From the Department of neurobiology, care sciences and society
Division of Family Medicine and Primary Care
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Improving general practitioners' management of COPD: a challenge in Swedish primary health care

Hanna Sandelowsky

Karolinska Institutet

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Hanna Sandelowsky

Main supervisor:
Anna Nager, M.D., Ph.D.
Karolinska Institutet
Department of Neurobiology, Care Sciences and Society
Division of Family Medicine and Primary Care

Co-supervisors:
Ingvar Krakau, M.D., associate professor
Karolinska Institutet
Department of Medicine

Sonja Modin, M.D., Ph.D.
Karolinska Institutet
Department of Neurobiology, Care Sciences and Society
Division of Family Medicine and Primary Care

Björn Ställberg, M.D., associate professor
Uppsala University
Department of Public Health and Caring Sciences,
Family Medicine and Clinical Epidemiology

Opponent:
Hasse Melbye, professor
The Arctic University of Norway, Tromsø
General Practice Research Unit

Examination Board:
Anne Lindberg. M.D., associate professor
Umeå University
Department of Public Health and Clinical Medicine

Annika Forssén. M.D., associate professor
Umeå University
Department of Public Health and Clinical Medicine

Hans Gilljam. M.D., professor
Karolinska Institutet
Department for Public Health Sciences

To my mother who taught me to respect and appreciate doctors and teachers.

“The life so short, the craft so long to learn.”
Hippocrates

ABSTRACT

Background and aim: General practitioners (GPs) who possess a high level of knowledge about chronic obstructive pulmonary disease (COPD) and good skills in managing COPD, other chronic conditions, and multimorbidity are prerequisites for optimal COPD care. However, there is a substantial discrepancy between COPD guidelines and practice. The general aims of this doctoral project were to describe the problem of underdiagnosis of COPD in Swedish primary care, explain reasons for underdiagnosis and deprioritization of COPD from a GP's point of view, and investigate whether continuing medical education (CME) can improve GPs' level of knowledge about and skills in managing COPD.

Material and methods: This mixed method implementation research project included four papers derived from three studies conducted in Stockholm County primary care. Study 1 (Paper I) was a quantitative, descriptive, epidemiological, targeted case-finding study. It used medical records and spirometry results from 138 patients diagnosed with respiratory tract infections in urgent primary care to determine the prevalence of undiagnosed COPD and factors associated with it. Study 2 (Paper II) was a qualitative study using grounded theory methods. It explored obstacles to bringing up COPD at patient-doctor consultations. Data were collected via focus group and individual interviews with 59 GPs. Study 3 resulted in two papers. Paper III presented the study protocol for the PRIMAIR study, a three-armed cluster-randomized controlled trial with two levels of outcomes (physicians, patients). Paper IV described the GP results of PRIMAIR. Twenty-four PHCCs were randomized into two CME intervention arms: case method learning (CM) (n=12) and traditional lectures (TL) (n=12). A reference group without CME (n=11) was recruited separately. GPs (n=255) participated in the study arm to which their PHCC was allocated: CM, n=87; TL, n=93; and reference, n=75. Two 2-hour CME sessions were given in a period of 3 months. GPs' pre- and post-CME levels of knowledge were measured with a 13-item questionnaire (0-2 points per question, total maximum score 26 points).

Results: In Study 1, the prevalence of previously undiagnosed COPD in the 138 patients was 27% (95% CI ±7%); 44.7% were in stage 1 (mild, FEV1≥80% of predicted), 52.6% in stage 2, (moderate, 50%≤FEV1<80% of predicted), 2.6% in stage 3 (severe, 30%≤FEV1<50% of predicted), and 0% in stage 4 (very severe, FEV1 <30% of predicted). We observed a significant association between COPD and being

≥55 years (OR = 10.9 [95% CI 3.8-30.1]) and between COPD and smoking intensity (>20 pack years) (OR = 3.2 [95% CI 1.2-8.5]). Sex, current smoking status, and type of infection were not significantly associated with COPD. Study 2 revealed that time-pressured patient-doctor consultations led to deprioritization of COPD. During unscheduled visits, deprioritization resulted from focusing only on acute health concerns, whereas during routine care visits, COPD was deprioritized in multimorbid patients. GPs' reasons for deprioritizing COPD were: not becoming aware of COPD, not becoming concerned due to clinical features, insufficient local routines for COPD care, negative personal attitudes and views about COPD, managing diagnoses one at a time, and perceiving patient motivation as low. The study 3 protocol article (Paper III), presented in-depth information about disease knowledge (COPD), CME and pedagogical research, cluster statistics, and the plans for implementing PRIMAIR. In the paper on PRIMAIR's GP outcomes (Paper IV), 133 GPs (52%) completed the questionnaire both at baseline and 12 months. Both pedagogical methods resulted in small yet significantly higher total questionnaire scores in level of COPD knowledge at 12 months: CM, 10.34 (baseline) vs. 11.44 (12 months); TL, 10.21 vs. 10.91 ($p<0.05$). There were few significant differences between the two CME methods. Both intervention arms had significantly better results than the reference group. At both baseline and 12 months, all three groups (CM, TL, reference group) had relatively high scores on questions about smoking cessation support and low scores on those that measured spirometry interpretation skills, interprofessional care, and management of multimorbidity.

Conclusion: It is crucial for GPs to identify patients at high risk of COPD and offer them spirometry testing to detect COPD early, as it may help motivate patients to quit smoking. To reduce the risk of deprioritizing COPD in patient-doctor consultations, we suggest that GPs actively apply a holistic consultation approach and that policy makers and PHCCs offer extended consultation time for multimorbid patients. It is difficult to improve the generally low levels of knowledge about COPD in GPs, at least via short CME sessions. For GPs, CME is career-long, cumulative experience, which makes it challenging to evaluate single CME interventions. More time for GPs' work and professional development regarding management of patients with COPD, other chronic diseases, and multimorbidity is crucial to public health.

This thesis is based on following original articles, referred to in the text by their Roman numerals.

I. Sandelowsky H, Ställberg B, Nager A, Hasselström J.
The prevalence of undiagnosed chronic obstructive pulmonary disease in a primary care population with respiratory tract infections - a case finding study.
BMC Family Practice 2011 Nov 3;12:122.
doi: 10.1186/1471-2296-12-122

II. Sandelowsky H, Hylander I, Krakau I, Modin S, Ställberg B, Nager A.
Time pressured deprioritization of COPD in primary care: a qualitative study.
Scandinavian Journal of Primary Health Care 2016;34(1):55-65.
doi: 10.3109/02813432.2015.1132892. E-published 2016 Feb 5.

III. Sandelowsky H, Krakau I, Modin S, Ställberg B, Nager A.
Case Method in COPD education for primary care physicians: study protocol for a cluster randomised controlled trial.
Trials. 2017 Apr 27;18(1):197.
doi: 10.1186/s13063-017-1889-4

IV. Sandelowsky H, Krakau I, Modin S, Ställberg B, Johansson S-E, Nager A.
Effectiveness of 2x2-hour traditional lectures and case methods in Swedish general practitioners' continuing medical education about COPD: a cluster randomized controlled trial.
Submitted.

Related paper
Sandelowsky H, Natalishvili N, Krakau I, Modin S, Ställberg B, Nager A.
COPD management by Swedish general practitioners - baseline results of the PRIMAIR study.
Scand J Prim Health Care. 2018 Mar;36(1):5-13.
doi: 10.1080/02813432.2018.1426148. E-published 2018 Jan 15.

CONTENTS

ACO	Asthma-COPD overlapping
APC	Academic Primary Health Care Centre *(Akademiskt primärvårds-centrum)*
CeFAM	Centre for Family Medicine *(Centrum för allmänmedicin)*
CI	Confidence interval
CM	Case method learning
CME	Continuing medical education
CONSORT	Consolidated Standards of Reporting Trials 2010 Statement
COPD	Chronic obstructive pulmonary disease
EPOC	The Effective Practice and Organisation of Care Group
FEV1	Forced expiratory volume of 1 second
FEV6	Forced expiratory volume of 6 seconds
FVC	Forced vital capacity
GTM	Grounded theory methods
GOLD	The Global Initiative for Obstructive Lung Disease
GP	General practitioner
ICC	Intraclass (intracluster) correlation coefficient
ICD-10	International Statistical Classification of Diseases and Related Health Problems, tenth revision
IPCRG	The International Primary Care Respiratory Group
OECD	The Organisation for Economic Co-operation and Development
PHCC	Primary health care center
PR	Pulmonary rehabilitation
ROC	Receiver/response operating characteristic
RTI	Respiratory tract infection
SOLO	Structure of Observed Learning Outcomes
SPIRIT	Standard Protocol Items: Recommendations for Interventional Trials
TL	Traditional lecture

Like most high school kids, I struggled to decide what I would become when I grew up. I liked going to school, so I thought working as a teacher would be nice. Or maybe a historian. Or a journalist. Or a physiotherapist. My friends and teachers thought I would make a good doctor. My parents just wanted me to decide.

Eventually, my parents were able to relax. My high school friends and teachers' prophecy that I would study medicine proved to be right, and I moved to Stockholm to go to school at Karolinska Institutet. One of my teachers at medical school in the early 1990s was a senior pulmonologist, who was (and still is) an expert in COPD. As a young student, I was impressed by the way she used simple, basic clinical skills to examine patients and by the respectful and kind way she treated people. She had this energizing aura about her. Once, in passing, she praised me for my undoubtedly fumbling attempts to examine and converse with a patient on the ward. I was flattered and I soon understood that I, too, wanted to become a truly skilled physician. I realized that I needed to learn what my teacher already knew: how to approach my patients so that I would understand their situation better. I then decided to become a GP. However, my teacher had managed to plant two more thoughts in my mind: an interest in airway diseases and a reawakened desire to share what I know by teaching others.

Many primary care patients come to see their GPs for airway problems. This gives GPs wonderful opportunities to learn and explore more about respiratory diseases in the general public. My growing curiosity about GPs' roles in the management of airway diseases eventually spurred me to start researching the topic. I signed up for a course in research methodology at the Centre for Family Medicine (CeFAM), now the Academic Primary Health Care Centre (APC). Later, CeFAM helped me put together a research team and take my first steps as a doctoral student. I was also employed part-time as a care development leader at CeFAM, which involved working with continuing medical education (CME) in primary care. Somehow, my high school plan of becoming a teacher had materialized. I started to look at CME with new, researcher's eyes. Soon, my doctoral project came to include a study about CME.

I am thankful for the opportunities I have been given and the choices I have made. During my 20 years as a GP, I have been fascinated by my profession: the versatility that paves the way for holistic, salutogenic, humanistic—and yet realistic—views of patients. I have seen people leave my room happy, strength-

ened, relieved, and hopeful, but also distressed and worried. I have had all those feelings myself. The job does not leave anyone unmoved. Becoming someone's GP takes years, and I am still learning.

The years that I have worked with CME have made me respect, appreciate, and value my GP colleagues. All the creative discussions, unexpected realizations, and some good laughs that have taken place during collegial dialogues and other CME sessions have helped me develop professionally and given me strength to cope with today's tough primary health care environment. As a CME teacher, I have also had the privilege of experiencing moments of "the ultimate teacher's high": the feeling that you have made others understand new things so they change their behavior.

Doctoral studies have not only taught me to think critically (and manage a bit of statistics), but also to organize, plan, and execute projects. I have grown as a physician, a teacher, and a person. I look forward to continuing all three of my professional roles as researcher, educator, and GP. After all, doctors can't wear their degrees around their necks. That's what stethoscopes are for.

"General practitioners are physicians who focus on the people who have diseases, not just the diseases that they have." (Lee, TH. 2008 [1])

1.1 FAMILY MEDICINE AND GENERAL PRACTITIONERS IN A CHANGING HEALTH CARE SYSTEM IN SWEDEN

Family medicine, also called general medicine, is the medical specialty of primary care. General practitioners (GPs) in Sweden are physicians with a specialist degree in family medicine. They are the backbone of the quality of primary health care. The following description of the development of family medicine and primary care in Sweden, found in the chapters 1.1.1 to 1.1.3, is mainly based on the 2016 report "Effective care," by Göran Stiernstedt et al. The report aimed to find the most effective way to use financial and professional resources in Swedish healthcare [2].

1.1.1 Historical perspective

Until World War II, GPs in Sweden played a central role in providing public health care. Hospitals with urgent care units became more common in the 1950s. In Sweden, the number of GPs began to decline and the number of hospital-based physicians started to increase. Uncertainties about the role and the level of competence of GPs appeared, young physicians were drawn to the hospitals, and recruiting new GPs became more difficult. Indeed, GPs experienced a degradation of their position as experts in medical care, which lasted over two decades. The situation began to change in the 1970s as Swedish politicians realized the benefits of organized public health care delivered by GPs. The organizational idea and term "primary health care" appeared [3], primary health care centers (PHCCs) were established around the country, teamwork with district nurses became GPs' standard working method, and reimbursement systems were reformed to benefit the newly started PHCCs. Simultaneously, the term "family medicine" came into being to describe GPs' professional specialty, and medical residency for GPs was standardized.

However, there was still no clear description of which professionals in the chain of health care were ultimately responsible for which activities. Thus, somewhat paradoxically, referrals from secondary to primary care started to increase in the 1970s. Before long, PHCCs were providing health care to new patients with more complicated diseases than before and were asked to conduct more medical investigations before referring a patient to secondary care. At the same time, the number of GPs did not grow, laying the foundations for the heavy workloads that still characterize GPs' work [4].

1.1.2 The organization of primary care in Sweden today

Today, Swedish primary care is a mix of two models described in a 2003 Canadian analysis of primary care organizations in OECD countries [5]. The first is an "integrated community model," in which PHCCs are responsible for meeting the needs of a geographically defined population and for integrating their work with that of other health care providers to achieve this goal. The second is a "professional coordination model," in which PHCCs provide medical services to those who seek or choose to register to obtain them. At a typical Swedish PHCC today, several GPs work together and in close cooperation with other professionals, such as nurses, physiotherapists, occupational therapists, and counsellors. An average PHCC in Sweden is responsible for approximately 10,000 registered patients. Practically all GPs are employed by PHCCs, which are run by county councils, either directly or through contracts with private companies. PHCCs often have specialized, nurse-led clinics to address prevalent diseases, such as diabetes, heart failure, and asthma/COPD [6].

The patients who visit GPs today vary from "occasional seekers" (patients without chronic conditions who seek medical help) to "regulars" (patients who often have chronic or multiple health issues). Unless the patient seeks urgent care for a single health problem, Swedish GPs usually address multiple health issues during one consultation, which can take up to 20 to 30 minutes. Ideally, patients have their own family doctor, a GP they consult whenever they have health problems. GPs consider patient continuity an essential characteristic of primary care. There is a positive association between patient-doctor continuity in primary care and outcomes such as patient satisfaction, adherence to treatments, fewer hospitalizations, better health status, and lower costs [7, 8]. However, in reality, discontinuity in the patient-doctor relationship is common, especially for urgent care visits and "occasional seekers."

1.1.3 The state of family medicine today

From the mid-1980s to the present, the burden borne by primary health care has continued to increase [9]. The rules for many of the structural changes that have affected the interactions between and responsibilities of primary and secondary care have primarily been set by policymakers and representatives of secondary care. No substantial redistribution of resources from secondary to primary care has materialized even though demanding tasks continue to be moved from sec-

ondary to primary care. The aging of the population is also increasing the workload in primary care, as it means that more people experience severe chronic conditions and multimorbidities. Still, clear and coherent communication between primary and secondary care is often absent, as are clear chains of care. On a positive note, all parties presently agree that cooperation and clarity about shared responsibilities are urgently needed.

The changes in primary care in recent decades have not led to substantial improvements in primary care. Many primary care patients are frustrated by discontinuity and lack of easy access to primary care. In parallel, many GPs feel stressed because the situation makes it so difficult to practice high quality family medicine. On a typical work day, GPs take care of a mix of urgent and regular patients, patient administration (including correspondence with patients and specialist care consultants by mail or telephone), supervision of junior colleagues and students, and management assignments. However, GPs may find it difficult to balance the different tasks. The reimbursement-related demand that GPs pack as many patient visits as possible into the working day contributes to stress, as it does not always harmonize with GPs' pursuit of patient continuity and a family-centered approach. Additionally, the versatility of the work, limits to knowledge in specialized areas of medicine, and uncertainty in decision-making may lead to increased stress [10].

A 2015 survey of approximately 4000 Swedish GPs revealed high levels of stress due to heavy workloads [11]. In the strained work environment, GPs and their managers tended to deprioritize time for professional development and continuing medical education (CME). Physicians in Sweden do not have to participate in CME is to keep their licenses. The managers of PHCCs are ultimately obligated to make sure their personnel are regularly provided with the necessary CME. Nevertheless, GPs in Sweden report they have, on average, less than 60 minutes per week for professional development, including unplanned collegial discussions, and one of six GPs report they have no time at all for CME [12]. About half of the GPs in Sweden today have seriously considered leaving the profession because of the high stress levels and unsatisfactory working conditions [11]. Thus, the current situation can be described as an ongoing crisis in family medicine. Similar alarming signals are found in other Western countries today. In the United Kingdom, studies show that the substantial increase in the levels of stress and distress in GPs are associated with significant increases in patients' care-seeking

behavior and with total clinical workload. The studies suggest that primary care in the United Kingdom, as currently delivered, is now close to reaching its saturation point [13, 14].

1.2 CHRONIC OBSTRUCTIVE PULMONARY DISEASE – A COMPLEX AND MULTI FACETED CONDITION

The organizational changes in recent decades mean that management of chronic conditions and severe multimorbidities has become a central part of GPs' work. Chronic obstructive pulmonary disease (COPD) is an example of such a disease. Moreover, it is both diagnosed and almost entirely managed in primary care in Sweden [15].

1.2.1 Epidemiology and costs of COPD

COPD is a common cause of morbidity worldwide; prevalence and mortality rates due to COPD continue to rise [16]. Today, COPD is the fourth most common cause of death in the world, after heart attack, stroke, and lower respiratory infections [17]. Despite some improvements in recent years, at least in the Western world, it is still grossly underdiagnosed and insufficiently managed [15, 18]. COPD is largely a man-made illness. In high-income countries, it is mainly caused by active or passive tobacco smoking, whereas in lower-income countries, outdoor pollution, unventilated indoor environments (e.g., in which people are exposed to smoke from cooking fires), and tobacco smoking are the main inducers of the disease. Patients with asthma are at particular risk of developing COPD. In patients with asthma, smoking and insufficient treatment of asthma accelerate development of COPD. A patient who presents with features of both asthma and COPD has asthma-COPD overlap syndrome (ACO). Patients with ACO have worse lung function and more symptoms than those with asthma or COPD only [19].

