PhD thesis

Organisational social capital in general practice.

Associations with practice characteristics.

A nationwide questionnaire survey measuring the level of organisational social capital in general practice and analysis of associations with organisational and individual characteristics in general practice, patient-evaluated quality of care and efficiency of the services.

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UNIVERSITY OF SOUTHERN DENMARK

THE RESEARCH UNIT
FOR GENERAL PRACTICE

Odense

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This PhD Thesis has been accepted for the defence of the medical PhD by the Faculty of Health Sciences, University of Southern Denmark. The defence will be on 7 march 2014 at the University of Southern Denmark, Winsløwparken 25, 5000 Odense C.

Preface

"The reward of our work is not what we get, but what we become." -Paulo Coelho

This thesis is a result of a meeting I attended almost four years ago at the Research Unit for General Practice in Odense. During the meeting we discussed why the majority of the research regarding management in the healthcare sector only seems to depict 'a small part' of the larger picture. I was asked if I was interested in studying the organisational mechanisms in general practice to find out whether it was possible to identify potentially changeable factors associated with performance and treatment. It was an interesting and tempting offer, which I happily accepted.

This PhD thesis is based on three studies carried out during my employment from September 2009 to November 2013 at the Research Unit of General Practice in Odense, Institute of Public Health, Faculty of Health Sciences, University of Southern Denmark. The origin of this PhD study would not have been possible without the help from the many persons involved. First of all I wish to express my gratitude to my very competent supervisors who introduced me to the field of epidemiology and social science research. In particular I wish to thank Jens Søndergaard, MD, PhD, Professor (chief supervisor) for his enormous helpfulness concerning all details of this PhD study and my wellbeing during the time it was conducted. I am especially grateful for his academic teaching and patience with my lack of understanding the results in front of me, but not least for his concerns for me and my family, as well as for his sense of humour and excellent company. Thanks to Janus Laust Thomsen, MD, PhD (project supervisor) and Anders Halling, MD, PhD, Professor, for your stimulating enthusiasm when others (including Jens?) were shaking their heads (but thanks to "the head-shakers" too), especially during the initial phase of the project. Also Pia Veldt Larsen, PhD, needs special thanks. Her patience in introducing me to STATA and statistics and her appreciated criticism of many article drafts has had a major impact on the final result. Thanks to

Vibeke Backer, MD, PhD, Clinical Professor, and Michael Hansen, MD, for their invaluable involvement in the birth of the project and their clinical views on as well as criticism of my work. Finally I want to thank my supervisor at the Danish Technical University of Denmark, DTU Management Engineering, Kasper Edwards, PhD, and my talented and in many ways brighter colleague from the same department, Sanne Lykke Lundstrøm, PhD Fellow, for letting me benefit from their knowledge about management and organisational research as well as their constant reminder to keep up the steam and not fall behind.

I also wish to thank my colleagues and co-authors in-house, particularly Jesper Lykkegaard, MD, PhD, for our discussions and his contributions to the papers. Further thanks are due to Research Secretaries Susanne Døssing Berntsen and Nina Døssing for their highly valuable assistance with data management. Thanks to Institute secretaries Ellinor Kruse and Helle Reintoft Andersen for their important help to solve all kinds of challenges concerning teaching and life at the University. A special thank you is extended to Administrator Lise Keller Stark for her always skilful proofreading of manuscripts and comments on language and many other matters.

Also, I wish to thank all my PhD fellows and other colleagues at the Research Unit of General Practice in Odense for an inspiring environment and for many stimulating discussions as well as days (and nights) with fun and laughter (-:

Finally, I wish to thank my wonderful wife, Christina, whose continued love, enormous patience and support I cherish every minute of every day, and my fantastic children, Laurits, Gustav and Sine, whose warm company and insistence on drawing me away from my work, keep me delighted and give me perspective on what matters in life!

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Odense, November 2013

Thomas Bøllingtoft Knudsen

Abbreviations

ATC	Anatomical Therapeutic Chemical
CI	Confidence Interval
COPD	Chronic Obstructive Pulmonary Disease
COPSOQ	Copenhagen Psychosocial Questionnaire
COPSOQ II	Copenhagen Psychosocial Questionnaire II
DADS	Digital Article Database Service
DanPEP	Danish Patients Evaluate general Practice
DTU	Danish Technical University
ICD-10	International Classification of Diseases, 10th Edition
NRCWE	The National Research Centre for the Working Environment
OR	Odds Ratio
OSC	Organisational Social Capital

List of papers

Organisational social capital in general practice is strongly associated with characteristics of the organisation and the subjects working within it. *Manuscript sent for review*.

Organisational social capital is significantly associated with patient evaluations of general practice: A population-based study in Danish general practice. *Manuscript sent for review*

Organisational social capital is associated with efficiency of general practice care: A population-based combined register and survey study. *Manuscript sent for review*

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This drawing was shown in context of a debate on social capital in Dagens Medicin, October 2011. Under license from Dagens Medicin and Lars Andersen

1 Introduction

1.1 Background

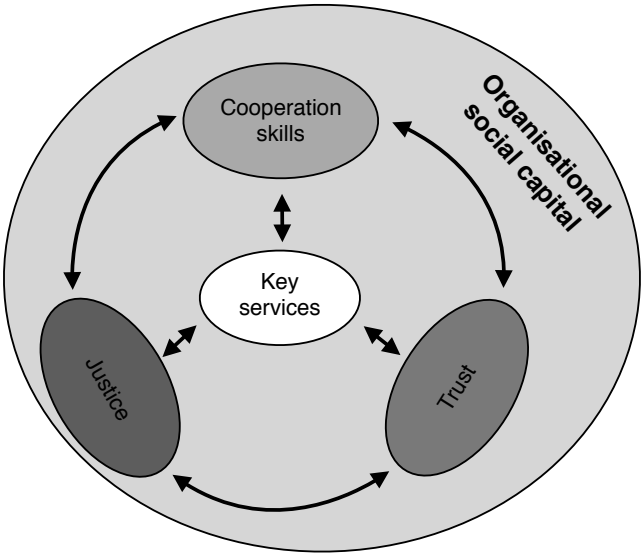
Primary healthcare is a central player in most healthcare systems. In Denmark, general practice plays a pivotal role in the delivery of public healthcare and general practitioners have been successful in providing accessibility, acting as gatekeepers and creating long-term relationships with the population (1). It has been shown that healthcare outcomes are better in healthcare systems with strong primary healthcare (2–5).

Danish primary care is still dominated by small practices in contrast to our neighbouring Nordic countries (6,7), but decision makers and politicians are for a number of reasons, e.g. sharing and development of knowledge and quality, scaled economies and recruitment issues, increasingly looking at larger primary healthcare clinics with the subsequent involvement of more healthcare professionals around each patient. This implies that non-technical abilities to ensure collaboration become of key importance to ensure efficiency and sustainability over time (8–10). This requires a new perspective on the management of care in general practice.

Recent research has indicated that non-technical abilities such as a psychosocial work environment that supports mutual trust, justice and cooperation skills are essential to efficiency of work in the financial, educational and production sector (11–14). It is reasonable to assume that the same organisational and management abilities linked to human resources apply to the healthcare system including general practice. The value of a mutual feeling of trust, justice and good cooperation skills is assumed to give rise to organisational social capital (OSC) (10,15). OSC is a productive force embedded neither within the individuals nor the physical resources of an organisation, but within the interpersonal relations. In general, the quality of a product delivered is

strongly associated with OSC, why management in the production sectors put considerable efforts into improving it (11,13,16–19).

Economists have argued that social capital might be the "missing link" to the yet unexplained 25% difference in growth rates across countries, sectors and branches (20,21). In line with this, Bjørnskov (22) has shown that increasing (decreasing) social capital by one standard-deviation increases (decreases) growth by 0.58 percentage points. Thus, social capital seems to be a key factor for productivity (23). It is possible that social capital acts as a social and economic "lubricant", lowering transaction costs in all sorts of interactions (24,25). Consequently, social capital has been put on the political agenda in most OECD-countries (Organization for Economic Co-operation and Development) (21). Decision makers and politicians desire to know whether, and if so, how social capital affects productivity and which factors might be associated with the formation of social capital.

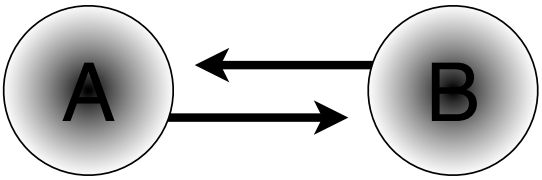


Organisational social capital: as proposed by Peter Hasle et al. Showing trust, justice and cooperation skills as subsets of organisational social capital (26).

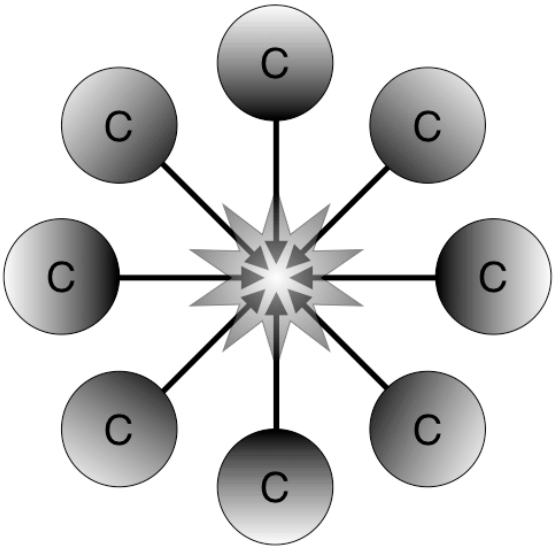
During my PhD period I discovered how vast the field of OSC research is and how many different directions it follows, why I have found it almost impossible to make a comprehensive review of the use of the social capital theories (Google has 2,420,000 hits with the exact search phrase “social capital” and 181,000 hits with the exact search phrase: “organisational social capital”). Nevertheless, I will try to shed some light on it, being aware that I have missed significant information. On the other hand, the overwhelming information has had the potential to change the project over and over again. Yet, I have realised that with regard to production and quality, social capital is considered to be a productive force in every research field. Furthermore, the value of social capital is not linked to one individual (which would make it vulnerable to changes in staff), but rather coming from and depending on the relations between all members of the group, network or organisation. Social capital is not improved by exchanging personal benefits (trading) person to person, but by building relationships. You could say that it is something "we" build up and something "we" benefit from.

We know surprisingly little about the role of OSC in the area of healthcare. It has proven difficult to introduce changes to the healthcare system, but it is possible to improve the level of OSC and thereby supposedly affect the productivity and quality of the services provided (11–14,16,27,28). So far, however, these associations remain untested.

1.2 Social Capital



A* < - > *B: Showing individuals receiving resources from shared relations.



C* + *C* + *C* + ….:** Showing individuals collaborating to achieve common goals. The central "explosion" can eventually reach out to include individual benefits for each ***C.

In recent years numerous capital concepts have been introduced in the search for answers to a broadening range of questions. Social capital is a more recent addition (29,30), but has become increasingly popular by sociologists, political scientists, economists and a wide range of other science disciplines. The theory behind social capital is the idea that an individual can benefit from the relational resources within a community and thereby achieve desired outcomes (16). Social capital has been defined in a variety of ways by a variety of authors:

"Social": Relating to society and to rules about behaviour with other people (31).

"Capital": a source of power or advantage (32).

Basically social capital is a source of power inherent within relations between people. It was introduced in its current form by the French sociologist Pierre Bourdieu in the 1960s. Pierre Bourdieu reformulated the economists' definition of the word "capital" to include non-material forms and distinguished between three types of capital: cultural capital, economic capital and social capital (27), and described the value of social capital as:

> *"The aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition."* (27)

Following Bourdieu the theory was further developed and refined by James Coleman, who again divided capital into physical capital, human capital and social capital (28,33). Both Bourdieu and Coleman regarded social capital as an asset, created from the relations between individuals and not the sum of the value of each individual within the network. The main difference between the two was that Bourdieu considered social capital to contain both positive but also harmful sociological mechanisms with the potential to maintain social differences between groups. Coleman focused on social capital as a sociological good that potentially could be used for the benefit of the members of a group or a community. Coleman's work showed that the level of trust between members of a group influenced the desire to share common resources and, consequently, influenced the amount of social capital and emphasised the fact that social capital is not the private property of any of the persons benefiting from it (27,28,33,34). The work of Bourdieu and Coleman became the foundation on which the theory is used today.

It was not until the early 1990s when Robert Putnam's work became known that the theory fell on fertile ground. Putnam showed that social capital could explain why a relatively homogeneous central European country like Italy could be so different from north to south based on differences in social capital (35). Putnam also discovered the correlations between social conditions and social capital in the United States, which he among other things described in his book "Bowling Alone: The Collapse and Revival of American Community" (36). Putnam fostered the concept of "bowling alone" to describe the extreme reduction in social capital in the United States, beginning with the end of World War II, not turning until the end of the millennium. Putnam saw that despite an increase in the number of Americans who went bowling in their spare time, fewer were members of a bowling club. People went "bowling alone"… The Americans, in other words, spent less time together and more time on solo activities like watching TV, working etc. The most striking development of the US society in that period was a rapidly growing distrust and increasing social differences. Putnam stated that:

> *"The core idea of social capital theory is that social networks have value" and that "social contacts affect the productivity of individuals and groups."* (37)

Putnam's work has had a major impact and social capital has received increasing political attention in recent years.

The high level of social capital in the Scandinavian countries has been suggested as an explanation for the fact that they are able to uphold a high level of competitiveness, despite large public sectors and high taxes (38). Social capital has also been seen as a key concept to understand why some developing countries are able to undergo a positive social and economic development,

while others apparently have stalled (39,40). In management research social capital has been found to give way to creation of knowledge and to improve sharing of knowledge (41,42). The feeling of trust between members of an organisation is crucial to make them share their knowledge with each other, when new ideas emerge. With regard to public health the research focus has been associations between social capital and health conditions (43).

Putnam introduces the "bonding" and "bridging" social capital, both co-existing interdependently. Bonding occurs between people tightly related and ensures strong ties and commitment with each other. Bridging ties are the weaker connections between groups (44). In recent years Szreter and Woolcock have introduced another type of ties; the 'linking' social capital. While bonding and bridging occur between people at the same level of hierarchy, linking social capital is a vertical dimension derived from relationships between persons across levels of hierarchy and power. This type of social capital has incorporated the role of formal institutions beyond the bonding and bridging communities and networks (45–47).

1.3. Organisational social capital (OSC)

If we consider the networks within an organisation where the desired outcome for all organisational members is to enhance the performance of the organisation, then the relationships between the members of the organisation are a valuable resource in terms of enhancing the productivity and quality of the service delivered. This is known as OSC and based on Putnam's work regarding social capital it has been defined by the National Research Centre for the Working Environment:

> *"The quality that enables the members of the organisation to jointly solve its key task".*
> *In order to solve this key task, it is necessary that the members*

are able to cooperate and that cooperation is based on a high level of trust and justice." (13)

The value of OSC is embedded within the relationships between the members of an organisation as opposed to being a sum of the skills of each member (13,14,16). In other words, high OSC describes a mutual understanding of how best to collaborate by using shared resources in your own organisation.

1.3.1 A change of focus: Psychosocial work environment and organisational social capital

How we measured organisational social capital: It is the feeling of trust, justice and good cooperation skills within an organiation, which are considered to give rise to high organisational social capital. These dimensions is linked to the psychosocial work environement. We measured the three dimensions to assess organisational social capital in each participating organisation.

Many historical examples, especially from the production sector, show that improving the psychosocial work environment generates increased productivity (48,49). However, the main focus of the psychosocial work environment is to address the influence of the work on the individual

person and therefore possibly conflicts with organisational efficiency. This implies attention to "the six best bets" of the job (50,51):

- Influence regarding the tasks and working procedures
- Demands and resources equal each other
- Social support
- Acknowledgement
- Meaningfulness
- Predictability

The level of the psychosocial working environment in many western countries has reached a point where further improvements tend to conflict with organisational efficiency. The concept of OSC, on the other hand, provides a new way of understanding how investments in the working environment not only favour the subjects but also the organisation. To emphasise this shift of focus "the three diamonds" have been introduced (13,26,51):

- Trust
- Justice
- Cooperation skills

... within an organisation.

1.3.2 Trust

Organisational trust is the expectations that the managers and employees apply to each other in order to collaborate (10). These expectations are based on cooperative behaviour and commonly

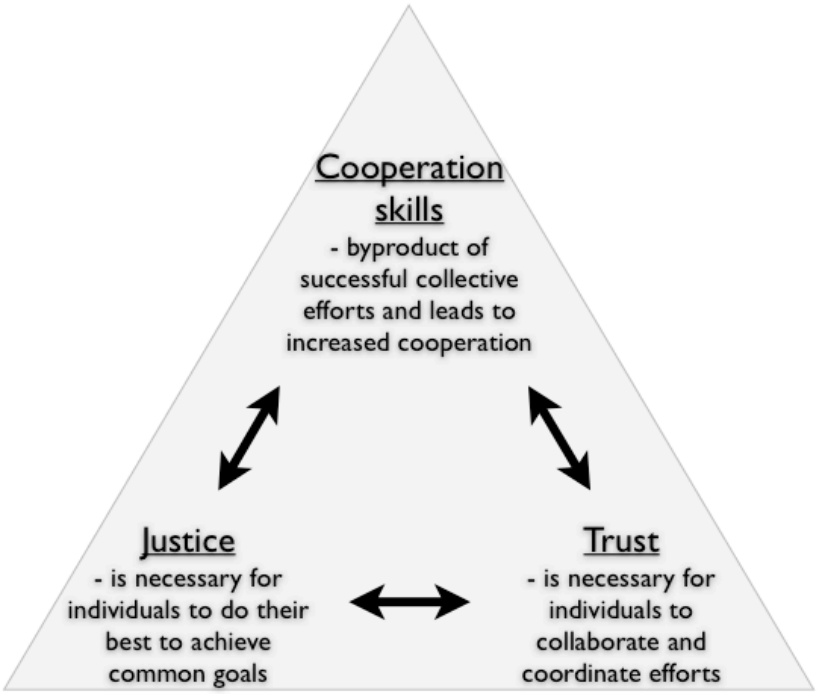
shared norms of the members of the organisation (52). Trust is of key importance to any organisation in order to be sustainable over time because it is necessary for people to work together on common projects and to coordinate their work. If the management does not trust the employees to comply with agreements or if employees do not have mutual trust in each other the need for monitoring internal processes will rise, which is time-consuming, expensive and unproductive (34,53).

1.3.3 Justice

Justice is necessary for the employees to perform their best in terms of achieving the goals of the organisation instead of their own (13). The perception of conflicts being resolved in a fair way and everyone at the workplace being treated equally are properties linked to the desire to cooperate. Organisational injustice, on the other hand, has been associated with retaliation, turnover, lower job satisfaction, misbehaviour and lower work commitment (54–56).

1.3.4 Cooperation skills

Collaboration is subject to trust and justice within an organisation. Good cooperation skills comprise clarity about division of tasks, functions and responsibilities. Good cooperation skills comprise a common idea about where “we” are going, what “our” goals are and how “we” reach them. If the organisation demonstrates good cooperation skills it will lead to a higher degree of trust and justice and to a further desire to cooperate (13,26,51).



Interactions of trust, justice and cooperation skills: It is the perception of trust, justice and good cooperation skills within an organisation which give rise to organisational social capital. The three dimensions is connected, but we do not know exactly how.

1.3.5 How to benefit from organisational social capital

In order to benefit from OSC organisations need to understand the same basic relationships developed within and between groups as in other social networks. A work culture of mutual trust, justice and good cooperation skills builds on bonding ties between team members with a close relationship. This fosters identity, affiliation and depicts a shared purpose (53,57). Without other relations bonding ties can become a basis for the pursuit of narrow interests, and can actively exclude outsiders (58). Bridging ties with distant associates and colleagues strengthen relationships between different working groups, improving performance by enabling employees to access the resources that are embedded within other networks (13,53,58). Groups that are characterised by strong trust and cooperative norms within the group may have low trust and cooperation with other groups in the organisation, which is why bridging ties are equally important to bonding ties.

Linking ties facilitate the vertical interaction in an organisation (13), enabling individuals to leverage resources, ideas and information from the management, which of course is of great importance to an organisation like a general practice or a health clinic (40).

1.3.6 Perspectives of social capital

Social capital is not the spectacular answer to all problems. As outlined above, it is not a new way of interpreting the psychosocial work environment or an extension to it. It is a parallel discussion. Thus, it is still highly necessary to pay attention to classic psychosocial work environment issues like noise, smoke and dirt and to factors related to burnout etc. and the “six best bets” of the psychosocial work environment, because OSC does not protect from dangerous work situations, attrition, etc. However, even in organisations with problems related to the work environment, raising the level of OSC can provide benefits. It makes good sense that the more confidence we have in someone, the less time we need to check on his/her work. Furthermore, if tasks and benefits are fairly distributed we continue to desire cooperation because of the shared benefits. The productive forces embedded within OSC are basically based on the creation of a culture where everyone, in a positive sense, "covers each other's back" and does not think “she has to deal with it herself." High OSC is a common understanding of the processes within the organisation, which enhances the ability to work well and produces good results using the available time, resources etc. in the most effective way. With certain boldness it is the only way in which two plus two equals five… And there is no reason not to exploit this potential!

1.4. Measuring organisational social capital

Asking the individual within an organisation to rate the level of trust, justice and cooperation skills within their own organisation is a widely used approach to assess OSC (15).

For the purpose of assessing these dimensions of the psychosocial work environment the National Research Centre for the Working Environment (NRCWE) has developed the Copenhagen Psychosocial Questionnaire II (59).

1.4.1 The Copenhagen Psychosocial Questionnaire (COPSOQ)

The Copenhagen Psychosocial Questionnaire (COPSOQ) was originally developed in 1997 by the NRCWE to satisfy the need of Danish working environment professionals and researchers for a standardised and validated questionnaire covering a broad range of psychosocial factors. The COPSOQ questionnaire was developed based on the following theoretical principles and considerations (15,59):

1. The questionnaire should be theory-based, but not on one specific theory
2. The questionnaire should consist of dimensions related to different levels of analysis
3. The questionnaire should include dimensions related to work tasks, the organisation of work, interpersonal relations at work, cooperation, and leadership
4. The questionnaire should cover potential work stressors, as well as resources such as support, feedback, commitment, and good health
5. The questionnaire should be comprehensive
6. The questionnaire should be generic, meaning that it should be applicable to all sectors of the labour market
7. The medium-length and short versions should be "user friendly" with regard to working environment professionals and respondents.

The COPSOQ has become the Danish national standard for assessing psychosocial working environment, and it has been used in several different Danish and international settings (15). The widespread use of the COPSOQ questionnaire led to a maintenance and redevelopment edition in 2005, the COPSOQ II. In the second version new scales and items measuring trust, justice and social inclusiveness were introduced. These scales were inspired by other researchers (60,61) and based upon the hypothesis that living up to such values has a great impact not only on the wellbeing of the employees, but also on the social processes in the workplace and supposedly production and quality of the outcome (15). The developers of the COPSOQ II found the scales of trust and justice to give a picture of the whole workplace (organisation) and not just the person's own job or department". The COPSOQ II was tested in 2004/5, and the data collection procedure and study population have been described in detail by Pejtersen et al. In brief, a total of 8000 participants were randomly selected from the Civil Registration System and after exclusion and dropout (i.e. respondents to COPSOQ I, immigration and death) 4732 (60.4%) returned a valid questionnaire. Of these respondents 3517 were wage earners and were used for testing the working environment scales (15).

