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ORIGINAL RESEARCH

A Multi-Specialty Delphi Consensus on Assessing and Managing Cardiopulmonary Risk in Patients with COPD

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Background: In Canada, COPD represents a significant burden to the patient and health system, as it is often under or misdiagnosed and sub-optimally treated. Cardiovascular disease (CVD) is a common co-morbidity in COPD and there is significant interplay between these two chronic conditions. Across all stages of COPD disease severity, deaths can be attributed not only to respiratory causes but also to cardiovascular-related factors. The established links between COPD and CVD suggest the need for a greater degree of collaboration between respirologists and cardiologists. This modified Delphi consensus was initiated to consider how optimal COPD care can be delivered within Canada, with specific consideration of reducing cardiopulmonary risk and outcomes in COPD patients.

Methods: A steering group with interest in the management of COPD and CVD from primary care, cardiology, and respirology identified 40 statements formed from four key themes. A 4-point Likert scale questionnaire was sent to healthcare professionals working in COPD across Canada by an independent third party to assess agreement (consensus) with these statements. Consensus was defined as high if ≥75% and very high if ≥90% of respondents agreed with a statement.

Results: A total of 100 responses were received from respirologists (n=30), cardiologists (n=30), and primary care physicians (n=40). Consensus was very strong (≥90%) in 28 (70%) statements, strong (≥75 and <90%) in 7 (17.5%) statements and was not achieved (<75%) in 5 (12.5%) of statements.

Conclusion: Based on the consensus scores, 9 key recommendations were proposed by the steering group. These focus on the need to comprehensively risk stratify and manage COPD patients to help prevent exacerbations. Consensus within this study provides a call to action for the expeditious implementation of the latest COPD guidelines from the Canadian Thoracic Society.

Keywords: chronic obstructive pulmonary disease, consensus development, consultation and referral, primary care, health care, Canada

Background

Chronic obstructive pulmonary disease (COPD) is a heterogenous lung condition characterized by respiratory symptoms (eg, dyspnea, cough, and sputum production) due to airway abnormalities that often cause progressive airflow obstruction.[1,2] COPD is a common condition and typically affects those over the age of 35.[3] Tobacco smoking, including passive exposure, is a major risk factor causing 80–90% of COPD cases.[4] Other reasons include genetic predispositions, exposure of biomass fuel, occupational dusts and chemicals, and frequent lung infections.[4] In Canada, the prevalence of COPD is increasing.[5] The condition represents a significant public health concern with the impacts to both the individual,

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in terms of quality of life (QoL), and to the state, with lost productivity and increased health-care costs.[3,6] There is also a concern, in Canada that the number of COPD hospitalizations has increased by >70% over the past 20 years, whereas most other major causes of hospitalization have decreased during the same period.[7]

Guidance published in 2023 by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) states that suspicion of COPD should be considered in any patient with respiratory symptoms (eg, dyspnea etc), a history of recurrent lower respiratory tract infections and/or a history of exposure to risk factors for the disease.[1] This aligns with latest guidance developed by the Canadian Thoracic Society (CTS), which also states COPD diagnosis should then be confirmed through clinical evaluation and, most importantly, spirometry.[1,8] However, access to spirometry remains a challenge for many patients and this can result in delay in diagnosis or incorrect diagnosis.[2]

Hospitalization rates of individuals younger than 75 with confirmed COPD have increased to 86 per 100,000 population for the period 2011–2015.[9] However, misdiagnosis of COPD is common, and can lead to patients being placed on incorrect treatment pathways.[10] Evidence suggests that 5.1% of patients are over-diagnosed, while approximately 14% are undiagnosed,[10,11] resulting in uncertainty regarding the true disease burden.[10] It has been estimated that 17% of the population between the ages of 35–79 within Canada are affected by COPD.[5] Errors in diagnosis have been attributed to insufficient utilization and access to spirometry and a lack of adherence of established guidelines.[11] The problem is amplified due to the lack of practice adherence to recommended optimization by guidelines when patients are hospitalized leading to an increased rate of readmission within 30 days for a COPD exacerbation.[12] Variation in access to healthcare resources also further contributes to the problem.[11]

