

Implementation of evidence-based knowledge in general practice

An interview, questionnaire and register-based study

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The papers

How GPs implement clinical guidelines in everyday clinical practice--a qualitative interview study: Le JV, Hansen HP, Riisgaard H, Lykkegaard J, Nexoe J, Bro F, Søndergaard J. *Fam Pract.* 2015;32(6):681-5.

Variation in general practitioners' information-seeking behaviour - a cross-sectional study on the influence of gender, age and practice form: Le JV, Pedersen LB, Riisgaard H, Lykkegaard J, Nexoe J, Lemmergaard J, Søndergaard J. *Scand J Prim Health Care.* 2016;34(4):327-35.

Are formalised implementation activities associated with aspects of quality of care in general practice? A cross-sectional study: Le JV, Lykkegaard J, Pedersen LB, Riisgaard H, Nexøe J, Lemmergaard J, Søndergaard J. *BJGP Open* 2017;1(2)

1. INTRODUCTION

General practitioners (GPs) around the world face significant challenges in continuously improving the quality of health care. An important part of the challenge is the rapid change in the knowledge base of medicine, which affects GPs as well as other medical specialists. The amount of new scientific knowledge of effective, efficient and safe patient care is ever growing and, concurrently, established knowledge increasingly becomes obsolete (7). Keeping up with the new evidence and implementing valuable new insights into the daily care for patients are a fundamental prerequisite for delivering a high quality of care. However, from research, it is well recognised that informing clinicians about new evidence does not necessarily lead to changes within daily

clinical practice, and it often takes a long time for research findings to reach patient care. As an example, in 2003 McGlynn et al showed that, on average, only 54.9 percent of the US population received recommended care in areas of preventive, acute and chronic care. They also demonstrated that there was a substantial variation in quality according to the different medical conditions (8). No comparable data exist regarding the Danish population. The findings strongly emphasised the need for implementation strategies to enhance adherence to recommendations and reduce deficits in care. Now, more than a decade later, even though progress has been made especially related to an increased use of theoretical approaches to address implementation challenges (2), there is still a need for more knowledge of how to further improve dissemination and implementation of evidence-based knowledge.

VARIATION IN CLINICAL PRACTICE – A LITTLE BIT OF HISTORY

Already back in the early 70's, Wennberg and Gittelsohn revealed an extensive variation in clinical practice (9). It implied the possibilities of too much medical care and thereby likelihood of iatrogenic illness as well as the risk of not enough service and unintended morbidity and mortality. This realisation contributed to initiation of the evidence-based medicine (EBM) movement, where the former paradigm on clinical practice, which was based on unsystematic observations, theoretical reasoning from basic science, common sense and expertise, was replaced by a new one (10). The new idea was that patient care should be based on the best available scientific evidence from high quality randomised trials and observation studies in combination with clinical expertise and the needs and wishes of patients. The goal was to achieve safer, more consistent, and more cost effective care (5). Clinicians should thus be trained in the finding, appraising and applying of scientific evidence. However, it turned out that clinicians in general (11), and general practitioners specifically (12), lacked the time and/or the interest in reviewing the original literature, and the importance in making scientific evidence more easily available to clinicians was acknowledged. A new focus on conducting systematic reviews of the literature, signified by the establishment of the Cochrane Library, which contains high-quality, independent systematic reviews to inform healthcare decision-making (13), and on developing evidence-based clinical guidelines was some of the most influential initiatives in this direction.

New resources for finding evidence are now continuously being developed, and the Internet provides the advantages of easily making evidence universally available and more feasible to keep up-to-date (14). Nevertheless, coping with the rapid increase in scientific evidence still poses a considerable challenge to all branches of medicine, although it has been suggested that generalists face particular challenges, due to the need to be adequately updated in all fields of medicine (15).

GENERAL PRACTITIONERS' INFORMATION-SEEKING BEHAVIOUR
"Information becomes "knowledge" only when the practitioners have collectively and/or individually combined it with their own experience, skills, intuition, ideas, judgements, motivations and interpretations" (16, p. 102).

Apart from keeping up with the scientific medical evidence, GPs need to draw on a wide range of other information sources to adequately match medical knowledge to the individual patient (17). These include information on the individual patient, on health and sickness within the local population, on local doctors available for referral, on local social influences and expectations as well as information on political, legal, social, managerial, and ethical changes that will affect how medicine is practiced in a society.

Regarding this thesis, the focus of attention will be on the seeking and implementation of evidence-based knowledge well recognising that the many different sources needed in daily clinical practice are inevitable intertwined to some degree. Further, even though the focus is on a general practice setting, the research referred is not limited to GPs, and the considerations, results and conclusions related to information-seeking might very well apply to other specialties as well.

In a busy everyday practice, the primary obstacles to information-seeking are a lack of time and a lack of confidence that a relevant answer may be found (18). GPs therefore prefer sources that are readily accessible, applicable to general practice, easy to use and have a high quality (19). Yet, information sources vary widely. To take an example: colleagues are often easier to access than journals, but perhaps not always as accurate (20). Furthermore, information provided by pharmaceutical sales representatives or the like is accessible to all GPs, but is potentially biased (21). There are good reasons to believe that GPs' choice of information sources is associated with the GP characteristics: age, gender and practice form, and in the following, these will be accounted for.

Previous studies have consistently found that colleagues and textbooks are the most frequently used information sources (19, 22, 23). However, GPs in single-handed practices do not have the same access to colleagues as GPs working in partnership practices, and it appears natural to assume that they may seek to compensate for this by using other sources more. Research is needed to investigate if (and how) GPs in single-handed and partnership practices differ in their use and perception of information sources.

Furthermore, novel research reports an increase in the use of Internet websites and clinical practice guidelines (24); yet, evidence has suggested that GPs aged more than 50 years use the Internet significantly less than their younger colleagues (25), and further, that the youngest group of GPs are more comfortable using online sources (26). Moreover, young physicians have repeatedly been shown to outperform their older colleagues on knowledge of and compliance with clinical guidelines on a variety of topics (27-30). These findings indicate that information-seeking varies with age, notably when information is sought in more recently developed information sources. However, little research has been devoted to investigating variation in information-seeking in more classic sources such as colleagues and textbooks, etc. Hence, there is a lack of knowledge of whether GPs in the older age groups seek less information (and why that may be), or if they simply prefer other information sources.

Variation in guideline adherence and knowledge has not only been reported between age groups, but also between genders. Thus, female physicians appear to do better than their male colleagues in terms of knowledge of and adherence to guidelines (27, 31, 32). The question is if this difference applies only to guidelines, or if it is related to the use of other information sources as well, and whether potential discrepancies between genders can be explained by differences in the perceived importance of the information sources available.

Further insight into this area is important as it may allow for a better-targeted dissemination of scientific research into clinical practice and, in consequence, a higher quality of care.

IMPLEMENTATION IN GENERAL PRACTICE

Even though dissemination of new scientific evidence is a necessary part of ensuring evidence-based care, previous research has shown that the mere dissemination of scientific evidence in itself will be insufficient to change professional behaviour in most cases. It may lead to an increase in knowledge or a change in attitude, but the beneficial effect on actual professional practice is sparse, according to a recent Cochrane review (33). Similar conclusions have been drawn concerning other types of interventions to improve quality of care, including educational meetings (34), educational outreach visits (35), local opinion leaders (36), audit and feedback (37), computerised reminders (38), and even tailored interventions (39): the effects have been small to moderate and mostly inconsistent. These findings confirm a point made by Oxman et al two decades ago: *"there are no magic bullets for improving quality of health care"* (40).

As a consequence, it is now well established that, to succeed in implementing innovations, new procedures, clinical guidelines or best practices, there is a need for a systematic approach and careful planning (7, p. 40-63). This involves a preceding analysis of the actual performance of the target group and of the setting. Then, based on knowledge of the target group, meticulous development or selection of strategies for both dissemination and implementation of change can be made. Typically, a range of strategies is necessary to take into consideration the

different needs of the target group and thus a key element in selecting the right strategies and securing high-quality care is to understand how different factors affect implementation. According to the theory to which they are related, factors can be placed as belonging to one out of four main groups: 1) the individual professionals, 2) the social context, 3) the organisational context, and 4) the economic context (7, p. 18-39). Common to all the factors is that they are all important for the process of changing behaviour, which has been summarised by Richard Grol as consisting of four steps (Figure 1) (41):

Figure 1. The four steps involved in the process of changing behaviour.



In most of previous implementation research, the focus has been on behaviour change by individual clinicians and not on the change process needed for implementation, the role of systems change, or the practice organisation (42). In recent years, though, factors related to the organisational context have become widely acknowledged as vitally important for ensuring successful implementation (2, 43). However, there is still a lack of knowledge regarding the actual implementation process in the individual general practices. To be able to facilitate change in clinical practice as described above, there is a need for a deeper understanding of what is done in the practices to implement evidence-based knowledge, and also how approaches differ between practices. This could provide valuable new insight into which factors are particularly important to target for future quality improvement programmes and intervention strategies.

In the international literature, implementation is just one out of multiple terms describing the concept of moving knowledge into practice, examples of other terms that are widely utilised across different healthcare systems are: quality assurance, quality improvement, knowledge translation, knowledge utilisation, knowledge transfer and exchange, innovation diffusion, research utilisation, evidence-informed policy and evidence-informed health systems (44). The fact that the terms are sometimes used interchangeably makes it difficult to identify a meaningful and consistent definition (45). For the purpose of this thesis, the definition of implementation proposed by Green et al will be applied: *“translation and application of innovations, recommended practices or policies. A process of interaction between the setting of goals and actions geared to achieving them”* (3).

In most implementation research, the implementation process is regarded as something externally planned and imposed, as appear from the paragraphs above. However, in this study, the perspective on implementation is: what is done in the individual practices to implement evidence-based knowledge? Keeping the above definition in mind, it implies investigating activities in the practices that can somehow be re-

garded as important for translating and applying evidence-based knowledge in everyday clinical practice.

IMPLEMENTATION ACTIVITIES

“For research evidence to inform practice, it must be subjected to a social process that continually and repeatedly transforms it from the explicit knowledge that emerges from the research world into something suitable for internalization, the knowledge-in-practice-in-context that is used in the clinical world. Research evidence is thus inevitably altered before it is used” (16, p. 102).

Implementation of evidence can be accomplished through formal or informal activities (46), and previous research indicates beneficial effects of specific organisational factors related to the degree of formalisation. In this respect, there has been a well-established consensus in the literature that professional interactions constitute a crucial part of the implementation process (16, 47, 48), and for instance, practice meetings have been considered to be important in this respect (49). Furthermore, in qualitative and ethnographic studies, the effect of developing standardised processes of care in general practice, for instance practice protocols, has been associated with successful implementation and a high quality of care (48, 50-52). However, within general practice, the evidence of the effect of meetings on implementation has been ambiguous (53, 54) and no evidence of the effect of neither meetings nor practice protocols from large-scale quantitative studies exists.

Even though general practice research indicates a positive effect of a formalised approach to implementation on quality of care, findings from the business literature suggest that a high degree of formalisation can exert a negative influence on concepts related to implementation: knowledge management and knowledge performance (55, 56). Since GPs have to prioritise their time and resources effectively, it is essential to investigate whether there is an association between formalised implementation activities and quality of care.

ASSESSMENT OF QUALITY OF CARE

In order to investigate the effect of specific factors on quality of care, large sets of observational data that display variation in the delivery of evidence-based health care are required (57).

Regarding this study, the use of spirometry in the diagnosis of airflow limitation provides an example of an evidence-based recommendation (58, 59) - and thereby serves as a proxy for quality of care - where substantial variation among practices has been demonstrated (60). Although variation has been found in many other areas of disease, in a Danish setting, the most comprehensive updated data available at the moment is on spirometry. Therefore, obstructive lung diseases were selected as a model area.

Many patients who redeem first-time prescriptions for medication against obstructive lung diseases do not undergo spirometry testing (61) and, in recent years, a general underutilisation of spirometry in the diagnosis of both asthma

and COPD has been a consistent finding across countries (62-68). To some degree, variation has been explained by patient factors (69) and organisational characteristics of the practices (60). However, considerable variation remains unexplained.

Measurement of lung function, preferably by spirometry, is essential for diagnosing chronic airflow limitation (58, 59). By not using spirometry to confirm airflow obstruction, there is a risk of misdiagnosis and improper treatment (70). As a consequence, patients risk to be exposed to unnecessary economic costs and medication risks (71) as well as unnecessary delays in the diagnostic process (72). Thus, spirometry testing is an example of an important recommendation that has not yet been fully implemented in daily clinical practice, and where substantial variation exists.

To summarise the key points of the complete introduction, Box 1 provides a brief overview.

Box 1. Introduction at a glance

Keeping up with the scientific evidence and implementing it into the daily care for patients are a fundamental prerequisite for delivering a high quality of care in general practice.

It often takes a long time for research findings to reach patient care, and substantial variation in quality of care exists.

There is a need for more knowledge of how to improve dissemination and implementation of evidence-based knowledge.

There are good reasons to believe that GPs' choice of information sources is associated with the GP characteristics: age, gender and practice form.

In recent years, factors related to the organisational context have become widely acknowledged as vitally important for ensuring successful implementation.

Research indicates beneficial effects on quality of care of a formalised approach to implementation. However, the effect of specific factors has yet to be tested in a quantitative design in general practice.

Spirometry testing among first-time users of medication against obstructive lung diseases can be used as a proxy for quality of care as it is an important recommendation that has not yet been fully implemented in daily clinical practice, and that further represents an area where substantial variation between practices exists

2. AIMS OF THE THESIS

The overall aim of this thesis was to investigate how evidence-based knowledge is sought and implemented in general practice and to analyse associations with GP characteristics and quality of care. To explore this aim, three separate studies each covering a specific part of the overall aim were undertaken.

STUDY I

The objective of study I was to examine how GPs implement clinical practice guidelines in everyday clinical practice, and how implementation approaches differ between practices.

STUDY II

The objective of study II was to assess GPs' information-seeking behaviour with regard to the use and perceived importance of scientific medical information sources and to investigate associations with GP characteristics.

STUDY III

The objective of study III was to investigate if there are associations between specific formalised implementation activities within general practice and quality of care – exemplified by the use of spirometry testing.

3. SETTING

Denmark is a country of 5.7m inhabitants of whom 98% are listed with a specific general practice. Patients are free to choose their own GP, but only among GPs who have an open list. GPs are allowed to close their lists to new patients when they reach 1600 persons. Patients who choose not to be listed with a specific GP have a minor co-payment for GP visits and can see office-based specialists without referral. Practice units are on average fairly small: usually two GPs per unit plus nurses and secretaries (73). There are two practice forms in Denmark: single-handed and partnership practices. Both can choose to work in collaboration, which implies having separate patient lists and separate economies, but sharing offices, personnel and/or clinical equipment. The units all have electronic medical records (EMR), electronic communication with hospitals and submission of prescriptions digitally to pharmacies etc. All GPs are self-employed working on contract for the public funder. The payment is a mixture of per-capita (approximately 30%) and pay-for-performance (approximately 70%) (73).

GPs act as gatekeepers with regard to referrals to specialists and hospitals. With a few exceptions, such as travel vaccinations and certain health certificates, all services are free of charge, including spirometry (73). All general practices have access to spirometry, mainly in their own practice but also by referral to hospitals or outpatient clinics. The majority of spirometry tests conducted among new medication users are performed in general practice by the GP or the practice staff (61). The GPs receive a special fee of approximately 15 Euro for a regular spirometry test and approximately 30 Euro for a double spirometry test that includes test for reversibility of airflow limitation.

All Danish citizens are assigned a unique personal identification number, which is registered in the Danish Civil Registration system (74). Likewise, each general practice is assigned a unique identification number. These identification numbers are used in national registers, enabling accurate linkage between patients, healthcare services and general practices (75).

Strategies for improving care in the Danish setting

In Denmark, as in most other countries, many stakeholders involved in healthcare are interested in implementing improvements in patient care and a broad range of quality improvement initiatives from many different providers are available. The way implementation is approached by these providers reflects their beliefs concerning changing human behaviour and the functioning of groups and organisations. Table 1 displays a theoretical summary of a selection of implementation strategies and the approaches and assumptions on which they are based (7, p. 3-17). With this overview in mind, an outline of the principal strategies for improving care in the Danish setting is provided below. The outline further demonstrates that most quality improvement initiatives are aimed at the individual practitioner and not at the practice organisation.

