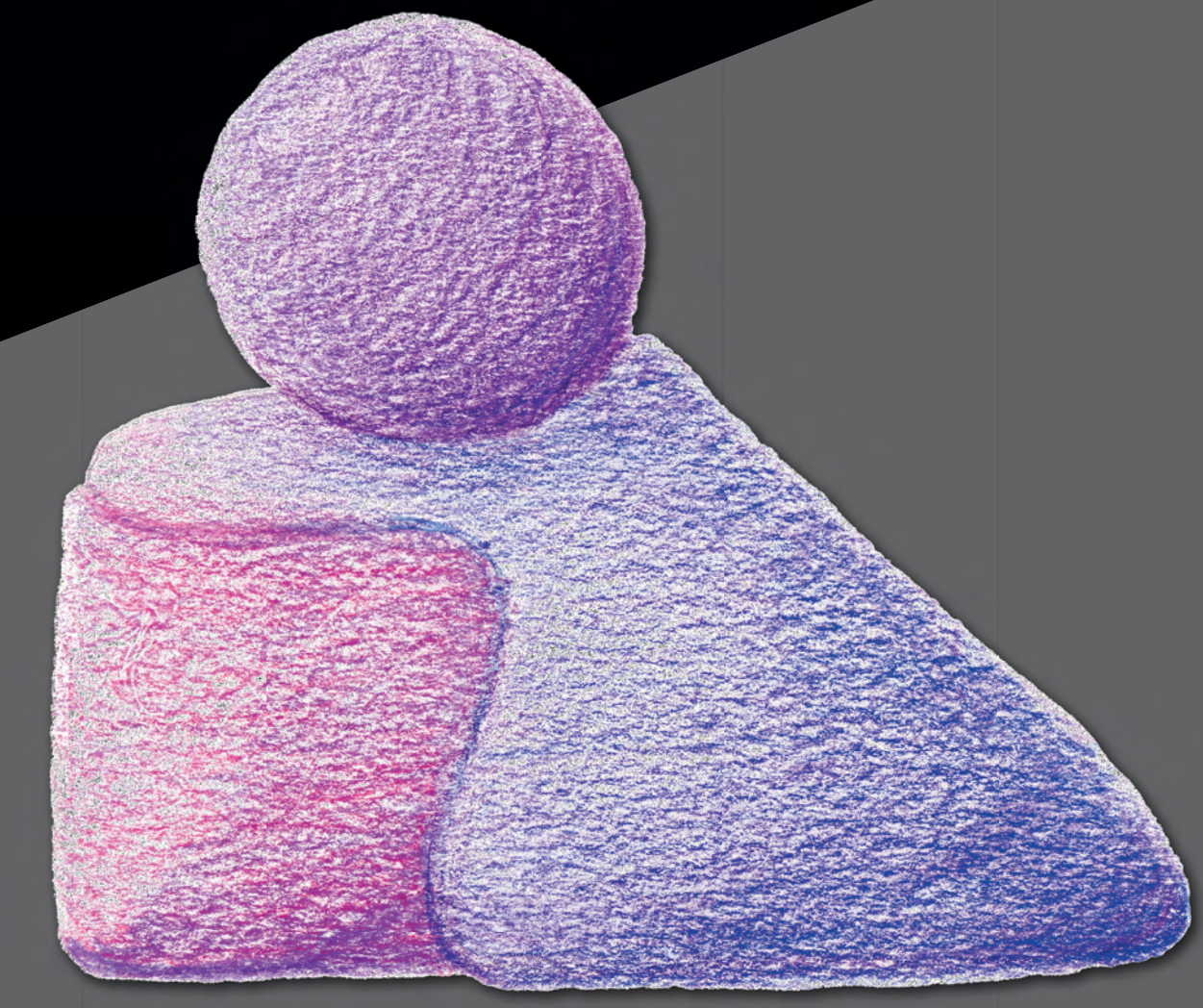
Evaluation of a chronic care model for primary care

Marianne Meulepas



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Evaluation of a chronic care model for primary care

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Contents

For reasons of consistency within this thesis, some terms have been standardised throughout the text. As a consequence the text may differ in this respect from the articles that have been published.

1

Introduction

Introduction

To bridge the gap between the care actually delivered for chronic diseases and what should be done according to the guidelines, we should learn more about strategies to improve the delivery system, emphasising comprehensiveness of care and the overall health of the patient.[1,2] This thesis focuses on organisational interventions that may play a role in improving the management of chronic diseases, in particular diabetes and chronic lung diseases, in a primary care setting. The aim of the study reported in this thesis was the systematic development and assessment of a new chronic care model for primary care. The feasibility of the model and its effects on patients with diabetes and COPD were evaluated.

Chronic diseases and care delivery

Chronic diseases are the main cause of death and disability worldwide. According to the World Health Organization, non-communicable conditions, including cardiovascular diseases, diabetes, obesity, cancer, and respiratory diseases, now account for 59% of the 57 million deaths annually and 46% of the global burden of disease.[3]

A disease with a duration of more than three months is considered chronic.[4] Chronic, non-communicable diseases are often a result of lifestyle, risk-taking behaviours, occupational exposure, or the ageing process. Chronic diseases are also associated with impairment, as they represent a decrease in or loss of ability to perform various functions. Despite the clinical differences across the specific chronic conditions, each illness confronts patients and their families with the same spectrum of needs: they need to alter their behaviour; deal with the social and emotional impacts of symptoms, disabilities, and approaching death; take medicines; and interact with medical care over time. Chronic conditions place similar demands on health systems, and comparable ways of organising health care are similarly effective regardless of biomedical aetiology.[5] New healthcare models are being introduced in Western countries in response to a set of common problems seen in various health care delivery systems; for example fragmented and uncoordinated arrangements for delivering care, a strong bias towards acute treatment, a neglect of preventive care, and inappropriate treatment.[6] Innovative models aiming to improve outcomes in chronic care have been described as managed care, integrated care, disease management, and case management. Determining which

models are most successful is difficult because there are no agreed definitions for each model and because of overlap of components between models. All models are multicomponental, and so far research designs have not compared different types of interventions to find the most effective.[7] Common in all models is the emphasis on the coordination of care.

One review defined coordinated care as targeting 'at risk' people with assessment of medical, functional, social, and emotional needs; provision of optimal medical treatment, self-care education, and integrated services; and monitoring of progress and early signs of problems.[8] The aim of coordinated care was to improve health outcomes and reduce costs. Programmes in the review were divided into either disease management or case management. Case management targeted complex patients who had multiple conditions and social problems. Disease management targeted patients with a single diagnosis. Both models were run by nurses. A common feature of successful programmes was the defining of patients' problems and setting goals for each problem.
A meta-analysis of disease management, which incorporated case management, found that improved disease control was associated with education of providers, reminders and feedback to providers, and with education of patients, reminders to patients, and incentives.[9]
Elements of successful programmes for chronic disease have been organised under the domains of the chronic care model (CCM).[10] It comprises four components: decision support, self-management support, clinical information systems and delivery system design. These components will be discussed briefly.

Decision support

Evidence-based practice guidelines or protocols can stimulate provider teams to be aware of effective treatments, but this information must be integrated into the process of decision-making - for example, reminders or standing orders - to have a meaningful impact on patient care. In addition to guidelines, practice teams must have access to professionals with clinical expertise and experience with respect to the condition.

Self-management support

In providing information and support to enable patients (and families) to manage their illness better, self-management support is central to improving care and outcomes.[11] Successful self-management support can be effectively delivered in 'stand alone' programmes,[12-14] but recent evidence suggests that long-term benefits may require an ongoing collaborative process between patients and professionals.[15,16]

Clinical information systems

A disease registry or database that includes information about the process and results of care for all patients is also an essential ingredient. Healthcare teams with access to a registry can contact patients with specific needs, deliver planned care, receive feedback on their team's performance, and benefit from reminder systems.

Delivery system design

Usual healthcare systems oriented to addressing acute illness make it difficult for productive interactions to occur. An Institute of Medicine report[17] makes clear that adding greater expectations or simple solutions to systems designed for a different set of healthcare problems is unlikely to be successful. The system must change, and this is reflected in delivery system design. For example, productive interactions are made more likely by planning visits or other interactions in advance. Non-physician members of a practice team are crucial for effective chronic illness care, but they need clear complementary roles. Patients with more complex conditions and/or care needs often benefit from intensive care delivered by nurse case managers and outreach workers who provide close follow-up and help to increase adherence.[18]

Disease specific management programmes have dominated the literature yet do not address the clinical reality that many patients and their health providers have to deal with more than one condition. A growing body of literature argues that an effective approach to meeting the needs of chronically ill patients is to improve the delivery of primary care.[19-22] Care for chronic diseases such as depression, diabetes and COPD, with a broad spectrum of severity and by far the most patients on the less serious side, can best be provided in primary care, at least to guarantee continuity, comprehensiveness and coordination.[23]

Chronic care model for primary care

From what we learned in the literature, we decided to develop a chronic care model for primary care. In usual primary care, many patients with chronic diseases do not receive optimal treatment.[24] Especially periodical check-ups and planned follow-up visits in which test results are discussed are often not offered.[25] Running an active recall system in diabetes care turned out to have a positive effect on diabetes management, but it also constitutes a heavy burden on the practice, which is why solutions are sometimes sought at a level beyond the single practice.[26,27] When an active recall system is combined with a structured delivery of care from a supporting service, poorly controlled patients reach better metabolic values.[28,29] However, this approach takes the care away from the responsibility of the general practitioner and thus one of the most important tasks – to provide integrated care for all patients with regard to all aspects of their health and well-being – may be hampered. Separating care delivery from the recall system may be the key. Herwitz described an experiment with a prompting system for primary care organised in secondary care.[30] We did not find any examples in the literature of a supporting service, organised in primary care, which offers only logistic support.

In the chronic care model for primary care we developed and tested in a region in the south of the Netherlands we gave great importance to logistic support, organised in primary care at a level beyond the single practice. Logistic support aimed at providing an active recall system and decentralised provision of tests.

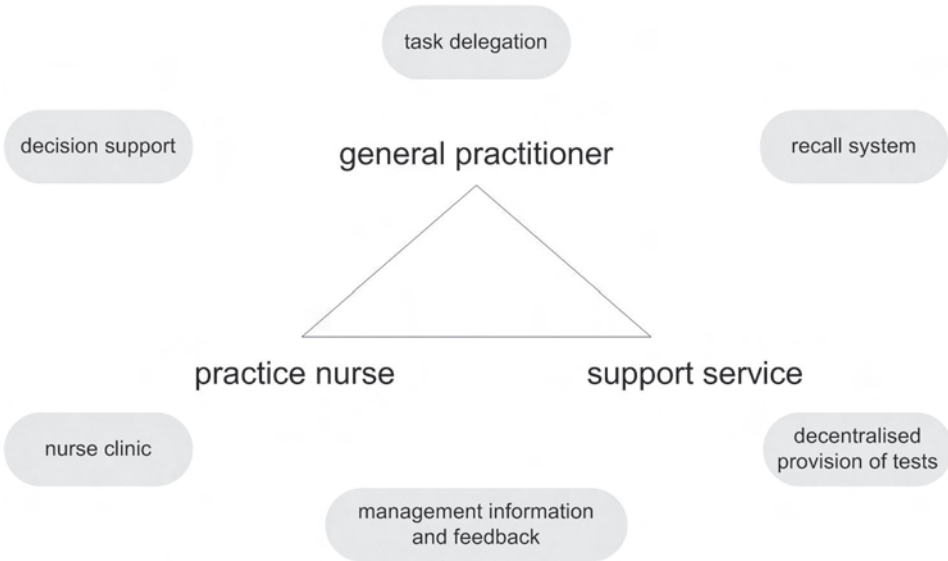
Following the CCM our primary care model has been shaped further as shown in figure 1. This structure was intended as a total model for chronic care management, rather than a model for specific chronic diseases. We developed the model based on national and regional disease-specific guidelines, practical experiences and consultations of (representatives of) the caretakers and authorities involved.

The delivery system of the model was equipped with the general practitioner, practice nurse and support service as the main caretakers. Support services were developed per condition (starting with diabetes and COPD) and were primarily meant to offer logistic support, for instance in calling for laboratory tests. The support services also formed the link with the medical specialists to deliver decision support.

Essential parts of the model were *decision support* including guidelines for

performing the care, *task delegation* by the general practitioner to the nurse and the support service, the organisation of a *recall system*, *decentralised provision of tests*, supplying the general practice with *management information and feedback*, and a *nurse-run clinic*.

Figure 1. Chronic care model for primary care



More specifically, our chronic care model for primary care includes:

Decision support

Two protocols were developed to achieve implementation of the national guidelines: one for asthma/COPD and one for diabetes. All general practitioners who want to start using the primary care model are given a protocol, which they develop further, tuned to the practice conditions.
A number of medical specialists from the regional hospitals provide decision support by 'paper' consultation (giving advice without actually seeing the patient).

Task delegation

In the primary care model the general practitioner is the person with final responsibility for the total care; he/she can delegate tasks to the support service and the practice nurse.

Recall and follow-up system

To offer logistic support, for instance in calling for laboratory tests, the support services are linked to the regional primary care laboratory. The support services maintain a patient register and employ a patient recall system for patients eligible for periodical laboratory testing.

Decentralised provision of tests

The primary care laboratory offers centralised and decentralised testing at general practice surgeries, health care centres, etc. This service brings the routine check-up within reach and added to that, it is also customer-friendly because there is little or no waiting time for the tests on offer. It increases the turnout and makes it possible for especially the elderly patients to participate in the control system.

Central management information

The data that become available through the support service help to maintain quality surveillance within the general practice, but also on a regional level. They support in further development of protocols and postgraduate courses for general practitioners and practice nurses and can be useful in determining the capacity policy for the deployment of practice nurses.

Nurse-run clinic

In the nurse-run clinic, the practice nurse can perform tests such as blood testing or lung function measurement. Otherwise, the main aim of the clinic is to provide information and education, whether or not on the basis of test results. In providing information and support to enable patients to manage their illness better, the nurse plays a key role in the self-management support.

Implementing and evaluating the model

We evaluated the feasibility and the effectiveness of the chronic care model for primary care for two conditions: diabetes and COPD.
We implemented the diabetes model stepwise, starting with a diabetes support service (DSS) that took care of a patient register with a recall system to ensure active follow-up. The aim of the logistic support by a DSS was to improve the process of care in terms of number, frequency and content of check-ups for patients with diabetes type 2 treated in primary care. The

effect of the DSS was investigated in a controlled, non-randomised study with delayed intervention in the control group. The study was carried out in the south of the Netherlands among 78 general practitioners.

In the next step we introduced a practice nurse whose most important task was running a clinic to discuss the test results with the patient and encourage self-management. After improving the process of care by logistic support, the patient-oriented interventions by a practice nurse were especially meant to improve patient outcomes. The research was carried out among the same practices included in the first step (delegation of patient register and recall system to DSS).

Having evaluated each step separately we wanted to implement the model as a whole and evaluate its effects by confronting it with usual care. A second reason was to examine the feasibility of the model for a different chronic disease, to be sure that we have developed a general primary care model for chronic diseases. So we developed the primary care model for COPD with the general practitioners, practice nurses and COPD support service (CSS) as the main actors. The components in the COPD model remained the same as for diabetes. The most important difference with diabetes was the key role of the decision support by the chest physician by evaluating lung function measurements and case history reports offered by the CSS.
The model was examined in a controlled study with delayed intervention in the control group.

Aims of the study

The study was set up to determine the feasibility of a chronic care model for primary care and its effect on guideline-based care provision and on patient outcomes.

Before implementing the model we searched in the literature to determine the effectiveness of the different organisational interventions targeted at the structure of care for patients with asthma or COPD in primary care. A review on interventions to improve the management of diabetes in primary care[31] was available but not on asthma or COPD.
Next, we introduced logistic support, centrally organised by a primary care

DSS and examined its effects on the care process and patient outcome.
Adding a practice nurse to the diabetes model we examined if combining patient-oriented interventions by a practice nurse with centrally organised check-ups by a DSS had more effect on patient outcome than centrally organised check-ups alone.
Finally we implemented a COPD model as a whole and examined the feasibility of such a model and its effect on the process of care and patient outcome.

Research questions per chapter are:

Research question	**Chapter**
What is known about organisational interventions to improve the management of patients with chronic obstructive lung diseases in primary care?	Chapter 2
What is the effect of logistic support by a diabetes support service (DSS) on the implementation of the guidelines for type 2 diabetes?	Chapter 3
What is the effect of patient-oriented interventions by a practice nurse in combination with logistic support by a DSS on diabetic patient outcome in primary care?	Chapter 4
What is the feasibility of a primary care model for diabetes in terms of delegating tasks to a DSS and a practice nurse and including patients in the care model?	Chapter 5
What is the feasibility of a primary care model for COPD in terms of delegating tasks to a COPD support service (CSS) and a practice nurse and including patients in the care model?	Chapter 6
What is the effect of an integrated primary care model for COPD on the process of care and patient outcome?	Chapter 7

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2

Effectiveness of organisational interventions to improve the management of chronic obstructive lung diseases in primary care

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Abstract

Background

To review the effectiveness of organisational interventions to improve the management of asthma and COPD in primary care.

Methods

A systematic review of controlled trials evaluating the effects of organisational interventions in primary care on the process of asthma and COPD care or patient outcomes. Search methods followed guidelines of the Cochrane Effective Practice and Organization Care group (EPOC).

Results

A total of eight studies met the inclusion criteria. These studies examined revision of professional roles (5), telephone consultation (2), and knowledge management (1). Delegating tasks to non-physicians was associated with improved inhalation techniques but had no effect on smoking cessation, lifestyle and coping. Telephone consultations proved to reach more patients in a fixed period of time and took less time per patient. The computerised decision support study showed no effects on the care process.

Conclusions

Of all the possible organisational interventions, we only found three types in our search; five out of the eight eligible articles studied revision of professional roles. Delegating tasks to non-physicians can be a successful intervention to improve asthma and COPD primary care. Telephone consultation is a good method to manage the growing number of patients. As the one knowledge management study did not show improvement in the everyday management of asthma and COPD in general practice, further investigation of this type of intervention is needed.

Background

Chronic obstructive lung diseases are a major cause of chronic morbidity and mortality throughout the world.[1] In recent decades many publications have contributed to the knowledge base concerning the available management options for asthma[2] or COPD.[3] A substantial number of evidence-based clinical practice guidelines are now available.[4-7] It is recommended to treat patients with mild or moderate symptoms in an integrated and systematic way in primary care. More severely ill patients who meet the referral criteria are to be treated in secondary care.[8,9] However, compliance with clinical practice recommendations for the treatment of asthma or COPD in primary care is inadequate.[10-12]

In the past decades several strategies have been described to implement guidelines or improvements in health care.[13] They can be categorised into four types of interventions: professional interventions (such as distribution of educational materials, educational meetings, local consensus processes, educational outreach visits, feedback and reminders), patient-oriented interventions (such as information, education and feedback), financial interventions (such as fee-for-service, provider/institution incentives/ penalty, patient co-payment, user-free, patient incentive), and organisational interventions (such as changes to the setting of care delivery, changes in medical record systems, changes in physical structure, facilities and equipment). Up until now there is little evidence to support decisions on selecting guideline or improvement strategies in specific circumstances.[14] Particularly information about the value of organisational interventions is lacking.

