

RESEARCH ARTICLE

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COPD management by Swedish general practitioners – baseline results of the PRIMAIR study

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is a common cause of suffering and death. Evidence-based management of COPD by general practitioners (GPs) is crucial for decreasing the impact of the disease. Efficient strategies include early diagnosis, smoking cessation and multimodal treatment.

Aim: To describe knowledge about and skills for managing COPD in GPs in Sweden.

Methods: Prior to COPD education (the PRIMAIR Study), GPs at primary health care centers (PHCCs) in Stockholm replied to 13 written, patient-case based, multiple choice and free-text questions about COPD. Their knowledge and practical management skills were assessed by assigned points that were analyzed with non-parametric tests.

Results: Overall, 250 GPs at 34 PHCCs replied (89% response rate). Total mean score was 9.9 (maximum 26). Scores were highest on 'management of smoking cessation', 'follow-up after exacerbation' and 'diagnostic procedures'. Spirometry was used frequently, although interpretation skills were suboptimal. 'Management of maintenance therapy', 'management of multimorbidity' and 'interprofessional cooperation' had mediocre scores. Scores were unrelated to whether there was a nurse-led asthma/COPD clinic at the PHCC.

Conclusions: Swedish GPs' knowledge of COPD and adherence to current guidelines seem insufficient. A nurse-led asthma/COPD clinic at the PHCC does not correlate with sufficient COPD skills in the GPs. The relevance of this study to participants' actual clinical practice and usefulness of easy-to-access clinical guides are interesting topics for future investigation. To identify problem areas, we suggest using questionnaires prior to educational interventions.

KEY POINTS

- General practitioners (GPs) play a crucial role in providing evidence-based care for patients with chronic obstructive pulmonary disease (COPD) who are treated in primary care.
- Swedish GPs' knowledge about COPD and adherence to current guidelines seem insufficient.
- Areas in greatest need of improvement are spirometry interpretation, management of maintenance therapy, management of multimorbidity in patients with COPD and interprofessional cooperation.

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Introduction

Chronic obstructive pulmonary disease (COPD) is common worldwide and its prevalence and mortality rates are increasing [1]. Apart from smoking cessation, management of COPD has traditionally focused on pharmacotherapy, which aims to reduce symptoms and prevent exacerbations. However, in recent years, this focus has been challenged. Studies have shown that COPD is a multicomponent disease and has a

wide range of systemic consequences [2]. Active management of lifestyle factors and comorbidities slows disease progress and increases quality of life [3]. This modern view of COPD has led to substantial efforts to translate research findings into clinical practice.

The Global Initiative for Chronic Obstructive Lung Disease has developed guidelines in the hope of increasing interest in and competence regarding COPD among practicing physicians in primary and secondary

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care [4]. However, awareness of and adherence to COPD guidelines is still insufficient in primary care [5]. Physician-related barriers identified in previous studies include not only unfamiliarity with the recommendations, but GPs have also found the recommendations to be of uncertain relevance to patients in primary care [6,7]. Additionally, time constraints and therapeutic nihilism combined with negative personal views about COPD or a perception that the patient's motivation is low contribute to low adherence to guidelines [7,8].

The Cochrane Effective Practice and Organisation of Care Group has proposed that continuing medical education (CME) is one way to tackle these barriers [9]. A better understanding of which recommendations GPs poorly recognize or carry out could help educators concentrate their efforts on weak areas. This could, in turn, promote clinicians' understanding of COPD and help guideline implementation. However, studying the effects of CME is not simple, as complex assessment methods are needed [10].

The aim of this study was to describe the level of knowledge about COPD and COPD management skills in general practitioners (GPs) in Sweden. An underlying objective was to use this information to plan future educational interventions.

Methods

Study methods have been described in detail in a previously published study protocol [11].

Study participants

Eighty primary health care centers (PHCCs) in Stockholm County (40% of all 205 PHCCs) with at least 10,000 registered patients were invited by regular mail and e-mail to participate in the PRIMAIR study, which investigated the effect of CME on the management of COPD [11]. Forty-five PHCCs did not respond or declined to participate. One PHCC was excluded because the first author worked there. Thirty-four PHCCs were thus included. Although GPs at each PHCC collectively agreed to participate, individual participation remained voluntary. The pharmaceutical industry played no role in the planning, execution, analysis or presentation of the results of this project.

The CME educator asked the GPs to fill in paper questionnaires about COPD and checked that the questionnaires were completed individually and without using outside sources of information or guidelines.

