

Identifying organisational principles and management practices important to the quality of health care services for chronic conditions

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PREFACE

The present thesis is based on four studies that were carried out between September 1st 2002 and June the 1st 2008 in the following organisations and departments: Department of Integrated Health Care, Bispebjerg University Hospital, and Department of Health Services Research, Institute of Public Health, University of Copenhagen. Part of the studies were carried out during a research visit at the Care Management Institute, Kaiser Permanente and the Institute for Health Policy Studies, University of California, San Francisco (UCSF) from 2002-2003.

LIST OF ORIGINAL PUBLICATIONS

1. Frølich A, Schiøtz ML, Strandberg-Larsen M, Hsu J, Krasnik A, Diderichsen F, Bellows J, Sjøgaard J, White K. A Retrospective Analysis of Health Systems in Denmark and Kaiser Permanente. *BMC Health Services Research* 2008;8:252.
2. Frølich A, Bellows J, Nielsen BF, Brockhoff PB, Hefford M. Effective population management practices in diabetes care – an observational study. *BMC Health Services Research* 2010;10:277.
3. Frølich A, Høst D, Schnor H, Nørgaard A, Ravn-Jensen C, Borg E, Hendriksen C. Integration of health care rehabilitation in chronic conditions. *International Journal of Integrated Care* 2010;10:1568-4156.
4. Frølich A, Talavera JA, Broadhead P, Dudley RA. A Behavioural Model of Clinician Responses to Incentives to Improve Quality. *Health Policy*, 2007;80:179-93.

1. INTRODUCTION

Clinical evidence regarding diagnosis, treatment, and rehabilitation in chronic conditions is chiefly well established. Further, evidence is expediently described in guidelines to make the knowledge accessible to health professionals. Unfortunately, guidelines have only negligible impact on clinical practice; the challenge is, therefore, how to get evidence into practice, a topic that has been discussed for at least ten years (1,2).

Insufficient quality of care results from inadequate provision of care, as well as from other factors, such as limited resources. It is a known fact that care in chronic conditions often does not meet standards and shows large variations in Denmark and internationally (3,4,5,6,7,8,9,10,11). In addition to the fact that care does not meet standards, the population of aging individuals is growing; the consequence is increased incidence and prevalence of chronic conditions, which is perceived as a major challenge to health care systems (12,13,14,7). Rising costs caused by inappropriate care and the growing number of patients force increasing expenditures by health care organisations.

For this reason, linking evidence-based medicine to evidence-based management has been seen as a way of improving quality of care (15,16). The 2001 Institute of Medicine report, *Crossing the Quality Chasm*, concluded that fundamental changes in the health care sector are needed to ensure high quality of care for patients with chronic conditions (12). The publication recommends evidence-based planned care and reorganisation of practices with the goal to become organisations that meet patients' needs.

1.1 Short description of the four studies of the thesis

A structural reform of the Danish Health Care System (DHS) was undertaken in 2007 with the goal of improving quality of care and increasing effectiveness of care. Therefore, the main goal of Study 1 was to identify possible effective organisational practices from a comparison of the DHS to Kaiser Permanente (KP). Kaiser Permanente, the largest private, non-profit integrated delivery system in the US has been described as providing high quality, cost-efficient care (17,18). I was especially interested in KP's provision of care in chronic conditions for which prevalence rates were high and increasing in the DHS. Further, it was known that care provided in the DHS often did not live up to standards (5,6,7).

Study 2 was initiated with the purpose of identifying effective management practices from the chronic care model (CCM). The CCM has been shown to improve quality of care in chronic conditions and is widely adopted for this purpose (19,20,21). However,

unanswered questions about the CCM include whether some individual management practices are more effective than others and whether some combinations of practices are more powerful at improving quality of care than others (22). The effects of fifteen practices on quality of care were compared in a diabetes population cared for within a US managed care organisation.

Management practices of the CCM have been proven effective in other health care systems but have not been implemented in a Danish context (20,23,24). This was the purpose of Study 3. Furthermore, integration of care was improved, supported by a conceptual model of integrated care (25).

Both financial incentives and public quality reporting are perceived as promising mechanisms for improving quality of care (26,27). In Study 4, evidence of their impact on quality of care was studied by means of a structured literature review based on a behavioural model of physicians' response to incentives to improve quality.

The overall goal of the four studies can be summarized as: to describe important determinants for quality of care at macro-, meso-, and micro- organisational levels.

1.2 Structure of the thesis

The thesis contains eight chapters and four papers. Chapter 1 gives a brief introduction to the main focus of the thesis and a resume of the four studies of the thesis. Chapter 2 sets the scene of the thesis; it defines quality of care, defines determinants of quality of care, and describes knowledge regarding the determinants. Chapter 3 defines the overall goal of the thesis and the aims of the studies. Chapter 4 describes methods and materials of the four studies. Chapter 5 presents results of the studies. Chapter 6 discusses principal findings, as well as the methodology used in the studies. Chapter 7 summarizes the conclusions of the four studies. Chapter 8 states perspectives for future research.

2. BACKGROUND

2.1 Quality of care

Definitions of quality of care will be described and discussed, as will approaches to measuring quality of care. Quality measurement drives quality improvement at macro-, meso-, and micro-organisational levels, spanning government, parliamentary politicians, local politicians and administrators, patient organisations, leadership of health care organisations and departments, health care professionals, and patients.

2.1.1 Definitions of quality of care

Various authors and organisations define quality of care differently. The Institute of Medicine (IOM) in the USA defines quality of care as 'the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge' (28). In *Crossing the Quality Chasm*, the IOM further defines good quality along six dimensions; the care should be safe, effective, patient-centred, timely, efficient, and equitable (12). The UK National Health Service (NHS) identifies domains defining quality of care: effectiveness, access, capacity, safety, and patient-centredness (29). The Organisation for Economic Co-operation and Development (OECD) Health Care Quality Indicators project defines quality of care using a framework of effectiveness, safety, and patient-centred care (30,31).

Donabedian stresses that quality of a service is the degree to which it conforms to the present standards of good care (32,33).

The World Health Organisation (WHO) stipulates that quality occurs when the following are in place: high professional standards, effectiveness, minimal risk for the patient, high patient satisfaction, and continuity of care. This definition has been adopted by the Danish National Board of Health. There has been a movement toward a common view of essential elements of quality (34,35). Suggested frameworks generally include measurement in at least five domains: access, effectiveness and appropriateness, responsiveness, safety, and equity.

2.1.2 Measurement of quality of care

Measurement of quality of care is central for quality assessment and subsequent quality development (36). A statement attributed to Florence Nightingale captures the relationship between quality measurement, quality management, and performance: "The ultimate goal is to manage quality. But you cannot manage it until you have a way to measure it, and you cannot measure it until you can monitor it" (37).

Donabedian's classic theory of structure, process and outcome is an often-used framework for defining and using quality indicators (33). Structure refers to elements of health care systems, such as the number of hospitals, number of beds in a hospital, or number of lung function spirometers in a practitioner's office. Process refers to the process of care delivery to patients, including elements such as tests, prescriptions, and procedures. Process measures are often only weakly connected to outcome measures, which is problematic for accurately assessing quality. However, process measures are relatively immune to bias related to small numbers and risk-adjustment issues.

Outcome refers to health status measures such as death, functional capacity, and quality of life. Often seen as the most important quality measures, outcome assessments are also prone to effects from time lag and patient characteristics. Outcome measures do not provide immediate information on possible actions. Evidence-based structure and process measures might be important to the final outcome and, simultaneously, to improving the process in question. Therefore, all three measures play different roles in the quality assessment process (38). High levels of validity and reliability are fundamental constructs of good indicators. The framework of quality indicators, structure, process and outcome is appropriate at the three different organisational levels (33).

2.1.3 Conclusions

I conclude that quality of care is defined according to the level in the health care system at which it is assessed. At the macro-level of countries and organisations, quality of care is defined based on frameworks with several dimensions characterizing important areas of care. National and large organisational frameworks assessing quality of care generally include measurements in at least five domains: access, effectiveness and appropriateness, responsiveness, safety, and equity. For each dimension, quality indicators are designated.

At the meso-level of organisations, the spectrum of quality of care narrows and definitions become more focused and include fewer dimensions, such as effectiveness of care, compliance with clinical guidelines, patient-related quality (e.g., quality of life, patient satisfaction) and organisational quality (e.g., safety, rate of rehospitalisation, average length of stay). The quality of care can also be defined in relation to specific technologies, such as care management practices. The micro-level includes measures related to patients (quality of life, patient satisfaction) and pro-

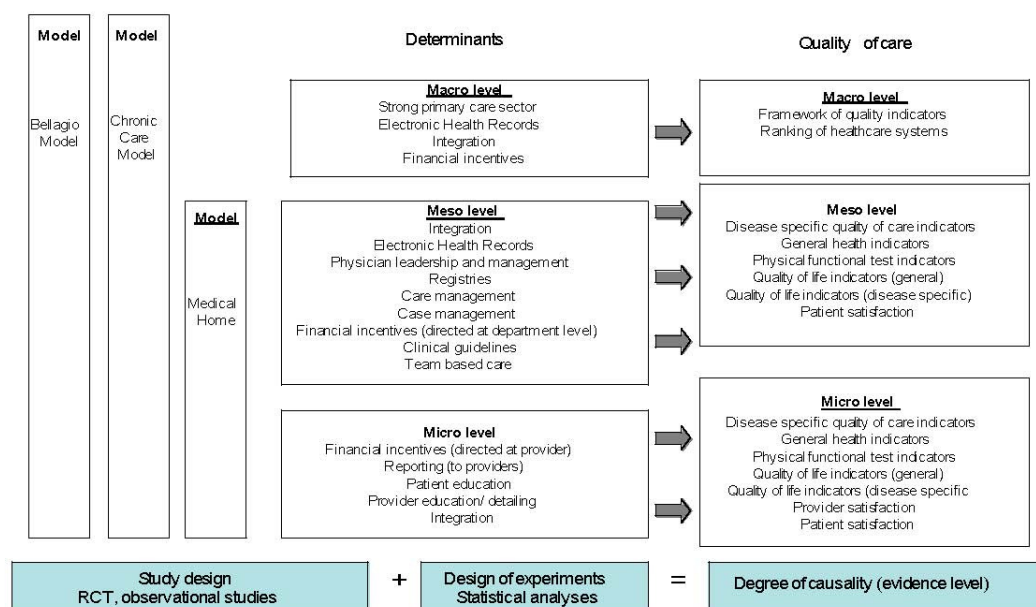


Figure 1
Three models developed for the purpose of improving quality of care. Determinants of quality of care at three organisational levels and outcome indicators are shown. The connection between study design and design of experiments and degree of causality is illustrated at the bottom of the figure.

viders (job satisfaction), and some measures are the same as those measured as at the meso-level.

2.1.4 Operational definition of quality of care and quality measures

Quality of care in the four studies was operationally defined as effectiveness; it is the most frequently assessed quality domain, typically measured by process indicators. The other domains certainly complete a more robust definition of quality, but they were not operationalized in the studies. Care effectiveness was assessed through the use of selected quality indicators.

In Study 1, we measured quality of care by four process indicators: two cancer screening rates (breast and cervical), retinal screening among patients with diabetes, and beta-blocker use among patients with acute myocardial infarction. Those measures express information on process of care effectiveness. We measured effectiveness of care in Study 2 with two diabetes process indicators, glycemic and lipid screening rates. In Study 3, we measured effectiveness of care by the following outcome measures: general health indicators (tobacco screening, physical activity level, Body Mass Index (BMI), waist measure) and disease-specific indicators (lung function (forced expiratory volume in first second (FEV1), forced vital capacity (FVC), MRC dyspnoea and Borg scales (39,40), physical functional tests (41), patient self-assessment of functional level using Avlund's scale (42), quality of life schemes (SF-36) and a disease-specific quality of life measure (CCQ) (43,44). Standards for the indicators were obtained from the literature.