Using the Digital Article Database Service at the Danish Technical University and the Web of Science all literature concerning the COPSOQ I/II was collected using the search term "COPSOQ". The search in DADS came up with 17 hits and WEB of Science with 18 hits. Of these 16 were found in both databases. References in the original articles were also investigated. Altogether a total of 36 articles were found. A total of 16 articles were considered highly relevant of this thesis. Of these 14 were published in 2010 in a special issue of the Scandinavian Journal of Public Health with the theme of COPSOQ: Five publications concerned the development of the questionnaire, of which Tage S. Kristensen and/or Jan Hyld Pejtersen were among the authors. One article, by Jakob Bue Bjorner, investigated the construct validity, which showed good accuracy

regarding observations. Three publications concerned the validation of the questionnaire and revealed a high internal consistency (Cronbach alpha above 0.7) of the scales, missing values for the scales between 0.6% and 3.3% and low floor and ceiling effects (15,62–76). Others have confirmed the test results (77).

1.4.2 Other methods of measuring organisational social capital

The most significant weakness of the concept of social capital is the absence of a unified definition and consequently the absence of consensus on how to measure it. Several different methods have been suggested, many with a different theoretical approach and aiming at different levels of the network, community or organisation. This has made it difficult to compare data and recommend a valid and consistent methodological approach. Furthermore, in most research on social capital in organisations or workplaces methods designed to investigate household and community networks have been used, rather than instruments directly developed for the exact purpose of organisational research. Consequently, both single-item surveys regarding the theoretical key element of "trust" (35) and also ad hoc questions have been used to measure social capital (78). Combined scales, however, have the advantage of recognising the multidimensional character of the concept of social capital. One of the large contributors to the development of a unified multi-dimensional instrument for measuring social capital is the World Bank (79). Based on extensive research the World Bank has developed The Social Capital Assessment Tool (80) for measuring social capital at the household, community and organisational levels and the Social Capital Integrated Questionnaire (81) for measuring social capital in developing countries. Both instruments, however, focus on implementation of operations at a macro-level and not on individual organisations. Recent suggestions for the measuring of social capital at the workplace have used different dimensions: cognitive social capital (social trust, coherence and mutual aid) and structural social capital (degree

of involvement in voluntary work and community participation), but have been suggested with the aim of investigating the impact of social capital on individuals (e.g. individuals' health status or mortality) rather than on productivity and quality of the services delivered (43,82)

1.5 General practice in Denmark

A general practice in Denmark comprises the practice owners and their employed staff. A Danish general practitioner is a private entrepreneur on contract with the Danish Governmental Regions. This is called the model of entrepreneurs. Health care in Denmark is largely financed through taxes, and patients have free access to all services related to general practice and hospital care, whereas prescribed medications are partly subsidised. More than 98% of the population in Denmark is registered with a general practitioner. General practitioners provide primary care services, acting as gatekeepers and referring patients to specialist care when needed (1,83,84).

In 2011 a total of 2060 general practices were registered with the Organisation of General Practitioners in Denmark. There are mainly two practice forms in Denmark: single-handed and partnership practice. A single-handed practice is owned by a single general practitioner, who has his own patients and economy. A partnership practice has two or more owners, who are general practitioners and who share patients and/or economy. There are several other organisational variations, among which the cooperation practice is most common. A cooperation practice comprises two or more single-handed and/or partnership practices with individual patient listings and economy, but with shared facilities and/or staff (1,83,84).

The general practitioner is available from Monday to Friday between 8 am and 4 pm. After 4 pm the patients can use the out-of-hours service, in which all general practitioners under the age of 60 are obliged to participate. Finally, citizens are free to contact the emergency departments 24 hours a day. General practice is usually the first contact for patients in need of medical services,

providing continuing medical care and taking account of physical, emotional and social factors when diagnosing illnesses and recommending the required treatment. Patients may be referred to hospital clinics for further assessment and/or treatment. Many general practices provide special care to specific groups of patients with specific conditions. These consultations are often managed by nursing staff, and in some cases other healthcare staff(1).

1.6 Changes in general practice in Denmark

Concerning general practice there are many historical and political demands influencing the organisation, all addressing the conflicting interests of enhancing productivity and quality while lowering the expenses. One common point of view is that large general practices foster organisational benefits, including specialisation of the healthcare professionals, scale economies etc. (83,85).

With the latest Health Care Act in Denmark, the Danish Governmental Regions achieved the privilege of designing and running general practices with employed physicians and staff, thereby taking ownership of the organisation form, size etc. We have so far only seen very few of these practices in Denmark, but it is the ordinary constellation in other comparable countries, (e.g. Norway and Sweden (6)). With the opportunity for the Danish Governmental Regions to run their own practices it is the hope to make it easier to recruit physicians to peripheral parts of the country and facilitate divided accountability between practices, e.g. in the situation where a practice is closing. Regarding the quality of treatment, the theoretical benefits of a large general practice are the fostering of networks from which the participating healthcare professionals can access shared knowledge, adopt appropriate strategies and thereby increase productivity and quality(86). It is a common belief that small single-handed practices are unable to uphold the same productivity and quality as the larger organisations. The changes of practice characteristics imply a greater extent of

teamwork with the involvement of different professional groups around each patient and a shift of functions from the doctors to other healthcare professionals (86–88).

However, no studies have yet explored how organisational characteristics (e.g. practice form and size) and the individuals' characteristics (e.g. age, gender, profession, work experience) are associated with OSC.

2. Aims of the thesis

The aims of the present studies were to:

I	Measure organisational social capital in Danish general practice and analyse associations between organisational social capital and individual and organisational characteristics.
II	Analyse associations between organisational social capital and patient evaluations of general practice.
III	Analyse associations between OSC and indicators of efficiency of COPD care in general practice.

3. Material and methods

3.1 Setting and design

We performed a cross-sectional national questionnaire-based survey in general practice in Denmark, measuring the level of OSC. In *Study I* we investigated associations between OSC and

individual characteristics and organisational characteristics of general practice. In *Study II* we combined the OSC survey with survey data regarding patient evaluations of general practice. In *Study III* we combined the OSC survey with register-based data regarding efficiency indicators comprising all patients from the participating practices, with a first-time COPD hospital admission in an interval of up to two years before the OSC survey. We used the time consumption measured by numbers of consultations per patient as a productivity indicator and the use of spirometry and prescriptions of specific COPD drugs as quality indicators in relation to patients with COPD.

3.2 Data sources and data collection

3.2.1 Organisational social capital in general practice (*Study I-III*)

From June to September 2011 all Danish general practitioners and their staff were invited to participate in a questionnaire survey measuring OSC in their practice. A complete list of general practices in Denmark (in total 2047 practices) was provided by the Organisation of General Practitioners. Based on the work of the NRCWE and the international standardised COPSOQ II questionnaire, the participants were asked to score a total of 11 items concerning the dimensions of trust, justice and cooperation skills within their own organisation (15,68,71). Each item was rated on a five-point Likert scale ranging from "poor", through "acceptable" to "excellent".

The trust scale comprised five statements (items 1.1-1.5) selected from the COPSOQ II dimensions of "trust regarding management" and "mutual trust between employees" (15). The justice scale comprised three statements (items 2.1-2.3) selected from the COPSOQ II dimension of "justice" (15). Regarding item 3.3 a negation of the original question from COPSOQ II (89) was used in order to check for consistency and make the respondents use both extremes of the 5-point

Likert scale. COPSOQ II does not include questions that relate directly to collaboration, but based on the use of the questionnaire the National Research Centre for the Working Environment has suggested the use of questions about social support from superiors and colleagues and about the community spirit in the workplace(13,15). We included these suggested ad hoc statements (item 3.1-3.3) to explore the dimension of "cooperation skills".

Scale, item number and questions

Scale	Number	Question
Trust	1.1	*You can trust the information coming from the management*
	1.2	*The management trust that the employees do their work well*
	1.3	*The employees do in general trust each other*
	1.4	*Do employees withhold information from each other?*
	1.5	*I am able to express my views and feelings to my colleagues*
Justice	2.1	*Conflicts between employees are resolved fairly for all involved*
	2.2	*Work is distributed fairly*
	2.3	*I do not have a large degree of influence over my work*
Cooperation skills	3.1	*Among us everybody is involved in decisions regarding changes*
	3.2	*If I forget something then one of my colleagues will take care of it for me*
	3.3	*We have good cooperation between workgroups*

In order to adapt the scales of trust, justice and cooperation skills to Danish general practice we used the Danish version of the items. Furthermore, we conducted interviews with all professional groups (doctors, nurses, secretaries and other healthcare personnel involved in general practice treatment) participating in the survey. Participants completed the questionnaire and were asked to comment on content, wording and intelligibility. No changes to the scales were made. Finally the questionnaire was pilot tested in the spring of 2011 in 100 randomly selected practices, selected by the Organisation of General Practitioners in Denmark. The internal consistency was found to be acceptable (Cronbach's alpha 0.52- 0.71).

For the survey a letter including questionnaires and a postage paid reply envelope were sent to each general practice in Denmark. The practice secretary was asked to distribute the questionnaires among the owner(s) and employee(s), fill in a background form with information about the practice, collect and return all questionnaires and the background form. Non-respondents received two reminders, the second one with new questionnaires, background form and pre-stamped reply envelopes. For respondents we were able to identify each respondent's practice, but not the individual person.

(Appendix I: Questionnaire used in the OSC survey)

(Appendix II: Background form used in the OSC survey)

3.2.2 DanPEP (Danish Patients Evaluate general Practice) survey data (*Study II*)

Patient evaluations based on studies of patients' priorities are a generally accepted method for quality assessment in general practice and in itself a key service of the healthcare system. Patient evaluations of general practice reflect the extent to which general practice succeeds in meeting the patients' individual needs (5,90–93).

The Danish EUROPEP survey, DanPEP (DANish Patients Evaluate general Practice), is a national survey using the EUROPEP questionnaire to measure patient-experienced quality of care in general practice. The EUROPEP questionnaire is an international standard comprising 23 items allocated to five dimensions: the doctor-patient relationship, quality of medical treatment, level of information and support, organisational service provided and accessibility. The DanPEP surveys have been conducted up to 2009. For each participating general practice 130 questionnaires were handed out consecutively to adult patients. The patients were included when attending the general practitioner with whom they were registered. All items were scored on a five-point Likert-scale (94–97).

3.2.3 Register-based data on COPD patients (*Study III*)

For this part of the thesis all data were grouped at Statistics Denmark. Statistics Denmark is a governmental institution collecting electronic records for a broad spectrum of statistical and scientific purposes in different registers. Since 1980 it has been possible to retrieve detailed longitudinal information at an individual level for the entire Danish population (5.56 million in 2011) (98).

All Danish citizens are registered in the Danish Civil Personal Registration System and assigned a unique civil personal registration number (CPR-number). Likewise, each general practice is assigned a unique identification number, enabling accurate linkage between patients and general practice (99).

Identification of COPD patients

The Danish National Patient Register has recorded administrative data from all hospital admissions to Danish hospitals, including diagnoses classified according to International Classification of Diseases 10th edition (ICD-10) since 1994. Using patients' CPR number, we linked the individual health administrative data with data from the Demographic Register obtaining dates of birth, deaths and migrations to or from Denmark (7).

COPD hospitalisation was defined as hospitalisation with one of the following combinations of ICD-10 diagnoses: 1) J41-44 (chronic bronchial conditions besides asthma) as primary diagnosis, or 2) J13-18 (pneumonia) or J96 (respiratory insufficiency) as primary diagnosis with J41-44 as a secondary diagnosis (100–102).

We used an 8-year retrospective period to determine, whether a patient's COPD hospitalisation was first-time (103) and ICD-10-coded diagnoses from the same period to calculate the Charlson comorbidity index (excluding COPD) (104). We used in-hospital morality and admission-free survival time between the first and second hospital admission to estimate whether OSC was associated with differences in admission severity threshold between the practices.

Identification of general practice variables

All general practitioners in Denmark are registered at the Organisation of General Practitioners.

The Health Insurance Register has complete individual-level data on the settling between general practice and the governmental regions of Denmark, including provider identification number, date and type of contact (phone, e-mail, surgery consultations and home visits), patient CPR numbers and services provided. Data for all contact between general practice and their COPD patient in the interval of one year before the first-time COPD hospital admission were retrieved. Likewise, data on all spirometry tests performed on COPD patients between 1994-2011 were retrieved (105).

The Danish National Prescription Database has complete individual-level data on all redeemed drug prescriptions (106). All drugs targeting COPD, with the anatomical therapeutic chemical (ATC) code R03, require a prescription. Data on all prescriptions for R03 drugs in an interval of one year before the first-time COPD hospital admission were retrieved. Prescription of the following specific R03 drugs and drug combinations are considered specific for COPD treatment: Long Acting Beta-2-adrenoceptor Agonist (LABA), Inhaled CorticoSteroids (ICS) in combination with LABA or Longacting Anticholingergs (LA).

3.3 Study populations

The Organisation of General Practitioners identified all Danish general practices 2074 in 2011. Of these 14 were closed and therefore wrongly identified. In total 2060 general practices were included.

Study I

To investigate associations between OSC and personal characteristics, all respondents from the OSC survey were included. To investigate associations between OSC and organisational characteristics, single-handed practices without any employees were excluded. Because of the structural differences within Denmark we chose to split the practices according to whether they were located in the capital region or other parts of Denmark.

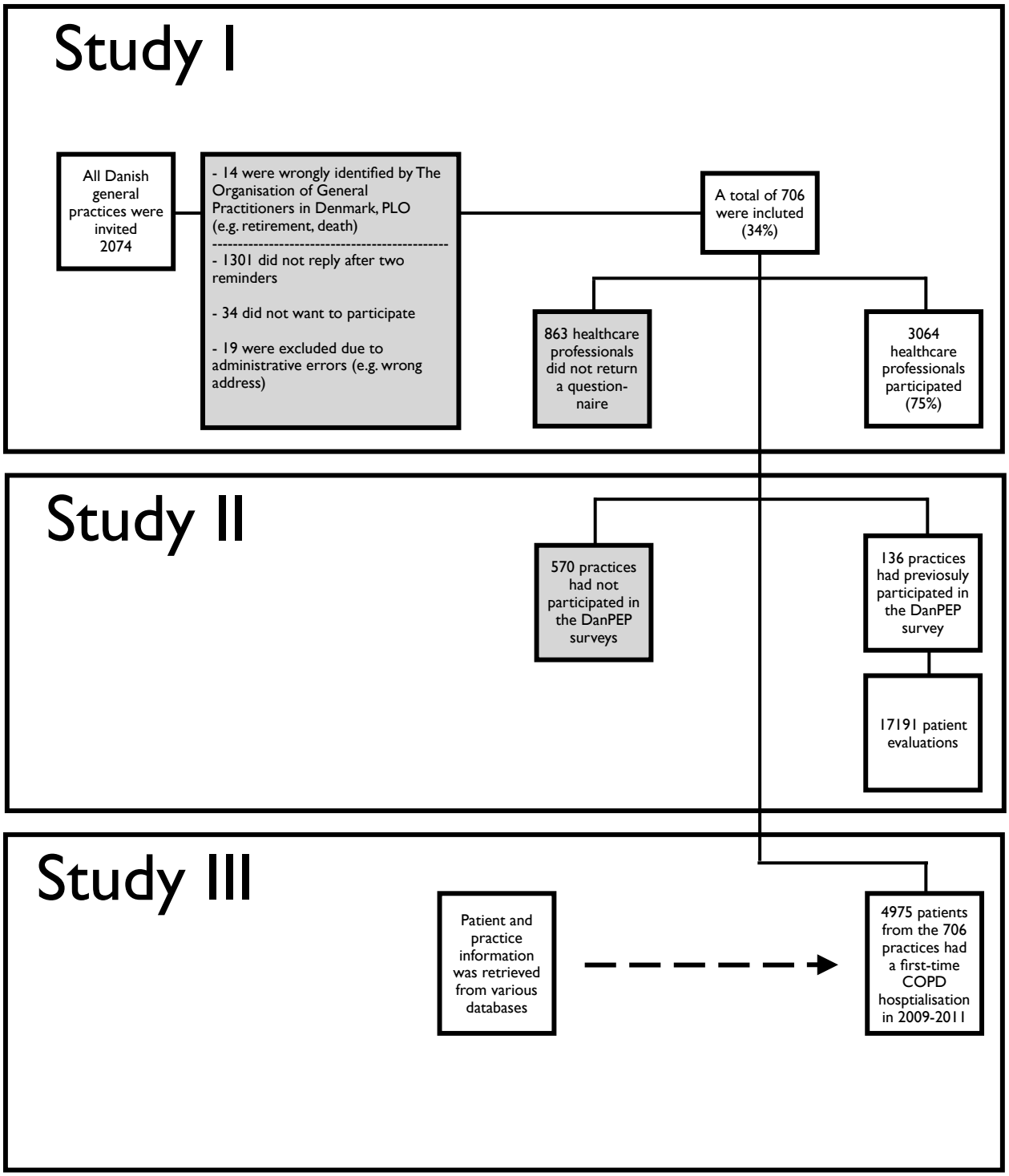
Study II

To investigate associations between OSC and patient evaluations of general practice, all practices from the OSC-survey previously participating in a DanPEP survey were included in the analysis.

Study III

To investigate associations between OSC and efficiency of COPD care, data for all patients with a first-time COPD hospital admission in a two-year interval prior to the OSC survey were retrieved, comprising all practices included in the OSC survey.

Flowchart: Inclusion of practices, healthcare professionals and patients



3.4 Outcome variables

Study I

The ratings of OSC and its three dimensions: trust, justice and cooperation skills.

Study II

Patient evaluations of general practice assessed in the national DanPEP survey based on the EUROPEP questionnaire.

Study III

For each general practice 1) The average time consumption for COPD patients in the one-year interval before a patient's first-time COPD hospital admission, measured by the mean number of consultations. 2) The proportion of COPD patients, who had had a spirometry test "up to 2 years before " or "up to 15 years before" (complete registration period) the first-time COPD hospital admission. 3) The proportion of COPD patients within each practice, who received prescriptions for specific COPD drugs in the one-year interval before the first-time COPD hospital admission.

3.5 Explanatory variables

Study I

The organisation form, number of healthcare professionals in the practice, number of patients listed with the practice, and gender, age and profession of the respondent.

Study II

The level of OSC, practice characteristics (organisation form, size of the organisation with regard to the number of healthcare professionals and the number of listed patients) and patient characteristics (sex, age, years listed with the present practice and self-rated health).

Study III

The level of OSC, practice characteristics (organisation form, size of the organisation with regard to the number of healthcare professionals and the number of listed patients) and patient characteristics (gender, age and comorbidity index).

3.6 Statistical analysis

Study I

The outcomes were the ratings of OSC and its three dimensions: trust, justice and cooperation skills. Each dimension was rated on a scale from 0 to 100. The rating of OSC was calculated as the mean of the ratings of the three dimensions. For each practice, the rating of OSC and the three sub-dimensions was calculated as a mean of the single ratings of all participants from that practice. Finally, the level of OSC in general practice in Denmark was calculated as a mean of the rating of the participating practices.

Possible associations with individual characteristics and organisational characteristics were analysed separately. Regression coefficients with 95% confidence intervals were calculated by means of univariate and multiple linear regression models. At the organisational level we adjusted for the geographical location (Danish capital region versus other parts of Denmark) of the practice. At the individual level we adjusted for geographical location of the practice and gender of the

respondent. The level of OSC and each of its three sub-dimensions trust, justice and cooperation skills were analysed separately. Single-handed practices without any employees were excluded for analysis at the organisational level.

All analyses were performed using Stata Release 11.0 (StataCorp, College Station, TX, USA). A p-value of <0.05 was considered statistically significant.

Study II

Analysis of associations with OSC and each of the dimensions: trust, justice and cooperation skills, was made. Regression coefficients (change in patient evaluation score when OSC increases by one) with 95% confidence intervals (CIs) were calculated by means of univariate and multiple linear regression models. To control for potential confounding factors we adjusted for organisational characteristics: organisation form, size of the organisation with regard to the number of healthcare professionals and the number of listed patients. Furthermore, we adjusted for patient characteristics: sex, age, years listed with current practice and self-rated health.

All analyses were performed using Stata Release 11.0 (StataCorp, College Station, TX, USA). A p-value <0.05 was considered statistically significant.

Study III

The following were calculated with regard to each general practice 1) Average time consumption for COPD patients in the one-year interval before a patient's first-time COPD hospital admission, measured by the mean number of consultations, 2) Proportion of COPD patients, who had had a spirometry test "up to 2 years before " or "up to 14 years before" the first-time COPD hospital

admission, 3) Proportion of COPD patients within each practice, who received prescriptions for specific COPD drugs in the one-year interval before the first-time COPD hospital admission.

OSC, patient characteristics (gender, age and comorbidity index) and practice characteristics (practice form, number of listed patients and number of healthcare workers) for each practice are reported as categorical variables.

The association with 95% confidence intervals (CI) between OSC (change of outcome when OSC increased by 1 point) and average number of consultations in general practice, proportion of patients having spirometry tests performed and proportion of patients receiving prescriptions for specific COPD drugs was analysed using linear regression. Analysis was conducted in three steps: unadjusted, adjusted for patient characteristics and finally adjusted for patient characteristics and organisational characteristics. The odds ratio with 95% CI for associations between OSC and in-hospital mortality was analysed using mixed logistic regression. Hazard ratio with 95% CI for associations between OSC and admission free survival time between the first to the second hospital admission was analysed using cox regression. P-values < 0.05 were considered statistically significant. All statistical analyses were carried out using STATA 11 (STATACorp, College Station, TX, USA).

3.7 Ethics

The study was approved by the Danish Data Protection Agency (2012-41-1286 and 2012-41-0985) and recommended by the Multi Practice Committee under the Danish College of General Practitioners.

The use of data from the DanPEP surveys was approval by the Research and Quality Committee in relation to the Danish General Practice Database.

As the study was questionnaire- and register-based and did not involve human biological material, according to the Danish legislation no approval from the Biomedical Research Ethics Committee was required.

4 Study results

4.1 Organisational social capital in general practice is strongly associated with characteristics of the organisation and the subjects working within it

All 2060 Danish general practices were invited to participate. A total of 706 general practices responded (34.3%). Of the participating practices 42.7% were single-handed practices and 29.8% were located within the capital region. The mean number of healthcare workers in the participating practices was 5.7 and a mean of 4.3 persons per practice responded, corresponding to a response rate from the participating practices of 75.4%. A total of 3064 persons completed the questionnaire. Of the respondents 62.7% were women and the mean age was 48 years. Table 1.1 shows baseline characteristics.