GPs' characteristics were self-reported. Data about each PHCC were obtained from the manager.

The questionnaire

GPs' knowledge about COPD and their practical strategies for managing the disease were evaluated via an author-constructed questionnaire [11]. The GPs completed the questionnaire at baseline and one year after the CME intervention. This study analyzed only baseline data.

The authors (HS and BS) constructed the questionnaire on the basis of the Swedish national guidelines and a previous study on real-life problems in COPD care from the GPs' perspective [7,9]. It was designed to align with the intended learning outcomes and assessment criteria of a planned CME intervention on COPD; thus, it was designed as an examination and followed the educational principle of constructive alignment developed by John Biggs [12]. The questionnaire consisted of five short patient cases, each of which gave rise to two or three questions (a total of 13 questions). The patient cases illustrated adherence to the national guidelines and incorporated problems from real-life primary care, such as time constraints, perceived low motivation for adherence to COPD care in patients and the low priority given to COPD care in patients with multimorbidity. To improve the assessment, the questionnaire included seven multiple choice and six free-text questions that measured a mixture of theoretical knowledge, practical skills and clinical experience. Responses were given a score of 0, 1 or 2 points. A predefined, detailed correction template was made by the authors (HS and BS). Together with the questions, it is now summarized in Table 1. Three of the questions (questions 5, 9 and 13) could, when incorrectly answered, lead to a negative score, as an indication of unsafe clinical practice. Participants were unaware of the scoring methods and did not receive feedback on their scores because it could have influenced their recall and post-intervention test scores one year later. The responses to the free-text questions were evaluated via quantitative content analysis of blinded data and were also given a score of between 0 and 2 points. HS carried out the initial analysis, which was later reanalyzed by SM, BS and HS, at which time possible disagreements were resolved via discussion. The questionnaire was pretested via discussions; i.e. using the 'think aloud' method at a non-participating PHCC, which resulted in minor changes to improve the questionnaire. As the questionnaire was designed as a heterogeneous construct with a fairly low number of questions, we chose to focus on

Table 1. Schematic description of the contents of the questionnaire used to assess GPs' knowledge of COPD and skills in managing the disease.

Topic covered in each question	Scoring requirements ^a	Type of question
<i>(Additional real-life clinical problems, ascertained in a previous study, were included in the questionnaire)</i>	General practitioners should:	
1. Diagnostic procedures	Include spirometry, chest X-ray and NT-proBNP test in the initial diagnostic procedures for patients presenting with smoking history, dyspnea and morning cough. PEF measured with a peak flow meter is inappropriate.	Multiple choice
2. Spirometry interpretation	Interpret spirometry on the basis of post- bronchodilator FVC and FEV1. (guides/handbooks for spirometry interpretation were not available during testing.) Recognize the importance of clinical history in discriminating between COPD and asthma.	Multiple choice
3. Smoking cessation, unmotivated patients (<i>management strategies in unmotivated patient</i>)	Use motivational intervention to address tobacco use and provide correct information about alternatives for smoking cessation support.	Free-text answer
4. Treatment of acute exacerbation	Recognize clinical features of acute COPD exacerbation and choose the recommended treatment (oral doxycycline or amoxicillin combined with oral prednisolone 20–30 mg/d for 5–10 d).	Multiple choice
5. Follow-up of acute exacerbation (<i>managing issues with time pressure</i>)	Propose a clinical follow-up carried out by a GP (not by a nurse) some weeks after an emergency visit due to exacerbation. Proposing a follow-up time obviously too far in the future or 'over-investigating' with irrelevant methods led to a reduction of 1 point.	Free-text answer
6. Smoking cessation, motivated patients (<i>local routines and practices in supporting smoking cessation</i>)	Propose smoking cessation strategies that employ counseling and, if needed, medications.	Free-text answer
7. Maintenance treatment of COPD (GOLD B patients)	Choose LAMA and/or LABA for COPD patients with chronic symptoms but no history of exacerbations.	Multiple choice
8. Heart failure medication for patients with COPD	Choose continued medication with beta-blockers when heart failure is present as a comorbidity.	Multiple choice
9. Follow-up of patients with stable COPD (<i>recognizing and prioritizing COPD patients without or with few airway symptoms</i>)	Mention a clinical follow-up with symptom evaluation 1–4 months after initiation of maintenance treatment for COPD. Pulmonary X-ray and spirometry are not recommended as routine monitoring of treatment and led to a reduction of 1 point.	Free-text answer
10. Interprofessional interventions (<i>local routines for interprofessional management of COPD</i>)	Choose a combination of optimized pharmacological treatment and interprofessional interventions (pulmonary rehabilitation that includes nutritional advice and physiotherapy) in symptomatic COPD patients who have lost weight.	Multiple choice
11. Managing suspected respiratory failure	Choose to refer patients with peripheral oxygen saturation below 92% at rest to measurement for arterial oxygen saturation for assessment of respiratory failure.	Multiple choice
12. Multimorbidity in COPD patients without obvious symptoms from airways or COPD comorbidities (an annual check-up) (<i>patient or GP not becoming concerned about COPD because patient's agenda does not include airway symptoms. Managing multimorbidity and discussing COPD during limited consultation time.</i>)	Describe the need to actively assess smoking status, symptoms of airways and/or COPD comorbidities during regular follow-up visits in multimorbid patients with known COPD.	Free-text answer
13. Multimorbidity in COPD patients with symptoms from airways and/or COPD comorbidities (an annual check-up) (<i>connected to the question above; managing even more complicated multimorbidity during limited consultation time. Prioritizing COPD with comorbidities in the consultation</i>)	State the need to evaluate comorbidities in a multimorbid COPD patient with changed symptom intensity; i.e. increased fatigue and/or dyspnea. Mention differential diagnostic procedures, including all three of the following: testing for anemia, evaluating heart function and taking a chest X-ray.	Free-text answer