Quality of care in Study 4 was measured by structure and process indicators used in eight RCTs: medication instruction (pharmacy) and preventive care processes, such as well-child continuity visit rates, vaccination rates and targets, cancer screening rates, tobacco screening rates, and tobacco cessation advice rates and targets.

2.2 Determinants of quality of care

2.2.1 Definitions of determinants of quality of care

Determinants of quality of care were defined as features developed with the purpose of improving quality of care; examples of determinants include electronic health records, integration, case management, financial incentives, and patient education (Figure 1). Determinants can be implemented at one or more organisational levels: macro-, meso-, or micro- level depending on the design of the determinant. For example, the determinant "team-based care" is implemented at the meso-level while financial incentives can be implemented at micro-, meso-, or macro-levels, depending on whether the incentive is directed at single provider (micro), at a department (meso), or an organisation, for instance, a health care center (macro). The impact of determinants on quality of care can be identified at all levels in the organisation.

2.2.2 Macro-level

Comparing health care systems is a widespread method used for identification of organisational characteristics and best practices that impact quality of care (31,45,46,47,48,49).

Methods used for identifying determinants of quality of care

Several comparison studies using quantitative or qualitative methods build on the understanding that there is a link between high performance and use of effective organisational structures and principles (17,18,31,45,46,48,50,51,52).

Comparison studies are also used to spur health policy debates, as in the case of the position paper of the American College of Physicians that will be considered later in this chapter (45). Several organisations conduct health care systems comparisons, including the Organisation for Economic Co-operation and Development (OECD), the World Health Organization (WHO), and the Commonwealth Fund (53,54,55). Health care system comparison has been described as a "nascent art" (49,56,57). Other methods, such as time trend analysis, can also be used. Time trend studies are epidemiological studies that describe characteristics of a

population (rather than of individuals) measured in repeated cross-sectional samples over time.

Comparisons of costs in health care systems

Comparison of costs between health care systems is problematic (58,59). Several methods have been proposed. Comparisons can be based on the percentage of total gross national product composed of health care expenses, but this method does not accurately capture the extent of available resources (60). Another method is based on comparison of expenses after conversion to US \$; this method is subject to error from changing stock markets and wage differentials between systems that cannot be transferred directly.

Purchasing power parity (PPP) is a frequently-used method for correcting for differences in purchasing power between two currencies that takes the prices of specific products into account. However, this method presupposes that price variations in society are also reflected in price variations in the health care system, which is a problematic assumption (59,61). The PPP method approximates the comparison of a predefined health care "benefit basket," also used to compare health care costs between countries (62,63).

Confounding factors

Comparison results can be influenced by various factors unrelated to the health care system such as populations (age, income distribution, educational levels) economic factors, different demography, and social and cultural factors (56). Confounding factors also are present at the meso- and micro- levels.

Determinants of quality of care at the macro level

Organisational structures and principles that affect quality of care in chronic conditions

A comparison between KP and the NHS demonstrated that KP delivered higher quality of care at about the same costs (17). A subsequent study compared inpatient bed utilisation in the NHS and Kaiser Permanente for patients older than 65 years, demonstrating that the bed use in the NHS for eleven leading conditions was three and a half times that of KP (18). The studies conclude that particular organisational structures and principles resulted in higher quality of care at comparable costs (17,18). KP attributes its more cost-effective performance to delivering integrated care, having effective physician leadership and management of hospitals, investments in information technology and, lastly, competition with other health care systems. In a recent study, more primary care physicians reported integration of care in KP than did clinicians in DHS (64).

Findings from a study comparing the NHS to five US managed care organisations (one of which was KP) characterized by high scores on performance measures concluded that six factors were important for providing high quality care to people with chronic illness: competition, ownership and exclusive contracting, integration of primary and specialist care for patients, financial incentives, chronic disease management, and alignment of goals (51,65). Important organisational principles included integrated care, competition, effective physician leadership and management of hospitals. For KP, information technology was important to achieving a high performance level; for all five managed care organisations, ownership and exclusive contracting and financial incentives were important.

Organisational structures and principles that affect quality of care

The American College of Physicians compared the American health care system to seven high-functioning western health care systems, aiming to identify successful organisational structures and principles supporting quality of care (45). Three features were identified as characteristic of high-performing health care systems; commitment to primary care, control over workforce supply, and widespread implementation of electronic medical records.

Different health care systems were compared to examine the impact of primary care on health outcomes, such as early childhood indicators, including low birth weight and post-neonatal mortality (52). The authors found that countries with stronger primary care generally had healthier populations. However, other non-health factors, such as better welfare policies and income support, might be connected to strong primary care systems, thereby influencing health and the outcome of the analysis.

Discussion and conclusion

There has been much interest from European public health researchers to gain insight into the organisational principles and methods used in US managed care organisations, including KP (51,66). These include integrated care, effective physician leadership and management of hospitals, information systems to support care and, lastly, competition with other health care systems. The study by Feachem et al. was criticised for inadequate cost-correction methods, and the authors concluded that the NHS was not similar to KP in coverage, costs, or performance (17,67). The findings on hospital bed utilization patterns were supported by other studies (18). Other US managed care organisations have been compared to the NHS, identifying organisational principles that support quality of care, including ownership and exclusive contracting, integration, financial incentives, chronic disease management, and alignment of goals (18,51). For health care systems in general, some studies have found that strong primary care is important, as are electronic patient records (52).

Health care system comparisons are challenged by several methodological problems, such as varying definitions and interpretations of data and results, limited data availability, and questions of validity and reliability of measures (31,45,46,54,68). Observed measures are typically not defined identically across health care systems; for example, diagnosis classification systems, registration practices, reporting principles and standards, and interpretation of data all differ.

It is essential for sound comparisons of health care systems that measures are aligned by agreed-upon definitions, as well as based on a shared understanding of what should be compared. Dimensions of health care quality that often form the basis for comparison must be defined identically and understood in the same way (69).

The essential challenge of the comparison method stems from the fact that health care systems occur in different contexts and cultures, making results difficult to interpret. This is illustrated by a study assessing transferability of quality indicators between the US and the UK (47). The study revealed several fundamental differences associated with different professional cultures and clinical practices that had to be taken into consideration before indicators could be transferred. In a study comparing European hospitals, Groene et al. conclude that interpretation of results based on quantitative data is often problematic; data is expected to reflect similar conditions, even though the underlying

context from which it is generated often varies between different health care systems (55).

Health care system comparison does not support understanding cause and effect relationships. For this purpose, stronger study designs are required, such as randomised controlled trials. The strength of the comparison method is that it supports the generation of broad hypotheses. Thus, it can be viewed as a very innovative tool for public health research purposes.

In conclusion, several organisational structures and principles were associated with high-functioning health care systems. Three studies that focused especially on care in chronic conditions identified integration of care, competition with other health care systems, and chronic disease management as important for high quality care. Two studies identified that strong primary care systems are important. Due to the observational design of the comparative studies, these determinants are hypothesized as having a positive impact on quality of care.

2.2.3 The meso-level

Management practices are important determinants for quality of care at the meso-level. Various management practices have been shown to improve quality of care in chronic conditions in general, as well as in diabetes care in particular. The chronic care model includes management practices that improve quality of care in chronic conditions. Other determinants for quality of care are discussed (70).

Methods used for identifying effective management practices

Effective management practices are identified in randomised controlled and cluster randomised studies, meta-analyses and reviews, and observational studies. In the following, the methods and results from selected studies are briefly described with emphasis on findings from meta-analyses, randomised trials, and reviews; i.e., studies with the best evidence for chronic diseases in general and for type 2 diabetes in particular. In addition, findings from observational studies are described, since they aid in understanding the effect of individual management practices on quality when multiple practices are used simultaneously.

The randomised controlled trial (RCT) is the classical study design for assessing the effect of management practices or new treatments on outcomes. Random assignment of participants to control and intervention groups at the start of the study ensures that the composition of the groups is similar with respect to factors that might affect the outcome, such as gender, age, socioeconomic status, and educational level. However, there are several types of problems for which RCTs cannot be used for ethical or practical reasons. For instance, it is not possible to randomise for the purpose of testing whether mothers' smoking has an impact on sudden infant death syndrome; randomisation may not be possible for operational or practical reasons, such as resource constraints.

Cluster randomised trials are perceived as the most robust design for quality improvement strategies. In cluster randomised study design, individuals are randomised in groups. Meta-analysis is a very strong research method for developing evidence regarding either medical or management questions. Systematic reviews provide the best evidence of the effectiveness of health care interventions, including quality improvement strategies (71,72).

An observational cross-sectional study is a design in which a statistically significant sample of a population is used to estimate the relationship between an outcome of interest and population variables as they exist at a particular time. Since both independ-

ent and dependent variables are measured at a single point in time, these studies cannot reveal cause-effect relationships. Applying multivariate statistical models in observational cross-sectional studies can be used to help identify effective management practices; however, they also identify associations, not cause-effect relationships. Time trend studies can also be used.

Determinants of quality of care at the meso level

Evidence-based management practices

I defined management practices as features developed for the purpose of improving quality of care. Management practices compose a subgroup of determinants of quality of care. Various management practices have been shown to improve quality of care in chronic conditions in general, as well as in diabetes care in particular, including patient education, integrated care, care path, team-based care, guideline training, registries, electronic health records, provider alerts, self-management support, and more (73,74,75,76,77). The Cochrane Effective Practice and Organisation of Care Group (CEPOC) defined various management practices with the purpose of aligning definitions between health care organisations (71).

Evidence-based management

In order to achieve high quality care, clinical evidence must be known and described in clinical guidelines. Moreover, physicians must apply relevant evidence-based management practices in order to ensure that care based on the clinical evidence is offered to the patient (15,16,78). Thus, it is fundamental that the two types of evidence—clinical and management—be used together. Evidence-based management is supported by various strategies such as the Chronic Care Model (CCM), disease management programmes, and integrated care programmes. These strategies overlap significantly, and I have chosen to describe the CCM.

The Chronic Care Model

The Chronic Care Model (CCM) was developed to guide chronic care improvement. The model was developed based on information obtained from literature reviews of interventions to improve care for the chronically ill (79,80); the result of the reviews was later confirmed by a Cochrane review (81).

The CCM takes into account three entities: the entire community, the health care system, and the provider organisation (82,83,84,85). Inside this "universe," six interdependent dimensions were defined: community resources and policies, health care organisation, self-management support, delivery system design, decision support, and clinical information systems. Each dimension includes a number of management practices. A recent review assessing the effect of the CCM on quality of care concluded that available evidence supports the framework as a guide for practice redesign (19).

Integration of care

Quality of care in chronic conditions is closely linked to the degree of integration of care services (86,87,88,89). The increasing specialisation of health care services is a challenge to integration or coordination of care (90,91,92). Patients with chronic conditions often require care from different specialists for optimal care; the common presence of multiple chronic comorbidities also makes integrated care difficult. Several factors have been posited as causes for lack of integration, including overstressed primary care, lack of interoperable electronic health records, dysfunc-

tional financing, and a lack of integrated systems of care (small independent providers) (93). Integration of care in chronic conditions is a complex task, and several organisational practices and methods have been proposed to support integration, such as referral agreements between primary care physicians and specialists, advanced practice nurses, and a “teamlet” model in which a two-person team consisting of clinician and a health coach cares for patients with chronic conditions (93). Axelsson & Axelsson, (25) propose a combination of development of an assessment tool improving integration at the same time to improvement of integration.

