

Changing the GP payment system

Do financial incentives matter?

Christel E. van Dijk

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<http://www.nivel.nl>

nivel@nivel.nl

Telefoon 030 2 729 700

Fax 030 2 729 729

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Nienke Laan

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Marian Brouwer

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Changing the GP payment system

Do financial incentives matter?

Veranderen van het bekostigingssysteem van huisartsenzorg

Doen financiële prikkels er toe?

Proefschrift

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Christel Evelien van Dijk
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Promotores:

Prof. dr. D.H. de Bakker

Prof. dr. P.P. Groenewegen

Copromotor:

Dr. R.A. Verheij

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1 | General introduction

The remuneration system of general practitioners (GPs) is seen as an important instrument to influence their behaviour.¹ Patients are highly dependent on the judgement of their physician for the provision of health care. Also, the need for health care is very unpredictable and so is the expected outcome of health care itself. For these reasons, physicians are thought to play an important role in the demand for health care. Physicians may ration health care utilisation when being provided with low financial incentives to offer services or induce more demand when being provided with high financial incentives.

In the Netherlands, the traditionally separate GP remuneration system for publicly and privately insured patients has been the issue of debate during many years. Several committees prepared plans to adjust the remuneration system of GPs, with the consistent aspect of the abolition of the separate remuneration system for publicly and privately insured patients. Often, these plans led to the resistance of health care providers, health insurers and/or other interest groups. Finally, in 2006 with the introduction of a new health insurance act, the GP remuneration system changed. In short, a capitation system for publicly insured patients and a fee-for-service (FFS) system for privately insured patients, usually with cost sharing, was replaced by a combined system of capitation and FFS. In terms of changing incentives, for privately insured patients cost sharing was abolished and GPs now receive fees for their services to (former) publicly insured patients. These changes in remuneration and cost sharing led to a unique opportunity to investigate the effects of changes in the GPs' remuneration system and patients' cost sharing on affordability, accessibility and quality of care.

For this study, longitudinal data were used from patient electronic medical records (EMRs) from general practices participating in the Netherlands Information Network of General Practice (LINH).² With the aid of these data aspects as supplier-induced demand, substitution effects, accessibility of health care, and quality of care are addressed in this thesis.

The aim of this introduction is to describe the background of the study, to present the research questions and theoretical considerations, and to explain the methodological approach of this thesis.

ROAD TO THE NEW GP REMUNERATION SYSTEM

In the history of Dutch general practice, policy makers at Ministry of Health, professional organisations and health insurers (sickness funds and private health insurers) have been looking for a suitable remuneration system for GPs. GPs play an important role in the health care system in the Netherlands. General practice is the formal point of entry into the health care system and GPs function as gatekeepers; specialist and hospital care can only be accessed by referral from a GP. All citizens are registered with a general practice, normally located in their own neighbourhood. In the remuneration system of GPs three important components can be distinguished: 1) financial incentives to establish a good GP–patient relationship, important in a gatekeeper system; 2) financial compensation for work performed to prevent unnecessary referrals to secondary care; and 3) financial incentives for quality improvement. This last component has not played an important role in the GP remuneration system. However, this was funded at a collective level. It has been argued that GPs as a profession traded individual income increase for collective support for quality improvement.

Since the Second World War, the Dutch health care system has been divided into two parts: public and private. Inhabitants had either compulsory public (sickness fund, 62%) or private (voluntary, 36%) health insurance depending, among other things, on income. In 2005, those with a gross annual income of below € 33,000 were publicly insured.³ The remuneration system for GPs was dependent on the patients' insurance type. An FFS system was in operation for privately insured patients and a capitation system for publicly insured patients. All GPs provided care to both publicly and privately insured patients. The differentiation in remuneration between publicly and privately insured patients was thought to be undesirable, as it could result in differences in the provision of GP care between these patient categories.^{4,5}

In recent decades, the remuneration system of GPs has been debated several times, with the consistent aspect being the abolition of the differentiation

between publicly and privately insured patients. In 1987, the Committee on the Organisation and Financing of Health Care (in Dutch: Commissie Structuur en Financiering Gezondheidszorg) was installed to advise the Minister of Health on the opportunities to control volume development in health care, on the further modification of the health insurance system and on the deregulation of government tasks.⁶ This committee advised the Minister to introduce a basic insurance for all inhabitants with more influence from market forces. The key item in their advice was substitution. Strengthening of primary care was seen as an important condition for substitution of care from hospitals and specialists to primary care and GPs. Amongst others, the observed barriers for substitution were the differences in the remuneration systems of various health care providers in primary and secondary care. For publicly insured patients, GPs were remunerated with a capitation fee only, while medical specialists were reimbursed with a fee for every service. This could have stimulated substitution from primary to secondary care, the opposite of the general objective of the Committee on the Organisation and Financing of Health Care. However, the committee did not advise on the specific GP remuneration system in the planned basic health insurance. The plan of the committee was seen as highly innovative at that time. Staged introduction of a basic health insurance, and, therefore, the abolition of the separate remuneration system for publicly and privately insured patients, failed in the early 1990's. However, the organisation of health care slowly moved to a more market oriented health care system. Further, in 1990, the National Association of General Practitioners (in Dutch: Landelijke Huisartsen Vereniging) and the association of sickness funds (in Dutch: Vereniging van Nederlandse Ziekenfondsen) agreed, in principle, on the introduction of fees for a set of seventeen services to be paid on top of the capitation fee. This separate payment was meant to shift services from secondary to primary care.⁷ However, the actual introduction of fees for these services did not take place until 2002.

The desire for a basic health insurance persisted over the years, with, in 1994, the installation of the Committee for the Modernisation Curative Health Care (in Dutch: Commissie Moderniserend Curatieve Zorg) to advise the Minister of Health on, among other things, the remuneration system for GPs, specialists and hospitals in the future basic health insurance.⁴ Like the Committee on the Organisation and Financing of Health Care, the Committee for the Modernisation

Curative Health Care advised the strengthening of primary health care and the broadening of GP tasks. They advised a GP remuneration system for all patients on the basis of a capitation system to establish a good GP–patient relationship. In addition, to compensate financially for work performed, a differentiation in the level of capitation fee according to the age of the patient was advised. To improve the quality of care and encourage substitution from secondary to primary care, the committee advised an additional flexible reimbursement for specific GP tasks. After this advice, differentiation in the level of capitation according to the age of the patient was introduced for publicly insured patients. However, the differentiation between publicly and privately insured patients was not abolished.

In the following years, the availability of GP care became an issue for debate, as more new GPs started working part-time. Especially in deprived areas, accessibility to GP care was at stake, since, besides the lower availability of GPs, the willingness among GPs to work in deprived areas was low. In 1996, this continuous discussion resulted in the introduction of an element of compensation in the capitation fee for publicly insured patients living in deprived areas.⁸ However, the national availability of GP care remained an issue for debate, with the increasing and more complex health care demands for chronic diseases and the high workload of GPs. This urged the need for more task delegation in general practice, with the introduction of primary care nurses in 1999.^{9,10} Primary care nurses are nurses or practice assistants having undertaken an additional one-year post-bachelor education programme.¹¹ Primary care nurses are employed by general practices and are predominantly involved in care for chronically ill patients.^{2,9} However, initially the services of primary care nurses were not reimbursed by all health care insurers, slowing down the introduction of primary care nurses in particular areas.