The link between COPD and cardiovascular disease (CVD), whilst not completely understood, is of paramount importance when considering management of both conditions. COPD and CVD share some common risk factors (eg, smoking, increased age, male sex, low physical activity, hypertension[13]), and symptoms (dyspnea and chest discomfort). However, the relationship of the conditions goes beyond this, and increasingly the overlap between conditions is referred to as a "cardiopulmonary continuum".[14] COPD is recognized as an independent risk factor for cardiovascular diseases.[13,15] Evidence suggests that individuals with COPD have a 2.5-fold risk of CVD compared with those without COPD,[13] and that CVD is the most common cause of morbidity and mortality in COPD, attributable to approximately 30–50% of deaths in individuals with COPD and is especially common in those with milder COPD.[16] A recently published retrospective population-based cohort study of nearly 143,000 individuals with COPD in Canada found significant increase in CV events following moderate or severe COPD exacerbations.[17] The risk of events increased for up to a year post-exacerbation and was highest for heart failure and arrhythmias.[17] Further research shows patients with COPD who have CVD (or increased CVD risk) have a 280% increased risk of a cardiovascular event in the first 30 days following a hospitalization for a COPD exacerbation.[18] Patients with COPD also face an increased risk of cardiopulmonary events and premature death. Within the Canadian population study, nearly one third of the deaths recorded were cardiac related.[17] Additionally, exacerbations were related to increased risk for all cause-death.

Variation in COPD care exists within Canada, and the ratio of respirologists to the total population in Canada is low (2.2/100,000),[19] suggesting that time available for follow-up for patients with COPD is limited. Access to specialists (who tend to be based in urban centers) is problematic for those in a rural or remote setting, resulting in the existence of COPD 'hotspots' with higher than average (up to 60%) hospitalization of patients with COPD compared with urban areas.[20]

The goals of COPD management are to alleviate respiratory symptoms, prevent and reduce exacerbations, minimize disease progression, manage comorbidities, and reduce mortality.[8,21] There is a need for both pharmacological and non-pharmacological (ie, smoking cessation, physical activity promotion, healthy diet, vaccination, and pulmonary rehabilitation) interventions.[22] Canadian treatment guidelines for COPD have adopted a new approach based on individual targeting of therapies based on patient's burden of symptoms and risk of exacerbations.[8] An opportunity exists to consider how earlier diagnosis and treatment can prevent exacerbations and reduce risk of cardiovascular complications.[23] Whilst such approaches would benefit from input provided by respirologists and cardiologists,[24] in Canada primary care plays a significant role in diagnosis and management of COPD.[25] Therefore, there needs to be an emphasis on collaborative approaches to diagnosis and management to ensure cohesive longitudinal care and to help improve health outcomes and reduce hospitalizations.

The established links between COPD and CVD suggest a greater degree of collaboration between respirologists and cardiologists, alongside earlier prevention from primary care, would potentially be beneficial. Managing COPD patients within a cross-functional team involving primary care, respirology and cardiology could lead to better outcomes for patients. This modified Delphi consensus was initiated to consider how optimal multidisciplinary COPD care can be delivered within Canada.

Methods

An initial context review was carried out to identify challenges in the methods for diagnosis, management, and treatment of COPD in Canada and to generate a prospective list of topics for discussion by a wider panel. In May 2023 a steering group of clinicians (the authors cited in this work) convened to review the current landscape of COPD diagnosis and treatment, and to ratify and systematically discuss the identified key topics. The steering group agreed upon the following areas:

1. Burden, awareness and cardiopulmonary risk
2. Case finding and assessment
3. Disease & risk factor management
4. Multidisciplinary approaches

The detailed discussion of these topics was supported by an independent Delphi facilitator (Triducive Partners Ltd). and culminated in the creation of 57 draft consensus statements by the group. These statements were anonymously ratified by the group members, and a final list of 40 consensus statements was developed. The statements were used to develop a 4-point Likert questionnaire for testing across a wider audience of clinicians involved in COPD care in Canada.