Since the facilities and organisation required for the care in general practice to meet the asthma and COPD guidelines are often lacking in usual care practices,[15-18] we were especially interested in organisational interventions aimed at improving the management of asthma and COPD care. Wensing et al.[19] distinguishes five types of organisational interventions to improve patient care: 1/ revision of professional roles (changes in tasks and responsibilities of health professionals, such as nurses taking on more medical tasks), 2/ multidisciplinary teams (clinical teams or collaborations of physicians, nurses and allied health professionals), 3/ integrated care services (organised systems for care delivery), 4/ knowledge management (information and communication technology, such as computerised medical record keeping), and 5/ quality management (a management approach, which focuses on

customers, continuous efforts to improve measurement and analysis of performance).

The objective of this review was to determine the effectiveness of the different organisational interventions targeted at the (infra)structure of primary care for patients with asthma or COPD.

Methods

Identification and selection of studies

English and Dutch language publications were selected from the following databases: Medline (1966 – 2006), Embase (1980 – 2006), and Cinahl (1982 – 2006). Additionally, we scanned the reference list of all relevant studies. As selection criteria for including studies we used the EPOC search strategy,[20] supplemented by the following free-text words and key words: 'asthma', 'COPD', 'obstructive lung diseases' and 'primary care', 'community care', or 'outpatient care'.
We examined studies that evaluated the effectiveness of organisational interventions directed to health care professionals who care for non-hospitalised adults with asthma or COPD in primary care, outpatient and community settings. The following selection criteria were used to determine the relevance of the studies:

- the study population included adults with asthma or COPD;
- the study was aimed at a primary care population (mild to moderate disease severity). Studies that examined only the effect on patients with severe lung diseases (defined by publication's author) were excluded;
- the intervention was organisational, defined as planned re-arrangements of one or more aspects of the organisation of patient care, and its main goal was improvement of the primary care management of asthma or COPD.

Next we used the following criteria for the study design:

- the study design was a randomised controlled trial (RCT);
- the follow-up period was at least six months;

- the dependent variables in the study included at least one dimension of process of care or patient outcome.

Two reviewers (MM and AL) working independently screened each paper retrieved in the searches and obtained the full text of potentially eligible studies. A consensus meeting was planned to deal with any disagreements that arose between the two reviewers. If no agreement could be reached a third investigator (JJ) decided whether the paper should be included.

Assessment of methodological quality of trials

The quality of the eligible trials was assessed independently by two reviewers (MM and AL) using the EPOC quality criteria.[21] Any discrepancies between reviewers were resolved by discussion or were referred to a third reviewer (JJ). The most important recorded items were the unit of allocation and analysis, concealment of allocation, blinding, statistical power, follow-up of professionals and patients, comparability of baseline measurements, protection of the control group against contamination from setting, study population, and follow-up period.

Data analysis

Where possible, data were tabulated in terms of means ± SEM for patient outcomes and proportions for process measures; other data were presented as reported in the original paper. Because of heterogeneity of interventions, settings, and reported outcomes, we decided to not statistically pool the results of the studies. Instead, we tried to relate the results of the studies to their methodological quality and the type of intervention used in the studies.

Results

The search resulted in 251 articles. Of these articles 236 were excluded because they did not meet the criteria for relevance: 82 studies examined specific patient categories that did not belong to our study population (children, severely ill patients), 154 articles described the effect of other types of interventions than organisational strategies (for instance professional education and patient education). Next, seven articles were excluded because of their study design, six studies[22-27] were not randomised controlled trials, and one[28] had a follow-up period shorter than six months. No articles were

excluded because they did not use dependent variables such as process of care or patient outcome; they had already been excluded for one of the previous criteria. Eight publications remained in analysis.[29-36] The overall agreement on the inclusion of articles was 100%.

Study quality

In six studies[29-34] patients were randomised within one practice, thereby making them prone to contamination. Similar baseline measurements between the intervention and control groups were reported in six studies.[30-34,36] Outcomes were assessed blindly or were objectively assessed by a standardised test in all studies. Four studies had dropout rates of more than 20%.[29-32] A priori power calculations were included in four studies.[30,31,34,36]; they achieved the intended sample size.

Characteristics of the studies

The characteristics of intervention and control groups are shown in table 1. Eight interventions were based in general practices, one in pharmacies. Categorising the publications by intervention type, five reported effects of revision of professional roles,[29-32,35] and one of knowledge management.[36] In the first category all studies examined care tasks delivered by non-physicians: practice assistant[30], practice nurse[29,31,32] and pharmacists.[35] Two studies on telephone consultation[33,34] could not be characterised as one of the five described by Wensing et al.[19]

Final results of the studies

The main findings of the studies are shown in table 2. Studies that examined new tasks for non-physicians used as outcome measures: inhalation technique, lung function (FEV1 / PEF), quality of life (QOL), symptom scores, exacerbations, smoking cessation, sick leave, use of health care facilities, patient satisfaction. In the study that investigated inhalation instruction by a practice assistant, significantly more patients in the intervention group versus the usual care group had a correct inhalation technique.[30] Although not investigated, in a second study improved inhalation was thought to be the reason for the improvement in lung function in COPD patients (FVC>>, FEV1>).[29] PEF was improved by the intervention that focussed on self-management by supplying patients with peak flow meters.[35] Nocturnal symptom scores improved in one study with a practice nurse,[31] while no improvement of symptoms was found in other studies. Neither intervention

Table 1 - Characteristics of selected studies

Study	Setting	Category	IG	CG	Duration	Intervention
Hesselink 2003 Netherlands	12 general practices with 14 GPs	COPD	PA: 2 patients: 139	patients: 137	24 months	patient education by PA focussing on inhalation technique and coping with the disease
Heard 1999 Australia	8 general practices with 42 GPs	asthma	nurses: ? patients: 97	patients: 94	6 months	3 nurse-run clinic sessions focused on spirometry, education and counselling, followed by a visit to the GP
Pilotto 2004 Australia	11 general practices	asthma	nurses: 2 GPs: 5 patients: 80	patients: 90	6 months	3 nurse-run clinic sessions focused on spirometry, education and counselling, followed by a visit to the GP
Van Son 2004 Netherlands	2 general practices with 7 GPs	asthma and COPD	nurses: 2 patients: 70	patients: 68	12 months	nurse clinic with spirometry, education and counselling (smoking cessation)
Pinnock 2003 UK	4 general practices with 29 GPs and 7 nurses	asthma	patients: 137	patients: 141	3 months	telephone review instead of office visits
Weinberger 2002 US	36 drugstores	asthma and COPD	CP drugstores: 12 patients: 447 PP drugstores: 12 patients: 363	drugstores: 12 patients: 303	12 months	patients received a peak flow meter and instructions about its use (CP and PP) pharmacists were provided with patient specific data (CP)
Eccles 2002 UK	62 general practices with practice nurses	asthma	practices: 31 patients: 1129	practices: 31 patients: 1101	12 months	computerised guidelines for the management of asthma
Gruffydd-Jones 2005 UK	1 single general practice	asthma	nurses : 2 patients: 97	nurses: 2 patients: 97	12 months	telephone consultation using ACQ

IG=intervention group, CG=control group, RCT=randomised controlled trial, PA=practice assistant, CP=complete program, PP=partial program, ACQ=asthma control questionnaire.

by practice assistants, nurses or pharmacists, nor making telephone calls instead of regular office visits, had an effect on quality of life, exacerbations or smoking cessation. In one study, the number of visits to the emergency department increased (asthma patients).[35] Patient satisfaction, when investigated, was positively influenced by additional care on top of or instead of regular care.[29,35] Telephone consultation instead of regular office visits did not diminish patient satisfaction.

Except for these patient outcomes, an important process outcome was the more frequent provision of a peak flow meter in nurse clinics.[31,32] Nurse clinics did not increase the number of written action plans.[31,32] Delegating tasks did not diminish the workload of the general practitioner[29] although patients tended to visit the general practitioner less for non-respiratory problems if an intensive nurse clinic was available.[31,32] Two projects specifically aimed at process outcomes. Telephone consultations proved to reach more patients within a certain period of time and took less time each, while the content was equal (symptoms, medication, treatment changes, peak flow, self-management).[33,34] The knowledge management study about computerised decision support did not show any effect on the care process.[36]

Discussion

This review was performed to identify effective organisational intervention strategies to improve the management of patients with asthma or COPD in primary care. Randomised controlled trials that met the methodological and quality criteria were included. A total of eight studies fulfilled the inclusion criteria, although most of these studies had methodological shortcomings. We categorised the studies into the five types of organisational interventions described by Wensing et al.[19] We found examples of only two types of organisational interventions, revision of professional roles and knowledge management. Besides, we added two studies on the effect of telephone consultation as a different type of organisational intervention.

In all five studies included in the revision of professional roles category, tasks were delegated to non-physician care providers. These care providers performed tasks which, although advised in the guidelines, were inadequately or not done at all by general practitioners. The focus was on patient education and instruction. Effects were seen in the improved inhalation technique, being important for asthma as well as COPD patients. Another obvious effect

Table 2 - Results of organisational interventions

Type	Study	Patient outcome	Process measures	Conclusion
Revision of roles	Hesselink	inh techn (+) med compl (0) dyspnoea (0) sympt (0) QOL (0) coping (0) smok cess (0)	not applicable	patient (+/0)
	Heard	absence (0) smok cess (0) sympt (+) med use (0) ED visit (0)	discuss TF (0) AP provided (0) owing PF (+)	patient (+/0) process (+/0)
	Pilotto	QOL (SGRQ (0) FEV1 (0) sick leave (0) smok cess (0) ED visits (0)	AP provided (0)	patient (0) process (0)
	Son	lung function (+) exacerbations (0) pat satisf (+)	diminishing workload GP (0)	patient (+/0) process (0)
	Weinberger	PEF (+) QOL (0) med compl (0) ED visit: - COPD (0) - asthma (+)	feasible care support by pharmacists(0)	patient (+/0) process (0)
Telephone consultation	Pinnock	QOL (0) pat satisf (0) sympt (0) exacerbations (0)	prop pat (+) duration cons (+) content of consultation (0)	patient (0) process (+)
	Gruffydd-Jones	asthma control (0) QOL (0) exacerbations (o) satisfaction (+)	prop pat (+) duration of consultation (+) costs (+)	patient (+) process (+)
Knowledge management	Eccles	not applicable	lung function ass (0) compl checked (0) inh techn ass (0) education (0) smok status known (0) smok cess advice (0) prescribed drugs (0)	process (0)

+ = positive effect, 0 = no effect
QOL=quality of life, inh techn=inhalation technique, med compl=medication compliance, smok cess=smoking cessation, sympt=symptom scores, absence=time lost from work or school, ED=emergency department, discuss TF=discussing trigger factors with doctor, AP=action plan, PF=peak flow meter, pat satisf=patient satisfaction, prop pat=proportion of patients reviewed, cons=consultation, ass=assessed, PEF=peak expiratory flow

was the increased number of peak flow meters handed out, which supports self-management in asthma patients.[37] Even when encouraged by the nurse, only very few action plans were actually made by the general practitioner.[32] Also in patients with COPD the use of written action plans can be helpful for the adequate management of complaints and exacerbations by adapting the medication.[38] Our review did not reveal how or what organisational interventions could best be used to stimulate this process outcome. A reason might be that, since pharmaceutical interventions are the responsibility of the general practitioner, the task to write these action plans is not suitable for delegation.

As shown by a meta-analysis of disease management programmes for a wide variety of chronic illnesses, including asthma and COPD, patient education is associated with patient disease control.[39] Delegating patient education might be important to improve the management of care to meet the guidelines, but the training level of the care provider must be in line with the full task. Being capable of teaching patients how to use their inhaler correctly does not implicate qualification for an intensive programme directed to smoking cessation, changing lifestyle and coping. Maybe that is the reason why no measurable effects were found for patient education in the eligible study. Considering the studies about revision of roles as a whole, we recognise the effect of patient education and counselling on the patient's awareness of his disease. This can lead to better management, even when the attention is mainly given by the research assistant.[35] The same study shows that this can lead to more emergency department visits, which is possibly an adverse effect, emphasising the importance of well-trained, non-medical care providers.

In the revision of professional roles category we also expected to find studies on spirometry, because much has been written about the need[2,3,4,7,40-42] and feasibility[43-45] of implementation of spirometry in general practice. However, no eligible articles were found on effects of diagnostic or monitoring support. Although there are experiments,[46] we assume that no RCTs have been performed or published yet.

As for other strategies to improve asthma and COPD management in primary care, we selected two articles introducing modern media techniques. Management of care for this population can be well supported by telephone interviews.[34] More patients can be reached and among them especially the patients with poor compliance to the control system.[33] Telephone calls are

shorter than office visits since the questions are more focused.[33] At the same time they lead to the same follow-up actions as office visits do. Follow-up is more often necessary in more severe cases. Also, especially patients with minor symptoms appreciate the efficient telephone check-ups more, even up to 88%,[33] while the more severely ill patients appreciate face-to-face contact.[47] Therefore the telephone interview is indeed a good instrument for the primary care setting in asthma patients. As for COPD it might be just as effective, since checking peak flow or lung function is not as relevant and advice, such as smoking cessation, could be given by telephone.
Knowledge management by computerised decision support in the eligible study failed to provide effective support in the management of asthma and angina pectoris patients, mainly because it was not used enough. Computerised systems have to fit in with the clinical encounters and follow the decision-making process of the general practitioner, who manages complex and multiple conditions. Time-consuming checklists are not suitable. Practice assistants or nurses, who are used to working in more structured way, with using protocols, might benefit more from computerised decision support, but the challenge to show if and how this is possible, desirable and efficient still remains.[36]

Shortcomings

The results of this review could be criticised on several points. Firstly it may be questioned whether all possible relevant articles were detected as we included only English and Dutch language papers. Secondly it has to be recognised that five of the studies specifically addressed asthma patients and one specifically COPD, so we have to be careful in interpreting the results in order to make them applicable for both asthma and COPD patients.

Conclusions

Revision of professional roles by delegating tasks to non-physicians can be a successful organisational intervention to improve asthma and COPD care in general practice. Since primary care patients usually suffer from mild to moderate symptoms, and have a moderately impaired quality of life and lung function, one cannot expect spectacular results from these interventions. By spending more time on education and giving more attention to the patient, disease awareness and self-management of exacerbations can improve. Professionalism and a broad education in lung diseases of the care provider are important conditions that might need attention when tasks as lifestyle

interventions are to be performed. However, task delegation does not imply that the workload of the general practitioner will diminish, as in most cases delegation means the start of a structured education process, raising awareness of the patients and improving compliance with treatment and control frequency.[48] Telephone consultation is a good method to manage the growing number of patients. More patients are reached and comply with the control system, telephone calls are very satisfactory for the patients and there is no loss of quality. This might stimulate the exploration of further use of technology, e.g. telemonitoring, in the care process. As the one knowledge management study did not any show improvement in everyday management of asthma and COPD in general practice, further investigation of this type of intervention is needed.

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3

Logistic support service improves processes and outcomes of diabetes care in general practice

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Abstract

Background

Guidelines for type 2 diabetes care in general practice are well known and accepted, but the implementation falls short.

Objective

To implement these guidelines by introducing a diabetes support service (DSS) to support the care delivered by the general practitioner.

Methods

A controlled, non-randomised study with delayed intervention in the control group; 78 general practitioners (n = 51 for the intervention and n = 21 for the control group) in the south of the Netherlands and 613 of their type 2 diabetic patients participated. Data were collected on the frequency, content and results of the check-ups (fasting blood glucose, HbA1c, cholesterol, cholesterol/HDL ratio, triglycerides, creatinine, blood pressure, fundus photography, foot examination, body mass index and smoking status) for three years. The year before signing up with the diabetes support service (DSS) was taken for the pre-measurements and after two years of DSS the post-measurements took place. The effect of the DSS was analysed in a mixed model with repeated measurement covariance structure.

Results

At baseline the intervention and control group did not differ in control frequency and outcome (HbA1c). After the intervention the percentage of patients that attended four or more quarterly check-ups (with at least testing of fasting blood glucose or HbA1c) increased from 59 to 78%. In contrast, the frequency of check-ups in the control group remained constant. This effect was significant. The HbA1c remained the same in the intervention group while there was a significant deterioration in the HbA1c in the control group.

Conclusion

Simple logistic support by the DSS proved to have the capacity to implement type 2 diabetes guidelines in general practice.

Introduction

National and international guidelines for type 2 diabetes care in general practice are especially directed towards strict metabolic control and management of the other risk factors for cardiovascular disease.[1-3] However, studies indicate that the guidelines are not adequately followed and many type 2 diabetic patients run a high risk of complications.[4,5] There is an enormous variety in care offered in the general practice setting.[6] Looking for reasons for this variety, Khunti et al. mention 54 possible factors at the level of the practice, the organisation and the patient.[7] A study carried out in 169 practices with a total of 18,642 diabetic patients in the United Kingdom, in which the relation between the various factors and the quality of care was investigated, showed that most of the factors did not have a proven effect on the quality of care.[8] However, a positive correlation was established between using an active recall system and the quality of diabetes care. Running an active recall system may have a positive effect on diabetes care but it also constitutes a heavy burden on the practice,[9] which is why solutions are sometimes sought at a level beyond the single practice.[10-12] It appears that when an active recall system is combined with a structured delivery of care from a supporting service, poorly controlled patients reach better metabolic values.[13,14] A disadvantage of this approach is that the care is taken away from the responsibility of the general practitioner. In this way the most important task of the general practitioner, to provide integrated care for all patients with regard to all aspects of their health and well-being, is frustrated.[15,16] Studies show that good diabetes care can be delivered in the general practice setting as long as the care is well structured.[17,18] Moreover, structure in general practice brings about a high level of participation among patients.[19,20] Separating the care from the organisation may be the key. Earlier, Hurwitz described a successful experiment with a prompting system.[21] Patients were brought in from outpatient clinics. We could not find any examples of centrally organised prompting for coordinating primary care outside the hospital. Therefore, we would like to introduce a diabetes support service (DSS) in primary care that offers logistic support in organising the care but leaves the actual provision of care in the hands of the general practitioner. The effect of this approach on the care process and outcome has, however, not yet been studied. The objective of our study is to determine the effect of the DSS on the implementation of the guidelines by measuring process and outcome indicators of type 2 diabetes care.

Methods

Design and study population

The effect of the DSS was investigated in a controlled, non-randomised study with delayed intervention in the control group. In order to make both groups as comparable as possible, general practitioners on the waiting list for the DSS were eligible for the control group. A pre- and post-assessment was performed with an interval of two years.
The study was carried out in the south of the Netherlands among 78 general practitioners with a total of 613 type 2 diabetic patients. General practitioners who used the DSS (intervention group, n = 51) were compared with general practitioners who were not yet using the DSS (control group, n = 27). General practitioners were eligible if they signed up in 1999 and at the start of the study (end 2001) had at least ten diabetic patients registered with the DSS (intervention group) or on the waiting list (control group). Furthermore, in the intervention group patients were included at the start of the study when they had been registered with the DSS for a minimum of one year and a maximum of two years at the start of the study. All patients in the study had had documented diabetes for more than four years at the start of the study: 449 of the 1292 patients in the intervention group versus 164 of the 553 in the control group met the inclusion criteria. Only patients with data available for the whole study period were included in the analysis. Patients who died or moved away from the area during the course of the study were excluded.

The power analysis was based on the assumption that the implementation strategy could lower the HbA1c of type 2 diabetic patients by 0.5 (SD 1.5). We corrected for known unbalanced groups (intervention group 70% and control group 30%). The clustering of patients per general practitioner was also taken into account. With alpha = 5%, power = 80%, ICC = 0.05, 75 general practitioners with a total number of 425 patients were needed (298 intervention and 127 control patients). With an expected dropout of 10%, the total number of patients needed was 468.

