

# Practice patterns in the management of chronic obstructive pulmonary disease in primary practice: The CAGE study

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J Bourbeau, RJ Sebaldt, A Day, et al. Practice patterns in the management of chronic obstructive pulmonary disease in primary practice: The CAGE study. *Can Respir J* 2008;15(1):13-19.

**BACKGROUND:** The information on usual care for patients with chronic obstructive pulmonary disease (COPD) in primary care is limited in Canada.

**OBJECTIVE:** To evaluate primary care practice in patients with COPD in Quebec and Ontario compared with recommended care.

**METHODS:** The COPD Care Gap Evaluation (CAGE) was a prospective, cross-sectional study. Physicians' self-reported data of enrolled COPD patients were compared with the recommended care for the level of disease severity (using the Canadian Thoracic Society classification by symptoms) and stability, derived from Canadian Thoracic Society COPD guidelines. Pharmacological treatment, spirometric confirmation of diagnosis and nonpharmacological management, including smoking cessation counselling, influenza immunization and referral for pulmonary rehabilitation, were assessed.

**RESULTS:** Participating physicians (n=161; 44 in Quebec, 117 in Ontario) recruited 1090 patients (320 in Quebec, 770 in Ontario). The mean ( $\pm$  SD) age of the patients was 69.9 $\pm$ 10.4 years; 60% were male and 40% were currently smoking. Pharmacological treatment that matched guideline recommendations was identified in 34% of patients. Discrepancies between reported and recommended treatment stemmed from nonprescription of long-acting bronchodilators (LABDs) for patients with moderate (27%) and severe (21%) COPD, nonprescription of two long-acting beta agonists (a beta<sub>2</sub>-agonist and an anticholinergic) for patients with severe COPD (51%), and prescription of inhaled corticosteroids (63%) and LABDs (47%) for patients with mild COPD for which the treatment is not recommended. Spirometric confirmation of diagnosis, as recommended by the guidelines, was reported in 56% of patients. For non-pharmacological management, smoking cessation counselling (95%) and influenza immunization (80%) were near optimal. Referral for pulmonary rehabilitation (9%) was not common. Differences between provinces were seen mainly in the prescription of short-acting bronchodilators (89% in Quebec, 76% in Ontario) and LABDs (60% in Quebec, 80% in Ontario).

**CONCLUSIONS:** Substantial gaps between recommended and current care exist in the management of COPD patients in primary care practice. Undertreatment of patients with severe COPD has potential clinical implications, including loss of autonomy and hospitalization.

**Key Words:** Care gap; COPD; Practice patterns; Primary care; Treatment guidelines

## Les modes de pratique pour la prise en charge de la maladie pulmonaire obstructive chronique en première ligne : L'étude CAGE

**HISTORIQUE :** L'information sur les soins habituels aux patients atteints d'une maladie pulmonaire obstructive chronique (MPOC) en première ligne est limitée au Canada.

**OBJECTIF :** Évaluer les pratiques de première ligne chez les patients atteints d'une MPOC au Québec et en Ontario par rapport aux soins recommandés.

**MÉTHODOLOGIE :** L'évaluation CAGE sur les écarts des soins dans la MPOC était une étude transversale prospective. Les auteurs ont comparé les données transmises par les médecins sur les patients participants atteints d'une MPOC aux soins recommandés d'après le taux d'activité de la maladie (au moyen de la classification par symptômes de la Société canadienne de thoracologie) et la stabilité de la maladie, tirés des lignes directrices de la Société canadienne de thoracologie à l'égard des MPOC. Ils ont évalué le traitement pharmacologique, la confirmation du diagnostic par spirométrie et la prise en charge non pharmacologique, y compris les conseils de renoncement au tabac, le vaccin contre la grippe et l'aiguillage en vue d'une réadaptation pulmonaire.

**RÉSULTATS :** Les médecins participants (n=161; 44 au Québec, 117 en Ontario) ont recruté 1 090 patients (320 au Québec, 770 en Ontario). Les patients avaient un âge moyen ( $\pm$ ÉT) de 69,9 $\pm$ 10,4 ans; 60 % étaient de sexe masculin et 40 %, fumeurs. Les auteurs ont remarqué un traitement pharmacologique qui correspondait aux recommandations des lignes directrices chez 34 % des patients. Les écarts entre le traitement déclaré et le traitement recommandé étaient causés par la non-ordonnance de bronchodilatateurs à action prolongée (BAP) chez les patients atteints d'une MPOC modérée (27 %) ou grave (21 %), la non-ordonnance de deux bêta-agonistes à action prolongée (un bêta<sub>2</sub>-agoniste et un anticholinergique) pour les patients atteints d'une MPOC grave (51 %), et l'ordonnance de corticoïdes en aérosol (63 %) et de BAP (47 %) aux patients atteints d'une MPOC bénigne pour qui le traitement n'est pas recommandé. Les médecins ont déclaré une confirmation du diagnostic par spirométrie, recommandée dans les lignes directrices, chez 56 % des patients. Pour ce qui est de la prise en charge non pharmacologique, les conseils de renoncement au tabac (95 %) et le vaccin contre la grippe (80 %) étaient pratiquement optimaux. L'aiguillage en vue d'une réadaptation pulmonaire (9 %) était peu courant. Les différences entre les provinces étaient surtout observables dans la prescription de bronchodilatateurs à action brève (89 % au Québec, 76 % en Ontario) et de BAP (60 % au Québec et 80 % en Ontario).