Table 1. Implementation strategies and the approaches and assumptions on which they are based

Approach	Assumption	Implementation strategies
The cognitive approach	People make decisions on the basis of rational arguments. Therefore, a lack of adoption of a specific practice is due to insufficient or unconvincing information about its effectiveness.	Summaries of scientific literature Evidence-based guidelines Computerised decision support tools
Reinforcing of behaviour	Based on learning theory and economic principles of conditioning and reinforcement, this approach regards human behaviour as something that can be influenced by external forces.	Audit and feed-back Benchmarking Material or non-material incentives and sanctions Changes in the compensation system
The motivational approach	Change is mainly created by an internal motivation to achieve optimal competence and performance.	Problem-based learning "Bottom-up" methods
Social interaction approaches	Learning and change come about by example. Therefore, interactions and influence of other people are important.	Opinion leaders Outreach visits Peer assessment Adaptations in the patient care team Patient mediated interventions
The management approach	Poor quality is a "systems problem". Hence, it is important to create the organisational conditions for change, i.e. changing the care processes,	Quality and safety management

changing roles and tasks and improving internal culture.

Control and compulsion	People are sensitive to what happens to them in terms of earning and privileges. Thus, external pressure, control, and compulsion are important in changing people's performance.	Legislation and issuing rules Relicensing Recertification and compulsory accreditation Budgeting and contracts Complaints procedures Disciplinary jurisdiction
The marketing approach	An interesting and appealing proposal for change that takes the needs and wishes of the target group into consideration is important in achieving change.	Mass media Professional media Personal contacts

The cognitive approach: Almost all the medical specialties, including the Danish College of General Practitioners (DCGP), develop their own guidelines, which are freely available online. DCGP guidelines are distributed in print to all members of the DCGP and are developed by peers in collaboration with other medical specialists. To ensure a transparent rating of the quality of evidence and the strength of recommendations in the DCGP guidelines, the GRADE system (76) has recently, on an experimental basis, been adopted by the guideline working groups. Besides guidelines aimed at specific medical specialties, lately, a number of cross-sectorial national clinical guidelines, have been developed by the Danish Health Authority, and for many years the Institute for Rational Pharmacotherapy (77) has offered guidelines on medical treatments.

Each DCGP guideline is accompanied by specific activities such as courses and workshops arranged by the Organisation of General Practitioners in Denmark in collaboration with the regions (73). Apart from this, the Organisation of General Practitioners continually arranges CME meetings on a variety of different topics. The largest event of the year in this respect is the conference, "Doctors days" (Lægedage). "Doctors days" offers an entire week of CME activities and social events for GPs and practice staff, where approximately 120 different courses and workshops are available to around 2,500 participants.

Also, a broad range of information sources are available to GPs for self-studies and in addition to traditional sources, such as books, journals and colleagues, new online sources have recently appeared. Thus, Danish GPs have had online access to a "Doctors Handbook" (Lægehåndbogen), an online source of evidence-based medical information, since 2009 (78). Furthermore, updated information on drugs is available online only (77, 79) and has been so since 2010.

Reinforcing of behaviour: Participation in CME activities is voluntary according to the collective agreement between Danish GPs and Danish Regions, and there is no requirement for recertification (73). Thus, the individual GP holds responsibility for securing CME and for maintaining and improving quality of care. However, participation in CME meetings approved by the Organisation of General Practitioners in Denmark is remunerated by up to approximately 2,000 Euro/year. There is no funding for non-approved activities, including courses and meetings arranged by the pharmaceutical industry. This arrangement provides the organisers of CME activities with an opportunity to ensure participation in high quality activities.

For more than two decades, audit projects have been offered regularly to GPs by “Audit Project Odense”, and new projects are still being launched. Participation in an audit project allows GPs to input data about their practice patterns, receive feedback, develop quality improvement interventions, and evaluate them (80).

The motivational approach: Problem-based learning is occasionally included in CME meetings, but the main arena for learning by reflection is probably small group-based activities and supervision groups. The individual regions are responsible for facilitating group activities and also administer remunerations. Around 80 percent of all GPs belong to a CME group and approximately one third join an on-going supervision group (81).

Social interaction approaches and the management approach: Besides from outreach visits provided by the pharmaceutical industry, some of the regions offer outreach visits by local peers or opinion leaders for instance giving free advice on quality and safety management. “TeamSydPol” in the Region of Southern Denmark is an example of such an initiative, which is well regarded by GPs and seems to become increasingly utilised by general practices.

Control and compulsion: So far, control and compulsion has played a very limited role in the implementation of improvements in patient care in Denmark. However, as a result of the latest collective agreement between Danish GPs and Danish Regions, a mandatory accreditation process has been initiated in 2016. It includes among others a standard called “good clinical practice” (standard 1.2), which is aimed specifically at COPD, diabetes and fragile patients and encourages the use of DCGP guidelines and specific practice management initiatives for ensuring quality of care. The accreditation process is currently being evaluated by a group of researchers at the Research Unit for General Practice in Odense.

The marketing approach: Several organisations use the marketing approach. Some of the most influential ones are probably the information campaigns by The Danish Health Authority of which for instance HPV vaccination is one of the more recent themes, but also prescribing of benzodiazepines has had a lot of focus a few years back. Furthermore, newsletters from the Danish Organisation of GPs, the Danish College of GPs and the Danish Medical Association play an important part as opinion formers. Advertisements are also still widely promoted by

the pharmaceutical industry, among others in the Danish Medical Journal and at some CME meetings, and are being distributed widely to general practices all over the country.

4. MATERIAL AND METHODS

This chapter begins with describing the overall design of the complete study. Hereafter, a detailed description of the qualitative study (Study I) is provided. Development of the questionnaire and the sampling procedure used for study II and III are then described, followed by an account of the registers used for study III. Finally, variables and statistical analyses for studies II and III will be explicated.

An overview of material and methods for each of the three studies is displayed in Box 2.

Box 2. Overview of material and methods of the individual studies

Study I: A qualitative interview study involving seven GPs from different practices in the Region of Southern Denmark.

Study II: A national cross-sectional survey of Danish GPs.

Study III: A national cross-sectional study combining survey data from general practice with patient data obtained from national registers.

DESIGN

This PhD study was designed as a mixed methods study combining qualitative interviews, questionnaire and register data. Mixed methods refers to “the use of two or more research methods in a single study when one (or more) of the methods is not complete in itself” (82, p. 9), and it typically combines and integrates qualitative and quantitative designs (83). In this study, qualitative and quantitative methods were applied sequentially as described in the “Instrument Design Model” by Creswell et al. (84). It meant that individual qualitative interviews with key informants were conducted to qualify the development of a national survey of general practitioners regarding their seeking and implementation of evidence-based knowledge. Further, to assess the effect of a formalised approach to implementation in the practices, data on quality of care from national registers were linked to data from the questionnaire.

QUALITATIVE INTERVIEWS (STUDY I)

Semi-structured individual interviews

To investigate GPs’ approaches to implementation of evidence-based knowledge and to develop a concise and practice-oriented survey, semi-structured individual interviews were performed. A semi-structured approach was chosen to ensure that the topics were relevant to the aim of the study while leaving enough space to elaborate on other relevant experiences, values and attitudes regarding implementation of guidelines and other sources of evidence-based knowledge (85). Clinical guidelines were used as a

specific example of evidence-based knowledge as a means of making the interviews as focused and concrete as possible.

When developing the interview guide, the main influence on the theoretical frame of reference was knowledge management in general practice as described by Gabbay and Le May (48), including how organisational features in the practice mediate clinicians' refinement of mindlines (16) and reviews on organisational innovation (86, 87). The interview guide was further informed by a literature search in PubMed and a snowball search aiming to assess what was already known about how guidelines are implemented in general practice including barriers and facilitators. The interviews took place in the GPs' surgeries and were digitally recorded with the consent of the participants. They lasted 30-40 minutes each and comprised questions regarding GPs' reactions to the latest clinical guideline, what had been done with clinical guidelines in general and what specific changes clinical guidelines had brought about (for interview guide see Table 2). Furthermore, following the structure of the interview guide, to cover as many relevant implementation activities as possible, the GPs were asked about changes brought on by other sources of evidence-based knowledge. Thus, the interviews focused on the GPs' own experiences and attitudes and were based on concrete examples from everyday clinical practice.

Table 2. Interview guide

Research questions	Main Topics	Probing Questions
How do GPs deal with new evidence-based knowledge as provided by clinical guidelines?	Reaction to clinical guidelines	What did you do the last time you received a new clinical guideline?
What is done in the practices to implement clinical guidelines?	Specific changes in practice	Could you give an example of a clinical guideline that has led to changes in your everyday clinical practice?
	Actions to bring about changes	What was done to make these changes happen? What do you think is most important to do to accomplish change?

The author of this thesis conducted the interviews and introduced herself as a medical doctor and future GP and explained that the interviews were part of a research study for a PhD degree. Furthermore, the aim of the interviews was laid out openly to the GPs. Box 3 provides an example.

Box 3. Introduction to the interviews

"Thank you for having me. I really appreciate you agreeing to talk to me. I would like to start by introducing myself. I graduated from medical school in 2008 and have, among others, completed my first year of training as a GP. I am currently doing a PhD study at the Research Unit of General Practice in Odense, and aim to continue my training as a GP after I have finished.

As I wrote in the letter, the aim of this interview is to investigate how you manage and apply evidence-based knowledge in this practice. It is important for me to know because I am going to develop a questionnaire regarding this topic and distribute it to all GPs in the country. The knowledge I have now is from experience and the scientific literature – and none of them are necessarily representative of Danish general practice as a whole. Therefore, if I interrupt you during the interview, wanting to elaborate on specific subjects, it is because I have to be focused around the aspects that could be relevant to include in the questionnaire.

I am going to record the interview and transcribe it afterwards. If you wish, I shall send the transcript for you to read afterwards? We have permission from the Danish Data Protection Agency and all information will be handled anonymously. The interview will last approximately 30 min. Do you have any questions before we begin?"

Sampling

A purposeful sampling strategy aiming to obtain maximum demographic variation (88) with regard to practice form, age and gender of the GPs was applied. This was done based on a hypothesis that these characteristics significantly affect how implementation is managed and perceived. The aim was to select cases that sufficiently displayed the variation in GPs' approaches to implementation while also allowing for identification of common patterns within that variation (89, p. 283-287).

Based on the study aim and the assumption that it would be relatively easy to identify practices with different approaches to implementation and along with the supervisors' previous experience in selecting appropriate sample sizes for interview studies, it was estimated that 7-10 GPs had to be included in the study. The GPs were approached by letter invitations, which were followed by a phone call (the letter invitation is available in Appendix II). In the time period from March to August 2012, nine GPs were invited, and seven GPs from different practices in the Region of Southern Denmark were included before a sufficiently broad range of approaches towards implementation of evidence-based knowledge in general practice was found to have been covered, to answer the aim of the interview study (for GP characteristics see Table 3).

Table 3. GP characteristics

Gender	Female	2
	Male	5
Age	<45	3
	>45	4
Practice form	Single-handed practice	2

	Partnership practice	4
	Collaborative practice	1
Practice size	1 GP	2
	2 GPs	2
	3 GPs	1
	4 GPs	2

Data analysis

The interviewer consecutively and verbatim transcribed the interviews. This process allowed for a continuous reflection on the data as well as on methodological issues during data collection as recommended by Malterud (90). The reflections and issues that arose during this process were continually discussed in the research group, comprising GPs skilled in qualitative research as well as an experienced anthropologist, thereby leading to a flexible and yet guided process. To give an example of a methodological issue: it was discussed how to best guide the interviews so that the informants were kept on track while allowing for enough space for them to elaborate on other themes that might turn out to be relevant for the research aim. This involved being very clear on explaining the aim to the informants as can be observed from Box 3 “Introduction to the interviews” and further, initiated the incorporation of a new question in the interview guide: “If you were to develop a questionnaire regarding implementation of new evidence-based knowledge, is there a question you would consider as central to include?”

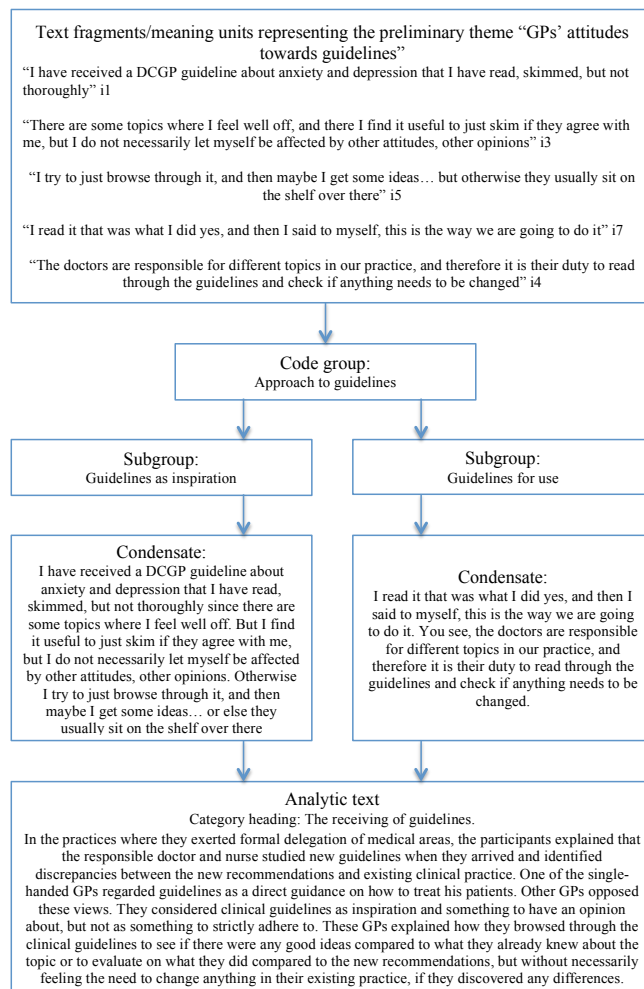
Because the intention was to understand how GPs manage implementation of evidence-based knowledge in their practices, and less so to understand why they did as they did, a descriptive approach to analysis appeared suitable, and systematic text condensation (STC)(85, 91) was chosen. STC is a strategy for qualitative analyses, developed by Kirsti Malterud and based on Giorgi’s psychological phenomenological method. Since it is more systematic than for instance qualitative description (92, 93), yet not as far-reaching in scope as phenomenology, it “offers the novice researcher a process of intersubjectivity, reflexivity and feasibility while maintaining a responsible level of methodological quality” (91). These qualities were found to appropriately meet the requirements according to the research aim as well as the first author’s qualitative experience.

STC involves four steps, which were systematically followed through analysis. First, the transcripts were read thoroughly to get a total impression of the material, and preliminary themes associated with the research questions were generated, discussed and written down. Next, text fragments from the transcripts (meaning units (91)) representing aspects of the preliminary themes were identified, and related meaning units were then labelled and gathered into code groups. Through discussion the code groups were adjusted and refined, and to clarify different aspects within the code groups, each code group was further split into 2-4 subgroups. Meaning units of each individual subgroup were then compiled into a “condensate”: a long coherent artificial quotation that included all the meaning units in a given subgroup. The process of condensation ensured that the meaning units included in each subgroup indeed expressed the same, and

meaning units that did not fit were either left out or placed in another subgroup. By compiling these condensates, the different aspects of each overall code group, representing the thematic content, was identified. Finally, based on the condensates, an analytic text for each code group was developed and the essence expressed in separate category headings. The analytic text was written as a story about each code group, grounded in the empirical data, but written in the third-person format. To illustrate the analytic process, Figure 2 provides a small extract.

At the end of analysis, all transcripts were re-read in search for data that might challenge the final conclusions. The process of analysis was not linear because the different steps caused the meaning units to be moved around, added or deleted leading to a continuous need to rethink the code groups. Decisions were continuously discussed within the research group.

Figure 2. Illustration of the analytic process



QUESTIONNAIRE (STUDY II & III)

Development

The questionnaire was designed to investigate the active seeking and implementation of evidence-based knowledge, and questions were aimed at two different levels: 1) a GP level, concerning GPs’ use and perception of sources of scientific medical information,

and 2) a practice level, assessing knowledge implementation activities in the practices.

Information-seeking

In the first part of the questionnaire, even though no validated questionnaire on GPs' use and perceived importance of scientific medical information sources could be identified, items from previous international studies were available (15, 23-25, 94-96). The research group contributed with specific knowledge of the Danish setting and, along with this, findings from the literature (97, 98) guided adaptation and the final selection of items to include. Three overall sources of information were included: interpersonal sources, print sources and online sources. Interpersonal sources comprised GP colleagues and colleagues from other medical specialties and further, regarding perceived importance: refundable CME meetings, non-refundable CME meetings and pharmaceutical sales representatives. These last three sources were not included in the measures of frequency of use because they are not as readily accessible as the other sources in everyday clinical practice; nor are they applicable when GPs need to make specific clinical decisions. Online sources were defined as only being available online and included medical websites and drug information websites. Printed sources comprised medical books, medical journals and DCGP guidelines and these sources were characterised by being available both in print and online.