Table 1.1: Basic characteristics

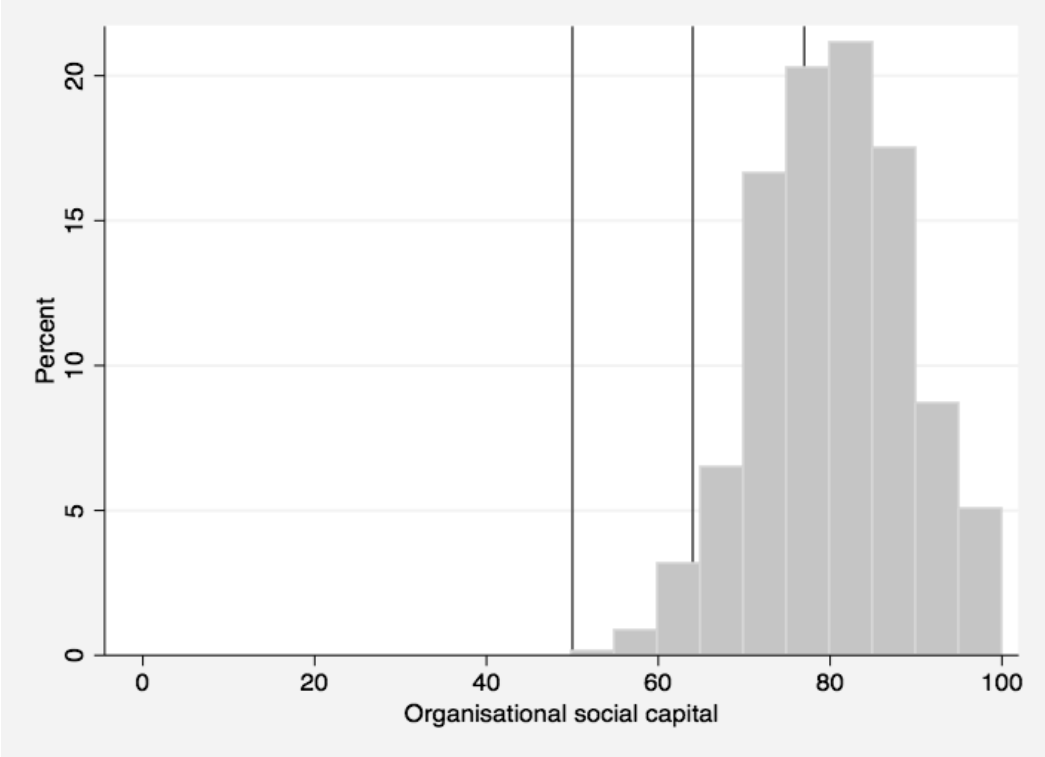
Table 1.1: Basic characteristics in absolute numbers and percentages

Basic characteristics	**N (%*)**
Individual characteristics	
Total number of individuals included	3064
Woman	1922 (62.7)
Age (mean, SD)	48.0 (9.9)
Profession	
Owners (always doctors)	1132 (37.6)
Employed doctors	256 (8.5)
Nurses	810 (26.9)
Secretaries	678 (22.5)
Medical Laboratory Technologist	63 (2.1)
Other	138 (4.6)
Owner characteristics	
Woman	409 (36.1)
Age (SD)	52.1 (8.8)
Years in present practice (SD)	14.1 (9.6)
Organisational characteristics	
Total number of participating practices	706 (34.3)
Practice form	
Single-handed practices	253 (42.7)
Shared-/Partnership practices	339 (57.3)
Mean number of employees (range, SD)	5.7 ([1-28]; 3.6)
Mean number of full-time employees per doctor (range; SD)	0.4 ([0-4]; 0.5)
Mean number of listed patients (range; SD)	3186.5 ([105-14920]; 2001.0)
Mean number of listed patients per doctor (range; SD)	1244.8 ([83.3-3200]; 446.7)

* If not specified in first column

The mean rating of OSC in general practice reached 80.5 (SD 8.74) out of 100 points, but with high variation within the practices. More than two-thirds (82.0%) of the practices had variation higher than the theoretical clinical limit of 0.5*SD = 4.37 points (15). Distribution of OSC is shown in Figure 1.1.

Figure 1.1: Distribution of score of mean organisational social capital (consisting of the dimensions trust, justice and cooperation skills) in general practice in Denmark. The three lines represent limit for low (score below 50 points), the Danish mean (64.9 points), and the limit for high (score above 77 points) organisational social capital.



At the individual level we found that male gender was positively associated with OSC, which was rated 2.21 points higher (95% confidence interval 1.00 to 3.43; p<0.001) compared to women. This was valid for all three sub-dimensions, but mostly for justice with a difference of 4.33 points (95% confidence interval 2.96 to 5.70; p<0.001). We found no associations between the rating of OSC and the age of the respondents, nor the location of the practice. For practices with a

single owner, the gender of the owner had no effect.

Profession was statistically significantly associated with rating of OSC. Doctors rated highest. Compared to doctors, nurses rated -2.67 (95% confidence interval -4.11 to -1.22; $p<0.001$) and secretaries -3.94 (95% confidence interval -5.47 to -2.41; $p<0.001$). This pattern was the same for virtually all sub-dimensions of OSC and was persistent after adjusting for gender of the respondent and the geographical location of the practice.

There was a tendency towards persons employed at the same practice between 6-10 years rating OSC lower than persons employed "<6 years" and ">10 years" (-1.72, 95%-CI (-3.49, 0.04)).

Employees rated OSC -2.71 (95% confidence interval -3.51 to -1.11; $p<0.001$) compared to the owners, adjusted for gender of respondent and geographical location of the practice, although employed doctors rated almost the same as the owners -0.14 (95% confidence interval -1.70 to 1.99; $p=0.878$).

Among the sub-dimensions of social capital, cooperation skills were rated higher by employed doctors compared to owners, although not statistically significant, 2.06 (95% confidence interval -0.15 to 4.27; $p=0.068$). The sub-dimension with the lowest rating was justice (mean 79.79; SD 9.69). Regarding cooperation skills only the ratings of practice owners and secretaries were significantly different -2.32 (95% confidence interval -4.08 to -0.57; $p=0.010$).

Associations between OSC including its sub-dimensions and individual characteristics are shown in Table 1.2.

Table 1.2: Associations between outcome measures and individual characteristics.

Table 1.2: Associations between outcome measures and individual characteristics

Individuals	**Social Capital**				**Trust**				**Justice**				**Cooperation skills**			
	Crude	Adjusted			Crude	Adjusted			Crude	Adjusted			Crude	Adjusted		
	Coef.	Coef.	95% CI		Coef.	Coef.	95% CI		Coef.	Coef.	95% CI		Coef.	Coef.	95% CI	
Gender, men compared to woman	2.20***	2.21***	[1.00	3.43]	1.04	1.05	[-0.15	2.25]	4.33***	4.33***	[2.96	5.70]	1.65*	1.65*	[0.27	3.04]
Age	0.00	-0.01	[-0.07	0.05]	-0.01	-0.02	[-0.07	0.04]	0.02	-0.01	[-0.08	0.06]	-0.03	-0.04	[-0.10	0.03]
Profession, compared to ordinary MD's																
Employed MD	-0.43	0.14	[-1.70	1.99]	-0.07	0.70	[-1.13	2.52]	-2.21*	-1.76	[-3.92	0.40]	-1.40	2.06	[-0.15	4.27]
Nurses	-2.47***	-2.63**	[-4.14	-1.12]	-1.84*	-2.22*	[-3.70	-0.74]	-4.51***	-4.23***	[-5.99	-2.48]	-1.07	-0.96	[-2.69	0.77]
Secretaries	-3.82***	-3.91***	[-5.46	-2.36]	-2.86**	-3.38***	[-4.90	-1.87]	-6.65***	-6.40***	[-8.22	-4.58]	-2.33*	-2.32*	[-4.08	-0.57]
Other	-2.81	-1.66	[-4.52	1.19]	-2.93*	-2.09	[-4.82	0.65]	-4.97*	-3.58*	[-6.65	-0.52]	-1.30	0.00	[-3.10	3.11]
Employed healthcare persons compared to owners	-2.71	-2.31***	[-3.51	-1.11]	-2.07***	-1.88**	[-3.08	-0.67]	-5.01***	-4.26***	[-5.65	-2.88]	-1.21*	-0.60	[-2.01	0.81]
Part time compared to full time	-1.96***	-1.51*	[-2.68	-0.35]	-1.76***	-1.51**	[-2.61	-0.41]	-3.24***	-2.14**	[-3.55	-0.73]	-0.89	-0.38	[-1.71	0.96]
Employment length, compared to '0-1 years'																
Years 2-5	-1.28	-1.26	[-2.80	0.29]	-1.41	-1.64*	[-3.11	-0.17]	-1.41	-1.09	[-2.93	0.75]	-1.99*	-1.87*	[-3.59	-0.14]
Years 6-10	-1.54	-1.72	[-3.49	0.04]	-1.69*	-2.20*	[-3.91	-0.50]	-1.25	-1.11	[-3.27	1.06]	-1.83*	-2.03*	[-3.99	-0.06]
Years 11+	-0.18	-0.63	[-2.18	0.93]	-0.55	-1.38	[-2.86	0.10]	0.73	0.18	[-1.67	2.02]	-1.39	-1.56	[-3.31	0.19]
Number of patients (quartiles, compared to smallest quartile, adjusted for geography and number of healthcare staff in the practice)																
Second quartile	-1.11	-1.12	[-3.41	1.18]	-1.52	-1.52	[-3.70	0.66]	-1.15	-0.86	[-3.42	1.69]	-2.11*	-2.10	[-4.49	0.28]
Third quartile	-2.67*	-2.69*	[-5.34	-0.03]	-2.48*	-2.26	[-4.91	0.40]	-3.02**	-2.72	[-5.63	0.19]	-3.41**	-3.71**	[-6.37	-1.05]
Fourth quartile	-5.29***	-4.40*	[-8.17	-0.64]	-4.80***	-3.80*	[-7.34	-0.25]	-5.63***	-4.37*	[-8.54	-0.20]	-6.21***	-5.30**	[-9.20	-1.40]

*p<0.05 **p<0.01 ***p<0.001. Adjusted: Differences are adjusted for gender of the respondent and geography of the practice.

When comparing OSC at the organisational level we found that small single-handed practices – both in terms of number of healthcare staff in the practice and in terms of number of listed patients – had higher ratings of OSC compared to other practices. All professional groups (including owners) from small single-handed practices rated higher than their corresponding professional groups working in other practices. The biggest difference was between employed doctors working in single-handed practices compared to employed doctors working in other practice forms, where the difference was 4.56 (95% confidence interval 1.31 to 7.84; p=0.003). The interclass correlation showed that 28% of the differences in OSC score could be explained by the organisational characteristics.

Adding one additional person to a practice reduced the OSC by 0.60 (95% confidence interval -0.62 to -0.78; p<0.001) (Figure 1.2). Compared to single-handed practices shared practices rated -3.63 (95% confidence interval -5.61 to -1.65; p<0.001) and partnership practices rated -3.17 (95% confidence interval -4.76 to -1.58; p<0.001).

Associations between OSC, the sub-dimensions and organisational characteristics are shown in Table 1.3.

Figure 1.2: Effect of increasing the size of the organisation. The numbers show that 81 of the included practices had 2 staff members, 98 had 3 etc. The 9 practices with only one staff member (a doctor) were excluded from the organisation analyses, but are shown here to present the difference between these and the 'organisations'. Adding one additional member decreases the organisational social capital with 0.60 points.

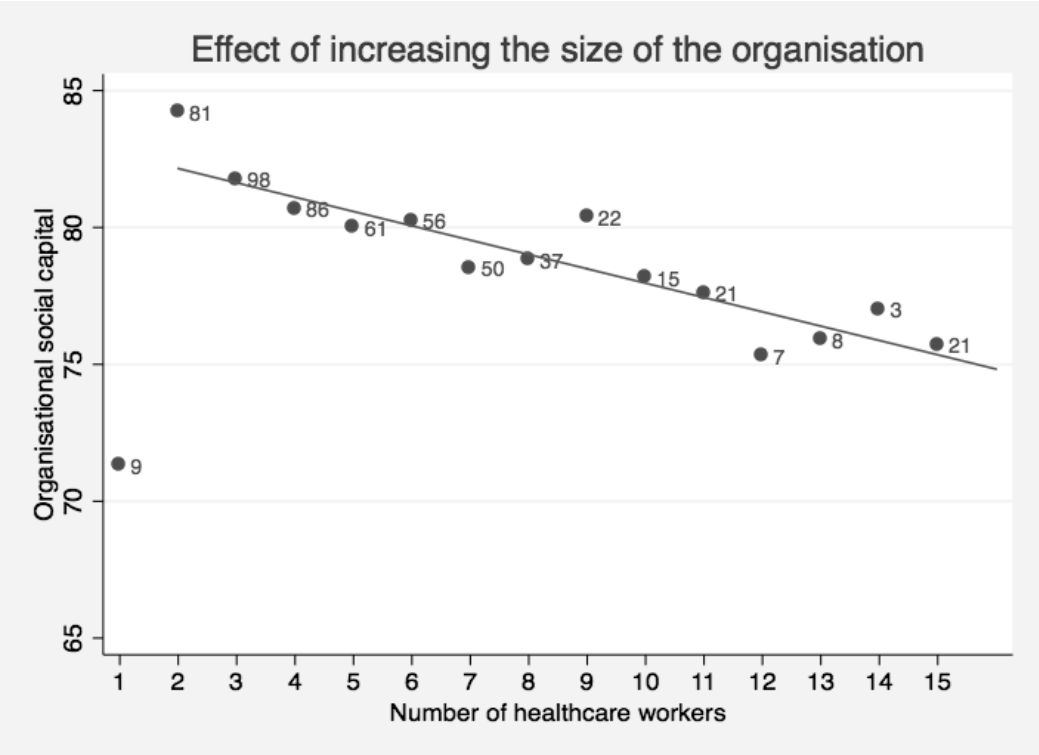


Table 1.3: Associations between outcome measures and organisational characteristics.

Table 1.3: Associations between outcome measures and organisational characteristics

Individuals	**Social Capital**				**Trust**				**Justice**				**Cooperation skills**			
	Crude	Adjusted			Crude	Adjusted			Crude	Adjusted			Crude	Adjusted		
	Coef.	Coef.	95% CI		Coef.	Coef.	95% CI		Coef.	Coef.	95% CI		Coef.	Coef.	95% CI	
Type of practice compared to single-handed practices																
Shared practices	-3.69***	-3.63***	[-5.61	-1.65]	-3.09**	-3.02**	[-4.93	-1.10]	-4.16***	-4.11***	[-6.31	-1.90]	-4.14***	-4.12***	[-6.37	-1.87]
Partnership practices	-3.21***	-3.17***	[-4.76	-1.58]	-2.43**	-2.37**	[-3.90	-0.83]	-3.76***	-3.72***	[-5.48	-1.96]	-4.32***	-4.30***	[-6.10	-2.50]
Effect of adding one doctor to the organisation, compared to practices with one doctor	-1.01***	-0.99***	[-1.36	-0.62]	-0.79***	-0.77***	[-1.14	-0.41]	-1.15***	-1.13***	[-1.55	-0.72]	-1.18***	-1.71***	[-1.60	-0.75]
Effect of adding one employee to the organisation, compared to practices with one employee	-1.80**	-1.90**	[-3.26	-0.54]	-1.25	-1.34*	[-2.66	-0.02]	-2.27**	-2.37**	[-3.86	-0.88]	-2.18**	-2.28**	[-3.85	-0.71]
Number of staff, compared to practices with one staff member	-0.51***	-0.51***	[-0.71	-0.31]	-0.39***	-0.39***	[-0.58	-0.19]	-0.60***	-0.60***	[-0.83	-0.38]	-0.62***	-0.64***	[-0.87	-0.41]
Effect of adding listed patients to the practice (quartiles, compared to smallest quartile, adjusted for geography and number of healthcare staff in the practice)																
Second quartile	-0.10	-0.10	[-2.23	2.03]	-0.69	-0.69	[-2.74	1.35]	0.16	0.16	[-2.19	2.51]	-0.05	-0.05	[-2.46	2.36]
Third quartile	-1.98	-1.95	[-4.11	0.22]	-2.02	-1.97	[-4.05	0.11]	-1.78	-1.74	[-4.14	0.65]	-3.08*	-3.07*	[-5.52	-0.63]
Fourth quartile	-3.74**	-3.68**	[-5.85	-1.51]	-3.24**	-3.16**	[-5.24	-1.07]	-4.38***	-4.31***	[-6.72	-1.91]	-4.48	-4.47***	[-6.92	-2.01]

*p<0.05 **p<0.01 ***p<0.001
Differences are adjusted for geography of the practice.

4.2 Organisational social capital is significantly associated with patient evaluations of general practice: A population-based study in Danish general practice

Enrollment and participant characteristics

Data regarding OSC were obtained from 706 (34.3%) Danish general practices, 42.7% were single-handed practices and 70.2% were located in rural areas. A total of 3064 individual healthcare professionals completed the questionnaire, corresponding to 75.4% of the healthcare professionals from the participating practices. Details and demographics have been shown in *Study I*. Of the 706 participating practices in the OSC survey, 136 also participated in the DanPEP survey, with a total of 679 healthcare professionals and 17191 patient evaluations (mean number of evaluations per practice 126.4, SD 82.55). Only minor differences between the practices participating in both surveys and practices only participating in the OSC survey were found (Table 2.1).

Table 2.1: Basic characteristics comparing practices participating in both the OSC and the DanPEP surveys with practices only participating in the OSC survey.

Table 2.1: Basic characteristics of practices participating in the OSC survey and the DanPEP survey

	Participants in OSC and DanPEP N (%*)	Participants in OSC but not DanPEP N (%*)
Organisational characteristics		
Number of practices	136 (19.3)	570 (80.7)
Total number of patient evaluations	17191	-
Evaluations per practice, mean (SD)	126.4 (82.6)	-
Organisational social capital, mean (SD)	80.3 (8.1)	80.5 (8.9)
Practice form		
Single-handed practices	46 (40.0)	206 (43.3)
Shared-/partnership practices	69 (60.0)	270 (56.7)
Number of listed patients, mean (SD)	3362.3 (1935.1)	3148.6 (2017.1)
Number of healthcare prof., mean (SD)	6.1 (3.6)	5.6 (3.7)
Patient characteristics (DanPEP respondents)		
Woman	5650 (33.5)	-
Age, mean (SD)	53.3 (17.7)	-
Years listed with current practice, mean (SD)	8.6 (8.1)	-
Self-rated health status		
Excellent	1067 (6.1)	-
Very good	4614 (26.8)	-
Good	7117 (41.4)	-
Fair	2799 (16.3)	-
Poor	566 (5.5)	-

* % if not specified in first column.

Associations between OSC and patient-evaluated quality of general practice

The level of OSC was statistically significantly and positively associated with patient evaluations of general practice. The association was linear with a change in patient evaluation score of 0.13 (95% confidence interval 0.02 to 0.249) when OSC increased by one (Figure 2.1). Unadjusted results indicated that both organisational characteristics (OSC, practice form and size) and patient characteristics (sex and number of years with the present practice) were statistically associated with the patient evaluations. Adjustments ruled out the effect of all but OSC (Table 2.2).

Figure 2.1: Effect of organisational social capital on patient evaluations of general practice care.

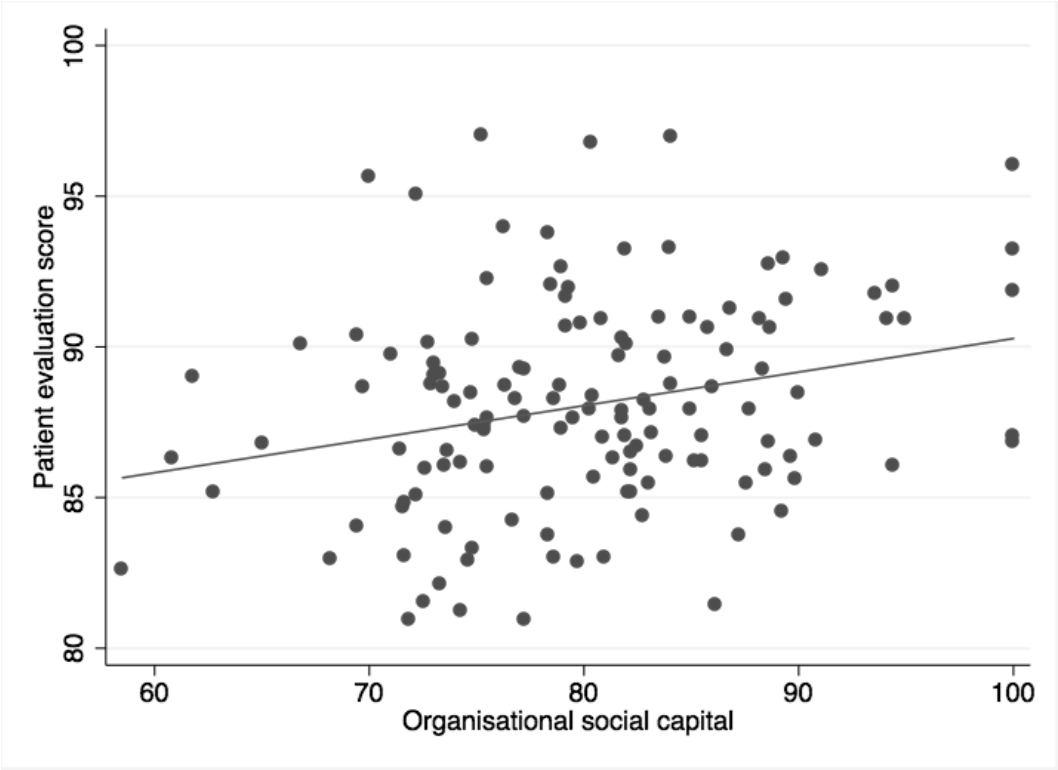


Table 2.2: The adjusted association between patient evaluations of general practice and organisational and patient characteristics. Patient evaluation score and OSC were measured for each practice.

Table 2.2: Adjusted association between patient evaluations of general practices and organisational and patient characteristics. Patient evaluation score and OSC were measured for each practice.

	Coef.	Adj. Coef.	95% CI	P-value
Organisational characteristics				
Organisational social capital	0.11*	0.13	[0.02 ; 0.24]	0.023
Practice form	-1.46*	-1.17	[-3.68 ; 1.34]	0.356
Number of listed patients	0.00	0.00	[0.00 ; 0.00]	0.700
Number of healthcare professionals	-0.19	0.12	[-0.36 ; 0.61]	0.616
Patient characteristics				
Woman	3.29	3.45	[-2.43 ; 9.33]	0.245
Age	0.15*	0.13	[-0.04 ; 0.31]	0.136
Years listed with current practice	0.22*	0.14	[-0.06 ; 0.34]	0.158
Self-rated health status	-0.54	5.90	[-2.33 ; 14.12]	0.157

* $p<0.05$ for the unadjusted coefficient

The three dimensions comprising OSC all showed similar positive associations: trust coefficient 0.11 (95% confidence interval 0.01 to 0.21), justice coefficient 0.12 (95% confidence interval 0.01 to 0.22) and cooperation skills coefficient 0.11 (95% confidence interval 0.01 to 0.21). The intraclass correlation with regard to the practices was high for both OSC (ICC=26%) and patient-evaluated quality of the practices (ICC=5%).