The questionnaire was distributed to physicians/family physicians (PCPs), respirologists, and cardiologists across Canada by an independent third party (Sermo); the identity of respondents was not known to the steering group. In addition to the Likert responses, the questionnaire also captured respondent province, gender (male, female, non-binary, transgender, prefer not to say), experience (as years in role), and typical volume of patients managed in a 3-month period. Experience was defined as either <5 years, 5–10 years, 11–20 years, and >20 years in their role. The minimum volume of (COPD) patients seen in a typical 3-month period was defined as 10–50, increasing in increments of 50 to a maximum of 300 patients per 3-month period.

Respondents were offered a 4-point scale to rate their agreement with each statement, ranging across "strongly disagree", "tend to disagree", "tend to agree" and "strongly agree". Completed questionnaires were collated and the individual scores for each statement analyzed to produce an arithmetic agreement score for each. The steering group defined the threshold for consensus at 75% a priori, a widely accepted threshold.[26] Consensus was defined as "strong" at ≥75% and "very strong" at ≥90%. The responses to consensus statements were analyzed in line with Delphi methodology.[27] It was agreed by the authors that a minimum of 100 responses would be appropriate.

The study was not considered human research according to Canadian Tri-Council Policy, and as such, Research Ethics Board review was not required. Survey respondents were presented with information about the study, their consent to participate was implied by completing the survey.

Results

Completed questionnaires from 100 responders were received and analyzed. All respondents were professionals involved in the management of people with COPD: PCPs (n=40); Respirologists (n=30); Cardiologists (n=30). Most responses were from Ontario (n=55), followed by Quebec (n=17), British Colombia (n=13) and Alberta (n=7) with 8 other responses: New Brunswick (n=3), Nova Scotia (n=2), Manitoba (n=1), Newfoundland and Labrador (n=1), and Saskatchewan (n=1).

Number of years in their role was split amongst the respondents (61%) having more than 10 years' experience in role (Figure 1); whereas the number of patients managed in a 3-month window tended towards the lower response levels. The majority (75%) of respondents identified as male with the remainder being female (23%) or preferred not to disclose (2%). Given the historical sex/gender bias in scientific research,[28] the steering group were keen to try and gain equal sex

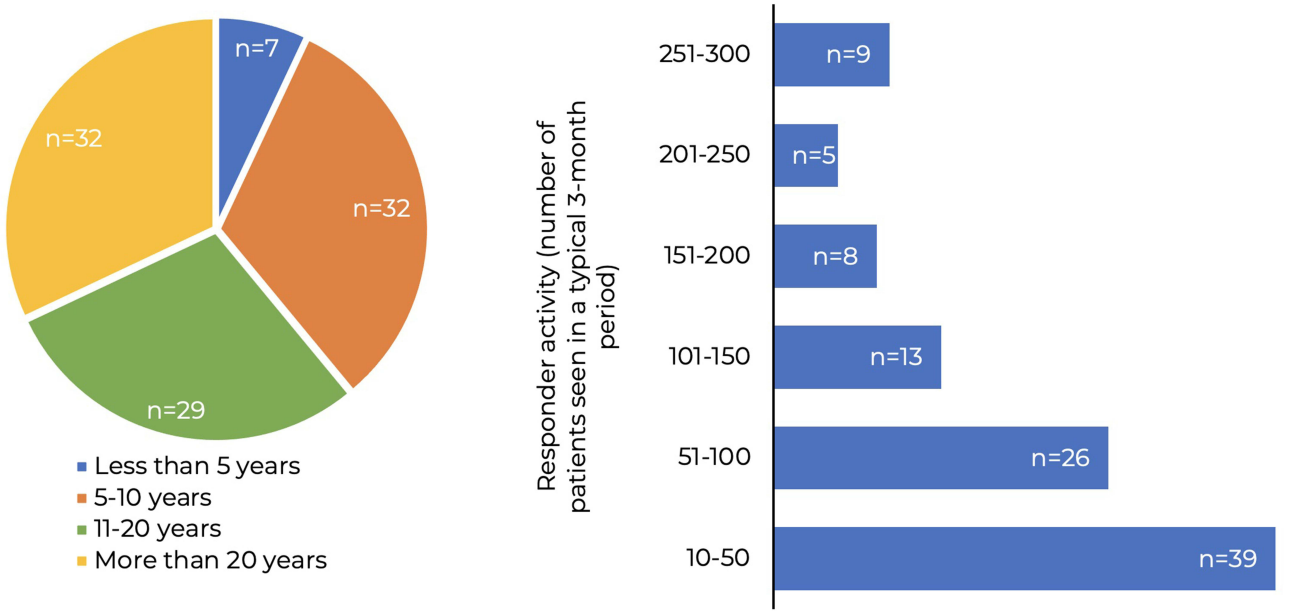

Figure 1 Respondents time in role (years) and responder activity (number of patients seen in a typical 3-month period).