Implementation activities

In this part of the questionnaire, the focus was on organisational factors in the inner context of general practice that is; in the individual practices. The intention was to investigate processes and structures that, hypothetically, could be important for the implementation process. For this purpose, the definition of implementation by Green et al provided the foundation for the selection of relevant factors: *“translation and application of innovations, recommended practices or policies. A process of interaction between the setting of goals and actions geared to achieving them”* (3). Thus, the aim was to measure activities hypothesised to have an effect on translation and application of evidence-based knowledge: implementation activities. Three domains were included to cover these activities: meeting structure, development of standardised processes of care and task differentiation among GPs. Task differentiation implied that GPs in a practice had formally delegated the responsibilities for medical update in specific areas of disease. The semi-structured qualitative interviews were essential in establishing which domains should be contained in the questionnaire and also in item development, including response categories. Also, research on knowledge management in general practice (48) and, specifically, how organisational features of the practice mediate clinicians' refinement of mindlines (16, p. 127-146) played a significant role in both the generation of hypotheses on the effect of specific implementation activities and in item development. To enhance generalizability and further ensure a theoretical basis, evidence on organisational innovation from the business sector (87) and health service

organisations (86) was taken into account in the final selection of which domains and items should be included.

Besides covering information-seeking and implementation activities, the questionnaire comprised questions regarding specific practice characteristics that were hypothesised to act as confounding factors such as the level of task delegation to practice staff and status as training practice.

The questionnaire was designed on the web-based online platform SurveyXact and distributed by email (the distribution email is available in appendix III). To access the questionnaire, the respondents had only to press a link, which was unique to each respondent and included in the email. The electronic format allowed for the creation of a leap structure, meaning that the respondents were guided through the questionnaire according to the answers already provided and thereby avoided irrelevant questions.

Due to practical circumstances, it was decided to merge the questionnaire with a questionnaire from another PhD study investigating task delegation and job satisfaction in general practice. The advantages of this merge were that challenges in getting access to GPs' email addresses and GP characteristics (i.e. age, gender, practice form and their unique identification number) were lessened, and that GPs were only approached once instead of twice. These benefits were considered to compensate for the disadvantage of increasing the length of the complete questionnaire. The complete questionnaire is available in appendix VI, and an overview of domains and sub-domains is displayed in table 4. The three domains concerned with the present study are outlined in bold.

Table 4. Domains and sub-domains in the complete questionnaire

Domains	Sub-domains
Practice characteristics	
Task delegation	Task division Substitution or supplementation Planned changes in employment of staff
Information-seeking	Frequency of use Perceived importance
Implementation activities	Meeting structure Development of standardised processes of care Task differentiation among GPs
Job satisfaction	Job satisfaction Job motivation

Testing

To begin with, a total of 19 persons from an academic setting participated in a pilot study, with the primary aim of testing comprehensibility of items included in the three domains: practice

characteristics, information-seeking and implementation activities. This resulted in alterations in the phrasing of instructions and items and of the introductory text. Also, revisions of response categories were made.

After having completed the first pilot study, the decision to merge the questionnaires from the two PhD studies was made. Subsequently, a new pilot study on the complete questionnaire, involving 14 participants, was performed. As a result hereof, inconsiderable changes of the phrasing of items were made. In order to improve the flow and comprehensibility of the questionnaire, the overall structure was revised, and introductions to each of the domains were clarified in concurrence with participants' comments. The functionality of the email distribution was also tested, and problems regarding the electronic format of the questionnaire, for instance suboptimal layout on tablets and problems with validation options, were identified and solved. Further, improvements such as a print button at the end of the questionnaire and redirection to the homepage of the Research Unit when finishing the questionnaire were made.

Finally, representatives of the target group were recruited to participate in a final pilot test. Nine GPs were involved in testing comprehensibility and completeness as well as relevance and acceptability (99, p. 57-61). Further, five GPs agreed to participate in a qualitative pilot test inspired by "The three-step test interview" (100). This implied that, with an observer sitting next to them, the participants were encouraged to "think aloud" when filling in the questionnaire. Afterwards, the observer would ask about the perceived content and interpretation of specific items as well as inquire into specific observations that had been made, but not commented on, during the session ("probing"). For example, regarding the question on whether or not meetings are held in the practice, two of the participants hesitated and explained afterwards that they needed options for the occurrence of informal meetings. Changes of the response categories were made to comply with these remarks. Based on the answers provided by the 14 GPs participating in the final pilot test, distribution of answers including floor and ceiling effects was assessed. Only minor revisions were made before the questionnaire was distributed.

Sampling

An extensive sampling strategy aiming to cover as much of the GP population as possible was chosen. On 4 December 2013, questionnaires were distributed electronically to all GPs who had an email address registered at the Organisation of General Practitioners in Denmark (approximately 96% of all Danish GPs). A reminder (appendix IV) was sent out on 7 January 2014 and was immediately followed by a notification email (appendix V) aimed at GPs who might have had their invitation caught in their mailbox's spam filters. The survey closed on 20 February 2014. Participation was voluntary, and no financial compensation was given to responders.

DANISH NATIONAL REGISTERS (STUDY III)

Along with the other Nordic countries, Denmark has a long history of collecting information on births, deaths, immigration and emigration, disease incidence, and social conditions. Therefore, high-quality data covering the entire population, which are linked together on an individual level by the use of a unique personal identification (CPR) number, are available (75).

The Danish National Prescription Register

The register contains data on all prescription drugs dispensed at outpatient pharmacies since 1994. Each prescription record includes variables in four categories: the individual drug user identified by CPR-number, the prescriber practice code, the code of the dispensing pharmacy, and detailed information on the dispensed drug - among other dispensing date and the Anatomical Therapeutic Chemical classification system (ATC) code (101). Specifically regarding the data used for this study, medications with ATC-code R03 are targeted the respiratory system (R) with "03" indicating obstructive airway diseases. Within R03 there is a range of subgroups and each chemical substance is identifiable by a unique code.

The Danish National Health Service Register

The register contains information about the activities of health contractors in primary health care, including GPs and practising medical specialists. The data have been available to researchers since 1990 and are generated through the providers' invoices to the Regional Health Administration. Based on contracts between providers and Danish Regions, services are individually priced. For general practice, this means that the fee list contains more than 200 different, individual services. For each registration, along with data on services and the week of reimbursement, data on the individual citizen and provider are included. Results of tests and diagnoses are not recorded (102).

The Danish National Patient Register

The register was established in 1977 as a monitoring instrument for hospital activities. It has been gradually expanded ever since, and from 2007 onwards, it has included all contacts to hospitals and outpatient clinics in Denmark. For each contact, information on patient's CPR-number, date of contact, data on the hospital and department as well as diagnostic and procedure codes, including spirometry, is recorded. From year 2000, it has served as the basis for the payment of public as well as private hospitals via the Diagnostic Related Group (DRG) system (103).

Demographic and socioeconomic registers

Data from a range of registers, collected for statistical and scientific purposes, can be obtained from Statistics Denmark. Among others, the registers encompass information on education (104), labour market affiliation (105) and personal income (106) as well as cohabitation status. Data are available on an individual level, cover the entire population and also include information on death or migration.

Explanatory variables

In study II, GP characteristics in the form of age, gender and practice form were used as explanatory variables. Age was divided into the following age groups: <45 years of age, 45-54, 55-64 and >64 years of age. Practice form was divided into: single-handed, partnership and collaborative practice based on questionnaire answers given by the GPs. Along with the email addresses, the Organisation of Danish GPs provided information on the unique identification number of each general practice, the practice form as well as GPs' age and gender.

Outcome variables

The outcome variables were GPs' reported use of different sources of information as well as the perceived importance of the various information sources.

Information-seeking: GPs were asked, "How often do you use the following information sources?" The sources included in the analysis were: GP colleagues, other medical specialists, medical books, medical journals, DCGP guidelines, drug information websites and medical websites. Response categories were: daily, weekly, monthly, less frequently, or "don't know".

Importance of the sources: GPs were asked to rate: "How important are the following sources for you at the moment in order to keep medically updated?" Answers were indicated on a four-point Likert response scale ranging from high importance to no importance on the same list of information sources as stated above. In addition, three information sources were added to this list: refundable CME meetings, non-refundable CME meetings and pharmaceutical sales representatives. As mentioned previously (p. 24), these three sources were not included in the measures of frequency of use because they are not as readily accessible as the other sources in everyday clinical practice; nor are they applicable when GPs need to make specific clinical decisions.

Statistical analyses

In order to compare the characteristics of the most frequent users of information sources with those of the less frequent users, answers were dichotomised into frequent use: yes/no. The median-split approach was applied to ensure an equal distribution between the two groups. Regarding perceived importance, a source was defined as being important to the respondent if the answers "high importance" or "some importance" were given. The answer "don't know" was considered "not frequently used" or "not important" in the analyses.

Multilevel mixed-effects logit models were applied to investigate associations between GP characteristics, and frequent use of information sources and perceived importance of the sources, respectively. Robust cluster estimation was applied to account for possible clustering within practices. Both unadjusted and adjusted odds ratios (ORs) were calculated. Adjustments were made for the covariates: gender (male/female), age (<45/45-54/55-64/>64) and practice form (single-

handed/partnership/collaborative), and in addition, but not reported in the results: status as training practice (yes/no) and GP workload (<37/37-45/>45 hours/week). The linear predictor, η , of the applied model is shown below.

$$\eta_{i,j} = \alpha_{i,j} + \beta_{1,i}male_j + \beta_{2,i}age(45-54)_j + \beta_{3,i}age(55-64)_j + \beta_{4,i}age(\geq 65)_j + \beta_{5,i}partnership_j + \beta_{6,i}collaborative_j + \beta_{7,i}training_j + \beta_{8,i}workload(<37hours)_j + \beta_{9,i>(>45hours)_j$$

Where i refers to the different outcome variables, and j refers to the specific GP.

Adjusted ORs were used for the primary analysis and are presented with 95% confidence intervals in tables eight and nine in the results section pp. 39 and 41. P-values < 0.05 were considered statistically significant.

STATA release 13.0 (StataCorp, College Station, TX, USA) was used for all statistical analyses. Prior to conducting the analyses, all hypotheses were thoroughly discussed in the research group.

DATA ANALYSES - STUDY III

Explanatory variables

GPs' answers to the questions included in the domain of "implementation activities" were pooled on practice level and used as explanatory variables. If disagreement among GPs in the same practice occurred, it was the highest level of formalisation reported that was included in the analyses. Table 5 displays how domains in the questionnaire were operationalised into explanatory variables in the analyses.

Table 5. How domains in the questionnaire were operationalised into explaining variables in the analyses

Domains	Items	Description	Dichotomisation
Meeting structure	Scheduled meetings	The occurrence of scheduled meetings (versus ad hoc conversations)	Scheduled meetings: Yes/no
	Interdisciplinary meetings	Frequency of GP and staff meetings: Weekly/monthly/quarterly/less frequently/never	Weekly: Yes/no
	GP meetings	Frequency of sole GP meetings: Weekly/monthly/quarterly/less frequently/never	Weekly: Yes/no
	Educational meetings	Frequency of meetings aimed at learning about a specific topic: Weekly/monthly/quarterly/less frequently/never	Weekly: Yes/no

	Formalised meetings	A formal agreement about agenda, mediator and/or minutes in relation to meetings. For each factor is stated: <i>Always/ often/ sometimes/ rarely/never</i>	Always for all factors: Yes/no
Standardised processes of care	Practice protocols	The extent to which practice protocols are developed in the practice: <i>In a range of areas of disease/in a few areas of disease/ not at all</i>	In a range of areas of disease: Yes/no
	Standard laboratory requisition formulas	The extent to which standard laboratory requisitions formulas are developed in the practice: <i>In a range of areas of disease/in a few areas of disease/ not at all</i>	In a range of areas of disease: Yes/no
	Standard phrases in the EMR	The extent to which standard phrases in the EMR are developed in the practice: <i>In a range of areas of disease/in a few areas of disease/ not at all</i>	In a range of areas of disease: Yes/no
Task differentiation among GPs	Responsibilities for medical update	The extent to which responsibilities (for instance regarding medical update on COPD ¹ , DM ² and IHD ³) are based on a formal agreement in the practice: <i>yes/informal/no</i>	Formal agreement: Yes/no

¹ Chronic Obstructive Pulmonary Disease ² Diabetes Mellitus ³ Ischemic Heart Disease

Outcome variable

In the Danish National Prescription Register (101), all patients over 17 years of age who redeemed a prescription on medication targeting obstructive lung diseases, ATC code R03, in year 2012 were identified. In order to include only first-time users in the study, patients who had redeemed a prescription of R03 medication within the previous five years were excluded.

Using a model that has been applied in previous research (60, 61, 69), for each first-time user of R03 medication, it was assessed whether or not a spirometry had been performed in an observation period that ran from 6 months prior to the first prescription redemption until 12 months after (see Figure 3).

Figure 3. Timeline of the observation period



Statistical analyses

Multilevel mixed-effects logit models with patients nested within practices were used to calculate ORs with 95% confidence intervals (CI) for the associations between implementation activities and patients having spirometry performed. This method for investigating associations between spirometry testing and practice characteristics has been applied in an earlier study (60). ORs are presented with 95% CI in the tables. P-values < 0.05 were considered statistically significant.

Associations between specific practice and patient characteristics and spirometry testing have previously been demonstrated (60, 61, 69), and these factors were adjusted for in the analyses. Practice characteristics comprised: age and gender of GPs, practice type (single-handed or partnership), status as training practice (yes/no) and task delegation to practice staff. Task delegation was dichotomised into delegation of follow-up care of chronic diseases: yes/no. For partnership practices, age was calculated as a mean age of all GPs in the practice, and gender was divided into five groups: female, predominantly female, predominantly male, male or equally mixed. Age was divided into four groups: < 45 years, 45-54 years, 55-64 years and > 65 years.

Patient characteristics comprised: age, gender, income, highest attained education, labour market affiliation, cohabitation status, and severe disease: yes/no. Income was divided into three categories based on disposable income for the entire household after taxation: low (first quartile), medium (second and third quartile), and high (fourth quartile). Highest attained education was also divided into three categories: < 10 years (primary and lower secondary education), 10-12 years (vocational training and upper secondary school), and > 12 years (higher education). Labour market affiliation was divided into: working, retired, or unemployed and finally, cohabitation status was categorised as married/cohabitating or living alone (never married, divorced or widowed). Regarding all the variables, data were extracted as to cover the patients' status in the beginning of the inclusion year 2012. Severe disease was defined as repeat redemptions of R03 medication and initiation of more than one type of R03 medication within the first year. Both measures have previously been associated with an increased chance of undergoing spirometry (61), and the definition of severe disease has been applied in previous research as well (60, 69).

In addition to these analyses, based on a hypothesis that the effect of formalised implementation activities on patients' OR of having spirometry performed would differ between practice forms, subgroup analyses with patients stratified into belonging to either single-handed or partnership practices were performed. Initially, in these analyses, partnership practices were further divided into small (2-3 partners) and large partnerships (>3 partners). However, no noteworthy differences between small and large partnerships could be inferred. The two groups were therefore collapsed in order to obtain higher power in the subgroup analyses.

STATA release 14.1 (StataCorp, College Station, TX, USA) was used for all statistical analyses. Prior to conducting

the analyses, all hypotheses were thoroughly discussed in the research group.

ETHICS

The study was approved by the Danish Data Protection Agency (journal 2012-41-0178), and the Multi Practice Committee under the Danish College of General Practice recommended GPs to participate (ref. no. MPU 10-2013). According to Danish legislation, no approval from the Regional Scientific Ethical Committee was required. No personally identifiable data were placed on the computers of the researchers.

Study I

The purpose of the interviews was laid out openly to the GPs along with information that all obtained data would be handled strictly anonymously. Each was asked if he or she would like to read through the transcript afterwards, but all of the GPs declined this opportunity. The published article was sent to each of the informants thanking them for participation and giving them an opportunity to comment on any issues they might feel like. Only a few responded to this inquiry and none of them with critical remarks.

Study II and III

The analyses for study II were performed on a remote desktop maintained by the University of Southern Denmark. For each user of the remote desktop, approval by the university is required whereafter access to a personal folder with a private password attached is created. This procedure ensured that no personally identifiable data were placed on the computers of the researchers. Regarding study III, all analyses were performed on the servers of Statistics Denmark where all personally identifiable data are anonymised and where only Statistics Denmark is in possession of the key file.