The wish to introduce a basic health insurance still continued. In 2001, the Committee for the Future Financing Structure GP care (in Dutch: Commissie Toekomstige Financieringsstructuur Huisartsenzorg) was installed to advise the Minister of Health on the remuneration system of GPs in the future basic health insurance.⁵ The committee advised a differentiation in the financing of the practice costs and the income of GPs. The income of GPs should be based on a combined system of capitation and FFS, with additional flexible reimbursement

for specific extra tasks of GPs that stimulate substitution or improve the quality of care. The basic idea behind this remuneration system was financial compensation for work performed by an FFS system and incentives to establish a good GP–patient relationship through a capitation system. After this advice, sickness funds got more freedom to organise and remunerate separate services. This so-called ‘regulation room for initiative sickness fund’ (in Dutch: regeling initiatiefruimte ziekenfondsverzekering) was introduced for publicly insured patients in 2002 to stimulate substitution from secondary to primary care or improve the quality of GP care.¹² However, it was not until 2006 that the separate remuneration system for privately and publicly insured patients was replaced with a uniform remuneration system (see next section).

Cost sharing arrangements

As with the remuneration system for GPs, cost sharing arrangements have been under debate for decades. While for privately insured patients cost sharing for GP care was very common and depended on the particular insurance policy, cost sharing arrangements for GP care for publicly insured patients have never been in operation. For publicly insured patients, cost sharing arrangements were introduced several times for other health care services, but were very soon abolished again. Examples are the introduction of co-payments for prescription drugs (also prescribed by GPs – from 1983), co-payments for visiting medical specialists (from 1988 to 1990), general co-payments (from 1997 to 1999) and no-claim refunds (2005 to 2008).¹³ The policy decision to exempt GP services from cost sharing arrangements for GP care can be explained by the gatekeeper role of GPs in the Dutch health care system. Gatekeeping filters ‘unnecessary’ demand to the more costly specialised care. Cost sharing is another approach of filtering demand and both are seen as functional alternatives. Moreover, introducing cost sharing arrangements for GP care is believed to limit accessibility to GP care, and is, therefore, thought to be undesirable in a gatekeeper system.¹⁴

THE 2006 HEALTH SYSTEM REFORM

In January 2006, the GP remuneration system changed simultaneously with the introduction of a new health insurance act based on the principles of managed competition.¹⁵ The combined system of public and private health insurance was

replaced by a single universal compulsory basic health insurance, covering a legally defined package of basic benefits including GP care. The new health insurance system gives insurers flexibility to better appeal to patients and the ability to selectively contract with health care providers, as this is thought to improve the efficiency of the health care system.^{16,17}

With the introduction of the new insurance system, a change in the GPs' remuneration system was necessary, since a separate remuneration system existed for publicly and privately insured patients. Three important actors, namely the National Association of General Practitioners, the Ministry of Health and Health Insurers Netherlands (in Dutch: Zorgverzekeraars Nederland), negotiated a new remuneration system for GPs.¹⁸ Health Insurers Netherlands, suggested an FFS remuneration system with negotiable fees for some GP-services, to realise financial compensation for the performed workload and to give insurers more information about performed services in general practice; whereas the National Association of General Practitioners suggested a capitation system without negotiable fees in order to establish good relations between the GP and the patient. The negotiations resulted in a combined system of capitation and FFS based on negotiable fees for only a very small part of GP-services (so-called modernisation and innovation services). The Dutch Healthcare Authority (in Dutch: Nederlandse Zorgautoriteit) is responsible for determining the majority of tariffs (maximum tariffs). For privately insured patients before 2006 and for all patients since 2006, the level of remuneration has been dependent on the type of contact and length of contact. For home visits, the remuneration is higher compared with practice consultations, and long home visits as well as long consultations (longer than 20 minutes) have a higher fee.

The aim of the new remuneration system was to combine the good features of both a capitation and an FFS system; on the one hand, a capitation system through which a strong relationship between patient and GP can be established, and on the other, an FFS system to realise financial compensation for performed work. To contain health care costs and to improve the quality of care, measures to encourage substitution from secondary to primary care and improve quality were important elements, although relatively small, in the new GPs' remuneration system. In the new remuneration system these services are called

modernisation and innovation services. These modernisation and innovation services can be divided into two parts: a predefined set of services with freely negotiable fees, and regional initiatives which are reimbursed by a supplement on top of the capitation fee, both agreed between individual health insurers and GPs. The predefined services were also in operation for publicly insured patients before the change in GPs' remuneration (known as 'regulation room for initiative sickness fund'). Examples of the predefined services are 'minor surgery' and 'cognitive function tests'. Examples of regional initiatives are accreditation for general practices that systematically and continuously put effort into quality improvement, and pharmacotherapy consultations. Table 1.1 gives a detailed description of the changes in the GPs' remuneration system. Financial incentives for quality improvement played almost no role in either the new or the old GPs' remuneration systems, since the modernisation and innovation services in the new system and 'regulation room for initiative sickness fund' in the old system only reimbursed additional services and not patient or performance outcomes, as in a pay-for-performance (P4P) system, although some regional initiatives focus on performance as the accreditation of general practices.

In addition, the funding system for primary care nurses changed. From 2006 to 2011, care provided by primary care nurses was funded from consultation fees equal to those of GPs and an additional capitation fee, whereas before 2006, for publicly insured patients, primary care nurses were only funded from a small supplement on top of the capitation fee.^{18,19} As mentioned earlier, the services of primary care nurses were not reimbursed by all health care insurers before 2006. Primary care nurses were thought to improve the care for chronically ill patients and to reduce GPs' workload and thereby stimulate substitution from secondary to primary health care.

With the new GP remuneration system, patients' cost sharing also changed. Before 2006, publicly insured patients did not face cost sharing for consulting their GP, whereas some privately insured patients had cost sharing for GP care. Payments depended on the particular insurance policy. Six percent of privately insured patients had no insurance for GP care and 31% had cost sharing of more than € 500.²⁰ After 2006, cost sharing for GP care was abandoned and GP care was also excluded from the no-claim refund in 2006 and 2007 and has been excluded from the regulation on deductibles since 2008.

Table 1.1: GPs' remuneration system in the Netherlands in 2005 and since 2006[§]

Remuneration system	2005		Since 2006
	Publicly insured	Privately insured	All insured
<i>Capitation fee</i>			
Insured person aged <65 years, non-deprived area	€ 77.00	-	€ 52.00
Insured person aged 65–75 years, non-deprived area	€ 90.80	-	€ 58.80
Insured person aged >75 years, non-deprived area	€ 90.80	-	€ 61.60
Insured person aged <65 years, deprived area	€ 84.80	-	€ 58.80
Insured person aged 65–75 years, deprived area	€ 98.60	-	€ 66.00
Insured person aged >75 years, deprived area	€ 98.60	-	€ 68.80
<i>Additional capitation fee</i>			
Primary care nurse	€ 9.30 [#]	-	€ 6.40
<i>Fee-for-service</i>			
Consultation <20 minutes	-	€ 24.80	€ 9.00
Consultation >20 minutes	-	€ 49.60	€ 18.00
Home visit <20 minutes	-	€ 37.20	€ 13.50
Home visit > 20 minutes	-	€ 62.00	€ 22.50
Telephone consultation	-	€ 12.40	€ 4.50
<i>Modernisation and innovation services</i>			
Predefined services*	Set fees	-	Negotiable fees
Regional initiatives			Negotiable supplement on capitation fee

[§] Maximum tariffs; [#] Not all health insurers reimbursed the services of primary care nurses;

* Before 2006 called 'regulation room for initiative sickness fund' (in Dutch: regeling initiatief-ruimte ziekenfondsverzekering).