representation in responses. When the bias towards male responses became obvious, the survey was halted for male responses and repeated attempts were made to try and reach more female physicians. The response window was also extended from four weeks to six to aid this, however, the responses remained unbalanced.

Overall, 35 statements achieved consensus (Figure 2), and responses according to topic are shown in Table 1. Consensus was very strong (≥90%) in 28 (70%) statements, strong (≥75 and <90%) in 7 (17.5%) statements and was not achieved (<75%) in 5 (12.5%) of statements. Consensus agreement by respondent role, province, and gender are shown in e-Figures 1–3 and e-Tables 1–3 along with the percentage response to each statement by category of response (e-Figure 4).

As 35/40 statements (87.5%) achieved consensus, the steering group elected to not to continue with additional rounds of survey.

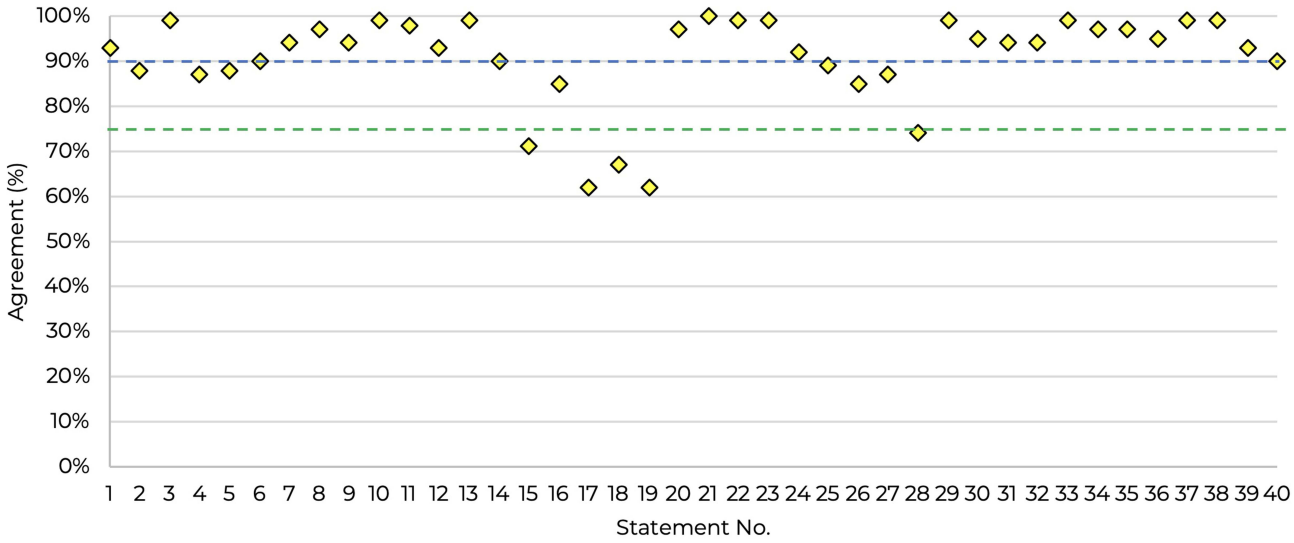

Figure 2 Consensus agreement levels by statement. Green horizontal line represents the 75% threshold for consensus agreement and the blue line indicates the threshold for very high consensus (90%).