We assessed the reliability of each of the five dimensions in the DanPEP questionnaire when applied to our sample and found Cronbach's alphas between 0.70-0.92. The following dimensions showed positive statistically significant association with the OSC score: the doctor-patient relationship 0.04 (95% confidence interval

0.00 to 0.07), the quality of medical care 0.04 (95% confidence interval 0.01 to 0.06), the level of information and support 0.03 (95% confidence interval 0.00 to 0.05) and the organisational service provided 0.01 (95% confidence interval 0.00 to 0.03). The only dimension not statistically significantly associated with the level of OSC was the level of accessibility 0.01 (95% confidence interval -0.03 to 0.06) (Table 2.3).

Table 2.3: The adjusted association between organisational and patient characteristics for each of the DanPEP dimensions. Patient evaluation score and OSC were measured for each practice.

Table 2.3 (Part 1/2): Adjusted association between patient evaluations of general practices and organisational and patient characteristics. Patient evaluation score and OSC were measured for each practice.

	Coef.	Adj. Coef.	95% CI	P-value
Doctor-patient relationship				
Organisational social capital	0.01	0.04	[0.00 ; 0.07]	0.034
Practice form	0.30	0.03	[-0.75 ; 0.80]	0.947
No. patients listed	0.00	0.00	[0.00 ; 0.00]	0.859
No. healthcare professionals	0.04	0.08	[-0.07 ; 0.23]	0.295
Patient sex	0.06	0.55	[-1.26 ; 2.37]	0.544
Patient age	0.02	0.02	[-0.03 ; 0.07]	0.463
Years listed with current practice	0.04	0.03	[-0.03 ; 0.09]	0.344
Patient self-rated health	0.43	1.67	[-0.88 ; 4.21]	0.194
Medical care				
Organisational social capital	0.01	0.04	[0.01 ; 0.06]	0.010
Practice form	0.11	0.02	[-0.59 ; 0.64]	0.948
No. patients listed	0.00	0.00	[0.00 ; 0.00]	0.871
No. healthcare professionals	0.02	0.06	[-0.06 ; 0.18]	0.320
Patient sex	0.37	0.38	[-1.06 ; 1.82]	0.600
Patient age	0.02	0.02	[-0.02 ; 0.07]	0.296
Years listed with current practice	0.05*	0.03	[-0.02 ; 0.08]	0.190
Patient self-rated health	0.13	1.09	[-0.93 ; 3.10]	0.284
Information and support				
Organisational social capital	0.01	0.03	[0.00 ; 0.05]	0.030
Practice form	0.24	0.07	[-0.49 ; 0.63]	0.799
No. patients listed	0.00	0.00	[0.00 ; 0.00]	0.658
No. healthcare professionals	0.03	0.07	[-0.04 ; 0.18]	0.186
Patient sex	-0.13	-0.37	[-1.68 ; 0.94]	0.571
Patient age	0.02*	0.04	[0.00 ; 0.08]	0.070
Years listed with current practice	0.03	0.01	[-0.03 ; 0.06]	0.508
Patient self-rated health	0.21	0.53	[-1.30 ; 2.36]	0.564

Table 2.3 (Part 2/2): Adjusted association between patient evaluations of general practices and organisational and patient characteristics. Patient evaluation score and OSC were measured for each practice.

	Coef.	Adj. Coef.	95% CI			P-value
Organisation of services						
Organisational social capital	0.01	0.01	[0.00	;	0.03]	0.024
Practice form	0.06	0.00	[-0.28	;	0.27]	0.986
No. patients listed	0.00	0.00	[0.00	;	0.00]	0.838
No. healthcare professionals	0.01	0.03	[-0.02	;	0.08]	0.289
Patient sex	0.17	0.16	[-0.49	;	0.80]	0.629
Patient age	0.02*	0.02	[0.00	;	0.04]	0.025
Years listed with current practice	0.02*	0.01	[-0.01	;	0.03]	0.361
Patient self-rated health	0.16	0.48	[-0.42	;	1.37]	0.291
Accessibility						
Organisational social capital	0.08*	0.01	[-0.03	;	0.06]	0.545
Practice form	-2.17*	-1.28	[-2.36	;	-0.21]	0.020
No. patients listed	0.00*	0.00	[0.00	;	0.00]	0.693
No. healthcare professionals	-0.29*	-0.12	[-0.32	;	0.09]	0.264
Patient sex	2.82*	2.73	[0.21	;	5.25]	0.034
Patient age	0.06*	0.03	[-0.04	;	0.11]	0.403
Years listed with current practice	0.08	0.06	[-0.03	;	0.14]	0.195
Patient self-rated health	-1.47	2.13	[-1.39	;	5.66]	0.231

* $p < 0.05$ for the unadjusted coefficient

4.3 Organisational social capital is associated with efficiency of general practice care: A population-based combined register and survey study.

Enrollment and participant characteristics

Data on OSC were obtained from 706 (34.3%) Danish general practices, of which 42.7% were single-handed practices. A total of 3064 individual healthcare professionals completed the questionnaire. The practices had a mean of 3225 patients listed. Further details have been shown in *Study I*.

A total of 4957 patients from the participating practices had a first-time COPD admission in the 2-year period before the OSC survey. The COPD patients had a mean number of 21.6 contacts to general practice in the year before their first-time COPD hospital admission. As shown in Table 3.1: 54.0% were women, the mean age was 71.3 and the mean Charlson comorbidity index was 1.5 (no points were added for COPD).

Table 3.1: Baseline characteristics.

Table 3.1: Baseline characteristics

	N (%*)
Number of participating practices	706 (34.3•)
Total number of patients from the participating practices with a first-time hospital admission regarding COPD in 2009-2011	4957
Organisational characteristics	
Number of listed patients, mean (SD)	3225 (2004)
Number of healthcare prof., mean (SD)	5.7 (3.6)
Organisational social capital, mean (SD)	80.4 (8.7)
Practice form	
Single-handed practices	244 (42.7)
Shared-/partnership practices	335 (57.3)
Patient Characteristics	
Woman	2678 (54.0)
Age, mean (SD)	71.3 (11.6)
Mean score on the Charlson comorbidity index (excluding COPD) (SD)	1.5 (1.8)
Total number of patients who had a spirometry test up to two years before the first-time hospital admission regarding COPD	1747 (35.2)
Total number of patients who had spirometry test up to fourteen years before the first-time hospital admission regarding COPD	2991 (60.3)
Number of patients who received prescriptions for specific COPD drugs in the year before their first-time COPD hospital admission✞	2924 (59.0)
Mean number of contacts with general practice in the year before the first-time hospital admission regarding COPD (SD)	21.6 (17.7)

Principal findings

The number of consultations decreased by -0.057 (CI -0.103 to -0.010) when OSC increased by one point (from 0 to 100), adjusted for patient characteristics and organisational characteristics (Table 3.2).

Table 3.2: Associations between organisational social capital and the number of consultations between general practice and listed COPD patients in the year prior to the first-time hospital admission for COPD.

Table 3.2: Associations between organisational social capital and the number of consultations between general practice and listed COPD patients in the year prior to the first-time hospital admission for COPD.
Change in number of consultations, 95% confidence intervals and P-values

	Change no. cons.	95% CI	P-value
Unadjusted organisational social capital	-0.063	[-0.101 ; -0.024]	0.001
Adjusted for patient characteristics			
Organisational social capital	-0.064	[-0.102 ; -0.026]	0.001
Gender (ref. female)	-0.543	[-1.917 ; 0.831]	0.438
Age	-0.063	[-0.125 ; -0.001]	0.045
Charlson comorbidity index	0.460	[0.116 ; 0.805]	0.009
Adjusted for patient- and organisational characteristics			
Organisational social capital	-0.057	[-0.103 ; -0.010]	0.017
Gender (ref. female)	-0.861	[-2.478 ; 0.756]	0.296
Age	-0.058	[-0.129 ; 0.012]	0.106
Charlson comorbidity index	0.321	[-0.072 ; 0.714]	0.109
Practice form (ref. single-handed)	-0.936	[-1.961 ; 0.089]	0.073
No. of healthcare prof. in practice	0.189	[-0.028 ; 0.406]	0.088
No. of patients listed at practice	0.000	[0.000 ; 0.000]	0.804

For patients with a first-time COPD hospital admission in 2009-2011, 35.2% had a spirometry test up to 2 years before the hospital admission and 60.3% up to 14 years before the hospital admission. Increasing OSC with one point (from 0 to 100) was not associated with changes in use of spirometry test up to 2 years before (-0.001 (CI -0.003 to 0.002)) or up to 14 years before (-0.001 (CI -0.004 to 0.002)) the hospital admission, when adjusting for patient characteristics and organisational characteristics (Tables 3.3a and 3.3b).

Table 3.3: Association between organisational social capital and the use of spirometry in the 2-year (3.3a) interval or 14-year interval (3.3b) before a patient's first-time hospital admission regarding COPD.

Table 3.3a: Use of spirometry tests up to 2 years before the first-time COPD hospital admission. Characteristics, change in number of consultations, 95% confidence intervals and P-values

	Change in use of spirometry	95% CI		P-value
Unadjusted organisational social capital	-0.001	[-0.004	0.001]	0.309
Adjusted for patient characteristics				
Organisational social capital	-0.001	[-0.003	0.001]	0.342
Woman	0.115	[0.033	0.197]	0.006
Age	-0.001	[-0.005	0.002]	0.427
Charlson's comorbidity index	-0.050	[-0.071	-0.030]	0.000
Adjusted for patient- and organisational characteristics				
Organisational social capital	-0.001	[-0.003	0.002]	0.663
Woman	0.135	[0.041	0.228]	0.005
Age	-0.001	[-0.005	0.003]	0.547
Charlson's comorbidity index	-0.058	[-0.081	-0.036]	0.000
Practice form (ref. single-handed)	-0.014	[-0.074	0.045]	0.635
No. of healthcare prof. in practice	0.014	[0.001	0.026]	0.031
No. of patients listed at practice	0.000	[0.000	0.000]	0.423

Table 3.3b: Use of spirometry tests up to 14 years before the first-time COPD hospital admission. Characteristics, change in number of consultations, 95% confidence intervals and P-values

	Change in use of spirometry	95% CI	P-value
Unadjusted organisational social capital	-0.001	[-0.004 ; 0.001]	0.254
Adjusted for patient characteristics			
Organisational social capital	-0.001	[-0.004 ; 0.001]	0.256
Woman	0.027	[-0.064 ; 0.119]	0.556
Age	-0.003	[-0.007 ; 0.002]	0.230
Charlson comorbidity index	-0.029	[-0.052 ; -0.006]	0.015
Adjusted for patient- and organisational characteristics			
Organisational social capital	-0.001	[-0.004 ; 0.002]	0.676
Woman	0.020	[-0.087 ; 0.127]	0.716
Age	-0.002	[-0.006 ; 0.003]	0.496
Charlson comorbidity index	-0.029	[-0.055 ; -0.003]	0.027
Practice form (ref. single-handed)	0.009	[-0.059 ; 0.077]	0.793
No. of healthcare prof. in practice	0.016	[0.002 ; 0.031]	0.024
No. of patients listed at practice	0.000	[0.000 ; 0.000]	0.358

A total of 59.0% received prescriptions for specific COPD drugs within one year before their first-time COPD hospital admission. Increasing OSC with one point (from 0 to 100) was not associated with the use of specific COPD drugs (-0.002 (CI -0.004 to 0.001)), when adjusting for patient characteristics and organisational characteristics (Table 3.4).

OSC was not associated with in-hospital mortality (Odds Ratio 1.007 (CI 0.993 to 1.020)) or the time between the first and second hospital admission (Haz.

Ratio 1.000 (CI 0.996 to 1.005).

Table 3.4: Associations between organisational social capital and the prescription pattern for specific COPD targeting drugs in the year prior to the first-time hospital admission regarding COPD.

Table 3.4: Association between OSC and prescription for specific COPD drugs

	Change in use of drugs	95% CI	P-value
Unadjusted organisational social capital	-0.001	[-0.003 ; 0.001]	0.264
Adjusted for patient characteristics			
Organisational social capital	-0.001	[-0.003 ; 0.001]	0.299
Woman	0.043	[-0.032 ; 0.119]	0.262
Age	0.002	[-0.001 ; 0.006]	0.155
Charlson comorbidity index	-0.021	[-0.040 ; -0.002]	0.030
Adjusted for patient- and organisational characteristics			
Organisational social capital	-0.002	[-0.004 ; 0.001]	0.194
Woman	0.062	[-0.025 ; 0.148]	0.163
Age	0.002	[-0.002 ; 0.006]	0.303
Charlson comorbidity index	-0.029	[-0.051 ; -0.008]	0.006
Practice form (ref. single-handed)	-0.034	[-0.089 ; 0.021]	0.226
No. of healthcare prof. in practice	0.009	[-0.003 ; 0.020]	0.138
No. of patients listed at practice	0.000	[0.000 ; 0.000]	0.186

5 General Discussion

5.1 Main findings

The variation in OSC between the participating general practices was significantly associated with individual and organisational characteristics. Regarding individual characteristics, male gender and high profession were associated with higher ratings of OSC. Regarding organisational characteristics, small single-handed practices rated OSC higher than other practice forms.

When combining the OSC survey with patient evaluations of general practice, strong positive associations were found.

Likewise, OSC was associated with efficiency in general practice, in terms of reducing the time consumption for COPD patients without compromising the use of spirometry or the use of specific COPD drugs.

5.2 Strengths and limitations

Several strengths and limitations need to be discussed in order to evaluate the internal validity (methodological considerations and bias) and external validity (generalisability) of the performed studies. These issues are discussed in the following section.

Methodological considerations:

The OSC survey was conducted using a multidimensional questionnaire designed for the specific purpose of measuring OSC (71). It was selected on the basis of theoretical considerations and adapted to the use in this specific study population. The survey

investigated the dimensions of trust, justice and cooperation skills. The dimensions of trust and justice were adopted from the COPSOQ II questionnaire. Several studies have investigated the use of the COPSOQ instruments to assess dimensions of the psychosocial work environment in Danish and international settings and found it to be reliable and valid (62–77). The dimension of cooperation skills was not included in the COPSOQ II, but items for assessing this dimension was proposed by the authors of the COPSOQ questionnaire based on items from other included scales (13,71). We tested the use of all three dimensions in our study population. Furthermore, analyses of the single dimensions of OSC were conducted and all showed the same associations with regard to both individual and organisational characteristics.

A potential weakness linked to the measuring of OSC is its observational nature using individual perceptions of OSC to calculate the organisations' OSC (77). There is no gold standard for measuring social capital with which the used method could be compared, but other methods have been proposed. These primarily focus on networks in communities or other geographical entities, rather than organisations. Also with regard to the effect of social capital in workplaces, associations with individual (e.g. health benefits or burnout) are the main focus instead of outcomes related to productivity and quality (12,43,107). Because of these differences it was difficult to make direct comparison between the methods used in this thesis and previous works.

Selection bias

First of all data were obtained from a large cohort of more than 700 general practices in a cross-sectional national survey. To our knowledge no other studies regarding the psychosocial work environment in Danish general practice have reached these

proportions. Nonetheless, this corresponds to no more than 34% of the general practices in Denmark. Those general practices that participated in the studies of this thesis are not necessarily a representative fraction of Danish general practice, and the possibility of selection bias must be considered. On this basis the mean OSC for general practice in Denmark should be interpreted with extreme caution.

Regarding all other analyses this thesis investigated contrasts within the population, making the results less vulnerable to selection bias. Furthermore, the baseline response rate of individuals from the participating practices was 75% (N=3064). In previous studies assessing social capital data from employed personnel, the response rate has varied between around 60% and 85% (82,108). The large sample size and the relatively high response rate of individuals from each practice diminished the possibility of chance findings, when organisations were compared to each other. The survey was conducted in comparable organisations, which is why the mechanisms behind the analysed associations were considered to be the same for all the organisations. We have no reason to believe that these mechanisms were different with regard to the non-participating organisations.

The survey included all individuals from the participating practices, irrespective of their profession or job contract (owner/employee, permanent/temporary and part-time/full-time). This broadens the picture of the organisation and incorporates the properties of bonding, bridging and linking ties within the organisation. A limitation to this was linked to the questionnaire handout procedure, as it is not know exactly why some individuals responded while others did not. Non-respondents could have peripheral connection to the practice or there could be other reasons associated with the lack of motivation to participate in this survey. However, these data include a wide variety of all groups, and we have no reason to

believe that dropout was caused by underlying systematic bias. We have, therefore, no reason to believe that this affects analysis of associations.

Ideally dropout analyses should include practice characteristics and characteristics about the people working in general practice. However, we did not have access to these data.

When the OSC survey was combined with DanPEP patient evaluations (*Study II*), DanPEP-non-participation analyses were possible and only minor differences between the practices participating in both surveys and practices only participating in the OSC survey were found. The OSC survey was also combined with register-based data (*Study III*). The unique Danish Civil Personal Registration System provided exact age- and sex-specific counts of all subjects and deaths in the population. The use of complete data on all hospitalisations, deaths, and migrations rendered this part of the project less vulnerable to selection bias (103).

A timespan between the collected data in Study II and in Study III represent a limitation to thesis. In Study II the OSC survey was combined with data from the latest patient survey, which was conducted up to two years before the OSC survey. Participation in the DanPEP survey could have caused subsequent changes to OSC, resulting in a possible over- or underestimation of the analysed associations. However, practices in Denmark are relatively stable with regard to organisation form, management and patient population. We know that by the time of the DanPEP survey the participating patients had been listed with the current practice for slightly less than 10 years and at the time of the OSC survey the doctors had worked in their current practice for slightly less than 15 years. Furthermore, DanPEP non-participation analysis found no differences with regard to OSC. This was consistent with unpublished data from the Danish Technical University showing that fluctuations in

OSC occur over longer periods time (*Edwards et al. Unpublished*). Likewise, research on the EUROPEP surveys showed that patient evaluations did not change over shorter periods of time (109).

In Study III patients from all 706 included general practices were included if they had a first time hospitalisation for COPD in an interval of up to two years before the OSC survey. We do not know whether changes in COPD management prior to the OSC survey could have affected OSC and thereby cause an over- or underestimation of the analysed associations. Since this was a national study bias could also be caused by differences with regard to severity threshold for COPD hospital admissions between practices and/or hospitals in Denmark. However, analysis found no associations between OSC and in-hospital mortality or readmission-free survival time between first-time and second hospital admission, indicating that OSC was not associated with disease severity at the time of the first hospital admission for the disease. Further, we have no indications that neither threshold for COPD admission nor management strategies changed significantly in the two year interval.

COPD was used as a model disease with regard to care for patients with chronic diseases, and chosen because of its progressive course, its increasing need for medical attention from general practice and the large diversity in the disease control obtained for the individual patient (100,103). Despite the high specificity of the hospital ICD-10 classifications, misclassification of patients remains a potential limitation to this part of the thesis. Furthermore, investigations of associations between OSC and care for patients with other chronic diseases would strengthen the results.

To investigate efficiency (*Study III*) we used time consumption as a productivity indicator and the use of gold standard testing with spirometry (110) and

the use of specific COPD drugs as quality indicators of care (103). The Health Insurance Register provided records of contacts and services. General practitioners are primarily paid according to these records, thus underreporting is supposed to be minimal (1). Identification and logging of patients using CPR numbers are mandatory and to a large degree automatic by use of electronic identification cards, which to some extent prevented overreporting. The Danish National Prescription Registry is based on reimbursement-driven record-keeping and data are entered by use of automated bar codes. These data are considered highly valid and almost complete (115). All drugs specified as "specific COPD drugs" in this thesis, are on prescription and the general practitioners are responsible for the vast majority of prescriptions. In some cases though, a patient could have redeemed a prescription from a provider others than their general practitioner, causing an over- or underestimation of the results.

Though data regarding the outcome indicators were register-based they were linked to patient's compliance. Good COPD management entails the ability to ensure compliance, but failing to achieve this could imply that a general practice has proposed tests or treatment, which the patient has rejected. However, spirometry testing is easily made, causes no pain or physical nuisances to the patients, thus it is unlikely that the patients have not followed the advice to have the test. We only included information about spirometry performed in general practice, but it is possible that some practices transfer patients to specialists or laboratories for specialised examinations, which would cause an underestimation of the association with OSC. Regarding specific COPD drugs, the drug had to be prescribed by the doctor and redeemed by the patient to count as a specific COPD treatment case. Sometimes the patients do not redeem a prescription or fail to actually use the drug (111,112), which

would also cause an underestimation of the association with OSC. However, most COPD patients have symptoms and immediately feel the benefit of medication. Therefore, among COPD patients, non-compliance probably occurs less often than for other diseases (e.g. hypertension (103).

Information bias

The analyses based on data collected by questionnaire (OSC *Study I-III* and DanPEP *Study II*) rely on self-reports, which involve the risk of information bias due to false or inaccurate responses from the participants. Regarding the OSC survey individuals could have underreported answers not preferred by the managers. And likewise, patients from the DanPEP survey, because they rely on good relations to their doctor, could have underreported negative answers. To minimise the risk of such information bias the following steps were taken: The questionnaire surveys (OSC and DanPEP) were anonymous and the respondents returned the questionnaire in individually concealed envelopes making the answers hidden from the employers and colleagues to ensure more reliable answers. Also, predefined and tested items and scales, including the latest theoretical approach to the research area, were used, and answers were given in prefixed categorised values, ensuring the use of all extremes.

Another type of information bias is linked to recall bias. Recall bias was unlikely to influence the answers, as all items concerned present situation conditions of the organisation and not historical events. Nevertheless, "Telescoping recall bias" describes how distant past events, e.g. disagreements, can affect current answers, which could have influenced both the results, as they specifically address relations between people.

Organisational social capital as a predictor of patients' evaluations and efficiency in general practice

Collaboration is an essential part of everyday work in the healthcare sector (and all other work sectors as well). With regard to small organisations like general practice with a network consisting of only a few people it is clear that both the individual persons and the workflow are vulnerable to bad relations between the co-workers and/or management. Try to imagine yourself in a work situation were others are dependent on your service. If the "customers" are helpless without your service they will keep coming back with their problems, but furthermore, they will also come if they feel worried about their situation, especially if their wellbeing or their life depend on it. In a medical team different healthcare professionals interact with each other and with the patient to handle different tasks of the patients healthcare. In a working environment where these co-workers feel that all are performing well and communicate with each other if they are not able to solve a problem themselves, one can confidently tell the patient that their problems are taken care of, to trust the organisation and to follow the plan. To support the example above, it has been shown that students from schools with a higher stock of social capital significantly outperform those with relatively low levels of social capital (14,113,114). Others have shown that workplaces with a social climate of trust and cooperation facilitate knowledge exchange and performance (16,115–118). Such properties are essential for the treatment in general practice, especially with regard to patients with chronic diseases like COPD (119). COPD patients need continuous consultations and their condition will decline over time. For the healthcare professionals access to shared knowledge about a specific patient or a work process is often needed. For the patients, consultations and guidance with a common thread are reassuring and eventually help

them cope with their situation, which again decreases the need for new examinations from their physician.

5.3 Generalisability

Optimal generalisability would imply that the findings of this thesis could be extrapolated to organisations throughout the healthcare system.