STUDY AIM

The changes in the GP payment system in terms of their remuneration system and patients' cost sharing arrangements for GP care led to clear alterations in the incentives for both GPs and patients. The aim of this study is to investigate the effects of the changes in the Netherlands in 2006 in the remuneration system of GPs and cost sharing for patients on aspects of affordability, accessibility and quality of health care. These three aspects are important elements for the solidarity and (cost) efficiency of a health care system.

THEORETICAL CONSIDERATIONS

To derive hypotheses about the effects of changes in the GPs' remuneration system, it is important to be aware of the incomplete principal-agent relationships in the health care market and the theory on remuneration systems.

Incomplete principal-agent relationship

A principal-agent relationship is a relationship whereby one individual (agent) acts on behalf of someone else (principal), and is characterised by conflicting interests of the principal and agent. In a complete principal-agent relationship of the GP to the patient, the GP acts only and fully in the best interests of the patient. This implies that GPs have full knowledge about the effects of health care for all patients and act in accordance with this knowledge, even if it is against their own interests. However, health care has specific characteristics which impede a complete principal-agent relationship, such as the uncertainty of health care needs and information asymmetry.²¹⁻²³

Uncertainty does not only exist about the timing of health care, but also about the effects of health care.^{1,22,24} Demand for health care is very unpredictable and so is the outcome of using health care itself. Information asymmetry is present when one party has more or better information than the other, and is very common in health care. GPs have more information about diseases, diagnostic possibilities and treatment effects than patients.^{23,25} Due to the uncertainty of health care and information asymmetry, physicians can influence the provided health care (maybe against the patient's interest or will) by limiting the provided care, i.e. rationing, or inducing more demand. Therefore, the principal-agent relationship of GP to patient is referred to as an incomplete principal-agent relationship.

The choices of GPs to influence the provided health care to patients are dependent on the utility function of GPs. Utility is a theoretical concept that indicates general welfare. We assume that GPs' utility function contains three arguments: medical ethics and guidelines, income and leisure.¹ Medical ethics and guidelines are thought to constrain the trade-off between leisure and income. In agreement with this theory, Domenighetti et al. showed that in an FFS system the use of common surgery services was lower among the most

informed users, the physician-patients, compared with the general population.²⁶ In the Netherlands, most GPs are self-employed and their income depends on the remuneration system applicable.²⁷ The remuneration system is, therefore, thought to be an important element in controlling the provided health care, even though the effects might be limited due to medical ethics and guidelines.

Also, the principal–agent relationship of the patient to the health insurer can be referred to as an incomplete principal–agent relationship, with patients having more information about the needed care than health insurers. Through the elimination of the price mechanism with health insurance, insured patients are thought to demand more health care compared with the uninsured. This is known as moral hazard.²⁸ Two approaches are commonly used to prevent unnecessary demand: 1) introducing cost sharing for services of directly accessible health care providers; and 2) having GPs act as gatekeepers to more specialised and more costly care.¹⁴

Also, the principal–agent relationship of GP to health insurer can be regarded as incomplete. We will not go into further detail about the consequences of the incomplete principal–agent relationship of GP to health insurer, since it is not the focus of this thesis.

The incentives of remuneration systems

As shown in the previous section, GPs' behaviour with regard to provided services is expected to be influenced by the remuneration system applicable. Three main remuneration systems with many combinations are the FFS system (including P4P), the capitation based system and the salary system. In an FFS system, physicians are paid per item or performance. Price and volume in an FFS system are open-ended and transaction costs are high for controlling budgets, billing for individual providers or patients and controlling fraud.²⁹ In a capitation based system, physicians are paid with an annual capitation fee per patient, possibly risk-adjusted. In general, patients have to register with a specific general practice in this system. Also, GPs function as a gatekeeper for specialist care. Capitation is intended to ensure access to primary health care services and to increase the continuity of care for patients. Due to the fixed patient list and the gatekeeper function of GPs, free choice of providers is limited. Transaction costs are lower compared with an FFS system.²⁹ In a salary

system physicians have a fixed salary, mostly dependent on the physician's qualifications and task profiles. A salary system is intended to combine basic income security for physicians and accessibility for patients. Transaction costs are very low in this system, and it is generally easier to keep a tight budget.²⁹ In short, in an FFS system, a clear relationship exists between work performed and income, whereas in a capitation system income is related to the number of registered patients. In a salary system, income is neither directly linked to performed work nor to patient-list size.

In general it is thought that an FFS system encourages GPs to provide services and not to delegate to other health care providers (outside practice), resulting in lower referral rates. Capitation and salary systems are thought to encourage providers to curtail services and more often refer to more specialist health care providers.³⁰⁻³⁴ The effects of these remuneration systems on quality of care are less often discussed. It has been argued that health care providers under a capitation or salary system have few incentives to improve the quality of services, as their payment (per patient) is effectively guaranteed in advance. However, in a capitation system, payment is dependent on the number of patients, with possibilities to switch GP when patients are not satisfied with the provided care; while in an FFS system, providers have an incentive to improve the quality of services as patients may be discouraged to attend a provider if they have experienced inadequate care.³⁵ This only applies to quality of care that is visible to the patient, such as service aspects. However, it has also been suggested that the incentive to provide more services in an FFS system, might come at the expense of quality.³⁶

Studies show that changes in the remuneration system do not necessarily affect the provision of health care, and, when effects are found, these often are limited.³⁷⁻⁴¹ Medical ethics and guidelines in the utility function of GPs might counteract the (large) effects of changes in remuneration.

RESEARCH QUESTIONS

The aim of this study is to investigate the effects of changes in the Netherlands in 2006 in the remuneration system of GPs and cost sharing for patients on aspects of affordability, accessibility and quality of health care.

Affordability

Effects on the affordability of health care are investigated in two ways: by estimating the effect of changes in remuneration on the costs of GP care and by estimating possible substitution effects from secondary to primary care of the modernisation and innovation services and the contribution of primary care nurses.

From the literature it is known that health care costs for general practice exceeded the budget in 2006 and that the spending on GP care increased by 3.1% yearly from 2006 to 2009.^{42,43} Due to the fixed maximum tariffs for most GP-services, this is most likely due to an increase in the volume of provided services. However, it is unknown whether these increases were due to changes in the remuneration system. Therefore, we investigated the effect of changes in the remuneration system on the number of contacts in general practice. The first research question is:

Research Question 1: Did the number of contacts with general practice change due to the alteration in the remuneration system, and if so, in which respect did it change?

Based on the theory on remuneration systems and the specific changes in incentives, we expect that publicly insured patients had a higher increase in contacts initiated by GPs than privately insured patients. For publicly insured patients an FFS system was introduced besides capitations, which is thought to encourage GPs to provide services. The fee for privately insured patients under the new scheme is much lower compared with the payment for privately insured patients before the change in remuneration.