**CONCLUSIONS :** On constate des écarts importants entre les soins recommandés et les soins prodigués lors de la prise en charge en première ligne des patients atteints d'une MPOC. Le traitement insuffisant des patients atteints d'une MPOC grave peut avoir des conséquences cliniques, y compris la perte d'autonomie et l'hospitalisation.

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Between 20% and 25% of Canadians smoke cigarettes regularly, and among current or former smokers, chronic obstructive pulmonary disease (COPD) is the most common cause of significant morbidity (1). A principal symptom of COPD is dyspnea, leading to a reduced capacity for physical activity. Recurrent acute exacerbations involving respiratory tract infections are frequent, often leading to hospital emergency room visits and admissions (2). An impaired quality of life generally results.

COPD is often unsuspected and undiagnosed (3,4). The 2003 Canadian Thoracic Society (CTS) guidelines (2) attempted to simplify and improve both the diagnosis and management of COPD. The primary treatment goals for patients with symptomatic COPD are improvement of dyspnea and exercise tolerance, and reduction in frequency and severity of exacerbations. Achieving these goals has a positive impact on the patient's quality of life and use of health services. The COPD guidelines (2) were one of the first to include pharmacological treatment recommendations according to disease severity (asymptomatic, mild, moderate and severe) derived from the Medical Research Council (MRC) dyspnea scale (grades 1 to 5). Pharmacological treatment, especially with long-acting bronchodilators (LABDs) (5-7), and pulmonary rehabilitation with exercise training (8) are most effective in improving symptoms of dyspnea, exercise tolerance and overall health status, while only smoking cessation has been proven to prevent disease progression (9). Vaccination, LABDs and inhaled corticosteroids (ICSs) reduce acute exacerbations or respiratory complications (7,10). The majority of COPD patients (80% in Canada) receive care in primary practice (3). While the impact of COPD can be reduced with appropriate management (2), little is known about current practice patterns for COPD patients in primary care. Two recent Canadian surveys of primary care (3,11) revealed some deficiencies in COPD prescribing patterns, access to treatment and diagnosis. The aim of the present prospective study was to evaluate the pharmacological treatment, diagnosis and nonpharmacological management of COPD in primary care practice in Quebec and Ontario.

## PATIENTS AND METHODS

### Study design

The objective of the COPD Care Gap Evaluation (CAGE) study was to document current COPD management in routine primary clinical care and to examine the appropriateness of care in relation to the 2003 CTS evidence-based guidelines. The present prospective, cross-sectional study was divided into sequential phases to allow implementation of physician feedback and educational interventions after each phase. This report presents results for baseline evaluation of COPD care from the first phase. There was no patient follow-up after enrolment, because patient care, rather than patient outcome, was assessed. Primary care physicians from Quebec and Ontario recruited up to eight consecutive COPD patients in each of four sequential eight-week phases. The study was approved by an independent ethics review board.

### Physician recruitment

Participating physicians were recruited from all primary care physicians in each province who prescribed respiratory medications (ie, bronchodilators, ICSs or combinations) and whose practice locations were community-based.

### Patient enrolment

Each participating physician enrolled successive patients who satisfied selection criteria. Included patients all had a smoking history of 10 pack-years or more, were at least 45 years of age, were seen in the physician's office for routine care, and had a working diagnosis of symptomatic COPD either by clinical judgment or by spirometric evaluation. Patients also had to receive a prescription (new or renewal) for COPD during the enrolment visit and provide informed consent. Patients were excluded if they had had a diagnosis of asthma before the age of 40 years; if they had an acute exacerbation while visiting their physician that was severe enough to require emergency referral, hospitalization or prescription of prednisone; or if they were part of a therapeutic trial.

### Data collection

Case report forms were completed by physicians during patient interviews. The data collected were designed to capture individual patient factors that allowed assessment of the appropriateness of care without imposing any guideline or scoring system on the physicians. Collected data included patient demographics, smoking history, COPD diagnosis and history, relevant comorbidities, COPD medications (what patients were receiving for treatment when they left the clinic visit), nonpharmacological care provided within 12 months and current adverse events associated with therapy. Current COPD status, including disease severity, was assessed formally, according to the CTS classification (2) based on the MRC dyspnea scale, and informally, by physician and by patient. A separate survey collected physician characteristics. Data were transferred anonymously to a data centre.