This thesis was based on theoretical methods used in several research fields, including health care, and in countries worldwide (69,77,120–125). Furthermore, the thesis investigated key dimensions of the psychosocial work environment and key services in health care, which for the first part are common to all human resources management and for the second part common for all contacts between patents and healthcare professionals, at least in primary healthcare.

Data were collected in Danish general practice, implying that the participating organisations were similar with regard to primary production outcome (healthcare services), the internal structures linked to the Danish model of entrepreneurs (physicians running private businesses under contract with the Danish Governmental Regions and employing healthcare professionals etc.) and the basis of work relations linked to the professional groups (physicians, nurses etc.). On the other hand, the organisations also demonstrated a large variation with regard to management form, number of persons in the organisation and size of the patient population linked to them.

In conclusion, the results are believed to be applicable to all general practices in Denmark. Based on the discussed similarities *and* differences in the material, and though it is up for discussion, it is very likely that the results also apply to almost all other types of medical practices, but also larger units like hospital departments in

Denmark and probably in western countries with similar healthcare systems.

5.4 Discussion of study results

Organisational social capital is significantly associated with individual characteristics

Although we only found small differences in OSC score between the participating professional groups, doctors rated significantly higher than other professional groups in almost all our analyses. The small differences in OSC between the professional groups may be due to a ceiling effect, but nevertheless indicating that the degree of insight and influence on work processes and organisational procedures is important for the rating of OSC. Doctors have both insight and influence on the work carried out by the nurses and secretaries, who perform tasks specified by the doctors. Likewise, the nurses in general practice often take over secretary functions or otherwise have influence on the work done by the secretaries. This naturally makes up a hierarchic constellation, where practice owners, who are always doctors, rate OSC higher than employees. This is consistent with studies from other sectors (15). Nevertheless, it is interesting that the employed doctors tend to rate the level of cooperation skills in the organisations higher than the owners. A possible explanation could be that the employed doctors do not have the same managerial challenges as the owners. We know that OSC is linked to the quality of leadership, but the relatively high variation within each practice indicates that in addition to the vertical linking ties between owners and employees, also the mutual understanding and involvement of all members of the organisation are important.

Organisational social capital is significantly associated with organisational characteristics

Interclass correlation indicated that 28% of the variation in OSC score was subject to the practice form. On this basis it seems fair to conclude that organisational characteristics are of great importance for OSC. We would expect it to be difficult for small organisations like general practices to harvest from collective resources. In theory, the key feature of OSC is a property of relationships, and as such requires more than a few subjects to exist. We found that not size, but rather organisations favouring simple and well-defined structures, with the ability for the individual subject to overview the ties between themselves and their co-workers, had the highest ratings. Especially small practices with 2-3 persons had high OSC. All professional groups working within single-handed practices, including owners, rated higher than corresponding professional groups working within other practice forms. Not only the number of healthcare workers, but also increasing number of listed patients were associated with a reduction in OSC.

The great majority of the 706 included practices had a high level of OSC, indicating that despite the small size general practice accumulates collective resources to a higher degree than expected. By comparing these results to previously published studies we found that others have shown the same association with organisation size. Furthermore, the mean rating of OSC in the participating general practices was very high (80.5 points) compared to the Danish national cohort (mean 64.9 points), comprising data from all work sectors in Denmark (15). The high ratings of OSC should be interpreted with extreme caution due to the possibility of selection bias. However, the high ratings of OSC could be related to the level of work satisfaction among healthcare workers in general practice, which is generally known to be good,

with regard to income, work recognition and working hours (126). The teamwork and role clarity are considered to be good, and problems are solved as a team structured by a highly accessible manager. Such factors facilitate a high level of trust, justice and cooperation (19) and consequently OSC.

Patient evaluations of general practice are associated with organisational social capital

This first study on OSC and patient evaluations of general practice found strong associations between the two. We know from other work sectors that OSC is important in order to maintain high quality and productivity, and our study demonstrated similar associations with regard to patient evaluations of general practice. Previous studies on patient evaluations of general practice have only shown associations with static characteristics, like the patient's and general practitioner's sex and age etc. In contrast, the level of OSC is potentially changeable. Therefore, our results strengthen the confidence regarding the importance of OSC. The association between OSC and patient evaluations of medical care, the level of information and support and the organisational service provided is very interesting for possible future interventions in order to increase both patient experience with general practice and possibly also OSC itself.

It strengthened the study that associations were found between each dimension of OSC and each of the five dimensions evaluated in the DanPEP questionnaire, with the exception of one. Furthermore, as discussed above the high level of intraclass correlation regarding the practices indicated that the variation in OSC to a great extent could be explained by practice differences. In this part of the study the intraclass correlation was still relatively high, indicating that differences in patient evaluations

could to a great extent be explained by differences in OSC.

By comparing these results to already published studies we found that practice characteristics were essential for both OSC and for patient evaluations. Consequently, we expected our results to be confounded. However, after adjusting the effect of OSC on patient evaluations for organisational characteristics and patient characteristics, the effect was still highly significant. Hence, OSC seems to be important for the organisational functioning of general practice with regard to the quality of the patients' experience and probably also to other quality indicators.

Efficiency of care in general practice associated with organisational social capital

The association between OSC and efficiency has previously been shown in other working sectors, but to our knowledge not in the healthcare sector or in studies of this scale comprising 706 individual organisations. The results of this part of the thesis showed that OSC is associated with efficiency in general practice, in terms of reducing the time consumption for COPD patients without compromising the use of spirometry or the use of specific COPD drugs. Again, this is interesting, because it is possible to change the level of OSC in contrast to many other organisational characteristics associated with efficiency of the services provided. This indicates that OSC should be an important dimension of consideration when discussing organisational changes of general practice. Also for the patients a high level of OSC appears to be important. OSC produces shared knowledge about the organisation and its key services, and as such each meeting between the patient and the healthcare professionals leads to the next. Such continuity is reassuring for the patient and could endorse safety and consequently make it easier for the patient to cope with his/her situation (127). This could be the explanation for the association between OSC and

the reduced need for consultations in general practice. It has previously been shown that OSC is positively associated with the patients' experience of the care provided in general practice (*Study II*). The results of this paper indicate that this could be obtained with fewer consultations, without compromising the quality of care. As OSC is measured by scales related to the psychosocial work environment it comprises information about the well-being of the people within the organisation. One could imagine that the well-being of the staff would spill over to the patients and thereby increase the desire for patients, especially with chronic diseases, for consultations. However, patients do not attend their practitioner to be examined, but rather to be reassured (128–130). The results from this study are interesting, because they suggest that high OSC can achieve precisely such a reassuring effect in the treatment of chronic patients.

Comparing these results to previously published studies showed that the same practice characteristics were associated with both the level of OSC and the use of spirometry in general practice (110). Nonetheless, after adjusting for practice characteristics the effect of OSC on the number of consultations was still highly significant. This indicated that OSC has an independent effect on efficiency by lowering the number of consultations without affecting the quality indicators. Regarding the use of specific drugs for obstructive pulmonary diseases, others have shown associations with patient characteristics. We found that both patient characteristics and organisational characteristics were associated with the use of spirometry, whereas only the patients' comorbidity index was associated with the use of specific COPD drugs.

5.5 Interpretation of study results

High OSC leads to high production and better quality in various work sectors. The results of this thesis suggest that this also applies to healthcare treatment in general practice. It was possible, even in the small organisations comprising Danish general practice, to find associations between OSC and individual and organisational characteristics as well as indicators of quality and productivity.

The mean rating of OSC in the study population was very high compared to other work sectors in Denmark. Taking the limitations of the thesis into consideration we do not know whether this is generalizable to the entire general practice sector, but nevertheless we now know that 1/3 of the practices in Denmark work so well that they accumulate shared resources in the form of OSC. Besides fixed characteristics like gender and geographical locations of the practice, we found several associations between OSC and changeable variables. Regarding individual characteristics the profession was associated with higher ratings of OSC, and regarding organisational characteristics the practice form was associated with higher ratings of OSC. These associations persisted even after adjusting for geographical location and gender of the respondent.

Others have shown associations between the level of social capital in healthcare organisations and both personal benefits for people working there (e.g. health-related benefits) and for the organisation (e.g. recruitment and burnout). Patient evaluations based on studies of patients' priorities are a generally accepted method for quality assessment and in itself a key service of the healthcare system. To our knowledge no one has investigated associations between such quality indicators and OSC before. The results showed that OSC was positively associated with patients' perception of the doctor-patient relationship, the quality of medical care, the level of

information and support and the organisational service provided. Before this study mainly fixed characteristics have been identified in association with the patients' evaluations of general practice (Hove and Koefoed).

General practice is challenged with increasing demands for prevention and care for patients with chronic diseases without increasing the expences (7,131,132). By investigating the productivity in relation to disease management and treatment goals, the last part of the thesis found positive associations with efficiency, which confirm the fact that OSC is a productive force also in general practice (13,133). However, OSC was not associated with changes in the use of diagnostic testing for patients with COPD or the use of specific drugs targeting COPD. The association between OSC and the decrease in the number of consultations persisted, when adjusting for both patient and organisational characteristics.

6 Conclusion

This thesis showed important associations between organisational social capital and individual and organisational characteristics, as well as with indicators of quality and productivity. Answers to the three aims of this thesis are:

Study I:

High organisational social capital is associated with practice form (single-handed practice) at the organisational level and with gender (male) and profession (doctors) at the individual level.

Study II

Organisational social capital is associated with patient evaluations of general practice.

Study III

High organisational social capital is associated with a reduction in the number of consultations in general practice, prior to a patient's first-time hospital admission for COPD. The use of spirometry and prescription for specific COPD drugs were not associated with organisational social capital.

7 Perspectives and implications

OSC is associated with efficiency of care in general practice by decreasing time consumption for patients with COPD without affecting the quality of the services. COPD was chosen as a model disease, but these results are very likely to apply to treatment of other diseases as well. The non-technical abilities for healthcare personnel to collaborate when solving key tasks are of high importance, not only when patients are treated in general practice, but also at emergency departments and in the operating room etc. As such OSC has the potential to generate not only benefits for the patients, but for society as well.

This thesis implies that OSC is very interesting in relation to the ongoing political discussion about the future development of the healthcare sector, and especially general practice in Denmark. Our findings suggest that decision-makers should carefully consider how changes are implemented and how human resources and communications strategies are used to manage the healthcare sector and the healthcare professionals. If management is able to incorporate trust, justice and

cooperation skills in the bonding, bridging (horizontal) and linking (vertical) ties it has the potential to ensure efficiency over time. On the other hand, the results suggest that OSC is high in general practice, why unwise and hasty political decisions could be destructive and dangerous.

It is possible to introduce and encourage changes of OSC with only minor investments by focusing and educating people within the healthcare sector. It is also possible that better matching of healthcare personnel or education and enhancement of management and teamwork can contribute to future improvements. We know that the management of an organisation is highly responsible for the formation of OSC, but on the other hand, the highest yields for improvements is made when raising the bar from the bottom up. Therefore initiatives to enhance OSC should include all professional groups, regardless of management status.

Future research should focus on: First, what factors contribute to the formation of OSC in general practice and in the healthcare sector as such. Second, if and why the level of OSC is much higher in general practice than in other work sectors, and if this also applies to other parts of the healthcare sector. Third, quality indicators of general practice healthcare should be investigated, and finally, how OSC influences on treatment of other diseases.

On this basis I hope that the results and implications of this thesis can lead to more research on how organisations in the healthcare sector can create and benefit from OSC.

8 Summary in English

This PhD thesis was performed during my employment at the Research Unit of

General Practice in Odense, University of Southern Denmark. It comprises an overview of three papers, all submitted for publication in international peer-reviewed scientific journals.

Background: Organisational social capital (OSC) is *the quality that enables the members of the organisation to jointly solve its task*. The concept of OSC provides a new way of understanding how investments in the work environment not only favour the subjects, but also the organisation, by improving productivity and quality. It is possible to improve the level of OSC. Due to the increasing demand for prevention and care of patients with chronic conditions in general practice, decision-makers have much focus on enhancing productivity and quality, while lowering the expenses.

Aims: To analyse associations between OSC in general practice and

- Individual and organisational characteristics (*Study I*).
- Patients' evaluations of general practice (*Study II*).
- Efficiency with regard to treatment of patients with chronic obstructive pulmonary disease in general practice (*Study III*).

Methods: From June to September 2011 we performed a cross-sectional national questionnaire-based survey in general practice in Denmark, measuring the level of OSC. *Study I*: We investigated possible associations between OSC and individual and organisational characteristics. *Study II*: We combined the OSC survey with data regarding patient evaluations of general practice. *Study III*: We combined the OSC survey with register-based data regarding management and treatment comprising all

patients from the participating practices with a first-time COPD hospital admission up to two years before the OSC survey.

Results: *Study I*: Data regarding OSC were obtained from 706 (35.0%) Danish general practices with a total of 3,029 healthcare professionals. The rating of OSC in general practice reached a mean of 80.5 points on a scale from 0 to 100. Male gender (+2.21 points (CI 1.00 to 3.43)) and high profession (nurses rated -2.67 points (CI -4.11 to -1.22) compared to doctors) were associated with higher ratings of OSC. Doctors from single-handed practices rated 4.56 points higher (CI 1.31 to 7.84) compared to doctors from other practice forms, and adding one additional member of staff changed the OSC by -0.60 (CI -0.62 to -0.78). *Study II*: Of the 706 participating practices, 136 had previously conducted surveys regarding patients' evaluations of general practice (17,191 patient evaluations). We found a positive association between OSC and patients' evaluation score by 0.13 (CI 0.02 to 0.249) when OSC increased by one. *Study III*: Finally, we analysed associations between OSC and efficiency of care comprising patients with COPD (4,957). The number of consultations decreased by -0.057 (CI -0.103 to -0.010) when OSC increased by one point (from 0 to 100). No associations, however, were found between OSC and quality indicators of the COPD management and treatment.

Conclusion: OSC is positively associated with efficiency and with patients' evaluations of the care provided in general practice. Furthermore, the variations in OSC in general practice were associated with changeable individual and organisational characteristics.

9 Summary in Danish (Dansk resumé)

Denne ph.d.-afhandling er udført under min ansættelse ved Forskningsenheden for Almen Praksis i Odense, Syddansk Universitet. Den består af en oversigt og tre manuskripter, alle indsendt til offentliggørelse i internationale peer-reviewede videnskabelige tidsskrifter.

Baggrund: Organisatorisk social kapital (OSC) er den egenskab, som sætter en organisations medlemmer i stand til i fællesskab at løse dens kerneopgave. Denne måde at anskue værdien af sociale relationer på i en organisation giver en ny forståelse for, hvordan investeringer i (psykisk) arbejdsmiljø ikke kun gavner den enkelte, men også organisationen ved at forbedre produktivitet og kvalitet. Det er endvidere muligt at forøge OSC i en organisation. På baggrund af et stigende behov for at håndtere forebyggelse og behandling af patienter med kroniske sygdomme i almen praksis er der fra beslutningstagerne massiv fokus på at forbedre produktiviteten og kvaliteten, samtidig med at omkostningerne nedbringes i den del af sundhedsvæsenet. Vi ved ikke, om OSC har betydning i denne henseende.

Formål: At analysere associationer mellem OSC i almen praksis og

- individuelle og organisatoriske karakteristika (*Studie I*).
- patienternes oplevelse af behandlingskvaliteten (*Studie II*).
- effektivitet i almen praksis i forbindelse med behandling af patienter med kronisk sygdom (*Studie III*).

Metode: Fra juni til september 2011 gennemførte vi en landsdækkende spørgeskemaundersøgelse blandt læger og praksispersonale i almen praksis for at

måle OSC. *Studie I*: Vi analyserede for associationer mellem OSC og individuelle og organisatoriske karakteristika. *Studie II*: Derefter kombinerede vi resultaterne fra OSC-undersøgelsen med resultater fra patienttilfredshedsundersøgelser fra de inkluderede praksis. *Studie III*: Endelig kombinerede vi OSC-undersøgelsen med registerdata vedrørende udredning og behandling af alle patienter fra de inkluderede praksis, der oplevede en førstegangsindlæggelse med diagnosen KOL, op til to år før OSC-undersøgelsen blev gennemført.

Resultater: *Studie I*: I alt deltog 706 (35.0%) almen lægepraksis med 3064 læger og praksispersonaler i undersøgelsen. Den gennemsnitlige OSC i almen praksis var 80,5 målt på en skala fra 0 til 100. Både køn og profession var associeret med OSC scoren, hvor mænd scorede +2,21 point højere end kvinder (CI 1,00 to 3,43)) og læger højere end andet sundhedspersonale (nærmeste score var sygeplejerskernes på -2,67 point i forhold til lægerne (CI -4,11 to -1,22)). Praksisformen var associeret med OSC, hvor læger fra solopraksis scorede højere (+4,56 (CI 1,31 to 7,84) sammenlignet med læger fra andre praksisformer. Ligeledes havde praksisstørrelsen med hensyn til antal af sundhedspersonale betydning. OSC scoren forandredes med -0,60 (CI -0,62 to -0,78) for hver gang, praksisstørrelsen forøgedes med én person. *Studie II*: Ud af de 706 praksis havde 136 tidligere udført patienttilfredshedsundersøgelser (hvor der samlet set deltog 17.191 patienter), og vi fandt, at patientevaluerings-scoren steg med 0,13 point (CI 0,02 to 0,25)) for hver gang, OSC blev forøget med ét point. *Studie III*: Her analyserede vi for associationer mellem OSC og effektivitet i behandlingen af patienter med KOL i almen praksis. I alt blev 4.957 patienter inkluderet, og studiet viste, at en stigning i OSC på ét point medførte et fald i antallet af konsultationer i

almen praksis på 6 procentpoint (CI -0.1 to -0.01). Der var ingen sammenhæng mellem OSC og indikatorer for kvalitet af udredning og behandling.

Konklusion: OSC er positivt associeret med effektiviteten i almen praksis og ligeledes med patienternes oplevelse af kvalitet af service. Ydermere er variationen i OSC i almen praksis associeret med både individuelle og organisatoriske karakteristika, der kan modificeres.

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11 The papers

Organisational social capital in general practice is strongly associated with characteristics of the organisation and the subjects working within it.

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Abstract

Objective: To measure organisational social capital in general practice and to analyse associations with individual and organisational characteristics.

Design: Questionnaire survey comprising Danish general practitioners and their staff.

Population: A total of 3064 subjects from 706 general practices participated.

Main Outcome Measures: Rating of organisational social capital and its three dimensions: trust, justice and cooperation skills.

Results: Doctors rated organisational social capital statistically significantly higher than nurses and secretaries. This pattern was similar for all dimensions of organisational social capital and was persistent after adjusting for gender of the respondent and geographical location of the practice. In single-handed practices with 2-3 persons the organisational social capital was rated significantly higher compared to in other practice forms.

Conclusions: Organisational social capital was found to be associated with type of profession (doctors) at the individual level and with type of practice (single-handed practice) at the organisational level.

What this study adds:

It is possible, even in small organisations such as Danish general practices, to find associations between organisational social capital and both individual and organisational characteristics.

Introduction

An important dimension of working together is the ability for the co-workers to "walk in the same direction". Organisational social capital is *"the quality that enables the members of the organisation to jointly solve its key task. In order to solve this key task, it is necessary that the members are able to cooperate and that cooperation is based on a high level of trust and justice"*(1). The concept of organisational social capital provides a new way of understanding how investments in the work environment not only favour the subjects but also the organisation by improving productivity and quality (2). It is possible to improve the level of organisational social capital (1,3–7).

Concerning general practice there are many historical and political demands influencing the organisation, all addressing the conflicting interests of enhancing productivity and quality while lowering the expenses. One common point of view is that large general practices foster organisational benefits, including specialisation of the healthcare workers, scale economies etc.(8,9). However, no studies have yet explored how organisational characteristics and the subjects' characteristics are associated with organisational social capital.

The purpose of this study was to measure organisational social capital in Danish general practice and to analyse associations between organisational social capital and individual and organisational characteristics.

Material and methods

Design and setting

We performed a questionnaire survey inviting all Danish general practitioners (GPs)

and their staff to participate from June to September 2011. A complete list of general practices in Denmark (in total 2047 practices) was provided by the Organisation of General Practitioners.

A general practice in Denmark comprises the practice owners and their employed staff. A Danish GP is a private entrepreneur on contract with the Danish Regions. There are mainly two practice forms in Denmark: single-handed and partnership practice. A single-handed practice is owned by a single GP who has his own patients and economy. A partnership practice has two or more owners who are GPs and share patients and/or economy. All Danish citizens have free access to health care through a tax-funded healthcare system (9–11).

Measurement of organisational social capital and data collection

A questionnaire comprising scales for trust, justice and cooperation skills based on the Copenhagen Psychosocial Questionnaire II was used. Asking subjects within an organisation to rate these three dimensions is a widely used approach to assess organisational social capital (12). The original questionnaire was developed and validated by the National Research Centre for the Working Environment. The Copenhagen Psychosocial Questionnaire II has become the national Danish standard for assessing psychosocial work environment, and it has also been widely used in other countries. Based on its use the Danish national cohort has been formed with data from all work sectors (12–16).

The process of adaptation to general practice included interviews with all professional groups participating in the survey. A pilot test in 100 randomly selected practices was conducted. The pilot test only elicited minor adjustments.

All respondents returned the questionnaire in individually enclosed envelopes.

Reminders were sent after 4-5 weeks.

Statistical methods and analysis

The outcomes were the ratings of organisational social capital and its three dimensions: trust, justice and cooperation skills. Each dimension was rated on a scale from 0 to 100. The rating of organisational social capital was calculated as the mean of the ratings of the three dimensions. For each practice, the rating of organisational social capital and the three sub-dimensions was calculated as a mean of the single ratings of all participants from that practice. Finally, the level of organisational social capital in general practice in Denmark was calculated as a mean of the rating of the participating practices.

Possible associations with individual characteristics and organisational characteristics were analysed separately. Regression coefficients with 95% confidence intervals were calculated by use of univariate and multiple linear regression models. At the organisational level we adjusted for the geographical location (Danish capital region versus other parts of Denmark) of the practice. At the individual level we adjusted for geographical location of the practice and gender of the respondent. As explanatory variables we considered the organisation form, number of healthcare professionals in the practice, number of patients listed with the practice, and gender, age and profession of the respondent. The level of organisational social capital and each of its three sub-dimensions trust, justice and cooperation skills were analysed separately. Single-handed practices without any employees were excluded for analysis at the organisational level.

All analyses were performed using Stata Release 11.0 (StataCorp, College Station, TX, USA). A p-value of <0.05 was considered statistically significant.

Ethics and permissions

This study was approved by the Danish Data Protection Agency (journal 2010-41-5298). According to Danish legislation no approval from the Danish ethical committee was acquired.

Results

All 2060 Danish general practices were invited to participate. A total of 706 general practices responded (34.3%) as shown in figure 1. Of the participating practices 42.7% were single-handed practices and 29.8% were located within the capital region. The mean number of healthcare workers in the participating practices was 5.7 and a mean of 4.3 persons per practice responded, corresponding to a response rate from the participating practices of 75.4%. A total of 3064 persons completed the questionnaire. Of the respondents 62.7% were women and the mean age was 48 years. Table 1 shows baseline characteristics.