Table 1 Statements Ratified by the Steering Group and Used in the Consensus Survey Presented Alongside the Aggregated Agreement Score

No:	Statement:	Agreement
	Topic A: Burden, awareness and cardiopulmonary risk	
1	COPD is underdiagnosed in Canada	**93%**
2	COPD is undertreated in Canada	**88%**
3	Patients with COPD have an increased cardiopulmonary risk due to the complex interplay between the pulmonary and cardiovascular systems	**99%**
4	At a general population level, the majority of deaths of COPD patients are related to CVD (cardiovascular disease)	**87%**
5	COPD is an independent risk factor for CVD (cardiovascular disease)	**88%**
6	All patients with COPD should undergo cardiac and pulmonary risk stratification	**90%**
7	Frequency and severity of COPD exacerbations is associated with CV mortality	**94%**
8	COPD exacerbations elevate the risk of having a CV event (MI/stroke) for up to 1 year	**97%**
	Topic B: Case finding and assessment	
9	Current COPD risk assessments do not sufficiently acknowledge the influence of cardiovascular risk and outcomes on the condition	**94%**
10	All patients with COPD should have their smoking status (including vaping and cannabis inhalation) documented	**99%**
11	Patients hospitalized with cardiovascular events should be vaccinated for influenza and pneumonia when indicated	**98%**
12	For cardiopulmonary risk stratification COPD patients should have a fasting lipid profile on diagnosis and yearly thereafter	**93%**
13	For cardiopulmonary risk stratification COPD patients should have their blood pressure documented on diagnosis	**99%**
14	For cardiopulmonary risk stratification COPD patients should be assessed for abnormal HbA1c on diagnosis	**90%**
15	For cardiopulmonary risk stratification COPD patients should be assessed for abnormal albuminuria on diagnosis	71%
16	For cardiopulmonary risk stratification COPD patients should be assessed for abnormal electrocardiogram (ECG) on diagnosis	**85%**
17	For cardiopulmonary risk stratification COPD patients should be assessed for abnormal natriuretic peptides (BNP)	62%
18	All patients with CVD (cardiovascular disease) who are not diagnosed with COPD should have the Canadian Lung Health Test administered	67%
19	All patients admitted to hospital with a CV event should be actively screened for COPD (eg, with the Canadian Lung Health Test)	62%
20	Every person with confirmed COPD should be assessed for risk of exacerbations using a validated risk prediction tool	**97%**
	Topic C: Disease & risk factor management	
21	Reduction in mortality and cardiopulmonary events should be a goal of COPD management and treatment	**100%**
22	Early COPD intervention and management before exacerbations occur is important for both the lungs and the heart	**99%**
23	Patients with both CVD and COPD should be intensively managed to positively impact outcomes for both conditions	**99%**
24	COPD patients who have acute exacerbations should be placed on single inhaler triple therapy (LAMA+LABA+ICS) to help prevent exacerbations, improve cardiopulmonary outcomes, and reduce readmission and mortality risk	**92%**
25	Symptomatic COPD patients should be placed on single inhaler triple therapy (LAMA+LABA+ICS) to help prevent exacerbations, improve cardiopulmonary outcomes, and reduce readmission and mortality risk	**89%**
26	Triple inhaler therapy (LAMA+LABA+ICS) should be prescribed on discharge after COPD exacerbation	**85%**

(*Continued*)

Table 1 (Continued).

No:	Statement:	Agreement
27	At hospital discharge prescribing of inhaled triple therapy (LAMA+LABA+ICS) has mortality benefits for cardiopulmonary COPD patients	**87%**
28	More than half of patients with COPD are discharged without appropriate disease modifying medication	74%
29	Patients admitted to hospital for acute COPD exacerbation should have cardiopulmonary risk factors optimized at discharge	**99%**
30	Patients admitted to hospital for a CV event should have their COPD optimized prior to discharge	**95%**
31	Cardio-selective beta blockers are preferred for patients with COPD, and should not be withheld when clinically indicated	**94%**
32	Beta-agonists in patients with CVD when clinically indicated should not be withheld if the patient has COPD	**94%**
33	Patients with COPD with both cardiac and pulmonary risk factors should be referred to appropriate rehabilitation centers when clinically warranted	**99%**
34	Post exacerbation all COPD patients require integrated multi-disciplinary care to comprehensively manage their disease and comorbidities	**97%**
35	Creation of joint cardio-respirology rehabilitation centers will help patient outcomes	**97%**
36	Guidelines for COPD management should be co-developed by respirologists, cardiologists, and primary care	**95%**
Topic D: Multidisciplinary working		
37	Optimizing cardiac and pulmonary care in COPD patients improves healthcare resource utilization (HCRU) and clinical outcomes	**99%**
38	The accuracy of cardiovascular risk prediction tools should be further evaluated in patients with COPD	**99%**
39	New tools are needed for cardiovascular risk prediction in patients with COPD	**93%**
40	Cardiologists should become familiar with COPD pharmacotherapy, so they become comfortable in initiating therapy in the event of absence of pulmonary specialized support	**90%**

Note: Agreement values above 75% are presented in bold.