Effective management practices in chronic care

In a meta-analysis including 112 RCT and non-RCT controlled studies, Tsai found that interventions in which at least one element of the CCM model was used improved clinical outcomes and processes of care (22). The analysis included four conditions: asthma, congestive heart failure, depression, and diabetes. There was a positive effect on quality of life in studies of chronic heart failure or depression. Tsai concluded that the presence of at least one element of the CCM model improved process and outcome measures of care in four chronic conditions (22). The study was inconclusive as to which elements had the greatest impact on outcomes. Most interventions showed positive effects, and delivery system design (care management roles, team practice, care delivery/coordination, proactive follow-up, planned visit and visit system change) and self-management support (patient education, patient activation, self-management assessment, self-management resources and tools, collaborative decision making with patients, and guidelines available to patients) seemed to have a stronger impact than the other four elements.

Weingarten et al. undertook a meta-analysis based on 102 studies that evaluated 118 disease management programmes (94). Provider education, feedback and reminders were associated with improved provider adherence to guidelines and significant improvements in disease control. Patient education, reminders, and financial incentives were associated with improved disease control.

Effective management practices in diabetes care

In a meta-analysis including 58 RCT, quasi-RCT, or controlled before-after studies, the effect on diabetes care of 11 different quality improvement strategies was evaluated (95). The effect on glycemic control of diabetics, i.e. the level of serum haemoglobin A1c, was evaluated. Two practices, team changes and case management, were found to have significant effects. For the practice of case management, the ability of the case manager to make independent adjustments in patient medications was important to improving quality.

A structured literature review included 41 multifaceted studies focusing on management practices aiming to improve care in patients with diabetes (81). Inclusion criteria required that studies should be RCT or quasi-RCT, interrupted time series, or non-RCT with data before and after the intervention. The review assessed the effectiveness of interventions focusing on health care professionals and/or structure of care that were implemented to improve management of diabetes care. In twelve studies, the effectiveness of professional interventions was compared to usual care (postgraduate education combined with local consensus procedures and/or reminders and/or audit and feedback), showing that the provision of diabetes care improved. The effect on patient outcomes was less clear. Nine studies compared organisa-

tional interventions to usual care, and the conclusion was that results should be interpreted with caution due to poor quality of the studies. Twenty studies assessed a combination of professional and organisational interventions. In sum, the review concluded that multifaceted professional interventions and organisational interventions that facilitate structured and regular review of patients were effective in improving the process of care. Adding patient education and enhanced nursing roles led to improvements in patient outcomes and the process of care.

A range of cross-sectional studies has been carried out with the aim of identifying effective care management practices in the treatment of diabetes (96,97,98,99,100,101,102,103,104). Two landmark studies have been chosen for review. One study took place in U.S. Veterans Administration medical centers (VAMCs) and found that medical centers distinguished by higher provider adherence to diabetes guidelines had more frequent feedback on diabetes quality of care, designation of diabetes champions, timely implementation of quality-of-care changes, and greater acceptance of guideline applicability. VAMCs with better patient outcomes had more effective communication between physicians and nurses and used educational programs and grand round presentations for the purpose of implementing guidelines (104).

A cross-sectional study assessed the association between disease management processes and diabetes care outcomes (process, control of intermediate outcomes, and amount of medication used when the intermediate outcomes are above target levels) (100). The study found that three disease management strategies were significantly associated with higher process measures (retinal screening, nephropathy screening, foot examinations, and measurement of haemoglobin A1c levels). Structured care management and performance feedback were associated with serum lipid testing and influenza vaccine administration. Greater use of performance feedback was associated with an increased rate of foot examinations. Physician reminders were associated with an increased rate of nephropathy screening. No strategies were associated with intermediate outcome levels or medication management.

Discussion and conclusion

The chronic care model provides a framework of practices that can guide practice improvement in chronic conditions. The model has been proved to be effective at improving chronic care (19). Models other than the CCM have been proposed, such as the medical home, which focuses on primary care and has been shown to support quality of care (105,106). The shortcoming of this model is that it does not include community resources and politics, as does the CCM. The Bellagio model was developed for assessing and advancing effective primary care focused on acute and chronic illness in populations. The combined focus might be demanding, as the care needs of the two patient groups differ (107). Integration of care is central for quality of care in chronic conditions but is also one of the most challenging themes regarding provision of care in chronic conditions (93).

The following dimensions of the CCM have been shown to be of importance for high quality care: community resources and policies, health care organisation, self-management support, delivery system design, decision support and clinical information systems. Each dimension includes a number of management practices. Due to resource constraints, it is mostly not possible to implement the full range of practices in the CCM (19). Moreover, it is unknown which practices, individually or in combination, impact care outcomes (19,22).

Results from meta-analyses, randomized controlled trials, reviews, and observational studies evaluating the impact of management practices on diabetes care conflict present divergent results about what constitute effective management practices in diabetes care (81,95,98,100,108,109). A meta-analysis assessing the effect of eleven management practices on quality of diabetes care demonstrates that only two practices had a significant effect on haemoglobin A1c levels: team changes and case management (95).

In sum, results from observational studies in diabetes care at meso- or organisational level factors showed a very inconclusive picture with no consensus on effective practices emerging from the evidence. Definitions of care management practices varied between studies, as did definitions of outcome variables, particularly composite measures of quality. Measuring implementation levels is a challenging endeavour about which relatively little has been written, adding to the variation in studies. Another cause of conflicting results in the existing literature may be the effect of organisational and cultural contexts on the frontline delivery of diabetes care.

2.2.4 Micro level

This section focuses on two determinants, financial incentives and public quality reporting, and their effect on professional behaviour and, consequently, quality of care. Other examples of micro-level determinants are patient self-management and case management.

Methods used for identifying effective management practices

With respect to the micro- or practice level, the same methods described above for the meso-level can be used to evaluate the effect of various determinants on quality of care. The RCT study design is the most appropriate study design for ascertaining the effect of incentives (110).

Determinants of quality of care at the micro level

Financial incentives

In 2001, the Institute of Medicine recommended the use of financial incentives, despite weak evidence regarding their effect on quality of care (12). Theories on the functioning of financial incentives stem from, among other fields, psychology, where individual characteristics of physicians, such as intrinsic motivation, professionalism and altruism, help determine the collective response to the incentive (36,111,112,113,114).

Financial incentives can be characterized by several factors (115,116). One is the method used for subsidising providers. The most common design for financial incentives seems to be lump sum bonuses for reaching specific targets. Another often-used incentive structure consists of bonuses that increase as performance improves ("graduated" bonuses). Yet another type of incentives is additional fee-for-service payments beyond those usually received (enhanced fee-for-service payment) (117,118).

Incentives are also characterized by the magnitude of potential additional revenues. Expectations about potential revenue also affect the impact of incentives. Opportunity cost relates to the general payment environment and may be greatest in fee-for-service (118). For example, doing more immunizations may prevent the provision of services that generate higher fees per unit time. In capitated systems, the financial opportunity cost of performing the new task is minimal and the extra work may cause loss of leisure time (118,119).

A key characteristic of incentives success is the degree of provider acceptance (1,120). Incentives linked to process indicators seem to be better accepted, because providers have more control over processes of care (e.g., dietary counselling) than outcomes (e.g., weight loss) (121). Physician acceptance is linked to the ability to appropriately modify quality indicators, such as excluding patients in the target population who refuse incentive care measures like prescribed medicine (121). The ethics and principles underlying incentives must also be in accordance with the values of the staff being rewarded (122,123).

Until recently, the evidence base resulting from RCTs supporting the impact of financial incentives on quality of care has been rather sparse, and the rationale for using both financial incentives and public reporting comes from other industries (124,125). Recent studies show mixed results regarding quality of care improvements (126,127,128,129). The UK pay-for-performance incentive was initiated in 2004 for family practitioners to improve quality of care (126,130). Three chronic conditions were targeted, and the study showed improved quality of care in asthma and diabetes but not heart disease. Unfortunately, the incentive scheme also possibly caused declines in quality of care in two conditions that were not related to the incentives; continuity of care also decreased.

Unintended consequences of financial incentives are several (26,121,131). Care for non-incentivized conditions may deteriorate, providers may become unmotivated to provide care that is not financially incentive, resources may be ineffectively allocated, incentives may have no effect whatsoever, or they may cause caregivers to select patients and avoid sick and high risk patients.

Public reporting

Public quality reporting is used to enable consumers to make informed choices between health care providers, organisations, or both (27,132). Presenting performance data to consumers is thought to be a driver for provision of high quality of care. Publication assumes that there is competition between providers and that patients want to use the information when choosing providers (133).

The first public reporting on mortality rates after coronary artery bypass surgery in New York State and Pennsylvania in 1991 was followed by lower mortality rates; low-performing providers stopped practicing or left the state. It was documented that providers improved their practice in several ways based on quality improvement processes (134,135,136).

The evidence regarding the impact on quality of care associated with publication of benchmarking data seems to be limited. In a 2001 review, Schauffler and Mordavsky (137) concluded that reporting did not affect decision-making, quality improvement activities, or competition. A systematic review was undertaken by Fung et al. in 2008 (27). The review included an earlier review executed in 2000 by Marshall and co-authors, which concluded that hospitals seemed to be most responsive to public quality data, but that studies on reporting were limited (138). The review by Fung et al. (27) concluded that the evidence for the effect of public quality reporting is limited, particularly with regard to individual provider practices. There is some evidence that public reporting stimulates quality improvement activities in hospitals, but effects on effectiveness, safety, and patient-centeredness are not clear.

Various unintended consequences of public reporting have been reported. In the coronary artery bypass surgery study in New York State and Pennsylvania, patients with severe conditions

might have been denied procedures (134,135,136). Public reporting might increase inequalities (139).

Discussion and conclusion

There is increasing evidence that financial incentives affect quality of care, although the impact is mixed (26,126,127,128,129,140). However, many factors impact the effect of incentives on care quality, and the overall magnitude of the effect is not clear. Incentives that are easily understood are those in which the providers' potential revenue is clear, and the target for the incentive makes sense and is aligned with organisational culture (121). It also seems to be important that providers can participate in deciding which patients are included for the purposes of calculating the quality indicator.

Hospitals are responsive to reporting that stimulates quality improvement activities (27). The evidence for the effect on quality development seems to be rather sparse. Two recent reviews reach the same conclusion: reporting of performance data has limited value to patients' choice of health care provider and on quality improvement (27,132).

3. OVERALL GOAL AND AIMS

The overall goal of the thesis is to describe organisational structures and management practices, including the effects of two selected incentives, on the quality of care in chronic conditions.

The dissertation is based on four studies with the following purposes:

1. At the macro or health care system level, identification of organisational structures and principles that affect the quality of health care services, based on a comparison of KP and the Danish health care system;
2. At the meso or organisational level, identification of management practices with positive effects on screening rates for haemoglobin A1c and lipid profile in diabetes;
3. Also at the meso or organisation level, an evaluation of the effect of the Chronic Care Model on quality of health care services and continuity of care in a Danish setting; and
4. At the micro- or practice-level, evaluation of the effect of financial incentives and public performance reporting on the behaviour of professionals and quality of care.

4. MATERIAL AND METHODS

This chapter describes the methods and materials of the four studies underlying the thesis. Furthermore, the chapter gives an overview of determinants, quality indicators, covariates, and study design for the four studies of the thesis.

4.1 Macro-level Study 1

4.1.1 Comparison between Kaiser Permanente and the Danish Health Care System

In study 1, we chose to compare Kaiser Permanente and the Danish Health Care System with the aim of identifying organisational structures and principles affecting quality of care.

Determinants: Organisational characteristics

Quality indicators: Breast cancer and cervical screening rates, retinal screening among patient with diabetes,

beta-blocker use among patients with acute myocardial infarctions.