COPD: chronic obstructive pulmonary disease; FEV1: forced expiratory volume in one second; FVC: forced vital capacity; GP: general practitioner; LABA: long-acting β 2 agonists; LAMA: long-acting muscarinic antagonists; PEF: peak expiratory flow

^aQuestions measured practical COPD management skills in primary care and real-life problems in COPD care. The questions were constructed on the basis of Swedish national guidelines (shown in roman/normal typeface) and a previous study (shown in italics) [7,9]. Each answer was given a score of 1–2 points. Correct answers received full points. Points were subtracted for incorrect/inappropriate answers.

assessing responses to individual questions rather than on the total score. Assessment of the validity or internal consistency (i.e. reliability) of the questionnaire with psychometric tests was, therefore, regarded as irrelevant.

Organization of COPD care in primary care in Sweden

In Sweden, the majority of GPs and primary care nurses are employed at PHCCs run by the county councils, either directly or through private companies that have contracts with the councils. The majority of patients with COPD are diagnosed and monitored in primary care, and many PHCCs have nurse-led asthma/COPD clinics [13]. Pulmonary rehabilitation (PR) units include physiotherapists, occupational therapists and nutritionists, and are often managed separately from PHCCs.

Statistics

Statistical analyses were performed with the Statistical Package for Social Sciences, version 24.0 (SPSS 24.0; IBM Corporation, Armonk, NY). We used both parametric and nonparametric statistics. *p* values of $<.05$ were considered significant.

Ethical approval

The study was approved by the Regional Ethical Review Board of Stockholm (ref 2013/232-31/5). Prior to enrollment, all participants provided written informed consent. The study is registered at www.clinicaltrials.com, Protocol Record 2013/232-31/5.

Results

The main characteristics of participating GPs and PHCCs are presented in [Table 2](#). More GPs in

Table 2. The main characteristics of the participants.

Main characteristics	
Participants, <i>n</i> (%)	250 (100)
PHCCs, <i>n</i>	34
Number of participants per PHCC, mean (range)	7 (2–15)
Gender, <i>n</i> (%)	
Male	105 (42)
Female	145 (58)
Age, mean (range)	47 (27–69)
Degree in family medicine, <i>n</i> (%)	
Specialist in family medicine	182 (73)
Training to be a specialist in family medicine	68 (28)
Years worked in primary care, mean (range)	14.5 (0–41)
Asthma/COPD clinic at PHCC, <i>n</i> (%)	
Yes	114 (46)
No	136 (54)

PHCC: primary health care center; COPD: chronic obstructive pulmonary disease

Stockholm than elsewhere in Sweden work at privately owned PHCCs (because there are more privately owned PHCCs in Stockholm than elsewhere), but otherwise, Stockholm GPs are representative of Swedish GPs in general [14]. A total of 280 GPs participated in the CME; 250 (89%) responded to the baseline questionnaire. Of the non-responders (*n* = 30, 11% of all GPs), 90% worked at a PHCC without an asthma/COPD clinic (*p* < .005). They did not differ from the respondents in gender, age or professional degree. Background data were not collected on the few GPs that were absent on the day of CME, and these GPs did not fill in the questionnaires.