An estimated 7% of the general population of Sweden have COPD. Internationally, the prevalence is 3% to 12% overall [20-22], 9% to 10% in adults older than 40 years [23]. It is 25% to 50% in a general smoking population and increases with age [22, 24-26]. The prevalence of ACO in Sweden is approximately 3% [19].

The majority of COPD expenses go to providing care for people in the most severe stages of the disease. The cost of COPD care in Sweden is approximately

1.5 billion euros (13.9 billion SEK) a year [27]. As COPD typically presents not only as an airway disease but also with multiple extra-pulmonary comorbidities, it has a significant and manifold impact on total public health care costs. Direct costs due to COPD are driven by hospitalizations, COPD-related comorbidities, and respiratory drugs. Indirect costs consists mainly of sick-leave expenses [28].

1.2.2 Pathophysiology and the classification of COPD stages

In COPD, chronic airway inflammation (bronchitis and bronchiolitis) and destruction of the lung parenchyma (emphysema) occur. Airway inflammation then seems to "spill over," causing systemic inflammation that affects other organ systems (extra-pulmonary features) [29]. COPD should be suspected in any patient with dyspnea, chronic cough or sputum production, and/or a history of exposure to smoking or other risk factors. The diagnosis of COPD is based on typical patient history and chronic airflow limitation demonstrated with spirometry testing. Disease severity is assessed to guide therapy. Until 2011, the severity grade of COPD was determined only by airflow limitation (spirometry measures) in accordance with The Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria [30, 31]. Between 2011 and 2017, the disease's impact on patients' symptom burden and the risk of future events (exacerbations, hospital admissions, or death) were added to the assessment of the severity grade, which gave rise to a new GOLD classification, A to D [31]. The current national guidelines in Sweden, published in 2015, are based on the 2014 GOLD guidelines [32]. However, yet another update to the GOLD classification was made in 2017, in which the classification into groups A to D was based solely on the symptom burden and exacerbation history [33]. The 2017 classification has not yet been implemented in Sweden. It involves changes in severity classification such that half of all patients with COPD would be classified in a lower risk-group than currently [34].

1.2.3 The slowly progressing symptoms of COPD

The early stages of COPD are characterized by indistinct, sometimes even unnoticeable symptoms. The patient typically adapts to the mild symptoms and both the patient and health care professionals often fail to suspect COPD. The first noticeable symptoms and signs, such as hypertension, are often associated with organs other than the airway. In fact, when noticeable airway symptoms appear, and a diagnosis of COPD is made, it is common that a substantial part of predicted

lung function has already been lost [35]. Fatigue, exertion dyspnea, increased production of sputum, chronic cough, frequent respiratory tract infections (RTIs), and prolonged colds are typical early and noticeable features of the disease. As COPD advances, wheezing and chest tightness may occur. Eventually, comorbidities such as heart disease, depression, osteoporosis, gastroesophageal reflux disease, and myopathy emerge [15, 36, 37]. Later, acute deterioration characterized by increased dyspnea and sputum volume and purulence (i.e., exacerbations) start to occur [38, 39]. During an exacerbation, the patient experiences troublesome symptoms, which often require urgent medical care. However, some patients "ride out" their exacerbations at home: an estimated 40% to 50% of exacerbations are not reported to health care professionals [40-42]. Typically, the patient recovers gradually from an acute exacerbation over the course of 7 to 8 weeks, slowly adapting to the symptoms that present in the post-exacerbation period.

Each exacerbation causes a permanent decline in lung function [43]. A significant proportion of patients who have started to exacerbate die within five years. In addition to poor lung function, older age and the presence of symptomatic comorbidities are closely associated with a higher risk of mortality [44, 45]. A permanent, slight worsening of lung function due to the exacerbation, which could be measured with spirometry, may go unnoticed because patients tend to adapt to their symptoms after each exacerbation, so warning signals may be missed [46].

"Nothing's changed. Same old same old! And I'm quite happy with that."
(A patient with COPD, when asked how he was feeling a few weeks after an exacerbation, Pinnock, et al. 2011 [46])

Under these circumstances, patients with COPD, their families, and their caregivers may be equally unprepared for a sudden, fatal deterioration **(Figure 1)** [46].

1.3 THE RATIONALE BEHIND THIS THESIS

The roots of this thesis lie in primary health care's commitment to managing the vast majority of patients with COPD. Thus far, primary health care has not been particularly successful in fulfilling this commitment, as clearly demonstrated by the gap between current guidelines and practice. Because GPs are usually the

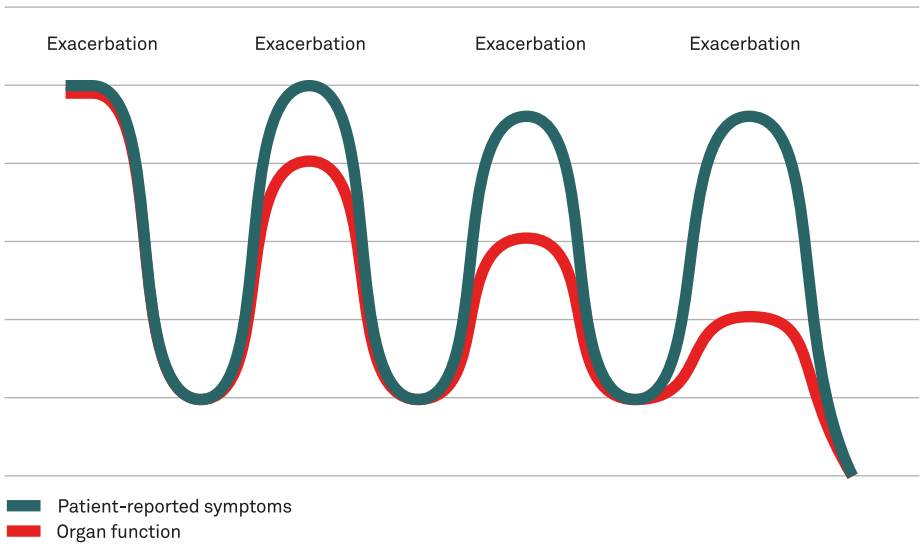


Figure 1. As COPD advances and relapses into exacerbations, a discrepancy arises between patients' reported symptoms and their progressive deterioration over time. Adapted with permission from Figure 5 in Giacomini M, DeJean D, Simeonov D, et al. Experiences of living and dying with COPD: a systematic review and synthesis of the qualitative empirical literature. Ont Health Technol Assess Ser 2012;12:1–47 [47].

first health care professionals that patients with COPD encounter, GPs' role in COPD care is essential to bridging the implementation gap. GPs' competence in COPD care must be assessed, evaluated, improved via education, re-evaluated, and reassessed, and the outcomes need to be measured in both GPs and patients.

1.3.1 COPD guidelines in primary care

Successful implementation of guidelines is the basis of patient-centered care and actions to prevent chronic diseases. In recent years, several largely compatible COPD guidelines have been published internationally, nationally, and locally. The guidelines referred to in this thesis were written by the Swedish National Board of Health and Welfare (2004, 2015), Swedish Medical Products Agency (2009, 2015), The GOLD (2014, 2017), and Stockholm County (the "Viss" clinical guidelines) [31, 32, 48, 49].

1.3.2 The role of primary care and GPs in managing COPD

Primary care is the first-line health care provider for the vast majority of people in Sweden and often the gate-keeper of secondary care. Thus, primary care is not only responsible for the early detection of many chronic diseases, but also has unique opportunities to do so and then provide patients with evidence-based treatments. The vast majority of patients with COPD are fully managed in primary care. Although the gap between the care called for in guidelines and that provided in practice has narrowed in recent years, there is still a clear discrepancy in both primary and secondary care [50]. In primary care, the discrepancy manifests as an insufficient detection rate, suboptimal treatment, and poor disease monitoring [15, 51-53]. More specifically, there is room for improvement in the early diagnosis of COPD, management of acute and maintenance treatments (such as choice of pharmacological therapies and use of inter-professional cooperation), and structured follow-up of patients at PHCCs [53-55].

As COPD-related airway damage is irreversible, treatments aim to reduce symptoms and prevent exacerbations, thus improving quality of life and prognosis. The current guidelines rest on three pillars: 1) non-pharmacological treatment (smoking cessation, exercise, and nutrition), 2) pharmacological treatment, and 3) advanced treatment of severe stages (oxygen, surgical interventions, and palliative care). Assessments of disease progress and therapeutic choices are made mainly by monitoring the development of symptoms.

Most patients need multidisciplinary management, in which interprofessional cooperation is essential [56]. In Sweden, practically all PHCCs have a spirometer [15]. At a PHCC-based, certified asthma/COPD clinic, a specialist nurse works closely with GPs, is responsible for spirometry testing and patient education, and coordinates the management of the patient's COPD with pulmonary rehabilitation units, which are often organized and managed independently of PHCCs.

1.3.3 The implementation gap

The International Primary Care Respiratory Group (IPCRG) has called for research on COPD guideline implementation [57]. Surveys have indicated that low familiarity with current guidelines, difficulty interpreting spirometry results, time constraints, and therapeutic nihilism may lie behind poor implementation of COPD guidelines [58, 59]. Moreover, GPs often experience conflicts between current

guidelines and a patient's individual needs or the GP's autonomy [60, 61]. Obstacles may also originate elsewhere in the healthcare system. Examples include financial disincentives and lack of access resources that are needed to implement guidelines, such as services, facilities, or equipment [62]. A 2014 study of GPs in southern Sweden suggested that patient safety; trust in the development of evidence-based, market-neutral guidelines; and sufficient time for dialogue with patients about the recommendations were the key motivating factors for good adherence to drug prescribing guidelines [60].

1.3.4 Using continuing medical education to reduce the implementation gap

CME is commonly used to bridge the gap between theory and practice. In line with existing theories of adult learning, the American College of Chest Physicians recommends using multiple teaching techniques in CME. Case method learning, lectures, hands-on demonstrations, discussion groups, and role playing are examples of activities that can effectively change physicians' knowledge and performance as well as clinical outcomes [63]. However, an Australian survey of 2500 GPs found that GPs preferred lecture-based CME (a "quantitative" learning method) to interactive CME (a "qualitative" learning method) [64]. Moreover, it is obvious that when faced with a wide spectrum of CME choices, busy GPs need to compromise and prioritize. Consequently, much of the CME for GPs in Sweden is provided in short, 1 to 2 hour sessions, often in the afternoon, mainly in the form of semi-didactic lectures, and preferably in one-time educational meetings the PHCC. We were particularly interested in studying two types of CME methods.

- ***Traditional lectures*** (TL), which are mainly characterized by quantitative learning and carried out in didactic style with a CME leader who is an academic expert. TLs often include short patient case vignettes that may or may not lead to some interaction between the CME leader and the participants; i.e., they are semi-didactic lectures. TLs primarily aim to reduce knowledge barriers at the level of the individual participant.

- ***Case method learning*** (CM), which is mainly characterized by qualitative learning but can be carried out in a similar setting and amount of time as TLs. Typically, CM does not involve didactic lecturing. The participants are active

generators rather than passive recipients of knowledge. The teaching approach in CM is clearly interactive. At a CM seminar, one or two open-ended narratives (i.e., cases) are thoroughly discussed, and the CME leader acts as a facilitator. The cases are always told from the perspective of a professional [65]. The primary aim of CM techniques is to improve clinical decision-making skills. Like other participatory learning methods, CM aims to improve participants' level of knowledge by influencing their attitudes. CM requires maturity, as well as previous knowledge and clinical experience in the subject. When used in CME delivered in primary health care settings, CM can have a positive impact on learning [66, 67].

Little previous research has investigated the effectiveness of CME methods for improving GPs' knowledge about managing COPD. This disease is unique in that it is common, severe, and chronic; typically has significant comorbidities and psychosocial manifestations [68]; and is complicated by obstacles related to the patient, clinician, and care system [69]. As a CME educator at the Stockholm County Council, I was particularly in interested in learning whether the two-hour CME sessions that seemed so popular among GPs were a suitable way to teach and learn about COPD, as this topic had not been previously studied. Additionally, I wanted to investigate whether achieving knowledge at a qualitative (more advanced) level via CM would improve knowledge at a quantitative (less advanced) level that normally is achieved via methods such as TL.

In this thesis project, I first set out to better understand the problem, asking the question, "What are some of the consequences of poor adherence to COPD guidelines in primary care?" I chose underdiagnosis as an example of a problem with adherence and studied it by investigating the rate of detection of previously unknown COPD in patients seeking urgent primary care. Next, I studied the reasons for the problem, asking "Why do GPs adhere poorly to the guidelines?" I addressed with a qualitative interview study. The final part of the project tested a CME intervention to address the question, "What can be done about the problem?"

The overall aim of this thesis was to explore GPs' management of COPD and improve their knowledge about COPD. There were three specific aims.

1) To a) describe the prevalence and severity of undiagnosed COPD in patients who were over 40 years, were current or former smokers, and presented with respiratory infections at an urgent primary care unit and b) identify the variables in patients' histories that were associated with previously unknown COPD.

2) To describe factors that hindered discussions between GPs and their patients about COPD.

3) To evaluate and compare the effects of two common types of CME methods and no CME at all on GPs' level of competence in different areas of COPD management.

All investigations conform to the principles outlined in the 2017 Declaration of Helsinki [36]. The Regional Ethical Review Board in Stockholm, Sweden approved all the studies included in this thesis.

The managers and participants at each of the PHCCs that actively contributed to the studies gave their written, informed consent to participate, with the exception of Study 1, in which written information about the study was provided and verbal consent obtained from the patients. Looking back, written consent would have provided the study group with a clearer record of consent to participate in the scientific project and would thus have been preferable.

Spirometry testing (Paper I) involved a physical intervention, but as the tests were conducted by a trained person and in accordance with usual praxis, the research group judged that they were not risky for the patients. The patients whose spirometry results were abnormal were referred to their own GPs for further action. The physicians who participated (Papers II and IV) were not exposed to any kind of physical intervention. It is possible that feeling peer pressure or feeling that one's professional skills were being questioned influenced the focus group discussions, but the researchers did not considered this a major ethical problem. In the interview situations (Paper II) and the CME seminars (Paper IV), great effort was put into creating an open, tolerant and non-hierarchical atmosphere in the groups. Each session started with the CME leader clarifying the aims and intentions of the studies. Throughout the case method sessions, the CME leader encouraged free, honest, and creative discussions. To further enhance open discussion, the managers of the PHCCs did not participate in group sessions. The participants were asked to treat the focus-group interviews as confidential and not talk about them outside the interview room.

In Study 3 (Paper IV), the recruitment of the reference group (11 PHCCs, 75 GPs) deviated from an optimal design for cluster randomized controlled trials, as it was recruited separately from the two intervention arms. All the PHCCs that wanted to participate in the two intervention arms were primarily interested in signing up for CME in COPD, and were thus given it. However, because of lack of resources, we could not offer CME to the reference group after the study period, and the group was informed of this before they agreed to participate.

All data in paper format (spirometry slips, questionnaires, and written consent forms) were anonymized, coded, and kept in locked storage during the

active research phase. They were later archived in accordance with Karolinska Institutet's regulations. The spirometry results and questionnaire replies were anonymized, and together with the code keys, transferred to digital data files to which only the researchers had access. Data were presented at the group level, which eliminated the risk that individual PHCCs, physicians, or patients would be identified.

The methods are described in detail in Papers I to IV and summarized in **Table 1.**

4.1 METHODS

4.1.1 Paper I: Epidemiological case-finding study in patients with respiratory tract infections

The participants in this cross-sectional study had visited either Brandbergen primary health care center or an urgent primary care unit in Handen, both in the Southern suburbs of Stockholm, between January and March 2005. They were 40 to 75 years old, either current or ex-smokers, did not have a known diagnosis of asthma or COPD, and had sought urgent primary care for the symptoms of an acute respiratory infection.

To determine the sample size needed, we chose a COPD prevalence of 30%. We based this decision on the result of previous studies that resembled ours in design [26, 73]. A random sample of 140 patients would have given a 95% confidence interval (CI) of ±7%, which was estimated to be sufficient to meet the aims of the study. A consecutive sample of 250 patients with an ICD-10 diagnosis of a RTI was extracted from the medical records. A total of 190 patients met the inclusion criteria and agreed to undergo spirometry testing 4 to 5 weeks after the RTI. However, 40 did not attend the spirometry appointment, so a total of 138 patients completed spirometry testing [74]. All the spirometry tests were carried out by HS and performed and interpreted on the basis of the GOLD criteria [38]. Information about the participants' smoking intensity (pack years), age, and gender was collected at the spirometry appointment. Patients who needed further medical attention, including all who were diagnosed with COPD, were referred to their GPs for follow-up.

The statistical analysis was performed using STATA, version 8 [75]. Summary statistics were computed using standard parametric methods. Multiple logistic regression was used to analyze variables associated with a COPD diagnosis, which also provided odds ratios and 95% CI. P-values of <0.05 were considered statistically significant.

	Paper I	Paper II	Paper III	Paper IV
Study	**1**	**2**	**3**	
Aim	Prevalence, severity grade, and indicators of undiagnosed COPD in urgent primary care	Factors that hinder discussions between GPs and their patients about COPD	To evaluate the effects of two types of CME methods and no CME on GPs' level of knowledge about and skills in managing COPD (the PRIMAIR study)	
Study years	2005-2006	2012-2013	2013-2017	
Paper publication year	2011	2013	2016	submitted 2018
Participants	138 patients attending urgent primary care in Stockholm	59 GPs at 11 primary health care centers in Stockholm	N.A.	255 GPs in Stockholm; 22 primary health care centers in the intervention arms and 11 in the reference group
Material	Medical records, spirometry results	Focus group and individual interviews	Literature, statistics	Questionnaires
Design	Quantitative, descriptive, epidemiological, targeted case-finding	Qualitative, grounded theory	Study protocol for cluster randomized controlled trial in accordance with SPIRIT[1] and CONSORT[2]	Quantitative, cluster randomized controlled trial
Topic studied	Diagnoses of COPD by spirometric criteria, patient characteristics as indicators of COPD diagnoses	GPs' narratives about the processes at a patient-doctor consultation that lead to deprioritizing COPD	COPD, pedagogy used in CME, statistics, development of a three-armed pragmatic real-life study with two levels of outcomes	GPs' knowledge of COPD before and after CME interventions, characteristics of GPs and PHCCs as indicators of high/low scores
Analyses	Descriptive statistics using standard parametric methods, multiple logistic regression	Grounded theory as described by Charmaz [70]	Cluster-adjusted statistical methods	Descriptive statistics using cluster-adjusted standard parametric methods, McNemar test, and a transition model including calculations of intracluster correlation coefficients
Ethical approval[3]	2005/384-31/1 2005-09-27	2011/731-31/1 2011-05-31	2013/232-31/5 2013-03-07	

[1] Standard Protocol Items: Recommendations for Interventional Trials 2013 explanation and elaboration: guidance for protocols of clinical trials [71].