Intervention

The intervention consisted of logistic support for the general practitioner by a DSS. The DSS called up patients for laboratory testing, foot examination, fundus photography and appointments with the dietician and the diabetes

nurse; the patient was asked to make an appointment at the surgery to discuss the results.
The DSS did not provide any patient care itself; there was no contact with patients except for calling them up for (repeated) three-monthly and annual blood testing. For this purpose the DSS worked together with a laboratory that offered blood testing centrally, but also decentralised at general practice surgeries, health care centres, etc.
The results of the requested tests were sent directly from the laboratory to the general practitioner. This was the same procedure as for the general practitioners in the control group who could request regular testing by the laboratory. The actions taken by the general practitioners after receiving the results were not part of the intervention.

Variables and instruments

Data were collected from all the patients in the research group on the frequency, content and results of the check-ups (fasting blood glucose, HbA1c, cholesterol, cholesterol/HDL ratio, triglycerides, creatinine, blood pressure, fundus photography, foot examination, body mass index and smoking status). In addition, a number of general characteristics of the general practitioners were noted: age, level of urbanisation of the place where the surgery was situated, size of the practice, percentage of employment of the general practitioner, and number of known diabetic patients. Of the patients, age and sex were noted as general characteristics.

The data were obtained from the databases of the DSS and the associated laboratory. Missing data – for instance if the general practitioner does the quarterly monitoring of fasting blood glucose in his own practice and the result is therefore not in the laboratory database – were collected from the practice.

Analysis

Differences in the frequency of tests and the test results between intervention and control groups were assessed with mixed models with repeated measures (Proc mixed procedure SAS V8.2).[22] Test results in as far as they were categorised (within the target value or not) and differences in whether or not the patient underwent four check-ups a year were assessed with a mixed logistic model repeated measures (Glimmix procedure SAS V8.2) over the year prior to registering with the DSS and the second year after registration.

All analyses were corrected for the random/cluster effect caused by patient and general practitioner.

Results

Response rate and possible selective loss

In total 78 general practitioners (out of 82) met the inclusion criteria and they all took part. Of their diabetic patients, 613 met the inclusion criteria of whom 497 patients (80%) gave consent to use of their details for study purposes; 15 patients (2%) of the latter group moved away from the area or died. Finally, data from 482 patients were analysed (Overview 1). Due to the combination of diabetes duration and date of intake with the DSS half of the patients did not meet the inclusion criteria. Comparison of metabolic values at the time of registering with the DSS, however, shows that there were no significant differences between patients who met the inclusion criteria and those who did not. The general practitioners in the control group were comparable with those in the intervention group as regards age, proportion of rural and urban practices, population size and number of known diabetic patients. The patients in the control group did not differ in age and sex from the intervention group (Table 1).

Table 1. Characteristics of general practitioners and patients at the start of the study

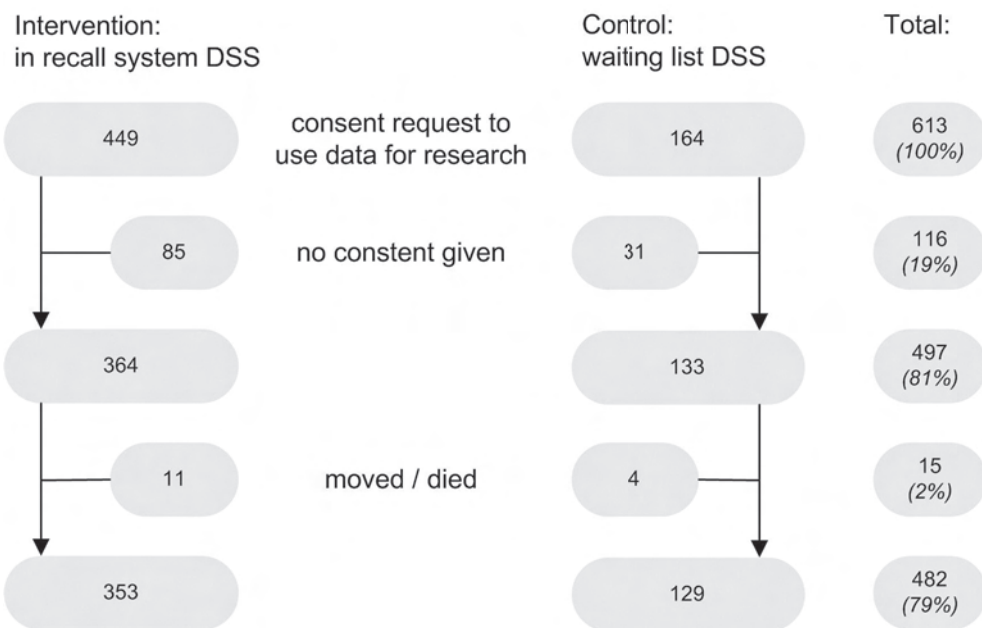
	Intervention group	Control group
Characteristics of general practitioners		
Number of general practitioners	51	27
Average age of general practitioners (sd)	48 (7.1)	49 (8.1)
% working in urban practice	37	32
Average population size/FTE general practitioner (sd)	2653 (360)	2827 (788)
Average number of diabetic patients/1000 registered per GP (sd)	26 (12.3)	22 (6.5)
Patient characteristics		
Number of patients	353	129
Average age (sd)	68 (11.7)	67 (10.7)
% men	45	48

Frequency and content of check-ups

In the year prior to registration with the DSS, 59% of the patients from the intervention group attended four or more quarterly controls (with at least testing of fasting blood glucose or HbA1c) versus 49% of the patients in the control group. The difference between intervention and control group at baseline was considerable but not significant. After the intervention this percentage increased to 78% in the second year, but remained constant in the control group ($P < 0.0001$).

Table 2 also shows the tests that were carried out at least once a year, generally during the annual check-up. A percentage of 100% means that a certain test was not only ordered by the general practitioner but that all the patients actually attended.

Overview 1. Patient flow



Before the intervention patients underwent on average four tests, as did those in the control group. These were mainly blood tests and blood pressure measurement. For the patients in the control group this did not change in the following years, while the intervention patients had undergone an average of eight of the nine tests on offer after two years. Foot examinations, fundus photography, and questioning about the smoking status gained most by the DSS.

Table 2. Frequency and contents of tests in check-up

	Intervention (n=353)		Control (n=129)		
	Before	After	Before	After	Difference in change between intervention and control group [CI]
Frequency of tests					
% patients with ≥4 fasting blood glucose and/or HbA1c values a year	59	78	49	50	2.12* [1.2, 3.7]
% patients tested at least once a year†					
Fasting blood glucose	91	100	87	94	4.0* [0.4,40.3]
HbA1c	87	100	69	71	13.4* [1.6,114.6]
Cholesterol	61	100	63	56	80.8* [9.9,659.1]
Creatinine	63	100	65	59	71.7* [8.7,589.4]
Blood pressure	76	100	65	72	8.8* [3.6,21.3]
Funduscopy‡	16	64	23	25	96.5* [20.5,215.6]
Foot exam¦	16	95	7	7	7.3* [2.0,25.9]
BMI	50	78	58	56	3.4* 1.7,6.7]
Smoking status	5	100	14	6	104.9* [25.6,430.1]
Average number of items (sd)	4.6 (1.8)	7.9 (0.7)	3.3 (2.6)	4.3 (1.9)	2.27 [1.7, 2.9]

* Expressed in odds ratios.
† The microalbumin value is not included due to the small number of patients younger than 50 years.
‡ A number of patients are called up once every two years for eye check-ups (95% when measured over 2 years).
¦ At one location BMI could not be measured (95% when this location is excluded).

Outcome of care

The patients in the intervention group had a lower mean fasting blood glucose in the year prior to registration with the DSS than the control patients, although this difference was not significant (Table 3). The HbA1c was 0.2% lower in the intervention group. Two years later, there was a significant deterioration in the HbA1c in the control group and no difference in the HbA1c in the intervention group. The difference in change between the two groups was 0.7%. The mean cholesterol values did not significantly differ within the groups and between the groups, but there was a shift in the percentage of patients with a cholesterol > 5 mmol. That was initially higher in the intervention group (63% versus 56%), but had dropped significantly after two years (51% versus 66%).
The mean systolic blood pressure in intervention patients was significantly lower than in the patients in the control group. The diastolic blood pressure did not significantly differ.

Discussion

Simple logistic support by a DSS without taking over patient care improved adherence to general practice guidelines for diabetes care. The recall system produced an increase in the number of patients who, in accordance with the guidelines, underwent four check-ups a year. Also the content of the check-ups was more in line with the guidelines than for patients not supported by the DSS. Modest but significant improvement or less worsening was seen in mean levels of HbA1c, systolic blood pressure, cholesterol and triglycerides, but not in diastolic blood pressure and cholesterol/HDL ratio. The rise in mean HbA1c levels in the control group was similar to the UKPDS trends in HbA1c levels.[23]

Table 3. Outcome of care

	Intervention (n=353)		Control (n=129)		
	Before	After	Before	After	Difference in change between intervention and control group [CI]
Mean fasting blood glucose (sd)	8.2 (2.0)	7.9 (1.8)	9.0 (2.2)	9.1 (1.8)	- 0.4 [-1.0, 0.1]
Mean HbA1c (sd)	7.2 (1.2)	7.2 (1.0)	7.4 (1.5)	8.0 (1.2)	- 0.7 [-1.0, -0.4]
- percentage <7%	45	46	43	18	3.8* [2.0, 7.0]
Mean systolic blood pressure (sd)	152 (17.5)	147 (24.6)	147 (15.9)	151 (15.7)	- 9.3 [-15.6, -3.0]
Mean diastolic blood pressure (sd)	83 (7.7)	81 (12.3)	85 (9.2)	83 (8.2)	- 0.3 [-3.8, 3.2]
- % systolic pressure >150 mmHg	53	44	46	54	0.5* [0.3, 0.9]
- % diastolic pressure >85 mmHg	35	38	48	41	1.4* [0.7, 2.7]
Mean cholesterol (sd)	5.4 (1.0)	5.0 (0.9)	5.5 (1.2)	5.2 (1.1)	- 0.2 [-0.5, 0.1]
Mean cholesterol/HDL ratio (sd)	4.8 (1.6)	4.3 (1.4)	5.2 (1.7)	4.5 (1,5)	0.4 [-0.7, 1.6]
Mean triglycerides (sd)	2.0 (2.1)	1.9 (1.3)	2.2 (1.4)	2.3 (1.2)	- 1.1 [-6.4, 0.4]
- % cholesterol > 5 mmol	63	51	56	66	0.5* [0.3, 0.8]

* Expressed in odds ratios.

There are some methodological considerations. Mixed models repeated measures are appropriate for nested analyses, but since we did not use a randomised design there is a potential bias in the selection of the candidates that is not corrected by analysis. In fact the mean entry value of the primary outcome measure HbA1c in the control group is high (7.4). Goudswaard et al. found a mean HbA1c of 7.1 in a population of 1641 patients.[24] So the intervention group resembles the mean population of Dutch diabetic patients in primary health. In that group the DSS appeared to be capable of preventing deterioration in metabolic levels. Secondly, the inclusion criteria resulted in half of the patients not being included in the study. This loss was not

selective for the metabolic values that were checked at baseline and did not differ significantly. We therefore assume that the study population provides a representative sample of the group of patients general practitioners ask the DSS to call up. Thirdly, the fact that the control group were on the waiting list could disturb the attribution of the effect. Classical threats are selection maturation, differential statistical regression and local history.[25] However, these treats do not seem very likely, because the waiting list problem was created by a totally unexpected national funding policy by health insurance companies that was corrected for after our intervention period.

After two years of support by the DSS the majority of tests are carried out in 100% of the patients which demonstrates the high level of willingness among patients to respond to the call up by a DSS. This is in line with the high level of participation among diabetic patients who are offered well-structured care from the general practice setting that is reported in the literature.[18,19] On the other hand, improvement in the blood glucose and blood pressure control of patients was less convincing than interventions described in the literature that focused on both the organisation and the general practitioner.[14,15] The UKPDS showed us that intensive blood pressure control in diabetic patients might be even more important than blood glucose control,[26] but with the support of the DSS target levels of the latest guidelines (140/85) could not be reached. Logistic support appears to be important for the improvement of the healthcare processes, but it should be possible to achieve a greater improvement in patient outcome. Further research is needed to investigate whether other forms of support in addition to the logistic support would produce more effect on the patient outcome. Options could include support in the surgery in discussing test results with the patient, as well as the consequences for treatment.

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4

Patient-oriented intervention on top of centrally organised check-ups improves diabetic patient outcome in primary care

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Abstract

Background

Logistic support to general practitioners improves the care processes for diabetic patients, but is not sufficient to meet all criteria.

Aim

To evaluate the added value of patient-oriented interventions by a practice nurse in general practices which already use logistic support to improve the care processes for diabetic patients.

Design of study

A controlled study with delayed intervention in the control group.

Setting

51 practices (n=23 for the intervention and n=28 for the control group) in the south of the Netherlands and 900 of their type 2 diabetic patients.

Methods

Data were collected on the results of the check-ups (fasting blood glucose, HbA1C, cholesterol, cholesterol/HDL ratio, triglycerides, creatinine, blood pressure, fundus photo, foot exam and body mass index), smoking status, physical activity and medication use. The effect of the patient-oriented intervention was analysed in a mixed model with repeated measurement covariance structure.

Results

The HbA1C improved in the intervention group, while that of the control group deteriorated. The percentage of patients with an HbA1C ≥ 8.5 was halved. Patients in the intervention group started to exercise more besides their daily activities compared with the control group. The need for medication increased more in the control group than in the intervention group (more changes to insulin and more defined daily dose (DDD) oral medication).

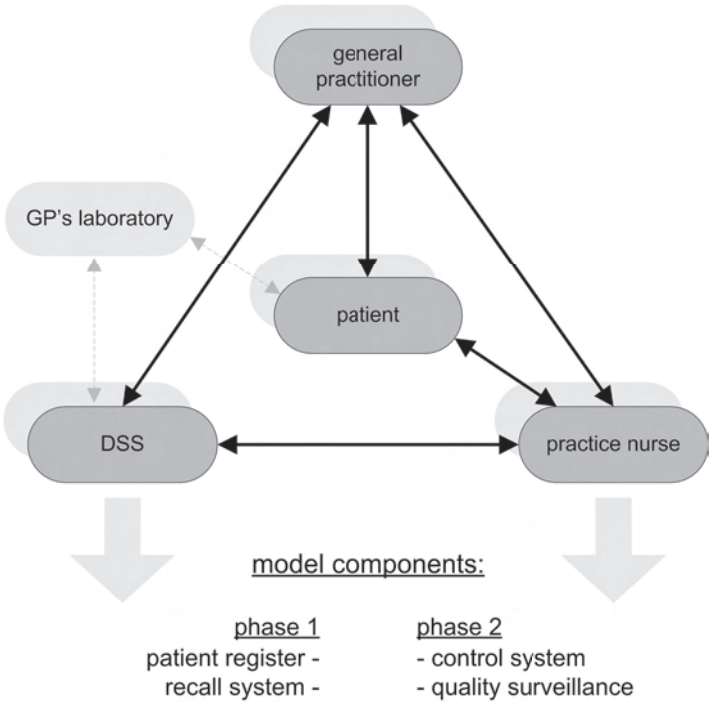
Conclusion

Patient-oriented interventions on top of logistic support have a positive effect on diabetic patient outcomes.

Introduction

Over the past years, a number of interventions to facilitate the care of patients with type 2 diabetes according to the current international guidelines have been tested.[1] Some interventions focus on strengthening the patient's participation (self-management) or the expertise of the professional (varying from advancement of expertise to the development of learning centres). Others focus on the improvement of the organisation (emphasising a systematic supply or allocating the tasks between hospitals and general practices) or they form a combination of two or three of the approaches mentioned above. Until now, there is no consensus about the intervention with the best outcome in terms of care given and the metabolic parameters of the patient. A meta-analysis proved that there was no positive connection between the kind of intervention on the one hand and the care processes and results on the other hand.[2] However, some intervention elements might particularly facilitate the implementation of guidelines, for instance a patient register,[3] an active recall system for monitoring patients (quarterly blood tests and annual check-ups),[4] a control system to discuss the test results with the patient[5,6] and quality surveillance at practice level.[7-11] In the literature we did not find any examples of diabetes management models in which all these elements were integrated. Therefore, we developed one (figure 1). The model is situated in general practice because intensive counselling of diabetics is found to be more cost-effective in that setting and even more important: most of the diabetic patients are adequately cared for in general practice.[12] Besides that, general practice offers great opportunities for integrated care.[13] The most important actors in the model are the general practitioner, the practice nurse and the diabetes support service (DSS). The model was introduced in two phases. First a DSS was set up that offered logistic support which consisted of a patient register with an active recall system. Secondly a practice nurse was appointed for the control system (patient level) and the quality surveillance (practice level).

Figure 1. Actors in primary care model for diabetes



Research after the first phase showed that the DSS had a positive effect on the care processes with regard to monitoring and surveillance of diabetics. The HbA1C of the patients who were called up by the DSS remained unchanged in two years time, while that of the people not called up by the DSS deteriorated. Expansion of the model in the second phase was expected to lead to better surveillance of patients (medication use and lifestyle interventions). This type of surveillance plays an important role in the treatment of diabetes[14,15] and nurses seem to be able to play a key role in this.[16-18] The success of the lifestyle interventions can be read from the degree to which the HbA1C reaches or remains at the target value without adjusting the medication.[19] We performed a study to check if the model would meet these expectations in the second phase. Our research question was: Does combining patient-oriented interventions with centrally organised check-ups have more effect on patient outcomes than centrally organised check-ups alone?

Methods

Design and study population

The effect of the patient-oriented interventions in the diabetes care model was examined in a controlled study with delayed intervention in the control group. With an interval of three years a pre-test and post-test were performed.
The research was carried out among 51 general practices in the south of the Netherlands. These practices started the first phase (delegation of patient register and recall system to DSS) two years before and met the criteria for hiring a practice nurse, that is: using an electronic patient register and having a workstation for the practice nurse.
Not all practice nurses could be appointed at the same time due to limited funds. Therefore, the intervention group (n=23) included practices that were able to appoint a practice nurse in 2002. The practices on the waiting list for appointing a practice nurse formed the control group (n=28). Patients were included if they were called up by the DSS for a periodical laboratory test at the start of the study (beginning of 2002): 431 in the intervention group and 469 in the control group. Data of the patients who died or moved during the research period were not included in the analysis.

The power analysis was based on the assumption that the implementation strategy could lower the HbA1C of type 2 diabetic patients by 0.5 (sd 1.5). The clustering of patients per general practitioner was taken into account. With alpha=5%, power=80%, ICC=0.05,[20] 51 general practitioners with a total number of 390 patients were needed. With an expected dropout of 10% the total amount needed was 429 patients.

Intervention

The intervention consisted of introducing a practice nurse with specific tasks regarding the control system (patient level) and quality surveillance (practice level). She gave information and lifestyle advice at patient level during the quarterly check-ups. She traced risk factors and on the basis of the risk profile found, she set short-term goals together with the patient for lifestyle adjustments or adjusted the medication. At the practice level, the surveillance of the control system (are all patients being followed up?) and its completeness (does every diabetic patient get the care that he needs?) were of importance.

In the control group the DSS support was continued.