Frequencies of correct answers and further analysis

Each question yielded 0, 1 or 2 points. GPs' mean total score was 9.9 of the maximum 26 points. We did not conduct further descriptive analyses of the total scores, as our focus was on describing the scores for each specific question.

We observed statistically significant differences in the results at the different PHCCs. Scores tended to be low at PHCCs in socially deprived geographic areas and at privately owned PHCCs (*p* < .05). There was no correlation between scores on individual questions and whether or not the PHCC had an asthma/COPD clinic, except on one question (question 5). After adjustment for age and years in the profession, female GPs scored significantly higher than male GPs on three of the questions (questions 3, 9 and 10). GPs' age was not correlated with their scores.

[Table 1](#) shows the principles used in the correction template and [Table 3](#) the frequency distribution of points per question.

We conducted an additional analysis of the percentage of GPs who gave partly or fully correct answers to each question to better understand which topics gave GPs more difficulty. The results of this analysis are presented below.

Questions that more than 75% of GPs answered partly or fully correctly

GPs' scores were highest on questions 3 and 6, which covered 'management of smoking cessation'. A majority of the participants said they would recommend motivational interviewing [15] to support patients' efforts to quit smoking (required for correct answer). Question 5, which assessed 'follow-up after exacerbation', also elicited a high percentage of correct replies. The GPs with access to an asthma/COPD clinic

at the PHCC scored worse on question 5 than those without access to such clinic (1.10 vs. 1.42 points, $p < .001$).

Questions that 25–75% of GPs answered partly or fully correctly

Fifty-one percent of the GPs received points on question 1, which was about 'diagnostic procedures'. Of those who received points, 98% chose spirometry as the primary diagnostic method, 84% suggested a chest X-ray, and 25% were inclined to test NT-proBNP (all three required for fully correct answer).

Additionally, 51% of GPs received points on question 12, which covered 'multimorbidity in COPD patients without obvious symptoms from airways or COPD comorbidities'.

In response to question 7 about 'maintenance treatment of COPD', 56% of GPs chose long-acting muscarinic antagonists (LAMA) as a single therapy, 20% chose long-acting β 2-agonists (LABA) as a single therapy (20% of GPs), and 8% chose 'LAMA + LABA' (required for correct answer: LABA, LAMA or LABA + LAMA). A total of 21% of the GPs chose the incorrect answer, inhaled corticosteroids (ICS).

Twenty-nine percent of GPs responded correctly to question 4, about 'treatment of an acute exacerbation', choosing both oral antibiotics and steroids in adequate dosages and for an adequate period of time. However, 70% of all responders suggested an adequate antibiotics regime but omitted the oral

steroids. Thirty-three percent chose the incorrect answer, ICS.

Twenty-eight percent received full points for question 10, about 'interprofessional interventions'. Most GPs chose to refer the patient to a PR professional but failed to mark all three choices (required for a full score). A total of 42% suggested a referral to a pulmonary specialist for measuring arterial oxygen saturation, and 66% suggested dietary advice without a referral to a nutritionist (incorrect answers).

Questions that less than 25% of GPs answered partly or fully correctly

Twenty-three percent of GPs provided the correct answer to question 2 on 'spirometry interpretation'. Doctors who had worked more than 30 years in their profession received significantly higher points on this question than those who had worked fewer years in their profession (0.77 vs. 0.39 points, $p < .05$).

Discussion

Main findings

The aim of this study was to describe GPs' level of knowledge about COPD and COPD management skills. Our underlying objective was to identify weak areas in current primary care practice and to find opportunities for further targeted interventions. GPs' scores were highest in the area of smoking cessation support. They seemed to employ spirometry as they should but their spirometry interpretation skills were suboptimal. The

Table 3. Frequency distribution of points per question^a, presented in three groups (1–3).