### Data analysis

Physicians' reported data were analyzed for consistency with the recommended care for levels of disease severity and stability as defined by the 2003 CTS guidelines (Table 1) (2). All patients were classified into four groups of disease severity by symptoms according to the CTS classification based on the MRC dyspnea scale: asymptomatic (MRC grade 1), mild (MRC grade 2), moderate (MRC grade 3 or 4) or severe (MRC grade 5). Patients were also separately grouped by disease stability (on day of visit) according to whether their visit was principally for an acute exacerbation (unstable) or for any other reason (stable).

Distributions of disease severity were cross-tabulated according to four categories (asymptomatic, mild, moderate and severe) to describe the agreement between the CTS classification based on the MRC dyspnea scale and the informal physician assessment of severity. A weighted kappa coefficient was calculated to assess the agreement between these two measures. A similar analysis was performed comparing the CTS classifications based on the MRC dyspnea scale with the patients' self-assessment of disease severity. Finally, differences in the appropriateness of pharmacological treatment were assessed between patients with and without a spirometric confirmation of their COPD diagnosis. Analyses were performed in SAS version 9.1 (SAS Institute Inc, USA).

Pharmacological treatment data were assessed with respect to disease severity and stability (Table 1), and patients in the formal 'asymptomatic' group, for whom no recommendations exist, were excluded. Diagnosis and nonpharmacological management (including smoking cessation counselling, influenza

**TABLE 1**  
**Recommended care for chronic obstructive pulmonary disease patients\***

Component of care	Stable disease <sup>†</sup>			Unstable disease
	Mild	Moderate	Severe	
Pharmacological treatment	One or two SABDs, no LABDs and no ICSs	One or two SABDs, and one LABD No ICSs unless there has been an exacerbation within 12 months	One SABA, one LABA and one LAAC ICSs may be either prescribed or not prescribed	Increase or initiation of at least one of the following: SABDs or LABDs, antibiotic or prednisone <sup>‡</sup> , and no increase in ICS prescription
Diagnosis	Check whether spirometry has been performed (ever)			All unstable patients were reclassified into severity groups because these components are independent of stability
Nonpharmacological management				
Smoking cessation	Discuss today or within 12 months, or make follow-up appointment to discuss within 12 months, or prescribe drug therapy today or within 12 months			
Influenza vaccination	Give today or within 12 months			
Referral to exercise training or pulmonary rehabilitation program	Give today or within 12 months; not considered for mild patients			

\*Patients were classified based on the 2003 Canadian Thoracic Society chronic obstructive pulmonary disease guidelines (2); <sup>†</sup>Mild disease is defined as patients with grade 2 dyspnea on the Medical Research Council scale, moderate disease as patients with grade 3 or 4, and severe disease as patients with grade 5; <sup>‡</sup>A prescription for prednisone, while appropriate, constituted an exacerbation severe enough to exclude patients from the present study. ICS Inhaled corticosteroid; LAAC Long-acting anticholinergic; LABA Long-acting beta<sub>2</sub>-agonist; LABD Long-acting bronchodilator; SABA Short-acting beta<sub>2</sub>-agonist; SABD Short-acting bronchodilator

vaccination and referral to pulmonary rehabilitation) were evaluated by groups of disease severity irrespective of disease stability on the day of visit. These two groupings reflect the structure of the recommendations. Results are reported for the whole patient group, and separately for Quebec and Ontario.

## RESULTS

### Physician characteristics

Of 4954 primary care physicians invited to participate in the study, 185 (3.7%) completed a brief training in the study procedures and 161 (3.2%; 44 in Quebec, 117 in Ontario) enrolled at least one patient. A survey of 119 participants (74%) indicated that the physicians had graduated an average of 23 years previously (Table 2). Physicians in Quebec reported seeing more COPD patients annually and were less likely to be in solo practice than physicians in Ontario.

### Patient characteristics

Data from 1155 patients (331 in Quebec, 824 in Ontario) were collected during phase 1 (baseline), which ran from May 2005 to July 2005. Of these, 65 patients were excluded due to missing or implausible data and 1090 patients were included in the analyses (Figure 1).

Patients were principally male (60%). On average, they smoked for 40.1 years, and 40% were currently smoking. Eighty-two per cent had one or more comorbidity (Table 3), and 73% had had COPD for longer than five years. Most patients had stable COPD (91%) on the date of their visit as suggested by the CTS classification: 14% were asymptomatic (MRC grade 1), 32% were mild (MRC grade 2), 41% were moderate (MRC grade 3 or 4) and 4% were severe (MRC grade 5). This grouping was used for analyses of pharmacological treatment. For analyses of diagnosis and nonpharmacological management, patients were classified as asymptomatic (14%), mild (36%), moderate (46%) or severe (4%) regardless of current stability (Figure 1).