Variables and instruments

Data were collected on the results of the check-ups (fasting blood glucose, HbA1C, cholesterol, cholesterol/HDL ratio, triglycerides, blood pressure, body mass index (BMI)), smoking status, physical activity and medication use (insulin versus oral medication, defined daily dose (DDD) equivalents of the oral medication and statins). In addition, a number of general characteristics of the general practices were noted: type of surgery, level of urbanisation of the place where the surgery was situated, size of the practice and number of patients with documented diabetes. As for the patients, age and sex were noted as general characteristics.

The data were obtained from the databases of the DSS and community pharmacists. A validated patient questionnaire[21] was used to measure the smoking status and the physical exercise besides the daily activities on a five-point scale (with 'daily' at one end and '≤ monthly' at the other).

Analysis

Differences in the test results, physical exercise and DDD equivalents between intervention and control groups were assessed with mixed models repeated measures[22] (Proc mixed procedure SAS V8.2). Test results as far as they were categorised (within the target value or not), smoking status and differences in insulin versus oral medication use or statins were assessed with mixed logistic model repeated measures (Glimmix procedure SAS V8.2) over the year prior to the intervention and three years later.
All analyses were corrected for the random/cluster effect caused by patient and general practitioner.

Results

Initially, 53 practices took part in the research; 23 were assigned to the intervention group, 30 to the control group. The data of two control practices were not included in the analyses; in one of the practices a practice nurse was appointed during the research period and another practice was taken over by a different general practitioner. Of the 993 patients who were registered with the DSS at the start of the research, 48 in the control group and 45 in the intervention group left the practice or died. Finally, the data of 51

practices (I=23, C=28) with 900 patients (I=431, C=469) were processed for the research. The patients from the intervention and control group were comparable (Table 1).

Table 1. Characteristics of general practitioners and patients at the start of the study

	Intervention group	Control group
Characteristics of general practitioners		
Number of general practices	23	28
% solo practices	39	42
% urban practices	35	38
Average population size/FTE general practitioner (sd)	2729 (267)	2741 (379)
Average number of diabetic patients/1000 registered per GP	26	29
Patient characteristics		
Number of patients	431	469
Average age (sd)	69 (11.3)	70 (10.7)
% men	45	48

Patient outcomes

The primary outcome indicator, the HbA1C, improved by 0.2% in the intervention group, while it deteriorated by 0.1% in the control group (Table 2). The difference in change was significant. In the intervention group the percentage of patients with HbA1C ≥ 8.5 was halved. Systolic blood pressure values deteriorated in both groups. Diastolic blood pressure values remained unchanged in the intervention group, but deteriorated in the control group. The difference in change was significant. Cholesterol values improved in both groups. The cholesterol/HDL ratio improved significantly more in the intervention group. The BMI deteriorated in both groups with a lower percentage of patients with a BMI < 27 in the final measurement. In both groups the percentage of non-smokers increased. Patients started to exercise more in the intervention group compared with the control group.

Table 2. Outcomes of care

	Intervention		Control		
	Before	After	Before	After	Difference in change between intervention and control group [CI]
Mean fasting blood glucose (sd)	8.0 (2.0)	7.6 (2.0)	8.1 (1.8)	7.9 (2.1)	0.1 [-0.2, 0.4]
Mean HbA1C (sd)	7.3 (1.2)	7.1 (0.9)	7.2 (1.1)	7.3 (1.2)	0.2 [0.05, 0.4]
- percentage < 7%	47	49	45	46	1.0* [0.7, 1.4]
- percentage ≥ 8.5%	13	6	16	14	0.5* [0.3, 0.9]
Mean systolic blood pressure (sd)	149 (22.9)	153 (22.5)	150 (23.3)	155 (24.3)	-0.5 [-4.3, 3.4]
Mean diastolic blood pressure (sd)	84 (12.1)	83 (11.1)	84 (12.5)	86 (12.1)	2.2 [0.2, 4.3]
- % systolic pressure < 150 mmHg	55	45	50	43	0.5* [0.6, 1.3]
- % diastolic pressure < 85 mmHg	54	55	51	41	1.4* [1.0, 2.1]
Mean cholesterol (sd)	5.0 (1.0)	4.7 (0.9)	5.1 (0.9)	4.8 (1.1)	-0.3 [-0.2, 0.1]
Mean cholesterol/HDL ratio (sd)	4.3 (1.3)	3.8 (1.0)	4.3 (1.2)	4.1 (1.2)	0.2 [0.07, 0.4]
Mean triglycerides (sd)	1.8 (1.2)	1.5 (0.9)	1.9 (1.2)	1.6 (0.8)	0.06 [-0.2, 0.08]
- % cholesterol < 5 mmol	47	61	46	58	1.1* [0.8, 1.5]
Mean BMI (sd)	28.7 (4.8)	29.2 (5.0)	28.6 (5.5)	29.7 (4.8)	0.5 [-0.2, 1.2]
- % BMI < 27	40	35	40	32	1.1* [0.7, 1.5]
% non smokers	82	87	82	88	0.9* [0.6, 1.3]
Mean physical exercise (sd)	3.0 (2.2)	2.8 (2.1)	3.0 (2.2)	3.2 (2.5)	0.4 [0.03, 0.8]

* Expressed in odds ratios.

Prescribing

The percentage of patients treated with insulin increased in both groups, but the percentage in the control group increased significantly more (Table

3). Also the prescribed daily dose for oral medication increased in both groups (due to raising the dose of the same medication and/or adding extra medication). That increase did not differ significantly between the two groups. The percentage of patients who were treated with statins doubled in both groups.

Table 3. Medication use

	Intervention		Control		
	Before	After	Before	After	Difference in change between intervention and control group [CI]
% of patients using insulin	11	23	10	34	0.5* [0.3, 0.9]
Mean DDD equivalent oral medication (sd)	1.3 (0.8)	1.8 (0.9)	1.5 (0.9)	2.2 (1.1)	0.2 [-0.04, 0.3]
% of patients using statins	31	63	26	55	1.11 [0.8, 1.4]

* Expressed in odds ratios.

Discussion

Expansion of a model for primary diabetes management was evaluated in this study. The patient-oriented interventions on top of logistic support gave an improvement in the primary outcome measure, the HbA1C. The difference in mean HbA1C of 0.2% was, although significant, modest and clinically not important. However, making analyses on sub-populations we noted that the percentage of patients with an HbA1C ≥ 8.5 was halved. So the patient oriented interventions seem to have especially effect on poorly controlled patients. Patients exercised more after the intervention. Moreover, the percentage of patients who had to be transferred to a treatment with insulin increased significantly less than in the control group. The counselling by the practice nurse, in which she set (short-term) goals together with the patient for lifestyle and medication use, seems to have had a delaying effect on the degenerative process of diabetes. It is difficult to compare the findings with the results of other studies about the influence of lifestyle interventions by practice nurses due to other result parameters, such as relative risk reduction[23] or mortality,[24] or because the results are not yet available.[25]
There are some methodological considerations related to this study. By introducing the two elements (control system and quality surveillance) at the

same time, the influence of each element in isolation cannot be discovered. We did not measure the influence of the quality surveillance by the practice nurse on the control system. Further analyses are needed here.
There is no reason to suppose that the baseline diabetic care given in the intervention practices differs to that of the control practices. In other words, if we could have randomised the study we would not have expected a different outcome. But by only including general practitioners who had already adopted the first phase of the model in both groups (instead of the whole care model versus no model) we might possibly have effected the results. After all, we had already found effects on patient outcomes with only the logistic support in phase 1. Finding even more effects on top of those in phase 2 can only mean that the difference between the entire model (with DSS and practice nurse) and usual care (without DSS and practice nurse) is much greater than we could show in this study.
With this study we conclude that combining patient-oriented interventions by a practice nurse with logistic support by a DSS improves diabetic patient outcome in primary care.

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5

Chronic care model for diabetes in primary care: applicability and feasibility

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Abstract

Introduction

Implementing guidelines for diabetes care in general practices can be improved by several relevant elements: 1/ a patient register, 2/ an active recall system, 3/ a nurse-run clinic, 4/ feedback, and 5/ quality surveillance. We developed a model that integrated these five elements around the triad: general practitioner, practice nurse and diabetes support service (DSS).

For all 1628 patients registered at 23 practices in the service district of the DSS we recorded whether they had been included in the model and if not, for what reason. We examined whether and how the 23 practices had integrated the five elements into their own protocols.

Main quality measures

The percentage of practices that delegated tasks according to the care model and the percentage of patients that had been included in the model.

Intervention

The model was implemented in general practices by supporting custom-made protocols in a standard manner. The practice nurses were prepared for the job during their training.

Effects

All five elements had been implemented systematically except quality surveillance. Of all known diabetic patients, 80% were treated in the general practice; 97% of these patients were included in the model. In 70% of the practices the practice nurse not only carried out the three-monthly consultations (clinic), but even the annual consultations. Of all patients seen by the practice nurse, 93% attended all their appointments.

Lessons learned and follow-up

The diabetes care model is well applicable. The general practitioner delegates tasks to the practice nurse and the DSS as intended. The fact that quality surveillance has not yet been carried out in all practices is likely related to a stepwise implementation of the five elements. It seems just a matter of time before all of them are integrated. The inclusion percentage at the clinic was far higher than figures in other research.

Introduction

In 1999, the Regional General Practitioner Organizations (DHV) were asked to supervise the introduction of the practice nurse into general practice.[1] The DHV South-East Brabant, a region in the south of the Netherlands, prepared for this task by drawing up a plan to reorganise regional diabetes care in general practice. A review of the roles of the different professionals was undertaken and where necessary amendments made so that care could be offered according to the national diabetes guidelines.[2] The aim of the review was to link normal practices to the current agreements about multidisciplinary cooperation. To that end, existing procedures, protocols and cooperation agreements were surveyed. An example of this is an agreement between the DHV, internists, home care and the diabetes support service (DSS) about switching patients to treatment with insulin. The DSS coordinated the switch to insulin that was being carried out by the home care diabetes nurse. Next, all the care providers and organisations involved in the care of diabetics were surveyed: general practitioners, practice assistants, dieticians and home care diabetes nurses, laboratories, DSS, hospital departments and pharmacists. The inventory was incorporated into a survey: what had to be done in every phase of the care model, who would be the best person to do this task and what would the task involve. The tasks, which were to be delegated by the general practitioner, were classified into five groups which formed the pillars of the review process. For each pillar we found indications in the literature that it facilitates the implementation of the guidelines: 1) a patient register,[3] 2) an active recall system for three-monthly blood testing, and the annual blood testing and additional tests,[4] 3) a clinic in which a care provider discusses the results and consequences of the tests with the patient, at least every three months,[5,6] 4) feedback at the practice level[7,8,9] and 5) quality surveillance at the practice level, especially regarding the clinic and the package of interventions offered.[7,10] The tasks would be delegated to the DSS and the practice nurse. The DSS had a larger (namely systematic) role in calling up patients for periodical tests and with that became responsible for the patient register and the recall system. A new task for the DSS was giving feedback about management and quality of care. The practice nurse was made responsible for the clinic and quality surveillance.

With this new division of roles a new chronic care model for diabetes in primary care was created that became functional in 2002. In this article,

we describe the applicability of the model and in particular whether it was successful in admitting patients.

Background

We studied the feasibility and applicability of the primary care model. For this purpose we approached general practitioners who:

- applied for a practice nurse in 2001 and met all the criteria as described in the district plan;[11]
- appointed a practice nurse for diabetes care in 2002;
- had at least two years experience with the DSS;
- had registered at least ten patients with the DSS by 1 January 2002.

We excluded general practitioners who had appointed a practice nurse before 2002.
The study was performed in 23 general practices with a total of 34 general practitioners, 70% of whom were male. The general practitioners were on average 47 years of age, 35% of the studied practices were located in an urban area (>80,000 inhabitants) and 39% worked in solo practices. Altogether the practices had appointed 9 practice nurses diabetes care. All of the 1628 people with documented diabetes mellitus type 2 in these 23 practices were included as patients.

Main quality standards

We investigated whether general practitioners delegated tasks for diabetes care to the practice nurse and the DSS as described in the model. A further aim was to determine how many of the patients with documented diabetes were admitted to the care model.

We used the following data.
Implementation of the model:

- percentage of practices with task delegation according to the protocol for (1) patient register, (2) recall system, (3) clinic, (4) management information and feedback and (5) quality surveillance;

- who performed the corresponding tasks (practice nurse, DSS or general practitioner).

Inclusion of patients:

- percentage of diabetes patients being treated by the general practitioner (end 2004);
- percentage of diabetes patients being treated by the general practitioner who were admitted to the care model (end 2004);
- attendance rate of the patients in the care model in 2004.

Data were collected through documents (protocols), interviews (explanation about the protocols), and registration by the DSS and the general practice (inclusion patients).

To assess whether the implementation of the model was successful, we used the following break points:

- in all the participating practices (100%) the five pillars of the care model were an integrated part of their own protocol;
- at least 90% of the patients being treated by the general practitioner were included in the model; in the literature a dropout rate of 20 to 40% has been described;[12,13]
- at least 90% of the patients attended all planned visits. In previous studies 15 to 35% missed one or more appointments.[14,15]

Intervention

For the implementation of the model a manual[16] was written with instructions for the practices on how draw up their own diabetes protocol. In courses for general practitioners the principles of the care model were discussed. During a running-in period of one year, the practice nurse was trained.

Model

The general practitioner has the end responsibility for diabetes care and can delegate tasks to the DSS and the practice nurse. The division of tasks is described in a protocol for each practice. The DSS supports the general practitioner in the care for diabetes. It manages the patient register and uses an active recall system for the three-monthly and annual blood testing. For that purpose, the DSS collaborates with a primary care laboratory that offers testing centrally and decentralised at general practices and health care centres. At the general practitioner's request, patients are also called up for podotherapeutic screening, fundus photography, and a visit to a dietician and diabetes nurse. If required, the DSS coordinates the switch to insulin. Besides that, the DSS visits the practices on an annual basis to give feedback to the general practitioner and practice nurse. Data (including the completeness of the package of interventions offered) on the diabetes population are presented and are compared with those of the region. The practice nurse's main tasks are running the clinic (patient level) and quality surveillance (practice level). At patient level she takes care of patient education during the three-monthly visits. She monitors the results of blood tests and additional tests, and calls in the general practitioner if there is a reason to do so. A home care diabetes nurse may be called in for insulin-dependent patients. Of importance at the practice level is maintaining quality standards in the clinic (are all diabetes patients being monitored?) and the package of interventions offered (does every diabetes patient get the care that he needs?). The general practitioner sees the patients at the annual consultation. Patients who meet the referral criteria are referred to an internist.

Effects

In the 23 general practices studied, all parts of the model were systematically conducted, except for quality surveillance (in 18 of the 23 practices, see Table 1).

Patient register and recall system

There were two registers for each practice, one at the practice itself and one at the DSS. The practice nurse kept a record of all patients who were diagnosed as diabetics by the general practitioner. She also recorded patients

Table 1: Implementation of parts of the model

Elements of care model	Implemented by (in % practices):		
	PN/DN*	DSS	GP
Patient register of all diagnosed diabetes patients	23 (100%)		
Patient register of called-up patients		23 (100%)	
Called up for the quarterly testing	7 (30%)	16 (70%)	
Called up for the annual testing		23 (100%)	
Three-monthly consultation	23 (100%)		
Annual consultation	16 (70%)		7 (30%)
Feedback		23 (100%)	
Quality surveillance	18 (78%)		

PN = practice nurse
DN = diabetes nurse
DSS = diabetes support service
GP = general practitioner
* the diabetes nurse can be called in for the three-monthly check-ups of insulin users

who were referred to the medical specialist. The DSS had a register of all the people who had to be called up for the three-monthly and/or annual tests. Most general practices (16) had their three-monthly blood tests performed by the primary care laboratory. In seven practices the practice nurses themselves took the blood samples for fasting blood glucose every three months (HbA1C was measured annually); in that case they called up the patients themselves. In those practices the DSS was only asked to call up patients for the annual check-ups.

Nurse-run clinic

In all practices the three-monthly consultation was performed by the practice nurse. She saw the patients who qualified for support according to the general practitioner and who agreed to receive this type of support (for numbers see Inclusion of patients).
In seven practices the annual consultation was performed by the general practitioner, in the other 16 by the practice nurse.

Feedback and quality surveillance.

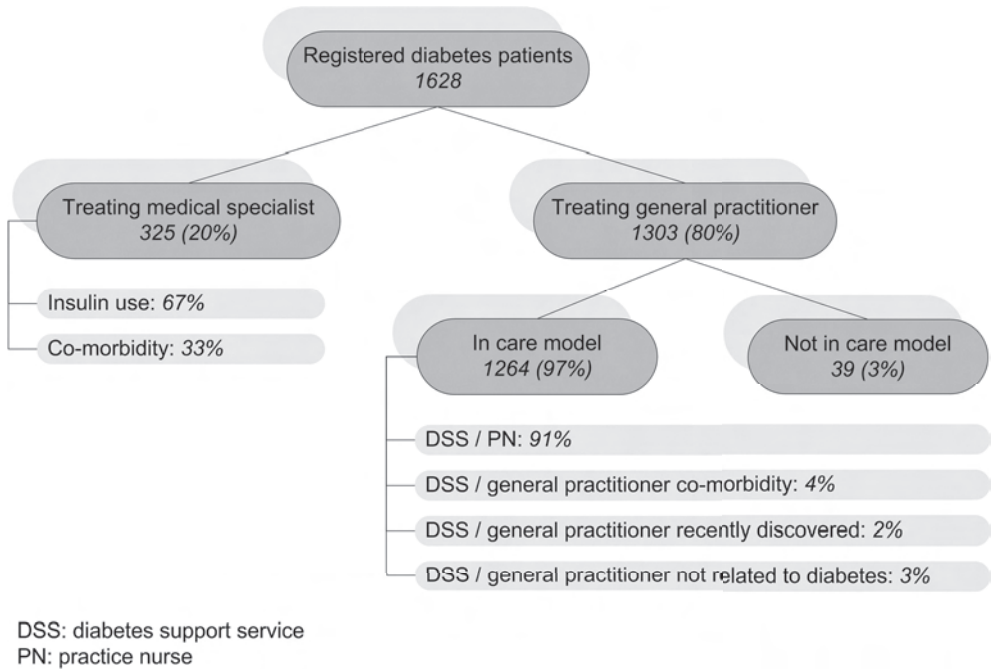
All practices were visited at least once by the consultant from the DSS for feedback data. The feedback contained management information: to what extent do patients undergo check-ups according the guidelines and what are

the average test results in the practice compared with averages in the region? In 18 practices the feedback was used for quality surveillance. That applied to the completeness of the package of interventions offered in the clinic (noting patients who did not undergo all the tests) as well as for recording the area's of attention (for instance, if the average blood pressure of the patients in this practice turns out to be higher than that of the entire region).

Inclusion of patients

Altogether, the 23 general practices had included 1628 known diabetes type 2 patients (prevalence 2.6%) after 18 months. Of these patients, 325 (20%) were being treated by a medical specialist (Figure 1).

Figure 1: Division of patients within and outside the care model



Of the 1303 patients treated in general practice, 97% were included in the care model. On the one hand, this means that the patients were offered care according to the model and on the other hand that the patients accepted the care according to the model. In 91% of patients the practice nurse performed the three-monthly consultations and in 9% the general practitioner performed

all the consultations (equally divided amongst the 23 practices). The general practitioner supported the patients himself in case of co-morbidity but also in cases of old age and mobility problems (thus nondiabetes-related problems). At the time the measuring was carried out, 2% of the patients were still in the diagnostic phase and for that reason had not yet been admitted into the care model.