Short description (question number)	Number of GPs (%)		
	0 points	1 point	2 points
1. Questions on which more than 75% of GPs scored 1–2 points			
Smoking cessation, unmotivated patients (3)	15 (6%)	162 (65%)	73 (29%)
Follow-up of acute exacerbation (5)	35 (14%)	112 (45%)	103 (41%)
Smoking cessation, motivated patients (6)	55 (22%)	59 (24%)	136 (54%)
2. Questions on which 25–75% of GPs scored 1–2 points			
Diagnostic procedures (1)	122 (49%)	107 (43%)	21 (8%)
Multimorbidity in COPD patients without obvious symptoms from airways or COPD comorbidities (an annual check-up) (12)	124 (50%)	102 (40%)	24 (10%)
Multimorbidity in COPD patients with symptoms from airways (increased fatigue and/or dyspnea) and/or COPD comorbidities (an annual check-up) (13)	132 (53%)	83 (33%)	35 (14%)
Follow-up of patients with stable COPD (9)	136 (54%)	90 (36%)	24 (10%)
Heart failure medication for patients with COPD (8)	148 (59%)	86 (34%)	16 (6%)
Maintenance treatment of COPD (GOLD B patients) (7)	150 (60%)	–	100 (40%)
Managing a suspected respiratory failure (11)	155 (62%)	–	95 (38%)
Treatment of acute exacerbation (4)	177 (71%)	–	73 (29%)
Interprofessional interventions (10)	181 (72%)	–	69 (28%)
3. Questions on which less than 25% of GPs scored 1–2 points			
Spirometry interpretation (2)	192 (77%)	–	58 (23%)

^aEach response was given a score of between 0 and 2 points; the highest possible score was 2 points. On questions 7, 11, 4, 10 and 2, only two scores were possible: 0 or 2 points.

mediocre scores on using symptom evaluations and referrals to PR indicated that GPs' management of COPD was insufficient. GPs often prescribed the incorrect medical therapy for acute exacerbation and maintenance. Finally, they often paid insufficient attention to COPD during patient consultations, especially in the scenario of multimorbidity.

General findings in relation to the findings of previous studies

Our finding of uneven knowledge about recommended best practice in COPD care has parallels in the previous literature [16–18]. Earlier researchers have suggested that unfamiliarity with guidelines and recommendations is a key barrier to guideline implementation. In addition, expected health benefits, motivation, prioritization and structural support are influential [8,19]. The suboptimal results in managing multimorbidity are unique to this study, as GPs' management of multimorbidity in COPD patients has not been addressed by previous research. This finding illustrates the complexity of COPD. It also emphasizes the need, suggested by the results of a qualitative study, to ensure that GPs in Sweden are trained in and competent to take a holistic view of medical care for patients with multimorbidities [7].

Good general knowledge about smoking cessation support

Smoking cessation reduces the risk of COPD and slows disease progression [7,20]. Because this is so well known, it did not surprise us to find that GPs demonstrated good clinical skills and a high level of awareness of current guidelines. Swedish guidelines recommend pharmacological treatment accompanied by behavioral interventions, such as motivational interviewing. In this study, although challenged by a description of an unmotivated patient, most GPs employed behavioral strategies, and every other GP combined them with pharmacological approaches. This result may also reflect increasing access to primary care nurses with competence in motivational interviewing.

Asthma/COPD clinics at the PHCCs may explain the patterns of spirometry use and management of exacerbation follow-ups

The high level of awareness of spirometry as a diagnostic tool that we observed is in line with the findings of a 2014 study that found substantial

improvements in spirometry use in primary care in Sweden [21]. According to a 2006 Dutch study, GPs' use of spirometry was correlated with adequate training in interpreting tests and with support from practice nurses [22]. At the same time, the GPs' spirometry interpretation skills were insufficient. This finding was surprising, since almost half of the PHCCs had an asthma/COPD clinic of good quality and hence used spirometry frequently. One possible reason for our finding is that GPs who work at PHCCs with nurse-led asthma/COPD clinics may not take the frequent opportunity to practice their skills in spirometry interpretation. These responsibilities may have been transferred from the GPs to specialized asthma/COPD nurses, resulting in stagnation in the GPs' own skills in spirometry. However, the results may have been negatively biased, as the GPs were not allowed to use additional sources that they commonly use, such as spirometry guides and summaries, while completing the questionnaire. Additionally, only one of the 13 questions measured spirometry interpretation skills, so only limited conclusions could be drawn. The presence of an asthma/COPD clinic also decreased GPs' knowledge of correct monitoring (i.e. follow-up) of acute exacerbations. This may also be a result of handing over their responsibilities to asthma/COPD nurses.