In the distribution email, the GPs were informed that all answers would be handled confidentially, and that the reporting of data would be anonymous. Further, the aim of investigating specific factors related to organisation in general practice was accounted for, along with a remark on how results were expected to benefit the on-going development of general practice.

5. RESULTS

In this chapter, along with the study populations of study II and III, the most important results from each of the three studies will be presented.

STUDY I

Analysis of the semi-structured interviews revealed the following three main themes regarding how GPs implement clinical guidelines in everyday clinical practice: 1) Establishing interest, 2) The receiving of guidelines, and 3) Concretisation of implementation.

Establishing interest

The GPs' inclination to read a clinical guideline was very much determined by the topic, and most GPs had areas of special interests. In some practices an informal kind of subspecialisation existed, whereas in others, responsibilities were formally delegated to GPs and nurses in the practice. This meant that, in relation to some of the chronic diseases, as for instance COPD, diabetes or hypertension, one doctor and one nurse were responsible for keeping up to date with, and implementing, new guidelines in the area.

"We have formed some small teams, where some are in charge of anything to do with the heart, some of lungs, some of diabetes, some of hypertension ... one doctor has the primary responsibility for heart, and that's me, and then someone is responsible for lung, so they have the ultimate responsibility for them (the guidelines) being implemented." (Male, 39 years, partnership practice)

The receiving of guidelines

In the practices where they exerted formal delegation of medical areas, the participants explained that the responsible doctor and nurse studied new guidelines when they arrived and identified discrepancies between the new recommendations and existing clinical practice. One of the GPs explained how he viewed it as his responsibility to transfer the new guidelines into patient care. One of the single-handed GPs elicited a similar statement. He regarded guidelines as a direct guidance on how to treat his patients.

Other GPs opposed these views. They considered clinical guidelines as inspiration and something to have an opinion about, but not as something to strictly adhere to. These GPs explained how they browsed through the clinical guidelines to see if there were any good ideas compared to what they already knew about the topic or to evaluate on what they did compared to the new recommendations, but without necessarily feeling the need to change anything in their existing practice if they discovered any differences.

"I try to just browse through it, and then maybe I get some ideas... but otherwise they usually sit on the shelf over there." (Female, 61, single-handed GP)

"The shelf" was mentioned by another GP, who explained how he rarely read the clinical guidelines when they arrived but rather waited until a need might arise. It could for instance be if the GP was to communicate its content to other people, patients, colleagues or students, or if a situation occurred that made him doubt his current quality of care.

One of the GPs pointed out how his use of a guideline depended on whom it involved: GPs or practice staff. If it involved practice staff, or could involve them, he was more inclined to read it thoroughly and to adhere to its recommendations.

Concretisation of implementation

Also implementation was characterised by very different approaches. One of the GPs described how they very informally discussed it when a new clinical guideline was disseminated - not necessarily its content, but rather the mere fact of its arrival. Thus, if new clinical guidelines were to be implemented in this practice, the GPs needed to apply it individually to their own clinical practice and then more tacitly than explicitly compel the others to do the same, as this quote demonstrates:

“Well, I think that I would pass it on, that it is a bit through diffusion that they will notice it. They will notice it the same way I did and maybe just think: oh, that’s the way it is done, so I’m going to do the same, maybe look into it, maybe come and ask me: what on earth is this?” (Male, 36 years, partnership practice)

Other GPs discussed the clinical guidelines in formalised meetings and made informal oral agreements to make a change based on guideline recommendations:

“Then we just talk about it: oh yes, we must remember to do this and that and then we do it”. (Female, 48 years, partnership practice)

Thus, an informal agreement was established, but no further collective actions were taken to support the decision. The actual actions to apply and sustain it were left to the individual GP. One of the single-handed GPs explained how he prepared practice protocols for the practice nurse to follow and used the clinical guidelines to do it. If the nurse then had any questions, they would discuss it afterwards. Similarly, two of the other GPs described how they prepared practice protocols although they did it in formalised meetings together with practice staff. One of the GPs explained part of their procedure like this:

“What we spend time doing is actually the logistics, making it fit into our clinic, our staff and our equipment... the guideline has to be adjusted so that it is practically implementable... We sit down together and say: what should be the content of the consultation? Who should do what and when and how? And describe the patient flow in it and then add some notes to the laboratory request chart and phrases to the patient records and other places so that we will remember that this is how we do it every time.” (Male, 49 years, partnership practice)

Hence, in this practice, the GPs prioritised time and resources on collective implementation activities and organised their everyday practice to support these activities.

It appeared that the GPs spending most time on collective guideline implementation activities were also the ones who valued consistency and agreement on patient care the most. As one of the GPs expressed:

“It is vitally important to come to an agreement. Of course there is room for disagreement, but when it comes to the kind of care we deliver, regarding the patients, we have to agree. We have to

agree on what it is that we do, where we are heading and how we want to treat our patients. We also have to agree on what kind of drugs we use for specific conditions” (Male 49 years, partnership practice).

The GPs who did not exert collective implementation activities expressed less need for agreement.

“We don’t reach agreement, and there is no requirement about us agreeing. The patients probably experience that they receive the same treatment, or have an expectation of the ideal being that they receive the same treatment, but I don’t think it is quite the ideal we have in the clinic. It’s not something that upsets or annoys us like mad that one doctor chooses differently from others.” (Male, 36 years, partnership practice)

Nevertheless, one GP made a clear distinction and explained that, with respect to tasks delegated to practice staff, some protocols had to be collectively developed for the staff to follow, but when it came to tasks only performed by doctors, he saw no need to interfere in decisions made by colleagues.

“When you are delegating tasks, you need to have... you need to agree on how you want to do things.” (Male, 49 years, partnership practice)

Another GP described how they discussed new clinical guidelines both internally in the practice and externally with network and at courses, but valued a very individual patient approach and expected the practice staff to do the same. Hence, they saw no need to collectively decide what guideline recommendations were to be followed, like for instance by developing practice protocols, as far as GPs or practice staff were concerned:

“People are just different, and they don’t fit into those boxes, and they will come whenever they see fit (laughs), so it’s also a bit like they (practice staff, ed.) have to learn the general practice approach to things and accept people for who they are, and when they are here.” (Female, 48 years, partnership practice)

Thus, the GPs’ attitudes to consistency in patient care appeared to be closely related to their approach to implementation.

Box 4. Key findings, study I

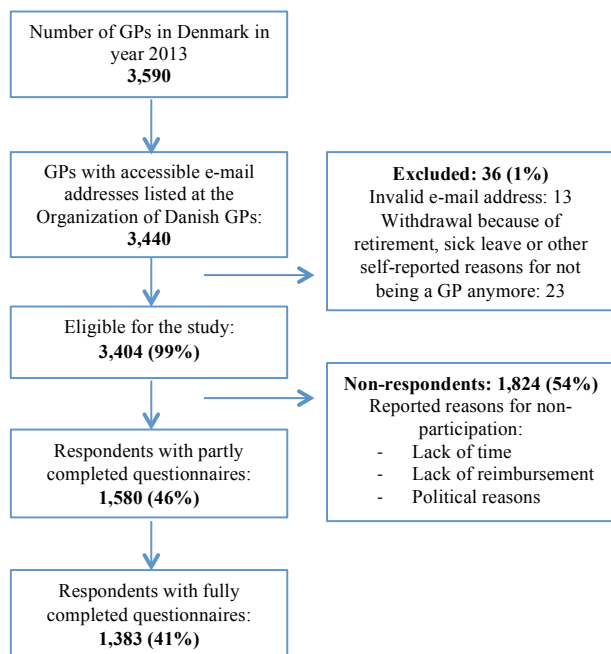
- Approaches to implementation of clinical guidelines vary substantially between practices.
- Overall, three different approaches were identified, depending on the degree to which implementation was collectively and formally organised.
- The GPs’ attitudes to consistency in patient care appeared to be closely related to their approach to implementation.

STUDY II

Study population

Out of the 3,404 GPs eligible for inclusion, a total of 1,580 GPs responded (46%), and 1,383 (41%) GPs answered all questions in the questionnaire. A flowchart of the study population is presented in Figure 4.

Figure 4. Flowchart of the study population



Women were slightly overrepresented among the respondents as were GPs in the two youngest age groups and GPs working in partnership practices. Characteristics of respondents and non-respondents are presented in Table 6.

Table 6. Characteristics of respondents and non-respondents*

	Respondents		Non-respondents	
	N	%	N	%
Gender				
Female	772	48.9	803	43.2
Male	808	51.1	1,057	56.8
Age				
< 45	350	22.2	380	20.4
45-54	483	30.6	517	27.8
55-64	622	39.4	737	39.6
≥ 65	125	7.9	225	12.1
Practice form				
Single-handed	462	29.2	621	33.4
Partnership	1,118	70.8	1,239	66.6

*Based on the Organisation of General Practitioners' registers.

Note that collaborative practice is not included as it is a

self-reported variable and therefore only available in the survey data.

Results

Three information sources were used daily by 50% or more of the respondents: medical websites, drug information websites and GP colleagues. These three sources were also the most frequent sources reported used on a daily or weekly basis (Table 7).

The sources perceived most important were: medical websites, refundable CME meetings and DCGP guidelines. With the exception of non-refundable CME meetings and pharmaceutical sales representatives, all of the other sources were perceived as being important by a majority of GPs (Table 7).

Table 7. GPs' use and perceived importance of information sources

	Use				Perceived importance	
	Daily		Daily/Weekly		N	%
	N	%	N	%	N	%
Interpersonal sources						
GP colleagues	703	50%	1,055	75%	1,149	83%
Other medical specialists	69	5%	661	47%	1,047	75%
Refundable CME meetings	n.a.		n.a.		1,261	91%
Non-refundable CME meetings	n.a.		n.a.		415	32%
Pharmaceutical representatives	n.a.		n.a.		238	17%
Printed sources						
Medical books	197	14%	727	52%	934	67%
Medical journals	74	5%	1,000	71%	1,067	77%
DCGP guidelines	183	13%	799	57%	1,252	90%
Online sources						
Drug information websites	729	52%	1,044	74%	1,236	89%
Medical websites	875	62%	1,286	91%	1,304	94%

n.a.: not applicable, not included in the questionnaire

Compared with their younger colleagues, GPs aged more than 44 years were more likely to seek information frequently from medical journals and significantly less likely to seek information from colleagues and other medical specialists, DCGP guidelines and websites.

GPs working in partnerships or collaborative practices were significantly more likely to seek information from GP colleagues than were single-handed GPs. Furthermore, while there was a non-statistically significant tendency towards female GPs to seek information from interpersonal sources more frequently than male GPs (GP colleagues: OR: 0.77 (CI: 0.58-1.01); other medical specialists: OR: 0.83 (CI: 0.66-1.05)), male GPs were found to be significantly more likely to seek information from medical books than female GPs (Table 8).

Table 8. Associations between frequent use of information sources and GP characteristics

	Interpersonal sources		Printed sources		Online sources ³	
	GP colleagues ¹	Other medical specialists ²	Medical books ²	Medical journals ²	Drug information websites ¹	Medical websites ¹
	OR adj. (95%CI)	OR adj. (95%CI)	OR adj. (95%CI)	OR adj. (95%CI)	OR adj. (95%CI)	OR adj. (95%CI)
Gender						
Female	1	1	1	1	1	1
Male	0.77 (0.58-1.01)	0.83 (0.66-1.05)	1.29 (1.04-1.61)*	1.27 (0.98-1.63)	1.19 (0.94-1.51)	0.94 (0.73-1.23)
Age						
< 45	1	1	1	1	1	1
45-54	0.56 (0.38-0.81)*	0.68 (0.49-0.93)*	1.15 (0.85-1.54)	1.65 (1.19-2.28)*	0.46 (0.33-0.64)**	0.56 (0.38-0.82)*
55-64	0.52 (0.36-0.75)**	0.47 (0.34-0.64)**	1.18 (0.88-1.57)	2.55 (1.83-3.55)**	0.25 (0.18-0.36)**	0.31 (0.21-0.45)**
≥ 65	0.74 (0.41-1.36)	0.30 (0.18-0.50)**	0.79 (0.49-1.25)	2.17 (1.27-3.70)*	0.13 (0.07-0.23)**	0.11 (0.06-0.21)**
Practice form						
Single-handed	1	1	1	1	1	1
Partnership	17.68 (9.72-32.15)**	1.23 (0.88-1.71)	0.79 (0.58-1.08)	1.20 (0.83-1.71)	1.20 (0.87-1.67)	1.04 (0.72-1.51)
Collaborative	17.22 (8.70-34.08)**	1.30 (0.84-2.01)	0.89 (0.59-1.35)	0.97 (0.60-1.55)	1.05 (0.68-1.64)	1.01 (0.62-1.64)
N=	1,407	1,407	1,406	1,406	1,406	1,406

¹ Frequent use defined as daily use.

² Frequent use defined as daily or weekly use.

³ Online sources are defined as only being available online whereas printed sources can exist both in print and online.

Adjusted for gender, age, practice form, workload and status as training practice.

*p-value < 0.05, **p-value < 0.001

While the frequency of use differed little between genders, male GPs were significantly less likely than their female colleagues to perceive almost all of the information sources as being important. However, they were more likely to perceive pharmaceutical sales representatives and non-refundable CME meetings as being important (Table 9).

Table 9. Associations between perceived importance¹ of information sources and GP characteristics

	Interpersonal sources				Printed sources		Online sources ²	
	GP colleagues	Other medical specialists	Non-refundable CME meetings	Pharmaceutical representatives	Medical books	Medical journals	Drug information websites	Medical websites
	OR adj. (95%CI)	OR adj. (95%CI)	OR adj. (95%CI)	OR adj. (95%CI)	OR adj. (95%CI)	OR adj. (95%CI)	OR adj. (95%CI)	OR adj. (95%CI)
Gender								
Female	1	1	1	1	1	1	1	1
Male	0.45 (0.33-0.63)**	0.76 (0.58-0.98)*	0.32 (0.19-0.52)**	1.57 (1.12-2.21)*	1.18 (0.92-1.51)	0.88 (0.67-1.15)	0.57 (0.39-0.83)*	0.66 (0.38-1.14)
Age								
< 45	1	1	1	1	1	1	1	1
45-54	1.03 (0.67-1.58)	0.99 (0.69-1.42)	1.10 (0.61-1.98)	1.03 (0.62-1.70)	1.42 (1.03-1.95)*	1.74 (1.22-2.47)*	0.80 (0.43-1.51)	0.31 (0.09-1.01)
55-64	1.05 (0.70-1.57)	0.75 (0.54-1.05)	1.38 (0.79-2.43)	1.81 (1.14-2.88)*	1.77 (1.29-2.42)**	2.13 (1.50-3.02)**	0.36 (0.20-0.62)**	0.12 (0.04-0.37)**
≥ 65	0.83 (0.47-1.48)	0.63 (0.38-1.04)	1.13 (0.52-2.45)	1.92 (0.98-3.78)	1.96 (1.15-3.34)*	2.80 (1.52-5.16)*	0.20 (0.10-0.39)**	0.05 (0.01-0.20)**
Practice form								
Single-handed	1	1	1	1	1	1	1	1
Partnership	2.11 (1.45-3.09)**	0.81 (0.56-1.17)	1.29 (0.75-2.19)	0.66 (0.42-1.03)	0.69 (0.47-0.99)*	0.98 (0.66-1.44)	1.01 (0.64-1.59)	0.92 (0.47-1.81)
Collaborative	3.40 (1.84-6.26)**	0.79 (0.49-1.26)	1.04 (0.52-2.06)	0.94 (0.53-1.67)	0.71 (0.44-1.15)	1.10 (0.65-1.87)	1.72 (0.88-3.38)	0.96 (0.40-2.31)
N=	1,392	1,392	1,392	1,392	1,392	1,392	1,392	1,392

¹⁾ Perceived importance defined as “high importance” or “some importance” according to the answers given in the questionnaire.
²⁾ Online sources are defined as only being available online whereas printed sources can exist both in print and online.
 Adjusted for gender, age, practice form, workload and status as training practice.
 *p-value < 0.05, **p-value < 0.001

A similar though non-statistically significant trend was found for practice forms as GPs working in a partnership found that pharmaceutical representatives and non-refundable CME meetings were less important than single-handed GPs did (OR: 0.66 (CI: 0.42-1.03) and OR: 0.79 (CI: 0.57-1.09), respectively). Furthermore, compared with single-handed GPs, GPs in partnership practices found that medical books were significantly less important and that guidelines were significantly more important.

Regarding age groups, the differences in perceived importance did not entirely reflect the differences found in frequencies of use as DCGP guidelines, other medical specialists and GP colleagues were less frequently used by GPs aged more than 44 years, but not perceived as being less important. Nonetheless, the perceived importance reflected the frequency of use for websites and medical journals (Table 9).