Thirty-nine patients (3%) qualified for admission to the care model, but did not want periodical check-ups and consultations. Of the 1264 patients in the care model, 93% attended all the appointments.

Lessons learned and follow-up

The primary care model for diabetes seems to be well applicable; the general practitioner delegates the tasks as intended and includes almost all patients according to the model. Patients accept periodical check-ups and consultations to a very large extent according to this model.

The participation in the clinic is very high (97% of the invited patients were included and 93% attended all the appointments). In comparison: in a study in a chronic care clinic, 65% of the invited patients attended.[17]

Monitoring at a population level was a new task in all the 23 general practices. That after 18 months, 18% of the practices were already controlling quality is probably a direct result of the feedback given by the DSS. With those data, it is easy to make a survey of the completeness of the package of interventions offered at the clinic. Based on the regional reference figures, the practice can set quality goals for the following year.

It seems to be only a matter of time before the other five practices start using the feedback in the same way. Not all of the tasks could be taken up at the same time.

The annual consultation is more often performed by a practice nurse than by the general practitioner. The question is whether general practitioners can still retain the end responsibility. However, whether or not general practitioners perform the annual consultation, they all feel that they have not lost control of diabetes care because of task delegation. In consultation with the practice nurse the general practitioner transfers knowledge about the co-morbidity and other complex issues. He also puts the 'human factor' into the care offered from the general practice because he can place the diabetes in the total picture of the patient. In that way, a general practitioner is very well able to

fulfil a directing role, even if the practice nurse has more specific knowledge about diabetes than he does himself.
The care model is meant to optimise primary care for diabetes and does not aim at tracing diabetes or bringing patients from secondary care back to primary care. Still, the influence of the model will possibly extend further than the patients who are already being treated in primary care. Because of the feedback from the DSS the general practitioner becomes aware of diabetes prevalence in his own practice compared with that in the region. If that shows a downward deviation, it might stimulate a more active approach towards identifying diabetes. Because the model provides support for insulin users, an adjustment can be expected in the referral policy of general practitioners who used to refer insulin-dependent patients to a specialist. Insulin use only is not a referral criterion in the model.
The elements patient register, recall system, clinic, feedback and quality surveillance at practice level appear to fit well into one model. With that, we seem to have a very promising model that gives general practices the opportunity to meet the guidelines, thus fitting into a modern setting.[18]
Further studies are needed to show the effects on the state of health of the diabetes patients included in the model.

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6

Chronic care model for COPD in primary care: applicability and feasibility

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Abstract

Aims

To investigate the applicability of a primary care model to improve the management of COPD.

Methods

An intervention study among 22 general practices, 11 practice nurses, a COPD support service (CSS) and all 1497 patients of theses practices with documented COPD.

Measures

Delegation of tasks to the CSS and practice nurse and performance in daily practice according to the model components (patient register with recall system, periodical history taking and lung function measurements, diagnostic and therapeutic advice, periodical visits with education and counselling).

Results

In the 22 general practices all components of the model were systematically performed, with the exception of asking for diagnostic and therapeutic advice (in 10 practices only). Of all the 1497 patients, 374 (25%) were checked and treated by a chest physician. Of the patients treated in general practice 88% were included in the care model, 12% refused periodical check-ups.

Conclusion

The primary care model for COPD proved to be very applicable; the general practitioner delegated the tasks appropriately and included almost all the patients in the control system according to the model. Most of the patients accepted check-ups according to this model.

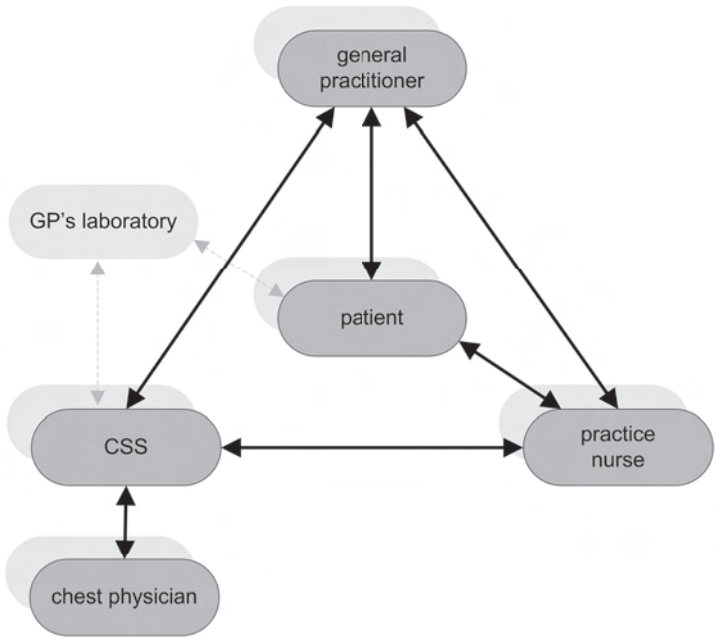
Introduction

Just as diabetes and depression, COPD belongs to the chronic diseases with a broad spectrum of severity, with a large majority of the patients on the less serious side. The care for this large group of patients can best be provided in primary care, at least seen from the perspective of continuity, comprehensiveness and coordination.[1] For that purpose, internationally accepted guidelines have been developed and distributed.[2,3] It is recommended to use lung function measurement in diagnosing and monitoring, to check health status and symptoms and if necessary, to adjust the medication. Furthermore, education should be used to help patients take over the daily management of their disease.

For the care in general practices to meet the guidelines, a number of facilities are required which are often lacking in usual care practices.[4-14] These are (1) decision support (2) registries and reminder systems to ensure active follow-up and (3) patient education and self-management support. Decision support means introducing specialist expertise for consultation in diagnosis and treatment.[15] A register is a list of all patients with a specific chronic disorder from which the care needed can be planned per patient. An active recall system spots non-attendees, so steps can be taken.[16] Self-management education is given to increase self-efficacy for improving clinical outcomes.[17] The three facilities mentioned all need a different type of expertise. Decision support has to be given by a medical expert, while registries for follow-up and patient self-management education include major roles for non-physicians.[18-21] We have developed a care model that integrates these different facilities with specific expertise (Figure 1). Part of the model was a COPD support service (CSS), which offers logistic support to the general practice by means of managing the patient register and a recall system for periodic history taking and lung function measurement. The CSS also forms the link with the specialist expertise. A number of chest physicians from the regional hospitals provide decision support by evaluating the lung function measurements and case history reports offered by CSS. A practice nurse to whom general practitioners can delegate patient education and counselling tasks is an integral part of the model. The implications of this model are twofold. On the one hand, it aims to help general practitioners to provide care according to the guidelines. On the other hand, it needs to be accessible and attractive to patients so that they will participate. Periodical contact appears to have a positive effect on long-term patient outcomes and quality of life.[22,23] In

this study the applicability and feasibility of the model in daily practice were tested.

Figure 1. Actors primary care model for COPD



Methods

Study population

The study evaluates the two-year implementation of a primary care disease management model in 22 practices (29 general practitioners). In a one-year run-in period practice nurses were trained and the CSS was organised. General practitioners qualified for the care model if they met the demands: a working space for the practice nurse and the use of an electronic medical register. After 18 months, the 22 practices had appointed 11 practice nurses with 2.1 FTE/1000 COPD patients.
All patients with documented COPD in these 22 practices were included in the study.

Model

The model[24] assumes that the care of COPD patients is carried out according to the national guidelines for general practitioners and agreements between general practitioners and chest physicians for COPD.[25,26] The general practitioner can delegate tasks but retains the end responsibility for the delivered care. To that purpose, every general practice will make a protocol in which the division of roles is described. Important actors (Figure 1) to whom the general practitioner delegates care tasks in this model are the practice nurse and the CSS. The latter is a facilitary service, connected to the regional primary care laboratory with a specialised lung nurse and some administrative employees. The laboratory takes care of lung function measurements, at its own location or in an external office. The latter can be the primary care office where the lung function measurement is delegated to the practice nurse. A written case history report is made for each lung function measurement. The CSS takes care of the reports for the diagnostic and therapeutic advice. This is given by the chest physicians from the adherent hospitals connected to the CSS and is based on the written case history report and lung function measurement. The CSS also maintains a patient register and employs a patient recall system for patients eligible for a periodical case history report and lung function measurement. The patient visits the general practice (general practitioner or practice nurse) on a yearly basis to discuss the outcome of the test and to establish whether the medication is still adequate. The practice nurse's most important tasks are education and counselling. Patients who meet the referral criteria will be referred to a chest physician for further diagnosis or treatment

Measures and data collecting

Data collecting took place 18 months after the general practice started to implement its own protocol. The following data were used to answer the research questions:

- implementation of the model: percentage of practices with (1) patient register and recall system and/or (2) periodical case history report and lung function measurements and/or (3) diagnostic and therapeutic advice and/or (4) periodical visits and/or (5) advice and counselling according to protocol;

- degree of inclusion in the care model: percentage of COPD patients treated by the general practitioner who were included in the care model.

Data were collected through documents (protocols), interviews (explanation to the protocols), CSS registration and general practice (inclusion patients). The following targets were set as criteria for success:

- in all the participating practices (100%) the five elements of the care model are part of the own protocol;
- at least 65% of the patients treated by the general practitioner are included in the model; this level was chosen because a drop-out of 40 to 60% is described in the literature in patients attending asthma care programs.[27,28]

Analysis

The data about the usage of the model and the inclusion of patients were processed in frequencies, percentages and averages.

Results

The study was performed amongst 22 practices with a total number of 29 general practitioners, of whom 76% were male (Table 1). At the start of the study, the average age of the general practitioners was 46 years; 38% of the study practices were located in an urban area (>80,000 inhabitants) and 32% were solo practices (with one general practitioner at the practice location).

Implementation of the model

In the 22 participating general practices all components of the model were systematically performed, with the exception of asking for diagnostic and therapeutic advice (in 10 practices, see Table 2).

Table 1. Characteristics of practices at baseline		
Number of practices	22	
Number of general practitioners	29	
% urban practice (>80.000 inhabitants)	38	
% single handed practices	27	
Mean population / FTE (sd)	2519	(346)
% practices with active recall system	0	

A double patient register existed for each practice. The practice nurse kept a list of all the patients with documented COPD; the CSS had their own register of patients who had to be called for a check-up. In seven practices the laboratory performed the periodical history taking and lung function measurement, 15 practices performed these tests on their own.
In all the practices the practice nurse set up a COPD clinic. In those sessions she integrated periodical visits (discussing test results and medication counselling) with education and counselling. She discussed the test results with the general practitioners before discussing them with the patient.
The patient was only seen by the general practitioner in case of special circumstances or symptoms.

Table 2. Model components implemented

	Caretaker (in n practices):			
	PN	CSS/CP	LAB	Total
Patient register with all the diagnosed patients	22			22
Patient register for recall system	13	9		22
Periodical anamnesis and spirometric test	15		7	22
Diagnostic and therapeutic advice		10		10
Periodical check-up	22			22
Self-management education	22			22

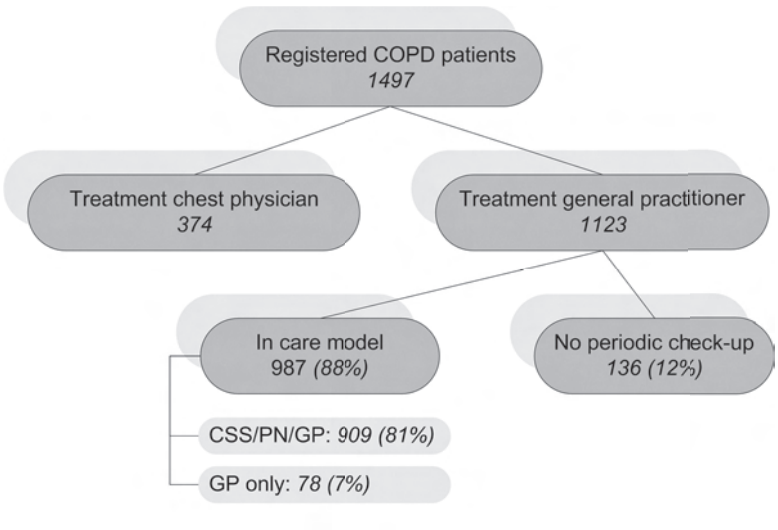
PN = practice nurse
CP = chest physician
CSS = COPD support service
LAB = laboratory

Degree of inclusion in the care model

Altogether, the 22 general practices saw a total of 1497 patients with documented COPD in the first 18 months of the study (prevalence 2.4%). Of these patients 374 were referred to the chest physician, which leaves 1123 patients under the control of the general practices (Figure 2).
Prior to the intervention non of the practices had an active monitoring system. Eighteen months later 81% of the 1123 patients were included in the care model with periodic lung function measurement followed by a discussion on the results with the practice nurse, who also provided information and

education. Of the patients seen by the general practitioner only 40 did not need periodic monitoring, according to the general practitioner; 23 had co-morbidity, and in 15 patients the diagnosis had not been confirmed. Altogether, 136 patients eligible for admission to the care model refused periodic monitoring.

Figure 2. Division of patients in and outside care model



CSS: COPD support service
PN: practice nurse
GP: general practitioner

Discussion

The primary care model for COPD appeared to be very applicable; the general practitioner delegated the tasks appropriately and included almost all the patients into the control system according to the model. Patients accepted the frequent check-ups according to this model. The prevalence of COPD in the study group was 23.6 which corresponds to the annual prevalence (per 1000) among the Dutch population (20.7) calculated from nine different general practitioners registries.[29] The distribution of the care between general practitioner and medical specialist, 75 versus 25%, is difficult to compare with the Dutch situation. In 2003, 78% of COPD patients visited the chest physician, but we do not know of they were treated in shared care.[30]

The findings are difficult to compare with other study results because we could not find a similar care model in the literature. Studies on the use of a practice nurse are nearly always focussed on the effects on patient outcome parameters such as lung function, use of medication, symptoms and quality of life, and not on participation in planned care. However, we can compare our study with a programme which was aimed at implementing the guidelines into the practice; 23% of the patients dropped out within one year.[31] In comparison, the participation of patients in our care model is enormous; only 136 (12%) of the eligible patients were not guided within the care model because they refused to take part.

With the introduction of the model in the participating practices, patient registration was, for the first time, set up on the basis of clear (repeat) diagnostics. That in itself should be seen as an enormous improvement in quality. The model provides insight into the prevalence figures for each practice and forms the basis for further monitoring of the patient with COPD. For the first time patients are being monitored systematically and supported. The elements patient register with recall system, periodical anamnesis and lung function test, diagnostic and therapeutic advice, periodical visits with information and counselling appear to fit very well into one model. It appears to be a promising model that offers the general practices the opportunity to follow the guidelines, which fits into a modern setting.[32] Especially the opportunity to educate COPD patients is very promising. Further research is needed to study the influence of the improvements in this COPD disease management model as a whole as well as parts of it, such as education, on the state of health of the COPD patients included in the model.

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7

Effect of an integrated primary care model on the management of middle-aged and old patients with obstructive lung diseases

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Abstract

Objective

To investigate the effect of a primary care model for COPD on process of care and patient outcome.

Design

Controlled study with delayed intervention in control group.

Setting

The GP delegates tasks to a COPD support service (CSS) and a practice nurse. The CSS offers logistic support to the practice through a patient register and recall system for annual history-taking and lung function measurement. It also forms the link with the chest physician for diagnostic and therapeutic advice. The practice nurse's most important tasks are education and counselling.

Subjects

44 practices (n=22 for intervention and n=22 for control group) and 260 of their patients ≥40 years with obstructive lung diseases.

Results

The percentage of patients reporting planned visits increased from 16 to 44% (p=0.014) and for annual lung function measurement from 17 to 67% (p=0.001). Compared with control more, but not statistically significant smokers received periodical advice to quit smoking (p=0.16). At baseline 41% of the intervention group were using their inhalers correctly and this increased to 54% after two years; it decreased in the control group (p=0.002). The percentage of patients without exacerbation in the previous three months rose from 79 to 81% in the intervention group; it decreased, with a difference in change not statistically significant, in the controls (p=0.24). The percentage of the intervention group not needing emergency medication rose from 79 to 84% but decreased in the controls (p=0.08).

Conclusion

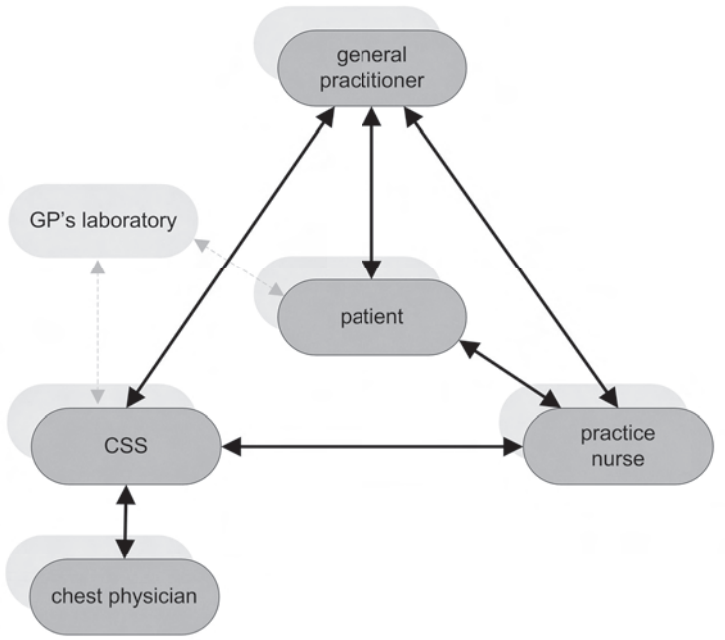
Combining different disciplines in one model has a positive effect on compliance with recommendations for monitoring patients, and improves the care process and some patient outcomes.

Introduction

By far the majority of patients with COPD are treated in general practice. To that end, international and national guidelines have been developed.[1-4] Recommendations include using lung function measurement in diagnostics and monitoring, checking symptoms periodically and if necessary adjusting medication, and educating patients to take responsibility for the daily management of their disease. However, care is often still not being given according to the guidelines.[5,6] Especially lung function measurements,[7] periodical check-ups[8] and supervision of inhalation techniques[9] have proved to be difficult. To implement guidelines, care must meet stringent requirements and should involve various disciplines, from non-medical staff to medical specialists. This means new disciplines are needed in general practice and/or specific disciplines outside general practice should be called in for task delegation and consultation.[10] Various interventions have been tested over the last few years. It appears that a recall system can be successfully organised on a scale that goes beyond the individual general practice and can be run by someone without a medical background.[11] Nurses can fulfil a key role in clinics by providing patient education and counselling.[12-15] According to Bodenheimer et al.[16] the possibility of consultation by a specialist without a full referral contributes essentially to the care of people with a chronic disease.

We have developed a care model that fits into such an approach to chronic disease management, one in which various disciplines (general practitioner (GP), practice nurse, logistic COPD support service (CSS) and chest physician, see Figure 1) are integrated. The GP can delegate tasks to the nurse and the CSS. The chest physician can support the diagnostic and therapeutic decision-making without actually seeing the patient. We assumed that the management of chronic obstructive lung diseases could be improved by the introduction of this model. The model was focused on the ≥40 age group with chronic obstructive lung diseases covering asthma as well as COPD as the difference between COPD and asthma is not always clearly established in the primary care population. We performed a study to test the effects of the care model for COPD and/or asthma on the process of care and on patient outcomes.