Covariates: Population characteristics (age, educational level, household income)

Design: Observational design

Method: A comparative retrospective analysis. The framework used in the comparison originated in the Chronic Care Model and Donabedian's well-known model of structure, process, and outcome. The comparison encompassed six dimensions of the organisations: the population served, health care professionals, health care organisations, utilization patterns, quality measurements, and costs. Specific measures for each dimension were chosen; their selection was based on importance, availability of data, and comparability demands.

Method: Comparison of costs. We chose to use the PPP method. To increase comparability, we adjusted the cost data in several ways. First, we converted Danish gross expenditures in Danish kroner (DKK) to USD using year 2000 purchasing power parities. We then subtracted capital depreciation and profit from gross expenditures to obtain operating expenditures for each system. Dental benefits vary between the systems, so we excluded these costs. We also excluded long-term nursing care expenses from DHS costs, because, while the figures reported to the Organisation for Economic Co-operation and development include these costs, the care is provided and funded by the municipal social service system. Long-term nursing care for KP was not included since individuals, supplemental long-term care insurance, or governmental agencies pay for it. Danish income data was converted to US dollars using purchasing power parity (PPP) conversion rates. We adjusted the Danish per capita expenditures for differences between the populations in age, education, and income. We then stratified Danish health care costs into age, education, and household income categories. By applying the characteristics of the KP population to these stratified costs, we adjusted the per capita Danish costs for differences between the populations.

Statistical methods: Significance of differences between rates of chronic conditions was tested using Chi-square tests.

Material: Data consisted of secondary data registered in different databases in KP and in DHS. The KP data were retrieved from automated systems; the U.S. Health Care Effectiveness Data Information Set (HEDIS), published reports, and an internal member survey (141). The Danish data were retrieved from various registries including, government ministry reports (142,143,144,145,146,147), national registries and professional organisations (148,149), published reports (150,151,152) and Organisation for Economic Co-operation and Development and World Health Organisation (WHO) reports (53,153,154).

4.2 Meso-level Study 2

4.2.1 Effective population management practices in diabetes care – an observational study

The aim of study 2 was to identify important management practices that improved quality of care in chronic conditions.

Determinants: Effective management practices

Quality indicators: Process indicators of diabetes care, glycemic and lipid screening rates

Covariates: Age, gender, depression, cardiovascular disease (CAD)

Design: Observational study

Method: Cross-sectional study. The study took place in a large U.S. integrated health care delivery system in 2003-2004. The aim was to identify effective management practices among fifteen already-implemented practices with regard to their effect on two diabetes process measures: glycemic and lipid screening. For practical and resource reasons, we chose to conduct an observational cross-sectional study.

Development of a survey instrument: Based on a review of the literature in diabetes care and the Chronic Care Model conducted to identify important management practices, we developed a survey questionnaire for the study. Fifteen care management practices were identified. Survey items were adapted from existing questionnaires in chronic conditions and chronic illness care the National Study of Physician Organisations, and the Translating Research into Action for Diabetes (TRIAD) study (85,155,156). The questions in our survey solicited factual information regarding organisational use of the fifteen practices. We developed algorithms to summarize detailed survey information into fifteen summary scores representing distinct population management practices. Three population care experts blinded to the data weighted individual items to form summary practice scores ranging from a minimum of 0 to a maximum of 1. More extensive implementation of management practices resulted in a higher score. The questionnaire was pilot tested; corrections were made after obtaining these results.

Material: Information on use of management practices and the level of their implementation was obtained by telephone interviews with forty-one key informants. Key informants were non-physician managers responsible for population based care or diabetes care. Information on outcome measures and two diabetes process measures were obtained from information systems in KP. Definitions of standards for screening measures followed the definitions used for the routine medical care in KP. The diabetes population comprised all adult members in KP with diabetes.

Statistical method: Stepwise logistic regression models were used to identify significant management practices. The management practices were used as explanatory variables in a forward selection, stepwise logistic regression model with medical centers and the observation level as random effects and glycemic and lipid screening as outcome variables.

4.3 Meso-level Study 3

4.3.1 Integration of health care in chronic conditions

The aim of study 3 was to evaluate the effect on the quality of care from implementation of rehabilitation programmes in four chronic conditions, based on management practices in the Chronic Care Model, in a Danish setting.

Determinants: New management practices, improved known practices, and standard practices

Quality indicators: General health measures, disease specific measures and lifestyle factors, physical functional tests, and general and disease-specific quality of life measures.

Covariates: Not included

Design: Observational study

Method: Cross-sectional study. The study took place in three organisational entities: Bispebjerg University Hospital, a local

health care center of Østerbro of the City of Copenhagen, and 57 general practitioners in the local area of Østerbro. To facilitate implementation of rehabilitation programmes in four chronic conditions, the project developed new management practices, improved existing practices, and used standard practices of the CCM. New practices were developed to support integration of care and were supported by the theoretical framework provided by Ahgrehn, 2007 (157) and Axelsson & Axelsson, 2006 (25).

The effect of the rehabilitation programs was assessed by pre- and post-intervention measurements. The degree of integration was assessed through survey questionnaires provided to general practitioners and health professionals in the hospital. Patient satisfaction with the new rehabilitation programs was assessed using a survey questionnaire. External assessment was performed by the National Institute of Public Health, University of Southern Denmark. Structured interviews were performed with key informants focusing on the project goal and important topics of the project.

Development of survey questionnaires: A questionnaire solicited patient opinions about the rehabilitation programmes in the health care centre; it was distributed at the centre to a purposive sample of 38 consecutive patients. The questionnaire was developed from validated instruments used with comparable patient groups, interviews with health professionals in the health care centre, and focus group interviews with a heterogeneous group of health care centre patients (158,159,160). The first version of the questionnaire was evaluated by six patients and by a group of health professionals; in response to their comments, revisions were incorporated into the final questionnaire. The survey questionnaire for patients in the health care centre was filled in at the patient's last visit to the program.

The 57 GPs in Østerbro received a mailed questionnaire to solicit their opinion on various aspects of collaborating with the health care centre. The overall response rate was 77%.

Material: The project covered a population of 67 000 citizens living in the local area of Østerbro. Bispebjerg Hospital serves approximately 300.000 citizens. Population data were obtained from registries in the City of Copenhagen and from Bispebjerg Hospital. Several physical assessment tests were performed. Nutritional status was assessed from BMI and waistline measurements. Pulmonary function was assessed from the FEV1 (forced vital volume in the first second), FEV1/forced vital capacity (FVC) rate for assessment of COPD disease level), the MRC dyspnoea scale, and the Borg test (39,40), physical functional tests (41), and patient self-assessment of functional level using Avlund's scale (42), quality of life schemes (SF-36) and a disease-specific quality of life measure (CCQ) (43,44).

Statistical tests: The student's t-test was used to assess the statistical significance of changes in continuous data of pre- and post measures. The Chi-square test was used to assess non-parametric data, identifying a p value of < .05 as denoting statistical significance.

4.4 Micro level Study 4

4.4.1 A Behavioural Model of Clinician Responses to Incentives to Improve Quality

The goal of the study was to evaluate the effect of financial incentives and quality reporting on the behaviour of professionals and subsequent quality of care. To accomplish this, we decided to develop a behavioural model illustrating the effect of external

incentives on providers' behaviour. The model was used as a basis for assessing the results of available literature on financial incentives and public reporting and the quality of the literature of randomized controlled trials of incentive use in health care.

Determinants: Financial incentives, public reporting
Quality indicators: Structure and process measures
Design: Randomised controlled trials of the use of incentives in health care
Covariates: Not included

Method: Development of a behavioral model. Financial incentives and public quality reporting operate in complex milieus, and numerous factors affect their impact. As delineating evidence as to their effect on quality of care is very challenging; we decided to gain insight into these mechanisms from a literature review in psychology, economics, and organisational behaviour (111,112, 113,115,116,133). To gain an inclusive understanding, the literature review was intentionally broad. I searched the literature in areas regarded as important for understanding the mechanisms underlying incentives, such as intrinsic motivation, professionalism, altruism of individual providers, and others. I identified information in six important areas which were used to develop a behavioural model inspired by Andersen's model, which illustrates patients' needs for health care in response to predisposing and enabling factors (158).

Method: Structured literature review. We searched the Medline and Cochrane databases from 1980 to 2005 for articles assessing the impact of incentives on quality of care (keywords: incentive or incent* or payment or pay* or reimbursement or reimb*, performance or perform* or value) and on quality of care (Keywords: quality or quality improvement or quality imprv* or medical error or error or patient safety or safety). We limited our search to studies written in English. We amplified our search strategy by hand-searching the reference lists of identified articles. Abstracts of papers that could provide evidence about incentives and care quality were independently reviewed by two of the authors independently.

Initially, 5629 papers were identified; 5440 of these were eliminated after reviewing the title or abstract. An additional 21 papers were eliminated as they did not concern incentives, and of the remaining 168 articles, 147 did not address incentives or used endpoints that were not measures of quality of care. It turned out that 21 papers reported studies on either financial incentives or quality reporting. Of these, nine were observational studies, leaving nine RCTs of which eight assessed financial incentives and one assessed performance reporting (159,160,161,162,163,164, 165,166,167). The study that assessed the effect of public reporting was not included in our review, as some elements we were interested in assessing were not examined in the study (168).

5. RESULTS

5.1 Study 1

5.1.1 Comparison between Kaiser Permanente and the Danish Health Care System

Population

The KP population was younger, better educated, and wealthier on average, compared to the DHS population. A lower percentage of KP members were 65+ years (10.2%) than in the DHS (15.1%) (Table 1). Nearly 95% of KP members had a high school diploma, while less than two thirds did in the DHS. In US dollars, 6.1 % of KP members reported annual household incomes below \$15,000, compared with 16% in the DHS. Conversely, 18% of KP members reported household incomes higher than US \$100,000 per year, compared to only 5% of the Danish population.

Table 1

Population characteristics, KP and DHS

	Kaiser Permanente (%)	Danish Population (%)
Age in years		
0-4	6.0	6.4
5-15	15.0	13.0
16-44	43.1	40.2
45-64	25.7	25.6
65-74	6.3	8.1
75-84	3.2	5.2
≥85	0.7	1.8
Educational level		
Less than high school	5.3	37.4
High school or higher	54.9	42.3
Bachelors degree or higher	39.8	20.3
Household income in USD (thousands)		
<15	6.1	16.0
15-25	9.2	14.6
25-35	11.1	13.8
35-50	17.5	15.6
50-65	12.9	17.9
65-80	13.3	11.1
80-100	12.1	6.1
>100	17.9	4.9

Data on educational level of KP membership is from 2002.

Danish utilisation index is from 2001; index adjusted for age, sex and income where all inhabitants older than 15 years=100.

Data on household income levels of Kaiser Permanente membership is from 1998.