Hypothesis 1: The change from a capitation system for publicly insured patients and an FFS system for privately insured patients to a combined system of

capitation and FFS led to a higher increase in physician-initiated contacts for publicly insured patients compared with privately insured patients.

As an attempt to contain health care costs, the new remuneration system involves elements to encourage substitution from secondary to primary health care by modernisation and innovation services and a new funding system for primary care nurses. Since the introduction of the new funding system for primary care nurses, the number of primary care nurses has shown a rapid growth. In this thesis, we investigate whether these measures resulted in substitution from secondary to primary care. The second question therefore is:

Research Question 2: Did the specific remuneration for modernisation and innovation services and the financing system for primary care nurses result in substitution from secondary to primary care, and if so, to what extent?

We expect both modernisation and innovation services and primary care nurses to have resulted in substitution from secondary to primary health care, since extra payments are thought to encourage GPs not to delegate to other health care providers (outside practice).

Hypothesis 2: Remuneration for modernisation and innovation services resulted in substitution from secondary to primary health care.

Hypothesis 3: The increased number of primary care nurses in general practice resulted in substitution from secondary to primary health care.

Accessibility

In the literature different aspects of accessibility can be distinguished, such as costs, travel distance, waiting time and the degree to which the supply satisfies the demand or the preferences of patients.⁴⁴ In this thesis, accessibility is described by the degree to which patients initiate contacts with their general practice for their complaints and the degree that different types of contacts (home visits, consultation, telephone consultation) are provided to patients.

We investigate whether the abolition of cost sharing for privately insured patients increased accessibility compared with publicly insured patients, and whether

changes in the remuneration system affected the type of contacts provided to patients. Our third and fourth research questions are:

Research Question 3: Has the abolition of cost sharing for privately insured patients increased the accessibility of general practice in terms of the degree to which patients initiate contacts to their general practice, and if so, to what extent?

Research Question 4: To what extent did GPs' contact type change as a result of changes in the remuneration system?

We expect an increase in accessibility of general practice for privately insured patients compared with publicly insured patients. We expect that privately insured patients would have a higher increase in contacts initiated by patients compared with publicly insured patients, as no cost sharing has been in operation after the health insurance reform. With regard to the type of contact, we hypothesise that the proportion of home visits has decreased and the proportion of telephone consultations increased for privately insured patients compared with publicly insured patients. The difference in revenues of GPs for privately insured patients between home visits, consultations and telephone consultations has decreased since the reform. We therefore expect GPs to become less inclined to provide time consuming contact types, such as home visits. For publicly insured patients, an FFS system was introduced, which was expected to make GPs less reluctant to provide patients with time consuming contact types.

Hypothesis 4: Abolition of cost sharing for privately insured patients resulted in a higher increase in patient-initiated contacts compared with publicly insured patients.

Hypothesis 5: As a result of the changes in the remuneration system, the proportion of home visits decreased and the number of telephone consultations increased for privately insured patients compared with publicly insured patients between 2002 and 2008.

Quality

In this thesis, quality of care is operationalised by the degree of guideline adherence and length of consultations. The new remuneration system does not directly intend to influence the quality of care, although some modernisation and innovation services intend to improve the quality of care. As shown in the literature on remuneration, some expect the quality of care to differ depending on the remuneration system. Our fifth research question is:

Research Question 5: Did the quality of care in terms of degree of guideline adherence and length of consultation change due to the alterations in remuneration, and if so, in which respect did they change?

We expect both guideline adherence and consultation length to have increased more for publicly insured patients compared with privately insured patients. Although the remuneration system is not directly linked to quality of care, the expected increase in time-investment for publicly insured patients in terms of contacts (see Hypothesis 1) is thought to improve the quality of care for these patients. And for publicly insured patients, the level of remuneration is dependent on the consultation time since the change in remuneration system, which is thought to encourage longer consultations.

Hypothesis 6: Changes in the remuneration system led to an increase in guideline adherence for publicly insured patients compared with privately insured patients

Hypothesis 7: As a result of the changes in the remuneration system, the consultation length increased more for publicly insured patients compared with privately insured patients.

In sum, we expected the changes in remuneration to have affected the affordability, accessibility and quality of care. The degree of change is expected to be limited since medical ethics and guidelines are thought to counteract large differences in the provision of health care.

STUDY DESIGN AND DATA

As shown by several reviews, research on remuneration systems that satisfy high methodological standards and criteria is scarce.^{7,31} Often, randomised trials are not suitable for investigating changes in remuneration systems, since physicians may be reluctant to take part in a study which might decrease their income. Also, changes in remuneration often affect the whole population with, as a consequence, no control group with which to compare changes. Therefore, available research is predominantly based on natural experiments which occur relatively seldom. The changes in the GPs' remuneration system and patients' cost sharing in the Netherlands provide a unique opportunity to investigate changes in remuneration and cost sharing on affordability, accessibility and quality of care.

Study design

We used a difference-in-difference approach to answer research questions about the effects of changes in the remuneration system for publicly and privately insured patients (Research Questions 1, 3, 4 and 5). For these research questions, we could identify a treatment (privately insured) and a control group (publicly insured) as well as a treatment (post 2006) and a control (pre 2006) period. The use of a difference-in-difference approach means that both group-specific factors (differences between publicly and privately insured patients – see Textbox 1.1) and time-specific factors are controlled for, thus revealing the effect of the change in remuneration.

To study the possible substitution effects of the modernisation and innovation services, we cross-sectionally analysed the extent to which GPs refer fewer patients to hospital care when they perform more modernisation and innovation services.

To investigate the possible substitution effects of the contribution of primary care nurses, we analysed whether possible changes in the referral rate for hospital treatment for type II diabetes mellitus patients between 2004 and 2006 were due to the contribution of primary care nurses in general practice.

Textbox 1.1: Differences between publicly and privately insured patients

Publicly and privately insured patients showed clear difference in their socio-demographic characteristics, health status and their health care utilisation. Publicly insured patients had a lower level of education, income and were generally more often aged 25–44 years or 65 years and older compared with privately insured patients. In terms of health status, more privately insured patients reported having a good health status than publicly insured patients.⁴⁵ Publicly insured patients more often presented health complaints in general practice, had more chronic diseases and more often had restrictions in daily functioning.^{45,46} With regard to their health care utilisation in general practice, publicly insured patients had more contacts and more often had prescriptions than privately insured patients, but no differences were found in the percentage of contacts in which a referral was made.^{45,46} The average consultation time was slightly longer for privately insured patients, although these differences were not statistically significant.⁴⁷

Data

For this study, longitudinal data were used from EMRs from general practices participating in LINH from 2002 to 2008.² The LINH database holds longitudinal data on contacts, morbidity, prescriptions and referrals of around 90 general practices and 350,000 patients derived from EMRs. Diagnoses are coded using the ICPC classification (International Classification of Primary Care).⁴⁸ The network is a dynamic pool of practices, with yearly changes in composition. Overall, GPs that participate in LINH are representative of the Dutch GP population with respect to age, gender, period of settlement, region and urbanisation, but not with respect to practice type (single handed, duo, group or health centre). The LINH database holds more data from GPs in a group or health centre than single handed GPs. LINH is registered with the Dutch Data Protection Authority; data are handled according to the data protection guidelines of the authority.