Figure 1. Actors primary care model for COPD



Material and Methods

Design and study population

The effect of the care model on COPD and/or asthma was examined in a controlled study with delayed intervention in the control group. With an interval of two years, pre-test and post-test measurements were performed. The care model was introduced in a region in the south of the Netherlands in 2002 with a running-in period of over a year. During that period the practice nurses were trained and the CSS (a logistic support service, linked to the regional primary care laboratory with a specialised lung nurse and some administrative staff) was set up. GPs qualified for a practice nurse if they had working space for a nurse and an electronic patient register. Due to limited funding, not all interested practices could start at the same time. Based on regional distribution criteria (division between sub regions and between urban – rural) the first cohort of practices was selected to start with the care model in 2002. These practices formed the intervention group (n=22); the

practices on the waiting list formed the control group (n=22). By October 2003, 11 practice nurses had been appointed. Before the nurse started, a random sample of patients per practice was drawn: patients ≥40 years with a documented lung condition and using inhalation medicines (137 in the intervention group and 123 in the control group).

Intervention

In each practice, the nurse (without knowing who had been selected in the random sample) made a survey of all patients ≥40 years with chronic lung obstruction on the basis of diagnostic data and medication use. The CSS called up all these patients for extensive history-taking and lung function measurement. The results were sent to a chest physician for assessment, diagnosis (or confirming or adjusting an earlier diagnosis) and advice about treatment. The CSS maintained a register of patients qualifying for annual history-taking and lung function measurement. Patients visited their GP to discuss the results and determine whether the medication was still adequate. They also visited the practice nurse who checked their inhalation technique, and gave education and counselling (smoking cessation). Patients who, according to the GP, met the criteria for referral were referred to the chest physician.
In the control group the patients received usual care, which generally meant that they were only seen when they consulted the GP about their symptoms.

Variables and instruments

To study whether patients received care according to the guidelines, we collected data on planned consultations, periodical lung function measurements and smoking cessation advice. To measure the effect of the care model on patient outcomes, we collected data on smoking status, inhalation technique, exacerbations and emergency medication. Furthermore, some general characteristics from GPs and patients were noted.

More in detail:

- process of care: contact with the general practice (when symptoms deteriorated /or at fixed moments); periodical lung function measurements (no/yes, in the surgery/yes, by the laboratory); smoking cessation advice (yes/no);

- smoking habits were assessed by asking patients about current smoking behaviour (yes/no);
- the inhalation technique was checked with inhalation-specific checklists from the Netherlands Asthma Foundation (Table 1);
- exacerbations were assessed by asking the patient about the duration of symptoms or changes in phlegm, cough, dyspnoea, wheezing and bronchodilator use in the past three months. An exacerbation was defined as an episode of >3 days with >3 of the above-mentioned 5 items;
- emergency medication: prescriptions for systemic corticosteroids (Anatomic Therapeutic Chemical Classification System (ATC) code A07EA);
- general characteristics of the general practice: number of GPs per location, degree of urbanisation (more or less than 80,000 inhabitants), size of practice (number of registered patients), number of active shifts per GP; number of patients with documented asthma/COPD at baseline, active recall system offering planned care (yes/no);
- general characteristics of the patients: age, gender. To assess the seriousness of the symptoms we used the MRC dyspnoea scale,[17] which comprises five statements: 1 = breathless only on strenuous exercise; 2 = short of breath when hurrying on the level or going up a slight hill; 3 = walking slower than their peers on the level because of breathlessness or having to stop for breath when walking at own pace on the level; 4 = stopping for breath after walking 100 meters or after a few minutes on the level; 5 = too breathless to leave the house.

All data were collected by means of questionnaires for the GP and the patients,[18] except inhalation technique and emergency medication. Inhalation technique was checked pre-test and post-test by the same laboratory assistant. Data about emergency medication were obtained from community pharmacists.

Power calculation

As primary outcome variable we choose the correct use of the inhaler because it has been shown that non-physicians can play an important role in this

aspect of care.[19] An earlier study showed that 60% of COPD patients used their inhalers correctly.[20] With the intervention, we expected an increase of 20%. Based on an alpha of 5% and a beta of 80% a random sample survey of 39 general practices with 5 patients each was needed (195 patients), taking into account clustering of patients per GP. With an expected dropout of 10%, the total number of patients needed was 215.

Analysis

Differences between the intervention and control group were tested with mixed logic model repeated measures (Glimmix procedure SAS V8.2). In all tests, corrections were made for the random/cluster effect caused by patient and GP.

Table 1. Inhalation checklist

Inhaler	
►	Shake inhaler well and remove protective cap
	Hold inhaler with opening underneath
►	Breath out
►	Place mouthpiece between teeth and seal lips around it
►	Push down top of inhaler and breath in slowly and deeply at the same time
	Take inhaler out of the mouth and hold breath to count of 5-10
	Rinse mouth after using corticosteroids
	Clean inhaler 1x a week

Inhaler with spacer	
►	Shake inhaler well and remove protective cap
	Put inhaler in spacer opening
►	Put mask over nose and mouth
	Place mouthpiece between teeth and seal lips around it
►	Press inhaler
►	Breath in and out gently, adults 3-5 times, children and very breathless patients 5-10 times, depending on the volume of the spacer
	Clean inhaler 1x a week

Ingelheim inhaler	
	Open mouthpiece
►	Put capsule in the opening and shut mouthpiece
►	Hold inhaler with mouthpiece at the top and press white release button with thumb x1
►	Inhale

Turbuhaler	
	Remove white protective cap
►	Hold Turbuhaler upright and twist blue or brown base to the right
►	Turn back until click
►	Inhale

Discus	
	Put thumb on thumbgrip and push your thumb away from you until Discus clicks
►	Slide lever away from you until Discus clicks (just before use!)
►	Inhale
	Close Discus by turning thumbgrip back (click)
	The window indicates the remaining number of inhalations

Diskhaler	
	Remove cover
	Pull the cartridge out using both hands
	Push cartridge back in
►	Raise lid as far as it will go to pierce both sides
	Close lid again
►	Inhale
	To replace medication disk press the ridges on both sides and remove cartridge. Replace medication disc and slide cartridge back in

► = essential in evaluation

Results

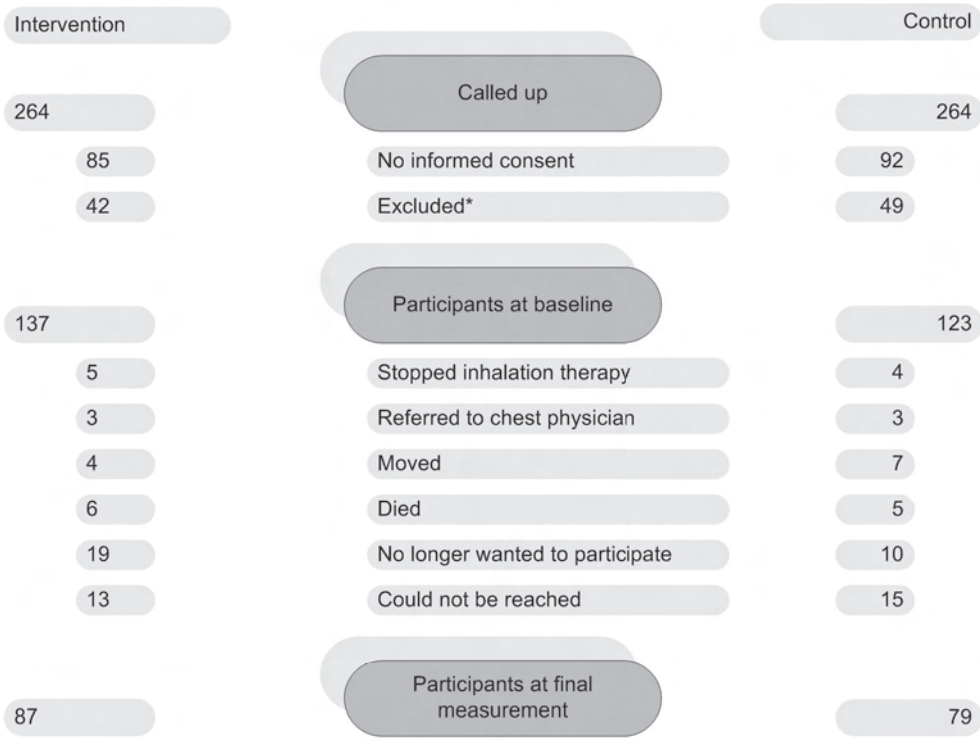
The 44 general practices approached were all included; there were no dropouts. At baseline the practices in the control group were comparable with those in the intervention group regarding number of GPs, population size and average number of asthma/COPD patients (Table 2). None of the practices had an active recall system offering planned care to COPD and/or asthma patients. The intervention practices were more often located in a city (>80,000 inhabitants) and were less often single-handed than the controls. Data of 260 patients were collected at baseline. The intervention group was comparable with the controls regarding age, gender and dyspnoea score (Table 2). During the intervention 94 patients (37% of the intervention and 36% of the control group) dropped out (stopped inhalation therapy, moved, died, were referred to a chest physician, or no longer wanted to participate, Figure 2), resulting in 87 in the intervention and 79 in the control group for the final measurement. Analysis showed that patients who dropped out did not differ in gender, age and dyspnoea score from patients who underwent a second measurement. That is why we included all the patients in the effect measurement (with more patients in the pre-test than in the post-test).

Table 2. Characteristics of practices and patients

	Intervention group	Control group
Characteristics of practices		
Number of practices	22	22
Number of general practitioners	29	28
Urban practice (>80,000 inhabitants) (%)	38	27
Single-handed practices (%)	27	52
Mean population/FTE (sd)	2519 (346)	2746 (414)
Mean number of asthma/COPD patients/1000 patients (sd)*	47 (25)	51 (19)
Practices with active recall system (%)	0	0
Characteristics of patients in sample		
Number of patients	137	123
Mean age (sd)	59 (12)	58 (10)
Males (%)	42	48
Dyspnoea score 1 or 2 (%)	62	61

* 12 intervention practices and 11 control practices could not supply these data.

Figure 2. Patient flow



*treated by chest physician/no longer inhalation therapy

Process of care

After two years of intervention, the percentage of patients included in planned care at the general practice rose from 16 to 44% (Table 3). The difference in change compared with the control group is statistically significant. The percentage undergoing periodical lung function measurements rose from 17 to 67% (to 75% if only patients involved in planned care are counted). All smokers were periodically advised to quit.

Table 3. Effect model on process of care and patient outcome

	Intervention		Control		
	Before	After	Before	After	Difference in change between intervention and control group Odds [CI]
Process of care					
Planned visits (% patients)	16	44	19	25	1.08 [1.2, 6.9]
Periodical lung function measurement (% patients)	17	67	11	18	5.54 [1.9, 16.2]
Periodical smoking cessation advice (% smokers)	60	100	61	58	17.41 [0.3, 971.4]
Patient outcome					
Non-smokers (% patients)	70	81	70	74	1.03 [0.5, 1.8]
Correct inhalation technique (% patients)	41	54	47	29	3.68 [1.5, 8.5]
No exacerbation in 3 months (% patients)	79	81	77	69	1.75 [0.7, 5.0]
No emergency medication in 12 months (% patients)	79	84	81	76	1.96 [0.8, 5.0]

Patient outcomes

The percentage of non-smokers rose 11% in the intervention and 4% in the control group; the difference in change was not statistically significant. Regarding inhalation technique, the percentage of patients handling their inhalers correctly rose from 41 to 54% in the intervention group while it decreased in the control group from 47 to 29%. The percentage of patients without exacerbation in the previous three months rose from 79 to 81% in the intervention group; it decreased in the controls from 77 to 69%. The difference in change was not statistically significant.

We also noticed a difference in change regarding emergency medication. The percentage of patients not needing emergency medication rose from 79 to 84% in the intervention group, while it decreased in the control group; this difference was not statistically significant.

Discussion

A model for integrated primary COPD and/or asthma management was evaluated in this study.

The model proved to have a positive effect on planned care and periodical lung function measurement. A positive effect on patient outcomes was also found. The percentage of patients who used their inhalers correctly rose. But the gain in preventing deterioration was even greater, as seen in the control group where the inhalation technique was not checked periodically (we hypothesised that if you assess inhalation technique at a random moment in a cross-sectional population, you also include people who have recently started on medication and have received instructions on how to use the inhaler and have a good technique. If you follow that same population, few people appear to retain the good technique). The data of patients in our study correspond to those of another Dutch study GPs (70% with a dyspnoea score ≤2).[21] At baseline we found fewer patients with a correct inhalation technique than in a comparable study among a Dutch population (45% vs. 72% with the correct technique). The high score there may have been due to extra attention to inhalation technique in a previous study by the same researchers, as they suggest themselves.[22] The difference between the intervention and control group in our study may be substantial, but still half of all users do not handle their inhalers correctly, meaning it is unclear whether they inhale the correct dose of medication. Further studies are thus needed to find out whether this can be improved by shortening the intervals between inhaler checks. For example, a check at every prescription renewal, because research shows that mistakes occur shortly after the instructions are given, arguing in favour of short cyclic check.[23]

Patient recognition of exacerbations and prompt treatment improves exacerbation recovery, reduces risks of hospitalisation and is associated with a better health-related quality of life.[24] From this perspective, the question is whether we should have expected less or maybe even more emergency drug use as positive effect of the care model. The decrease we found is not significantly different from the control group, but we believe it is a positive effect because we also saw a decrease in self-reported exacerbations.

The number of patients willing to take part in the study was relatively low (intervention: 68%, control group: 65%) and the dropout rate was very high. This can be considered a weakness of the study (for data collection patients had to visit a laboratory twice to check the inhalation technique and fill in

the questionnaire) but not a weakness of the care model. In fact 88% of all patients being treated by the GP were included in the care model.[25]
Although the number of patients with both measurements was lower than the calculated number needed in the power analyses, we do not think that our study is under-powered. In the repeated measurement analysis (PROC MIXED, SAS) all patients are included. This means that data of patients with only one measurement were also analysed.
We did not study the cost-effectiveness of the model, but we would like to make a few points here. A great deal of the efforts (and thus also the costs) in the intervention group were put into surveying the target group. These efforts will always be needed if the GP is going to provide planned care for patients with asthma or COPD, and therefore should not be accounted to this specific model. The same applies to setting up the call-up system. On the other hand, paper consultations by chest physicians are model-specific. Consultation in this way is cheap, has proved to be valid[26] and increases the number of patients who can be treated in primary care.
We conclude that this study has shown that combining various disciplines in an integrated model as described here improves care processes and patient outcomes in primary care for COPD and/or asthma. The care model is especially interesting in those settings in which chronic disease management is general practice based.

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8

General discussion

The aim of this thesis was to determine the feasibility of a chronic care model for primary care and its effect on guideline-based care provision and on patient outcomes. The model has been tested for diabetes and COPD care in different studies. This chapter summarises the main findings from the individual studies. General conclusions are drawn with regard to methodological aspects. The implications of this research for policy and practice as well as recommendations for further research are described at the end of this chapter.

Main results and conclusions

Against the background of an increasing burden of chronic diseases on today's healthcare systems and the specific needs of chronically ill patients, reorganisation of practice systems and provider roles in primary care is considered important.[1-3]
We evaluated a chronic care model for primary care in which general practitioners delegate tasks to two new providers: a facilitating support service and a practice nurse. Essential parts of the model are decision support including guidelines for performing the care, task delegation by the general practitioner, the organisation of a recall system, decentralised provision of tests, supplying the general practice with management information and feedback and a nurse-run clinic.
We concluded that the model is feasible for diabetes care as well as for COPD care, although the different parts were not of equal importance for each condition. For example, decentralised provision of tests is much more important for diabetes than for COPD, while decision support by 'paper' consultation (advice by a medical specialist without actually seeing the patient) is important for COPD and less for diabetes. Concerning the chronic care model for diabetes and COPD that has been implemented in a region in the south of the Netherlands we concluded that redesign of primary care delivery according to this model was associated with improvements in the management of care and patient outcomes.

Organisational interventions in asthma and COPD care

A review was performed to identify effective organisational intervention strategies to improve the management of patients with asthma or COPD in primary care. Of all possible organisational interventions (Wensing et

al.[4] described five different types) we found examples of only two types of organisational interventions, revision of professional roles (nurse-run clinics) and knowledge management (computerised guidelines). In the revision of professional roles category we also expected to find studies on spirometry, because much has been written about the need[5-7] and feasibility[8-10] of implementation of spirometry in general practice. However, no eligible articles were found on effects of diagnostic or monitoring support. Although there are experiments,[11] we assume that no RCTs have been performed or published yet. Besides, we expected studies about an active recall system since it has been shown to have a positive effect on diabetes management.[12,13] According to Bodenheimer et al.[14] the possibility of consultation by a specialist without a full referral contributes essentially to the care of people with a chronic disease. That is why we were interested to find examples of organising this type of decision support, but no such articles were identified.

Chronic care model for diabetes in primary care

The study of the chronic care model for diabetes in primary care was set up in two phases. In the first phase a Diabetes Support Service (DSS) was introduced and evaluated. In the second phase logistic support was combined with patient-oriented interventions by a practice nurse (discussing test results, lifestyle advice and counselling, and adjusting medication).
The chronic care model for diabetes appeared to be feasible; the GP delegated logistic tasks according to the model to the DSS and patient-oriented tasks to the practice nurse. Almost all eligible patients were included in the model. A large majority of patients accepted periodic check-ups and planned visits according to the model. Simple logistic support by a DSS without taking over patient care improved adherence to general practice guidelines for diabetes care. The recall system produced an increase in the number of patients who, in accordance with the guidelines, underwent four check-ups a year. Also the content of check-ups was more in line with the guidelines than for patients not supported by the DSS.
Logistic support by a DSS resulted in modest but significant improvement or less deterioration in mean levels of HbA1c, systolic blood pressure, cholesterol and triglycerides, but not in diastolic blood pressure and cholesterol/HDL ratio. The rise in mean HbA1c levels in the control group was similar to the UKPDS trends in HbA1c levels.[15] After two years of support by the DSS the majority of tests proved to be carried out in 100% of the patients, which demonstrates the high level of willingness among patients to respond to the recall by a

DSS. This is in line with the high level of participation among diabetic patients who are offered well-structured care from the general practice setting that is reported in the literature.[16,17] On the other hand, improvement in the blood glucose and blood pressure control of patients was less convincing than interventions described in the literature that focused on both the organisation and the general practitioner.[18,19] The UKPDS showed that intensive blood pressure control in diabetic patients might be even more important than blood glucose control,[20] but target levels of the latest guidelines (140/85 mmHg) were not reached in our system.

Expansion of the model by patient-oriented interventions by a practice nurse resulted in further improvement in the HbA1c. The percentage of patients with an HbA1c ≥8.5 decreased in particular (from 13 to 6). No further improvement in blood pressure was, however, reached.