Box 5. Key findings, study II

- Single-handed GPs seek information from colleagues less frequently than GPs in partnerships or collaborative practices and do not use other sources more frequently.
- GPs aged above 44 years do not seek information as frequently as their younger colleagues and prefer other information sources.
- Male and female GPs seek information equally frequently, but do not consider information sources equally important in keeping medically updated.

STUDY III

Study population

A total of 56,269 first-time users of R03 medication in the year 2012 were identified. After excluding the patients whose regular GP could not be identified or did not respond to the questionnaire and the patients who died or migrated during the study period as well as the patients with missing socio-demographic data, 33,788 patients were linked to a responding practice. A flowchart of first-time users is presented in Figure 5.

According to the National Health Service Register, a total of 2,117 general practices were registered in Denmark in year 2013. Out of those, 1,932 (91%) had one or more GPs with an email address registered at the Danish Organisation of GPs. GPs from 1,114 (58%) practices responded, of which 476 (43%) answers came from single-handed practices, and 638 (57%) came from partnerships. GPs from 996 practices (52%) answered all questions in the

questionnaire. A flowchart of the study population is displayed in Figure 6.

Figure 5. Flowchart of the inclusion of first-time users of R03 medication in the year 2012

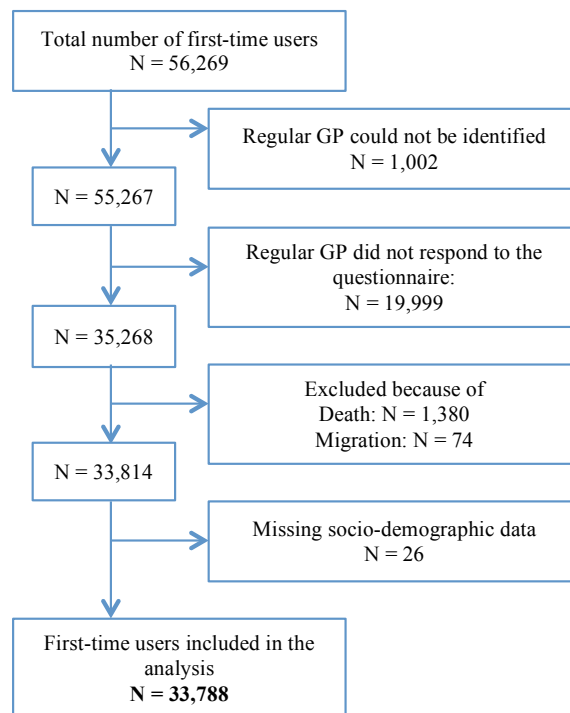
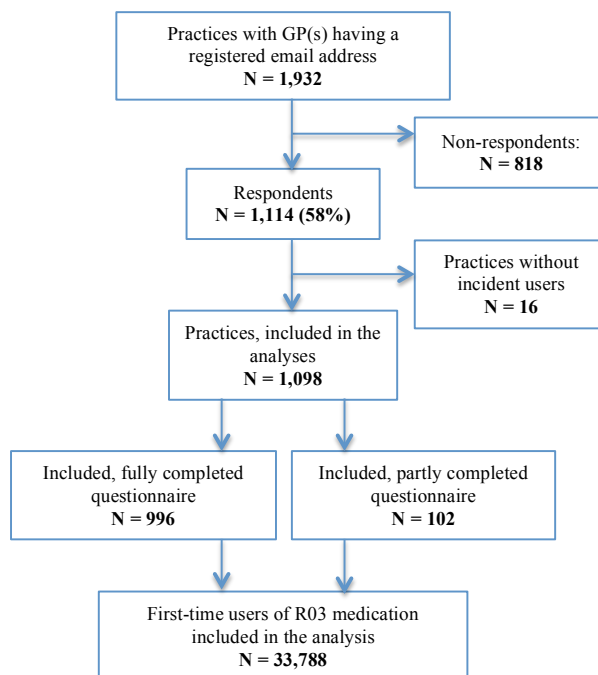


Figure 6. Flowchart of the study population



With the exception of educational meetings, a significantly higher proportion of formalised implementation activities in partnership practices compared to single-handed practices was found (Table 10).

Table 10. Distribution of implementation activities in single-handed and partnership practices

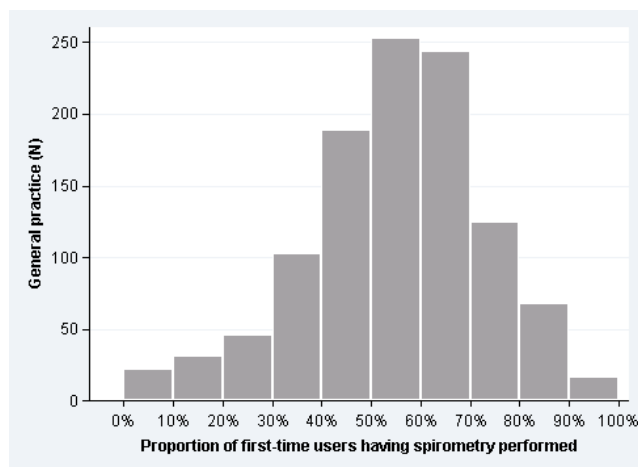
	Single-handed N (%)	Partnership N (%)	P-value**
Meeting structure			
Scheduled meetings			
- Yes	249(60.4%)	544(92.4%)	< 0.001
Interdisciplinary meetings			
- Weekly	41(16.6%)	161(29.6%)	< 0.001
GP meetings*			
- Weekly	30(25.2%)	243(44.7%)	< 0.001
Educational meetings			
- Weekly	37(15.0%)	101(18.6%)	0.22
Formalised meetings			
- Yes	55(22.3%)	211(38.8%)	< 0.001
Standardised processes of care			
Practice protocols			
- In a range of disease areas	153(37.5%)	394(67.0%)	< 0.001
Standard laboratory requisition formulas			
- In a range of disease areas	219(53.7%)	473(80.4%)	< 0.001
Standard recordings in the EMR			
- In a range of disease areas	131(32.1%)	303(51.5%)	< 0.001
Task differentiation among GPs			
Formal agreement*			
- Yes	30(19.4%)	211(35.9%)	< 0.001

* Single-handed practices were only asked these questions if they had previously reported being in collaboration with other practices

** Calculated using Chi2-test

Among general practices, the mean proportion of first-time users of R03 medication, who had a spirometry performed, was 54.5%. Figure 7 displays the variation between practices.

Figure 7. Variation in spirometry testing among general practices



Regarding the non-stratified results on associations between formalised implementation activities and patients' OR of having spirometry performed, after adjusting for practice characteristics

and patient characteristics, significant associations were found for both weekly interdisciplinary meetings and weekly GP meetings (as opposed to less frequent meetings) as well as for development of all of the standardised processes of care in a range of disease areas (as opposed to only a few areas or none at all) (Table 11)

In the stratified analyses, the most pronounced effects of formalised implementation activities were found in partnership practices. In single-handed practices, it was only development of standard laboratory requisition formulas in a range of disease areas that showed significant association with patients' OR of having spirometry performed. In partnership practices, weekly interdisciplinary meetings and weekly GP meetings as well as development of practice protocols and development of standard recordings in the EMR in a range of disease areas were significantly associated with patients' ORs of having spirometry performed (Table 12). It should be noted that all ORs except from ORs on formalised meetings and task differentiation (only single-handed practices), pointed towards a positive effect on spirometry - even though most factors were not statistically significant in single-handed practices.

Table 11. Associations between implementation activities and patients' OR of having spirometry performed

	N (%)	OR adj. (95% CI)
Meeting structure		
Scheduled meetings		
No	2,092 (51.2%)	1
Yes	15,014 (55.2%)	1.07(0.94-1.22)
Interdisciplinary meetings		
Monthly or rarer	10,766 (54.5%)	1
Weekly	4,231 (57.0%)	1.13(1.02-1.26)*
GP meetings¹⁾		
Monthly or rarer	7,574 (53.3%)	1
Weekly	6,183 (57.4%)	1.17(1.06-1.29)*
Educational meetings		
Monthly or rarer	11,852 (54.6%)	1
Weekly	3,145 (57.5%)	1.05(0.93-1.19)
Formalised meetings		
No	8,815 (55.0%)	1
Yes	6,182 (55.4%)	0.96(0.87-1.06)
Standardised processes of care		
Practice protocols		
Few/none at all	5,770 (50.4%)	1
In a range of disease areas	11,264 (57.1%)	1.23(1.11-1.35)*
Standard laboratory requisition formulas		
Few/none at all	3,513 (50.9%)	1
In a range of disease areas	13,521 (55.7%)	1.19(1.07-1.33)**
Standard recordings in the		

EMR			
Few/none at all	8,341 (52.9%)		1
In a range of disease areas	8,693 (56.4%)	1.11(1.01-1.21)*	
Task differentiation among GPs			
Formal agreement¹⁾			
Informal/no	8,868 (53.7%)		1
Yes	5,954 (56.5%)	1.09(0.98-1.20)	

ORs are adjusted for practice characteristics (GPs' age and gender, practice form, status as training practice, task delegation to practice staff) and patient characteristics (age, gender, income, highest attained education, labour market affiliation, cohabitation status, and severity of disease)

¹⁾ Single-handed practices were only asked these questions if they had previously reported being in collaboration with other practices

* p < 0.05 ** p < 0.001

Table 12. Associations between implementation activities and patients having spirometry performed - stratified on practice type

	Single-handed		Partnership	
	N (%)	OR adj. (95% CI)	N (%)	OR adj. (95% CI)
Meeting structure				
Scheduled meetings				
No	1,296 (49.6%)	1	796 (54.1%)	1
Yes	2,343 (54.5%)	1.09 (0.89-1.33)	12,671 (55.3%)	1.00 (0.82-1.22)
Interdisciplinary meetings				
Monthly or rarer	1,903 (53.2%)	1	8,863 (54.8%)	1
Weekly	423 (60.3%)	1.20 (0.89-1.61)	3,808 (56.7%)	1.12 (1.00-1.25)*
GP meetings¹⁾				
Monthly or rarer	801 (51.0%)	1	6,773 (53.6%)	1
Weekly	285 (56.2%)	1.40 (1.00-1.96)	5,898 (57.4%)	1.15 (1.04-1.27)*
Educational meetings				
Monthly or rarer	1,924 (53.9%)	1	9,928 (54.8%)	1
Weekly	402 (57.0%)	1.06 (0.79-1.43)	2,743 (57.6%)	1.05 (0.92-1.20)
Formalised meetings				
No	1,817 (54.8%)	1	6,998 (55.1%)	1
Yes	509 (52.9%)	0.85 (0.65-1.10)	5,673 (55.7%)	1.00 (0.90-1.11)
Standardised Processes of care				
Practice protocols				
Few/none at all	2,100 (50.5%)	1	3,670 (50.3%)	1
In a range of disease areas	1,481 (55.3%)	1.13 (0.93-1.37)	9,783 (57.4%)	1.29 (1.15-1.43)**

Standard laboratory requisition formulas				
Few/none at all	1,459 (48.5%)	1	2,054 (52.7%)	1
In a range of disease areas	2,122 (55.4%)	1.28 (1.06-1.55)*	11,399 (55.8%)	1.13 (0.99-1.29)
Standard recordings in the EMR				
Few/none at all	2,324 (51.3%)	1	6,017 (53.6%)	1
In a range of disease areas	1,257 (54.6%)	1.02 (0.84-1.25)	7,436 (56.7%)	1.14 (1.03-1.26)*
Task differentiation among GPs				
Formal agreement¹⁾				
Informal/no	1,073 (50.7%)	1	7,795 (54.1%)	1
Yes	296 (49.7%)	0.99 (0.71-1.39)	5,658 (56.9%)	1.10 (1.00-1.23)

ORs are adjusted for practice characteristics (GPs' age and gender, status as training practice, task delegation to practice staff) and patient characteristics (age, gender, income, highest attained education, labour market affiliation, cohabitation status, and severity of disease)

¹⁾ Single-handed practices were only asked these questions if they had previously reported being in collaboration with other practices

* p < 0.05 ** p < 0.001

Box 6. Key findings, study III

- Weekly interdisciplinary meetings and weekly GP meetings were associated with higher quality of care compared with less frequent or no meetings.
- Development of standardised processes of care in a range of disease areas compared with only a few areas or none at all showed a positive association with quality of care.
- When stratifying on practice form, the results were less evident in single-handed practices, indicating that formalised implementation activities are most important in partnership practices.

6. DISCUSSION

This chapter begins with a presentation of the main findings from each of the three studies, followed by a discussion of their relation to the existing literature. Hereafter, an account for the general methodological considerations of the entire study will be provided.

MAIN FINDINGS

Study I: The analysis of the interviews revealed three different approaches to the implementation of clinical guidelines. In some practices, the GPs prioritised time and resources on collective implementation activities and organised their everyday practice

to support these activities. In other practices, GPs discussed clinical guidelines collectively, but left the application up to the individual GP whilst others saw no need for discussion or collective activities depending entirely on the individual GP's decision on whether and how to manage implementation. The GPs' attitudes to consistency in patient care appeared to be closely related to their approach to implementation.

Study II: Medical websites were used weekly by 91% of the GPs and were thus the most frequently used information source. The second most frequently used information source was professional discussions with GP colleagues (75%), closely followed by drug information websites (74%). All of the investigated sources were rated as important by a majority of the GPs (range 67-94%), albeit with a few exceptions: pharmaceutical sales representatives (17%) and non-refundable CME-meetings (32%). Age was the single most important factor in determining the use of information sources whereas, in rating the sources by importance, gender proved to be the factor associated with most significant differences.

Study III: Frequent meetings and development of standardised processes of care in a range of disease areas were associated with higher quality of care measured by patients' ORs of having spirometry performed in relation to initiation of R03 medication. Development of practice protocols showed the strongest association ($p < 0.001$). When stratifying on practice type, the results were less evident in single-handed practices, which indicate that formalised implementation activities are more important in partnership practices.

COMPARISON WITH EXISTING LITERATURE

Study I

The results of study I mostly correspond with the findings of Grant et al. (50), who performed an ethnographic study of variation in application of current best research evidence exemplified by quality indicators on prescribing. They revealed two different approaches to making prescribing decisions: macro and micro prescribing decisions. Macro decisions involved collective, policy decisions made in concurrence with research evidence whereas micro decision were made in the consultations with the individual patients and considered their preferences and circumstances. They found that the practices ranking highest in performance were the ones exerting both macro and micro decisions while the practice with the lowest performance only applied micro prescribing decisions. These findings mirror findings from this study on how general practices differ with regard to collective or individual approaches to implementation. However, in the present study an additional "middle group" was identified; a group of GPs who prioritised collective knowledge-sharing activities in the practice, but who did not value consistency or develop practice protocols.

Important explanations for a reluctance to consistency of care could lie in barriers to performing "cookbook medicine" and not treating patients individually, as well as a wish to maintain clinical autonomy and to safeguard one's own and colleagues' professional pride (107, 108), although the present

study indicates that task delegation to practice staff in some instances cancels out these barriers. Especially, the notion of treating patients individually appeared important and was stated explicitly by one of the informants as a reason not to develop practice protocols. Also, in the literature, an overemphasis on following algorithmic rules has been regarded as one of the negative consequences of the EBM movement, due to the risk of letting care be management driven rather than patient centred (5). Nevertheless, discussing clinical guidelines with partners or colleagues and reaching consensus on practice protocols have previously been associated with high quality of care in general practice (50, 52). Findings by Gabbay and LeMay support this although they underline that it is mainly through discussion and social interaction that clinical guidelines are internalised, and that the actual practice protocols are of less importance in that respect (48). Social interaction is a recurring theme in Normalization Process Theory (NPT) as well (109). NPT characterises implementation as a social process of collective actions based on four components: coherence, cognitive participation, collective action and reflexive monitoring. Thus, according to NPT, both discussions of the evidence as well as definition of which recommendations should be implemented and by whom are essential.

Keeping the four steps involved in the process of changing behaviour in mind as described by Richard Grol (41) (illustrated on p. 11 in this thesis), implementation of scientific evidence will, however, not be initiated unless the evidence has first been assessed and accepted by its potential user(s). The interest in reading could be initiated by a formal appointment of responsibility in a given area as demonstrated in the present study. Thereby, this finding adds to previous research, which has shown how the interest and intention to change can be aroused through three different mechanisms (110): first, an accumulation of evidence in a certain direction in combination with the authority of the various sources providing the evidence. Second, the occurrence of a clinical challenge or "crisis" and third, through preparedness to change, meaning that the evidence fulfils a need or fits well with previous experience or preconceptions about a topic. In the present study, besides the interest established through formal appointment, it was noticed that the informants also touched upon all of the three mechanisms during the interviews as reasons for engaging with a clinical guideline.