OUTLINE OF THESIS

Chapters 2 to 6 will answer the research questions. In Chapters 2 and 3 we investigate whether modernisation and innovation services and the contribution

of primary care nurses resulted in substitution from secondary to primary care. Chapter 2 demonstrates whether or not the modernisation and innovation service 'minor surgery' was associated with fewer referrals to secondary care. Chapter 3 reports the effect of primary care nurses on the referral rate for specialist treatment for type II diabetes patients. Chapter 4 describes the effect of changes in remuneration and cost sharing on the number of contacts, distinguishing patient-initiated and physician-initiated contacts. It answers the questions as to whether the number of contacts initiated by GPs has changed due to the remuneration system and whether accessibility has changed since the abolition of cost sharing for privately insured patients. Chapter 5 reports the effect of changes in the remuneration system on the type of contact and length of consultation. In Chapter 6, we show whether or not adherence to the guidelines has changed due to the alterations in the remuneration system. The final chapter, Chapter 7, presents a summary and a discussion of the results of our study.

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Minor surgery in general practice and effects on referrals to hospital care: Observational study

2



Background

Strengthening primary care is the focus of many countries, as national health care systems with a strong primary care sector tend to have lower health care costs. However, it is unknown to what extent general practitioners (GPs) that perform more services generate fewer hospital referrals. The objective of this study was to examine the association between the number of surgical interventions and hospital referrals.

Methods

Data were derived from electronic medical records of 48 practices that participated in the Netherlands Information Network of General Practice (LINH) in 2006-2007. For each care episode of benign neoplasm skin/nevus, sebaceous cyst or laceration/cut it was determined whether the patient was referred to a medical specialist and/or minor surgery was performed. Multilevel multinomial regression analyses were used to determine the relation between minor surgery and hospital referrals on the level of the general practice.

Results

Referral rates differed between diagnoses, with 1.0% of referrals for a laceration/cut, 8.2% for a sebaceous cyst and 10.2% for benign neoplasm skin/nevus. The general practices performed minor surgery for a laceration/cut in 8.9% (SD:14.6) of the care episodes, for a benign neoplasm skin/nevus in 27.4% (SD:14.4) of cases and for a sebaceous cyst in 26.4% (SD:13.8). General practices that performed more minor surgery interventions had a lower referral rate for patients with a laceration/cut (-0.38; 95%CI:-0.60- -0.11) and those with a sebaceous cyst (-0.42; 95%CI:-0.63- -0.16), but not for people with benign neoplasm skin/nevus (-0.26; 95%CI:-0.51-0.03). However, the absolute difference in referral rate appeared to be relevant only for sebaceous cysts.

Conclusions

The effects of minor surgery vary between diagnoses. Minor surgery in general practice appears to be a substitute for specialist medical care only in relation to sebaceous cysts. Measures to stimulate minor surgery for sebaceous cysts may induce substitution.

2 Minor surgery in general practice and effects on referrals to hospital care: Observational study

Van Dijk CE, Verheij RA, Spreeuwenberg P, Groenewegen PP, De Bakker DH. Minor surgery in general practice and effects on referrals to hospital care: Observational study. BMC Health Services Research 2011; 11:2.

BACKGROUND

International comparative research shows that health care systems with a strong primary care orientation tend to have lower health care costs.¹ In the last years, strengthening of primary care is the focus of several countries.² In a recent report of the World Health Organisation (WHO) the importance of primary health care was emphasized.³ Examples of countries with a strong primary care system are the UK, the Netherlands and Scandinavian countries. In these countries, general practitioners (GPs) function as a gatekeeper to other health care providers and they decide on whether or not to refer patients for hospital treatment. Research also shows that within these countries, there is a great variation in GP referral rates.^{4,5} A reason for this variation could lie in the variation in therapeutic services performed by the GPs themselves, such as minor surgery and cyriax injections. However, little is known about the effects of GP services on referral behaviour. In this paper, we will investigate whether GPs that perform more therapeutic services, generate lower hospital care costs, i.e. lower referral rates.

Research that focuses on the effects of the numbers of GP services on referral behaviour is scarce and the results are inconsistent.⁶ In Denmark, Krasnik et al. found a decrease in the number of referrals when there was an increase in the number of GP services (after the introduction of a payment for specific services).⁷ In the Netherlands, Groenewegen found cross-sectional associations between performed services and referrals, (more services were associated with fewer referrals). This evidence was in relation to therapeutic services, such as stitching an open wound or incising an abscess, but not for diagnostic services or removal of cysts.⁸ In comparison, in the UK, Lowy et al. found no reduction in the number of referrals with an increase in minor surgery services after the introduction of a reimbursement system for minor surgery.⁹ However, these

studies date back to 1990, and they did not take into account clustering of data within practices or analysed effects on aggregated level and they did not distinguish between diagnoses. All these factors could affect the applicability of these effects in relation to the current situation.

The purpose of this paper is to examine whether GPs do refer fewer patients to hospital care when they perform more therapeutic services. The study will undertake this investigation in relation to separate diagnoses and will correct for the clustering of general practices. It will focus on minor surgery for dermatological problems. These problems represent one of the most common reasons for GP consultations and referrals to specialist care.^{10,11} The following questions will be answered: To what extent do GPs refer fewer patients to hospital care when they perform more minor surgery? How do these rates of referral vary between specific diagnoses? Which factors influence this association?

METHODS

Data were used from electronic medical records (EMRs) from general practices that participated in the Netherlands Information Network of General Practice (LINH).¹¹ The LINH database holds longitudinal data on morbidity, prescriptions and referrals. Diagnoses are coded using the ICPC classification (International Classification of Primary Care).¹² The network is a dynamic pool of practices, with yearly changes in their composition. The effect of minor surgery in general practice on referrals was analysed using 2006 and 2007 data. Medical ethical approval was not required for this research.

Episodes of care were defined as the unit of analysis. An episode of care includes 'all encounters for the management of a specific health problem'.¹³ For example, if a patient consulted the GP for sebaceous cysts at visit 1 and the patient was treated via surgery at visit 2, both visits are included in the episode of care. Episodes were constructed with the aid of EPICON, an algorithm to group ICPC-coded contact records from EMRs in general practice into episodes of care.^{14,15} The effect of minor surgery on referral was analysed for four different diagnoses. These diagnoses represent the top four most frequently observed

diagnoses for minor surgery: laceration/cut, neoplasm skin benign/unspecified, nevus/mole and sebaceous cyst. The difference between the diagnosis neoplasm skin benign/unspecified and nevus/mole is not clear-cut. GPs can record a mole as nevus/mole and as neoplasm skin benign/unspecified, and therefore, the included complaints and GPs' decision making process were expected to be similar in both diagnoses. For this reason, these diagnoses were grouped into one category: benign neoplasm skin/nevus.

Data were used from 48 general practices with complete data on the registration of care episodes,¹⁶ claimed services, referrals and number of GPs (whole time equivalents (WTE)) working in the practice in 2006 and 2007. These practices form a representative sample of Dutch general practices with regard to practice type (solo, duo, group or health centre), degree of urbanisation and location (province). From these practices, patients (whose age and gender were known), who were undergoing certain care episodes, were identified; these care episodes were laceration/cut (ICPC: S18), benign neoplasm skin/nevus (S79/S82) or sebaceous cyst (S93). After the inclusion criteria, a total of 14203 patients and 15923 care episodes were included in the analyses.