Patients exercised more after the intervention. Moreover, the percentage of patients who had to be transferred to a treatment with insulin increased significantly less than in the control group. The counselling by the practice nurse, in which she set (short-term) goals together with the patient for lifestyle and medication use, seems to have had a delaying effect on the degenerative process of diabetes. It is difficult to compare the findings with the results of other studies about the influence of lifestyle interventions by practice nurses due to other result parameters, such as relative risk reduction[21] or mortality,[22] or because the results are not yet available.[23]

Chronic care model for COPD in primary care

We evaluated a chronic care model for COPD in primary care that integrated GP care, logistic support by a COPD support service (CSS), decision support by a chest physician, and patient-oriented interventions by a practice nurse. The chronic care model for COPD appeared to be feasible; the general practitioner delegated logistic tasks according to the model to the CSS and patient-oriented tasks to the practice nurse. Almost all eligible patients were included in the model. The findings are difficult to compare with the results from other studies because a similar care model is missing in the current literature. Studies on the use of a practice nurse are nearly always focussed on the effects on patient outcome parameters such as lung function, use of medication, symptoms and quality of life, and not on participation in planned care. However, we can compare our study with a programme which was aimed at implementing COPD guidelines into the practice; 23% of the patients dropped out within one year.[24] In comparison, the participation of patients

in our care model proved to be enormous; only 136 (12%) of the eligible patients were not followed up within the care model because they refused to take part.
With the introduction of the model in the participating practices, patient registration was, for the first time, set up on the basis of clear (repeated) diagnostics. That in itself is to be seen as a substantial improvement in quality. The model provides insight into the prevalence figures for each practice and forms the basis for further monitoring of the patients with COPD. For the first time patients are being monitored and supported systematically. Specific components such as a patient register with recall system, regular history taking and lung function testing, requesting diagnostic and therapeutic advice, and regular visits with information provision and counselling appeared to fit very well into one model. The model equips the general practices with facilities to meet (inter)national guidelines. The barriers to organising planned visits and periodic lung function measurement could thus be removed.
Our conclusion is that we have developed a promising chronic care model that offers the general practices the opportunity to follow evidence-based guidelines in a modern care delivery context.[25]
The model proved to have a positive effect on the provision of planned care and performing periodical lung function measurement. A positive effect on patient outcomes was also found. The percentage of patients who handled their inhalers correctly rose. But the gain was even greater in preventing deterioration, as was seen in the control group where the inhalation technique was not checked periodically. At baseline we found fewer patients with a correct inhalation technique than in a comparable study among a Dutch population (45% vs. 72% with the correct technique).The high score in the other study may have been connected with extra attention for inhalation technique from a previous study by the same researchers, as they suggest themselves.[26] Although the difference between the intervention and control group in our study was substantial, still half of all patients did not use their inhalers correctly. So, there is still a lot to improve as far as these skills are concerned.

Methodological considerations

Study design

The study on the effectiveness of a primary care model for diabetes type 2 and COPD was designed as a controlled before-after study with delayed intervention in the control group. Randomised controlled trials (RCT) are often considered the ´gold standard´ for studies on the effectiveness of interventions because they are the best way of defining causality. In our study general practices were not randomly divided between the intervention and control group. Due to limited financial resources, it was not possible to allocate a practice nurse to all the GPs who were interested in the care model at the same time. An audit was carried out in the practices, in the order in which they were registered, to determine whether the criteria for participation had been met. When making funds available for a nurse, a formula was used which took account of regional distribution. This meant that it was possible that a GP from one town could appoint a nurse while a GP from another town who had registered earlier ended on the waiting list. The question is whether this method of dividing up the groups resulted in differences between the intervention and control groups and bias in the effect measures. At baseline the diabetes patients in the intervention and control group did not differ in age, gender, control frequency and outcome (HbA1c). Also the COPD patients in the intervention group were comparable with the controls regarding age, gender and dyspnoea score. The general practices were comparable regarding level of urbanisation of the place where the surgery was situated, size of the practice, percentage of employment of the general practitioner, and number of known diabetic and COPD patients.
So we conclude that the GPs and patients in the intervention and control group were comparable at baseline and accept that, despite the lack of randomisation, the effects can be attributed to the intervention.

Reference group

The fact that the control groups were on the waiting list may have disturbed the attribution of the effect. Classical threats are selection maturation, differential statistical regression and local history.[27] However, these threats do not seem very likely, because the waiting list problem was created by a totally unexpected national funding policy by health insurance companies that was corrected for after an intervention period.

Patient population

In the intervention group of the first phase of the diabetes study patients were included when they had been registered with the DSS for a minimum of one year and a maximum of two years at the start of the study. All patients in the study had had documented diabetes for more than four years at the start of the study: 449 of the 1292 patients in the intervention group versus 164 of the 553 in the control group met the inclusion criteria. Only patients with data available for the whole study period were included in the analysis. Patients who died or moved away from the area during the course of the study were excluded. The inclusion criteria resulted in half of the patients not being included in the study. This loss was not selective for the metabolic values that were checked at baseline and did not differ significantly. We therefore assume that the study population provides a representative sample of the group of patients general practitioners ask the DSS to call up.

Loss to follow-up

Among the patients who were included in the COPD study there was a high dropout rate. Because COPD effects a population of mainly elderly people, and it is a chronic complex disease, some loss to follow-up is inevitable due to severe illness, hospitalisation or death. However, a high dropout rate may cause selection bias when loss to follow-up is not random and is related to the outcomes of interest. It may also reduce the power of the study to detect small changes in outcomes. The high dropout rate was probably caused by data collection (patients had to visit a laboratory twice to check the inhalation technique and fill in the questionnaire). This assumption was confirmed by studying the inclusion numbers of patients in the care model (Chapter 6). Patients who did not attend the appointment for data collection, did actually attend planned visits and annual lung function measurements. The dropout was equal in intervention group and controls.

Statistical analyses

Differences between intervention and control groups were assessed by mixed models with repeated measures (Proc mixed procedure SAS V8.2) and mixed logistic model repeated measures (Glimmix procedure SAS V8.2). Mixed models make it possible to use patients as unit of analysis and to adjust the calculated effect sizes for the dependency of observations made of patients who all receive care from the same care provider. According to the literature,

one can expect that adjustment for clustering will increase the standard errors and will consequently lead to wider confidence intervals and therefore higher P-values. However, adjustment for clustering is not expected to influence the effect sizes.[28]
Mixed models repeated measures are appropriate for nested analyses, but since we did not use a randomised design there is a potential bias in the selection of the candidates that is not corrected for by analysis. In fact, the mean entry value of the primary outcome measure HbA1c in the control group in the diabetes study (Chapter 2) is high (7.4). Goudswaard et al. found a mean HbA1c of 7.1 in a population of 1641 patients.[29] So the intervention group resembles the mean population of Dutch diabetic patients in primary health. In that group the DSS appeared to be capable of preventing deterioration in metabolic levels.

Practical implications

From this thesis it has become clear that a chronic care model for primary care including logistic support by a support service (patient register, recall system) and patient-oriented interventions by a practice nurse improves the process of the care provided by GPs and some patient outcomes. Continuous monitoring and optimisation of protocols is considered necessary, since the process of care is likely to be influenced by, for example, changes in underlying guidelines.

Since nurses see only a few patient categories, they can attain a high level of expertise in these diseases (a nurse might even surpass the GP). Still the GP's central role remains essential in supplying the ´human measure`: provide care with regard to all aspects of the patient's health and well-being. Besides, many patients have more than one chronic disease at the same time, so the GP having the final responsibility is the best guarantee for a general primary care model that integrates care for different chronic conditions.

Improvement in care is only possible if GPs are amenable to changing their daily practice. One strategy is to pay doctors for performing well in treating and monitoring chronic diseases, running well-organised modern services, and involving patients in both planning and care. The fee system that is currently implemented in the Netherlands, the Diagnosis Treatment Combinations

System (Diagnose Behandel Combinaties), is intended to play a stimulating role (it is now being tested in the region where the chronic care model for primary care has been implemented), although this is not yet fully supported by literature.[30]

Non-pharmaceutical interventions in diabetes care

Guidelines for type 2 diabetes care in general practice are especially directed towards strict metabolic control and management of the other risk factors for cardiovascular disease. Most studies evaluating interventions to improve diabetes care emphasise focusing on cardiovascular risk factors without relating to the type of treatment (e.g. drug use or lifestyle changes). In our study the counselling by the practice nurse, in which she sets (short-term) goals together with the patient for lifestyle and medication use, seems to have had a delaying effect on the degenerative process of diabetes. In future interventions to improve diabetes care more attention should be paid to achieving control by non-pharmaceutical care and encouraging self-management.

Spirometry in COPD care

Spirometry is pivotal to the screening, diagnosis and monitoring of respiratory disease and is increasingly advocated in general practice. The quality of the performance of spirometry in general practice depends on the quality of the instrument and the training of the GP or practice nurse. Collaboration with a CSS can upgrade the quality level, the CSS can advise or actually deliver instruments. Besides, the CSS can train GPs and practice nurses or can perform lung function measurements if the GP wants to delegate this task. And lastly, when interpreting the results of the measurement, the CSS can play a role by presenting a history report and lung function measurement to a chest physician for a diagnostic and therapeutic advice.

Further research

The difference in mean HbA1c in relation with drug use between the diabetes intervention group and controls is promising. We think that programmes in which practice nurses are further trained in lifestyle interventions can lead to greater improvements. Specific research is needed to assess to what extent these programmes meet the expectations.

The difference in inhalation technique between the COPD intervention group and controls in our study may be substantial, but still half of all patients do not use their inhalers correctly. This means that it is unclear whether these people inhale the correct dose of medication. So, there is still a lot to improve on this matter. Further investigation is necessary on whether this could be achieved if the intervals between the inhaler checks can be shortened. For example a check at every prescription renewal, because research shows that mistakes already occur shortly after the instructions have been given, which argues in favour of short cyclic check.

Another area that needs more study concerns the cost of the primary care model. In our study we found that the primary care model for diabetes type 2 and COPD is effective in improving adherence to guidelines. Preferably, an analysis should be performed to determine the cost-effectiveness of the primary care model and its effects on patient outcome compared with usual care (in which guidelines are not followed adequately, so a different patient outcome will be seen).
Similarly detailed cost analyses are needed to enable comparisons between different care models to manage the care in primary care, especially those organised in secondary care and those in which the support service actually delivers direct patient care.
While comparing costs, it is important to make a clear distinction between the costs of the development and implementation and the costs of proving care according to the model.

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Summary

The aim of this thesis was to determine the feasibility of a chronic care model for primary care and its effect on guideline-based care provision and on patient outcomes. The model has been tested for diabetes and COPD care in different studies.

Chapter 1 gives a general introduction to the theme. Chronic diseases are the main cause of death and disability worldwide. Despite clinical differences across specific chronic conditions, all chronic conditions place similar demands on health systems. New healthcare models are being introduced in Western countries in response to a set of common problems seen in various health care delivery systems; for example fragmented and uncoordinated arrangements for delivering care, a strong bias towards acute treatment, a neglect of preventive care, and inappropriate treatment. One model that has gained widespread credibility is the chronic care model (CCM). It comprises four components: decision support, self-management support, clinical information systems and delivery system design.
Based on the principles of the CCM we developed a chronic care model for primary care. Essential parts of the model were *decision support* including guidelines for performing the care, *task delegation* by the general practitioner to a practice nurse and support service, the organisation of a *recall system*, *decentralised provision of tests*, supplying the general practice with *management information and feedback* and a *nurse-run clinic*.
The feasibility of the model and its effects on patients with diabetes and COPD were evaluated. Specific study questions were:

Research question	Chapter
What is known about organisational interventions to improve the management of patients with chronic obstructive lung diseases in primary care?	Chapter 2
What is the effect of logistic support by a diabetes support service (DSS) on the implementation of the guidelines for type 2 diabetes?	Chapter 3
What is the effect of patient-oriented interventions by a practice nurse in combination with logistic support by a DSS on diabetic patient outcome in primary care?	Chapter 4
What is the feasibility of a primary care model for diabetes in terms of delegating tasks to a DSS and a practice nurse and including patients in the care model?	Chapter 5
What is the feasibility of a primary care model for COPD in terms of delegating tasks to a COPD support service (CSS) and a practice nurse and including patients in the care model?	Chapter 6
What is the effect of an integrated primary care model for COPD on the process of care and patient outcome?	Chapter 7

Chapter 2 reports on the results of a systematic review in which the current available evidence for organisational interventions to improve the management of COPD in primary care is summarised. This review was conducted according to the guidelines and criteria of the Effective Practice and Organization of Care (EPOC) group within the well-established Cochrane Collaboration.
After an extensive systematic literature search for relevant publications, studies were assessed for inclusion independently by two reviewers on the basis of explicit inclusion criteria. Each publication was scored by the reviewers according to a standardised set of methodological criteria.
A total of eight studies met the inclusion criteria. The studies identified examined revision of professional roles (5), telephone consultations instead of surgery visits (2) and knowledge management (computerised guidelines) (1). Delegating tasks to non-physicians resulted in improved inhalation technique but had no effect on smoking cessation, changing lifestyle and coping. Telephone consultations proved to reach more patients in a certain period of

time and take less time per consultation. The knowledge management study showed no effects on the care process.
Revision of roles by delegating tasks to non-physicians can be a successful intervention to improve COPD care in primary care. Telephone consultation is a good method to manage the growing number of patients. As the one knowledge management study did not show improvement in the everyday management of asthma and COPD in general practice, further investigation of this type of intervention is needed.

In **Chapter 3** the effect of logistic support by a diabetes support service (DSS) on the management of diabetes type 2 patients in primary care was examined. We concluded that simple logistic support by a DSS has the capacity to implement type 2 diabetes guidelines in general practice. At baseline the intervention and control group did not differ in control frequency, content of check-up and outcome (HbA1c). After the intervention the percentage of patients who, in accordance with the guidelines of the Dutch College of General Practitioners (NHG), attended four or more quarterly check-ups (with at least testing of fasting blood glucose or HbA1c) increased from 59 to 78%. In contrast, the frequency of check-ups in the control group remained constant. This effect was significant. At baseline the content of the check-ups consisted mainly of blood tests and blood pressure measurement. For the patients in the control group this did not change in the following years, while the intervention patients had undergone an average of eight of the nine tests on offer after two years. Foot examinations, fundus photography, and questioning about the smoking status gained most by the DSS. The HbA1c remained the same in the intervention group while there was a significant deterioration in the HbA1c in the control group.

Chapter 4 reports the results of a study that evaluated the effect of patient-oriented interventions by a practice nurse on top of logistic support by a DSS on diabetic patient outcome. We examined the results of the check-ups (fasting blood glucose, HbA1c, cholesterol, cholesterol/HDL ratio, triglycerides, creatinine, blood pressure, fundus photo, foot exam and body mass index), smoking status, physical activity and medication use. The HbA1c improved in the intervention group, while that of the control group deteriorated. The percentage of patients with an HbA1c ≥ 8.5 was halved. Patients in the intervention group started to exercise more besides their daily activities

compared with the control group. Moreover, the percentage of patients who had to be transferred to a treatment with insulin increased significantly less than in the control group. The counselling by the practice nurse, in which she set (short-term) goals together with the patient for lifestyle and medication use, seems to have had a delaying effect on the degenerative process of diabetes.

Chapter 5 describes the implementation of a chronic care model for diabetes in primary care that was built around the triad of general practitioner, practice nurse and DSS. Important tasks to meet diabetes guidelines (a patient register, an active recall system, a control system, feedback, and quality improvement on population level) could be delegated to the practice nurse and the DSS. For all 1628 patients registered at 23 practices in the service district of the diabetes support service we recorded whether they had been included in the model and if not, for what reason. We examined whether and how the 23 practices had integrated the five elements in their own protocols. All five elements had been implemented systematically, except monitoring quality improvement (in 18 of 23 practices). The fact that monitoring quality improvement has not yet been carried out in all practices is likely related to a stepwise implementation of the five elements. It seems just a matter of time before they are all integrated. Of all known diabetic patients 80% were treated in general practice; 97% of these patients were included in the model (selected by the general practitioner and accepted by the patient). In 70% of the practices the practice nurse not only carried out the quarterly controls, but even the annual control. Of all patients seen by the practice nurse, 93% attended all appointments.

The feasibility of a chronic care model for COPD in primary care was investigated in **Chapter 6**. The model was build around the triad of general practitioner, practice nurse and COPD support service (CSS). The CSS also formed the link to the chest physicians to integrate specialist expertise.
We examined the delegation of tasks to the CSS and practice nurse and performance in daily practice according to the model components (patient register with recall system, periodical history taking and lung function measurements, diagnostic and therapeutic advice, periodical visits with education and counselling).
The chronic care model for COPD in primary care proved to be feasible; in

the 22 study practices all components of the model were systematically performed, with the exception of asking for diagnostic and therapeutic advice (in 10 practices only). Of all 1497 documented COPD patients, 374 (25%) were checked and treated by a chest physician. Of the patients treated in general practice, 88% were included in the care model, 12% refused periodical check-ups.

To investigate the effect of a chronic care model for COPD in primary care on process of care and patient outcome, a controlled study with delayed intervention in the control group was performed, which is reported in **Chapter 7**. We included 44 practices (n=22 for the intervention and n=22 for the control group) in the south of the Netherlands and 260 of their elder patients (≥ 40) with obstructive lung diseases. Data were collected on the care offered (planned visits, periodic lung function measurement and stop smoking advice) and patient outcomes (smoking status, inhalation technique, exacerbations and emergency medication). Inhalation technique was assessed by a lung function technician, using inhaler-specific checklists from the Dutch Asthma Foundation. Data about emergency medication were obtained by community pharmacists. All other data were collected using a written patient questionnaire. Data were analysed in a mixed logistic model with repeated measurement covariance structure.
After two years of intervention the percentage of patients who declared that they consulted the GP or practice nurse at planned visits increased from 16 to 35%. The percentage of patients with a periodic lung function measurement increased from 17 to 67%. The percentage of non-smokers increased equally in both conditions. In the intervention group at baseline 43% of the patients performed all key inhalation technique items correctly and this increased to 50% after two years. In the control group correct use of the inhaler decreased. The percentage of patients without exacerbation in the foregoing three months rose from 79 to 81% in the intervention group; it decreased in the control group. The difference in change was significant. The percentage of patients without emergency medication rose from 79 to 84% in the intervention group, it decreased in the control group. But this difference was not significant.

Finally, **Chapter 8** summarises the main findings of this thesis. We concluded that the model is feasible for diabetes care as well as for COPD care, although

the different parts were not of equal importance for each condition. For example, decentralised provision of tests is much more important for diabetes than for COPD, while decision support by 'paper' consultation (advice by a medical specialist without actually seeing the patient) is important for COPD and less for diabetes. Concerning the chronic care model for diabetes and COPD that has been implemented in a region in the south of the Netherlands we concluded that redesign of primary care delivery according to this model was associated with improvements in the management of care and patient outcomes.

The chapter concludes with recommendations for daily clinical practice and suggestions for future research. Since nurses see only a few patient categories, they can attain a high level of expertise in these diseases (a nurse might even surpass the GP). Still the GP's central role remains essential in supplying the ´human measure`: provide care with regard to all aspects of the patient's health and well-being. Besides, many patients have more than one chronic disease at the same time, so the GP having the final responsibility is the best guarantee for a general primary care model that integrates care for different chronic conditions.

Improvement in care is only possible if GPs are amenable to changing their daily practice. One strategy is to pay doctors for performing well in treating and monitoring chronic diseases, running well-organised modern services, and involving patients in both planning and care. The fee system that is currently implemented in the Netherlands, the Diagnosis Treatment Combinations System (Diagnose Behandel Combinaties), is intended to play a stimulating role (it is now being tested in the region where the chronic care model for primary care has been implemented), although this is not yet fully supported by literature.

The difference in mean HbA1c in relation with drug use between the diabetes intervention group and controls is promising. We think that programmes in which practice nurses are further trained in lifestyle interventions can lead to greater improvements. Specific research is needed to assess to what extent these programmes meet the expectations.

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Samenvatting

Het doel van dit proefschrift was de haalbaarheid van een eerstelijns zorgmodel voor chronisch zieken te onderzoeken evenals de effecten van het model op het naleven van de richtlijnen en op patiëntuitkomsten. Het model is getest voor diabetes en COPD in verschillende deelonderzoeken.