Physicians' informal classifications of severity on the day of the patients' visits were mild in 33%, moderate in 52% and

**TABLE 2**  
**Characteristics of surveyed physicians by province\***

Characteristic	Total (n=119)	Quebec (n=34)	Ontario (n=85)
Years since graduation, mean ± SD	23±9.7	24±10.6	23±9.3
Working in solo practice, n (%)	63 (53)	10 (29)	53 (62)
Number of COPD patients seen in the previous year, mean ± SD	146±125	201±170	125±95
Number of COPD-related continuing medical education events attended in the previous year, mean ± SD	2.8±4.2	3.5±5.0	2.5±3.8

\*Based on a subset of participating physicians (n=119 of 161). COPD Chronic obstructive pulmonary disease

severe in 15%, while patients' corresponding self-classifications were 45%, 44% and 11%, respectively. Because a diagnosis of symptomatic COPD was an inclusion criteria, all patients classified as asymptomatic from the MRC dyspnea scale (14%) were considered as misclassified by the physicians' and patients' assessments. Physicians' informal assessment of severity coincided with the CTS classification based on the MRC dyspnea scale in 47% of patients; the corresponding figure for patients' self-assessment was 48%. While there was some agreement (weighted kappa = 0.28, 95% CI 0.24 to 0.32; P<0.0001) between the physicians' and CTS' classifications of severity, the level of agreement is only classified as 'fair' on the Landis scale (12). With a weighted kappa coefficient of 0.27, the level of agreement between patients' self-assessment and CTS classifications is similar. Distributions of assessments of disease severity indicate that 43% of patients were rated more severely by their physicians than by the CTS classification and 36% of patients rated themselves more severely than the CTS classification.

### Pharmacological treatment

Analyses of physician-reported prescriptions revealed that 80% of stable, symptomatic COPD patients received short-acting

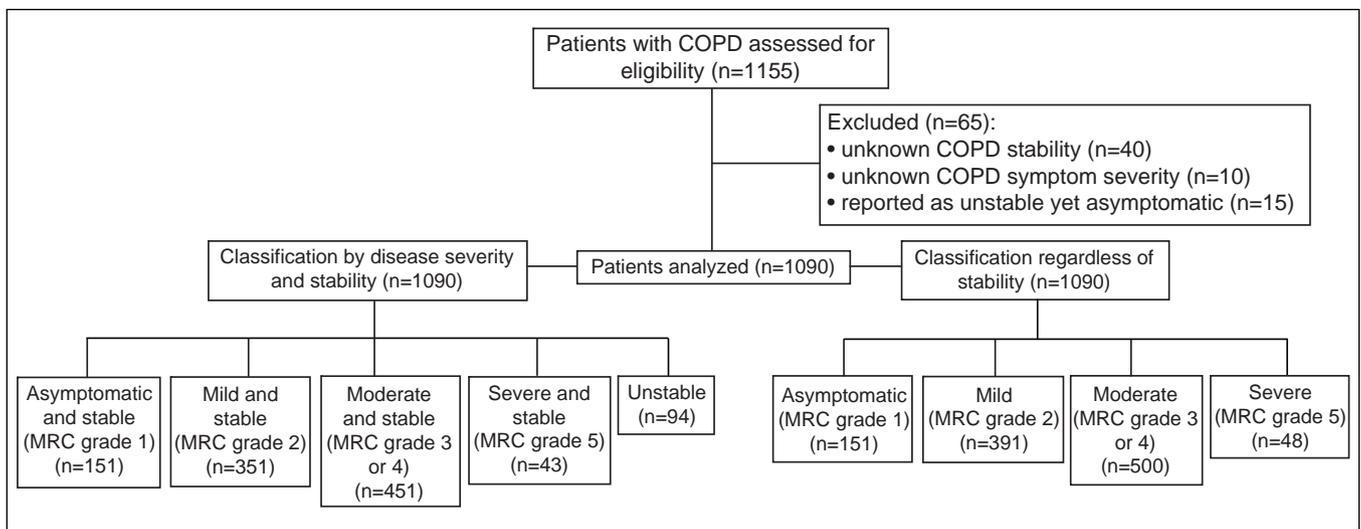


Figure 1) Flow of patients included at various stages of the analyses. COPD Chronic obstructive pulmonary disease; MRC Medical Research Council