The mean rating of organisational social capital in general practice reached 80.5 (SD 8.74) out of 100 points, but with high variation within the practices. More than two-thirds (82.0%) of the practices had variation higher than the theoretical clinical limit of 0.5*SD = 4.37 points (12). Distribution of organisational social capital is shown in Figure 2.

At the individual level we found that male gender was positively associated with organisational social capital, which was rated 2.21 points higher (95% confidence interval 1.00 to 3.43; $p<0.001$) compared to women. This was valid for all three sub-dimensions, but mostly for justice with a difference of 4.33 points (95% confidence interval 2.96 to 5.70; $p<0.001$). We found no associations between the

rating of organisational social capital and the age of the respondents, nor the location of the practice. For practices with a single owner, the gender of the owner had no effect.

Profession was statistically significantly associated with rating of organisational social capital. Doctors rated highest. Compared to doctors, nurses rated -2.67 (95% confidence interval -4.11 to -1.22; p<0.001) and secretaries -3.94 (95% confidence interval -5.47 to -2.41; p<0.001). This pattern was the same for virtually all sub-dimensions of organisational social capital and was persistent after adjusting for gender of the respondent and the geographical location of the practice.

There was a tendency towards persons employed at the same practice between 6-10 years rating organisational social capital lower than persons employed "<6 years" and ">10 years" (-1.72, 95%-CI (-3.49, 0.04)).

Employees rated organisational social capital -2.71 (95% confidence interval -3.51 to -1.11; p<0.001) compared to the owners, adjusted for gender of respondent and geographical location of the practice, although employed doctors rated almost the same as the owners -0.14 (95% confidence interval -1.70 to 1.99; p=0.878).

Among the sub-dimensions of social capital, cooperation skills were rated higher by employed doctors compared to owners, although not statistically significant, 2.06 (95% confidence interval -0.15 to 4.27; p=0.068). The sub-dimension with the lowest rating was justice (mean 79.79; SD 9.69). Regarding cooperation skills only the ratings of practice owners and secretaries were significantly different -2.32 (95% confidence interval -4.08 to -0.57; p=0.010).
Associations between organisational social capital including its sub-dimensions and individual characteristics are shown in Table 2.

When comparing organisational social capital at the organisational level we

found that small single-handed practices – both in terms of number of healthcare staff in the practice and in terms of number of listed patients – had higher ratings of organisational social capital compared to other practices. All professional groups (including owners) from small single-handed practices rated higher than their corresponding professional groups working in other practices. The biggest difference was between employed doctors working in single-handed practices compared to employed doctors working in other practice forms, where the difference was 4.56 (95% confidence interval 1.31 to 7.84; p=0.003). The interclass correlation showed that 28% of the differences in organisational social capital score could be explained by the organisational characteristics.

Adding one additional person to a practice reduced the organisational social capital by 0.60 (95% confidence interval -0.62 to -0.78; p<0.001) (Figure 1.2). Compared to single-handed practices shared practices rated -3.63 (95% confidence interval -5.61 to -1.65; p<0.001) and partnership practices rated -3.17 (95% confidence interval -4.76 to -1.58; p<0.001).

Associations between organisational social capital, the sub-dimensions and organisational characteristics are shown in Table 3.

Discussion

Principal findings

The variation of organisational social capital between the participating practices was significantly associated with individual and organisational characteristics. Regarding individual characteristics male gender and high profession were associated with higher ratings of organisational social capital. Of organisational characteristics small single-handed practices rated organisational social capital higher than other practice

forms. These patterns were consistent for virtually all analyses and were persistent after adjusting for gender of the respondent and the geographical location of the practice.

Individual characteristics associated with ratings of organisational social capital

Although we only found small differences in organisational social capital score between the participating professional groups, doctors rated higher than other professional groups in almost all our analyses. The small differences may be due to a ceiling effect, but nevertheless indicating that the degree of insight and influence on work and organisational procedures is important for the rating of organisational social capital. Doctors have both insight and influence on the work carried out by the nurses and secretaries, who perform tasks specified by the doctors. Likewise, the nurses have influence on the work done by the secretaries. This naturally makes up a hierarchic constellation where practice owners, who are always doctors, rate organisational social capital higher than employees. This is consistent with studies from other sectors (12). Nevertheless, it is interesting that the employed doctors tend to rate the level of cooperation skills in the organisations higher than the owners. A possible explanation could be that the employed doctors do not have the same managerial challenges as the owners. We know that organisational social capital is linked to the quality of leadership, but the relatively high variation within each practice indicate that in addition to the vertical ties between owners and employees, also the mutual understanding and involvement of all members of the organisation is important.

Organisational characteristics associated with ratings of organisational social capital

The interclass correlation indicated that 28% of the variation in organisational social capital score was subject to the practice form. We therefore conclude that the organisational characteristics are of great importance. We would expect it to be difficult for small organisations like general practices to harvest from collective resources. In theory, the key feature of social capital is a property of relationships, and as such requires more than a few subjects to exist. We found that not size, but rather organisations favouring simple and well-defined structures, with the ability for the individual subject to overview the ties between themselves and their co-workers, had the highest ratings. Especially small practices with 2-3 persons had high organisational social capital. All professional groups working within single-handed practices, including owners, rated higher than corresponding professional groups working within other practice forms. Not only the number of healthcare workers, but also increasing number of listed patients were associated with a reduction in organisational social capital.

In total we included more than 700 similar organisations and the great majority had a high level of organisational social capital, indicating that despite the small size general practice accumulates collective resources to a higher degree than expected.

Comparison with other studies

The rating of organisational social capital in general practice is very high with a mean of 80.5 points compared to a mean of 64.9 points from the Danish national cohort, comprising data from all work sectors in Denmark (12). The high ratings of

organisational social capital may be related to the level of work satisfaction among healthcare workers in general practice, which is generally known to be good, regarding income, work recognition and working hours (17). The teamwork and role clarity are considered to be good and problems are solved as a team structured by a highly accessible manager. Such factors facilitate a high level of trust, justice and cooperation (18) and consequently organisational social capital.

Strengths and weaknesses

To our knowledge rating of organisational social capital in general practice has not been done before. Studies from other work sectors have provided ample evidence of the importance and useful influence of organisational social capital with regard to both productivity and quality. To measure the dimensions of organisational social capital within an organisation we used scales from the validated Copenhagen Psychosocial Questionnaire II. Furthermore, we tested the dimensions on general practice before adapting the method. Our results showed a high degree of interclass correlation, indicating that the questionnaire could discriminate between individual practices, but also indicating that organisational characteristics are of great importance for the outcome found.

Participation was voluntary which may have had an impact on the representativeness of the study population. Furthermore, the participation rate of general practices was 34%, which was low, but relatively high for surveys of this kind (19). With 700 practices and more than 3000 healthcare workers participating we were able to detect very small differences between the groups as being statistically significant. Because of that it is relevant to assess the practical significance of the associations found.

We have no reason to believe that the mechanisms behind the associations found are different within the non-participating practices. Hence we believe that our results are generalisable to all general practices in Denmark and to general practices with similar structures in other countries.

Implications and unanswered questions

Higher level of organisational social capital leads to higher production and better quality in other work sectors. If this applies to healthcare treatment, the associations we have found are interesting in order to maintain high levels of performance over time. It is important to uncover the reasons for this high level of social capital, so that new legislation does not erode social capital in general practice and consequently diminuate performance.

CONCLUSIONS

High organisational social capital is associated with practice form (single-handed practice) at the organisational level and with gender (male) and profession (doctors) at the individual level.

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Competing interests

The authors report no conflicts of interests.

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Figures & Tables:

Figure 1: Inclusion & exclusions. Exclusions: 19 wrong identification numbers or address.

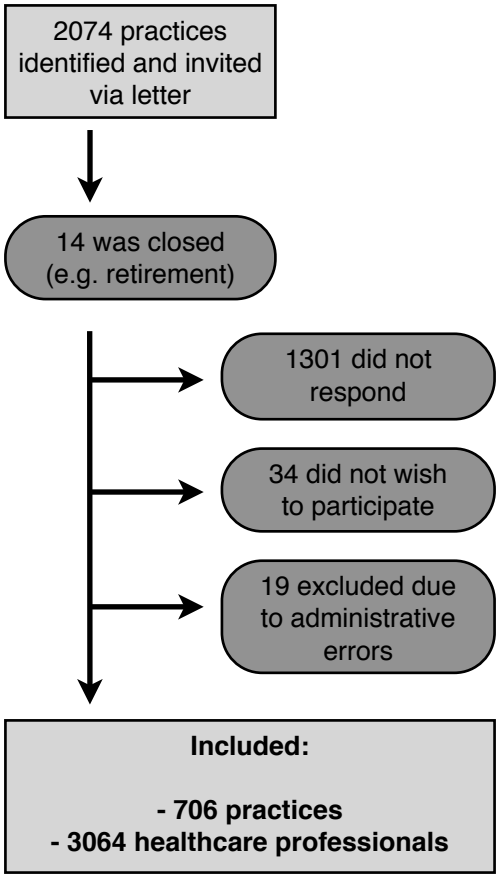

Figure 2: Distribution of score of mean organisational social capital (consisting of the dimensions trust, justice and cooperation skills) in general practice in Denmark. The three lines represent limit for low (score below 50 points), the Danish mean (64.9 points), and the limit for high (score above 77 points) organisational social capital.

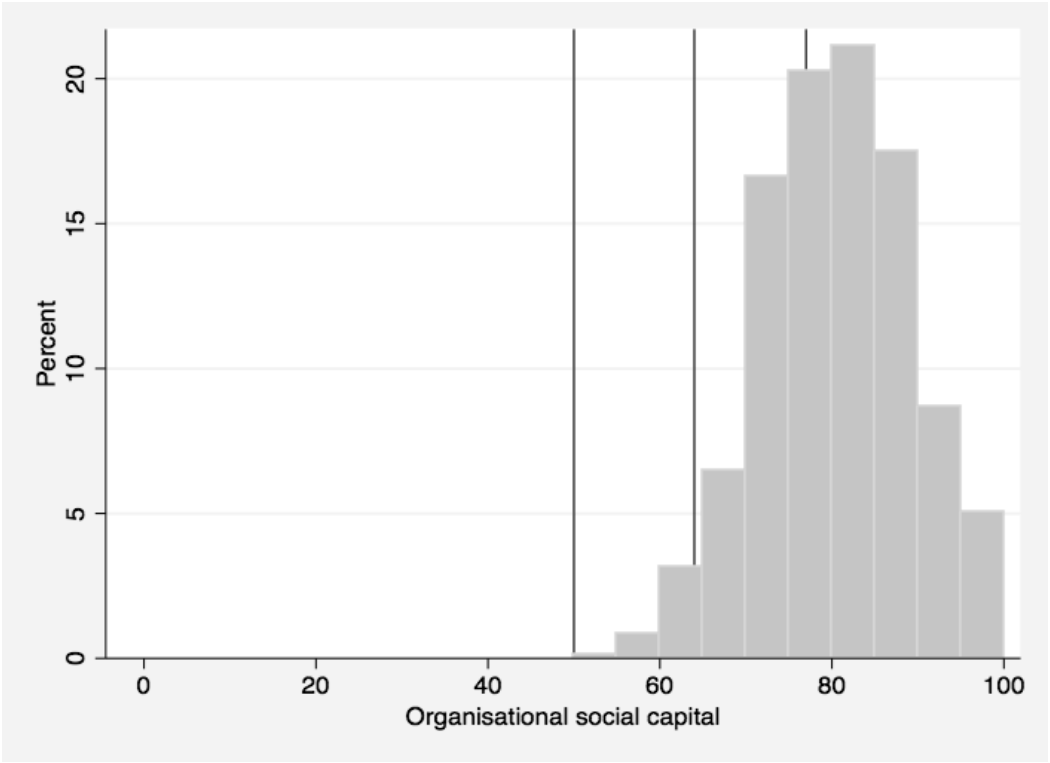

Figure 3: Effect of increasing the size of the organisation. The numbers show that 81 of the included practices had 2 staff members, 98 had 3 etc. The 9 practices with only one staff member (a doctor) were excluded from the organisation analyses, but are shown here to present the difference between these and the 'organisations'. Adding one additional member decreases the organisational social capital with 0.60 points.

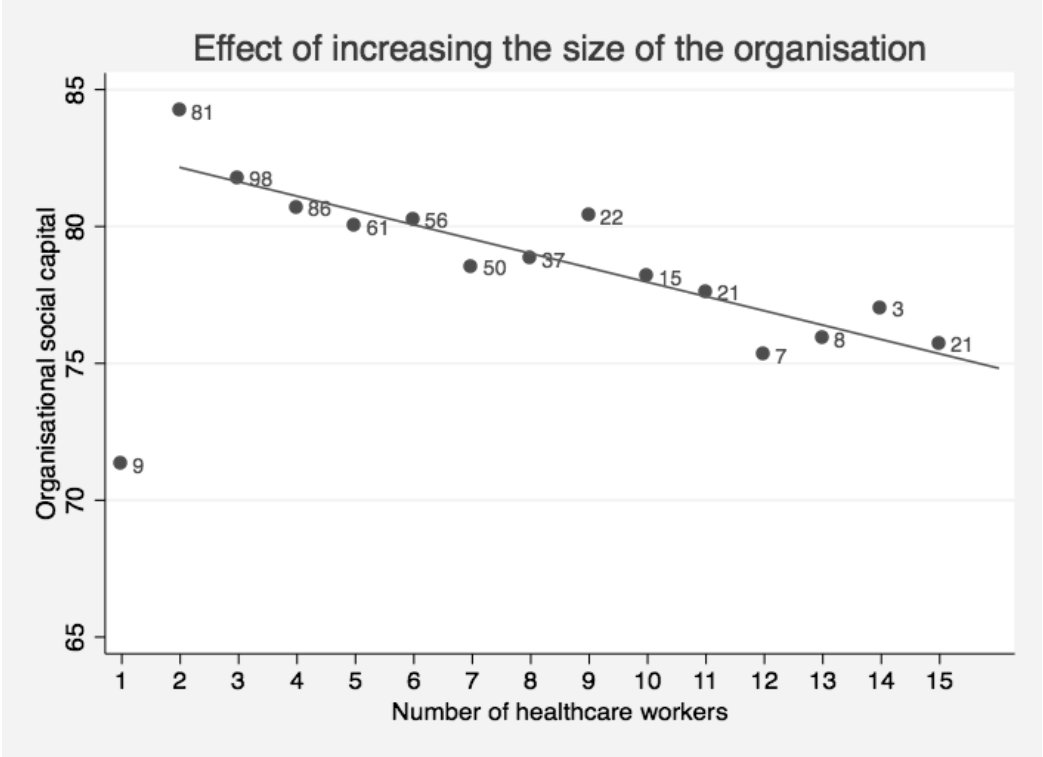

Table 1: Basic characteristics

Table 1: Basic characteristics in absolute numbers and percentages

Basic characteristics	N (%*)
Individual characteristics	
Total number of individuals included	3064
Woman	1922 (62.7)
Age (mean, SD)	48.0 (9.9)
Profession	
Owners (always doctors)	1132 (37.6)
Employed doctors	256 (8.5)
Nurses	810 (26.9)
Secretaries	678 (22.5)
Medical Laboratory Technologist	63 (2.1)
Other	138 (4.6)
Owner characteristics	
Woman	409 (36.1)
Age (SD)	52.1 (8.8)
Years in present practice (SD)	14.1 (9.6)
Organisational characteristics	
Total number of participating practices	706 (34.3)
Practice form	
Single-handed practices	253 (42.7)
Shared-/Partnership practices	339 (57.3)
Mean number of employees (range, SD)	5.7 ([1-28]; 3.6)
Mean number of full-time employees per doctor (range; SD)	0.4 ([0-4]; 0.5)
Mean number of listed patients (range; SD)	3186.5 ([105-14920]; 2001.0)
Mean number of listed patients per doctor (range; SD)	1244.8 ([83.3-3200]; 446.7)

* If not specified in first column

Table 2: Associations between outcome measures and individual characteristics.

Table 2: Associations between outcome measures and individual characteristics

Individuals	**Social Capital**				**Trust**				**Justice**				**Cooperation skills**			
	Crude	Adjusted			Crude	Adjusted			Crude	Adjusted			Crude	Adjusted		
	Coef.	Coef.	95% CI		Coef.	Coef.	95% CI		Coef.	Coef.	95% CI		Coef.	Coef.	95% CI	
Gender, men compared to woman	2.20***	2.21***	[1.00	3.43]	1.04	1.05	[-0.15	2.25]	4.33***	4.33***	[2.96	5.70]	1.65*	1.65*	[0.27	3.04]
Age	0.00	-0.01	[-0.07	0.05]	-0.01	-0.02	[-0.07	0.04]	0.02	-0.01	[-0.08	0.06]	-0.03	-0.04	[-0.10	0.03]
Profession, compared to ordinary MD's																
Employed MD	-0.43	0.14	[-1.70	1.99]	-0.07	0.70	[-1.13	2.52]	-2.21*	-1.76	[-3.92	0.40]	-1.40	2.06	[-0.15	4.27]
Nurses	-2.47***	-2.63**	[-4.14	-1.12]	-1.84*	-2.22*	[-3.70	-0.74]	-4.51***	-4.23***	[-5.99	-2.48]	-1.07	-0.96	[-2.69	0.77]
Secretaries	-3.82***	-3.91***	[-5.46	-2.36]	-2.86**	-3.38***	[-4.90	-1.87]	-6.65***	-6.40***	[-8.22	-4.58]	-2.33*	-2.32*	[-4.08	-0.57]
Other	-2.81	-1.66	[-4.52	1.19]	-2.93*	-2.09	[-4.82	0.65]	-4.97*	-3.58*	[-6.65	-0.52]	-1.30	0.00	[-3.10	3.11]
Employed healthcare persons compared to owners	-2.71	-2.31***	[-3.51	-1.11]	-2.07***	-1.88**	[-3.08	-0.67]	-5.01***	-4.26***	[-5.65	-2.88]	-1.21*	-0.60	[-2.01	0.81]
Part time compared to full time	-1.96***	-1.51*	[-2.68	-0.35]	-1.76***	-1.51**	[-2.61	-0.41]	-3.24***	-2.14**	[-3.55	-0.73]	-0.89	-0.38	[-1.71	0.96]
Employment length, compared to '0-1 years'																
Years 2-5	-1.28	-1.26	[-2.80	0.29]	-1.41	-1.64*	[-3.11	-0.17]	-1.41	-1.09	[-2.93	0.75]	-1.99*	-1.87*	[-3.59	-0.14]
Years 6-10	-1.54	-1.72	[-3.49	0.04]	-1.69*	-2.20*	[-3.91	-0.50]	-1.25	-1.11	[-3.27	1.06]	-1.83*	-2.03*	[-3.99	-0.06]
Years 11+	-0.18	-0.63	[-2.18	0.93]	-0.55	-1.38	[-2.86	0.10]	0.73	0.18	[-1.67	2.02]	-1.39	-1.56	[-3.31	0.19]
Number of patients (quartiles, compared to smallest quartile, adjusted for geography and number of healthcare staff in the practice)																
Second quartile	-1.11	-1.12	[-3.41	1.18]	-1.52	-1.52	[-3.70	0.66]	-1.15	-0.86	[-3.42	1.69]	-2.11*	-2.10	[-4.49	0.28]
Third quartile	-2.67*	-2.69*	[-5.34	-0.03]	-2.48*	-2.26	[-4.91	0.40]	-3.02**	-2.72	[-5.63	0.19]	-3.41**	-3.71**	[-6.37	-1.05]
Fourth quartile	-5.29***	-4.40*	[-8.17	-0.64]	-4.80***	-3.80*	[-7.34	-0.25]	-5.63***	-4.37*	[-8.54	-0.20]	-6.21***	-5.30**	[-9.20	-1.40]

*p<0.05 **p<0.01 ***p<0.001. Adjusted: Differences are adjusted for gender of the respondent and geography of the practice.

Table 3: Associations between outcome measures and organisational characteristics.

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Individuals	**Social Capital**				**Trust**				**Justice**				**Cooperation skills**			
	Crude	Adjusted			Crude	Adjusted			Crude	Adjusted			Crude	Adjusted		
	Coef.	Coef.	95% CI		Coef.	Coef.	95% CI		Coef.	Coef.	95% CI		Coef.	Coef.	95% CI	
Type of practice compared to single-handed practices																
Shared practices	-3.69***	-3.63***	[-5.61	-1.65]	-3.09**	-3.02**	[-4.93	-1.10]	-4.16***	-4.11***	[-6.31	-1.90]	-4.14***	-4.12***	[-6.37	-1.87]
Partnership practices	-3.21***	-3.17***	[-4.76	-1.58]	-2.43**	-2.37**	[-3.90	-0.83]	-3.76***	-3.72***	[-5.48	-1.96]	-4.32***	-4.30***	[-6.10	-2.50]
Effect of adding one doctor to the organisation, compared to practices with one doctor	-1.01***	-0.99***	[-1.36	-0.62]	-0.79***	-0.77***	[-1.14	-0.41]	-1.15***	-1.13***	[-1.55	-0.72]	-1.18***	-1.71***	[-1.60	-0.75]
Effect of adding one employee to the organisation, compared to practices with one employee	-1.80**	-1.90**	[-3.26	-0.54]	-1.25	-1.34*	[-2.66	-0.02]	-2.27**	-2.37**	[-3.86	-0.88]	-2.18**	-2.28**	[-3.85	-0.71]
Number of staff, compared to practices with one staff member	-0.51***	-0.51***	[-0.71	-0.31]	-0.39***	-0.39***	[-0.58	-0.19]	-0.60***	-0.60***	[-0.83	-0.38]	-0.62***	-0.64***	[-0.87	-0.41]
Effect of adding listed patients to the practice (quartiles, compared to smallest quartile, adjusted for geography and number of healthcare staff in the practice)																
Second quartile	-0.10	-0.10	[-2.23	2.03]	-0.69	-0.69	[-2.74	1.35]	0.16	0.16	[-2.19	2.51]	-0.05	-0.05	[-2.46	2.36]
Third quartile	-1.98	-1.95	[-4.11	0.22]	-2.02	-1.97	[-4.05	0.11]	-1.78	-1.74	[-4.14	0.65]	-3.08*	-3.07*	[-5.52	-0.63]
Fourth quartile	-3.74**	-3.68**	[-5.85	-1.51]	-3.24**	-3.16**	[-5.24	-1.07]	-4.38***	-4.31***	[-6.72	-1.91]	-4.48	-4.47***	[-6.92	-2.01]

*p<0.05 **p<0.01 ***p<0.001
Differences are adjusted for geography of the practice.

Organisational social capital is significantly associated with patient evaluations of general practice: A population-based study in Danish general practice

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Short title

Organisational social capital is associated with patient evaluations of general practice

Word count

XXXX (without abstract and references) + abstract 220

Keywords

Social capital, trust, justice, cooperation skills, general practice, evaluation, questionnaire

Abstract

Introduction: Organisational social capital is the ability of the members of an organisation to collaborate when solving the key tasks of the organisation.

Objective: To analyse associations between organisational social capital and patient evaluations of general practice.