Measurements

For each care episode, GPs had three options: (I) to do nothing, i.e. no referral or minor surgery, (II) to perform minor surgery and (III) to refer patients to a medical specialist.

Referrals

Each episode was typed as 'referred' or 'not referred', dependent on whether a new referral had been issued in any of the contacts within this episode of care. Only referral to dermatology, surgery and plastic surgery were included.

Minor surgery

Each episode was typed 'minor surgery' or 'not minor surgery' dependent on whether or not minor surgery had been claimed in any of the contacts with this episode of care.

Covariates influencing the association

Distance to hospital

For each patient, distance to the closest hospital by road was assessed on the basis of postal codes. For a patient, the distance to the closest hospital might influence the association between minor surgery and referral rate to specialist care, since GPs might be more reluctant to refer patients living further away from a hospital.⁴

Primary care nurse

The presence of a primary care nurse might influence the time available to perform minor surgery. GPs in a practice with a primary care nurse could delegate more tasks and therefore, have more time for minor surgery. Also, specialised primary care nurses may sometimes perform or assist with minor surgery.

GPs' workload

GPs' workload might negatively affect the number of minor surgery interventions. GPs' workload was defined as the weighted number of short and long consultations (weight of 1 and 2) and short and long home visits (weight of 1.5 and 2.5) per WTE GP working in the practice divided by 1000. As most of the GPs in this study (and in the Netherlands as a whole) are self-employed, we used a self-report of WTE; A whole working week is set at 5 days each consisting of two parts (morning and afternoon). GPs were asked to report the number of day parts they work in the practice.

In addition to factors that might influence the association between minor surgery and referral rate to specialist care, patients' age and gender were also taken into account.

Statistical analyses

To analyse the effect of minor surgery on referral behaviour in general practice, multilevel multinomial regression analyses were conducted comparing three groups: (I) no referral or minor surgery, (II) minor surgery and (III) referral to dermatology, surgery or plastic surgery. Minor surgery (II) and referral to medical specialist (III) were regarded as treatment groups and were compared to 'no referral or minor surgery' (I). In the multilevel analyses two levels were

distinguished: care episodes within general practices. No separate level for patients was discerned because very few patients had more than one episode of care. For these diagnoses, 5.4% to 9.2% of the patients had more than one episode.

For each diagnosis group, multilevel multinomial regression analysis was performed in two steps. In step one, crude multilevel multinomial regression analyses were performed with no covariates taken into account. In step two, covariates were added to the model to correct for differences in the practice population (age and gender) and assess the effect of the addition of factors. On the general practice level the influence of the general practice on the use of the therapy group is measured using per therapy group variances and a covariance between the therapy groups. Based on these variances and covariance we can measure the correlation, which represents the association between minor surgery and referrals at the general practice level. A negative correlation indicates that general practices that perform more minor surgery refer fewer patients. It is important to notice that this correlation is corrected for the covariates in the model. The general practice effects for minor surgery and referral are estimated by the model as two normally distributed variables (logit scale) with a mean (intercept) and a variance (sum of the general practice variance and covariance associated with that variable). To illustrate how the change in minor surgery leads to a change in referrals, we further analysed the correlation derived from the multilevel multinomial regression analyses using the following formula $(Y - Y_{\text{mean}})/SD_Y = r * (X - X_{\text{mean}})/SD_X$. Y is referral and X is minor surgery value (on the logit scale), SD is the standard deviation calculated as the square root from the sum of the variance and covariance (at the general practice level), and r is the correlation. After transforming the values back to the probability scale we can see how much percentage of change in referral is associated with percentage change in minor surgery. It is crucial to notice that this relation on the probability scale is nonlinear. This means (assuming a negative correlation) that if the referrals would change from 5% to 7% the minor surgery could go down with say 1.5%, but if the referrals would change from 1% to 3% the minor surgery could go down 0.5%. In addition, intraclass correlations (ICC's) and a 95% range on general practice level (intercept plus and minus 1.96 times the square root of the between practice variation and transformed back from a logit scale) were calculated for all outcome measures. The association

between the covariates and the two therapy groups is expressed using odds ratios (OR) and 95% confidence intervals (CI). The models were estimated using multilevel multinomial regression analyses, for unordered categories, with PQL (penalised quasi-likelihood), first order and constrained level I variance (MLwiN 2.02).

RESULTS

Table 2.1 describes the patient and practice characteristics. Patients with care episodes of laceration/cut, benign neoplasm skin/nevus or sebaceous cyst had a mean age of 39 years (SD:21.4). On average, patients were living 8187 (SD:6452) metres away from a hospital. Almost two thirds of the general practices had a primary care nurse working in the practice. General practices performed minor surgery in 8.9% (SD:14.6) of the care episodes with laceration/cut. This was 27.4% (SD:14.4) for benign neoplasm skin/nevus and 26.4% (SD:13.8) for sebaceous cyst. The referral rate differed strongly between the diagnoses. For care episodes with a laceration/cut, 1.0% of the patients were referred to hospital care, whereas this was 10.2% for benign neoplasm skin/nevus and 8.2% for sebaceous cyst.

Table 2.1: Patient and practice characteristics

Patient level (n=14203)	
Distance to hospital (kilometres) ¹	8.19 (SD: 6.45)
Age (years) ¹	39.2 (SD: 21.4)
Gender ²	
Male	6908 (48.6%)
Female	7295 (51.4%)
Practice level (n=48)	
Primary care nurse ²	
Yes	29 (60.4%)
No	19 (39.6%)
Workload GP (consultation units/WTE/1000) ¹	6.32 (SD: 1.41)

¹ Mean (SD); ² Number (%).

Table 2.2 shows the referral rate for episodes with and without minor surgery. In general, referral rates were lower in care episodes in which minor surgery was performed. For laceration/cut, only 0.7% of the cases with minor surgery had a referral to a medical specialist. For benign neoplasm skin/nevus and sebaceous cysts, this was 2.4% and 2.2%, respectively. Without minor surgery, referral rates were much higher, especially for benign neoplasm skin/nevus and sebaceous cyst with a referral rate of 13.3% and 10.6%, respectively. These results suggest that minor surgery indeed substituted for referrals. However, these results might also reflect differences in severity. For severe complaints, patients will probably be directly referred to the medical specialist. And for minor complaints, it is likely that no referral or minor surgery will be performed. Therefore, these results could be biased by the type of laceration/cut, sebaceous cysts or benign neoplasm skin/nevus which patients present to GPs. To take this into account, we analysed the effects of minor surgery on referral rate on the level of the general practice. Since, laceration/cuts, sebaceous cysts and benign neoplasm skin/nevus are common complaints we expected the severity of the cases to be equally spread over the practices.

Table 2.2: Number of care episodes with and without minor surgery with the percentage (standard deviation) of referrals

	Minor surgery in disease episode			
	No		Yes	
	Number of care episodes	Percentage of referrals	Number of care episodes	Percentage of referrals
Laceration/cut	4440	1.1	815	0.7
Benign neoplasm skin/nevus	5373	13.3	2177	2.4
Sebaceous cyst	2220	10.6	899	2.2

Relationship between percentage of minor surgery and referrals

Table 2.3 shows the results of the multilevel multinomial regression analyses for each diagnosis group. Since our model divided the care episodes in (I) no referral or minor surgery, (II) minor surgery or (III) referral, care episodes with both minor surgery and referral (see Table 2.2) were excluded from the multilevel multinomial regression analyses.