Finally, regarding informants' receiving of guidelines, according to previous research, acceptance of evidence will to some extent depend on the perceived applicability of research findings to individual patients and is promoted if it is authored by peers or approved of in the local medical community (111). However, even when referring to the same guidelines developed by peers in the DCGP, there was still significant variation in the informants' receiving of the guideline. This indicates that among GPs there are basic differences in the reliance on research and evidence and the perception of applicability to individual patient care.

Study II

In 2006, Coumou and Meijman concluded in their review that,

despite the increase in and better availability of electronic information sources, not much had changed in the information-seeking of primary care physicians during the years 1992 – 2005 (23). However, findings from this study suggest differently for the more recent years. Although other studies also report an increase in the use of online sources (24, 94), the level of use found in this study is considerably higher than the levels previously reported and is only comparable with findings from a very recent study from Scotland (26). Thus, in one study from 2013, 49.4% of family physicians reported using their favourite Internet website at least once per month (24), and in another from 2005, 59% of family physicians reported using the Internet daily or weekly (94). In comparison, 91% of GPs in the present study stated a daily or weekly use of medical websites. This strongly suggests that the websites available to Danish GPs at the moment fulfil the need of being accessible, well developed and easy to use. Moreover, since 2010, drug information websites have been the only available updated source for drug information in Denmark, which leaves no other choices for GPs than to use these sources. It appears that, in many countries, there is a general and continuous move towards developing evidence-based Internet sources that are feasible for GPs to use in everyday practice. The Cochrane Collaboration was some of the initiators of this movement around 20 years ago (112), and considering Balas and Boras' finding that it takes an estimated average of almost 16 years to implement new research or technology into practice (1), it is perhaps of little wonder that it is not until now that the Internet has become more widely utilised.

It is well recognised that most of the information that GPs use when seeing patients is obtained from memory (17), and one of the most frequent reasons for not seeking information during consultations is the belief that a decision could be based on current knowledge (22). This introduces a risk that the information could be out of date or incorrect (17), which will naturally make it difficult to deliver a high quality of care and to handle patients with uncommon problems. According to the present study, this risk may increase with increasing age as GPs aged more than 44 years less frequently consulted guidelines, drug information websites and medical websites that, along with medical journals, have the prospects of bearing the most updated information. Furthermore, the first barrier to physicians' adherence to guidelines is a lack of awareness of these guidelines (113), and doctors in the youngest age groups have repeatedly been shown to have a better knowledge of guidelines and higher adherence to new recommendations than their older colleagues (27-30). Younger doctors' more frequent use of websites as an information source has also been reported elsewhere (25, 96), although these studies applied only descriptive analyses and thus did not have the opportunity to adjust for possibly confounding factors. However, in the present study, GPs > 44 years of age more often sought information from medical journals and found them to be more important in keeping medically updated. Medical journals represent a more detailed and unrefined type of knowledge than guidelines (45). An explanation for these findings could therefore be that younger and more inexperienced GPs

prefer explicit recommendations (third-generation knowledge), whereas more experienced GPs prefer the unrefined types of knowledge (first-generation knowledge). It is equally possible that older GPs prefer journals because they are more familiar to them than online sources of information. Finally, it can be speculated that GPs over 44 years of age prioritise to read journals in their spare time to a greater extent than the youngest GPs. Also, regarding professional discussions with GP colleagues, GPs aged more than 44 years may not feel the same need as younger GPs for seeking the tacit knowledge provided by colleagues. It should not be forgotten, though, considering the frequency of use of information sources, that GPs in general only search for answers to about one third of all questions that arise during consultation (22, 114), and presumably inexperienced GPs generate more questions than experienced GPs. Hence, inexperienced GPs would naturally more frequently have a need for assessing readily accessible sources like for instance websites and GP colleagues. Nevertheless, the results indicate the presence of competency traps in general practice, where experienced GPs favour their well-established routines instead of seeking new ones (115) and therefore do not update their medical knowledge to the same extent as the youngest GPs. A final notion to the differences between age groups is that GPs in the youngest age groups have been educated and trained to practice EBM, which might make them more likely to engage in the seeking and appraising of scientific medical information, making it a more natural part of their everyday clinical practice.

In this study, compared with single-handed GPs, GPs in partnership practices had a 17 times higher OR of consulting frequently with GP colleagues. Although this difference appears high, it is intuitive. What is not clear is whether the twice as high OR of perceiving that colleagues were an important source, which was found for GPs working in partnership, primarily is due to convenience or because they are believed to be authoritative. Nonetheless, the difference in use was much higher than that of importance, which might indicate that the physical accessibility is not the most important factor.

The past decade appears to have seen a substantial decline in GPs' reliance on the pharmaceutical industry as an important source of keeping medically updated (15, 24). However, a non-statistically significant trend was found that single-handed GPs are less sceptical towards the pharmaceutical industry than GPs working in partnership practice. Together with results from previous research showing that single-handed GPs see pharmaceutical representatives more frequently than GPs working in large partnerships (116), these findings may imply that, regardless of practice form, GPs require professional discussions and that single-handed GPs have to rely on potentially biased sources (21) to a greater extent than GPs in partnership practices. However, it should be noted that overall, only 17% of all GPs perceived pharmaceutical representatives as an important source of information.

It was surprising to find that, even after adjusting for GP characteristics, also male GPs found pharmaceutical sales representatives and non-refundable CME activities more

important than their female colleagues. Precisely these sources were regarded as important by the smallest proportion of GPs, probably due to the above mentioned risk of bias (21), and it is interesting to consider what might explain this gender difference. It is well established that there is variation in male and female patients' health information-seeking, even though the reasons are not yet fully understood (117). The explanation for the differences between male and female GPs might very well be found in the same sociological literature that is concerned with patients' health information seeking, and which touches upon factors such as masculinity and variation in risk perception (117). However, more research is needed in this particular area. Additionally, the results of the present study show that male GPs value guidelines and other sources less than females do, which may contribute to explain previous research findings that female doctors are more inclined to adhere to recommendations than their male colleagues (27, 31, 32). Surprisingly, no significant differences in the actual frequency of use in the present study were found to support these previous findings. This indicates that even though male and female GPs seek information to the same extent, their perceptions of information sources affect their adherence to recommendations, which could have consequences for the quality of care provided.

Study III

Findings from this study contribute to the literature by showing a positive association between weekly meetings and quality of care. Having a forum for sharing and discussing information and developing one's knowledge is essential for successful implementation (47, 48, 50), and it has been speculated that informal interactions might be more important than formal ones in establishing interactions that are easy and constructive (16, p. 127-146). Regarding implementation, results from the present study underline the importance of (also) having a formalised forum in the form of frequent meetings (particularly in partnership practices) where knowledge can be shared and discussed if implementation is to be successful. Furthermore, it appears important that interactions occur frequently as the mere occurrence of scheduled meetings did not reveal any significant association with quality of care. These findings support qualitative research findings on characteristics of practices that succeed in quality improvement (118). In concurrence with findings from the business literature on the negative effect of a high degree of formalisation (55, 56), having a formalised meeting structure (agenda, mediator and minutes) showed no effect. It seems possible that the translation process of implementation will occur at meetings even if no formalised structure is present and, taking findings from the business literature into account, it might be expected that, in some cases, it could lead to a freer discussion.

Developing practice protocols or other standardised processes of care is a way of ensuring consistency in the approach to patients within a practice. However, the most important features of such processes are probably the reflections and discussion required to ensure their applicability to the local context (as also mentioned by one of the informants in study I, p.

34). This process could involve considering the evidence in relation to previous knowledge and experience, skills and expertise, established practice routines, features of the computer system, the perceived impact on remuneration and quality of care, as well as taking an array of factors in the local community into account (16, p. 127-146). Such discussions can then lead to a practical interpretation of who does what and when and how, which is necessary for developing, for instance, a practice protocol. Using a quantitative design, our study confirms findings from previous ethnographic and interview studies showing a positive effect of such processes on implementation and quality of care (48, 50-52). It also corresponds to previous quantitative research that indicated the same effect; although those conclusions were based on self-reported outcome measures and included fewer respondents (119).

Having an anchor person who takes on responsibility for improvement (54), a formally appointed internal implementation leader (46) or an internal clinician champion for a guideline (42) has been suggested to influence implementation and quality improvement positively. Similarly, task differentiation among GPs has been associated with spirometry utilisation (119). Results from the present study were unable to confirm these findings convincingly even though the confidence intervals pointed in the direction of a positive effect. The lack of effect was surprising, but could be explained if a lack of explicit time was dedicated to the task (46), or by a lack of commitment of the persons in question (54). It could be that if a person has a specific interest in an area and to a higher degree maintains the professional up-date in a practice, the actual formal appointment is not that important. However, since the survey was not aimed specifically at obstructive lung diseases, it could also be that not all practices that reported having formalised task differentiation had a person responsible for this specific area. Similar reservations are relevant to consider regarding the results on standardised processes of care.

Even though the results pointed in a clear direction of a positive effect of specific formalised implementation activities in both single-handed and partnership practices, the effect sizes may not appear that pronounced. For the significant results, it ranged from 12% (interdisciplinary meetings) to 29% (practice protocols). This underlines that there are many other factors that influence implementation ranging from characteristics of the implementation object (for instance guidelines) to characteristics of the individual practitioner, to the organisation and beyond (2). However, while many of the other factors are difficult for practitioners to address or change, having frequent meetings and developing standardised processes of care represent factors that are feasible to include in everyday clinical practice and are associated with quality of care.

The overall result of the stratified analyses showing that the association between formalisation of knowledge implementation activities and quality of care is more pronounced in partnership practices compared to in single-handed practices is – although intuitive - interesting. By their very nature, single-handed practices are different from partnership practices. This

probably explains the differences on the effect of meetings since single-handed practices might not require these as often. Previous research has not been able to demonstrate a higher quality of care in partnership practices than in single-handed practices, neither generally (120) nor specifically concerning spirometry testing (60). This, together with results from the present study, could suggest that in order to maintain a high quality of care in more complex organisations as partnership practices, formalisation of implementation activities is required to a higher extent.

Finally, to make proper use of formalised implementation activities it appears that practices need to be willing to engage with the evidence and, for partnerships, to value at least some degree of consistency in behaviour among GPs. According to findings from studies I and II, and along with findings from previous literature (107, 108), these factors could pose significant barriers towards the introduction and/or meaningful use of formalised implementation activities. However, since the conclusions are based on a cross-sectional design, with exposure and outcome being measured simultaneously, no causal relationship can be inferred (121), and results should be tested in an experimental design. This will be discussed further in the “Implications” section.

METHODOLOGICAL CONSIDERATIONS

In this section, the following issues are discussed: study design, the quality of the data sources, bias, confounding, statistics and generalisability.

Study design

Applying mixed-methods in a PhD study has significant and important pros and cons. It is a time-intensive method that requires expertise of both qualitative and quantitative researchers (122), and having to learn several methods within the limits of a PhD study holds a risk of introducing a certain degree of pragmatism in the approach to each of the methods. Since this PhD study involved integration of interview, questionnaire and register data, it was a major challenge to achieve the necessary skills and competences needed, and the interdisciplinary team of supervisors was invaluable in this respect. However, the nature of the research question must drive the choice of methods (123), and an immense strength of mixed methodology is that it provides an opportunity to “*attack a research problem with an arsenal of methods that have non-overlapping weaknesses in addition to their complementary strengths*” (124, p. 4). In this case, exploring the “how” of implementation through qualitative interviews was essential with regard to understanding the phenomenon and informing the development of a concise and practice-relevant questionnaire, which made it possible to investigate implementation activities in a generalised manner. By further adding register data, the effect of the activities on quality of care could be estimated. Therefore, using the “exploratory sequential design” as described by Creswell (84, 123), integrating collection and analyses of qualitative data with quantitative data collection, appeared the best choice. Thus, for this study “exploratory” referred to exploration of implementation through qualitative interviews,

“sequential” implied that the quantitative data collection occurred subsequently to the interviews, and finally, “design” indicated the level of the research process where the integration took place – in this case at the design level as opposed to the methods or interpretation and reporting levels (123).

The quality of the data sources

Interview data

The aim of using semi-structured interviews was to gain insight into how GPs manage implementation in the practices. Clinical guidelines were used as examples of evidence-based knowledge, and to strengthen reliability and encourage concrete accounts of everyday practice, the starting point of the interviews was the receiving of the latest clinical guideline. Likewise, if the informants did not by themselves provide examples of concrete actions during the interviews, they were prompted to do so by the interviewer. However, despite the attempts to keep accounts as concrete and as close to everyday clinical practice as possible, the method of interviewing leaves no opportunities to check if it is the actual behaviour that is being described. Addressing this issue would have required adding observations to the investigation. The issue of including observations was debated in the research group; it might have provided a deeper understanding of how implementation was managed, and why it was managed in a specific way. Nonetheless, the expected benefits with regard to the overall aim of informing the development of a questionnaire, were considered not to be proportional to the extra amount of time and resources it would require to obtain a useful data material by observation - not least regarding the challenges involved in learning yet another research methodology.

Judging the appropriateness of one’s sample size in a qualitative study is very different from judging it in a quantitative study since no standards for assessment of sample size exist for qualitative studies (125). Many qualitative studies, though, claim to end their sampling after having reached the point of data saturation. Reaching data saturation was not an aim of this study, and it has been speculated that the concept might have been applied a bit more widely than originally intended, when it was first introduced in relation to grounded theory studies (125). Since the purpose of this study was to inform the development of a questionnaire relevant for general practice, an essential part of judging the appropriateness of the sample size was to continually evaluate whether or not the entire range of approaches to implementation was believed to have been covered; from the practices putting the most efforts into implementation to the practices putting the least efforts into implementation. However, it was also important to obtain a broad insight into what kinds of implementation activities were undertaken in different practices and to be able to identify common patterns across cases. Therefore, a maximum variation sampling strategy, aimed at selecting information-rich cases, was employed. Maximum variation is one of the most widely utilised kinds of purposeful sampling (88), and the strength of this strategy is that with a greatly diverse sample, it is possible to identify two kinds of findings: detailed descriptions of each case as well as shared patterns

between cases (89, p. 283-287). From early on in the study, a wide range of variation in the approaches to implementation among informants was recognised, and surprisingly few were needed before the obtained information was considered adequate to answer the purpose of the study. While the material made it possible to identify common patterns and while it presumably also covered the full range of approaches, it cannot be claimed that the entire spectrum of implementation activities applied in general practices as a whole has been covered. However, Malterud states that for explorative studies there is no need to strive for a complete description of all aspects of the phenomenon under study (91), and the risk of undermining the credibility of research findings by inadequate sample size must be weighed against the risk of having too much data to complete a detailed analysis (88, 126).

The subjective role of the researcher as an interviewer was recognised from early on in the study. This meant that preconceptions representing previous experiences, pre-understandings, motivation and qualifications for doing the study, as well as the influence of education and interests (126) were sought identified. The interviewer's preconceptions were primarily formed during medical and GP training, where acquaintance with several different general practices was made. It became apparent how each practice was unique in itself and possessed different qualities, among other related to practice structure and culture, and the practice of EBM. Along with the interviewer's new awareness of the challenges posed by health care restructurings, these observations aroused the interest in the best way to organise a practice to secure a high quality of care. During the data collection and analysis, the influence of preconceptions was continually tested by discussion in the research group. Such discussions involved for example the selection of which questions should be included in the interview guide, the identification of preliminary themes, the creation of code groups and the decision on when to cease sampling. Both the interviewer and the research group were thus aware of the importance of avoiding letting preconceptions govern data collection and analysis. Further, in the analysis, as a means of reducing the risk of letting preconceptions guide the choice of meaning units to include in the final result, the step of "condensation" in STC provided a valuable tool since this method makes it almost impossible to contain a meaning unit in a code group where it does not belong (91).

Being a medical doctor and a future GP interviewing GP colleagues involved a risk of creating a case of "shared conceptual blindness" where the interviewer's own feelings and opinions would control the dialogue and interpretation (127). Also, sharing an understanding about the field might have affected the interviewer's capability of interrogating the respondents effectively. However, confidentiality related to the common experiences and attributions of a shared professional identity could also have led to more rich and intuitive responses (127). Because of this ambiguity, especially preconceptions related to the professional role were recognised as influential, and therefore an important part of data collection was having the transcripts

read through by a GP experienced in qualitative research and knowledgeable about the field as well as by an experienced anthropologist. This was done for the purpose of identifying if there was too much knowledge taken for granted during the interview process, and it led to further guidance from the supervisors on interview technique and thereby also contributed to optimisation of data collection.