[2] Consolidated Standards of Reporting Trials 2010 statement: extension to cluster randomised trials [72].

[3] Regional Ethical Review Board in Stockholm.

Table 1. Summary of the methods.

4.1.2 Paper II: Qualitative study about factors that hinder discussions about COPD in patient-doctor consultations

Study 2 was a qualitative study. Data were collected via semi-structured individual and focus group interviews of GPs at 11 PHCCs in Stockholm County between 2012 and 2014. The analysis was inspired by grounded theory methods (GMT), and a constructivist perspective as described by Kathy Charmaz was used [70, 76-78]. We performed constant parallel data collection and comparative analysis in which the process of collecting, coding, and analyzing data was undertaken at the same time as theoretical sampling to generate a theory that answered the research question. The process is illustrated in **Figure 2**.

I carried out all the interviews, and in line with Charmaz' perspective, sought to understand differences and variations among the participating GPs. Using these differences and variations, I attempted to co-construct meanings while remaining constantly aware of my relationships to the participants and pre-understandings that may have affected the procedure. As our research group consisted only of GPs, we consulted a non-GP researcher (IH) to help increase my awareness of my pre-understanding before each interview and achieve the best possible objectivity and open-mindedness in new interview situations.

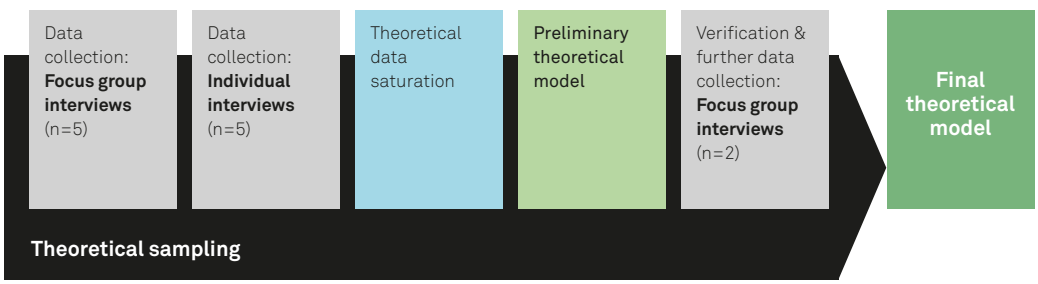


Figure 2. A figure showing the principal steps in the process of generating and developing a theoretical model that answers the research question.

4.1.2.1 Purpose-driven theoretical sampling

We started out by employing open sampling and soon proceeded to *theoretical sampling*. In other words, the sampling became theoretically oriented; i.e., it aimed to generate and develop a conceptual and explanatory theory to answer the research question. This purpose-driven approach is the major difference between GTM and simpler qualitative research methods, such as content analysis. The theoretical sampling was continually directed by the emerging theory. We followed up leads as they arose in the data, progressively focusing data collection to refine and integrate the theory [76]. Memo writing helped us organize the expanding data.

Example 1 illuminates how the constant parallel data collection and comparative analysis were performed by applying theoretical sampling at an early stage in the study:

Example 1. Theoretical sampling.

*Initially, we used **open sampling,** conducting focus group interviews with all GPs at the two first PHCCs that agreed to participate in the study. The focus of these two interviews was to get answers to our original research question, "Why don't GPs adhere to the current guidelines for COPD?" Based on the analysis of the initial two interviews, we discovered that COPD was rarely brought up during patient-doctor consultations. This made us wonder what factors lay behind not discussing COPD, so we backed up and asked a new, modified research question, "What are the factors that led to deprioritization of COPD in patient-doctor consultations?"*

*We then proceeded to use **theoretical sampling.** We looked for GPs who could further explain or provided nuanced information relevant to the question. The first two interview groups had included a rather large number of young GPs, which affected what was discussed. For example, they brought up issues related to their phase of life and relative lack of professional experience: "I have just come back from parental leave and feel I am all out of practice when it comes to COPD!" To find older and more experienced GPs for the next interviews, we used our own network of acquaintances and snowballing (i.e., previous interviewees referred us to new GPs). The next interviews revealed new information, and the data thus became richer. **Theoretical sampling** continued. Some GPs had described how COPD nurses' routines made the GPs prone to bring up COPD with patients. We then wanted to interview GPs whose PHCC did not have a COPD nurse to see whether this would affect the ways the GPs prioritized the disease. In these next interviews, we also found new information that enriched the data.*

4.1.2.2 Interviews

An initial interview guide was used but was constantly developed as the study proceeded. The initial interviews focused on gaining information about clinical situations that would lead GPs to suspect COPD in a patient. The open discussion led by HS encouraged the participants to share their opinions, points of view, and experiences with each other, which led to follow-up questions.

After gathering new information and insights, the research group assessed and condensed the information, which resulted in new, focused interview questions aimed at achieving deeper understanding. In this way, the interviews focused on successively more specific issues, such as the way COPD care was organized at the PHCCs, GPs' personal views on smoking, and how shame and guilt in patients with COPD could affect the GPs. Concepts, subcategories, categories, and their interrelationships emerged, as did a core process. We continued the process until *theoretical saturation* was reached; i.e., until no new issues came up in the interviews and theorizing had come to a sufficiently comprehensive end. We presented a preliminary theory, which we *verified* in two more focus group discussions, after which we could write the final theory.

4.1.2.3 Analysis: steps and coding

The analysis was carried out in four steps that coincided with the phases of initial, focused, and theoretical coding **(Figure 3)**. In *initial coding,* HS, AN, and SM worked in parallel to extract meaningful sentences from the entire text line-by-line or incident-by-incident. Those sentences became the first rudimentary categories. During this process, we constantly looked for concepts and patterns in the data and compared data across all the interviews. This analysis led us to *focused coding,* in which the data were condensed into the most important subcategories and categories. We constantly tried to determine whether newly emerged subcategories were important to the development of new categories or whether they were dimensions or properties of categories we had already identified. In other words, focused coding led us to structure the relationships among categories and subcategories. In *theoretical coding,* we crystallized the emerging core process into a theoretical model, finding answers to questions like "When?" "Where?" "How?" and "Why?" and using diagrams and flow charts to illustrate the process.

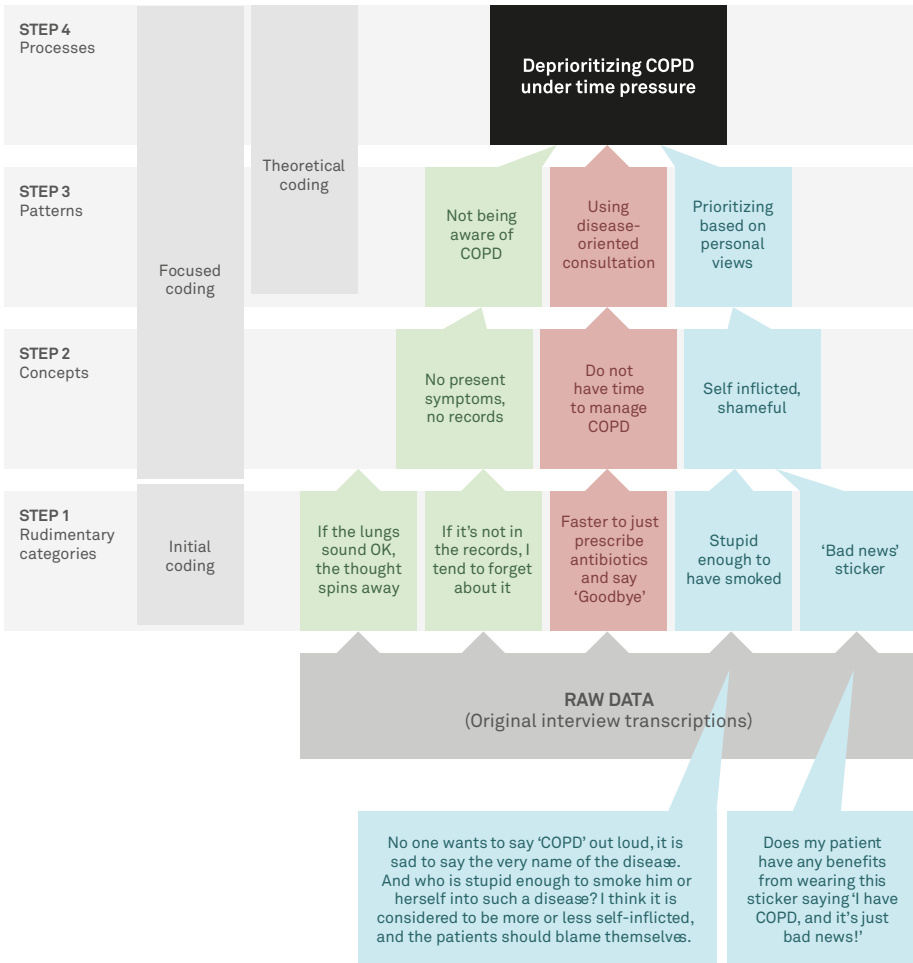


Figure 3. Schematic figure of the four steps and the different phases of coding in grounded theory methods. The coding process is shown via examples of three paths (green, red, and blue) that led to the main categories. Sample raw data from the original interview transcriptions are only shown for the blue path. There were more codes and subcategories than shown in this example.

4.1.3 Papers III and IV: Cluster randomized controlled trial about the effect of continuing medical education (the PRIMAIR study); methods and GP results

Paper III was a protocol article that described the methods of the PRIMAIR study in detail. The protocol article was included in this thesis because PRIMAIR was such a large project that required multiple kinds of research expertise to design and carry out and because I was deeply involved in each phase, from project design through implementation and analysis. The protocol was developed on the basis of 1) an in-depth exploration of current CME literature, 2) current and former COPD guidelines, and 3) research about cluster randomized trials and relevant statistics that included consultation of literature and a statistical expert (SEJ). The original ideas and features of the interventions in PRIMAIR were based on clinical and educational experiences of members of the research group and our fellow GPs in clinical practice.

Paper IV described the GP-related outcomes of PRIMAIR. It also presented the final statistical methods we chose to use and further information about the challenges of CME research. We have also published an article on the baseline data gathered about the GPs (the "related article" mentioned in the list of scientific papers at the beginning of this thesis) [79].

4.1.3.1 Summary of enrollment in PRIMAIR

We sent e-mail invitations to all 80 PHCCs in Stockholm with >10,000 registered patients. The first 24 PHCCs that agreed to participate were included. The reference group of 12 PHCCs was recruited separately. The flow chart of PRIMAIR as presented in Paper III is summarized in **Figure 4**.

Paper III was written in line with *Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) 2013 explanation and elaboration: guidance for protocols of clinical trials [71] and the Consolidated Standards of Reporting Trials (CONSORT) 2010 statement: extension to cluster randomised trials [72].* Paper IV also followed the CONSORT statement, and both papers included flow chart models required by these sources.

4.1.3.2 The PRIMAIR schedule

The research group (HS, AN, SM, BS, and IK) started working on PRIMAIR in 2013, planning, constructing, and testing the material for the educational interven-

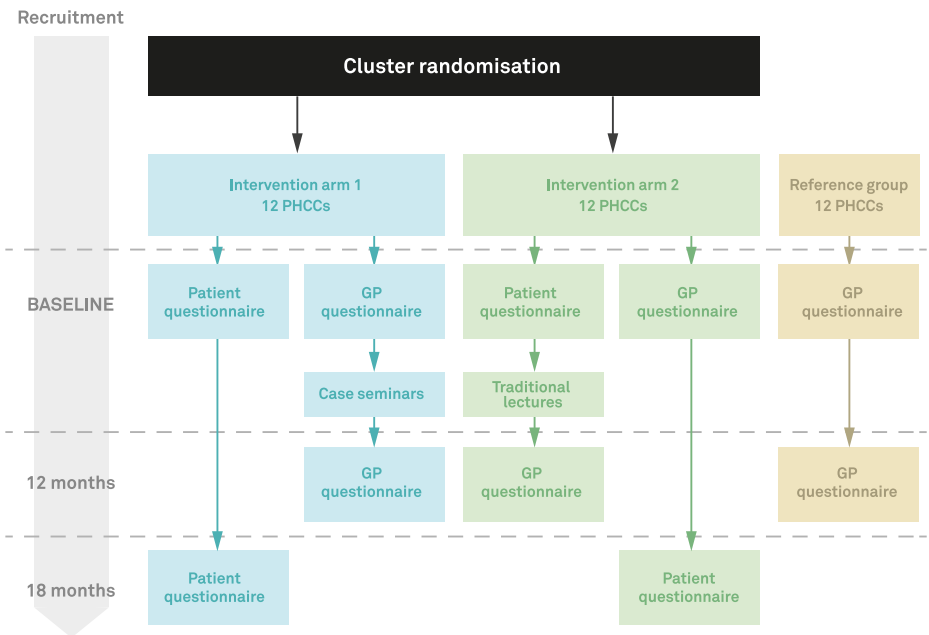


Figure 4. Flow chart of PRIMAIR adapted from Figure 1 in Paper III.

tions and the assessment tools (questionnaires). PHCCs, GPs, and patients were recruited between January and August 2014, after which computerized cluster randomization was completed. The CME interventions were carried out from September 2014 to January 2016. GPs completed the questionnaire just prior to the start of the first CME session. Twelve months after baseline, the GPs who completed the study replied to the questionnaire a second time. The reference group (no CME) was recruited separately. Because of limited funding, we were unable to offer reference PHCCs CME after the study period. The reference GPs replied to the baseline questionnaires between November 2015 and May 2016. They were thus the last participants from whom 12-month follow-up data were collected (in May 2017). Patient recruitment and collection of patient data occurred parallel to the collection of data from the GPs. Patient data were collected by HS between 2014 and 2017.

4.1.3.3 CME interventions

Two kinds of CME were used, case method learning (CM) and traditional lectures (TL). The methods were compared with each other and to no CME (the reference condition). Both CME methods were provided in 2x2-hour educational meetings at each PHCC. HS led all 24 CM sessions, and four other lecturers led a total of 24 TL sessions.

PRIMAIR used outcome-based CME that followed John Biggs' educational theory of constructive alignment [80]. Thus, intended learning outcomes, teaching and learning activities, assessments, and the examination (GP questionnaire) worked together (were aligned) to enable learners to achieve deeper levels of knowledge. Biggs' Structure of Observed Learning Outcomes (SOLO) taxonomy [81] helped us understand the level of learning required to achieve each intended learning outcome **(Table 2)**. This, in turn, helped us choose teaching and learning activities, assessments, and examination questions on the GP questionnaire that were appropriate to and would facilitate each outcome. We thus chose TL as a learning method appropriate to achieving SOLO levels 1 to 3 (characterized by quantitative learning), and CM as a method appropriate to achieving SOLO levels 1 to 5 (characterized by qualitative learning).

4.1.3.4 CME sessions using case method learning

Achieving the learning outcomes of the case seminars largely depended on the participants' levels of activity and the facilitator's ability to encourage discussion in an open, respectful, and creative educational setting [65]. At each CM session, 5 to 15 GPs from the same PHCC met to read and discuss one case in groups of two and in the whole group. The cases were based on HS's interviews with GPs. They were written in a narrative form by HS so that all the intended learning outcomes of the CME could be covered in the discussions. The GP was the main character of the story. The cases thus resembled virtual "role plays": the GPs could put themselves in the place of the decision maker as they reflected on and discussed the cases. The first case ("The super doctor") focused on managing an acute exacerbation during a busy and stressed GP appointment. It incorporated elements of interprofessional cooperation in the emergency room, the GP's negative attitude toward smokers, and GP's rationale for planning a follow-up visit. The second case ("The ingrained smell of smoke") was about describing the problems of delayed detection of COPD, spirometry interpretation, maintenance therapies, handling a

Intended learning outcomes	SOLO[1] level	Case method learning	Traditional lectures
Acquire unstructured information about COPD pathophysiology, epidemiology, symptoms, treatment principles, and prognosis.	1	Yes	Yes
Identify suspected COPD patients, recognize initial investigations needed for diagnosis, and *interpret* spirometric results.	2	Yes	Yes
List treatments available, *describe* management of acute exacerbation of COPD and stable COPD, and list COPD co-morbidities. *Recognize* the responsibilities of primary, secondary, and interprofessional care in COPD management.	3	Yes	Yes
Level of examination (GP questionnaire)			
Describe, discuss, analyze, explain, argue about, and *compare* knowledge about the management of COPD in a primary care setting, including management of an urgent visit characterized by time pressure and stress. *Reflect* over and *pay attention* to one's own and others' attitudes and judgments about COPD and smoking and how they may affect the prioritization of COPD in patients with comorbidities. *Reflect* over the mission and responsibility of primary care in COPD care. *Describe* physicians and nurses' areas of responsibility in COPD care. *Recognize* where to find guidelines and further information.	4	Yes	No
Reflect on and *combine* new knowledge with own experiences to *solve* complex issues of COPD care for each patient in real-life situations by managing time constraints and aligning doctors and patients' agendas so that active COPD care can be achieved.	5	Yes	No

[1]SOLO = Structure of Observed Learning Outcome

Table 2. The alignment of the intended learning outcomes of case method learning, traditional lectures, and the examination (GP questionnaire) with SOLO taxonomy levels. SOLO levels 1-3 (S1= prestructural, S2 = unistructural, S3 = multistructural) are characterized by quantitative learning. Levels 4-5 (S4 = relational, S5= extended abstract) are characterized by qualitative learning and involve gradually increasing demands on reflection, hypothesizing, creativity, discussion, and abstraction so that the learners can apply the new skills to new and broader areas.

patient who lacked motivation to stop smoking, interprofessional cooperation, and managing the progressive advancement of COPD and its comorbidities. Thus, both cases were meant to illustrate typical primary care situations in which GPs need to successfully manage several tasks at once—like simultaneously playing several games of chess and being expected to win all of them. Shortened versions of the two cases are summarized in **Examples 2** and **3**; the full texts are found in Paper III. The questions that emerged during the CM discussions typically had no obvious right or wrong answers. Instead, they could be answered in several acceptable ways. The CM leader facilitated the sessions by asking the participants to discuss the context, contents, and ethics of the case and the responsibilities and tasks of the characters (i.e., who should perform the actions and how and when should they be performed). The leader then encouraged the participants to try to solve problems through detailed discussions, reflection, and collaboration on based on the knowledge, skills, and experience they already had. CM stimulated creative thinking, communication, tolerance of different views, the ability to defend one's own point of view with logic and analysis, and decision making [82]. The teaching and learning activities at CM sessions were designed to help learners achieve SOLO levels 1 to 5 (mainly qualitative learning).