Results show that minor surgery is more often performed in older patients for all diagnosis groups. There is no age effect on referrals, except for benign neoplasm skin/nevus (0.99;CI:0.99-1.00). For benign neoplasm skin/nevus, minor surgery is more often performed in older patients and fewer of them are referred. The presence of a primary care nurse only affects the number of minor surgery interventions for benign neoplasm skin/nevus (1.49;CI:1.06-2.09). Women have a smaller likelihood of minor surgery (0.62;CI:0.53-0.73) and a smaller likelihood of referral (0.76; CI:0.58-0.99) for sebaceous cysts. So, it seems that for sebaceous cysts, males rather than females more often receive treatment in the form of minor surgery or referral.

Table 2.3 also shows the correlation between minor surgery intervention and referrals to a medical specialist at general practice level. There is a significant negative correlation for laceration/cut (-0.38;CI:-0.599 - -0.108) and sebaceous cyst (-0.42;CI:-0.629- -0.16), but not for benign neoplasm skin/nevus (-0.26;CI:-0.506-0.03). This means that for laceration/cut and sebaceous cyst care episodes, general practices that perform more minor surgery refer fewer patients to a medical specialist. The correlations were affected by the addition of the covariates. To look into the effects of the separate covariates on the correlations between minor surgery intervention and referrals to a medical specialist at general practice level for laceration/cut and sebaceous cyst, analyses were performed with and without the covariates included in the analyses. The presence of a primary care nurse and GPs' workload affected the correlation negatively, i.e. the correlation showed a higher negative correlation when these variables were included in the analyses. In addition, distance to hospital affected the correlation for laceration/cut positively, i.e. addition of the factor showed a correlation closer to zero, and thereby explained part of the relation. Age and gender hardly affected the correlation between minor surgery and referral rate.

Table 2.3: Multilevel multinomial regression analyses for minor surgery and referral in comparison to no treatment*

	Laceration/cut				Benign neoplasm skin/nevus			
	Empty model		Adjusted model		Empty model		Adjusted model	
	Minor surgery	Referral	Minor surgery	Referral	Minor surgery	Referral	Minor surgery	Referral
	Intercept (SE)	Intercept (SE)	Intercept (SE)	Intercept (SE)	Intercept (SE)	Intercept (SE)	Intercept (SE)	Intercept (SE)
	-2.18 (0.18)	-4.74 (0.22)	-2.05 (0.15)	-4.82 (0.23)	-0.94 (0.12)	-2.01 (0.13)	-0.80 (0.10)	-1.82 (0.12)
	-10.2%	-0.9%	11.4%	0.8%	28.1%	11.8%	31.0%	13.9%
	OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)	
Gender, female			0.85 (0.72-1.01)	1.23 (0.68-2.20)			0.94 (0.85-1.05)	1.13 (0.96-1.33)
Age			1.01 (1.01-1.01)	1.01 (1.00-1.02)			1.01 (1.01-1.01)	0.99 (0.99-1.00)
Distance to hospital			1.00 (1.00-1.00)	1.00 (1.00-1.00)			1.00 (1.00-1.00)	1.00 (1.00-1.00)
Primary care nurse			1.69 (0.96-2.99)	1.66 (0.64-4.28)			1.49 (1.06-2.09)	1.43 (0.93-2.18)
Workload			1.00 (1.00-1.00)	1.00 (1.00-1.00)			1.00 (1.00-1.00)	1.00 (1.00-1.00)
	Variance (SE)		Variance (SE)		Variance (SE)		Variance (SE)	
Between GP practice variance	1.25(0.30)	0.76 (0.41)	0.80 (0.21)	0.74 (0.40)	0.57 (0.13)	0.67 (0.16)	0.40 (0.09)	0.51 (0.13)
Covariance	-0.26 (0.27)		-0.29 (0.22)		0.11 (0.10)		-0.12 (0.08)	
	Correlations		Correlations		Correlations		Correlations	
Correlation GP practice variances								
'therapy groups' ^a	-0.27 (-0.51-0.02)		-0.38 (-0.60-0.11)		0.18 (-0.44-0.11)		-0.26 (-0.51-0.03)	
ICC	27.5	18.7	19.6	18.3	14.9	16.8	10.8	13.5
95% range on GP practice	1.6-44.3%	0.2-3.4%	3.1-34.4%	0.2-2.9%	7.2-66.3%	2.3-43.1%	13.7-55.9%	4.5-35.5%

* Based on multilevel multinomial regression analyses for minor surgery and referral rate in comparison to no treatment in care episodes of laceration/cut, benign neoplasm skin/nevus and sebaceous cyst.

^a This is the correlation between the variances of the two defined therapy groups (minor surgery and referral) at GP level.

^b Because we used nominal data the variance at the lowest level (episodes) is not determined but given by $\pi^2/3$.

^c Calculated by intercept plus and minus 1.96 times the square root of the between practice variation and transformed back from a logit scale.

Continued

Table 2.3: Multilevel multinomial regression analyses for minor surgery and referral in comparison to no treatment*

	Sebaceous cyst			
	Empty model		Adjusted model	
	Minor surgery	Referral	Minor surgery	Referral
	Intercept (SE)		Intercept (SE)	
	-0.87 (0.09)	-2.26 (0.12)	-0.89 (0.09)	-2.26 (0.12)
	29.5%	9.4%	29.1%	9.4%
	OR (95% CI)			
Gender, female			0.62 (0.53-0.73)	0.76 (0.58-0.99)
Age			1.00 (0.99-1.01)	1.00 (0.99-1.01)
Distance to hospital			1.00 (1.00-1.00)	1.00 (1.00-1.00)
Primary care nurse			1.03 (0.71-1.49)	1.32 (0.80-2.18)
Workload			1.00 (1.00-1.00)	1.00 (1.00-1.00)
	Variance (SE)		Variance (SE)	
Between GP practice variance	0.32 (0.09)	0.38 (0.14)	0.27 (0.08)	0.33 (0.13)
Covariance	-0.11 (0.08)		-0.13 (0.07)	
	Correlations		Correlations	
Correlation GP practice variances 'therapy groups' ^a	-0.31 (-0.55 - -0.03)		-0.42 (-0.63 - -0.16)	
ICC	8.7	10.3	7.7	9.2
95% range on GP practice	14.6-49.3%	3.6-22.4%	16.5-46.1%	4.2-20.0%

* Based on multilevel multinomial regression analyses for minor surgery and referral rate in comparison to no treatment in care episodes of laceration/cut, benign neoplasm skin/nevus and sebaceous cyst.