Discussion

The results established strong agreement amongst physicians in Canada for most statements, establishing a set of principles for delivery of optimal COPD care. Results and implications are discussed by topic below (Note: in the discussion below statement numbers are referred to as S1, S2, etc).

Topic A: Burden, Awareness & Cardiopulmonary Risk

All statements in this topic achieved agreement, with respondents clearly recognizing the interplay between COPD and CVD (S3, 99%; S5, 87%), and evidence suggesting that shared risk factors, physiologic changes, and inflammation play central roles in the progression of both conditions.[14] It is key that cardiologists recognize burden of CVD attributed mortality in individuals with COPD, especially given recently published Canadian research,[17] and survey responses indicate that this is the case. Analysis of statement 4 (overall 88%) shows similarly strong agreement between both cardiologists and respirologists (87% and 90%, respectively). It is imperative that this understanding is disseminated to HCPs across Canada who manage patients with COPD and/or CVD, particularly family physicians and PCPs who are the first point of contact for most patients in their communities.

Topic B: Case Finding & Assessment

This topic contains four statements that did not achieve consensus (although they all achieved a broad majority agreement). Respondents supported the need for risk stratification in patients with COPD, incorporating fasting lipid profile (S12, 93%), blood pressure (S13, 99%) and ECG (S16, 85%). Whilst respondents clearly recognize the link between CVD and COPD progression and mortality, there is some discrepancy regarding the need to measure albuminuria (S15, 71%), and B-type natriuretic peptide (BNP) (S17, 62%) for cardiopulmonary risk assessment in patients with COPD. Albuminuria is a biomarker for kidney disease, an established risk factor for CVD,[29] and elevated BNP is associated with disease severity and prognosis in patients with heart failure.[30] It is notable that cardiologists agreed with S15 (87%), but pulmonologists did not (53%), suggesting cardiologists surveyed may appreciate better the link between kidney disease and CVD. Variation in consensus here would support the view that there needs to be greater multi-disciplinary management of COPD and CVD to increase knowledge sharing of disease risk factors and relevant tests.

It is clear from responder agreement that there is an appreciation of the level of underdiagnosis (S1, 94%) and undertreatment (S2, 99%) of COPD in Canada. However, S18 (67%) and S19 (62%), regarding the need to screen for COPD in CVD patients, did not achieve consensus. This result was surprising and warrants further study in future research. Agreement levels for S18 were consistent between cardiologists, pulmonologists, and PCPs, showing general agreement that not all patients with CVD should be screened for COPD. For S19, 73% of pulmonologists agreed patients admitted with a CV event should be screened for COPD, compared to 60% of PCPs and 53% of cardiologists. Within S18 and S19, the Canadian Lung Health Test (CLHT) was posed as potential screening method as it is a short questionnaire to establish if patients require spirometry. Differences in agreement between roles for S18 and S19 suggests that it may not necessarily be the use of this test that respondents disagreed with, but rather the need to screen all patients versus only those who present with CV events. However, the discrepancy between roles shows there is a need to educate clinicians on the impact COPD has on CV outcomes, what the CLHT is, and how screening for COPD may be beneficial to patient prognosis.

The dichotomy between the agreement with S18/S19 and the overwhelming consensus that intervention prior to exacerbation is important (S22, 99%), suggests an urgent need to educate HCPs to take a more proactive preventative approach to COPD management. Recent literature emphasizes the need for earlier identification and treatment of COPD patients, before they present with exacerbations.[24,31,32] Additionally, literature suggests that physicians should be attentive to patients presenting with "exacerbation-like respiratory events" in the emergency setting, which may be an initial presentation of previously undiagnosed COPD.[33] It is suggested, therefore, that efforts are made to educate HCPs on risk factors for exacerbations and the need for preventative measures to identify patients before presentation within emergency care. The use of the CLHT within cardiology clinics is not part of routine clinical practice. However, it could bolster standard aspects of the patient's medical history and highlight patients who warrant further investigation.