More KP members reported having chronic conditions than did Danish citizens: 6.3% reported having diabetes mellitus in KP vs. 2.8% in DHS; 19% reported having hypertension in KP vs. 8.5% in DHS; and 1.0% reported having a stroke in KP vs. 0.2% in DHS. The

Table 2

Smoking and obesity rates						
	Kaiser Permanente 2002 Age≥20 years		DHS population 2000 Age≥16 years		DHS population 2005 Age≥16 years	
Risk factors	Men	Women	Men	Women	Men	Women
Smoking rate (%)	14	11	39	35	32	28
Overweight (%) (BMI between 25 to 30)	43.4	26.0	40	26	41	26
Obese (%) (BMI>30)	21.9	23.3	10	9	12	11

Table 3

Mean length of stay by diagnosis for patients age 65 and over		
Diagnosis	KP Days (mean)	DHS Days (mean)
Stroke	4.3	23.0
COPD	3.8	5.1
Coronary bypass	9.8	N/A
AMI	4.4	7.2
Angina pectoris	2.2	4.5
Hip replacement	4.5	9.5
Hip fracture	4.9	12.1
Kidney or urinary bladder infection	3.8	5.0

Table 4

Health care expenditures		
Category	Kaiser Permanente (2000) US Dollars	Danish Health Care System (2000) US Dollars
Gross expenditures/revenue adjusted for:	\$14 200m	\$12 791m
-Less capital depreciation	-\$557m	-\$256m
-Less profit	-\$668m	-0
Operating expenditures:	\$12 975m	\$12 535m
Operating expenditure corrected for different expenditures:	\$12 975m	\$12 535m
-Dental care	-\$10m	-\$473m
-Special circumstances	-\$1 065m	-\$278m
-Long term nursing care		-\$2 283m
Net expenditures after corrections	\$11 900m	\$9 779m
Standardised per capita expenditures (6.1 million people for Kaiser; 5.3 million for DHS)	\$1 951	\$1 845
-Adjustments for age differences	\$1 951	\$1 639
Final adjusted per capita expenditure	\$1 951	\$1 480

rates for individual risky behaviours such as excess weight and smoking also varied between the populations (Table 2). Fewer KP members reported smoking on a daily basis than did Danish citizens. While the percentages who were overweight, defined as having a BMI from 25-30, were similar in the two populations, a higher percentage of KP members met the definition of obesity; i.e., BMI >30.

Professional staff

KP had fewer physicians and total health professionals than did the DHS: 134 physicians and 1,125 health professionals per 100,000 members versus 311 physicians and 2,025 health professionals per 100,000 citizens. Physicians include all types of physicians: residents, physicians, specialists, and general practitioners. Health professionals cover all health professionals except physicians.

Delivery system

Both systems rely on contractual relationships between individual physicians and the health care delivery system. However, the

delivery systems for primary care are quite different. All KP physicians are salaried members of multi-specialty physician groups. In the DHS, specialists are primarily salaried hospital employees, but all primary care physicians (PCPs) are self-employed and receive a combination of capitation and fee-for-service compensation. In addition, 38% of DHS PCPs have solo practices.

Utilisation patterns

Hospital beds in KP were occupied 270 days per 1,000 persons per year, compared to 814 days per 1,000 persons per year in the DHS. Acute care admission rates showed a similar spread: seven per 1,000 persons per year in KP and 18 per 1,000 persons per year in Denmark.

The length of stay for acute admissions averaged 3.9 days at KP and 6.0 days in Danish hospitals (Table 3). Stroke patients displayed the most remarkable difference in average length of stay. They remained hospitalised an average of 4.26 days at KP, compared to 23 days in Denmark. At KP, cardiovascular angioplasty rates were 25% higher and the rate of coronary bypass grafts was

twice that of the DHS. KP also had higher kidney transplantation rates (4.8 per 100,000 population compared to 2.9 per 100,000).

Quality processes

KP had higher rates for breast cancer screening (78% vs. 10%), retinal screening among patients with diabetes (93% vs. 46% in the single reporting Danish county), and beta-blocker use among patients with acute myocardial infarction (93% vs. 69%). Screening rates for cervical cancer were roughly comparable at 80% and 75%.

Medical costs

Operating expenditures for KP and the DHS were similar at PPP \$12,975 million and \$12,535 million (Table 4). Per capita expenditures were higher for KP at PPP \$1,951, compared to PPP \$1,845 for the DHS. Adjusting for different distributions of age, education and income yielded Danish per capita expenditures of PPP \$1,480, 24% less costly than at KP.

5.2 Study 2

5.2.1 Effective population management practices in diabetes care – an observational study

The 41 practice sites provided care for 553,556 adults with diabetes, 51% of which were male. Among patients with diabetes, 16% were also diagnosed with coronary artery disease (CAD) and 13% with depression. Four percent of patients with diabetes were 18 to 34 years of age, 18% were 35 to 49 years old, 38% were 50 to

64 years old, and 40% were aged 65 years and up. The mean HbA1c was 7.2% and the mean LDL-C level was 105.1 mg/dl.

The regression models showed that provider alerts significantly affected the likelihood of both glycemic and lipid screening. This care management practice, in which providers received reminders of appropriate care delivered as computerized prompts or paper chart attachments, had a strong effect on both glycemic and lipid screening rates, increasing the odds ratios for glycemic screening by 4.07 ($p<0.00001$) and for lipid screening by 1.63 ($p<0.0006$) (Table 5). Sites that scored highest on this practice had automated, computerized alerts integrated into electronic medical records.

Two other practices affected screening rates. Guideline distribution and training increased the likelihood of glycemic screening; the odds ratio was 1.46 ($p<0.03$). Action plans increased the likelihood of lipid screening; the odds ratio was 1.44 ($p<0.03$).

The covariates of gender, age, CAD, and depression affected screening rates in both models (Table 3). Gender differences for screening rates decreased with increasing age. The combined effect of depression and age resulted in statistically higher odds ratios for both types of screening for members up to 64 years of age, while odds ratios were lower for those who were 65 or older (0.95 and 0.87). The combined effect of CAD and age only affected the likelihood of glycemic screening in adults between the ages of 50 and 64, the odds ratio was 1.18 ($p<0.0001$). The combined effect of CAD and gender increased the likelihood of lipid screening significantly in both men and women.

In summary, the models for glycemic and lipid screening

Table 5

Parameter estimates and odds ratios for selected practices and covariates

	Glycemic screening model			Lipid screening model		
	Parameter estimate	Odds ratio	P value	Parameter estimate	Odds ratio	P value
Provider alert	1.40	4.07	<0.00001	0.49	1.63	0.0006
Guideline distribution and training	0.38	1.46	0.03			
Action plans				0.36	1.44	0.03
Group	-0.63	0.53	0.0003	-0.7	0.93	0.52
Age 35-49	-0.23	0.80	0.18	0.53	1.70	<0.0001
Age 50-64	0.12	1.13	0.49	0.98	2.67	<0.0001
Age 65 up	0.29	1.34	0.09	1.200	3.32	<0.0001
Age 18-34 female	-0.56	0.57	<0.0001	-0.47	0.62	<0.0001
Age 35-49 female	-0.17	0.84	<0.0001	-0.13	0.88	<0.0001
Age 50-64 female	0.08	1.08	0.005	0.09	1.10	0.0006
Age 65 up female	-0.08	0.93	0.002	-0.06	0.94	0.02
Age 18-34 and depression	0.30	1.34	<0.0001	0.29	1.33	<0.0001
Age 35-49 and depression	0.34	1.41	<0.0001	0.31	1.37	<0.0001
Age 50-64 and depression	0.19	1.21	<0.0001	0.22	1.25	<0.0001
Age 65 up and depression	-0.05	0.95	0.08	-0.14	0.87	<0.0001
Age 18-34 and CAD	0.20	1.22	0.41			
Age 35-49 and CAD	0.11	1.11	0.03			
Age 50-64 and CAD	0.17	1.18	<0.0001			
Age 65 up and CAD	-0.02	0.98	0.39			
Male and CAD				0.74	2.10	<0.0001
Female and CAD				0.51	1.67	<0.0001

showed highly consistent effects; we interpreted this finding as genuine because the implementation level of provider alerts differed across sites for these outcomes.

5.3 Study 3

5.3.1 Integration of health care in chronic conditions

The organisation of the project supported integration of health care, as did the use of management practices suggested by the chronic care model as a framework for implementing the four rehabilitation programmes. The new management practices we developed included between-organisation leadership and knowledge-sharing meetings. Known practices were improved to support integration, including the use of clinical guidelines, population stratification, consistent performance measures, and teaching programmes for staff across the three organisations. Known practices used for implementation purposes included patient action plans, patient education, and team work.

Patient assessment of the health care centre

The questionnaire was completed by a sample of 38 consecutive patients, of whom 19 were women (50%); the mean age of all respondents was 65 years. Ten patients had type 2 diabetes, ten had COPD, seven had CHF, five had a history of falls, and six had more than one diagnosis. All were satisfied with their initial motivational dialogue about the rehabilitation programme, and 34 (89%) were satisfied with their exit dialogue at the conclusion of the rehabilitation programme. Thirty-six (95%) patients were satisfied with the rehabilitation programmes, 33 (86%) patients changed their habits regarding physical exercise, and 16 (42%) changed their dietary habits.

General practitioner referral patterns and assessment of the health care centre

Fifty-one of 57 GPs (90%) in Østerbro referred patients to the Østerbro health care centre or Bispebjerg Hospital rehabilitation units. Forty-four (77%) GPs in Østerbro answered the mailed questionnaire. Of those responding to the survey, 42 (96%) found the rehabilitation programmes to be valuable for their patients with chronic conditions, 21 (48%) found that the collaboration with the health care centre was fulfilling, 20 (46%) found that it was acceptable, and 3 (6%) found that the collaboration was unsatisfactory. Only 16 (39%) of GPs found that the discharge summary fulfilled their needs for information on patients; 11 (25%) found that the discharge summary lacked some important information, 1 (2%) was dissatisfied with the discharge summary,

Table 6

Characteristics of patients receiving COPD rehabilitation

	Bispebjerg Hospital COPD-Rehabilitation Unit	Østerbro Health Care Centre
Number of patients	90	131
Age (range)	70 (42-85)	70 (35-89)
Gender		
Female	60 (66%)	89 (68%)
Male	30 (33%)	42 (32%)
Tobacco use	79 (88%) ^a	54 (41%) ^b
Mean BMI (SD)	24 (5)	27 (6)
Mean waistline (SD)	92 (15)	98 (16)
FEV1 (SD)	37 (14)	52 (17)
FEV1/FVC (SD)	47 (13)	62 (15)
MRC score (SD)	3.4 (0.9)	2.7 (1.2)
Borg test score (SD)	4.8 (1.7)	5.7 (2.1)

Abbreviations: BMI, body mass index; MRC, Medical Research Council scale in COPD patients; FEV1, forced expiratory volume in first second expressed as percentage of expected value for age and sex; FEV1/FVC, percentage of forced vital capacity expired in the first second of maximal expiration; SD, standard deviation, ^aPrevious or current smoker, ^bCurrent smoker

and 15 (34%) did not have an opinion on the adequacy of the discharge summary.

About one third (34%) of the GPs did not acknowledge any barriers to collaboration with the health care centre. Half of the GPs found that the tests required to refer patients to the programmes were too extensive and somewhat confusing; this was a barrier to referring patients to the health care centre. The GPs did not understand why the health care centres needed verification of the patient's condition by various test results. About one fourth of the GPs found it problematic to decide which City programmes to refer patients to as several programmes for elderly patients with chronic conditions were offered.

COPD clinical and functional status

338 patients were estimated as suffering from severe and very severe COPD based on GOLD classification and should have qualified to receive rehabilitation in the hospital based on stratification rules. Ninety consecutive patients with severe or very severe COPD were referred by either the pulmonary specialist in Bispebjerg hospital or a GP to the hospital rehabilitation programme, corresponding to 26.6% of the population that could have benefited from taking part in the rehabilitation programme. Of the 90 patients referred for the programme, 66 (73%) completed it. Their mean age was 70 years, 30 (33%) were men and 79 (88%) were active or previous smokers. Pulmonary function showed a mean FEV1 of 33% of expected value for age, gender and ethnicity (Table 6).

The mean score on the MRC scale was 3.4. Nutritional status was normal before start of the programme and remained unchanged. Physical function tests all improved to a statistically significant degree: the shuttle walk test improved by 92%, the Chair Stand by 20%, and the 2.45-meter up-and-go test by 13% (Table 7). Patient assessment of physical functional level, as measured by the CCQ scale, improved slightly, as did quality of life the SF-36; the quality of life as measured by the Avlund scale improved to a statistically significant degree. The mental component summary of the SF-36 questionnaire improved significantly, while the physical component summary remained unchanged.