Design: We combined data from two national questionnaire surveys in general practice in Denmark. The healthcare professionals measured the organisational social capital, and the patient filled in a questionnaire evaluating the quality of general practice care.

Population: The combined study comprised 136 general practices. A total of 679 healthcare professionals and 17,191 patients participated.

Main outcome measures: Outcome was patient evaluations of general practice assessed in the national survey based on the EUROPEP questionnaire. As explanatory variables we included organisational characteristics (organisation form, size of the organisation with regard to the number of healthcare personnel and the number of listed patients) and patient characteristics (sex, age, years listed at the present practice and self-rated health).

Results: The level organisational social capital was positively associated with patients' evaluations of general practice. The association was linear with a change in patient evaluation score of 0.13 (95% confidence interval 0.02 to 0.249), when organisational social capital increases by one. The intraclass correlation regarding organisational social capital (ICC = 26%) and patient evaluations of general practice (ICC = 5%) were high.

Conclusions: Organisational social capital is strongly associated with patient evaluations of general practice.

What this study adds

Organisational social capital is the ability to collaborate within an organisation. In various types of organisations it is associated with efficiency. This study found that, organisational social capital is highly related to patient evaluations of care in general practice. Future studies should address how to improve organisational social capital in general practice and how this affects treatment goals.

Introduction

Organisational social capital (OSC) is "the ability of the members of an organisation to collaborate when solving the key tasks of the organisation"[1]. In general, the quality of a product is strongly associated with the level of OSC in the producing organisation, and therefore other working sectors put considerable management efforts into improving OSC [1–5].

The concept of OSC provides a new way to understand how investments in the working environment not only favour the individuals, but also improve quality of the product [1,6–8]. OSC is a productive force imbedded neither within the individuals nor the physical resources of an organisation, but within the interpersonal relations [1,9]. It is measurable by three dimensions; trust, justice and cooperation skills perceived by the individual members of the organisation [10].

Patient evaluations based on studies of patients' priorities are a generally accepted method for quality assessment in general practice and in itself a key service of the healthcare system. Patient evaluations of general practice reflect the extent to which general practice succeeds in meeting the patients' individual needs. Previous studies on what affects patient evaluations of general practice have, however, been inconsistent in their conclusions and could only explain a little part of the variation between the practices [11].

General practices generally have a high level of OSC, but also with variation. Taking evidence from other working sectors into consideration, it is reasonable to assume that patient evaluations of general practice are correlated with OSC. The purpose of this study was to explore whether these organisational characteristics had the same impact on the patients' experience with general practice care by analysing associations between OSC and patient evaluations of general practice.

Material and methods

Design and setting

Data from two cross-sectional national questionnaire-based surveys in general practice in Denmark were combined. The first survey measured the level of OSC rated by the healthcare professionals in general practice (conducted in 2011). The second survey regarded the patient evaluations of general practice (conducted in 2009).

A general practice in Denmark comprises the practice owners and their employed staff. A Danish general practitioner (GP) is a private entrepreneur and on contract with the Danish governmental regions, who provides primary care services, acts as a gatekeeper and refers patients to specialist care when needed. GPs often spend their entire career in the same practice. There are mainly two practice forms in Denmark: single-handed and partnership practice. A single-handed practice is owned by a single GP, who has his own patients and economy. A partnership practice has two or more owners, who are GPs sharing patients and/or economy. All Danish citizens have through a tax-funded healthcare system free access to health care, and 98% are currently listed with a GP [12,13].

Questionnaire-based survey measuring OSC in general practice

From June to September 2011 all Danish GPs and their staff were invited to participate in a questionnaire survey measuring OSC in their practice. A complete list of general practices in Denmark (in total 2060 practices) was provided by the Organisation of General Practitioners. Based on the work of the Danish National Research Centre for the Working Environment and the international standardised Copenhagen Psychosocial Questionnaire II, the participants were asked to score a total of 11 items concerning the dimensions of trust, justice and cooperation skills, within their own organisation [10,14,15]. The process of adaptation to general practice has been described

in details elsewhere (*Knudsen et al. Submitted*).

Each item was rated on a five-point Likert scale ranging from "poor", through "acceptable" to "excellent". The item score was used to calculate the dimension score for each dimension from 0 to 100. The score of OSC was calculated for each practice as a mean of the individual ratings of all healthcare professionals in each practice.

All respondents returned the questionnaire in individually enclosed envelopes. Reminders were sent after 4-5 weeks.

Patient evaluations of general practice

The Danish EUROPEP survey, DanPEP (DANish Patients Evaluate general Practice), is a national survey using the EUROPEP questionnaire to measure patient-experienced quality of care in general practice. The EUROPEP questionnaire is an international standard comprising 23 items allocated to five dimensions: the doctor-patient relationship, quality of medical treatment, level of information and support, organisational service provided and accessibility [16–19]. The DanPEP surveys have been conducted periodically between 2002-2009. For each participating GP 130 questionnaires were handed out consecutively to adult patients. The patients were included when attending the GP with whom they were registered. All items were scored on a five-point scale, and score for each of the five dimensions was calculated similarly to the OSC survey.

Statistical methods and analysis

The outcome was the patient evaluation score of general practice. Analysis for associations with OSC and each of the dimensions: trust, justice and cooperation skills, was made. Regression coefficients (change in patient evaluation score when OSC increases by one) with 95% confidence intervals (CIs) were calculated by means of univariate and multiple linear regression models. To

control for potential confounding factors we adjusted for organisational characteristics: organisation form, and size of the organisation with regard to the number of healthcare personnel and listed patients. Furthermore, we adjusted for patient characteristics: sex, age, years listed with current practice and self-rated health.

All analyses were performed using Stata Release 11.0 (StataCorp, College Station, TX, USA). A p-value <0.05 was considered statistically significant.

Ethics and permissions

This study was approved by the Danish Data Protection Agency (journal number 2010-41-5298). According to Danish legislation no approval from the Danish ethical committee was required.

Results

Enrolment and participant characteristics

Data regarding OSC were obtained from 706 (34.3%) Danish general practices, 42.7% were single-handed practices. A total of 3064 individual healthcare professionals completed the questionnaire, corresponding to 75.4% of the healthcare professionals from the participating practices. Details and demographics have been published elsewhere (*Knudsen et al. Submitted*). Of the 706 participating practices in the organisational social capital survey, 136 also participated in the DanPEP survey, with a total of 679 healthcare professionals and 17191 patient evaluations (mean number of evaluations per practice 126.4, SD 82.55) (Figure 1). Only minor differences between the practices participating in both surveys and practices only participating in the OSC survey were found (Table 1).

Associations between OSC and patient-evaluated quality of general practice

The level of OSC was statistically significantly and positively associated with patient evaluations of general practice. The association was linear with a change in patient evaluation score of 0.13 (95% confidence interval 0.02 to 0.249) when OSC increased by one (Figure 2). Unadjusted results indicated that both organisational characteristics (OSC, practice form and size) and patient characteristics (sex and number of years with the present practice) were statistically associated with the patient evaluations. Adjustments ruled out the effect of all but OSC (Table 2).

The three dimensions comprising OSC all showed similar positive associations: trust coefficient 0.11 (95% confidence interval 0.01 to 0.21), justice coefficient 0.12 (95% confidence interval 0.01 to 0.22) and cooperation skills coefficient 0.11 (95% confidence interval 0.01 to 0.21). The intraclass correlation with regard to the practices was high for both OSC (ICC=26%) and patient-evaluated quality of the practices (ICC=5%).

We assessed the reliability of each of the five dimensions in the DanPEP questionnaire when applied to our sample and found Cronbach's alphas between 0.70-0.92. The following dimensions showed positive statistically significant association with the OSC score: the doctor-patient relationship 0.04 (95% confidence interval 0.00 to 0.07), the quality of medical care 0.04 (95% confidence interval 0.01 to 0.06), the level of information and support 0.03 (95% confidence interval 0.00 to 0.05) and the organisational service provided 0.01 (95% confidence interval 0.00 to 0.03). The only dimension not statistically significantly associated with the level of OSC was the level of accessibility 0.01 (95% confidence interval -0.03 to 0.06) (Table 3).

Discussion

This first study on OSC and patient evaluations of general practice found strong associations

between the two. These effects of OSC ruled out the effects of major organisational characteristics, which is extraordinary and has not previously been demonstrated. We know from other work sectors that OSC is important in order to maintain high quality and productivity, and our study demonstrates similar associations with regard to patient evaluations of general practice. Previous studies on patient evaluations of general practice have suggested associations with only static characteristics like patients' sex and age, and similar characteristics of the GPs were important for the patient evaluations of general practice. In contrast, the level of OSC is potentially changeable. Therefore, our results strengthen the confidence regarding the importance of OSC. Furthermore, OSC might also be related to effectiveness in the healthcare sector, and the association with patient evaluations of medical care, level of information and support and the organisational service provided is a very interesting topic for possible future interventions in order to increase both patient experience with general practice and possibly also OSC itself.

The results should, however, be interpreted with some caution, taking potential weaknesses of the study into consideration.

Due to low participation rates, selection bias may pose a problem, but we analysed for associations between OSC and patient evaluations and have no reason to believe that the mechanisms behind the associations were different within the non-participating practices. Hence, we believe that our results are generalisable to the Danish general practice sector and possibly to general practice sectors with a similar structure in other western countries.

Another limitation could be related to the timespan of 2 years between the DanPEP survey and the OSC survey. In theory, the consequences of poor DanPEP evaluations could lead to subsequent changes in the individual practice and thereby improve the level of OSC. This would lead to underestimation of the associations between OSC and patient evaluations. Furthermore, practices in Denmark are relatively stable. We know that by the time of the DanPEP survey the

participating patients had been listed with their current practice for slightly less than 10 years and by the time of the OSC survey the doctors had worked at their current practice for slightly less than 15 years.

A strength of the study was that associations were found between each dimension of OSC and not only the overall patient evaluation score of general practice, but for each of the five dimensions evaluated in the DanPEP questionnaire, with the exception from one. Furthermore, a high level of intraclass correlation regarding the practices indicated that the variation in OSC to a great extent could be explained by practice differences and even though it was lower for patient evaluations, it was still relatively high.

The questionnaires used were internationally established and validated instruments with good reliability after testing within our study population.

By comparing our results to already published studies we found that practice characteristics were essential for both OSC and for patient evaluations. Consequently, we expected our results to be confounded. However, after adjusting the effect of OSC on patient evaluations, for organisational and patient characteristics, the effect was still highly significant. We believe that this association is probably of major importance for the organisational functioning of general practice with regard to the quality of care.

Implications and unanswered questions

Organisational functioning, as measured by OSC, seems to be of great importance for the quality of the patients' experience of general practice care. Future studies should analyse OSC's association with other types of quality measures like use of guidelines and achieving treatment goals. Furthermore, ways of improving OSC in general practice should be developed.

CONCLUSIONS

Organisational social capital is associated with patient evaluations of general practice.

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Competing interests

All authors have completed the International Committee of Medical Journal Editors Unified Uniform Disclosure Form for Potential Conflicts of Interest (available upon request from the corresponding author) and declare that there are no conflicts of interest.

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Figures & Tables:

Figure 1: Flowchart for combination of practices participating in the OSC survey and the DanPEP survey.

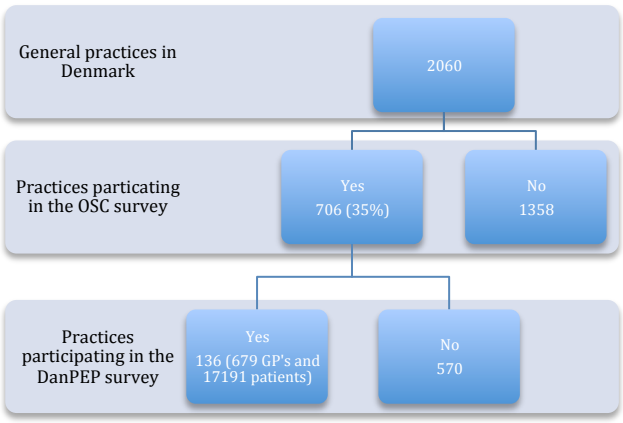

Figure 2: Effect of organisational social capital on patient evaluations of general practice care.

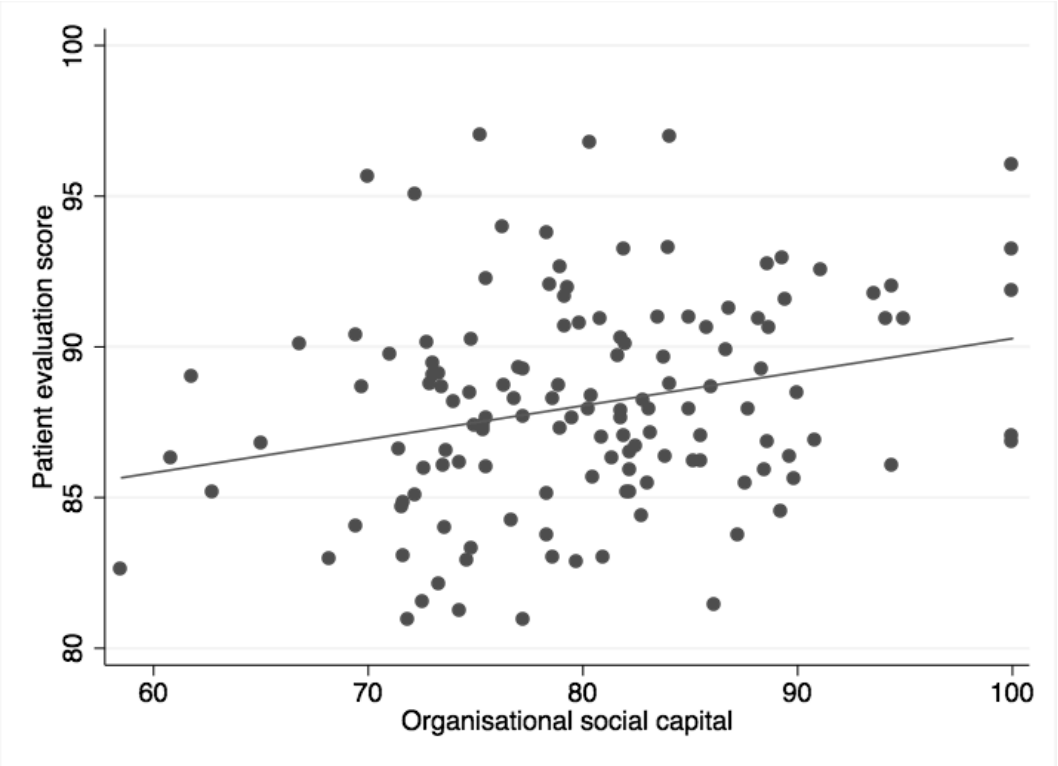

Table 1: Basic characteristics comparing practices participating in both the OSC and the DanPEP surveys with practices only participating in the OSC survey.

Table 1: Basic characteristics of practices participating in the OSC survey and the DanPEP survey

	Participants in OSC and DanPEP N (%*)	Participants in OSC but not DanPEP N (%*)
Organisational characteristics		
Number of practices	136 (19.3)	570 (80.7)
Total number of patient evaluations	17191	-
Evaluations per practice, mean (SD)	126.4 (82.6)	-
Organisational social capital, mean (SD)	80.3 (8.1)	80.5 (8.9)
Practice form		
Single-handed practices	46 (40.0)	206 (43.3)
Shared-/partnership practices	69 (60.0)	270 (56.7)
Number of listed patients, mean (SD)	3362.3 (1935.1)	3148.6 (2017.1)
Number of healthcare prof., mean (SD)	6.1 (3.6)	5.6 (3.7)
Patient characteristics (DanPEP respondents)		
Woman	5650 (33.5)	-
Age, mean (SD)	53.3 (17.7)	-
Years listed with current practice, mean (SD)	8.6 (8.1)	-
Self-rated health status		
Excellent	1067 (6.1)	-
Very good	4614 (26.8)	-
Good	7117 (41.4)	-
Fair	2799 (16.3)	-
Poor	566 (5.5)	-

* % if not specified in first column.

Table 2: The adjusted association between patient evaluations of general practice and organisational and patient characteristics. Patient evaluation score and OSC were measured for each practice.

Table 2: Adjusted association between patient evaluations of general practices and organisational and patient characteristics. Patient evaluation score and OSC were measured for each practice.

	Coef.	Adj. Coef.	95% CI	P-value
Organisational characteristics				
Organisational social capital	0.11*	0.13	[0.02 ; 0.24]	0.023
Practice form	-1.46*	-1.17	[-3.68 ; 1.34]	0.356
Number of listed patients	0.00	0.00	[0.00 ; 0.00]	0.700
Number of healthcare professionals	-0.19	0.12	[-0.36 ; 0.61]	0.616
Patient characteristics				
Woman	3.29	3.45	[-2.43 ; 9.33]	0.245
Age	0.15*	0.13	[-0.04 ; 0.31]	0.136
Years listed with current practice	0.22*	0.14	[-0.06 ; 0.34]	0.158
Self-rated health status	-0.54	5.90	[-2.33 ; 14.12]	0.157

* $p<0.05$ for the unadjusted coefficient

Table 3: The adjusted association between organisational and patient characteristics for each of the DanPEP dimensions. Patient evaluation score and OSC were measured for each practice.

Table 3 (Part 1/2): Adjusted association between patient evaluations of general practices and organisational and patient characteristics. Patient evaluation score and OSC were measured for each practice.

	Coef.	Adj. Coef.	95% CI	P-value
Doctor-patient relationship				
Organisational social capital	0.01	0.04	[0.00 ; 0.07]	0.034
Practice form	0.30	0.03	[-0.75 ; 0.80]	0.947
No. patients listed	0.00	0.00	[0.00 ; 0.00]	0.859
No. healthcare professionals	0.04	0.08	[-0.07 ; 0.23]	0.295
Patient sex	0.06	0.55	[-1.26 ; 2.37]	0.544
Patient age	0.02	0.02	[-0.03 ; 0.07]	0.463
Years listed with current practice	0.04	0.03	[-0.03 ; 0.09]	0.344
Patient self-rated health	0.43	1.67	[-0.88 ; 4.21]	0.194
Medical care				
Organisational social capital	0.01	0.04	[0.01 ; 0.06]	0.010
Practice form	0.11	0.02	[-0.59 ; 0.64]	0.948
No. patients listed	0.00	0.00	[0.00 ; 0.00]	0.871
No. healthcare professionals	0.02	0.06	[-0.06 ; 0.18]	0.320
Patient sex	0.37	0.38	[-1.06 ; 1.82]	0.600
Patient age	0.02	0.02	[-0.02 ; 0.07]	0.296
Years listed with current practice	0.05*	0.03	[-0.02 ; 0.08]	0.190
Patient self-rated health	0.13	1.09	[-0.93 ; 3.10]	0.284
Information and support				
Organisational social capital	0.01	0.03	[0.00 ; 0.05]	0.030
Practice form	0.24	0.07	[-0.49 ; 0.63]	0.799
No. patients listed	0.00	0.00	[0.00 ; 0.00]	0.658
No. healthcare professionals	0.03	0.07	[-0.04 ; 0.18]	0.186
Patient sex	-0.13	-0.37	[-1.68 ; 0.94]	0.571
Patient age	0.02*	0.04	[0.00 ; 0.08]	0.070
Years listed with current practice	0.03	0.01	[-0.03 ; 0.06]	0.508
Patient self-rated health	0.21	0.53	[-1.30 ; 2.36]	0.564

Table 3 (Part 2/2): Adjusted association between patient evaluations of general practices and organisational and patient characteristics. Patient evaluation score and OSC were measured for each practice.

	Coef.	Adj. Coef.	95% CI	P-value
Organisation of services				
Organisational social capital	0.01	0.01	[0.00 ; 0.03]	0.024
Practice form	0.06	0.00	[-0.28 ; 0.27]	0.986
No. patients listed	0.00	0.00	[0.00 ; 0.00]	0.838
No. healthcare professionals	0.01	0.03	[-0.02 ; 0.08]	0.289
Patient sex	0.17	0.16	[-0.49 ; 0.80]	0.629
Patient age	0.02*	0.02	[0.00 ; 0.04]	0.025
Years listed with current practice	0.02*	0.01	[-0.01 ; 0.03]	0.361
Patient self-rated health	0.16	0.48	[-0.42 ; 1.37]	0.291
Accessibility				
Organisational social capital	0.08*	0.01	[-0.03 ; 0.06]	0.545
Practice form	-2.17*	-1.28	[-2.36 ; -0.21]	0.020
No. patients listed	0.00*	0.00	[0.00 ; 0.00]	0.693
No. healthcare professionals	-0.29*	-0.12	[-0.32 ; 0.09]	0.264
Patient sex	2.82*	2.73	[0.21 ; 5.25]	0.034
Patient age	0.06*	0.03	[-0.04 ; 0.11]	0.403
Years listed with current practice	0.08	0.06	[-0.03 ; 0.14]	0.195
Patient self-rated health	-1.47	2.13	[-1.39 ; 5.66]	0.231

* $p < 0.05$ for the unadjusted coefficient

Organisational social capital is associated with efficiency of general practice care: A population-based combined register and survey study.

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Short title

Organisational social capital is associated with efficiency of general practice care

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Social capital, trust, justice, cooperation skills, teamwork, management, general practice, COPD.

Abstract

Background: Organisational social capital is a measure of the ability of the members of an organisation to collaborate when solving its key task. OSC is a productive force believed to be important for efficiency.

Objective: To analyse associations between organisational social capital and practice efficiency measured by number of consultations, use of diagnostic spirometry and specific treatments for patients with COPD in general practice.

Design: A national questionnaire-based survey measuring organisational social capital in general practice in Denmark was combined with register-based data on all listed COPD patients with a first-time COPD hospital admission between 2009-2011.

Population: A total of 702 (33.8%) general practices with 3,029 healthcare professionals and 4,957 COPD patients were included.

Results: Organisational social capital was associated with a reduction in the number of consultations in general practice of -0.057 (CI -0.103 to -0.010), when the level of organisational social capital was increased by one point on a scale from 0 to 100. No associations were found between organisational social capital and the use of spirometry (-0.001 (CI -0.003 to 0.002)) or specific COPD drugs (-0.002 (CI -0.004 to 0.001)).

Conclusions: This study found that high organisational social capital is associated with a reduction in the number of practice consultations, prior to the patients' first-time hospital admission regarding COPD. The use of spirometry and prescription for specific COPD drugs were not associated with organisational social capital.

What this study adds

In general practice high organisational social capital is associated with a reduction in time consumption per patient in the 1-year period prior to their first COPD hospitalisation, without compromising the quality of care or the severity threshold for hospital admission.

Introduction

Both technical skills and non-technical abilities are necessary to maintain a high level of efficiency within an organisation (1,2). Efficiency describes not only the productivity, but the ability to work well and produce good results using the available time, resources etc. in the most effective way (3). Non-technical ability, enabling the members of an organisation to jointly solve its key task, is called organisational social capital (OSC) (4). OSC has previously been associated with efficiency in other work sectors (5–7) as well as positive patient evaluations of general practice care (*Knudsen et al. Submitted*). It is the mutual feeling of trust, justice and good cooperation skills within the organisation that in total is assumed to comprise high OSC. The value of OSC is embedded within the relationships between the members of an organisation, rather than the sum of the skills of the member. It has proven difficult to change the organsation of the healthcare system, but it is possible to improve the level of OSC and through that supposedly increase the efficiency of the services (4,5,8–12).