Use of corticosteroids

ICS increase the risk of pneumonia and are inappropriate in patients with mild to moderate COPD [4]. A previous study found, as we did, that GPs overprescribed ICS [23]. The authors of that study attributed the problem to lack of familiarity with recommendations. It may also be a result of inaccurate diagnoses by the GPs; in this case, ambiguity about whether the patient had asthma, COPD or both. However, oral steroids were underused to treat exacerbations. This finding is in line with the findings of a previous Swedish study [24].

Low levels of use of pulmonary rehabilitation

Our study revealed that GPs did not refer patients to PR as often as they should have. This is particularly noteworthy given the accessibility of PR in Swedish primary care [25]. Previous researchers found that GPs' inadequate knowledge of the role of PR in treatment, insufficient experience, and lack of routines explained their low rates of referral to PR [26]. PR units that are separate from PHCCs may increase the risk that GPs will not become familiar with the role of PR in COPD care.

Follow-up and management of patients with multimorbidity

Unlike the GPs in a 2016 study, who relied on patients to make appointments [27], many GPs in this study proposed active, GP-initiated follow-up after they made changes in treatment (86% after an acute exacerbation and 46% during a stable phase). However, the responses to questions 12 and 13 showed that management of COPD comorbidities and COPD patients with multimorbidity was insufficient. Although the GPs knew the patient had a COPD diagnosis, they tended to focus on the patient's agenda, which clearly did not include COPD. Consequently, many GPs stated that they would investigate a wide range of other medical issues taken up by the patient but omitted COPD. This focus would lead GPs to deprioritize medical assessment of COPD and give up their role as COPD experts. This finding supports previous observations of this kind in a similar setting [7].

As many patients have difficulty recognizing the importance of COPD and its long-term implications, it is crucial that GPs bring up COPD in consultations and use their expert knowledge about the disease and its often extra-pulmonary symptoms [28]. At the same time, many guidelines focus on one disease, limiting their feasibility in real life practice [29]. As a result, cooperation between the professionals involved in the care of patients with multimorbidity remains insufficient, and professionals perceive healthcare pathways as fragmented [30]. These findings of unsatisfactory interprofessional cooperation lead to a growing need for integrated health care for multimorbid patients with chronic conditions like COPD. Unlike in United Kingdom, in Sweden, there are currently no guidelines for management of patients with multimorbidity [31].

The effects of GPs' background characteristics on the scores

Although questionnaire scores were not correlated with the GPs' age, researchers have previously speculated that younger physicians may be more likely to follow clinical guidelines than older physicians, whose training lies further in the past [32]. In one study, Swedish female GPs appeared to be better than male GPs at reaching treatment goals in hypertensive patients [33]. However, the relevance and consequences of our findings on gender differences need further research. The same applies to the results on social deprivation and private ownership of PHCCs.

Methodological considerations

The strength of this study is that the questionnaire covered real-life clinical problems that are easily recognizable to GPs [7]. The answers required pragmatic decisions in concordance with current guidelines, which provided meaningful insights into 'real-world' practices. The free-text answers allowed us to explore local routines in COPD management. We could thus compare clinical modalities and ascertain areas where improvements were most needed.

However, assessing CME's effects on clinicians is complex. Using 'Miller's pyramid of competence', Wass et al. have argued that to be reliable and valid, assessments must use multiple methods. The demands on assessment methods increase when one moves from assessing the level of knowledge at the base of the pyramid (when the student 'Knows') to the following two levels ('Knows how' and 'Shows how') and finally to the apex ('Does') [10]. A weakness of our study was the fact that the questionnaire revealed only theoretical knowledge and self-reported, preferred actions. What the GPs do in practice remains unknown.

Conclusions and implications for future research and practice

This study showed that a group of Swedish GPs had insufficient knowledge in multiple areas of COPD diagnosis and management and insufficiently adhered to current guidelines. GPs at PHCCs with nurse-led asthma/COPD clinics did not have more COPD knowledge or management skills than GPs at PHCCs without such clinics. To investigate whether the results of this study relate to the participants' actual clinical practice, the authors are currently analyzing the effects of the CME on patient outcomes. Future studies could investigate the usefulness of easy-to-access guidelines, as GPs generally deal with time constraints and patients with a number of complex medical conditions in their everyday work. Identifying actual clinical management patterns and problem areas can help in planning future CME interventions that focus on these problem areas. This, in turn, may improve GPs' COPD diagnosis and management and thus prevent long-term negative consequences for patients with COPD.

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