Topic C: Disease & Risk Factor Management

Most statements in Topic C achieved very strong consensus with only one failing to achieve consensus agreement by a small margin (S28, 74%). The statements within this topic achieved agreement on some key management principles for COPD in Canada, including the need for intensive and early management for COPD/CVD to achieve the goal of reducing mortality and cardiopulmonary events.

The latest COPD guidelines created by the Canadian Thoracic Society (CTS) state that more targeted interventions should be used after severe COPD exacerbations, as patients are at a substantial risk of rehospitalization.[8] The guidance states that single inhaler triple therapies (LABA+LAMA+ICS) should be used in cases of moderate to severe dyspnea and/or impaired health status and a high risk of future exacerbations, and mortality.[8] Agreement amongst survey respondents (S24, 92%) shows an apparent willingness to prescribe triple therapies, including on discharge from hospital for patients' post-exacerbation (S27, 87%). This is aligned with the new approach of individualized targeted therapies promoted by the 2023 CTS COPD guideline, where treatment initiation should be based on the established optimal therapy assuming that on average patients will achieve the best outcomes.

There was also agreement for S25 (89%) that symptomatic patients should be prescribed triple therapies to reduce mortality and prevent exacerbations. This aligns with the new, strong recommendation presented in the CTS COPD guidelines that stable patients with high risk of exacerbations and high symptom burden should be placed on single inhaler triple therapy as an initial maintenance therapy.[8] The current survey has shown that there is strong alignment between clinicians and the latest CTS guidelines when considering the use of single inhaler triple therapies. It should, therefore, act as a call to action to ensure that this guidance is implemented within Canada as assiduously and expeditiously as possible.

Regarding S28, almost three quarters of respondents agreed that over half of COPD patients are discharged without appropriate disease modifying medication. Research does suggest that COPD prescribing is often not in line with guideline recommendations.[34,35] Targeting optimization of therapy for COPD on discharge may have a significant positive impact on recurrence of exacerbations and control of symptoms.

Topic D: Multidisciplinary Working

Multidisciplinary care has led to advances in management and improved patient outcomes in chronic conditions.[36] The established link between COPD and CVD makes a multidisciplinary approach vital to providing optimal patient care.[13,15] It therefore follows that CV risk should be established in individuals with COPD using standardized risk prediction tools. There is a need for interdisciplinary agreement on the most appropriate risk prediction tools to use in COPD (S38, 99%), and new tools should be developed and evaluated for this purpose (S39, 93%). A recent Canadian study based on the general population has shown that Individuals with impaired spirometry have a higher prevalence of CVD compared with peers with normal spirometry, half of whom have not received a diagnosis from their physicians.[37] However in this recent study, the pooled cohort equations (PCE) and Framingham risk score (FRS) performed poorly in predicting CVD with and without spirometry findings in a limited 3-year follow-up. This highlights the needs for developing new and more predictive risk scores of CVD specific to patients with COPD.

Canada has a heterogenous population, and the realities of care provision vary, meaning a full multidisciplinary care team (MDT) may not be readily accessible to all individuals. MDTs should be developed to support COPD diagnosis and management using the resources available. In more sparsely populated regions access to a respirologist may not be possible: an issue recognized by respondents who support the role of the cardiologist in initiating therapy (with adequate training) in the absence of specialist respiratory support (S40, 90%). Further allied HCPs, such as pharmacists and nurses, could also help provide patient support and monitoring to bolster MDT services. Pharmacists could also help to train cardiologists in initiating inhaled therapies and ensure that patients are discharged post-exacerbation with appropriate therapies. Nursing provision within MDTs is also beneficial and can improve patient education and treatment adherence.[38,39]

It is clear from the CV risks faced by COPD patients, and the structure of the Canadian healthcare system, that a proactive multidisciplinary approach involving primary care, respirology, and cardiology is needed to effectively diagnose and manage this chronic condition. Involvement from clinicians across primary and secondary care has the potential to improve patient outcomes and healthcare resource utilization in individuals with COPD by ensuring patients receive effective treatment in a timely manner.