Questionnaire data

It had been an advantage if a validated questionnaire, adequate for the purpose of this study, had been available. It would have saved time and resources on developing a new one, as well as provided better opportunities for comparison to other studies (128). However, since a literature search did not reveal a suitable questionnaire, a new one was developed.

An essential part of the questionnaire development was integration of findings from the preceding semi-structured interviews. The identified themes from the interviews were not all directly transferred to represent domains in the questionnaire as it was primarily the last of the themes "concretisation of implementation", which described concrete implementation activities. The descriptions included in this theme were, however, directly transferred to item development and the different accounts provided by informants led to development and selection of response categories. For example, the domain "meeting structure", was included as a concrete implementation activity related to both translation and application of evidence-based knowledge, and the different subdomains and items were developed based on accounts made by the informants. The same applied to the domain of "standardised processes of care" and for "task differentiation among GPs", although in the interviews, as opposed to the first two domains, the latter was referred to as an important part of the entire implementation process from establishing interest to concretisation of implementation. Thus, many of the activities described by the informants were included in the questionnaire and, further, the interviews provided valuable knowledge for the selection of response categories. Nevertheless, integrating interview data in questionnaire development was challenging and a balance had to be found between using what was already known from the literature in a meaningful way while also allowing for the new knowledge obtained from the interviews to guide development.

Even though the questionnaire did not undergo comprehensive tests for validity and reliability, the theoretical background and principles of these measurement properties were kept in mind during development and pilot testing.

The essence of a valid questionnaire is that it measures what it claims to measure (128) and three main types of validity can be distinguished: content validity, criterion validity and construct validity (99, p. 150-197). Content validity is defined as the degree to which the content of a measurement instrument is an adequate reflection of the construct(s) to be measured (129), and it should involve assessment of both relevance and comprehensiveness (130). In this study, the items were designed to represent activities related to translation and application of

evidence-based knowledge. The relevance of the items to include in the questionnaire was ensured by preceding qualitative interviews along with discussions in the research group and knowledge of previous research and theories. The relevance for the target population was further assessed during the pilot test. Thus, in the testing of the questionnaire, apart from filling in the questionnaire, participants were asked to comment specifically on content and wording. Thereby, problems in understanding instructions, problems with the structure, problems with unclear wording of questions and missing response categories were identified and resolved. Also, as a specific means to assess comprehensiveness of the items, participants in the qualitative part of the pilot testing were asked to comment on whether they felt that items considered relevant were missing.

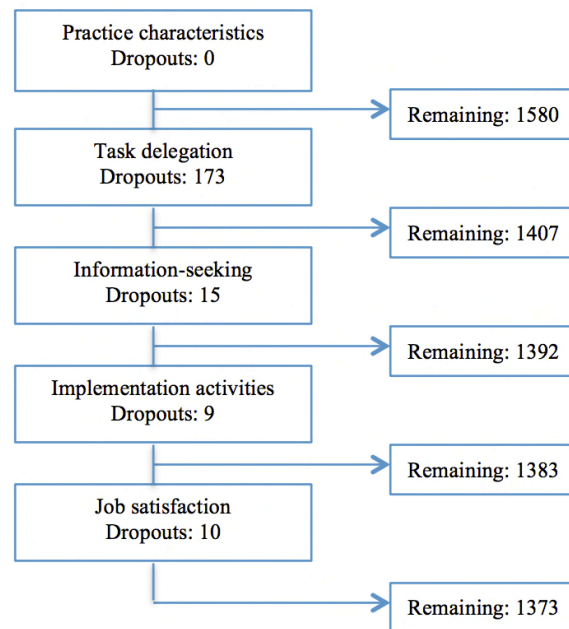
No “gold standard” to compare the results with existed, and the estimates were solely based on self-reported behaviour and attitudes regarding information-seeking and implementation. A gold standard refers to the true state of the construct to be measured (99, p. 150-197). In this study, the true state could have been assessed by observation of an appropriate sample of the target population, which would have validated the accurateness of reported behaviour. However, as mentioned previously, adding to the methods by introducing an observational study was beyond the scope of this PhD study.

To claim reliability a questionnaire should generate consistent results from repeated samples and different researchers over time (128). Since a general weakness of questionnaire-based studies is that the respondents may understand or interpret the items differently than intended, a specific focus was put on assessing comprehensibility of the items. Comments obtained during the three rounds of pilot studies resulted in improved comprehensibility. For instance, the participants’ understanding of the term “meetings” differed. This finding led to a specification of each of the types of meetings and, further, a definition of the term was added to the introduction to the items. Later on, the combination of think aloud” and “probing” that was used in the qualitative pilot study aided in determining if the respondents understood the questions, whether they did so in a consistent way, and in the way the researchers intended (100). However, retrospectively, it would have been very informative to supplement the individual interviews in the qualitative part of pilot testing with focus group interviews comprising GPs from the same practices to further establish if the GPs understood and answered the questions in a similar way. This would probably have revealed some of the problems with discrepancy between GPs’ answers that was discovered when analysing the data.

To ensure that respondents could not pass to a new page without having filled in all the questions on the current page, electronic validations were included throughout the questionnaire. The obvious advantage was that missing data were thereby practically avoided. However, it might have caused annoyance to some respondents and made them drop out if they considered specific questions too long or too tedious, or if they got stuck in a question due to inadequate response categories. To illustrate the extent of this problem, Figure 8 displays the dropout

rates in relation to each domain. It demonstrates that the primary dropouts occurred during the second domain; the one regarding task delegation.

Figure 8. The dropout rates in relation to each domain



The merge of two questionnaires had some disadvantages, and most important was probably the length of the complete questionnaire. Thus, in the testing, it took around 20 minutes for participants to fill it in. The acceptability of this time consumption to the participants was dependent on whether they regarded the time as well spent, that is, if the topic of the questionnaire appeared meaningful and the content relevant. As a consequence of this realisation, already in the invitation email, efforts were made to express the aim of the questionnaire and the expected benefits to the respondents. Also, to sustain respondents’ attention throughout the questionnaire, the topics covered and their sequencing were designed to appear logic to the respondent. Positive feedback indicated that, despite the merge, continuity and perceived relevance of the complete questionnaire were accomplished: “The questionnaire is good and relevant and, best of all, when filling it in and at the end, it is possible to make personal comments on how you think things are really going” and: “Good questions that you think can be used for something too”.

The questionnaire primarily consisted of closed-ended questions and, to compensate for some of the disadvantages by using these types of questions, (i.e. that they do not allow respondents to expand on their responses or offer alternative views), respondents were offered the opportunity to expand on specific responses and to comment or elaborate on each domain during the course of the survey. The benefits of using closed-ended questions, compared to open-ended questions, are that they appear quick and easy for respondents to fill in, and that responses are usually clear and complete. Also, it is easier to standardise, code and analyse (128). However, it involves the

risks that respondents tick the wrong box by mistake, or that respondents just guess or tick any response at random. The layout was important in reducing the risk of mistakes. The length of the questionnaire was believed to increase the risk that respondents would tick responses at random due to exhaustion. In this respect, offering a monetary or non-monetary incentive as opposed to no incentive was much debated in the research group. The concern was that, if respondents received a fee for completion of a questionnaire, the risk of random responses would increase. Therefore, even though incentives have been shown to increase the response rate among general practitioners (131), it was decided not to offer any.

Some of the consequences of a low response rate are that they can lead to a loss of power and selection bias. Thus, to compensate for the relatively extensive questionnaire and the lack of fee, other methods to increase responses were applied (132), including an emphasis on the relevance of the topic and content as well as the use of an appealing layout.

A problem with the distribution from the electronic platform SurveyXact caused some of the emails to get caught in the spam filters of GPs' mailboxes. As SurveyXact could not offer a solution to this problem in time, notification emails (see appendix IV) were distributed to all GPs in relation to sending out the first reminder. However, the problem may have caused a lower response rate and due to the extra contact to the GPs in the form of the notification email, it was decided to send out only one reminder instead of two. Nevertheless, the survey reached a response rate of 46%, which is comparable with other surveys in the same setting (133, 134).

Finally, concerning the use of questionnaire data for study III, the maximum time period when the individual practice could be observed with regard to spirometry testing among the patient cohort was 30 months, i.e. from six months prior to January 2012 until 12 months after December 2012. The questionnaire was distributed at the end of this observation period in December 2013/January 2014. One can speculate on how many changes can occur over 2.5 years in the way a practice is organised, and there was no suitable method available to capture such changes and taking them into account. However, practices in Denmark are regarded as being relatively stable with respect to organisation form, management and patient population. Moreover, the observation period included a period with disputes of contract terms between GPs and the Danish Regions, when many GPs did not engage in reorganisation or quality development due to insecurity about the future of general practice, and therefore restructurings were less likely to occur.

Register data

The validity of the Danish National Registers is generally considered high (75) and in study III, the use of data from these registers is a major strength.

The patient cohort was identified in the Danish National Prescription Registry. All R03 medications require a prescription, and the registration of first-time users is therefore virtually complete. However, a weakness of using data on re-

deemed prescriptions is that patients who fail to redeem prescriptions (primary non-adherence) are not included. In a Danish setting, though, the level of primary non-adherence is relatively low: 9.3% in general, and specifically for bronchodilators and inhaled corticosteroids; 8.6% and 8.8%, respectively (135), and it ought not to influence results on associations. Another limitation worth considering is that the index date assigned to each individual corresponds with the redemption date, not the date the drug was prescribed. This could affect the results since it is possible to redeem medication several months after prescription. However, a vast majority ($\approx 85\%$) of all patients redeem their prescriptions within the first week (135), and it is not considered to influence the results significantly.

Information on spirometric procedures was collected from the Danish National Health Service Register (covering primary health care, including GPs and practising medical specialists) and the Danish National Patient Registry (covering secondary health care, including public and private hospitals and outpatient clinics). The Health Insurance Service covers every Danish resident, and people register with their unique personnel identification number when contacting the healthcare system. In most private practices and outpatient clinics, people register by putting their issued card through a reader connected to the electronic patient record. This ensures an accurate patient identification.

A prerequisite for providers being reimbursed when performing a spirometry is that it is recorded in the registers. This offers a strong incentive to report spirometric procedures. However, the validity of procedure codes in the Danish National Health Service Register has not been assessed. One could speculate that the frequency of errors or oversights is higher regarding the services where the fee is small, which is not the case for spirometric procedures. Also, the risk of errors due to GPs' economic incentive to overreport, is probably inconsiderable since GPs have to explain their invoices to the Regional Health Administration if they exceed 25% of the average for the GPs in the region (102). Regarding data collected from the Danish National Patient Registry, even though a range of validation studies on ICD10 codes and treatments have been performed, there is a lack of evidence on the validity of procedure codes (136). Also in this registry reimbursement depends on reporting of procedure codes, and the accuracy is considered to be high. However, over- or underreporting of spirometric procedures cannot be precluded. There is little risk, though, that such errors would systematically influence the results on associations as there are no reasons to believe that certain hospitals code less consistently, and as most spirometric procedures were performed in general practice.

Comprehensive registers containing socioeconomic and demographic data enabled adjustment for socioeconomic status on an individual level in the analyses. Statistics Denmark collects these data annually, and since data are derived from administrative registers (tax, labour market, educational and social registers), they are regarded as being of high quality. This means that there is a low risk of misclassification. Also, the amount of missing data is very limited. In the current study, only 26 patients were excluded due to missing socioeconomic data.

Relevance of outcome

Spirometry testing among first-time users of R03 medication was used as an example of an evidence-based recommendation and thereby as a proxy for quality of care. As stated in the introduction section, research provides good arguments for adhering to this recommendation. The risk of misdiagnosis and improper treatment is one of them. In a study by Collins et al., actual airflow obstruction was only present in 62% of patients treated for COPD, and comorbid illnesses, such as congestive heart failure, depression, diabetes, obesity and sleep apnea, were generally associated with a lower risk of having airflow obstruction (70). By treating patients with inhaled medications without confirmatory spirometry, there is a risk of delays in the diagnosis and treatment of the true aetiology of dyspnoea, not to mention the high cost of inhaled medication and the risk of adverse effects, as for instance pneumonia (71). On the other hand, undiagnosed COPD also appears to be common in a primary care setting indicating a general misdiagnosis of these patients, which further emphasizes the need for spirometry testing. Thus, in a study from 2007, Tinkelman et al. performed screening of smokers over 40 years of age and found almost 20% having undiagnosed COPD (137). Similarly, among symptomatic patients with a history of smoking, the prevalence of undiagnosed COPD has been reported to be just above 25% (138, 139), and it has been implied that opportunities to diagnose COPD are being missed and could be improved, for instance by case-finding in patients with lower respiratory tract infections (72). Despite these findings, screening for COPD is widely debated. This is primarily due to disputes on the expected benefits of treating patients with mild COPD (140) (i.e. smoking cessation, exercise, vaccinations against pneumococcal and influenza viruses as well as pharmacologic therapy (141)), weighed against the costs related to screening and the risk of harm related to false positive diagnoses (142). Very recently it has been concluded that there is still a need for further research before a recommendation either for or against screening can be determined (142, 143).

However, all guidelines agree that treatment with medications against obstructive lung diseases should be preceded by confirmatory spirometry (58, 59) and furthermore, there is little evidence to support any benefits of treatment with inhaled medications for a clinical diagnosis of acute cough or acute bronchitis (144). In spite of this, substantial variation among general practices' use of spirometry testing among first-time users of R03 medication prevails, and it appears that there is indeed room for improvement. One might argue a number of reasons not to use spirometry testing when initiating treatment in spite of research findings; among others the patients' needs and wishes as well as the patients' ability to perform spirometry. Since EBM means using the best available scientific evidence in combination with clinical expertise and the needs and wishes of patients, an adherence of 100% could never be expected. In the DCGP-guideline concerning COPD in general practice, it is stated that 90% of all Danes \geq 50 years of age who receive first-time prescriptions for R03 medication should have spirometry performed (145). The results of the present study reveal that only a

minority of general practices seem to meet this quality indicator. It is however very hard to define a "correct" percentage, and what is most important for the aim of this study is not the number, but rather the substantial variation among general practices, which can only to a limited degree be explained by patient or practice characteristics (60, 69).

The validity of the data used for assessment of the outcome measure is high. However, the validity of spirometry testing in first-time users of R03 medication as an indicator of quality of care has yet to be investigated.

Bias

Selection bias

Register data and email addresses obtained from the Organisation of General Practitioners in Denmark made it possible to invite approximately 96% of all Danish GPs (representing 91% of all general practices in the country) to participate in the survey and to acquire valid background information on both respondents and non-respondents (gender, age and practice form). This allowed for a qualified evaluation of the representativeness of the study population.

Concerning study II, if responding GPs are more engaged in information-seeking than non-respondents, there is a risk that the overall use and perceived importance are overestimated. In the association analyses, age, gender and practice form were found to be explanatory factors related to information-seeking. Hence, non-response bias might also affect the results. However, as can be observed from Table 6 (p. 37), the difference between the characteristics of responders and non-responders was not very pronounced, and extensive sampling ensured that much of the GP population was, indeed, covered.

Regarding study III, GPs from a total of 1931 practices (58% single-handed and 42% partnerships) were invited to participate. This distribution reflected the general distribution of practice forms at the time of the survey. As 43% of the responses were obtained from single-handed practices and 57% from partnerships, single-handed practices were underrepresented among the responding practices. However, for partnership practices to be included, it was only necessary that one GP had responded, which can explain the somewhat skewed distribution of responses among practice forms.

Further, for study III, one could expect that GPs with a special interest in COPD and/or implementation would be overrepresented. The finding that the mean spirometry proportion among practices was higher than what has previously been reported in a similar setting, (54.5% versus 50.8%) (60), supports this notion. However, since register data on all first-time users of R03 medication, including data on patients belonging to non-responding practices, were available, it was possible to make an additional calculation on the spirometry proportion that covered the entire population. This calculation revealed a mean spirometry proportion of 53%, which indicated that selection bias is limited, and that a slight increase in spirometry testing among practices might have occurred during the last four years. However, regarding implementation activities, there was no way to estab-

lish if GPs from responding practices, due to a higher interest in the subject, generally had a more formalised approach to implementation than GPs from non-responding practices. If this indeed was the case, it could mean that the contrasts between the groups were misjudged, which could lead to an underestimation of the effect of implementation activities on spirometry testing.

Information bias

The use of self-reported data carries a risk of introducing recall and reporting bias.

Because the majority of items concerned the present situation in the organisation and not historical events, the risk of recall bias is considered to be small.

To reduce the risk of inaccurate reporting, very concrete questions were provided, and in order to further reduce the risk of reporting bias, it was emphasised to the GPs that all data handling would be strictly anonymous.