General practice is challenged with increasing demands for prevention and care for patients with chronic conditions without increasing the expences. Consequently, decisionmakers have much focus on improving the efficiency (13–15).

Care of chronic obstructive pulmonary disease (COPD) is a suitable topic for investigating associations between efficiency and OSC in general practice. COPD is the fifth leading cause of morbidity and mortality in the world (16,17), and general practice is responsible for almost all out-hospital care for these patients. Though most patients are likely to have had the disease for decades and treatment evidently would reduce the risk of hospitalisation with more than 20%, many patients have not received medical treatment before their first hospitalisation with the disease, and even fewer have had a diagnostic spirometry in general practice (18–21). The lifetime risk of hospitalisation with COPD is above 10%, and hospitalisation is usually considered a hard endpoint for the disease (22).

The aim of this study was to analyse associations between OSC and indicators of efficiency of COPD care in general practice.

Material and methods

Design

A nationwide questionnaire-based survey measuring OSC in general practice in Denmark conducted in 2011 (*Knudsen et al. Submitted*) was combined with register-based data on patients having a first-time COPD hospitalisation in an interval of up to two years before the OSC-survey (2009-2011). Efficiency was assessed by the time consumption per COPD patient per year as productivity indicator, and the use of spirometry and prescriptions for specific COPD drugs as quality indicators.

All Danish citizens are registered in the Danish Civil Registration System and assigned a unique civil personal registration number (CPR-number). Likewise, each general practice is assigned a unique identification number, enabling accurate linkage between patients and general practice (23). More than 98% of the population in Denmark is registered with a general practitioner, providing primary care and acting as gatekeeper. Healthcare in Denmark is largely financed through taxes, and patients have free access to all services related to general practice and hospital care, whereas prescribed medications are partly subsidised (24,25).

Measuring organisational social capital in general practice

Based on the work of the Danish National Research Centre for the Working Environment and the internationally standardised Copenhagen Psychosocial Questionnaire II, all general practitioners and staff members were asked to score a total of 11 items. Adaption of the questionnaire to general

practice has been described in details elsewhere (*Knudsen et al. Submitted*). Each item was rated on a five-point Likert scale ranging from "poor" to "excellent". The item ratings were used to calculate a score for the dimensions of trust, justice and cooperation skills (from 0 to 100), within each organisation (26–28). OSC was calculated for each practice as the mean of the dimension scores.

Identification of COPD patients

The Danish National Patient Register hold administrative data from all admissions to Danish hospitals, including diagnoses classified according to International Classification of Diseases 10th edition (ICD-10). Using patients' CPR-number, we linked the individual health administrative data with data from the Demographic Register obtaining dates of birth, deaths and migrations to or from Denmark (7).

COPD hospitalisation was defined as hospitalisation with one of the following combinations of ICD-10 diagnoses: 1) J41-44 (chronic bronchial conditions besides asthma) as primary diagnosis, or 2) J13-18 (pneumonia) or J96 (respiratory insufficiency) as primary diagnosis with J41-44 as a secondary diagnosis (29–31).

We used an 8-year retrospective period to determine whether a patient's COPD hospitalisation was first-time (22), and ICD-10 diagnoses from that period was used to calculate the Charlson comorbidity index (excluding COPD) (32). We used in-hospital mortality and admission-free survival time between the first and second hospitalisation to estimate, whether OSC was associated with differences in admission severity threshold between the practices.

Identification of general practice variables

A complete list of general practices in Denmark (2060) was provided by the Organisation of General Practitioners.

The Health Insurance Register has complete individual-level data on the settling between general practice and the governmental regions of Denmark, including provider, date and type of contact, patient CPR-numbers and services. Data for all contact between general practice and their COPD patients in the interval of one year before first-time COPD hospitalisation were retrieved. Likewise, data on all spirometry tests performed on COPD patients between 1994-2011 were retrieved.

The Danish National Prescription Database has complete individual-level data on all redeemed drug prescriptions. All drugs targeting COPD (anatomical therapeutic chemical (ATC) code R03) require a prescription. Data on all prescriptions for R03 drugs, in an interval of one year before first-time COPD hospitalisation, were retrieved. Prescriptions for the following specific R03 drugs and drug combinations are considered specific for COPD treatment: Long Acting Beta-2-adrenoceptor Agonist (LABA), Inhaled CorticoSteroids (ICS) in combination with LABA or Longacting Anticholinergs (LA).

Statistical methods and analysis

The following was calculated with regard to each general practice: 1) Average time consumption for COPD patients in the one-year interval before a patient's first-time COPD hospitalisation, measured by the mean number of consultations, 2) Proportion of COPD patients, who had had a spirometry test "up to 2 years before " or "up to 14 years before" the first-time COPD hospitalisation, 3) Proportion of COPD patients within each practice, who received prescriptions for specific COPD drugs in the one-year interval before the first-time COPD hospitalisation.

OSC, patient characteristics (gender, age and comorbidity index) and practice characteristics (practice form, number of listed patients and number of healthcare staff) for each practice are reported as categorical variables.

The association with 95% confidence intervals (CI) between OSC (change of outcome when OSC increased by 1 point) and the average number of consultations in general practice, the proportion of patients having spirometry tests performed and the proportion of patients receiving prescriptions for specific COPD drugs was analysed by means of linear regression. Analysis was conducted in three steps: unadjusted, adjusted for patient characteristics and finally adjusted for patient and organisational characteristics. The odds ratio with 95% CI for associations between OSC and in-hospital mortality was analysed using mixed logistic regression. Hazard ratio with 95% CI for associations between OSC and admission-free survival time between the first and the second hospitalisation was analysed using cox regression. P-values < 0.05 were considered statistically significant. All statistical analyses were carried out using STATA 11 (STATACorp, College Station, TX, USA).

Ethics and permissions

The study was approved by the Danish Data Protection Agency (journal 2012-41-0985). According to Danish legislation no approval from the Danish health research ethics committee was required.

Results

Data on OSC were obtained from 706 (34.3%) Danish general practices, of which 42.7% were single-handed. A total of 3064 individual healthcare professionals completed the questionnaire. The practices had a mean of 3225 patients listed. Further details have been published elsewhere (*Knudsen et al. Submitted*).

A total of 4957 patients from the participating practices had a first-time COPD admission in the 2-year period before the OSC survey (Figure 1: Flowchart). The COPD patients had a mean

number of 21.6 contacts to general practice in the year before their first-time COPD hospitalisation. As shown in Table 1 54.0% were women, the mean age was 71.3 and the mean Charlson comorbidity index was 1.5 (no points were added for COPD).

Principal findings

The number of consultations decreased by -0.057 (CI -0.103 to -0.010) when OSC increased by one point (from 0 to 100), adjusted for patient characteristics and organisational characteristics (Table 2).

For patients with a first-time COPD hospitalisation in 2009-2011, 35.2% had a spirometry test up to 2 years before the hospital admission and 60.3% up to 14 years before the hospitalisation. Increasing OSC with one point (from 0 to 100) was not associated with changes in use of spirometry test up to 2 years before (-0.001 (CI -0.003 to 0.002)) or up to 14 years before (-0.001 (CI -0.004 to 0.002)) the hospitalisation, when adjusting for patient characteristics and organisational characteristics (Tables 3a and 3b).

A total of 59.0% received prescriptions for specific COPD drugs within one year before their first-time COPD hospitalisation. Increasing OSC by one point (from 0 to 100) was not associated with use of specific COPD drugs (-0.002 (CI -0.004 to 0.001)), when adjusting for patient characteristics and organisational characteristics (Table 4).

OSC was not associated with in-hospital mortality (Odds Ratio 1.007 (CI 0.993 to 1.020)) or the time between the first and second hospitalisation (Haz. Ratio 1.000 (CI 0.996 to 1.005).

Discussion

OSC is associated with efficiency in general practice, in terms of reducing the time consumption for COPD patients without compromising the use of spirometry or specific COPD drugs.

The association between OSC and efficiency has previously been shown in other work sectors, but to our knowledge not in the healthcare sector or in studies of this scale comprising 700 individual organisations. Our results are interesting, because it is possible to change the level of OSC, in contrast to many other organisational characteristics associated with efficiency of the services provided. This indicates that OSC should be an important dimension of consideration, when discussing organisational changes of general practice. Also for the patients a high level of OSC appears to be important. OSC produces shared knowledge about the organisation of the health care provided, and as such each meeting between the patient and the healthcare professionals leads to the next. Continuity is reassuring for the patient and could endorse safety and consequently make it easier for the patient to cope with his/her situation (33). This could be the explanation for the association between OSC and the reduced need for consultations. It has previously been shown that OSC is positively associated with the patients' experience of the care provided in general practice (*Knudsen et al. Submitted*). The results of this paper indicate that this could be obtained with fewer consultations, without compromising the quality of care. As OSC is measured by scales related to the psychosocial work environment it comprises information about the well-being of the people within the organisation. One could imagine that the well-being of the staff would spill over to the patients and thereby increase the desire for patients, especially with chronic diseases, for consultations. However, patients do not attend their practitioner to be examined, but rather to be reassured (34–36). The results from this study are interesting because they suggest that high OSC can achieve precisely such a reassuring effect in the treatment of chronic patients.

The questionnaire used for the OSC survey was an internationally established and validated instrument with good reliability after testing within our study population. Furthermore, the scope of the study with 700 practices and complete data regarding their COPD patients contacts, use of spirometry testing and prescription of drugs was a strength of the study. However, the results should

be interpreted with some caution, taking potential weaknesses into consideration. Selection bias could have influenced our results, as practices having chosen to participate might have a different level of OSC than non-participating practices. However, there was substantial variation in the OSC score between the participating practices, and we have no reason to believe that the associations between OSC and care for COPD patients differ between participating and non-participating practices. Therefore, we believe that our results are generalisable to the Danish general practice sector and possibly to general practice sectors with similar structure in other western countries.

Other potential limitations were the timespan of up to 2 years between the first-time COPD hospitalisation and the OSC survey in 2011. We do not know whether changes in COPD management prior to the OSC survey could have affected OSC and thereby caused an over- or underestimation of the analysed associations. Since this was a national study bias could also be caused by differences with regard to severity threshold for COPD hospitalisation between practices and/or hospitals in Denmark. However, Danish general practices are relatively stable (*Knudsen et al. Submitted*), analysis found no associations between OSC and in-hospital mortality or readmission-free survival time between first-time and second hospital admission, all indicating that OSC was not associated with disease severity at the time of the first hospitalisation for the disease. The timespan could therefore dilute the impact of change in OSC, but we do not believe it to cause bias to the results. Further, we have no indications that neither threshold for COPD hospital admission nor management strategies changed significantly in the two year interval.

We used COPD as a model disease because of its progressive course, its increasing need for medical attention from general practice and the large diversity in disease control obtained for the individual patient (29). Outcome measures were therefore linked to the general practice's treatment pattern and subsequent the patient's compliance. COPD management comprises the ability to endure a high level of compliance, whereas failing to achieve this could imply that a general

practice has proposed spirometry or issued prescriptions, to which the patients have been noncompliant. This could cause an underestimation of the association between OSC and the outcome.

Previously published studies showed that the same practice characteristics were associated with both the level of OSC and the use of spirometry (37). Nonetheless, after adjusting for practice characteristics the effect of OSC on the number of consultations was still highly significant. This indicates that OSC has an independent effect on efficiency by lowering the number of consultations without affecting the quality indicators. Regarding the use of specific drugs for obstructive pulmonary diseases, others have shown associations with patient characteristics. We found that both patient characteristics and organisational characteristics were associated with the use of spirometry, whereas only the patients' comorbidity index was associated with the use of specific COPD drugs.

CONCLUSIONS

This study found that high organisational social capital is associated with a reduction in the number of general practice consultations, prior to a patient's first-time hospital admission for COPD. The use of spirometry and prescription for specific COPD drugs were not associated with organisational social capital.

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Figures & Tables:

Figure 1: Flowchart for inclusion of general practices and their COPD patients.

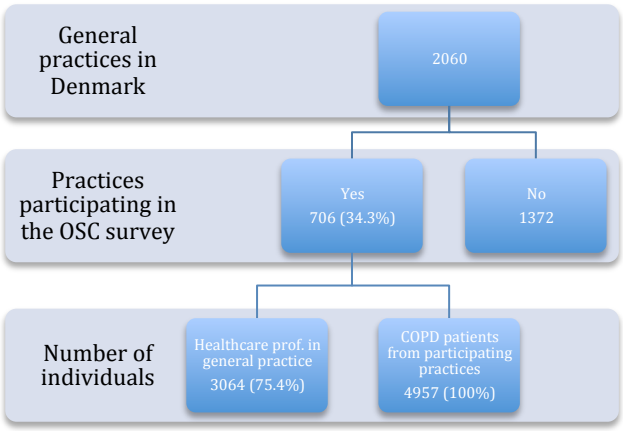

Table 1: Baseline characteristics.

Table 1: Baseline characteristics

	N (%*)
Number of participating practices	706 (34.3•)
Total number of patients from the participating practices with a first-time hospital admission regarding COPD in 2009-2011	4957
Organisational characteristics	
Number of listed patients, mean (SD)	3225 (2004)
Number of healthcare prof., mean (SD)	5.7 (3.6)
Organisational social capital, mean (SD)	80.4 (8.7)
Practice form	
Single-handed practices	244 (42.7)
Shared-/partnership practices	335 (57.3)
Patient Characteristics	
Woman	2678 (54.0)
Age, mean (SD)	71.3 (11.6)
Mean score on the Carlson's comorbidity index (excluding COPD) (SD)	1.5 (1.8)
Total number of patients who had a spirometry test up to two years before the first-time hospital admission regarding COPD	1747 (35.2)
Total number of patients who had spirometry test up to fourteen years before the first-time hospital admission regarding COPD	2991 (60.3)
Number of patients who received prescriptions for specific COPD drugs in the year before their first-time COPD hospital admission✞	2924 (59.0)
Mean number of contacts with general practice in the year before the first-time hospital admission regarding COPD (SD)	21.6 (17.7)

Table 2: Associations between organisational social capital and the number of consultations between general practice and listed COPD patients in the year prior to the first-time hospital admission for COPD.

Table 2: Associations between organisational social capital and the number of consultations between general practice and listed COPD patients in the year prior to the first-time hospital admission for COPD.

Change in number of consultations, 95% confidence intervals and P-values

	Change no. cons.	95% CI		P-value
Unadjusted organisational social capital	-0.063	[-0.101	-0.024]	0.001
Adjusted for patient characteristics				
Organisational social capital	-0.064	[-0.102	-0.026]	0.001
Gender (ref. female)	-0.543	[-1.917	0.831]	0.438
Age	-0.063	[-0.125	-0.001]	0.045
Charlson comorbidity index	0.460	[0.116	0.805]	0.009
Adjusted for patient- and organisational characteristics				
Organisational social capital	-0.057	[-0.103	-0.010]	0.017
Gender (ref. female)	-0.861	[-2.478	0.756]	0.296
Age	-0.058	[-0.129	0.012]	0.106
Charlson comorbidity index	0.321	[-0.072	0.714]	0.109
Practice form (ref. single-handed)	-0.936	[-1.961	0.089]	0.073
No. of healthcare prof. in practice	0.189	[-0.028	0.406]	0.088
No. of patients listed at practice	0.000	[0.000	0.000]	0.804

Table 3: Association between organisational social capital and the use of spirometry in the 2-year (3a) interval or 14-year interval (3b) before a patient's first-time hospital admission regarding COPD.

Table 3a: Use of spirometry tests up to 2 years before the first-time COPD hospital admission. Characteristics, change in number of consultations, 95% confidence intervals and P-values

	Change in use of spirometry	95% CI	P-value
Unadjusted organisational social capital	-0.001	[-0.004 ; 0.001]	0.309
Adjusted for patient characteristics			
Organisational social capital	-0.001	[-0.003 ; 0.001]	0.342
Woman	0.115	[0.033 ; 0.197]	0.006
Age	-0.001	[-0.005 ; 0.002]	0.427
Charlson's comorbidity index	-0.050	[-0.071 ; -0.030]	0.000
Adjusted for patient- and organisational characteristics			
Organisational social capital	-0.001	[-0.003 ; 0.002]	0.663
Woman	0.135	[0.041 ; 0.228]	0.005
Age	-0.001	[-0.005 ; 0.003]	0.547
Charlson's comorbidity index	-0.058	[-0.081 ; -0.036]	0.000
Practice form (ref. single-handed)	-0.014	[-0.074 ; 0.045]	0.635
No. of healthcare prof. in practice	0.014	[0.001 ; 0.026]	0.031
No. of patients listed at practice	0.000	[0.000 ; 0.000]	0.423

Table 3b: Use of spirometry tests up to 14 years before the first-time COPD hospital admission. Characteristics, change in number of consultations, 95% confidence intervals and P-values

	Change in use of spirometry	95% CI		P-value
Unadjusted organisational social capital	-0.001	[-0.004	0.001]	0.254
Adjusted for patient characteristics				
Organisational social capital	-0.001	[-0.004	0.001]	0.256
Woman	0.027	[-0.064	0.119]	0.556
Age	-0.003	[-0.007	0.002]	0.230
Charlson comorbidity index	-0.029	[-0.052	-0.006]	0.015
Adjusted for patient- and organisational characteristics				
Organisational social capital	-0.001	[-0.004	0.002]	0.676
Woman	0.020	[-0.087	0.127]	0.716
Age	-0.002	[-0.006	0.003]	0.496
Charlson comorbidity index	-0.029	[-0.055	-0.003]	0.027
Practice form (ref. single-handed)	0.009	[-0.059	0.077]	0.793
No. of healthcare prof. in practice	0.016	[0.002	0.031]	0.024
No. of patients listed at practice	0.000	[0.000	0.000]	0.358

Table 4: Associations between organisational social capital and the prescription pattern for specific COPD targeting drugs in the year prior to the first-time hospital admission regarding COPD.

Table 4: Association between OSC and prescription for specific COPD drugs

	Change in use of drugs	95% CI	P-value
Unadjusted organisational social capital	-0.001	[-0.003 ; 0.001]	0.264
Adjusted for patient characteristics			
Organisational social capital	-0.001	[-0.003 ; 0.001]	0.299
Woman	0.043	[-0.032 ; 0.119]	0.262
Age	0.002	[-0.001 ; 0.006]	0.155
Charlson comorbidity index	-0.021	[-0.040 ; -0.002]	0.030
Adjusted for patient- and organisational characteristics			
Organisational social capital	-0.002	[-0.004 ; 0.001]	0.194
Woman	0.062	[-0.025 ; 0.148]	0.163
Age	0.002	[-0.002 ; 0.006]	0.303
Charlson comorbidity index	-0.029	[-0.051 ; -0.008]	0.006
Practice form (ref. single-handed)	-0.034	[-0.089 ; 0.021]	0.226
No. of healthcare prof. in practice	0.009	[-0.003 ; 0.020]	0.138
No. of patients listed at practice	0.000	[0.000 ; 0.000]	0.186

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The Corresponding Author affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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Competing interests

All authors have completed the International Committee of Medical Journal Editors Unified Uniform Disclosure Form for Potential Conflicts of Interest (available on request from the corresponding author) and declare that there are no conflicts of interest.

12 Appendices:

12.1 Questionnaire used in the OSC survey

Hvem er du?

Sekr ☐ Sygepl ☐ Ordinær læge ☐ Ansat læge ☐ Bioanalytiker/lab. ☐ Andet ☐_____

Arbejder du: Fuldtids ☐ Deltids ☐ Din alder:_____ Køn: Mand ☐ Kvinde ☐

Hvor mange år har du arbejdet i denne praksis: _____år

Flg. spørgsmål handler ikke om dit eget job, men om din arbejdsplads som helhed

	meget uenig	uenig	del-vist	enig	meget enig
1) Vi tænker på, hvad sundhedsvæsenets ressourcer bruges til hos os	☐	☐	☐	☐	☐
2) Hos os bliver alle involveret i beslutninger om forandringer	☐	☐	☐	☐	☐
3) Personalekonflikter løses retfærdigt for alle involverede	☐	☐	☐	☐	☐
4) Man kan stole på de udmeldinger, der kommer fra ledelsen	☐	☐	☐	☐	☐
5) Ledelsen stoler på, at medarbejderne gør et godt stykke arbejde	☐	☐	☐	☐	☐
6) Jeg synes, at arbejdsopgaverne er fordelt på en hensigtsmæssig måde	☐	☐	☐	☐	☐
7) Jeg føler mig som en del af et fællesskab på arbejdspladsen	☐	☐	☐	☐	☐
8) De ansatte stole i almindelighed på hinanden	☐	☐	☐	☐	☐
9) Arbejdsopgaverne fordeles på en retfærdig måde	☐	☐	☐	☐	☐
10) Hvis jeg glemmer noget, så vil mine kolleger rette det for mig	☐	☐	☐	☐	☐
11) Behandlingen i min praksis har et højt fagligt niveau	☐	☐	☐	☐	☐
12) Holder de ansatte informationer skjult for hinanden	☐	☐	☐	☐	☐
13) Jeg har ingen indflydelse på beslutninger om mit arbejde	☐	☐	☐	☐	☐
14) Vi har et godt samarbejde mellem faggrupperne	☐	☐	☐	☐	☐
15) Lægerne i min praksis er omhyggelige	☐	☐	☐	☐	☐
16) Der er en god stemning mellem mine kolleger og mig	☐	☐	☐	☐	☐
17) Jeg kan give udtryk for mine meninger over for kollegerne	☐	☐	☐	☐	☐
18) Jeg tror, at andre lægepraksis fungerer bedre end vores	☐	☐	☐	☐	☐

12.2 Background form used in the OSC survey

Oplysningsskema

FORSKNINGSENHEDEN
FOR ALMEN PRAKSIS

DETTE SKEMA ØNSKES UDFYLDT AF KONTAKTPERSONEN (SEKRETÆR/SYGEPLEJERSKE ELLER LÆGE)
og skal sendes retur med de personlige spørgeskemaer, der skal forblive i lukkede kuverter.

a) Ydernummer: _____

b) Praksisform:

☐ Solopraksis (typisk ét ydernummer og en ejer)

☐ Delepraksis (typisk ét ydernummer der deles af flere læger)

☐ Kompaniskabspraksis (typisk flere læger med hver sit ydernummer der deler faciliteter og har fælles klinikpersonale)

c) Antal tilmeldte patienter: _____

d) Hvor mange arbejder i jeres praksis inkl. ejer(e): _____

Hvem er i, i jeres praksis:

e) Ordinære læger: Fuld tid _____ Deltid _____

f) Uddannelseslæger: Fuld tid _____ Deltid _____

g) Ansatte speciallæger (vikarer/aflastningsemanuensis):
Fuld tid _____ Deltid _____

h) Sygeplejersker/SOSU/Bioanalytikere:
Fuld tid _____ Deltid _____

i) Sekretærer: Fuld tid _____ Deltid _____

j) Andet personale: Fuld tid _____ Deltid _____

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