Example 2. A shortened version of case 1, "The super doctor"

GP Karin Adamsson had recently returned from maternity leave and was excited to get back to work. It was a sunny day in October, and she was scheduled to be on duty as emergency doctor at her health care center that morning. Emergency shifts were understandably stressful, but today was a good day. There were always fewer patients in the middle of the week: the lull before the weekend storm. . . . Karin's day started off as expected, and the first three patients came and went. She had just received her fourth, when the emergency nurse, Maria, popped her head round the door. "Hey, Karin, would you be able to come down when you're done with this patient? I've got someone with respiratory problems out there. It's a regular. I need a prescription for the inhalations." . . . Karin found a middle-aged man sitting alone in the emergency room with the door ajar. She briefly introduced herself to the ashen, slender figure sitting slightly hunched on the chair, smelling of smoke, arms hanging at his sides. "Kalle," said the man. He was taciturn and short of breath, with an intense look in his eyes. Karin had never seen him before. "A regular, Maria said, she thought. "I suppose I'll just have to get busy with the inhalation." On the paper sheet on his stretcher, Maria had written in pen, "Lennart 'Kalle' Karlberg, 490612-xxxx, O2sat

89%, PEF 200, B/P 150/90, P 90, temp 36.8." Karin listened to Kalle's lungs and established that his condition was obstructive. She called in Maria, who started administering the prescribed inhalations. . . . Back in her office, Karin had a quick look at Kalle's medical records. "It doesn't say that he was a smoker, but you could tell by the smell," thought Karin. . . . Twenty minutes later, Maria reappeared at her door while Karin was busy with another patient. "He's done," said Maria quickly and rushed out again. . . . Kalle was breathing more easily now. His lungs sounded much clearer; his saturation had climbed to 95% and his PEF to 220. He was a little more talkative now and his gaze less intense. He gave a little smile and told Karin he suspected he had gotten the cold from his grandkids. ". . . So I like to come here to breathe in a little medicine now and then. Figured I'd come tomorrow too. I normally do that. Damn good stuff this medicine. Smoked? Hell, yeah, for at least 50 years! But not these days, no way." . . . Karin was not really convinced that it was worth the trouble to talk with Kalle about quitting smoking: he seemed to have a dubious lifestyle, and given that his COPD was self-inflicted, he should seek help for it himself. Besides, there were five patients still in the waiting room, all of them coughing and sniffling. . . . "Got to keep up the pace. Emergencies are emergencies, that's my concern for today." Karin prescribed a 5-day course of cortisone and antibiotics, renewed Kalle's prescription for Bricanyl, and said to him, "Come back if you don't feel any better."

[Group discussion]

Example 3. A shortened version of case 2, "The ingrained smell of smoke"

2007: Lars Holmgren was a resident GP at a medium-sized primary health care center in a small town on the coast, 10 miles or so away from the local hospital. He had lived with his wife and two children in this town his entire adult life. Lars was in his 30s, active in sports, and known locally as a skilled, cheerful, and pleasant doctor. He was involved in his children's sports, and since he was interested in lifestyle issues, he also worked with an anti-smoking campaign for teenagers. He was a non-smoker and always had been. . . . One day in November, stepping into the waiting room, he spotted a familiar face: Gerd Alvén, a cashier at the local supermarket. A few years back, he had taken care of Gerd's husband, who had COPD and had died recently. Lars ushered Gerd into his office, and as she waddled into the room, she was pursued by the familiar rank smell of stale tobacco. . . . "I've got such a pain in my back. I've had it for ages, but now it's so bad I can't sleep at night, can't get myself into a good position. And my legs are acting up too, it's the knee you know, it gives me grief when I walk. Ugh, I just feel so old and tired." . . . Lars knew Gerd was a smoker too, and thought she probably had COPD as well. He had noticed that she was slightly out of breath when she came in with Gösta. . . . And then suddenly she said, "And then there's this blasted cough of mine, too."

[Group discussion]

. . . . "No, I've not had a cold particularly. It's just this cough, and the back. I find it hard to sleep at times. I haven't had a proper night's sleep since—since—my husband passed away. I feel so lonely. I miss him so much. I don't really know what to do with myself when I get home from work." . . . Lars eventually established that neither her back nor her knee showed any sign of disease or injury. When he suggested a spirometric examination, she willingly agreed, but clearly became anxious and nervy. She understood, of course, that she might also be diagnosed with this fatal disease. But she wanted to do as the doctor suggested.

[Group discussion]

. . . . A few weeks later, Lars saw her spirometry results: FEV1/FVC 0.40 and FEV1 at 48% of expected value. . . . Lars informed Gerd that she had COPD. He prescribed medicine for her and advised her to quit smoking. "I tried quitting before, but it didn't work. I can't give up. And I don't want to, either." . . . . Lars managed to make Gerd see Eva, a skilled asthma/COPD nurse. Gerd was clearly not motivated to quit smoking, so she and Eva agreed that Gerd would get in touch if she ever changed her mind.

[Group discussions and practice of spirometry interpretation]

2010. Lars had recently become a registered GP, and despite the considerable increase in his workload, still enjoyed his job. Gerd was becoming a regular at the clinic's new drop-in center. He had also received a few follow-up referrals from the hospital, where Gerd had sought emergency help for respiratory problems. On her follow-up visits to Lars, she usually said that she felt "no different" and wanted no more help. . . . After a hospitalization due to pneumonia and heart failure, Gerd's condition worsened and she had to stop working. . . . Gerd was now ready to meet Eva again, but still found it hard to talk about smoking, although she did consent to let Eva help her with several things: Eva sorted out all the different medicines that Gerd had had over the years and suggested that she should use a walker. "It's the best thing that's ever happened to me!" exclaimed Gerd.

[Group discussion]

Epilogue to be read aloud by the educator at the end of the session: *Gerd started to feel that she needed to see Eva and Lars more and more often as her exacerbations grew gradually worse. She became increasingly short of breath and started to lose weight. . . . Lars updated her*

medication, and Gerd still showed no interest in a quit-smoking program or physiotherapy. She occasionally ended up in the hospital again but did not like it there and was mainly managed by Lars and Eva. . . . Usually her oxygen saturation was at 91% to 92%—a little lower during exacerbations. Her COPD had advanced to stage 4. She was constantly short of breath: she found it hard to laugh, to cry, and even to eat. Since she was a smoker, she could not be given oxygen at home despite her respiratory failure. . . . Gerd remained anxious and tired and eventually refused to socialize. She was prescribed an SSRI but mainly found support in Lars and Eva. Their conversations often turned to the subjects of death and helplessness. . . . At the age of 72, six years after her diagnosis, she was ravaged by COPD. One day she did not wake up. She had died at home, alone. "Poor Gerd. If only she'd stopped smoking. If only we could have made her quit." Lars wondered privately if there was anything he could have done differently.

[Final group discussion]

4.1.3.5 CME sessions in the form of traditional lectures

Achieving the intended learning outcomes following TL depended on TL leaders' ability to convey the information needed to achieve the outcomes, but perhaps most of all on participants' active learning efforts [83]. TLs were delivered in a traditional, didactic style. The TL leader acted as an academic expert; i.e., he or she decided on the content of the session and taught with predominantly one-way communication, using PowerPoint presentations as a pedagogical tool. Some interaction between the leader and the students could occur; for example, when the leader answered questions. The teaching and learning activities at TL sessions were designed to help learners achieve SOLO levels 1 to 3 (mainly quantitative learning).

4.1.3.6 Data on GPs' level of knowledge and other data collected in the study

We used the GP questionnaire to assess GPs' level of knowledge about COPD. (For the full questionnaire, see Papers III and IV.) It was constructed by the research group, pretested in a "think-aloud" discussion with a group of non-participating GPs, and improved on the basis of the GPs' feedback during that discussion. The 13 questions were aligned with intended learning outcomes at SOLO levels 1 to 3, which were included in both the CM and TL arms of the CME intervention. The questions were about "knowledge/skills" and "practical management" and consisted of a mixture of multiple choice and open questions based on five short case vignettes. The responses to the open questions were analyzed using quantitative

content analysis. Responses were scored with a premade scoring template (see Paper IV for the full template), and the participants could score 0, 1, or 2 points per question. The higher the scores, the higher the level of knowledge. Additionally, data about GPs' gender, age, and years in the profession were collected at baseline, as was demographic information about the PHCCs' catchment area.

4.1.3.7 Cluster-adjusted statistics

Most statistical analyses presented in Paper IV, including the initial power calculation, were adjusted for clusters. We used an intracluster (intraclass) correlation coefficient (ICC) of 0.01, which we chose on the basis of the results of previous, similar studies [84-86], to calculate 80% power. In theory, when ICC = 1, all responses within a cluster are identical. An ICC value close to 0 implies that the within-cluster variance is much greater than the between-cluster variance, and when ICC = 0, it indicates that the responses within a cluster are uncorrelated. Usually, ICC is between 0.01 and 0.02 in human studies, especially in primary care [85]. In the analysis phase, we chose to use a transition model adjusted for cluster randomized data because of its simplicity: in a transition model, the outcome variable at a previous time point was included as a fixed effect covariate. We wanted to publish the ICC values of our results, as they could eventually help future researchers estimate the ICC for similar populations.

5.1 PAPER I: UNDIAGNOSED COPD IN PATIENTS WITH RESPIRATORY TRACT INFECTIONS

5.1.1 The prevalence of COPD and characteristics of the patients

The prevalence of COPD in the 138 patients was 27% (95% CI ±7%). Of the patients with COPD, 44.7% were in GOLD [31] stage 1 (mild, FEV1≥80% of predicted), 52.6% in stage 2, (moderate, 50%≤FEV1<80% of predicted), 2.6% in stage 3 (severe, 30%≤FEV1<50% of predicted), and 0% in stage 4 (very severe, FEV1 <30% of predicted). **Table 3** summarizes the characteristics of the patients. Women with COPD were significantly younger than men with COPD in both groups (with or without COPD).

Variables	Total	COPD	No COPD
N (%)	**138**	38 (27)	100 (73)
Age			
Years, mean (95% CI)	55 (54-57)	62 (59-64)	53 (51-55)
Age group 40-54 years n (%)	62 (45)	5 (13)	57 (57)
Age group 55-70 years n (%)	76 (55)	33 (87)	43 (43)
Smoking intensity			
Pack years1, mean (95% CI)	24 (22-26)	32 (27-36)	21 (19-24)
Pack years, median (range)	20 (5-75)	31 (5-75)	20 (5-56)
Smoking status			
Current smokers, n (%)	73 (52.9)	25 (65.8)	48 (48.0)
Former smokers, n (%)	65 (47.1)	13 (34.2)	52 (52.0)
Diagnosis			
Upper respiratory infection, n (%)	57 41.3)	15 (39.5)	42 (42.0)
Lower respiratory infection, n (%)	79 (57.2)	23 (60.5)	56 (56.0)
Viral infection/influenza, n (%)	2 (1.5)	0 (0)	2 (2.0)
Sex			
Female, n (%)		19 (50)	58 (58)
Male		19 (50)	42 (42)

Table 3. Description of 138 patients with respiratory tract infections seeking urgent primary care. Numbers in total and divided into groups with or without COPD.

5.1.2 Associations between COPD and patient characteristics

After adjustment for all explanatory variables included in the study, multiple logistic regression analysis that used COPD as a response variable revealed a statistically significant association between COPD and 1) being older than 55 years and 2) having smoked more than 20 pack years **(Table 4)**. Current smoking, sex, and type of respiratory tract infection were not significantly associated with COPD.

Characteristic	OR (95% CI)
Age 56-75	10.9 (3.8;30.1)
Pack years > 20	3.2 (1.2;8.5)
Current smoker	2.5 (0.9;6.6)
Upper respiratory tract infection	0.8 (0.3;2.0)
Female sex	0.9 (0.3;2.1)

Table 4. The association between COPD and patient characteristics.

5.1.3 How good was our model at predicting new cases of COPD?

We used the observations above to create a model for predicting COPD. "Age ≥55," "pack years ≥20," and "current smoker" were included as positive predictors of COPD. The sensitivity, specificity, and positive and negative predictive values of the model and their 95% confidence intervals are shown in **Table 5**.

Sensitivity	44.7%	(95% CI 30-60%)
Specificity	89.0%	(95% CI 81-94%)
Positive predictive value	60.7%	(95% CI 42-76%)
Negative predictive value	80.9%	(95% CI 73-87%)
Correctly classified	76.8%	

Table 5. Characteristics of the model.

We also used the receiver/response operating characteristic (ROC) curve to assess the most optimal prediction model for variables associated with COPD **(Figure 5)** [87]. The area under the ROC curve was 0.83.

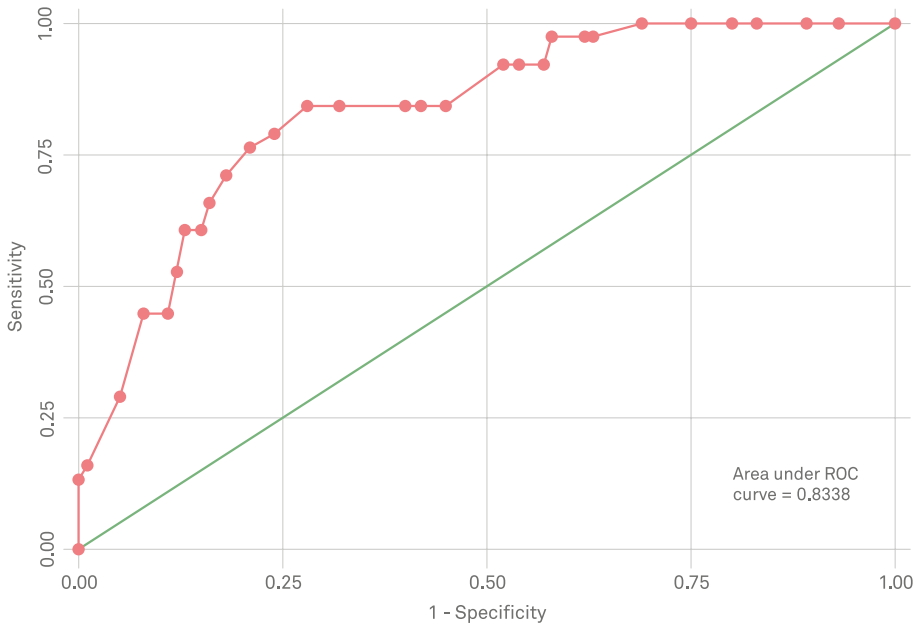


Figure 5. The standardized values describing the area under the receiver/response operating characteristic (ROC) curve show how well the model discriminated between those with and without the disease (excellent = 0.90-1, good = 0.80-.0.90, fair = 0.70-0.80, poor = 0.60-0.70 and fail = 0.50-0.60). The closer the ROC curve is to the upper left corner, the higher the overall accuracy of the test.

5.2 PAPER II: FACTORS THAT HINDER DISCUSSIONS ABOUT COPD AT A CONSULTATION

5.2.1 Participant characteristics

Between 2012 and 2014, we recruited 59 GPs from 11 PHCCs in Stockholm County. The characteristics of the GPs are shown in **Table 6**. The PHCCs were located in urban or suburban areas of Stockholm. The demographic and socioeconomic characteristics of the PHCCs' catchment areas varied, as did the number of patients listed at the PHCCs. Both PHCCs with and without a nurse-led asthma/COPD clinic were included.

Initially, HS conducted five focus group interviews; four to ten GPs participated in each interview. To conclude the data collection, HS carried out four addi-

Characteristic	Number Mean Median	%
Gender, n=59		
Men	30	51
Women	29	49
Educational degree, n=59		
Specialist in family medicine	40	68
Not a specialist in family medicine	19	32
Age, mean (SD)	45.5 (10.5)	
Age, median (range)	44 (28-68)	
n=54 (missing data n=5)		
Years in profession, mean (SD)	14.0 (10.2)	
Years in profession, median (range)	12.5 (1-39)	
n=43 (missing data n=16)		
1-5 years	10	22
6-10 years	8	18
11-20 years	14	31
21-30 years	7	16
> 31 years	5	11
Working at PHCC with nurse-based asthma/COPD clinic, n=59		
Yes	45	76
No	14	24

Table 6. Characteristics of the GPs who participated in the interviews about discussing COPD in patient consultations (n=59). No comparable routine data were available for GPs in Stockholm at the time of the study.

tional individual interviews, a focus group interview with seven participants, and a focus group interview with five participants. The average duration of the interviews was 37 minutes (range, 23 to 55 minutes).

5.2.2 Time constraints and patients' other health concerns lead GPs to deprioritize COPD

The 59 GPs from 11 PHCCs described two main types of patient visits in primary care (urgent and regular visits) that seemed to lay behind the feeling of constant time pressure. In turn, the feeling of time pressure was the starting point of the process described in the theoretical model **(Example 4)**.

Example 4.

"You have to keep up the pace. You don't have time to think."
(Female GP, 53 years, about urgent visits).