Recommendations

1. There needs to be improved awareness of the relationship between COPD and CVD, and how exacerbations in one condition can lead to increased risk of mortality.
2. There needs to be greater knowledge sharing between Cardiology, Primary Care, and Respirology so that COPD is appropriately and comprehensively managed in order to improve outcomes including specific outcomes to CVD.
3. The level of underdiagnosis of COPD means that a more considered approach to screening is needed especially in the population of patients with CVD.
4. There is a need for assessing CV risks in patients with COPD as these patients are at higher risk of CVD than the general population.

5. Once patient risk is understood, they must have their inhaler treatment optimized as early as possible to prevent exacerbations and complications, including hospital admissions and mortality.
6. Implementation of pharmacological recommendations from the most recent CTS guidelines should be rapid and universal in order to provide a standardized, evidence-based approach to optimal care of COPD in Canada.
7. Post-exacerbation, patients will require integrated multidisciplinary care to comprehensively manage their disease and comorbidities.
8. All COPD patients should receive yearly check-ups to monitor their condition and cardiovascular health, discuss current medications, update their vaccinations as indicated, and integrate a more comprehensive approach that also include non-pharmacological treatment such as pulmonary rehabilitation and support for smoking cessation.
9. Better multidisciplinary working, for example joint cardio-respiratory clinic and pulmonary rehabilitation where appropriate, should be considered to improve patient care and outcomes.

Strengths and Limitations of This Study

Strengths include:

- Clinician opinion based on high levels of consensus used to inform questionnaire.
- Opinions of a large number of cardiologists, respirologists, and family physicians from across Canada were used to inform recommendations.
- 100 responses gained across the three target roles.
- High level of responder experience and a mix of center activity levels provides insight into the "reality" of COPD.

Limitations include:

- Selection of participants who may be more knowledgeable on COPD because of their interest in the disease and in practice compared to the general population of primary care physicians, cardiologists, and respirologists.
- Imbalance of responses by gender with the majority (75%) or responders being male, despite attempts to mitigate during the data collection phase with the survey time extended by two weeks to try and gain more female responses.
- Unequal representation across provinces means that results were more heavily biased towards urban centers (Ontario alone was responsible for 55% of responses).
- The high levels of agreement achieved may have been an indication that the statements were constructed allow confirmation bias during interpretation, while this was not the intention, the authors acknowledge this possibility.
- Statement 11 in topic B did not address whether patients hospitalized with cardiovascular events should receive vaccinations against COVID-19 and Respiratory Syncytial Virus as well as influenza and pneumonia.
- Inferential statistics were not utilized. Given the generally high agreement and limited variation of ±10% from the mean when comparing gender, role, and province, it was seen as unnecessary to carry out further statistics.

Conclusion

The steering group was able to form a strong set of recommendations based on the high levels of agreement achieved for most statements. The survey provides consensus on the approach to assessing cardiopulmonary risk in COPD patients. These recommendations, and the consensus illustrated by the survey, are aligned with the latest guidance on COPD management from the Canadian Thoracic Society.[8] It is hoped that adoption of the current recommendations, alongside the latest guidance, will improve the care of COPD patients and raise awareness of the relationship between COPD and CVD, increase detection, and optimize preventative and acute management. Studies are needed to assess whether adopting these recommendations will impact outcomes on COPD patients.

Abbreviations

COPD, chronic obstructive pulmonary disease; CTS, Canadian Thoracic Society; CVD, cardiovascular disease; GOLD, Global Initiative for Chronic Obstructive Lung Disease; QoL, quality of life.

Ethics Approval and Consent to Participate

This study did not require registration because neither the assigned interventions nor the outcomes assessed were related to the health of participants. The study was not considered human research according to Canadian Tri-Council Policy and as such, Research Ethics Board review was not required. All respondents involved in the survey within study were informed of the research purpose and that their data would remain anonymous. Their consent to was assumed through the completion and submission of their survey responses.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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