TABLE 3  
Patient characteristics by province

Patient characteristic	Total (n=1090)	Quebec (n=320)	Ontario (n=770)
Age, years, mean ± SD	69.9±10.4	70.0±10.8	69.9±10.2
Male, n (%)	650 (60)	180 (56)	470 (61)
Public drug coverage, n (%)	904 (83)	272 (85)	632 (82)
Highest level of education, n (%)			
Primary	410 (38)	156 (49)	254 (33)
Secondary	502 (46)	143 (45)	359 (47)
Main reason for physician visit, n (%)			
Other care unrelated to COPD	436 (40)	111 (35)	325 (42)
Follow-up of stable COPD	444 (41)	154 (48)	290 (38)
Currently smoking, n (%)	439 (40)	123 (38)	316 (41)
Number of years smoking, mean ± SD	40.1±14.9	40.0±16.1	40.1±14.4
COPD onset more than five years previously, n (%)	784 (73)	242 (76)	542 (70)
Severity of disease (MRC scale)*, n (%)			
Asymptomatic and stable	151 (14)	20 (6)	131 (17)
Mild and stable	351 (32)	96 (30)	255 (33)
Moderate and stable	451 (41)	157 (49)	294 (38)
Severe and stable	43 (4)	20 (6)	23 (3)
Symptomatic and unstable (exacerbating)	94 (9)	27 (8)	67 (9)
Followed by a respirologist, n (%)	221 (20)	72 (23)	149 (19)
Comorbidities (any), n (%)	893 (82)	254 (79)	639 (83)
Hypertension, n (%)	554 (51)	157 (49)	397 (52)
Coronary artery disease, n (%)	312 (29)	77 (24)	235 (31)
Diabetes, n (%)	212 (19)	64 (20)	148 (19)
Depression, n (%)	160 (15)	47 (15)	113 (15)
Osteoporosis, n (%)	151 (14)	35 (11)	116 (15)
Peripheral vascular disease, n (%)	141 (13)	47 (15)	94 (12)
Congestive heart failure, n (%)	118 (11)	33 (10)	85 (11)
Asthma, n (%)	111 (10)	22 (7)	89 (12)
Stroke, n (%)	76 (7)	21 (7)	55 (7)
Sleep apnea, n (%)	53 (5)	12 (4)	41 (5)
Sinusitis, n (%)	44 (4)	11 (3)	33 (4)

\*Mild disease is defined as patients with grade 2 dyspnea on the Medical Research Council (MRC) dyspnea scale, moderate disease as patients with grade 3 or 4, and severe disease as patients with grade 5. COPD Chronic obstructive pulmonary disease

TABLE 4  
Physician-reported prescriptions for chronic obstructive pulmonary disease medication by disease severity and province

Prescribed medication and disease severity	Both provinces (n=939)	Quebec (n=300)	Ontario (n=639)
Short-acting bronchodilator, n (%)			
Mild and stable	253 (72)	84 (88)	169 (66)
Moderate and stable	386 (86)	144 (92)	242 (82)
Severe and stable	38 (88)	18 (90)	20 (87)
Unstable	79 (84)	21 (78)	58 (87)
Total	756 (81)	267 (89)	489 (76)
Inhaled corticosteroid, n (%)			
Mild and stable*	221 (63)	54 (56)	167 (65)
Moderate and stable†	311 (69)	103 (66)	208 (71)
Severe and stable	30 (70)	13 (65)	17 (74)
Unstable	66 (70)	16(59)	50 (75)
Total	628 (67)	186 (62)	442 (69)
Single long-acting bronchodilator, n (%)			
Mild and stable*	166 (47)	41 (43)	125 (49)
Moderate and stable	174 (39)	60 (38)	114 (39)
Severe and stable	13 (30)	9 (45)	4 (17)
Unstable	32 (34)	7 (26)	25 (37)
Total	385 (41)	117 (39)	268 (42)
Long-acting beta <sub>2</sub> -agonist and long-acting anticholinergic, n (%)			
Mild and stable*	92 (26)	11 (11)	81 (32)
Moderate and stable*	156 (35)	35 (22)	121 (41)
Severe and stable	21 (51)	8 (40)	13 (57)
Unstable	36 (38)	8 (30)	28 (42)
Total	305 (32)	62 (21)	243 (38)

\*Not consistent with the 2003 Canadian Thoracic Society guidelines; †Not consistent with the 2003 Canadian Thoracic Society guidelines unless an exacerbation had occurred within the previous year

bronchodilators (SABDs), in agreement with the 2003 CTS guidelines. A majority of mild, stable COPD patients (63%) received an ICS, although it is not recommended for this severity group (Table 4). A single LABD was prescribed for 39% of moderate, stable COPD patients, in accordance with 2003 CTS