"I always feel there are too many things going on! And new things keep coming. It's sleeping problems and it's something on the skin, and it's the GP's destiny! It's classic! And then I feel like I need to push [COPD] aside, or forward in the future."
(Female GP, 40 years, about regular visits)

Thus, the GPs' *main concern* was "the difficulty of prioritizing COPD in the limited time available." That is, GPs prioritized either one urgent medical issue or one of many diagnoses in a patient with multimorbidity, thus neglecting detection and long-term management of COPD. Hence, the *core process,* "prioritization under time pressure," leads to deprioritization of COPD. The *theoretical model* summarizing the "process of omission or deprioritization of COPD at a patient-doctor meeting" is shown in **Figure 6**. (The complete model is found in Paper II.) GPs who were unaware that the patient had a diagnosis of COPD could omit COPD from the consultation without ever considering bringing it up. The prioritization of COPD in the consultation depended on the following factors (i.e., the main categories): the clinical picture, local support, personal views, consultation approach (managing diagnoses one at a time or using a holistic consultation approach), and patient motivation. In the interviews, GPs described factors, events, and finally, processes that led them to either prioritize or deprioritize COPD in consultations. In the model shown

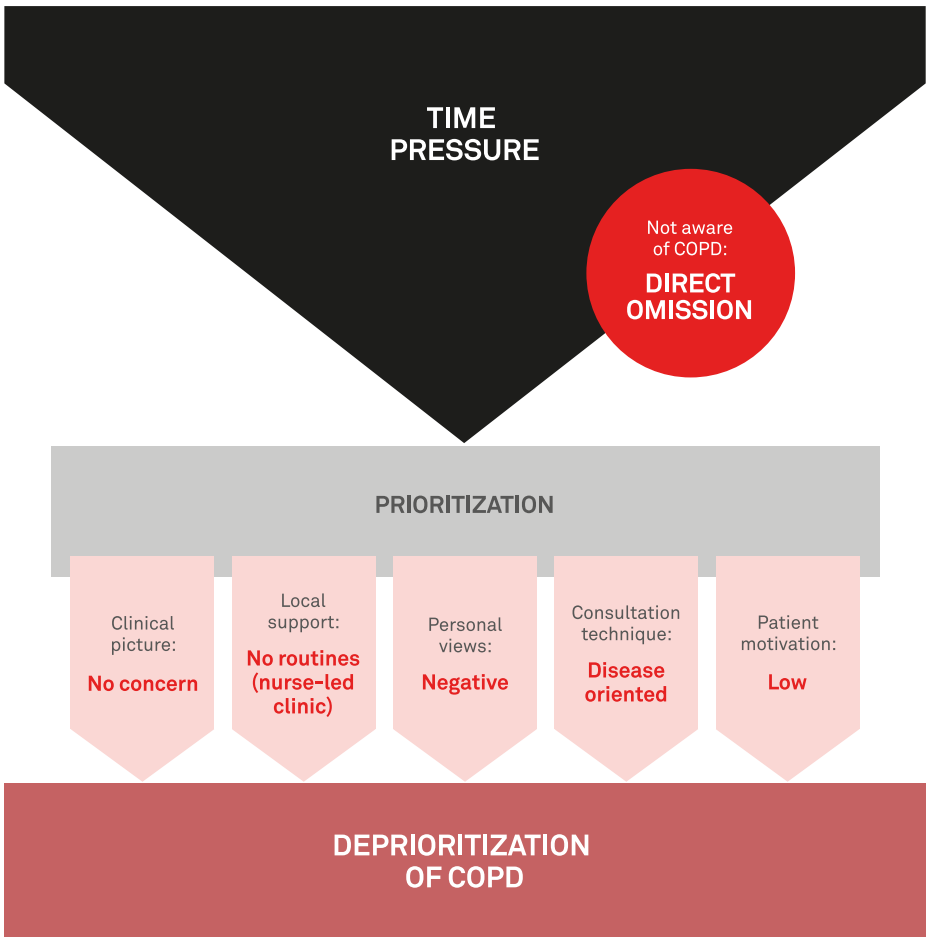


Figure 6. The theoretical model summarizing the process of omission or deprioritizing of COPD at a patient-doctor meeting.

in Paper II and the accompanying model **(Figure 6)**, we chose to focus on the negative pathway; that is, the pathway that leads to deprioritization of COPD. At the same time, however, there were factors, events, and finally, processes that led GPs to prioritize COPD in consultations. Such processes included GPs becoming aware of COPD because of a clinical concern, having a local support system (e.g., rou-

tines, flow charts, and nurse-led COPD clinics at the PHCC), having neutral views of smoking and of COPD as a chronic disease, using a holistic consultation approach, and perceiving that the patient was highly motivated to seek COPD care and adhere to treatment.

5.3 PAPERS III and IV: THE EFFECTS OF CONTINUING MEDICAL EDUCATION ON GPs' LEVEL OF KNOWLEDGE OF COPD AND COPD MANAGEMENT SKILLS

The CME interventions were carried out at 48 educational visits to the PHCCs (two visits to each PHCC). The 24 CM sessions were led by HS, and the 24 TL sessions by four other lecturers, all experienced GPs who were also experienced in leading CME on COPD.

5.3.1 Description of the participants

At baseline, 207 GPs attended the CME sessions. In the CM arm, 87 of 100 GPs (87%) agreed to participate in the study, and in the TL arm, 93 of 107 GPs (87%) agreed to participate. The reference group consisted of 75 GPs. The majority (90%) of the 27 GPs who did not agree to participate worked at a PHCC without a nurse-led asthma/COPD clinic ($p<0.005$). They did not differ from the participants in age, gender, number of years in profession, educational degree, the care need index (CNI) of the PHCC's catchment area (the CNI measures social deprivation), or whether the PHCC where they worked was publically or privately owned.

Of the 255 participants who responded to the questionnaire at baseline, 122 (48%) did not respond again at 12 months ("non-responders"). The remaining 133 GPs were the final participants ("responders"). The characteristics of the responders and non-responders are seen in **Table 7**. A significantly higher percentage of the non-responders than responders were employed at PHCCs in socially deprived areas of Stockholm.

A significantly higher percentage of GPs in the CM arm than in the TL arm or the reference group worked at a PHCC with a nurse-led asthma/COPD clinic (64% vs. 36%-38%). The means for gender, age, years in profession, and the CNI of the PHCC's catchment area did not differ significantly between the GPs in the three groups, and the participants were generally representative of Swedish GPs with regard to these characteristics [88].

Main characteristics	Baseline	12 months	
Participants n (%)	**All** 255 (100)	**Responders** 133 (52)	**Non-responders** 126 (48)
Number of participants per PHCC, mean (range)	7.5 (2-15)	4.3 (1-10)	
Gender, n (%)			
Women	149 (58)	81 (61)	68 (56)
Age, mean (range)	47 (27-69)	47 (27-68)	47 (27-69)
Degree in family medicine, n (%)			
Specialist in family medicine	184 (72)	102 (77)	82 (67)
Training to be a specialist in family medicine	71 (28)	31 (23)	40 (33)
Years worked in primary care, mean (range)	14 (0-41)	15 (0-37)	14 (0-41)
Asthma/COPD clinic at PHCC, n (%)			
Yes	114 (45)	70 (53)	51 (42)
Ownership of PHCC			
Stockholm County Council	132 (52)	71 (53)	61 (50)
Private	123 (48)	62 (47)	61 (50)
CNI[1] of PHCC's location, mean (SD)	2.17 (0.78)	2.03 (0.67)	2.32 (0.86)
range	0.92-5.05	0.92-5.05	0.92-5.05

[1] CNI, Care Need Index; COPD, chronic obstructive pulmonary disease; PHCC, primary health care center. The CNI is based on sociodemographic factors, including percentage of older adults living alone, children under age 5, unemployed people, people with low educational status, single parents, high mobility, and foreign-born people. High CNI = high sociodemographic burden; mean CNI in Stockholm County = 2.49.

Table 7. The main characteristics of the participants.

5.3.2 Scores between and within the study arms, before and after the CME

5.3.2.1 Total scores

Both CM and TL resulted in small yet significantly higher total scores at 12 months than at baseline **(Figure 7)**. There was no significant difference between these two methods, yet both were significantly better than no CME (reference group).

Scores were unrelated to whether there was a nurse-led asthma/COPD clinic at the PHCC. At baseline, the GPs who worked at PHCCs in the most socially deprived areas (CNI 2.29-5.05, 21% of all GPs) had lower total scores than the others (8.50 vs. 10.32, p=0.000), and the non-responders in the deprived areas scored lowest of all non-responders (7.98 vs. 9.71, p=0.007). At 12 months, the GPs who had worked 21 to 30 years had significantly lower total scores than the others (10.55 vs. 11.77, p=0.016). The responders' total scores were not associated with the GPs' age or gender or whether the PHCC was privately owned or run by the county council.

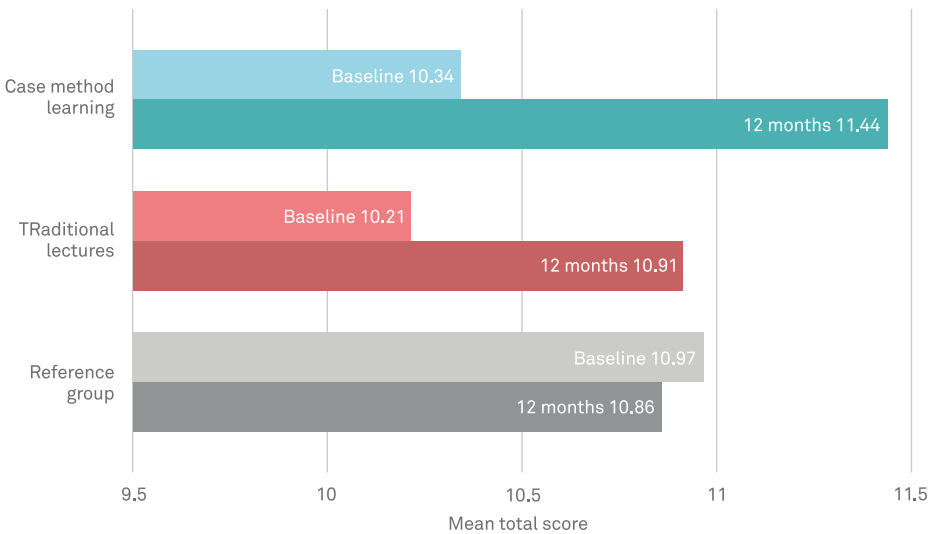
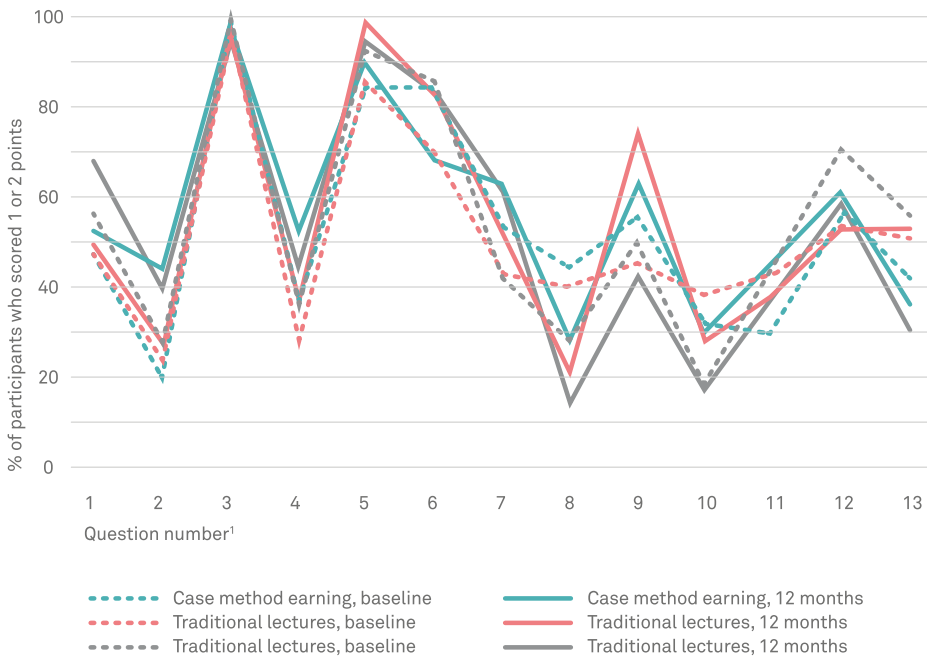


Figure 7. Changes in the total scores in each study arm over time. Total score minimum = 0 points, maximum = 26 points.

5.3.2.2 Scores on individual questions

A comparison of the arms revealed that the TL arm had a statistically significantly higher OR than the reference group of "scoring 1 or 2 points" (i.e., the participants had a partly or fully sufficient level of knowledge) at 12 months on two of questions: the question about the follow-up of stable patients (question 9) and the question about multimorbidity in a patient with airway symptoms (question 13). Similarly, the TL arm had a higher OR than the CM arm with regard to smoking cessation support for patients who were motivated to quit smoking (question 6). The CM arm's ORs were not significantly higher than the TL arm's or reference group's ORs on any of the questions.

Studying the changes in the scores *within each study arm* revealed that weak areas of knowledge remained weak and strong areas remained strong both pre- and post-CME. All participants' scored similarly on the individual questions at baseline. At 12 months, many scored similarly to how they scored at baseline **(Figure 8)**. On three questions, however, there were significant differences between baseline and 12 months in the proportion of participants who scored "1 or 2 points" and who scored "0 points." In the CM arm, the scores on question 2 (spirometry interpretation) improved between baseline and 12 months. In the TL arm, the scores on question 9 (follow-up of patients with stable COPD) improved. In the reference group, scores on question 13 (multimorbidity in COPD patients with symptoms from airways and/or COPD comorbidities) were lower at 12 months than at baseline. Scores were generally high on questions about smoking cessation support and low on those that measured spirometry interpretation skills, interprofessional care, and management of multimorbidity.



[1]Questions: 1) diagnostic procedures, 2) spirometry interpretation, 3) smoking cessation (unmotivated patients), 4) treatment of acute exacerbation, 5) follow-up of acute exacerbation, 6) smoking cessation (motivated patients), 7) maintenance treatment of COPD (GOLD B patients), 8) heart failure medication for patients with COPD, 9) follow-up of patients with stable COPD, 10) interprofessional interventions, 11) managing a suspected respiratory failure, 12) multimorbidity in COPD patients without obvious symptoms from airways or COPD comorbidities (an annual checkup), and 13) multimorbidity in COPD patients with symptoms from airways and/or COPD comorbidities (an annual checkup).

Figure 8. Changes in the scores per question and study arm, over time, presented as percent of participants who scored 1 or 2 points. Each response was given a score of between 0 and 2 points; the highest possible score was 2 points. On questions 2, 4, 7, 10, and 11, only two scores were possible: 0 or 2 points.

6.1 MAIN FINDINGS

This thesis provides information about GPs' work with patients with COPD. It explores conditions that contribute to obstructing and facilitating optimal management of COPD in primary care in Sweden.

First, I addressed the problem of underdiagnosis of COPD and the importance of early detection, asking the question, **"What is the problem?"** Paper I revealed that the prevalence of previously undiagnosed COPD was high (27%) in the target population. It described how assessing three simple variables in middle-aged or older patients with any kind of acute RTI could be a useful and feasible way to quickly and efficiently shortlist patients who should be referred to spirometry testing to confirm COPD. The three variables were age, smoking intensity (i.e., pack years), and current smoking status.

Next, I addressed the question, **"Why is there a problem?"** The study focused on GPs' role as one of the most important actors in the guideline implementation process. The findings shed light on the process that occurs when GPs deprioritize COPD in patient-doctor consultations that take place under constant time pressure (Paper II). GPs meet patients with COPD mainly in two ways: at urgent visits and at regular visits. Both visit types are prone to lead to time pressure during the consultation. In urgent visits, GPs often feel that they have to rush through consultations, focusing on the urgent treatment of airway problems. Thus, plans for further COPD care are omitted. At regular visits, the scenario is dominated by other factors, mainly because of the need to manage several health issues (multimorbidity) in a limited period of time. Time pressure leads to a process of deprioritization for which GPs give six reasons: "Not becoming aware of COPD," "Not becoming concerned due to clinical features," "Insufficient local routines for COPD care," "Negative personal attitudes and views about COPD," "Managing diagnoses one at a time," and "Perceiving a patient's motivation as low." Paper II also provided interesting descriptions about the general conditions that GPs often work in and about the role and identity of GPs.

Finally, I attempted to answer the question, **"What can be done about the problem?"** by conducting a CRCT about the effectiveness of short CME interventions for GPs (PRIMAIR) (Papers III-IV). My coauthors and I used the findings of studies 1 and 2 to develop the contents of the CME. That is, we incorporated real-life primary care problems (e.g., multimorbidity, time pressure, and heavy

workloads) instead of focusing only on teaching the guidelines, as is often done in CMEs. Because previous reports, research, and studies 1 and 2 had given us reason to believe that GPs' schedules were busy and CME was often deprioritized [12, 89], we decided to offer short afternoon CME sessions as educational meetings at the workplace. This way we could feel fairly positive that GPs would sign up for our trial. The 2x2 hour CME sessions used interactive, participatory pedagogical methods (case method learning) and didactic methods (traditional lectures). Both led to equally modest yet significantly great improvements in the GPs' the level of knowledge about optimal COPD care than no CME. The results indicated generally unchanged high levels of knowledge about smoking cessation support, as well as insufficient proficiency in spirometry interpretation and insufficient knowledge about interprofessional care and management of multimorbidity.

6.2 THE TIMING OF THE STUDIES

Study 1 (Paper I) was carried out separately from and some years before studies 2 and 3 (Papers II-IV). Study 1 should be regarded as an initial study that sparked my interest in continuing to research the topic. The organization of primary care in Stockholm County and COPD guidelines remained essentially the same during the study period.

6.3 PAPER I: FINDING CASES OF COPD IN PATIENTS WITH RESPIRATORY TRACT INFECTIONS

6.3.1 Need for a method to detect COPD earlier, preferably with minimal extra effort on the part of GPs

6.3.1.1 Organized screening of the public or targeted screening of smokers?
As early detection of COPD saves lives, reduces suffering, and limits expenditures [90-92], many researchers have studied different approaches to finding new cases at an early stage. Study 1 resulted in a detection rate (prevalence) similar to those found in previous studies of risk groups (middle-aged or older smokers) from different contexts who replied to symptom-based questionnaires or participated in

random screening with spirometry [26, 73, 93-95]. Although early detection is important, the 2016 U.S. Preventive Services Task Force Recommendation Statement recommends against screening for COPD in asymptomatic people and concludes that the benefits of smoking cessation far outweigh the benefits of screening for diseases caused by smoking [96, 97]. Health care professionals should thus focus on modifying risk factors, especially smoking, and identifying patients with chronic respiratory symptoms. Identifying patients at risk of COPD and then managing to test them using spirometry, however, is challenging [98]. The patients described in Paper I were highly motivated to undergo spirometry (75% of all invited patients attended), even though the tests took place several weeks after the urgent visit, and the patients had not previously met the researchers. The high attendance rate among the patients could have been a sign that they were worried about having COPD, possibly after having made their own conclusions about COPD and their smoking history. Previous research shows that patients at risk of COPD seem to be responsive to information about COPD and realize the benefits of quitting smoking. New diagnosis of COPD are associated with increased rates of smoking cessation [99].

6.3.1.2 The more smokers in the population, the easier it is to screen for COPD
The authors of a 2014 study argued against screening for COPD in smokers with RTIs, as their results indicated that few smokers actively seek health care for RTIs [100]. Moreover, the work of other researches also indicates that smokers avoid seeking health care [101, 102]. The 2014 authors thus suggested that rather than relying on patients seeking health care for respiratory symptoms, strategies for early detection of COPD should be directed toward the public [100]. However, general screenings of the public are questionable [96]. On the other hand, methods for targeted screenings should be further studied, keeping in mind that the results, and thus the usefulness, may vary by context. In our study, all patients had actively sought help, and many were, in fact, smokers. While conducting Study 1, we noticed that the information about smoking habits was largely missing in the patient records, which made it hard for us to find the exact number of smokers in the patient population that visited urgent primary care. Later reports have indicated that physicians often fail to document information about smoking habits in patient records [103]. We telephoned all the otherwise eligible patients to find out whether they smoked prior to including them in the study. Of the 250 patients we telephoned, 198 (79%) confirmed they were current or former smokers. This

number indicated that smoking was common in middle-aged patients visiting urgent primary care in the Tyresö-Haninge-Nynäshamn area for RTIs. We knew that the prevalence of smokers in the actual catchment area was high. Additionally, Haninge and Nynäshamn had relatively many blue-collar workers and a high sick-leave frequency [104-106], which also may have contributed to the pattern of frequent health-care seeking. Finally, as smoking may increase a person's desire for antibiotics when they have a RTI [107], we were not surprised to see many smokers seeking a doctor's appointment.