Previous research has shown that GPs might not realise what sources they use most frequently, and that they have a tendency to overestimate the use of printed sources and underestimate the use of interpersonal sources (146). Therefore, in study II, a risk of bias in reported behaviour must be recognised. There is little chance, though, that such bias would affect the results on associations between GP characteristics and information-seeking as there are no reasons to believe that specific errors in reporting can be linked to certain GP characteristics. However, regarding the overall results on frequency of use and perceived importance, reporting bias could have caused an over- or underestimation on the utilisation and importance of the information sources included. While this is of course problematic, it probably does not affect the comparability of this study to other surveys that have investigated the same sources.

In study III, despite a systematic validation process, not all GPs in partnership practices gave the same answers to all of the questions, which strongly indicates some degree of reporting errors. The reasons for this could be that some GPs report the intentional behaviour as for instance “we aim to meet once a week” while others report the actual behaviour “we succeed in meeting once every fortnight”. If this is the case, though, it will probably not happen systematically and thus not lead to biased results.

Confounding

A simple way of describing confounding is as a “confusion of effects”. This implies that the effect of an exposure on an outcome is mixed with another variable, making it impossible to judge the real relationship between exposure and outcome. A confounding factor is associated with the exposure and with the outcome (as a cause or as a proxy for a cause), but must not be an effect of the exposure, meaning that it must not be a link in the cause-effect relationship between exposure and outcome (147, p. 124-147).

Concerning study II, adjustments were made for the investigated GP characteristics (age, gender and practice form) and additionally for two other hypothesised confounding

factors: status as training practice and workload. Status as training practice was hypothesised to influence information-seeking since the trainees’ information needs might influence GPs’ information-seeking and, perhaps also, perceived importance of sources. Moreover, since a lack of time is one of the most important barriers to information-seeking (18), workload was included in the model as well. For study III, the specific practice and patient characteristics that have previously been proved to be associated with spirometry testing (60, 69) had to be taken into account in the analyses, which made these models relatively more extensive.

To be able to control for several confounding factors simultaneously, multivariable regression models were used for analyses in both study II and III. However, even with meticulous development of the models, it cannot be ruled out that some unknown or unconsidered factors may have confounded the results. As a means of approaching this problem, the assumed effects of being affiliated with a specific practice, for study II concerning the GPs and for study III the patients, was taken into account by using robust cluster estimation. Still, there is no guarantee that all relevant factors have been identified and covered by the applied models. For instance, it might have been relevant to include other practice characteristics, e.g. primary care physician supply. This specific characteristic has previously been associated with quality of care for chronic conditions (148). However, we did not have access to reliable data on this measure and, further, specifically regarding spirometry testing among first-time users of R03 medication, research has been unable to determine an association (60).

One of the factors that it could have been relevant to include is co-morbidity since it may influence GPs’ decision to use spirometry as well as the patients’ motivation and ability to performing it. However, the Danish National Patient Registry contains data only on diagnosis from secondary care and no data on diagnoses can be obtained from primary care. Therefore, if comorbidity were to be measured on the basis of diagnoses, using for instance the Charlson index (149), the registries would not have adequately reflected chronic conditions that had solely been treated in primary care. A reasonable alternative to using the Charlson Index could have been to assess the number of prescribed drugs, which have been shown to be the strongest predictor of future consultations in a primary care setting and the second best predictor of mortality (next after the Charlson index score) (150).

Statistics

In studies II and III, questionnaire variables were dichotomised; in study II concerning the outcome variables: frequent use and perceived importance, and in study III concerning the explaining variables contained in the overall domain: implementation activities. The intention was to elucidate the contrasts between the groups and investigate associations. However, dichotomisation may lead to a loss of information, and it can be difficult to determine what is the most appropriate cut-off point. Also, since it was a newly developed questionnaire, no previously defined stand-

ards for dichotomisation of the included variables existed even though previous research did provide some guidance. For each item in the questionnaire, during the development phase, preliminary decisions on the cut-off points were made. However, these had to be modulated in concurrence with the results from the questionnaire. For instance, most previous research has regarded frequent use of information sources on a weekly or monthly basis, but for some of the sources in study II, the frequency of use was so high that, to elucidate the contrasts sufficiently, the cut-off point was set to daily/weekly instead of weekly/monthly. Furthermore, since contrasts will only be sufficiently explicated if there is a broad distribution of answers, distribution was assessed for each of the included variables prior to dichotomisation.

In study III, both stratified and non-stratified analyses were performed. Stratification was made on practice form due to an assumption that practice form would function as an effect-measure modifier. Effect-measure modification implies that a measure of effect changes over values of some other variable (147, p. 198-210). In this case, the hypothesis was that the effect of formalised implementation activities on spirometry testing would not be as pronounced in single-handed practices as in partnerships, because fewer people entail less need for formalised coordination of knowledge-sharing activities as well as no need for reaching an agreement among GPs. However, when testing for interaction between each of the explaining variables and practice form none of them was significant. This meant that the hypothesis of a mediating effect could not be statistically confirmed. Since stratification can lead to a loss of power and an increased risk of type I errors, to ensure transparency, both the stratified and the non-stratified results of the analyses are reported in this thesis.

For study III, it was decided that, in the cases where discrepancies among GPs in the same practice occurred, the highest level of formalisation reported would be included in the analyses. As a consequence of this choice, results may be a conservative estimate of the association between formalised implementation activities and spirometry testing. To test this notion, additional analyses could have been made, including the lowest level of formalisation reported instead of the highest level. To confirm the above assumption, by doing this, associations would expectedly become more pronounced.

Generalisability

The size of the surveyed population, along with a reasonable response rate and respondents being representative of the entire population with regard to age, gender and practice form (Table 6, p. 37) and to some extent the spirometry proportion, makes it likely that the results can be generalised to the entire population of GPs and general practices in Denmark. Furthermore, since most of the investigated information sources are not unique in a Danish setting, the results on information-seeking would probably be applicable to other Scandinavian and European countries and even to the US. Moreover, the recommendation on spirometry testing used as a proxy for quality of care in this study is based on international guidelines (58, 59). So, for other western countries

with a healthcare system similar to the Danish one, it appears reasonable to generalise the findings from this study too.

7. CONCLUSION

GPs' information-seeking behaviour appears to be evolving concurrently with the development of new information sources. The choice of source as well as the perception of its importance are associated with the GPs' age, gender and practice form. The results of the present study indicate how GP characteristics should be taken into consideration when disseminating scientific medical information to ensure that patients are provided with medically updated, high-quality care.

Further, when disseminating scientific evidence and developing interventions or quality improvement initiatives, it is important to recognise that approaches to implementation of evidence-based knowledge vary substantially between practices. Knowledge of which approaches are used in specific practice settings could prove essential when deciding where to put the focus and support. This study shows that an important factor to consider in that respect is formalised implementation activities as some degree of formalisation appears to contribute to sustaining a high quality of care by supporting implementation of evidence-based recommendations – especially in partnership practices. Frequent meetings and the use of standardised processes of care are thus associated with higher quality of care, measured by the use of spirometry testing among first-time users of R03 medication.

8. IMPLICATIONS

Findings from this thesis provide new knowledge of how evidence-based knowledge is sought and implemented in general practice, and how these activities are associated with GP characteristics and quality of care. Even though the study only covers a very small part of the entire field of dissemination and implementation research, insights might be useful in guiding future quality improvement initiatives in the inner context of general practice as well as by external providers. Moreover, the findings have led to further research questions that it seems obvious to pursue. Thus, a number of implications are relevant to consider:

- Balas and Boren have stated that: *“Relying on the passive diffusion of information to keep health professionals’ knowledge up to date is doomed to failure in a global environment in which about 2 million articles on medical issues are published annually”* (1). Even though not all 2 million articles are of relevance to GPs, it exemplifies the overload of available scientific information and underlines the significance of targeting both dissemination and implementation of relevant scientific evidence. In this respect, it is important to keep in mind that GPs aged more than 44 years do not seek information from colleagues, guidelines, medical websites and drug information websites as frequently as their younger colleagues. Although part of this finding can

probably be explained by experienced GPs' having a higher likelihood of being able to base their decisions on current knowledge, it still involves a higher risk of overlooking new information, including recommendations. Moreover, today's focus on developing guidelines and medical websites may not sufficiently consider the information needs of this group of GPs, and therefore a broad array of relevant information sources must still be prioritised. It is equally important to consider that part of the difference among age groups in their choice of information sources could be the force of habit. Whereas GPs in the youngest age group have probably been accustomed to drawing on the Internet for information ever since they finished their training, GPs in the older age groups have primarily been trained using printed sources. However, to a wide extent, the Internet is now the preferred source for dissemination of information, and more efforts must be made to ensure the usability of important information websites for all GPs. Regarding single-handed GPs, it appears that they may need to be provided with better opportunities for professional discussions in their everyday practice, and initiatives in this direction could be valuable.

- Practicing EBM is not only a question of seeking information; it is also to a high degree a matter of asking the right questions (10). In Denmark, during GP training, it is obligatory to participate in a research module, which implies writing and defending a small-scale research project. An essential element in this module is to learn how to ask the right questions and how to seek answers to them. Maybe GPs who have not had that kind of training would benefit from CME activities inspired by this approach.
- According to the present study, DCGP guidelines are regarded as important by almost all GPs (90%) and are also reported widely utilised (57% on a daily or weekly basis). This is valuable information for the future development and dissemination of guidelines in general practice. One of the core values in primary health care is to provide holistic patient-centred care (151), and even if GPs make an effort to keep up with the scientific evidence, it can pose significant challenges to transfer findings from scientific research into the context of general practice. Especially, the fact that the vast majority of RCT studies are performed in tertiary care hospital settings and include only selected groups of patients make it difficult to transfer findings from the study populations to the population under care (152). Therefore, to aid GPs in practicing EBM, it is absolutely essential that the primary care professional societies, such as the Danish College of General Practice, continue to develop guidelines and statements of high professional standard aimed at the primary care setting (153) and, to enhance

credibility, let them be authored by peers with special interests and skills in the particular field (111).

- Novel research has shown how it is important to take GPs' preferences into account when developing interventions related to the distribution of clinical guidelines (154). According to findings from this thesis, there is a substantial variation in GPs' approaches to implementation of evidence-based knowledge in their practices. This means that the mere dissemination of clinical guidelines could lead to quality improvements in some practices, whilst not having any effect in others. Therefore, along with GPs' preferences for the type of intervention, if implementation strategies in relation to dissemination of guidelines or other types of scientific evidence are to provide adequate guidance and support, it is crucial to take into consideration the already established implementation activities of the individual practices.
- A certain degree of formalisation appears to contribute to sustaining a high quality of care by supporting implementation of evidence-based recommendations. GPs could therefore benefit from prioritising time and space for frequent meetings and from processes aimed at ensuring consistency in the approach to patients through development of standardised processes of care. However, more formalised activities such as task differentiation between GPs and having a highly formalised meeting structure seem to be less beneficial. This is important because, traditionally, GPs have worked very individually in general practice, but an ageing population and an increase in patients suffering from chronic diseases, along with expectations that GPs practice EBM, have led to formation of larger practices with more task delegation to practice staff and a higher focus on guidelines, equity, and quality of care. This tendency is not only seen in Denmark, but in other developed countries as for instance The Netherlands, The United Kingdom, Canada and Australia as well (155). Therefore, most changes in clinical activity will now involve more than one person. This means that translation and application of new evidence are not necessarily only up to the individual GP anymore, and attempts to implement evidence-based knowledge could easily go wrong if this notion is not considered.
- Future research should test if the results on the effects of formalised implementation activities are transferable to other evidence-based recommendations than spirometry testing. Such studies would contribute to further validation of the organisational factors included in "implementation activities" and thereby provide a more solid basis for recommendations to general practitioners, researchers and managers of quality improvement initiatives on how best to organise implementation

work in the future. Moreover, because the cross-sectional design of the study does not allow for any inferences on causality, the findings should be tested in an experimental design in a representative general practice setting. If the effects of formalised implementation activities could be confirmed in a RCT study, there would be a strong foundation for initiating a general tailored intervention aimed at these specific factors with the purpose of guiding GPs in performing implementation activities as a natural part of their everyday clinical practice. Further, to improve targeting of dissemination activities, more research is needed regarding male and female GPs' different perceptions of the importance of information sources and the potential association with the quality of care delivered. Finally, spirometry testing among first-time users of R03 medication has been applied as an indicator of quality of care. However, the value of this indicator has yet to be established in a validation study.

9. SUMMARY IN ENGLISH

Background

Keeping up with the evidence and implementing it into the daily care for patients are fundamental prerequisites for delivering a high quality of care in general practice. However, despite many years of research into dissemination and implementation of evidence-based recommendations, significant challenges remain. In recent years, organisational factors have become widely acknowledged as vitally important for ensuring successful implementation. Further knowledge is needed to understand more about which factors affect the seeking and implementation of evidence-based knowledge in general practice.

Aim

The overall aim was to investigate how evidence-based knowledge is sought and implemented in general practice and to analyse associations with GP characteristics and quality of care. Three separate studies, each covering a specific part of the overall aim, were undertaken:

- I. To examine how GPs implement clinical practice guidelines in everyday clinical practice, and how implementation approaches differ between practices.
- II. To assess GPs' information seeking behaviour with regard to the use and perceived importance of scientific medical information sources and to investigate associations with GP characteristics.
- III. To investigate if there are associations between specific formalised implementation activities within general practice and quality of care – exemplified by the use of spirometry testing among first-time users of medication against obstructive lung diseases.

Methods

The study was designed as a mixed methods study combining qualitative interviews, questionnaire and register data. Study I was a qualitative interview study that involved purposefully selected GPs representing seven different practices. The interviews were analysed using systematic text condensation, and results were used to qualify the development of a national survey of general practitioners regarding their seeking and implementation of evidence-based knowledge. This survey was distributed on December 4th to all GPs in Denmark who at the time had an email address registered at the Danish Organisation of GPs (N = 3,440). Study II was a cross-sectional study based on the survey data. In study III, while also applying a cross-sectional design, data on quality of care from national registers were linked to data from the survey. Spirometry testing among patients redeeming a first-time prescription for medication targeted obstructive lung diseases (R03 medication) was used as an example of an evidence-based recommendation, and thereby as a proxy for quality of care.

Results

Study I: The analysis of the semi-structured individual interviews revealed that approaches to implementation of clinical guidelines differed substantially between practices. Overall, three different approaches were identified, depending on the degree to which implementation was collectively and formally organised. In some practices, the GPs prioritised time and resources for collective implementation activities and organized their everyday practice to support these activities. In other practices, GPs discussed guidelines collectively, but left the application up to the individual GP whilst others saw no need for discussion or collective activities depending entirely on the individual GP's decision on whether and how to manage implementation. The GPs' attitudes to consistency in patient care appeared to be closely related to their approach to implementation.

Study II: A total of 1,580 (46.4%) GPs responded to the questionnaire. Results showed that GPs' information-seeking behaviour is associated with gender, age and practice form. Single-handed GPs use their colleagues as an information source significantly less than GPs working in partnership practices, and they do not use other sources more frequently. Compared with their younger colleagues, GPs aged over 44 years are less likely to seek information from colleagues, guidelines and websites, but more likely to seek information from medical journals. Male and female GPs seek information equally frequently. However, whereas male GPs are more likely than female GPs to find that pharmaceutical sales representative and non-refundable CME meetings are important sources in keeping medically updated, they are less likely to find that colleagues, refundable CME meetings, guidelines and drug information websites are important.

Study III: GPs from 1,114 practices (58%) responded to the questionnaire, and 33,788 patients were linked to a responding practice. In partnership practices, compared with less frequent or no

meetings, weekly interdisciplinary and weekly GP meetings were significantly associated with higher quality of care measured by patients' OR of having spirometry performed. Furthermore, the development of practice protocols and standard recordings in the EMR in a range of disease areas, compared with only a few areas or none at all, were significantly associated with quality of care. The effect of formalised implementation activities was not as evident in single-handed practices as in partnerships.

Conclusion

The results show how GP characteristics could be taken into consideration when disseminating scientific medical information to better ensure that patients are provided with medically updated, high-quality care. Further, the study demonstrates the variation in approaches to implementation of evidence-based knowledge in general practices. This variation should be taken into consideration when developing quality improvement initiatives or interventions. Thus, knowledge of which approaches are used in specific practice settings could prove essential when deciding where to put the focus and support. Finally, the study indicates that important factors to be considered in that respect are the presence of formalised implementation activities in the practices as some degree of formalisation appears to contribute to sustaining a high quality of care by supporting implementation of evidence-based recommendations.

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