Nineteen hundred and eighty-five patients were estimated to suffer from moderate COPD in the Østerbro local area. One hundred thirty one consecutive patients with moderate COPD were referred to the Østerbro Health Care Centre rehabilitation programme, corresponding to 6.6% of the population, which could have benefited from rehabilitation. Of these, 74 (84%) were referred by their GP, and 14 (16 %) were referred by a Bispebjerg

Table 7

Changes in physical function and quality of life^a

	Bispebjerg Hospital		Østerbro Health Care Centre	
	Pre	Post	Pre	Post
BMI	24 (5)	24 (5)	27 (5)	27 (5)
Waistline ^b	92 (5)	91 (4)	98 (16)	95 (15)
Shuttle walk ^c	183 (94)	348 (289)**	213 (74)	573 (424)**
Chair stand ^c	10 (3)	12 (3)	11 (4)	14 (5)
2.45 m 'Up and Go' ^c	8 (2)	7 (2)**	9 (4)	7 (3)**
CCQ total score	2.4 (1.1)	2.3 (1.2)	1.9 (0.9)	1.6 (0.8)**
Avlund scale score	8 (2)	9 (2)**	9.9 (1.9)	10.7 (1.5)
SF-36 Physical Component Summary score	31 (7)	32 (9)	36 (9)	38 (19)**
SF-36 Mental Component Summary score	46 (13)	49 (12)*	48 (12)	50 (11)

Abbreviations: BMI, body mass index; CCQ, Clinical COPD Questionnaire

^aPresented as mean (standard deviation)^bMeasured in centimetres^cMeasured in seconds

*Statistically significant at p<0.05

**Statistically significant at p<0.01

hospital pulmonary specialist; all 88 (67%) completed the programme. The mean age of patients referred to the health care centre was 70 years, 42 (32%) were male, and 54 (41%) were active smokers. Pulmonary function showed a mean FEV1 of 52% of expected value for age and sex. The mean MRC scale score was 2.7. Nutritional status was normal before start of the programme and remained unchanged; physical function improved significantly. Patient assessment of physical function improved to a statistically significant degree, as did quality of life. The physical summary score of the SF-36 improved, while the mental component remained unchanged.

External assessments of integration and quality of care

The interviews and observations focused on the following dimensions of integration: the new organisation of health care, perceived level of integration, quality of care, and barriers to integration. The external evaluation concluded that the project had developed new methods and practices that supported integration of health care between organisations. Health professionals found the established collaboration forums, such as working groups and knowledge-sharing meetings, very important. The interviewed professionals found it important that the guidelines were developed across institutional borders and that new settings for collaboration were initiated.

Collaborative relationships between health professionals at the hospital rehabilitation units and the health care centre were perceived to be very supportive of improved care. The collaboration between health professionals from three organisations in the working groups was perceived to be very important to integration. The knowledge-sharing meetings provided possibilities for collective education of health professionals from the hospital and the health care centre and were perceived as very important, especially by professionals from the health care centre. The project has changed the professionals' attitudes regarding integration of care and thereby created new possibilities for further integration.

Health professionals in the hospital rehabilitation units felt that they were isolated in relation to the outpatient clinics and the clinical departments; they proposed that continuing to share experiences, acquired knowledge, and challenges between the rehabilitation units would be beneficial. Before the project, there was not much collaboration between the departments, outpatient clinics, and the rehabilitation unit in the hospital, nor was

collaboration very developed between the rehabilitation units in different specialities.

All those interviewed found that the rehabilitation programmes' quality of care was substantially improved. The expertise represented by professionals from the hospital was perceived as especially important by professionals at the health care centre.

With respect to barriers to integration, the project leaders reported that there had been support from hospital management and from the City of Copenhagen, but that the professional leadership of the hospital departments did not always support the project. At the project start, there was some resistance both from the GPs and from the specialists; the latter did not expect that the GPs or the professionals in the City of Copenhagen would have the skills for provision of high quality care. The GPs found that the stratification and referral procedures were cumbersome, and several GPs found that the stratification rules did not make sense.

5.4 Study 4**5.4.1 A Behavioural Model of Clinician Responses to Incentives to Improve Quality**

A comprehensive, health care-specific model of the impact of incentives on quality

In economic terms, the original version of the Behavioral Model explains the demand for health care, while incentives directed at providers target the supply of health care. Nonetheless, the essential structure of the Behavioral Model could also be applied to providers, in the sense that a decision-maker (the provider) receives a stimulus (the incentive) and must decide how to react, and that decision can be influenced by predisposing and enabling factors. We show this adaptation of the Andersen model from the original in Figure 2.

This approach allows us, then, to pull together theories about incentives from multiple disciplines (Table 8).

From the psychological and economic literature, we expect that the strength of the stimulus is determined by key financial characteristics, such as revenue potential and costs, by reputational characteristics such as the intensity of marketing efforts to reach consumers, or by other characteristics such as the decision to use rewards versus punishments. The extent to which incentives reach individual providers is determined by whether the incentives are targeted at individuals or groups and whether groups pass incentives along to individuals. Pre-existing traits of

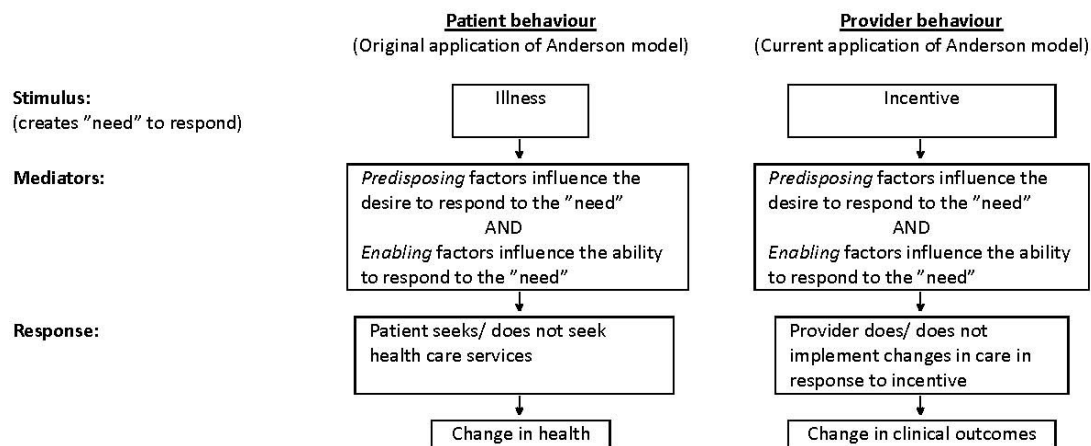


Figure 2
Adaption of Anderson's model of patient behaviour to explain provider behaviour

individual providers (e.g., altruism) or characteristics of the overall approach to payment (e.g., other implicit incentives from capitation or fee-for-service), market (e.g., amount of competition (113,169), or regulatory environment (170) may determine whether a provider is predisposed to respond to the next incentive offered. In this context, organisational resources and patient factors (see "Mediators", Table 8) then enable (or inhibit) the providers' response. (Whether we have applied the "predisposing" versus "enabling" labels correctly to each of these factors is not especially important here. Further research would be needed to refine this categorization and some factors may both predispose and enable. The main point is that all these factors could mediate and mitigate the response to incentives and must be

Table 8

Potential determinants of provider's response to incentives

Domain of the conceptual model	Specific variable
Incentive Characteristics	
Financial characteristics of incentive programs	<i>Recipients</i> : individual provider vs. provider group; <i>Revenue potential</i> : magnitude of the financial incentive; <i>Revenue potential</i> : incentive as a proportion of total income; <i>Impact on cost</i> : direct costs and opportunity costs of complying
Reputational characteristics of incentive programs	<i>Target audience</i> : consumers, health plans, employers, or some combination; <i>Marketing efforts</i> : extent of efforts to ensure data reaches target audience(s); <i>Clarity of data presentation</i> : ability of target audience(s) to understand the data
Other characteristics of incentive programs	<i>Perceived salience</i> : do the providers believe responding to the incentive is important (how relevant is the measure and the payer to the provider's practice); <i>Perceived attainability</i> : how easy/difficult it is to accomplish the task of the incentive; <i>Performance domain measured</i> : structure, process, outcome
Mediators	
Predisposing factors	<i>Financial characteristics of the environment</i> : proportion of income from: fee for service, salary, capitation; <i>Financial characteristics of the environment</i> : number of other incentives in place; <i>Provider characteristics</i> : demographics, specialty, and other immutable factors; <i>Provider characteristics</i> : workload, proportion of patients if service where incentive relevant; <i>Market characteristics</i> : e.g., extent of competition or community-level professional initiatives
Enabling factors	<i>Organizational characteristics</i> : capabilities such as information systems, use of guidelines and feedback, etc.; <i>Organizational characteristics</i> : leadership culture etc.; <i>Patient characteristics</i> : demographics and other immutable factors; <i>Patient characteristics</i> : type of insurance, benefits structure

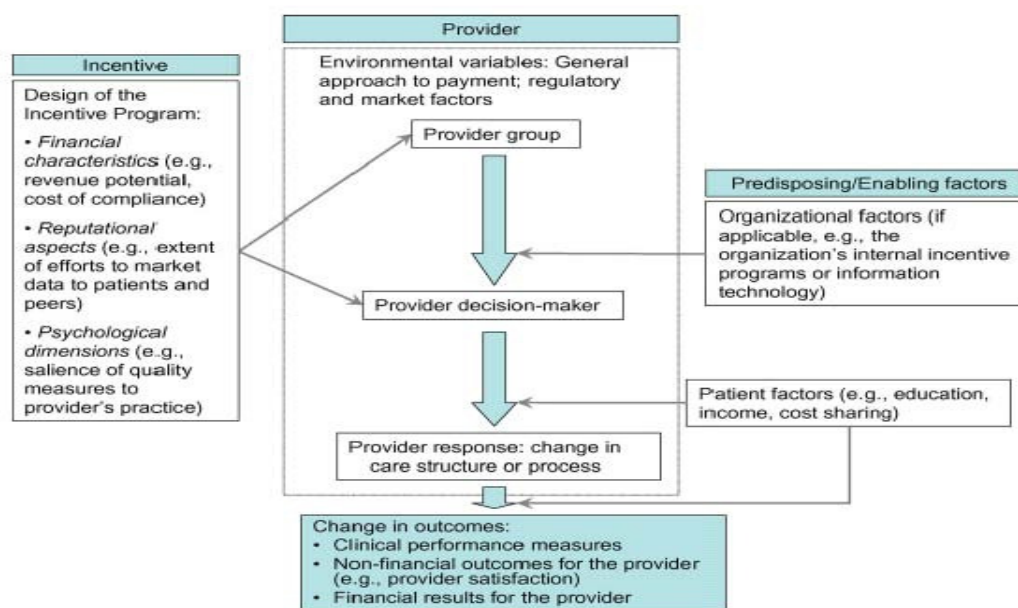


Figure 3
Conceptual model of the determinants of providers' responses to incentives

and decision and organisational theory literature on incentives (111,112,115,125,171,172,173,174). We now use this model as a basis for assessing the results of the available literature on pay-for-performance or public quality reporting and the quality of reports of randomized controlled trials of incentive use in health care. In this way, we hope to evaluate the extent to which empirical researchers have addressed key theoretical issues and to stimulate discussion about how future research should proceed.