6.3.1.3 The usefulness of our screening method

For three main reasons, we consider the method for detecting undiagnosed COPD described in Paper I a complement to other screening methods in the symptomatic public.

1. The approach is *feasible.* That is, it can easily be adapted to a real-life context in which patients with airway symptoms actively seek medical care. As the time available in primary urgent care does not allow further investigations on the spot, the GP's central action to reduce underdiagnosis is to ensure the patient is referred to a follow-up visit at which further investigations will be planned. Simplified methods for assessment of lung function, such as FEV1/FEV6 tests at PHCCs increase efficiency in screening for COPD in risk groups [108, 109].

2. The method may be particularly useful in *populations with a high prevalence of smoking.* It is noteworthy that different surroundings and contexts may affect smokers' care-seeking patterns. Thus, conclusions drawn from research results may also differ by context. For instance, Sweden's sick-leave regulations, combined with highly accessible primary urgent care, may have affected the results of Study 1.

3. The method seems *more usable than public screenings* for COPD, as the amount of time and effort required to arrange screenings is not trivial. The positive (61%) and negative (81%) predictive values of our model, which used three variables (age, smoking status, and smoking intensity) to detect COPD

in patients with an acute RTI were relatively high. In other words, in our study the probability of COPD in patients with RTI who were over 55 years old and had smoked more than 20 pack years was 61%. Additionally, we would falsely suspect that 11% of the patients had COPD and would thus refer them unnecessarily to spirometry. However, contact with health care professionals and a spirometry test would not be in vain, as it might increase patients' awareness of COPD and motivate even those who did not yet have the disease to quit smoking. A possible explanation for the characteristics of our model may be that the multiple regression analysis was influenced by the presence of random factors that are typical for small-sample studies. Assessment of the health economic consequences of our method could be an interesting topic for future research.

6.3.2 About the diagnostic criteria for COPD

The diagnoses of COPD in Papers I and III were solely based on a fixed spirometry cut-off of FEV1/FVC < 0.7 as outlined in GOLD. There is always a risk of some misclassifications, particularly among the oldest patients, when a fixed FEV1/FVC is used instead of lower limit of normal (LLN) for FEV1/FVC, as the latter is adjusted for age and for the reference system for the population in question [110]. However, in Study 1, the lung function values were evenly distributed across all ages. Moreover, the mean age was 55 years, and only a few patients were 70-75 years. Thus, the risk of misclassifications due to fixed FEV1/FVC was reduced in this study. As the prevalence of COPD found in Study 1 was based on spirometry results only, the "true" prevalence of COPD in the study population may have been somewhat lower. Today, clinicians are instructed to base the diagnosis of COPD on a consistent, professional assessment of a combination of typical patient history, clinical findings, and lung function measures. One of the main purposes of basing the diagnosis on broader information is to make it easier to discriminate between patients with asthma and those with COPD.

6.4 PAPER II: REASONS FOR POOR GUIDELINE ADHERENCE AND GPs' PERSPECTIVES ON THEIR WORK WITH COPD PATIENTS

6.4.1 Getting in contact with patients with COPD

One major way that people who have or might have COPD meet a physician is through urgent visits (usually 10-15 minutes) prompted by acutely worse symptoms, which usually means the patient is exacerbating. The limited time available is used to provide immediate treatment for urgent airway problems. Often, the patient and the GP are unfamiliar with each other, which may further increase the risk that the GP will omit to discuss COPD or plan for a follow-up.

Another major way is through planned visits (usually 20-30 minutes long). These visits are typically annual or other regular check-ups or follow-ups for medical issues in a patient with a COPD diagnosis. Such patients may present with mild airway symptoms that are not obvious to the GP and not bothersome enough for the patient to bring up at the consultation. In fact, many patients with or at risk of COPD do not have ongoing, troubling symptoms when they see their GPs. Instead, they come to see the doctor for a reason other than COPD. They bring up many different problems and issues, which leads to the process of deprioritizing COPD at the consultation.

As the portal to interprofessional COPD care, GPs play a crucial role in identifying symptoms and signs of the disease, discussing COPD, and diagnosing it. Annual checkups should be planned for patients with multimorbidity, and these consultations should be long enough so that the different diseases or diagnoses can be thoroughly covered via a dialogue and medical assessment. Without a vigilant GP, there will be neither diagnosis nor further COPD care.

6.4.2 GPs' and patients personal views on COPD

Paper II discusses the reasons for poor GP adherence to guidelines and for deprioritizing COPD in consultations. GPs brought up factors related to clinical findings, organizational models, and holistic views of patients. Unlike their colleagues in northern Sweden [111], the Stockholm GPs did not mention lack of competence as a reason for deprioritizing COPD or as a reason for the gap between guidelines and practice. In Paper II, I found the descriptions about the patients and doctors' levels of motivations for care, their personal views on COPD as a disease, and their difficulty bringing up the sensitive issue of smoking to be the most interesting features

of the results. The GPs in Study 2 mentioned that they did not have high expectations of their patients' capacity to change behavior and did not always trust their own capacity to influence the patient to change behavior. GPs may regard managing COPD like trying to swim against a stream; i.e., as not worth the trouble, given the small gains [112]. For instance, GPs sometimes choose not to bring up smoking in their discussions with patients because they do not expect the patient to be able to quit smoking [113]. On the other hand, if the patient presents with smoking-related symptoms, the GPs are more likely to actively support the patient's efforts to quit [114].

6.4.3 Multimorbidity

The GPs clearly confirmed the findings of previous research that the disease-oriented approach in the current single-disease guidelines has often led them to question whether the guidelines can be applied to patients with multimorbidity [115]. No evidence-based guidelines for the management of patients with multimorbidity currently exist, despite obvious need. Thus, an international initiative to work on this topic is underway [116], and some steps have already been taken in the United Kingdom and the Netherland [117, 118]. Because of their expertise in treating patients who have multimorbidity GPs should play a central role in writing such guidelines.

6.4.4 GPs' reflections on their professional identity

Consistently aiming to be vigilant and observant is an essential part of working successfully as a GP. In addition to the theoretical model, Study 2 gave rise to general reasoning about the core features of family medicine and the work and identity of GPs. GPs' identity and medical specialty is not only associated with competence and expertise, but also with the way GPs' everyday work is done. Paper II describes how being a specialist in managing patients with unselected medical conditions and patients with multimorbidity, together with a holistic view of people, give rise to a firm sense of GPs' identity. These descriptions parallel some of Matti Klockars' (a Finland-based professor in family medicine) reflections about "the identity of a GP" [10]. Among the concepts Klockars believes are central to GPs' identity are their ability to live with uncertainty, the value they place on continuity of care, their ability to think epidemiologically, their ability to coordinate their own work, and their patient-centered rather than disease-oriented approach. A study

of young doctors in Finland showed that GPs saw themselves as humanists with a social orientation, health promoters, and care providers, whereas hospital doctors considered themselves to be people who cure, who engage in science, and who conduct research [119].

Professional identity is built through a person's internal sense of belonging to a group and through outsiders' perceptions and descriptions of the group. Today, GPs' sense of belonging and others' perceptions of GPs may be threatened by escalating workloads that lead to a decrease in GPs' sense of autonomy [120]. Stress is also a problem. GPs are not invulnerable to the emotional demands of their work [121] and may experience ethical stress due to new diagnostic and therapeutic options that seem endless [10, 120]. These problems could make it challenging to build a strong identity "from within." A network of collegial support and dialogue via CME adjusted to GPs' needs is more crucial than ever.

6.4.5 Methodological considerations concerning grounded theory

GTM is a qualitative research method that offers a systematic and interpretive way to move from data to a theory that has the potential to explain, interpret, and ultimately guide clinical practice. The core idea of GTM is that it can be more relevant to develop a theory in direct response to immediate problems than to start with a hypothesis or a pre-existing theory and test it [76]. The GTM we used in Study 2 was mainly inspired by the constructivist views of Charmaz [70]. It involves actively acknowledging that the researcher as not an objective observer and analyst, but an individual taking part in the data collection phase and constructing the theoretical model. As the constant parallel data collection and comparative analysis advances, researchers must continuously examine and strive to be aware of how their values and preconceptions may affect their interpretation.

A number of methodological considerations are particularly relevant to GTM:

- *Variation in the study population*. The heterogeneity of the study population is crucial to collecting "rich data" in qualitative studies. The theoretical sampling in Study 2 contributed to good variation in the study population.

- *Interview quality*. The interviewer (HS), who was familiar with interview techniques from previous work, followed a semi-structured interview guide. After

each interview, the research group evaluated its work, documenting what happened in the interview and their future plans in memos. Interview guides were revised as the study proceeded.

- *Results*. Thorough analysis by the research group contributed to grounded and structured results. The results were *original;* i.e., new information was uncovered, as the area was previously unstudied. The results were *relevant* and *useful,* because they were further implemented in a new CME intervention (Study 3). They were *trustworthy,* because they were *credible* (i.e., the final theoretical product was actually "grounded" in the data) and *consistent*. This credibility and consistency were enhanced by the interviewer's familiarity with the topic and settings, the thorough methods used to collect and analyze data, and linking the conceptual categories and empirical data. However, in Paper II we could have further clarified the evidence of credibility by describing the whole process of developing the theory more explicitly and in greater detail. Specifically, we could have described the flow of theoretical sampling more thoroughly. The results were *resonant* and *reliable;* their correspondence to participants' experiences was verified in the last two focus group interviews. As previously noted, the researchers were careful to evaluate their *objectivity* during the entire analytical process. However, as is generally true of GTM studies, the results presented in Paper II cannot be *generalized* outside of the sample, but they may be transferrable to similar contexts.

6.4.6 Using the new information to create an educational intervention

The theoretical model presented in Paper II **(Figure 6)** was based on GPs' descriptions about the process that occurs when COPD is deprioritized at a patient-doctor consultation. However, the data uncovered many strategies that were the opposite of the "negative path" (deprioritization), revealing a corresponding "positive path" (prioritization). The positive path **(Figure 9)** described the factors GPs thought lay behind successful COPD care. The positive path was incorporated into the PRIMAIR educational intervention in Study 3. Each intended learning outcome was to be achieved by basing learning activities on examples from the positive path, using mainly didactic pedagogics in the TL arm and case method learning and discussions in the CM arm.

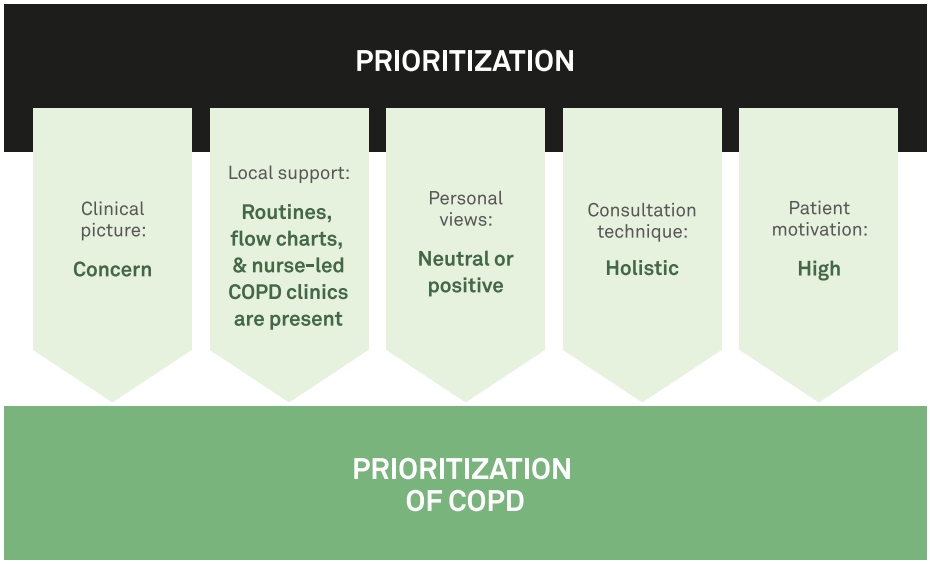


Figure 9. A model summarizing the process of prioritization of the positive path COPD at a patient-doctor meeting.

Citations from the data illustrate how GPs' nonjudgmental views on smoking and neutral attitudes towards COPD can lead to prioritization:

"I'm always nagging about smoking. I see it as a fringe benefit."
(F, "Anti-smoking doctor")

"I have seen so many other types of patients who live miserable lives, either self-inflicted or because of other things ... I mean, I'm not here to be the police."
(I, "Equating all diseases")

Some GPs described how using a holistic consultation technique instead of focusing on each diagnosis separately helped them grasp both the patient's main agenda and how seemingly different medical issues interacted to make up a whole:

"I need to know how the patient is feeling. It gives me loads of information. I give feedback, summarize, make open questions and confirm while the patient tells me things. So I'm familiar with my patients, and many problems get solved, because I have the information about the patient."
(J2, "Seeing associations," "Keeping up continuity")

When GPs felt that the patients were highly motivated to receive COPD care, the discussion was likely to move toward active or proactive measures. They thought that patients who experience worrying symptoms are likely to be motivated to take in information about the disease and accept treatment suggestions.

"But when they start to feel symptoms they get worried. Really worried, so that they don't come at all because they neglect the concern, or else they come to have a severe disease excluded. Cancer and COPD."
(D3, "Patient worrying about severe disease")

6.4.7 What might patients think are the reasons for COPD deprioritization?

Studies about patients' perspectives on the reasons for deprioritized discussions about COPD are scarce. A cross-sectional, descriptive study from Canada in which the researchers used a validated questionnaire in 364 patients indicated that a satisfactory patient-physician relationship and continuity correlated most strongly with good care for chronic conditions (diabetes, hypertension, or COPD). Moreover, in the patients' view, interdisciplinary care and technical quality of care contributed only modestly to good care [122]. On the other hand, other studies have indicated that continuity of care from an interprofessional team that also provides education in self-management improves patients' motivation to receive care and adhere to medications [53, 122, 123]. Patients have reported that a nonjudgmental attitude toward smoking is essential for decreasing shame and increasing the patient's motivation to receive treatment for COPD [124, 125]. Patients with COPD also call for more psychological support than what is currently typical after an acute exacerbation, as feelings of loss, hopelessness, and uncertainty are common [126]. A follow-up visit with a GP shortly after an acute exacerbation could thus provide the opportunity to schedule an appointment with a COPD nurse for intensified psychological support via motivational interviews about smoking cessation.

6.5 PAPERS III AND IV: EFFECTS OF CONTINUING MEDICAL EDUCATION FOR GPs

The overall results described in Paper IV show that CME about COPD generally leads to learning although evaluating the effects of a single CME intervention for GPs is challenging. Both pedagogical methods—CM and TL—led to improvements in total scores on the questionnaire. However, neither of the methods was superior to the other. Additionally, the positive effects were only modest and thus left room for substantial improvement.

Perhaps unexpectedly, GPs at PHCCs with nurse-led asthma/COPD clinics did not know more about COPD or have better COPD management skills than GPs at PHCCs without such clinics. This may be a result of GPs handing over parts of their responsibilities to asthma/COPD nurses. An alarming finding was that GPs working in deprived areas in Stockholm were at particular risk of delivering insufficient COPD care.

6.5.1 Level of knowledge about COPD before and after the CME intervention

The results described in Paper IV revealed that even after the CME interventions, strong areas of knowledge remained strong and weak areas weak among the participating GPs. Neither of the CME methods led to significant improvements in managing COPD in patients with multi- and comorbidities, managing acute exacerbation under time pressure, managing patients who lack motivation to quit smoking, or handling patients whose focus during the consultation is something other than COPD. Thus, these typical real-life conditions and problems encountered by GPs remain difficult to overcome with two short sessions of CME regardless of whether lectures or case methods are used.

6.5.1.1 Smoking cessation

At baseline and 12 months, GPs best levels of knowledge and adherence to recommendations were observed in the area of smoking cessation support. Traditional lectures led to further improvements in the results regarding smoking cessation support for motivated patients. The overall good results were not surprising, as the effects of quitting smoking (i.e., lower risk of COPD and slower disease progression [69, 127]) are well understood by clinicians. The baseline results showed that most GPs employed behavioral strategies to promote smoking cessation, and

every other GP combined them with pharmacological approaches [79]. This result may also reflect increasing access to primary care nurses competent in motivational interviewing. However, it is important to point out the gap between what GPs know about smoking and what they do. Earlier research has shown that doctors rarely take active measures to help patients quit smoking [128]. The preliminary results of analyses of PRIMAIR data on patients with GOLD 2-3 COPD indicate that approximately 60% of the current or former smokers (n=382) had *not been offered* smoking cessation support, and 80% had *not been given* such support by their GPs or nurses (Sandelowsky, in manuscript). GPs need to understand their important role in motivating patients to quit smoking. This role needs to be given continuous attention in CME situations.

6.5.1.2 Spirometry

GPs seemed to want to employ spirometry as recommended in guidelines, which is in line with the overall improved awareness of spirometry in diagnosing airway diseases [53]. However, spirometry interpretation skills remained suboptimal at baseline in all the studied groups, although CM led to small, yet significant improvements. The "hands-on," participatory learning activities in CM, such as studying and discussing spirometry curves, may have been effective. Conclusions should be drawn with caution, however, because only one of the 13 questions measured spirometry interpretation skills, and guides for spirometry interpretation were not allowed. Interestingly, the poor spirometry interpretation results were not echoed in the findings of Study 2. The GPs interviewed in Study 2 did not even mention problems with spirometry interpretation as a reason for deprioritizing COPD. GPs' unrealistic assessments of their own spirometry interpretation skills may explain the discordance, or it may have been the result of the inability to use interpretation guides when responding to the questionnaire. The presence of an asthma/COPD clinic seemed to be associated with low scores in spirometry interpretation. One possible explanation is that GPs have transferred this responsibility to specialized asthma/COPD nurses, resulting in stagnation in the GPs' own skills in spirometry.