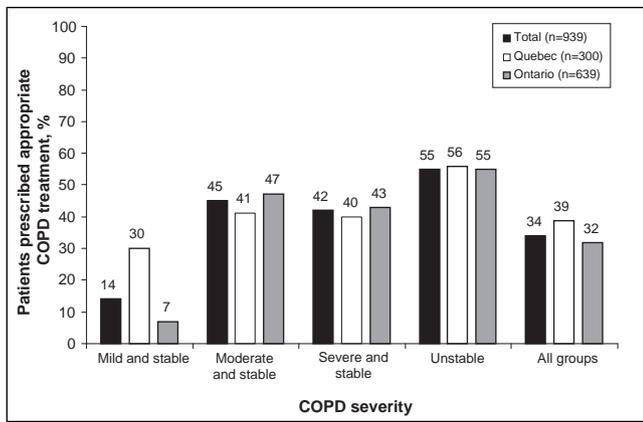


Figure 2) Recommended pharmacological treatment for chronic obstructive pulmonary disease (COPD) patients by disease severity and province

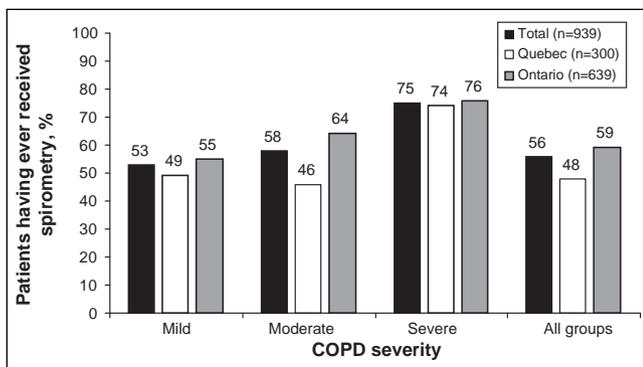


Figure 3) Rates of diagnosis confirmed with spirometry for chronic obstructive pulmonary disease (COPD) patients by disease severity and province

guidelines, but also for 47% of mild, stable COPD patients, for whom the treatment is not recommended (Table 1). Two LABDs (a long-acting beta<sub>2</sub>-agonist [LABA] and a long-acting anticholinergic [LAAC]) were prescribed for only 51% of severe, stable COPD patients, for whom the combination is recommended, and for 26% of mild and 35% of moderate patients.

The biggest differences between Quebec and Ontario were in the prescribing of SABDs for patients with mild COPD (88% in Quebec, 66% in Ontario), the overall prescribing of LABDs (60% in Quebec, 80% in Ontario) and the overall prescribing of a combination of an LABA and an LAAC (21% in Quebec, 38% in Ontario) (Table 4).

Comparison of physician-reported prescriptions with the 2003 CTS guidelines revealed that 34% of COPD patients with mild, moderate, severe and unstable COPD (as classified by the MRC dyspnea scale) received recommended pharmacological treatment (Figure 2). Physicians prescribed recommended care most often to patients with unstable COPD (55%), followed by those with moderate and stable COPD (45%), severe and stable COPD (42%), and mild and stable COPD (14%).

Recommended pharmacological treatment was observed in 39% of patients with a documented spirometric confirmation of their COPD diagnosis, compared with 32% of those without spirometric confirmation.

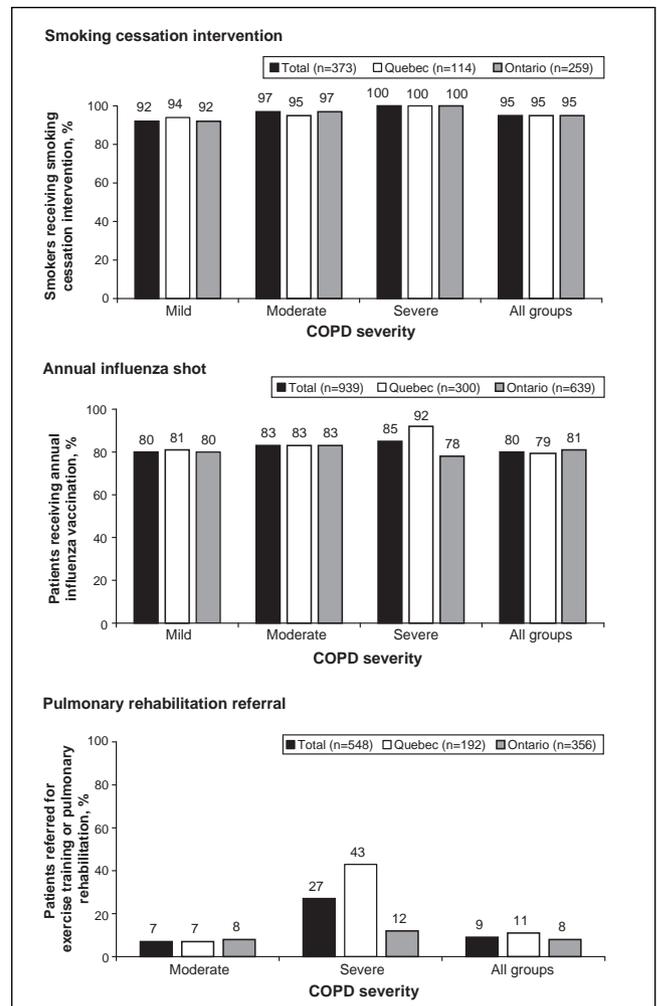


Figure 4) Recommended nonpharmacological management of chronic obstructive pulmonary disease (COPD) patients by disease severity and province