Prior research identified

We located 5629 articles that potentially addressed pay for performance (P4P) or public reporting (PR) and quality. After review of the titles and abstracts of these articles, we eliminated 5440 that appeared from review of the title or abstract not to address the study question, leaving 189 articles for full text review. We eliminated 21 of these articles because they concerned cost-effectiveness or were responses to questionnaires. Of the remaining 168 articles, 147 did not address incentives at all, were review articles, or used endpoints that were not measures of quality of care (e.g., provider satisfaction or utilization). Only 21 articles describing 18 trials reported results of studies designed to evaluate the impact of PR or P4P on clinical quality. Of these, 9 trials were observational (6 with no control groups), and 9 were RCTs. Since the observational trials were few and were of limited quality, we do not include them below, but doing so would not have significantly changed our findings.

Results of RCTs of pay for performance

The eight RCTs of P4P initiatives varied in terms of both the incentive offered and the performance indicator measured. Thus, we present their results as a function of the variables within the conceptual model that were reported in all papers. Note that among these eight trials, ten hypotheses were tested; because one study had two intervention arms (a fee-for-service arm and a bonus arm) compared to controls (163) and one (164) had two performance indicators smoking cessation counselling and smoking cessation outcomes).

Recipient of incentive

In five studies (with seven dependent variables), the recipients of the incentive were individual providers (159,163,164,165,166, 167), while in the other three the recipient was the provider group or could be an individual provider or a group (160,161,162). Among the studies targeting individual providers, five were positive and two negative; among studies in which the target was a provider group, there were one positive and two negative results. (We use "positive" to mean the incentive increased measured quality and "negative" to mean the incentive had no significant effect on measured quality).

Magnitude of the incentive

Incentive magnitude ranged from \$0.80/flu shot (162) to a bonus of up to \$10,000 annually per group (164). There was no consistent relationship between incentive magnitude and response: some very small incentives worked (159,162) but the study involving the bonus of up to \$10,000 per group was negative (164). However, the failure in all studies to report the number of providers per group or patients per provider makes it impossible to assess the magnitude of the incentive per provider.

Structure of the incentive

Five studies (with five dependent variables) assessed fee-for-service (FFS) incentives (159,162,163,165,166,167), and four were positive. Among the four studies (with five dependent variables) measuring the effect of bonuses tied to performance (160,161,163,164), two were positive and three negative. Only one study assessed differing incentive structures; Fairbrother et al.,2001 (163) compared graduated bonus payments to enhanced FFS, with approximately the same total maximum income potential for providers in each arm. In this study, no difference was found between bonuses and FFS, although both were superior to receiving no incentive.

Table 9

Available results by conceptual model domains tested

Conceptual domain and specific variable	Results
Financial characteristics of the incentive: recipient individual vs. group	Individual: 5 positive, 2 negative; group or individual: 1 positive, 2 negative
Financial characteristics of the incentive: recipient provider type	Physicians: 5 positive, 4 negative; pharmacists: 1 positive
Financial characteristics of the incentive: magnitude	No clear relationship between magnitude and results; both trials in which the performance required to achieve the bonus was unknown were negative
Financial characteristics of the incentive: structure	FFS: 4 positive, 1 negative; bonus: 2 positive, 3 negative (but 2 negative involved only a chance for bonus if performance was superior to others)
Patient factors	Goals likely to encounter fewer patient barriers (immunizations, tobacco screening): mostly positive; goals that required modest patient cooperation (e.g., well child visits and cancer screening): mixed; goals that require significant patient cooperation (e.g., tobacco cessation): negative

Patient factors

The burden adherence would place on patients was not assessed in any study. However, in general, incentives to achieve performance were more effective when the indicator to be followed required less patient cooperation (e.g., answering inquiries about smoking) than when significant patient cooperation was needed (e.g., actually quitting smoking), as depicted in Table 9.

Results of an RCT of reputational incentives

In the single trial of performance reporting, Hibbard et al.,2003 (168) assessed how hospitals in Wisconsin responded to performance reporting about orthopaedic, cardiac, and obstetric services. Every Wisconsin hospital was assigned to receive a report that was also released to the local media, a confidential report, or no report. Hospitals whose performance was publicly reported were more likely to adopt quality improvement programs than those receiving confidential reports or no report. The impact of PR was especially large among those hospitals whose performance was worse than average.

Completeness of reports of RCTs

Given the number of factors we have identified that might influence responses to incentives, it is not surprising that incentive programs have had mixed results. In fact, if the available literature addressed the various elements of our model and elucidated the relationships between these factors and an incentive program's impact on quality, having reports of both successful and failed programs would enhance our understanding of how incentives work. Unfortunately, the literature is much less useful than it could be, primarily because of incomplete reporting of important aspects of incentive programs or the contexts in which they are applied.

Trials of P4P

In Table 10, we describe the completeness of reporting of the eight P4P trials (159,160,161,162,163,164,165,166,167). (As these are reports of financial incentives only, the reputational variables in our model are not relevant and are not included.)

As the table shows, the revenue potential associated with P4P is reported in only four studies, and the revenue potential as a percent of total income is never reported. Most studies give no description of the general payment environment (capitation versus fee-for-service versus salary) and only one describes local market factors, such as local professional initiatives to improve quality. The costs of improving quality are never reported. Simi-

larly, no investigators report the extent to which providers believed the incentives were salient to their practice and were attainable or the capabilities of the organisations studied to help providers meet improvement goals.

The RCT of performance reporting

We did not include the single RCT of performance reporting in Table 10 because some of the elements of that table are not applicable to or not measurable (e.g., most financial variables) and others were not applicable to the specific trial (e.g., market characteristics vary when a study is done state wide). In that article, however, there was no explicit consideration of whether response to the incentive varied with differences among hospitals in terms of organisational or patient factors.

6. DISCUSSION

6.1 Discussion of principal findings

Comparison between KP and the NHS revealed higher quality of care and lower bed utilization rates in KP (17,18). Other comparative studies of KP and other American managed care organisations have hypothesised that a range of organisational principles or determinants enable high performance (17,18,51). Identified organisational determinants include integration of care, competition with other organisations, and efficient physician leadership and management of hospitals. With respect to KP, health information technology was also important. For all other organisations, ownership and exclusive contracting and financial incentives were also important. However, these studies do not address the internal or external validity of these determinants (17,18,51). Findings in the literature indicate that strong primary care is important for high quality care (45,52). KP is also characterised by well-developed primary care, but, again, internal and external validity were not established. Comparisons of health care systems are an established method for identifying effective organisational principles and practices, although the method contains complex challenges as discussed in Chapter 2. Our own findings and results in the literature indicate a possibility for learnings from KP to transfer to DHS.

Comparing the results from this Study 2 to findings from other studies, it was shown that many management practices are effective at improving quality of care, but none is consistently found to be better than others, as discussed in Chapter 2. The effect of individual management practices has been assessed by study designs such as RCT, meta-regression analyses, and structured reviews, confirming a high degree of internal validity (74,95, 108,175,176,177,178,185). Observational studies have been used

to assess the comparative effect of practices (98,100,103,104). Generally, these studies are difficult to compare due to varying definitions of practices, outcome indicators, and inclusion of covariates, as well as unspecified levels of implementation of practices. However, the most important explanation of the divergent findings is that the studies took place in different health care systems with very different types of organisations, practices, and organisational cultures (22). Hence, results were obtained in very different contexts. This context dependence, which I think is a fundamental cause of the differing conclusions regarding management practices, is in accordance with the results from Study 4 of the thesis.

Study 3 revealed that the management practices used in the CCM could be implemented in a Danish context and that the philosophy in the model found favour with and was accepted by Danish healthcare professionals. The CCM has been proposed for the DHS from the national Board of Health (179,180). Management practices of the CCM have been transferred with success to other healthcare systems in Europe and Australia, thereby suggesting that it has at least a practical level of external validity (23,24). The internal validity of the model has been assessed in several studies (19). Internal validity is high for several of the management practices used in the model (74,95,108,175,176, 177,178,185).

For the practices developed in Study 3, internal validity could not be assessed within the study design. The study showed that the quality of care improved in the implemented rehabilitation programs, as measured by before and after quality indicators. The study design did not allow for conclusions regarding external validity of the implemented management practices.

Results obtained from the literature review of Study 4 showed that evidence for the effect of financial incentives and public reporting on quality of care is sparse. Since our literature review was completed, new results have been published by the NHS and others, suggesting that financial incentives are likely to affect quality of care (26,126,127,128,129,140). However, the internal validity of financial incentives and public quality reporting at the provider level is questionable. The results from these studies also show that financial incentives cause undesirable side effects; reduction of quality for other chronic diseases and reduction in continuity of care might express problems with validity.

In the development of the behavioural model of Study 4, review of the literature showed that financial and disclosure incentives are very context dependent. Factors in the setting in which they are applied heavily influence their effect on quality; these include the health care professionals targeted by the incentive, patient characteristics, organisational circumstances, and conditions of other nearby organisations (115,120,159,181,181,183, 184). In addition, the way the incentive is implemented, including its shape, content, and design, have a large influence on its effect (121). All in all, the behavioural model shows that the effect of these incentives is heavily influenced by their specific design and highly dependent on external factors. This context dependency is in accordance with characteristics of determinants recognized at the meso- and macro- levels.

6.2 Methodological considerations

In Study 1, I chose to compare two health care systems at the macro level, although we knew that the methodology is complex and that observational design only allows for hypothesis generation. Other designs could have been chosen: for example, time trend studies. The study compared the two systems along six dimensions including population, professional staff, delivery

system, utilisation pattern, quality measures, and medical costs. Additional or different dimensions could have been chosen to obtain a deeper understanding of differences between the two health care systems. Suggested frameworks for comparisons of healthcare systems often include measurements of the following dimensions: access, effectiveness and appropriateness, system capacity, responsiveness, safety, and equity (34,35). Of these, we only had comparable information on effectiveness. Several quality indicators were compared. Ideally, the comparisons should have been preceded by assessment of the comparability of the definitions, recording methodologies, and content.

Quality of the two datasets was not validated, but doing so would have strengthened the study. The challenges of transferring quality indicators have been discussed by Marshal in a study assessing transfer of indicators between the US and the UK, concluding that several fundamental differences associated with professional cultures and clinical practices had to be taken into consideration before indicators could be transferred (122). The challenges of comparing quantitative data are discussed in Chapter 2. Furthermore, different cultures in the two organisations and in the populations of the two different countries add to underlying differences that may not be expressed in the results.

Comparisons of costs were done carefully in an attempt to take important differences between the populations and organisations into account. We used the purchasing power parities (PPP) method for correcting for differences in purchasing power between two currencies. However, the method presupposes that price variations in society are also reflected in price variations in the health care system, which is a problematic assumption (58,59,61). Feachem et al. compared costs between KP and the NHS and found comparable expenses (17); however, the study was criticised for methodological reasons (67). Our results align with findings in the literature regarding quality of care and utilization patterns in KP, as compared to the DHS. It is therefore appealing to hypothesize that the organisational principles used in KP and other US managed care organisations and discussed earlier might be valuable for the DHS; however, external validity has not been proven. In other words, comparable process indicators as observed in KP compared to other healthcare organisations does not prove that organisational principles exert a similar effect if they are transferred from KP to another organisation. In conclusion, the internal and external validity of our findings in Study 1 could be questioned. Weaknesses of the study were the observational design and methodological problems associated with comparisons of health care systems. The strength of the study was that our comparison of quality of care was based on widely accepted quality measures and comparison of costs was performed carefully.

At the meso level, Study 2 was designed as an observational study for practical reasons and to address resource limitations. Other possible study designs were a RCT or a cluster randomized study, but these were not practically applicable to the U.S. integrated health care delivery system.

Regarding quality of care measures, it was decided to use two diabetes process indicators, glycemic and lipid screening rates, which reflected providers' adherence to diabetes guideline recommendations.

