all 5=completely agree					Comment (if $\leq 2$ ask respondent to explain their rating & enter here)
<b>Accessibility</b>	1	I found it easy to get the care that I needed	1	2	3	4	5	
	2	The hours of the program were convenient	1	2	3	4	5	
<b>Availability of resources</b>	3	I was able to contact the program easily when I needed to	1	2	3	4	5	
	4	The wait times in the program were short	1	2	3	4	5	
<b>Continuity of care</b>	5	It was easy to get a referral when I needed one	1	2	3	4	5	
	6	My doctor knew what was happening with me at the program during my regular visits	1	2	3	4	5	
<b>Outcome of care</b>	7	Participation in the program helped me to improve my overall health	1	2	3	4	5	
	8	I am able to better manage my condition	1	2	3	4	5	
	9	The action plan was helpful in managing my condition	1	2	3	4	5	
	10	The program made it less likely for me to have to go to the hospital emergency room	1	2	3	4	5	
	11	The program met my needs	1	2	3	4	5	
<b>Finances</b>	12	I did not lose any money by attending the program	1	2	3	4	5	
	13	The program gave good value to taxpayers for their money	1	2	3	4	5	
<b>Humanness</b>	14	The program staff listened to my problem	1	2	3	4	5	
	15	The program staff spent the right amount of time with me	1	2	3	4	5	
	16	The program staff were caring and responsive to my needs	1	2	3	4	5	
<b>Information gathering</b>	17	The program staff kept my information private/confidential	1	2	3	4	5	
	18	I did not need to repeat my information at different departments in the program	1	2	3	4	5	



		Rating 1 to 5 1= do not agree at all 5=completely agree						Comment (if $\leq 2$ ask respondent to explain their rating & enter here)
<b>Information giving</b>	19	The advice I got from the program staff was good for my condition	1	2	3	4	5	
	20	The education materials/ sessions from the program were clear and easy to follow	1	2	3	4	5	
	21	The staff fully answered all of my questions	1	2	3	4	5	
<b>Pleasantness of surroundings</b>	22	The facilities I used were clean and neat	1	2	3	4	5	
	23	The facilities were comfortable	1	2	3	4	5	
	24	I felt safe while using the facilities/attending the program	1	2	3	4	5	
	25	My privacy was respected at the facilities I used	1	2	3	4	5	
	26	The program staff were courteous and friendly	1	2	3	4	5	
<b>Quality and/or competence</b>	27	The program staff were competent	1	2	3	4	5	
	28	The quality of my medical care was ...	1	2	3	4	5	
	29	My overall satisfaction with the program is...	1	2	3	4	5	
	30	How likely would you be to recommend this program to your family and friends?	1	2	3	4	5	
<b>Open ended questions</b>	31	What are some of the things that you liked about participating in the program?						
	32	What are some of the things that made it hard for you to participate in the program?						
	33	In what way could we improve the program?						

**Thank you for taking the time to participate in this survey!**