### Diagnosis and nonpharmacological management

Diagnosis and nonpharmacological management were assessed in patients grouped by disease severity, regardless of current stability. Spirometry had been performed at some point in their history in 56% of patients overall (48% in Quebec, 59% in Ontario) (Figure 3), as recommended. It was used more frequently among patients with severe COPD (75%) than among those with moderate (58%) and mild (53%) COPD. Spirometry had been performed in 79%, 61% and 52% of patients informally rated by their physicians as severe, moderate and mild, respectively.

More than 90% of currently smoking patients were counselled on smoking cessation (Figure 4). Annual influenza vaccination was provided to 80% of patients. Referral to pulmonary rehabilitation was offered to only 9% of patients with moderate or severe disease, for whom it is recommended.

### DISCUSSION

The present study demonstrates that a substantial care gap exists relative to recommended practices in the primary care management of COPD patients in Canada's two largest provinces. While a majority of patients had received the recommended smoking cessation counselling (95%) and influenza

vaccination (80%), only a minority received currently recommended pharmacological treatment (34%) and referral to pulmonary rehabilitation (9%). Spirometric confirmation of a diagnosis of COPD was reported in the follow-up history of only 56% of patients. Pharmacological overtreatment was commonly found in patients with mild disease and undertreatment in those with severe disease. Differences between reported and recommended pharmacological treatments were mainly nonprescription of LABDs (LABAs or LAACs) for patients with moderate (27%) and severe (21%) COPD; nonprescription of LABAs and LAACs in combination for patients with severe COPD (51%); and prescription of ICSs (63%) and at least one LABD (74%) for patients with mild COPD. The importance of using the LABDs in moderate to severe COPD and the unrecognized efficacy of ICSs in mild COPD has been reiterated in the most recent (2007) CTS guidelines (13).

The Canadian component of the international Confronting COPD study, a survey of 401 patients (80% with mild to moderate COPD) (3,14) performed approximately four years before the CAGE study, reported that 37% of patients received ICSs, closely followed by SABDs (33%) and LABAs (9%), suggesting an overuse of ICSs. These figures are lower than those reported in the CAGE study, (67%, 81% and 74%, respectively) and may suggest a discrepancy between patient-reported and physician-reported (CAGE) prescribed medications or may reflect temporal differences between the eras of the two studies. Underuse of efficacious therapies in high-risk patients has been demonstrated in the CAGE study, as has ICS overuse in mild disease. The absence of a gradient between disease severity and use of LABDs may reflect a lack of recognition of the value of these drugs in COPD management in clinical practice. This is reinforced by the fact that physicians tended to overestimate disease severity compared with the CTS classification based on the MRC dyspnea scale. On the other hand, the substantial use of ICSs suggests that their perceived benefits in COPD are exaggerated and that they are used irrespective of a diagnosis of asthma or COPD. Undertreated patients with severe COPD may risk losing their autonomy and becoming hospitalized, while unnecessary use of drugs is not risk free. In terms of public health impact, both misuses represent missed opportunities. If they can be resolved, there will be improvements in the clinical outcomes of COPD patients in Canada.

The CAGE study has revealed that only 56% of patients had undergone spirometry, while the 2003 and 2007 CTS guidelines (2,13) recommend it to confirm a diagnosis of COPD. A postbronchodilator forced expiratory volume in 1 s of less than 80% of the predicted value and forced expiratory volume in 1 s/forced vital capacity less than 0.70 are both required for COPD to be diagnosed (2). Misdiagnosis of COPD may prevent COPD patients from receiving therapy that can reduce symptoms and future risk, while causing others to receive unnecessary treatment. A recent Canadian survey, the COPD national report card (11), found that access to spirometry was relatively high nationally (74%), but few family physicians were using it (35%) or considered themselves able to interpret the results (19%).

The present study suggests that nonpharmacological management, more specifically smoking cessation counselling and influenza vaccination, was provided to almost all patients. This is an improvement over a 2003 Canadian patient survey performed four years earlier (3). However, only 9% of moderate

and severe patients in our study were referred for pulmonary rehabilitation – known to be of great value for patients in whom respiratory symptoms are associated with reduced functional capacity. Currently, there are only 24 pulmonary rehabilitation facilities in Ontario and 10 in Quebec, and it is estimated that 1.2% of the Canadian COPD population is being managed by them (11).