The data were obtained from a health information technology (HIT) system recording patient data. The dataset was assessed for missing data, assumption of normal distribution, and outliers. The studies originally included more measures, but to manage the dataset and accomplish statistical analysis, I decided

to reduce the size of the dataset and use simple and easily understandable outcome measures.

We assumed that the management practices were defined identically across a integrated health care delivery system that has systematically aligned care procedures and implemented national clinical guidelines; both of these support alignment of management practice definitions. Optimally, the definitions of the practices should have been assessed for comparability between the medical centers, as local differences seem to exist.

The survey questionnaire was generated by combining questionnaires that were already developed and used in other organisations for survey purposes. A stronger questionnaire design would have been developed specifically for our study. The survey was administered through telephone interviews with key informants in the medical centres. The questions were formulated very concretely to encourage respondents to answer as precisely as possible. Respondents might have been biased in answering the questionnaire and have given more positive answers regarding both use of practices and their implementation levels. This effect was not assessed in the study.

We decided to use stepwise regression analysis to obtain a reasonably parsimonious statistical model. Care management practices were used as explanatory variables in a forward selection stepwise logistic regression model, while the dependent variables were glycemic and lipid screening rates. As noted above, the implementation levels of the fifteen practices were evaluated by a survey questionnaire developed in the study. The algorithm used for calculating the implementation level might have been imprecise and have introduced an error in our calculations.

Internal and external validity of the identified management practice, provider alerts, has been proven in the literature (81,100,104). However, our study design does not allow us to draw conclusions concerning the validity of the management practice. A primary weakness of the study was the observational design. Measuring implementation levels of the management practices was also a challenge. Strengths of the study were the very large diabetes population in a large integrated health care delivery system and the use of multivariate statistical models that allowed comparison of the impact of multiple care management practices.

Study 3 at the meso-level used an observational design. I could have chosen a stronger design, such as a cluster RCT with randomization at the health care centre level. When the study was conducted, Østerbro health care centre was the only health care centre in Copenhagen, making randomization at this level impossible.

To measure the impact of rehabilitation programs on the quality of care, we chose to use before and after measurement design of the programs offered in Bispebjerg hospital and in Østerbro health care centre. At this level of the study, we could have chosen to use a randomized design with patient assignment to usual care and rehabilitation program care.

The quality of care indicators included both general and disease-specific health indicators, physical functional tests, and quality of life schemes. The indicators used for assessment of the programmes were chosen for their clinical relevance and were well-accepted by the health care professionals. The programmes were evaluated in accordance with assessment methods of comparable studies (186). The data were tested for missing data, distribution assumptions, and outliers. Patient drop-out was recorded and analysed and is reported elsewhere (187).

The study aimed to improve integration of care by using new management practices and known practices developed for this

purpose. The degree of integration was assessed through interviews with GPs and health professionals. A validated test instrument would have been useful to assess the level of integration (25,64,188,189,190). The weakness of the study was the observational design and the method used for evaluation of the level of integration of care.

At the micro level in Study 4, we chose to use the literature review method. Other methodologies could have been chosen, including RCT, cluster RCT studies, studies with observational designs, and time series analysis. However, as pointed out by Chassin, 2004 (110), undertaking a good RCT study on the impact of financial incentives on quality of care is a challenge due to numerous obstacles to a sufficient design.

Study 4 completed a broad literature review regarding financial and disclosure incentives, and covered diverse areas of psychology, organisational behaviour, and economics. The broad literature review formed the basis for developing a behavioural model of clinicians' responses to incentives to improve quality. Andersen's model was originally developed with the purpose of illustrating patients' demands for healthcare when they become ill (158). We found the model suitable for our purpose, and the elements of Andersen's original model were easily transferable to become elements of the behavioural provider model. However, it could be questioned whether a model developed for one purpose is valid as foundation for the development of a model with a different purpose.

The behavioural model was used as basis for the structured literature review on financial incentives and on quality disclosure. The literature identified by the review might have been incomplete due to deficiencies in the behavioural model, as important factors could have been missed. We could have expanded our review to include the highest-quality observational studies. However, we judged that those papers did not provide new information and might introduce weaknesses due to their less rigorous design.

The internal validity of both incentives, financial and disclosure was shown to be low, based on the findings in the literature.

7. CONCLUSION

Results from Study 1 were in accordance with those of previous studies comparing KP to other healthcare systems. The single exception was costs; KP had higher expenses per member than DHS had per inhabitant. KP's high performance has been explained by organisational principles including integrated care, use of electronic data systems, financial incentives, and efficient physician leadership and management of hospitals. I conclude that possibilities for mutual learning between KP and DHS exist.

Findings in the literature show that many management practices in diabetes care are effective; however, conclusions from different studies are somewhat inconsistent. The most important explanation of divergent findings from different studies is that they took place in different health care systems; hence, results were obtained in different contexts. Practices are very context-dependent, and generalisation is challenging. The study put forward the hypotheses that knowledge concerning quality determinants at high-performing sites is extremely context dependent and that transfer of knowledge is smoothest between organisations with comparable contexts.

Management practices of the Chronic Care Model were accepted and applied in a Danish context to support quality of care improvements in chronic conditions. However, this cannot be

taken as proof that other organisational principles for high quality of care can be transferred to the DHS.

The literature review revealed that evidence for effect of financial incentives and public reporting on quality of care is sparse. The behavioural model illustrates that the mechanism of operation and effect on quality of care of financial and disclosure incentives are complex and highly dependent on shape, content, and design of the incentive. Their effect is also exceedingly dependent on patient characteristics, organisational circumstances, and conditions of other nearby organisations; that is, the context in which the incentive operates.

Determinants of quality of care such as organisational principles, care management practices, and incentives are heavily context dependent. Transfer of knowledge between health care organisations should be preceded by deeper analyses to assess levels of internal and external validity.

8. PERSPECTIVES

8.1. Research in progress

Study 1 was the first study in a group of projects that compare KP and DHS with regard to several aspects of health care provision in chronic conditions. Two groups of studies focusing on integrated care, self-management in diabetes patients and utilization patterns in chronic care, respectively are underway. A paper reporting results from the study on integrated care has been accepted for publication (64). Results from the study evaluating self-management and utilization patterns are in progress (191).

8.2 Planned research

Regarding Study 3, a subsequent study will be initiated in Spring 2010 with the purpose of improving integrated care in COPD patients between three organisational entities, including Bispebjerg University Hospital, the City of Copenhagen, and primary care physicians in the local area. An additional study aim is to develop an evaluation tool for assessment of level of integration of care.

8.3 Perspectives for future research

Comparison and benchmarking between health care systems have been designated a nascent art. The methodology of comparison is rather challenging and obtained results should be interpreted with much caution. More research regarding development of stronger methodology regarding comparison of healthcare systems is needed to identify areas in which comparisons in reality can support improvement of quality of care (56).

Management practices can be seen as tools or multifaceted composites with a core that makes them work, although the exact content of the core is often not known (192). As practices exert their effect in complex organisational milieus or contexts, it might be difficult to distinguish between the effects of the practice itself and the effect of the context. To better understand what makes practices work and which qualities of the context support their function, a useful perspective for future research may well be to unite well-known empiric methods (RCT, meta-analysis, observational studies) with methods that have other research qualities. Methods such as quasi-experimental designs, time serial analysis, simulations, anthropological methods, and other qualitative methods have been proposed.

9. SUMMARY

Identifying organisational principles and management practices important to the quality of health care services for chronic conditions

Background

The quality of health care services offered to people suffering from chronic diseases often fails to meet standards in Denmark or internationally. The population consisting of people with chronic diseases is large and accounts for about 70% of total health care expenses. Given that resources are limited, it is necessary to identify efficient methods to improve the quality of care. Comparing health care systems is a well-known method for identifying new knowledge regarding, for instance, organisational methods and principles. Kaiser Permanente (KP), an integrated health care delivery system in the U.S., is recognized as providing high-quality chronic care; to some extent, this is due to KP's implementation of the chronic care model (CCM). This model recommends a range of evidence-based management practices that support the implementation of evidence-based medicine. However, it is not clear which management practices in the CCM are most efficient and in what combinations. In addition, financial incentives and public reporting of performance are often considered effective at improving the quality of health care services, but this has not yet been definitively proved.

Aim

The aim of this dissertation is to describe the effect of determinants, such as organisational structures and management practices including two selected incentives, on the quality of care in chronic diseases. The dissertation is based on four studies with the following purposes: 1) macro- or healthcare system-level identification of organisational structures and principles that affect the quality of health care services, based on a comparison of KP and the Danish health care system; 2) meso- or organisation-level identification of management practices with positive effects on screening rates for hemoglobin A1c and lipid profile in diabetes; 3) evaluation of the effect of the chronic care model (CCM) on quality of health care services and continuity of care in a Danish setting; 4) micro- or practice-level evaluation of the effect of financial incentives and public performance reporting on the behaviour of professionals and quality of care.

Methods and results

Using secondary data, KP and the Danish health care system were compared in terms of six central dimensions: population, health care professionals, health care organisations, utilization patterns, quality measurements, and costs. Differences existed between the two systems on all dimensions, complicating the interpretation of findings. For instance, observed differences might be due to similar tendencies in the two health care systems that were observed at different times, rather than true structural differences. The expenses in the two health care systems were corrected for differences in the populations served and the purchasing power of currencies. However, no validated methods existed to correct for observed differences in case-mixes of chronic conditions. The population of about half a million patients with diabetes in a large U.S. integrated health care delivery system affiliated with 41 medical centers employing 15 different CCM management practices was the basis for identifying effective management practices. Through the use of statistical modelling, the management practice of provider alerts was identified as

most effective for promoting screening for hemoglobin A1c and lipid profile.

The CCM was used as a framework for implementing four rehabilitation programs. The model promoted continuity of care and quality of health care services. New management practices were developed in the study, and known practices were further developed. However, the observational nature of the study limited the generalisability of the findings.

In a structured literature survey focusing on the effect of financial incentives and public performance reporting on the quality of health care services, few studies documenting an effect were identified. The results varied, and important program aspects or contextual variables were often omitted. A model describing the effects of the two incentives on the conduct of health care professionals and their interaction with the organisations in which they serve was developed.

Conclusions

On the macro-level, organisational differences between KP and the Danish healthcare system related to the primary care sectors, utilization patterns, and the quality of health care services, supporting a hypothesis that KP's focus on primary care is a beneficial form of organisation. On the meso-level, use of the CCM improved quality of health care services, but the effect is complicated and context dependent. The CCM was found to be useful in the Danish health care system, and the model was also further developed in a Danish setting. On the micro-level, quality was improved by financial incentives and disclosure in a complex interplay with other central factors in the work environment of health care professionals.

ABBREVIATIONS

BMI	Body Mass Index
CAD	Cardiovascular disease
CCM	Chronic Care Model
CCQ	Clinical COPD Questionnaire
CEPOC	Cochrane Effective Practice and Organisation of Care Group
CHF	Chronic Heart Failure
COPD	Chronic Obstructive Pulmonary Disease
DHS	Danish Health Care System
DKK	Danish kroner
FEV1	Forced vital volume in first second
FFS	Fee For Service
FVC	Forced Vital Capacity
GP	General Practitioner
IOM	Institute of Medicine
KP	Kaiser Permanente
MRC	Medical Research Council dyspnoea scale
OECD	Organisation for Economic Co-operation and Development
P4P	Pay for Performance
PCP	Primary care physicians
PPP	Purchasing Power Parities
PR	Public Reporting
RCT	Randomised controlled trial
SF-36	The Medical Outcome Study 36-item Short Form Health survey
TRIAD	Translating Research into Action for Diabetes
WHO	World Health Organisation

VAMC

U.S. Veterans Administration Medical Centers

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