6.5.1.3 Acute exacerbations

The results on managing follow-up visits after acute exacerbations were satisfactory (regarding the proper time and contents of the visit). However, both pre- and post-CME, the treatment of an ongoing exacerbation was among the items

that showed the worst results. The baseline data showed a negative association between GPs' level of knowledge about these topics and the presence of asthma/COPD clinics, again, possibly indicating that GPs hand over their responsibilities to asthma/COPD nurses. The choices of antibiotics seemed largely satisfactory, but oral steroids were underused to treat exacerbations [79], which has also been shown in a previous Swedish study [129]. The CME had no effects on GPs' level of knowledge about the topics involving acute exacerbations.

6.5.1.4 Management of stable COPD

CME did not affect GPs' skills in managing pharmacological maintenance therapy, which were insufficient both pre- and post-CME. Baseline results indicated that GPs overprescribed inhaled corticosteroids [79], which is in line with previous research [130]. Lack of familiarity with recommendations and uncertainties about correct diagnosis (i.e. whether patient has asthma or COPD) may lie behind this finding. GPs underused pulmonary rehabilitation (PR) despite the high accessibility of PR in Swedish primary care [131]. GPs' inadequate knowledge of the importance of PR in treatment, which can both cause and be caused by insufficient experience and lack of routines, have previously been mentioned as explanations of the low rates of referral to PR [132].

6.5.1.5 Multimorbidity

GPs generally paid insufficient attention to COPD during patient consultations, except consultations for acute exacerbations. They struggled to handle COPD when patients with multimorbidity had several health issues to discuss in a limited time. The patient's agenda, which clearly did not always include COPD, often led the GP to omit COPD, although the GP was aware of the diagnosis. This finding supports the results of Study 2.

Many patients do not recognize the importance of COPD and its long-term implications [133]. It is thus crucial that GPs bring up COPD in discussions with patients and use their expert knowledge about the disease to give the patient a picture of how the often extrapulmonary features are connected and interact with each other. Additionally, the absence of guidelines for assessing and managing patients with multimorbidity contributes to poor COPD management [134] and insufficient interprofessional cooperation. Both patients and clinicians may thus perceive health care pathways as fragmented and unsatisfactory [135].

6.5.2 Bridging the implementation gap: translational research

Failure to translate research into practice and policy is one of the most consistent findings from clinical and health services research [136]. Despite significant financial investments in biomedical, clinical, and public health research; undergraduate training and CME; and projects to improve quality and patient safety, healthcare systems and professionals still fail to ensure that effective and cost-effective programs, services, and drugs get to those who need them [136]. The discipline that focuses on this subject is called *implementation science,* or preferably, *translational research*. The two main types of translational research are "T1 research," the translation of basic biomedical research into clinical science and knowledge, and "T2 research," the translation of this new clinical science and knowledge into actions in practice and thus improved health [137]. T2 researchers argue that "evidence-based medicine should be complemented by evidence-based implementation" [138]. Researchers planning the framework for translational activities, such as CME, and the subsequent analysis of these activities should answer five key questions: *What* knowledge should be transferred, and *to whom, by whom, how,* and *with what effect* should it be transferred? [139]. In this thesis, I have followed the seven essential steps needed for a well-conducted translational research project defined by the Knowledge Translation Theories Group at University of Ottawa [140]:

1. Identify care gaps and the need for change (Paper I).
2. Identify barriers to the consistent use of guidelines (Paper II).
3. Review evidence from previous implementation interventions on similar topics (Papers III-IV).
4. Tailor or develop the intervention (Papers III-IV).
5. Implement the intervention (Paper IV).
6. Evaluate the process of implementation (Paper IV, except cost analysis).
7. Evaluate outcomes of the intervention (Paper IV).

To complete steps 3-7, the PRIMAIR researchers will continue to study patient outcomes.

6.5.3 Challenges in using CME for knowledge translation

6.5.3.1 The effectiveness of CME interventions

Evidence on the most effective and feasible types of CME is still incomplete [136]. Compared to educational and pedagogical research about undergraduate learning, CME research is a fairly young discipline. However, the number of studies on the effectiveness of CME is increasing because of a growing focus on cost-effectiveness in health care. The Effective Practice and Organisation of Care Group (EPOC) states that systematic reviews provide the best evidence about the effectiveness of CME interventions [141, 142]. Based on EPOC's statement, Grimshaw et al. (2012) concluded that systematic reviews should be used to discuss and develop CME, as studies about individual CME interventions may be misleading because of bias in their conduct or random variations in their findings [135]. Individual CME interventions do not generally result in large absolute effect sizes. Most clustered trials are powered to detect absolute improvements of 10% to 20%. Under these circumstances, it is not surprising that different types of interventions have had similar effect sizes. **Table 8** summarizes EPOC's list of professional behavior change strategies and their effectiveness at the time we created the PRIMAIR intervention.

Intervention	Effect size	Dispersion
Printed educational materials	4.3%	Range −8.0% to +9.6%
Educational meetings	6.0%	IR[1], +1.8% to 15.3%
Educational outreach	4.8%	IR, +3.0% to + 6.5%
Local opinion leaders	12.0%	IR, +6.0% to +14.5%
Audit and feedback	5.0%	IR, +3% to +11%
Computerized reminders	4.2%	IR, +0.8% to +18.8%
Tailored interventions	Pooled odds ratio of 1.52	95% CI2, 1.27 to 1.82, $p < 0.001$

[1] IR = Interquartile range [2] CI = confidence interval

Table 8. Summary of The Cochrane Effective Practice and Organisation of Care (EPOC) group's review of professional behavior change strategies and effectiveness, 2011.

6.5.3.2 Is repetition the foundation of learning?
There is no solid evidence that either multifaceted educational interventions (interventions with multiple components) or repeated exposure to CME on the same topic (reminders) guarantee the translation of knowledge to practice [136]. Undergraduate training, specialist training, and CME constitute a continuum of professional development that takes place over many years. This continuum should be kept in mind when interpreting the results of isolated interventions such as those listed in Table 8 because one CME intervention might be based on, boosted by, or lead to another intervention. Each CME intervention can affect an individual participant's interest in the topic in different ways. In summary, the effects sizes of participating in multiple interventions over time are probably bigger in real life than Table 8 might indicate.

6.5.3.3 What characterizes an effective CME for GPs?
GPs' work is characterized by first-line management of unselected health problems and holistic assessments. GPs also manage multiple diseases rather than diseases of a specific organ system or age group. A CME intervention that enhances GPs' learning experience should be tailored to primary care settings and should have patient-centered content that reflects the nature of primary care practice [143]. Research shows that multiple educational activities are more effective than single activities [63, 144]. Nevertheless, GPs seem to want to attend traditional, didactic CME sessions. Moreover, they seem to prefer CME via group sessions to CME on their own (e.g., on-line courses) [64]. In a recent Stockholm-based study, Ingemansson et al. described the core elements of how GPs learn and transfer information from guidelines to their practice. GPs use interactive (peer) contextualized dialogues. They gain confidence that they are providing high quality care through own or others' experiences, and they use guidelines that are easy to access and adapt to the decision-making process [145]. Additionally, a study from the United Kingdom found that in a situation of clinical uncertainty, contact with hospital doctors and observation of hospital practice was as likely as using guidelines to bring about changes in GPs' practice [146].

6.5.3.4 Mandatory or optional CME for GPs?
Although the managers of PHCCs in Stockholm are obligated to provide GPs with the CME the GPs consider necessary, GPs are not required to participate in CME.

The current reimbursement system does not encourage managers to promote CME for GPs. Educational meetings at the workplace are well-received by professionals [147]. Although feasible and relatively inexpensive to carry out in primary care settings (their main cost is related to the release time for GPs) [136], educational meetings at the workplace are nevertheless deprioritized. Consequently, the number of GPs participating in CME activities is decreasing [12]. GPs indicate that time constraints, staffing problems, and increasingly heavy workloads are the main reasons for deprioritizing of CME [88]. Because CME for GPs is so deprioritized in Sweden today, The Swedish Medical Association (physicians' union) has recently announced that they aim to actively lobby for mandatory CME for all physicians [148].

6.5.3.5 Implementing and researching CME is a complex task

Whereas undergraduate educators are often professional pedagogues, CME educators are often professional clinicians with limited pedagogical training. They may thus be less well-equipped than professional pedagogues to face the potential pitfalls of implementing and assessing CME. Although the amount of CME research is growing, many current CME activities may still be based on beliefs rather than evidence about the likely effectiveness of different approaches [138].

We faced a number of methodological challenges in designing and conducting Study 3, which may have biased the results:

Identifying barriers to guideline adherence before designing CME activities. Researchers studying guideline implementation agree that gathering information about the likely barriers to and facilitators of implementation increases the chances of creating a successful CME intervention. Barriers are preferably identified at the planning and designing stage of a CME intervention. Methods of identifying barriers and facilitators can be qualitative (e.g., individual interviews, focus groups, and participant observation) or quantitative (surveys) [149]. We used the results of Study 2 and other previous research to identify GPs' barriers to COPD guideline adherence, and we believe this method was sufficient.

Research based on real-life context is never precise. It is usually not possible to implement a CME intervention in a clean-cut, objective, and "scientific" manner because of the biases that characterize real-life contexts. In Study 3, the CME sessions were led by different teachers with varying teaching styles, which led to heterogeneity in the interventions. Each CME session also varied in the composition of the participants and in contexts. It was thus impossible to use a "one size

fits all" approach.

Assessing the effects of CME: the GP questionnaire. The biggest challenge in the CME implementation process is often to create a good assessment tool. We noticed a pattern of contradictions and dilemmas in method of assessment we chose. In the GP questionnaire, the assessment method (multiple choice questions and short, free-text answers) was appropriate for assessing learning at SOLO levels 1 to 3. That is, it aligned with the level of intended learning outcomes that were facilitated by teaching and learning activities in both intervention arms. The questionnaire was designed this way for practical reasons (to keep it short) and because we hoped to find out whether the higher-level learning activities in the CM arm would result in better lower-level (SOLO 1-3) learning than TL. However, this choice meant that the questionnaire was not directly designed to capture the higher-order thinking or the professional approach required to achieve intended learning outcomes at SOLO levels 4 to 5 [150]. Thus, we do not know for sure whether or not the GPs achieved these higher levels of learning.

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") [151]. However, we mixed multiple choice with open questions to achieve a well-constructed question stem that forced participants to show not only their level of lexical knowledge ("Knows"), but also their capacity to identify and solve problems by assessing the whole situation described in the case vignettes ("Knows how"). Thus, the GP questionnaire revealed theoretical knowledge and self-reported, preferred actions but did not measure the two highest levels of knowledge in Miller's pyramid. In other words, we were unable to assess whether the GPs' behaviors changed in practice. Self-reports are usually subject to bias and thus not recommended for use as the sole measure of guideline adherence [152]. PRIMAIR therefore also includes an assessment of patient outcomes. This analysis is currently underway.

Constructing questions requires particular care. The overall goal is to design questions that will be answered correctly by those who know the answer and incorrectly by those who do not. Questions on a test and items on a questionnaire should be characterized by the following qualities [153, 154]:

- *Cognitive complexity,* which permits various levels of learning to be tested; e.g., by testing different levels of Biggs' SOLO taxonomy [81].
- *Content quality,* because the test questions will permit participants to demonstrate their knowledge.
- *Meaningfulness,* which makes test questions worth participants' time and helps students recognize and understand their value.
- *Language appropriateness,* so that the question is clear and coherent to both the teachers and the participants.
- *Transferability and generalizability,* so that successful performance on the test actual knowledge achieved.
- *Fairness,* so that performance is scored in the same way for everyone.
- *Reliability,* so that answers to test questions measure what participants know.

We improved the quality of the questions and thus even parts of the reliability of the questionnaire via a "think-aloud" pilot test with a group of GPs who would not later participate in the intervention.

Placement of questions on the questionnaire matters, too: easy questions should be placed in the beginning so responders will gain confidence. Short-answer questions and sensitive questions (e.g., about attitudes and demographic) should be placed last [153]. We could not follow this advice strictly, as the questionnaire consisted of five separate case vignettes, and each vignette required a range of easy to short-answer questions. The way questions are worded and responses are scaled is also important, especially if the questions are about attitudes or involve approximations [155]. We chose not to include any questions that obviously addressed attitudes and personal views in order to reduce the risk of social desirability bias; i.e., people's tendency to respond in a way that they think is socially preferable [155]. Finally, the modestly positive results of Study 3 led me to reflect on the overall design of the GP questionnaire:

- *Could the test have been too hard?* The research group thoroughly discussed whether the chosen questions were aligned with the intended learning outcomes and learning activities (Biggs' constructive alignment [80]). We aimed to include the issues that would best reflect the participants' competence in managing COPD (evidence-based practice, correct diagnoses, recommended

treatments, holistic views of multimorbidity, team work, ethical practice, and communication skills).

- *Were the scoring requirements too strict?* The scoring criteria also followed the principles of constructive alignment and were discussed by the research group. However, the intended learning outcomes were not presented to the participants prior to the CME, which may have negatively affected learning, as the participants could not see what they were expected to learn.
- *Was the scaling of scores (0-2 points per question) too narrow?* A test with a mix of easy and difficult questions and a scale (scores) with more than three steps would have helped discriminate between the participants and changes in scores over time.

6.6 GPs' KEY ROLE IN MANAGING PATIENTS WITH COPD

6.6.1 The stigma of COPD complicates the management of the disease

COPD is a chronic condition that often has a major impact on patients' lives. Receiving the diagnosis can be a life-changing experience, as can living with the disease every day, going through exacerbations, approaching the end-of-life stage, and contacting and communicating with care providers [47]. In the Merriam-Webster dictionary, *stigma* is defined as "a scar left by a hot iron, a mark of shame or discredit and an identifying mark or characteristic." The stigma of COPD has been the topic of increasing discussion in the scientific literature, as it seems to decrease GPs' ability to deliver evidence-based COPD care. According to a systematic review (2017), patients with COPD are commonly stigmatized. The stigma is associated with psychosocial, behavioral, physical, and treatment- and employment-related outcomes [156]. The stigma can be affected, negatively or positively, by the people the patient encounters, including the GP.

6.6.2 The circle of COPD management

Figure 10 illustrates my thoughts about how different actors are involved in and interact in the management of COPD. The stigma of COPD is created and kept alive via actors throughout the whole circle, including the public, health care professionals and their managers, and patients. Each actor is also a member of the public, and individuals can play more than one role simultaneously (e.g., a GP can also be a member of the research community or a patient can also be a politician or a health care manager), so complicated interactions may occur. Depending on the actions taken, one of two kinds of circles can be initiated: a negative, "vicious" circle of undermanagement of COPD or a positive, "health promoting" circle of COPD management.

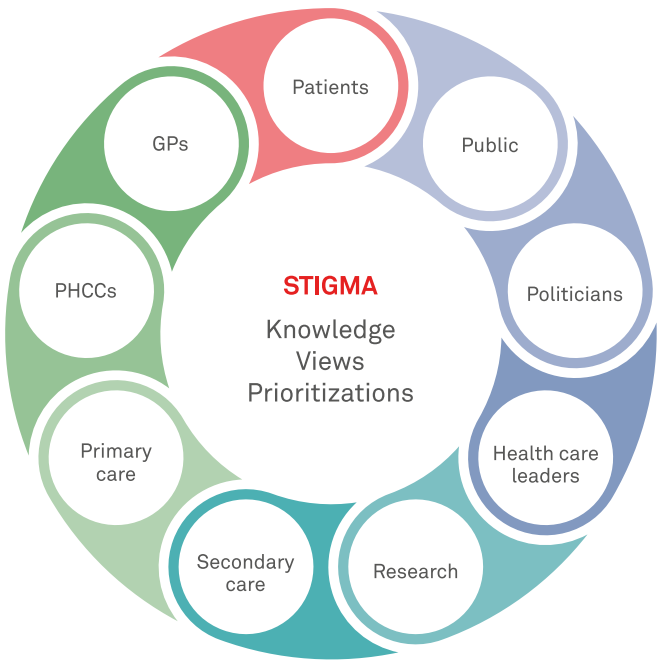


Figure 10. The circle of COPD management.

6.6.3 Actions leading to the vicious circle of undermanagement of COPD

Lack of knowledge and negative views about COPD in the public lead to deprioritization of COPD in the minds of the public, politicians, researchers, CME leaders, public health care mangers, and finally, in professionals in both secondary and primary health care. In the end, patients are not only left without optimal care, but also get multiple signals that COPD is not important, which maintains and feeds the stigma of COPD. Thus, with stigma as its engine, the vicious circle is complete and continues to run.

The public demands high quality care and easily accessible health care services. Additionally, the public has a generally negative view of smoking and demands that tobacco use is regulated in public places [157]. Thus, most elected politicians share these views, and execute the desired policies via new laws. However, the anti-tobacco actions of policymakers do not always mean that they supply sufficient resources to manage smoking-related diseases, prevent tobacco use, or carry out smoking-related research projects [158]. Instead, the focus of the tasks of public health care lies elsewhere. The public's demand for readily accessible healthcare is highly prioritized in Sweden today. Officials in the health care bureaucracy carry out political decisions by creating reimbursement schemes that encourage prompt and numerous patient visits to primary care. Long-term work to prevent people from smoking or help the quit, interprofessional management of patients with multimorbidity, and professional development and CME come second. The poor COPD detection rate described in Paper I and the insufficient management of COPD described in Papers II to IV are natural consequences of these schemes. This leads to insufficient patient education and insufficient support for self-management, which in turn means patients are poorly prepared to handle their disease, especially at times of exacerbation. Poorly prepared patients experiencing exacerbation contribute to the public's need for easy-to-access urgent care, continuing the vicious circle of undermanagement of COPD.

6.6.4 GPs role in breaking the vicious circle

GPs' core professional skills are particularly important to reducing the stigma of COPD, and ultimately, to delivering optimal COPD care. Key competencies include a high level of knowledge about and good skills in managing COPD, chronic conditions, and multimorbidity. GPs should use a holistic consultation technique as their main tool for gaining and giving information about the impact of COPD in patients'

lives and assessing their health. Public understanding of COPD is still relatively low, and false and frightening stories flourish in people's minds and in the daily press. GPs thus have a crucial role to play as educators and leaders. Through evidence, they can improve the level of the general knowledge about COPD and help shape public opinion. Just as in the fight against smoking, it is urgent for GPs to shoulder their responsibility as trustworthy and professional clinicians, inspiring educators and mentors, consistent authorities and leaders, and strong opinion makers [159].

Because of GPs' key role in COPD care, GPs' role as patient educators deserves further attention. Neutral yet supportive and evidence-based information delivered by health care professionals increases both patients' and professionals' adherence to guidelines [53, 160]. Even successful smoking cessation, which is possibly the most difficult and stigma-burdened part of COPD care, is easier to achieve with professional patient education and support [161].