Several differences were observed between the provinces in the present study, which may reflect attitudes toward diagnosis, treatment or access to care. The use of LABDs in all groups of patients was much lower in Quebec than Ontario, likely reflecting the restricted listing of LABDs in Quebec during the study. The present study also suggests that the diagnostic evaluation of COPD by spirometry is somewhat less common in Quebec than Ontario, consistent with the use of spirometry reported in the COPD national report card (11). Variations between the provinces may be related to access to spirometry, because fewer physicians in Quebec reported access to this diagnostic tool in the report card (11).

Limitations of the present study include the participation of a self-selected group of family physicians (3% of those contacted) with large COPD practices, physician self-reporting and absence of randomization of sequential patient selection by physicians. However, these features would likely have biased the study toward an underestimation of treatment gaps. Guidelines were used as a reference standard, but these may not always be applicable to individual patients. Adherence to treatment guidelines was evaluated based on CTS classification of disease severity – on which the COPD guidelines are based but which may not necessarily correspond to informal physician classification of disease severity. Finally, the study was not designed to assess reasons for differences between recommended and current practices.

The present study indicates that a minority of COPD patients seen in primary care in Quebec and Ontario receive currently recommended pharmacological treatment and referral to pulmonary rehabilitation; approximately one-half of the patients do not have their diagnosis confirmed by spirometry, while a majority receive recommended smoking cessation counselling and influenza vaccination. Analyses of follow-up phases of the CAGE study will provide some insights into the impact of educational interventions on physician self-reported care of COPD patients. Necessary changes in our health care system must include better ways to transfer new knowledge to clinical practice and to give access to interventions proven to maintain health. If these gaps can be closed, we will gain improvements in health care for our patients, as well as reduce hospitalizations.

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**ACKNOWLEDGEMENTS:** The authors wish to thank all 161 primary care physicians who participated in this study. This study was made possible by a grant from Pfizer Canada Inc and Boehringer Ingelheim Canada Ltd. This article was prepared with the assistance of BioMedCom Consultants Inc, Montréal, Canada.

## REFERENCES

- Office on Smoking and Health. The Health Consequences of Smoking: Chronic Obstructive Lung Disease: A Report of the Surgeon General. Rockville: United States Department of Health and Human Services, Public Health Service, 1984.
- O'Donnell DE, Aaron S, Bourbeau J, et al. Canadian Thoracic Society recommendations for management of chronic obstructive pulmonary disease – 2003. *Can Respir J* 2003;10(Suppl A):11A-65A.

3. Chapman KR, Bourbeau J, Rance L. The burden of COPD in Canada: Results from the Confronting COPD survey. *Respir Med* 2003;97(Suppl C):S23-31.
  4. Vrijhoef HJ, Diederiks JP, Wesseling GJ, van Schayck CP, Spreeuwenberg C. Undiagnosed patients and patients at risk for COPD in primary health care: Early detection with the support of non-physicians. *J Clin Nurs* 2003;12:366-73.
  5. Appleton S, Poole P, Smith B, et al. Long-acting beta<sub>2</sub>-agonists for poorly reversible chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2006:CD001104.
  6. Barr RG, Bourbeau J, Camargo CA, Ram FS. Tiotropium for stable chronic obstructive pulmonary disease: A meta-analysis. *Thorax* 2006;61:854-62. (Erratum in 2007;62:191).
  7. Nannini L, Cates CJ, Lasserson TJ, Poole P. Combined corticosteroid and long acting beta-agonist in one inhaler for chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2004:CD003794.
  8. Lacasse Y, Wong E, Guyatt G, King D, Cook DJ, Goldstein RS. Meta-analysis of respiratory rehabilitation in chronic obstructive pulmonary disease. *Lancet* 1996;348:1115-9.
  9. Anthonisen NR, Connett JE, Murray RP. Smoking and lung function of Lung Health Study participants after 11 years. *Am J Respir Crit Care Med* 2002;166:675-9.
  10. Alsaeedi A, Sin DD, McAlister FA. The effects of inhaled corticosteroids in chronic obstructive pulmonary disease: A systematic review of randomized placebo-controlled trials. *Am J Med* 2002;113:59-65.
  11. Canadian Lung Association. Chronic obstructive pulmonary disease (COPD): A national report card. <[www.lung.ca/\\_resources/2005.copd\\_reportcard.pdf](http://www.lung.ca/_resources/2005.copd_reportcard.pdf)> (Version current at November 27, 2007).
  12. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977;33:159-74.
  13. O'Donnell DE, Aaron S, Bourbeau J, et al. Canadian Thoracic Society recommendations for management of chronic obstructive pulmonary disease – 2007 update. *Can Respir J* 2007;14(Suppl B):5B-32B.
  14. Halpern MT, Musin A, Sondhi S. Economic analysis of the Confronting COPD survey: Methodology. *Respir Med* 2003;97(Suppl C):S15-22.
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