Hoofdstuk 1 geeft een algemene inleiding op het onderwerp. Chronische ziekten vormen wereldwijd de belangrijkste oorzaak van sterfte en arbeidsongeschiktheid. Ondanks klinische verschillen tussen specifieke chronische aandoeningen, stellen alle chronische aandoeningen soortgelijke eisen aan gezondheidszorgsystemen. In westerse landen worden nieuwe zorgmodellen geïntroduceerd als antwoord op gemeenschappelijke problemen in de verschillende zorgsystemen, zoals versnipperde en ongecoördineerde voorzieningen, een sterke gerichtheid op acute zorgproblemen, verwaarlozing van preventieve zorg, en inadequate behandeling. Een model dat wijd verbreid aan geloofwaardigheid heeft gewonnen is het Chronic Care Model (CCM). Het is opgebouwd uit vier componenten: decision support, self-management support, clinical information systems en delivery system design. Gebaseerd op de principes van CCM hebben we een eerstelijns zorgmodel voor chronisch zieken ontwikkeld. Essentiële onderdelen van dat model waren *decision support* waaronder richtlijnen voor de uitvoering van de zorg, *taakdelegatie* door de huisarts aan de praktijkondersteuner en de facilitaire dienst, de organisatie van een actief oproepsysteem, *decentraal aanbod van testen*, de huisartspraktijk voorzien van *managementinformatie en feedback*, en een *categoraal spreekuur*.
De haalbaarheid van het model en zijn effecten op patiënten met diabetes en COPD zijn geëvalueerd. Onderzoeksvragen waren:

Onderzoeksvraag	Hoofdstuk
Wat is bekend over organisatorische interventies om het eerstelijns management van patiënten met chronische obstructieve longziekten te verbeteren?	Hoofdstuk 2
Wat is het effect van logistieke ondersteuning door een diabetesdienst op de implementatie van de richtlijnen voor diabetes type 2?	Hoofdstuk 3
Wat is het effect van patiëntgeoriënteerde interventies door een praktijkondersteuner in combinatie met logistieke ondersteuning door een diabetesdienst op patiëntuitkomsten in de eerste lijn?	Hoofdstuk 4
Wat is de haalbaarheid van een eerstelijns zorgmodel voor diabetes in termen van het delegeren van taken aan een diabetesdienst en een praktijkondersteuner, en van het opnemen van patiënten in het model?	Hoofdstuk 5
Wat is de haalbaarheid van een eerstelijns zorgmodel voor COPD in termen van het delegeren van taken aan een COPD-dienst en een praktijkondersteuner, en van het opnemen van patiënten in het model?	Hoofdstuk 6
Wat is het effect van een geïntegreerd eerstelijns zorgmodel voor COPD op het proces van zorg en op patiëntuitkomsten?	Hoofdstuk 7

Hoofdstuk 2 rapporteert over de resultaten van een systematisch literatuuronderzoek naar beschikbaar bewijs om het eerstelijns COPD management te verbeteren door organisatorische interventies. Dit literatuuronderzoek werd uitgevoerd volgens de richtlijnen en criteria van de Effective Practice and Organization of Care (EPOC) group binnen de Cochrane Collaboration. Na een uitgebreide systematische zoekopdracht naar relevante publicaties, beoordeelden twee onderzoekers onafhankelijk van elkaar op basis van expliciete inclusiecriteria welke artikelen daaraan voldeden. Acht artikelen werden geselecteerd. Het betrof onderzoek naar taakherschikking (5), telefonische in plaats van persoonlijke consulten (2), en kennismanagement (gecomputeriseerde richtlijnen) (1). Taakdelegatie aan niet-medici leidde tot verbeterde inhalatietechniek maar had geen effect op het stoppen met roken. Met telefonische consultatie werden meer patiënten

in een bepaalde periode bereikt, terwijl elk consult minder tijd in beslag nam. Het onderzoek naar kennismanagement vond geen effect op het proces van zorg.
Taakherschikking aan niet-medici kan een succesvolle interventie blijken om de eerstelijns COPD zorg te verbeteren. Telefonische consultatie is een goede manier om een groeiend aantal patiënten periodiek te kunnen volgen. Aangezien het ene onderzoek naar kennismanagement geen verbetering kon laten zien in het dagelijkse management van astma en COPD in de huisartspraktijk, is verder onderzoek naar dit type interventie noodzakelijk.

In **hoofdstuk 3** werd het effect van logistieke ondersteuning door een diabetesdienst op het management van eerstelijns diabetes type 2 patiënten onderzocht. Wij concludeerden dat met eenvoudige logistieke ondersteuning door een diabetesdienst richtlijnen voor diabetes type 2 in de huisartspraktijk geïmplementeerd konden worden. Bij de 0-meting verschilden interventie- en controlegroep niet van elkaar in controlefrequentie, inhoud van het jaarlijks onderzoek en patiëntuitkomsten (HbA1C). Na de interventie steeg het percentage patiënten dat volgens de richtlijn drie of meer kwartaalonderzoeken onderging van 59 tot 78%. Daarentegen bleef de controlefrequentie in de controlegroep gelijk. Het effect was significant.
Bij de 0-meting bestonden de onderzoeken met name uit bloedtesten en bloeddrukmetingen. Bij patiënten in de controlegroep veranderde dit niet in de daarop volgende jaren, terwijl de interventiepatiënten gemiddeld acht van de in totaal negen onderzoeken hadden ondergaan. Het aantal voetonderzoeken, fundusfoto's en registraties van de rookstatus steeg aanzienlijk met de oproep door de diabetesdienst. Het HbA1C bleef gelijk in de interventiegroep, terwijl het in de controlegroep verslechterde. Het verschil in verandering was significant.

Hoofdstuk 4 beschrijft de resultaten van een onderzoek naar de effecten van patiëntgeoriënteerde interventies door een praktijkondersteuner in combinatie met logistieke ondersteuning door een diabetesdienst. We onderzochten de testuitslagen (glucose nuchter, HbA1C, cholesterol, cholesterol/HDL ratio, triglyceriden, kreatinine, bloeddruk en body mass index (BMI)), rookstatus, lichamelijke activiteit en medicatiegebruik.
Het HbA1C verbeterde in de interventiegroep, terwijl het in de controlegroep verslechterde. Het percentage patiënten met een HbA1C>8,5

werd gehalveerd. Patiënten in de interventiegroep gingen meer aan lichaamsbeweging doen naast hun dagelijkse activiteiten dan de patiënten in de controlegroep. Bovendien was het percentage patiënten dat in de interventiegroep overging op behandeling met insuline significant lager dan in de controlegroep. De begeleiding door de praktijkondersteuner, waarbij ze samen met de patiënt (korte termijn) doelen formuleert over leefstijl en medicatiegebruik, lijkt een vertragend effect te hebben op het degeneratieve proces van diabetes.

Hoofdstuk 5 beschrijft de implementatie van het eerstelijns zorgmodel voor diabetes dat werd ontwikkeld rond de driehoek huisarts, praktijkondersteuner en diabetesdienst. Belangrijke taken, voortvloeiend uit de diabetes richtlijnen (1/ een patiëntregister, 2/ een actief oproepsysteem, 3/ een controlesysteem, 4/ feedback en 5/ kwaliteitsbewaking op populatieniveau) konden worden gedelegeerd aan de praktijkondersteuner en de diabetesdienst. Van alle 1628 diabetespatiënten, ingeschreven bij 23 huisartspraktijken, zijn we nagegaan of ze werden opgenomen in het zorgmodel en zo niet, wat daarvoor de reden was. We onderzochten verder of en hoe de 23 praktijken de vijf genoemde elementen in hun eigen protocol integreerden.
Alle vijf elementen werden door alle praktijken systematisch geïmplementeerd, uitgezonderd kwaliteitsbewaking (in 18 van de 23 praktijken). Het feit dat dit niet door alle praktijken werd uitgevoerd heeft waarschijnlijk te maken met een stapsgewijze invoering van de vijf elementen. Het lijkt slechts een kwestie van tijd voordat ze allemaal zijn geïntegreerd in het eigen protocol.
Van alle bekende diabetespatiënten werd 80% behandeld in de huisartspraktijk; 97% van deze patiënten werd opgenomen in het zorgmodel (aangeboden door de huisarts en geaccepteerd door de patiënt). In 70% van de praktijken voerde de praktijkondersteuner niet alleen de kwartaalcontroles uit, maar ook de jaarcontrole. Van alle patiënten die werden uitgenodigd voor het spreekuur van de praktijkondersteuner, verscheen 93% op alle afspraken.

De haalbaarheid van een eerstelijns zorgmodel voor COPD is onderzocht en beschreven in **hoofdstuk 6**. Het model werd ontwikkeld rond de driehoek huisarts, praktijkondersteuner en COPD-dienst. De COPD-dienst vormde tevens de link met de longartsen voor ‘papieren’ consultatie (beoordelen van longfunctiemetingen en anamneseformulieren). We

onderzochten of de taakdelegatie door de huisarts aan de COPD-dienst en de praktijkondersteuner, en de uitvoering ervan in de dagelijkse praktijk plaatshad volgens de componenten van het model (patiëntregister met oproepsysteem, periodieke anamnese en longfunctiemeting, diagnostisch en therapeutisch advies, periodieke controles met educatie en counseling) en hoeveel patiënten in het zorgmodel werden opgenomen.
Het eerstelijns zorgmodel voor COPD bleek haalbaar. In de 22 onderzoekspraktijken werden alle onderdelen van het model systematisch uitgevoerd, met uitzondering van het vragen om een diagnostisch en therapeutisch advies (in 10 praktijken). Van alle 1497 bekende COPD patiënten werden er 374 (25%) behandeld door de longarts. Van alle patiënten behandeld in de huisartspraktijk werd 88% opgenomen in het zorgmodel, 12% wenste geen periodieke controles.

Om het effect van een eerstelijns zorgmodel voor COPD op het proces van zorg en patiëntuitkomsten te onderzoeken, voerden we een gecontroleerd onderzoek uit met uitgestelde interventie in de controlegroep, dat wordt besproken in **hoofdstuk 7**. het onderzoek werd uitgevoerd onder 44 huisartspraktijken (22 interventie en 22 controle) in zuid Nederland en 260 van hun oudere patiënten (≥ 40) met obstructieve longziekten. Gegevens werden verzameld over de aangeboden zorg (geplande controles, periodieke longfunctiemeting en stop-roken-advies) en patiëntuitkomsten (rookstatus, inhalatietechniek, exacerbaties en stootkuren). De inhalatietechniek werd beoordeeld aan de hand van inhaler specifieke checklists van het Nederlands Astma Fonds. Gegevens over stootkuren werden verkregen van de openbare apotheken. Alle andere data werden verzameld met schriftelijke patiëntvragenlijsten. De gegevens werden geanalyseerd met mixed logistic model met herhaalde metingen covariantie structuur.
Na twee jaar steeg het percentage patiënten dat aangaf de huisarts of praktijkondersteuner te zien tijdens geplande controles van 16 naar 35%. Het percentage patiënten met periodieke longfunctiemetingen steeg van 17 naar 67%. Het percentage niet-rokers steeg evenredig in beide groepen. In de interventiegroep voerde 43% van de patiënten alle essentiële handelingen bij inhaleren correct uit. Dit aantal steeg na twee jaar tot 50%. In de controlegroep verslechterde het juist gebruik van de inhaler. Het percentage patiënten zonder exacerbatie in de voorgaande drie maanden steeg van 79 naar 81 in de interventiegroep, het daalde in de controlegroep, maar het

verschil was niet significant.

Tot slot vat **hoofdstuk 8** de belangrijkste bevindingen van dit proefschrift samen. We concluderen dat het eerstelijns zorgmodel haalbaar is voor zowel de diabeteszorg als voor de COPD zorg, hoewel de verschillende onderdelen niet van gelijk belang zijn voor elke aandoening. Zo is het decentraal aanbieden van testen veel belangrijker voor diabetes dan voor COPD, terwijl beslissingsondersteuning door 'papieren' consultatie (advies van een medisch specialist zonder daadwerkelijk de patiënt te zien) belangrijk is voor COPD en veel minder voor diabetes.
Het eerstelijns zorgmodel voor diabetes en COPD dat werd geïmplementeerd in een regio in zuid Nederland leidde tot verbetering van het management van de zorg en patiëntuitkomsten.
Aangezien praktijkondersteuners een beperkt aantal patiëntcategorieën zien, kunnen zij heel deskundig worden met betrekking tot deze aandoeningen (zelfs uitstijgen boven het niveau van de huisarts). Toch blijft de centrale rol van de huisarts essentieel in het aanbrengen van de 'menselijke maat': zorgen dat de geleverde zorg gebaseerd is op de gezondheidstoestand en het welzijn van de patiënt. Bovendien hebben veel patiënten meer dan een chronische aandoening tegelijkertijd; de huisarts als eindverantwoordelijke is de beste garantie voor een eerstelijns zorgmodel dat de zorg voor de verschillende aandoeningen integreert.
Kwaliteitsverbetering door herschikking in de zorg is alleen mogelijk als de huisarts bereid is tot veranderingen in zijn dagelijkse praktijk. Een mogelijke manier is de huisartsen te betalen voor het leveren van kwaliteit in de behandeling en monitoring van chronische aandoeningen, goed georganiseerde moderne diensten aan te bieden, en de patiënt betrekken bij de zorg. Het betaalsysteem dat momenteel wordt geïmplementeerd in Nederland, de Diagnose Behandel Combinaties, is bedoeld om een stimulerende rol te spelen; het wordt op dit moment getest in de regio waar het onderzochte eerstelijns zorgmodel werd geïmplementeerd.
Het verschil in gemiddeld HbA1C in relatie met medicatiegebruik tussen de diabetes interventie- en controlegroep is veelbelovend. Wij denken dat programma's waarin de praktijkondersteuners verder worden getraind in leefstijlinterventies kunnen leiden tot verdere verbeteringen. Verder onderzoek is gewenst om te bepalen in hoeverre dergelijke programma's aan de verwachtingen kunnen voldoen.

D

Dankwoord

In de jaren negentig wilden de huisartsen in Zuidoost Brabant een bureau dat sturingsinformatie kon leveren ter ondersteuning van hun kwaliteitsbeleid. In 1997 kwam dat bureau er onder de naam Meetpunt Kwaliteit en ik mocht er werken. Toen de Districts Huisartsen Verenigingen (DHV) een paar jaar later de taak kregen om de invoering van praktijkondersteuning in de eigen regio te begeleiden, gaf de DHV Zuidoost Brabant aan Meetpunt Kwaliteit de opdracht om een evaluatie uit te voeren. Het was Jules Keyzer, directeur van het Diagnostisch Centrum Eindhoven, waar Meetpunt Kwaliteit was gestationeerd, die mij adviseerde er een promotietraject van te maken. Jules die sprak over een paar artikeltjes met een nietje erdoor - een beeld dat ik de daarop volgende jaren voor ogen hield, ook als het soms anders voelde - wist me te overtuigen. Jules, daar ben ik je reuze dankbaar voor, evenals voor alle steun die ik van je kreeg bij de uitvoering van het onderzoek.
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Samen met Hennie van Bavel, collega bij Meetpunt Kwaliteit, heb ik urenlange gesprekken gevoerd met Emmy Derckx en Annelies Lucas om de evaluatie voor te bereiden. Emmy was als projectleider bij de DHV verantwoordelijk voor de implementatie van praktijkondersteuning in Zuidoost Brabant. Annelies was de architect van het zorgmodel; zij ontwierp in opdracht van de DHV de modellenwegwijzers voor diabetes en astma/COPD, waarmee huisartsengroepen een op maat gemaakt protocol konden opstellen op basis van de elementen uit het zorgmodel. In onze gesprekken probeerden we te verwoorden wat het model aan verbeteringen zou laten zien in het management van de zorg voor diabetes en astma/COPD en waar het onderzoek zich op zou moeten richten. Hennie, Emmy en Annelies, bedankt voor het gezamenlijk leggen van de fundamenten onder het onderzoek. Annelies is daarna actief gebleven in onderzoeksteam, begeleidingscommissie en als medeauteur.
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Omdat ik van het evaluatieonderzoek een promotietraject wilde maken, meldde ik me bij Richard Grol, de aangewezen persoon als het gaat om het begeleiden van onderzoek naar de kwaliteit van zorg, leek me. Ik vroeg hem of hij mijn promotor wilde worden. Richard maakte me duidelijk dat hij liever niet werkt met externe promovendi; ze haken nogal eens af omdat de combinatie met het eigen werk te zwaar blijkt. Op dat moment kun je als universiteit het onderzoek niet overnemen en er een ander op zetten. Verspilde energie dus. Ondanks zijn bezwaren is Richard met mij in zee gegaan. Bedankt voor het vertrouwen dat je me hiermee gaf en voor je begeleiding in de daarop volgende jaren. De vragen die je me stelde hielpen me om mijn onderzoeksopdracht helder voor ogen te krijgen.
Richard introduceerde Jozé Braspenning en Annelies Jacobs als copromotoren, Jozé met speciale aandacht voor diabetes en Annelies voor astma en COPD. Maar dwars door diabetes en astma/COPD heen, vond ik bij Jozé steun in het steeds weer bepalen van de grote lijnen en het leggen van dwarsverbanden en was ik Annelies dankbaar om haar precisie en nauwgezetheid. Dankjewel voor de uren die ik op jullie kamer doorbracht en de vele kopjes koffie die ik er heb gedronken.
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In het eerste jaar van het onderzoek werkte Robin van Houdt bij Meetpunt

Kwaliteit. Een paar dagen in de week werkte hij mee aan dit onderzoek. Daarna vertrok hij naar Amsterdam om een eigen promotieonderzoek te beginnen. Tja, Robin, door jouw vertrek is het natuurlijk nooit meer iets geworden met de kostenevaluatie.
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CV

Curriculum Vitae

Ik ben geboren op 13 december 1954 als jongste in een gezin met zes kinderen. Ik haalde in 1972 mijn VWO-diploma aan het Elzendaal College in Boxmeer. Daarna ging ik niet meteen naar de universiteit, ik wilde eerste een 'vak' leren. Van 1972 tot 1976 nam ik daartoe de gelegenheid aan de HBO-Verpleegkunde in Nijmegen. Ik werkte vervolgens een paar jaar op de afdeling Psychiatrie van het Maasziekenhuis in Boxmeer. Toen was ik klaar voor de universiteit. Ik koos voor de studie Sociale Pedagogiek en Andragogiek aan de Katholieke Universiteit Nijmegen waar ik in 1986 afstudeerde. Als onderzoeker bleef ik aan de afdeling verbonden tot ik in 1988 ging werken bij Stichting O&O in Utrecht onder andere voor projecten rond de implementatie van NHG-standaarden. Stichting O&O werd opgeheven en ging in januari 1995 in afgeslankte vorm door als Stichting Doelmatige Geneesmiddelen Voorziening (DGV). Vanuit deze stichting kwam ik als adviseur in Zuidoost Brabant terecht. In 1997 werd ik gedetacheerd bij Meetpunt Kwaliteit en van daaruit heb ik het hier beschreven onderzoek mogen doen.
In de tijd dat ik bij Stichting O&O werkte, ben ik vier jaar lang op zaterdag naar de schrijvervakschool in Amsterdam gegaan. In combinatie met mijn werk voor DGV heb ik vervolgens tot in 2000 als eindredacteur voor het tijdschrift Apotheekmanagement en als journalist voor onder andere het Tijdschrift voor Huisartsgeneeskunde bij Mediselect in Leusden gewerkt.