At present, most patients are first offered structured patient education, including action plans for exacerbations, when their lung function has declined below 50% of predicted (i.e., GOLD stages 3 and 4) and they have repeated exacerbations, hospital admissions, significant every-day symptoms, and reductions in health-related quality of life [162, 163]. However, research indicates that many patients have had exacerbations before entering GOLD stages 3 and 4 [129, 164, 165].

The preliminary results of a questionnaire to randomly selected COPD patients (n=567) at the PHCCs participating in PRIMAIR indicate that patients in stage 2 have a greater need for information about COPD than those in stage 3. Moreover, they more often considered themselves not capable of self-managing an exacerbation ($p<0.05$-0.005). Many doctors think of patient education as a task of COPD nurses, but patients with a great need for information deem contact with their GP more important than contact with a COPD nurse (Sandelowsky, in manuscript). For this reason, and because many patients already experience exacerbations in stage 2, I reason that GPs should begin educating patients, preferably in cooperation with an asthma/COPD nurse, earlier than is common today. GPs are competent patient educators when they provide adequate yet respectful and supportive information about the natural course of COPD, gather rich information about the patient's agenda, subsequently assess the situation together with the patient and the patient's family. Supporting patients in their lifetime journey with COPD may help reduce the fear, guilt, shame, and stigma associated with COPD and help patients cope with the disease.

6.6.5 The six factors behind successful management of chronic conditions by GPs

GPs' actions in managing chronic conditions are typically the result of a combination of pragmatism and evidence-based medicine. This approach distinguishes GPs from other physicians, as it is based on the person-centered and holistic view that is central to competent general practice. It develops gradually over many years in the profession. However, Swedish health care authorities emphasize that "evidence based practice" is an important goal of primary care. Quantitative and qualitative studies have identified six factors crucial to providing evidence-based general practice [166, 167]:

1. Taking multimorbidity into account when constructing guidelines. GPs rarely consider single disease guidelines useful in primary care patients, as these patients often have multiple diseases. It is therefore essential to involve GPs in the design of clinical recommendations and care programs for patients with multimorbidity.
2. Having access to digital clinical support guidelines that are easy to access, updated, concise, easy to use, and adjusted for primary care. Guidelines are necessary, as GPs may find it difficult to find and select useful information from among the large volume of research evidence and then finding time to read, appraise, and understand this information.
3. Taking part in CME on a regular basis. GPs' participation in CME activities needs to be encouraged and rewarded by PHCC managers. CME needs to be effective, as well as adjusted to, interesting for, and feasible to carry out at primary care practices.
4. Following one's own clinical results by regularly monitoring desired measures, such as diagnoses, prescriptions, and actions.
5. Daring to change old habits. Sometimes GPs show considerable skepticism toward new recommendations, which radically slows down the implementation process. This can be counteracted by visualizing, discussing, and comparing the GPs' own results and any deviations from the guidelines, preferably through collegial dialogues.

6. Prioritizing quality over money. A long-term commitment to evidence-based practice by PHCC managers is crucially important. Step-by-step changes work better than trying to make the changes all at once. For example, focusing on care processes for specific diagnosis groups, one at a time, helps to achieve value for the money spent.

6.7 IT'S ABOUT TIME

6.7.1 Time is money: more and faster

A recurrent theme found in the results and discussions of this thesis is time. Like most people in modern society, GPs are constantly reminded about time. Terms like "efficiency" and "production plan" that were coined during the industrial age have been adapted in most Western health care systems, and the emphasis on maximizing the use of time has only grown in recent decades. Stockholm's primary care reimbursement model resembles a marketplace where each action has a different price tag. Some tags have a large price on them (e.g., patient visits) and bring more money to the PHCC. Some tags have no price (e.g., contacts with patients by telephone or letter) or a negative figure (e.g., referrals to external investigations or attending CME) and are consequently deprioritized.

In recent years, our society has become globalized and increasingly "knowledge-based." Quickly and easily available information can simplify and shorten decision-making procedures. Indeed, never before have GPs been able to access information as quickly as they can today. However, new problems arise when people take it for granted that quick access to information always equals quick decisions. Additionally, the idea that we can be more efficient than ever before has spilled over into health care, but the reality of health care as experienced by GPs does not bear this out. Instead, as activities that carry price tags with zeros or negative numbers are deprioritized, care suffers. GPs are robbed of the time they need to process new information and manage tasks that require concentration and intellectual engagement, such as evaluating and caring for patients with multmorbidity. If this suboptimal care situation continues or even increases, costs to society, patients, and their families will escalate.

6.7.2 The lack of time

Demands for immediate care put person-centered care at risk [168, 169] by shortening consultations; consultations that are too short can leave both patients and physicians unsatisfied. GPs consider time constraints and lack of resources, such as sufficient staffing, the main reasons for inadequate quality of care [146, 170]. A meta-synthesis of qualitative studies parallels these concerns, concluding that the key to patient safety lies in face-to-face communication between patients and professionals, collegial dialogues, and interprofessional cooperation and communication [171].

Given that GPs in Sweden experience high levels of stress despite relatively long consultations times (24 minutes, the longest in an international comparison of 67 countries) [12, 172], the problem may be even greater in other Western countries. However, there are differences between countries regarding typical diagnoses and the severity of health conditions treated primary care, which makes such comparisons tricky.

6.7.3 It's all about time

It is time to realize how changes in society and medicine in recent decades have radically changed the nature of primary care and family medicine [173]. Complex decision-making happens regularly each day in primary care, and this decision-making takes time. Inevitably, when GPs feel that they lack time, it perpetuates the gap between theory and practice.

It takes years to become a competent GP. The necessary CME that helps GPs maintain sufficient competence also takes time.

In other words, *GPs deal with time-consuming but life-saving actions.* Giving them the time and resources they need for professional development will pay off. Neglecting the time pressure that currently casts a shadow across GPs' work conditions jeopardizes the quality of primary care and recruitment of new GPs, making these topics serious and growing concerns in the future.

7. CONCLUSIONS

COPD is a potentially life-threatening, chronic disease. Its progress can be slowed relatively easily and inexpensively by smoking cessation. GPs play a crucial role in bringing about optimal management of patients at risk of COPD and those with COPD. However, to deliver acceptable care to patients with COPD, GPs need more time and resources than they have today.

In Study 1 **(Paper I)**, we concluded that patients 40 years or older who have smoked more than 20 pack years and who have any type of respiratory infection may have underlying COPD. It is thus crucial for GPs to identify this high-risk group and offer them spirometry testing to detect COPD early. This may motivate those patients to quit smoking.

In Study 2 **(Paper II)**, we discovered that COPD is deprioritized during patient-doctor consultations in primary care and identified several factors associated with time constraints and multimorbidity that are involved in the deprioritization process. We suggest that GPs actively apply a holistic consultation approach and extend consultation times for patients with multimorbidity. In addition, we call for better documentation of COPD-related issues and better local routines, particularly for planning of disease monitoring.

In Study 3 **(Paper IV)**, we concluded that GPs' level of knowledge and skills about COPD are generally low. Furthermore, it is difficult to improve these skills, at least through short continuing medical education sessions that use either case method learning or traditional lectures. In fact, the use of any single continuing medical education method in short sessions should be questioned as a strategy for improving management of patients with multimorbidity.

The results of this thesis may contribute to a constructive dialogue between the public, policy makers, and medical professionals, as a strong primary health care system and sufficient financing are prerequisites for high quality and cost-effective management of COPD and other chronic diseases [2, 174]. Additionally, the thesis sheds light on the unused potential of GPs to use their power as trusted medical advisors to enhance patients' understanding of COPD and influence them to take the necessary steps to improve their condition; most importantly, to quit smoking. The results also illuminate the professional identity and unique contributions of GPs, which will hopefully boost their professional pride at a moment when time and other pressures are placing a particular strain on many GPs.

Most of all, I hope the thesis inspires GPs to nurture and improve their expertise in managing patients with multimorbidity. They should strive to participate in writing the guidelines for assessing multimorbidity, as current clinical guidelines for single diseases tend to promote polypharmacy and offer no guidance on how to prioritize recommendations in these patients [175]. Another important goal is improving medical students' understanding of the impact of COPD in patients with multimorbidity, as medical students still receive a predominantly hospital-based education oriented toward single diseases.

In the near future, together with the PRIMAIR research group, I will continue evaluating patient outcomes. These studies will primarily provide new information about symptoms, treatments, and levels of self-management skills before and after the CME intervention. The outcomes of the patient studies will also help us measure whether GPs achieved the more advanced intended learning outcomes described in Paper III. A clear difference between patient outcomes and GP outcomes would indicate that the GP questionnaire (described in Papers III and IV) needs improvement.

Designing and conducting a study about the effectiveness of accumulated CME activities and knowledge translation over several years of a GP's career would be interesting but so time-demanding that it is probably not feasible. A more feasible and also useful future study could investigate whether easy-to-access guidelines about COPD are helpful to GPs.

9.1 BAKGRUND

Allmänläkaren är primärvårdens specialistläkare och allmänmedicin primärvårdens medicinska specialitet. Allmänläkarens arbete har genomgått stora förändringar under de senaste decennierna. I takt med att slutenvårdsplatserna har minskat i Sverige och befolkningen blivit äldre och därmed också alltmer multisjuka, handlägger allmänläkarna och övrig primärvårdspersonal fler patienter med allt svårare kroniska sjukdomar. En sådan sjukdom är kroniskt obstruktiv lungsjukdom (KOL). Det är en inflammatorisk luftrörs-/lungsjukdom i vilken samsjuklighet med andra kroniska sjukdomar är vanligt. I Sverige beräknas 400 000–700 000 personer ha KOL. Cirka hälften av dessa personer beräknas vara odiagnostiserade. Diagnosen misstänks främst bland rökande patienter som uppvisar kliniska fynd förenliga med KOL, och den bekräftas med spirometri, som vid KOL påvisar en icke-reversibel obstruktivitet i de nedre luftvägarna. Tobaksrökning är den viktigaste orsaken till KOL, och rökstopp har en central roll i behandling och bromsande av fortsatt progress av sjukdomen.

Då majoriteten av patienterna med KOL upptäcks, behandlas och kontrolleras i primärvården är det av största vikt att diagnostiken och kvaliteten på vården där är optimal för att minska mortalitet och morbiditet i denna patientgrupp. Att upptäcka KOL i tidigt stadium är viktigt för att motivera patienten till rökstopp och för att symtomlindrande behandling ska kunna sättas in. Då kan progress av sjukdomen bromsas och kostnader för samhället minskas. Allmänläkaren är i en nyckelposition för att upptäcka patienter med KOL tidigt och se till att de får optimal vård. Allmänläkarens kompetens att göra professionella bedömningar med helhetssyn över patientens individuella förutsättningar är viktig för patientens prognos.

Sedan flera år finns internationella och nationella riktlinjer och rekommendationer som beskriver diagnostik, uppföljning och behandling av KOL. Tidigare svenska studier har påvisat att det finns stora brister i hur både primärvården och den specialiserade vården följer riktlinjerna. Det finns ett stort behov att studera orsaker till detta, både hos allmänläkare som yrkesgrupp och primärvården som organisation.

För allmänläkarnas kompetens krävs effektiva utbildningsprogram anpassade för primärvårdens behov. Det är vanligt att allmänläkare försöker tillfredsställa sitt behov av bred och kontinuerlig allmänmedicinsk fortbildning genom

att delta i ett par timmar långa utbildningar inom en rad medicinska områden. På sådana utbildningar är en traditionell föreläsningsbaserad pedagogik vanligt förekommande, med eller utan inslag av deltagaraktiverande moment. Traditionella föreläsningar baseras på att en lärare, som är expert i ämnet, förmedlar kunskap till deltagarna. Casemetodik är en deltagaraktiverande utbildningsmetod med professionsspecifika perspektiv. Deltagaren ställs inför realistiska problem, beskrivna i ett praktikfall eller "case", i vilket professionen (i vårt fall allmänläkaren) är huvudpersonen i caset. Frågeställningen i ett case bygger på att det inte finns något korrekt svar (däremot kan det finnas felaktiga eller i varje fall orealistiska lösningar), vilket betyder att lärarens roll är att främja deltagarnas diskussion och egna tänkande, snarare än att vara den som sitter inne med och presenterar kunskapen. Deltagarens egen aktivitet före och under casediskussionen är avgörande för lärandet. Casemetodiken har tidigare visat goda resultat i samband med fortbildning av allmänläkare i Stockholm, men inga studier om casemetodikens effekter i KOL-fortbildningar har genomförts tidigare i Sverige.

9.2 MÅLSÄTTNING

Den övergripande målsättningen med denna avhandling var att beskriva underdiagnostik av KOL som ett exempel på en konsekvens till otillräcklig följsamhet till riktlinjerna för KOL *(Vad är problemet?)*, orsaker till allmänläkares bristande följsamhet till riktlinjerna för KOL *(Varför finns problemet?)* och utvärdera effekt av fortbildning på allmänläkares kunskaper i KOL *(Kan vi göra något åt problemet?)*.

9.3 MATERIAL OCH METOD

Avhandlingen består av fyra delstudier. I delstudie 1 (artikel I) identifierades prevalens och svårighetsgrad av tidigare oupptäckt KOL bland patienter i åldern 40-75 år som var eller hade varit rökare och som hade fått diagnos akut luftvägsinfektion av en allmänläkare vid Handens Närakutmottagning eller Brandbergens vårdcentral.Patienterna genomförde en spirometriundersökning 5-6 veckor efter läkarbesöket och karakteristika för patienter som visade sig ha tidigare odiagnostiserad KOL beskrevs. Studien genomfördes under 2005-2006.

I delstudie 2 (artikel II) identifierades hinder för tillämpning av riktlinjer och vårdprogram. De omständigheter som styr om allmänläkarna tar upp och diskuterar KOL med patienter undersöktes genom en kvalitativ studie enligt Grounded Theory Methodology (GTM) med intervjuer av allmänläkare. Allmänläkare (n=59) vid olika vårdcentraler i Stockholms län deltog antingen i fokusgrupps- eller individuella intervjuer under 2012-2013.

Delstudie 3 (artiklar III och IV) är en klusterrandomiserad kontrollerad studie (PRIMAIR) i vilken effekten av en för allmänläkare riktad fortbildningsintervention i KOL implementerades och utvärderades. Interventionens syfte var att öka allmänläkares kunskap om evidensbaserad KOL-vård i primärvården för att förbättra handläggning av deras patienter. Studien genomfördes 2014-2017. Den hade två interventionsarmar: casemetodik jämfördes med traditionell fortbildning. Dessutom jämfördes bägge studiearmarna med en referensgrupp i vilken deltagarna inte fick fortbildning. Utfallen mättes både på de allmänläkare som fick fortbildning (kunskap, kompetens) och på deras patienter (livskvalitet, symtomupplevelse, rökstopp). Frågeformulär användes för datainhämtning bland både läkare och patienter. Artikel III är en så kallad protokollartikel i vilket PRIMAIR-studiens upplägg och metodik redovisas i detalj. Artikel IV beskriver genomförandet av PRIMAIR-studien bland allmänläkarna och dess resultat. Resultat på patientnivån ingår inte i denna avhandling.

9.4 RESULTAT

Delstudie 1 (artikel I) visade att av rökande (eller tidigare rökande), medelålders eller äldre patienter utan känd lungsjukdom, som sökt akut i primärvården på grund av en luftvägsinfektion, hade 27 % KOL (95 % CI ±7 %). Av dem hade 44,7 % KOL i GOLD stadium 1 (mild KOL, FEV1≥80 % av förväntat), 52,6 % stadium 2 (medelsvår KOL, 50 %≤FEV1<80 % av förväntat), 2,6 % stadium 3 (svår KOL, 30 %≤FEV1<50 % av förväntat) och 0 % i stadium 4 (mycket svår KOL, FEV1 <30 % av förväntat). Vi fann ett signifikant samband mellan KOL och ålder ≥55 (OR = 10,9 [95 % CI 3,8-30,1]) och mellan KOL och rökningsintensitet (paketår > 20) (OR = 3,2 [95 % CI 1,2-8,5]). Kön, aktuell rökningsstatus och typ av luftvägsinfektionsdiagnos vid akutbesöket hade inte signifikant samband med förekomst av KOL.

Delstudie 2 (artikel II) beskrev hur tidspress ledde till nedprioritering av

KOL i ett patient-läkarmöte. Vid oplanerade (akuta) besök ledde den knappa konsultationstiden till att allmänläkarens fokus enbart låg i att lösa det mest akuta problemet och att fortsatt planering av KOL-vård uteblev. Vid planerade besök (t ex årskontroller) blev KOL nedprioriterad bland en rad andra hälsoproblem och diagnoser, då de allra flesta patienter med KOL hade flera andra samtidiga sjukdomar. Orsakerna till att allmänläkarna nedprioriterade KOL var att läkaren inte var medveten om KOL, inte blev orolig för KOL på grund av de kliniska fynd som just då fanns hos patienten, hade en negativ inställning till KOL som sjukdom och rökare i största allmänhet, använde sig av diagnosorienterad konsultationsteknik (istället för helhetssyn), uppfattade att patienten inte var motiverad för KOL-vård inklusive rökstopp och att det saknades fungerande rutiner för KOL-vård på vårdcentralen. Delstudie 3 (artiklar III och IV) visade att både casemetodik och traditionella föreläsningar som fortbildningspedagogik ledde till små men signifikanta förbättringar i allmänläkarens resultat i ett kunskapstest om KOL (totalpoäng för casemetodik 10,34 vs 11,44; och för traditionella föreläsningar 10,21 vs 10,91; $p<0,05$, max totalpoäng 26 p.) Det fanns få skillnader mellan de två fortbildningsmetoderna. Kontrollgruppens totalpoäng förändrades inte över tid och var signifikant lägre efter 12 månader än båda de andra gruppernas totalpoäng (casemetodik och traditionella föreläsningar). Kunskaperna om tobaksavvänjning var generellt höga, medan kunskaperna om spirometritolkning, interprofessionell samverkan och multi- och samsjuklighet var låga, både före och efter fortbildningsinterventionen.

9.5 SLUTSATSER

I denna avhandling har KOL presenterats som ett exempel på en vanlig kronisk sjukdom där majoriteten av patienterna tas om hand av primärvården. KOL är en potentiellt livshotande, kronisk sjukdom, vars progress kan stoppas genom att sluta röka. Allmänläkares kompetens och möjligheter att handläggapatienter med KOL är avgörande för att ge dem som lider av denna vanliga, dyra och dödliga folksjukdom en optimal vård. Emellertid behöver allmänläkare i Sverige mer tid och resurser för att i sitt vardagliga, kliniska arbete kunna upprätthålla sin kompetens och fullgöra sin uppgift att både upptäcka, behandla och följa upp patienter med KOL.

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