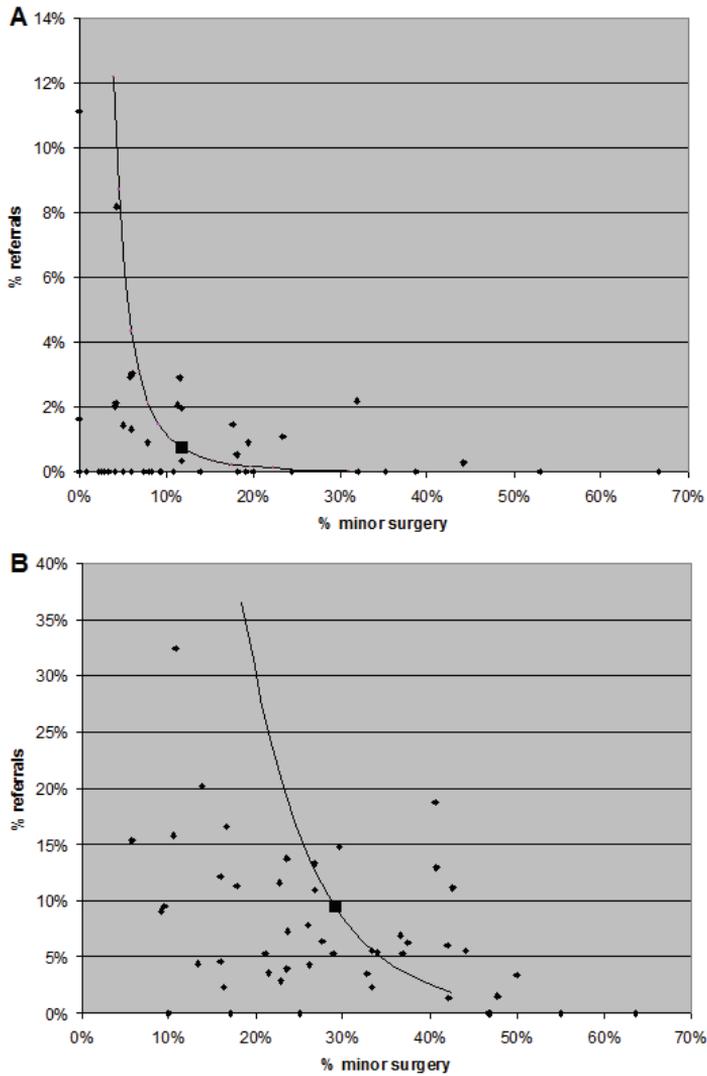
^a This is the correlation between the variances of the two defined therapy groups (minor surgery and referral) at GP level.

^b Because we used nominal data the variance at the lowest level (episodes) is not determined but given by $\pi^2/3$.

^c Calculated by intercept plus and minus 1.96 times the square root of the between practice variation and transformed back from a logit scale.

To illustrate the clinical relevance of these differences, Figure 2.1 shows the absolute percentage of minor surgery interventions and referrals for care episodes of laceration/cut and sebaceous cyst. The 'dot' in the figure represents the average general practice. The correlations for laceration/cut and sebaceous cyst are similar; however, the size of the absolute effect differs. For the average general practice, performing minor surgery in 5% more of the care episodes of laceration/cut (from 11.4% to 16.4%), changes the referral rate from 0.8% to 0.3%. In comparison, in care episodes of sebaceous cysts, 5% more minor surgery interventions (from 29.1% to 34.1%) changes the referral rate from 9.4% to 5.1%. These results are based on association, and therefore, conclusion about cause-effect relationships can not be made.

Figure 2.1: Relation between minor surgery interventions and referral rate on the level of general practice*



- ◆ Represents 'real' general practices, the line represents the model (outcome multilevel multinomial regression analyses), and
 - dot represents the average general practice in this model.
- * Results based on the calculated correlations between minor surgery intervention and referral rate in general practice in multilevel multinomial regression analyses for care episodes of laceration/cut (A) and sebaceous cyst (B).

DISCUSSION

Our findings indicate that the effects of minor surgery performed in general practice on the rate of referral to hospital care varied by diagnosis. Minor surgery was associated with fewer referrals to hospital care for sebaceous cysts and laceration/cuts, but not for benign neoplasm skin/nevus. However, the absolute difference in referral rate appeared to be only relevant for sebaceous cysts. For laceration/cuts, referral rates were generally low, in absolute terms, with a mean of 1%, whereas for sebaceous cysts the mean referral rate was 8.2%. If an average general practice performed 5% more minor surgery interventions in cases of sebaceous cysts, this would lead to a lowering of the referral rate of 4.3%.

Previous research is inconsistent with respect to effects of services provided in general practice on referrals to medical specialists. Krasnik et al.,⁷ Groenewegen⁸ and Fleming¹⁷ found an effect of (specific) GP interventions on the chance of referrals, whereas Lowy et al.⁹ found no reduction in the chance of referrals, with an increase in minor surgery interventions. Our study found an effect of minor surgery on the number of referrals in two out of three diagnosis groups, and showed that effects on referrals were diagnosis specific. This variation in outcome between these studies may be caused by methodological differences. For example, Lowy et al. did not distinguish between diagnoses. Krasnik et al. and Fleming analysed the total contact and referral rates, without distinguishing between specific services or diagnoses. Groenewegen distinguished different services and diagnoses but this study was based on a limited number of care episodes.

The only relevant association between the number of minor surgery interventions performed in a practice and the chance of referral was found for sebaceous cysts. Performing more minor surgery for laceration/cuts and benign neoplasm skin/nevus in the general practice did not have a (large) effect on the change of referral. What are the reasons for this difference between diagnoses?

For laceration/cuts, the magnitude of the correlation was in the same order as care episodes of sebaceous cysts. However, the absolute change in referral rate was small. This was due to the low overall referral rate for laceration/cuts.

Mostly, GPs will see non-urgent problems, because usually, patients with serious lacerations/cuts will go directly to hospital emergency departments. Therefore, the overall referral rate for laceration/cuts is low, namely 1.0%.

On the other hand, referral rates for benign neoplasm skin/nevus are high, with an average of 10.2% and minor surgery is often performed for this diagnosis. So, in care episodes of benign neoplasm skin/nevus, enough room exists for improvement, but still no effect was found. The reason for this could be that the treatment for sebaceous cysts is more straightforward than for benign neoplasm skin/nevus. This is supported by the smaller variation in referral rates between practices (see Table 2.3). There is less professional uncertainty in the treatment of sebaceous cysts than for neoplasm skin/nevus.¹⁸ Sebaceous cysts hardly ever become malign, whereas research has reported that approximately 25% of melanomas are historically associated with a pre-existing nevus.¹⁹ In addition, research has shown that GPs do not always recognise skin malignancies, or inadequately excise neoplasm of the skin.²⁰⁻²² More often than not, GPs will perform minor surgery for benign neoplasm without suspicion of malignancies. This is also the case where no referral is needed. So, minor surgery is probably mostly performed for cases of benign neoplasm skin/nevus where no room for improvement in referral rate exists. In the case of sebaceous cysts, risks are lower and therefore, room for improvement in terms of referral rate to medical specialist is present.

For sebaceous cysts, males rather than females more often receive treatment in the form of minor surgery or referral. An explanation could lie in the GP visiting behaviour of women with sebaceous cysts. Woman could visit the GP more frequently for aesthetic reasons, when treatment is not necessary. However, incidence rate did not differ between men and women, and therefore, does not confirm this explanation.

Policy relevance

Theoretically, performing five more minor surgery interventions per 100 care episodes would result in 4.3 fewer referrals for sebaceous cysts. In the Netherlands, the fee for minor surgery ranges from €51 to €76.5 in general practice and €136.50 to €458.05 in hospital settings. So, five more minor surgery interventions would cost €255 - €382.5 and save €587-€1969.6. In the UK,

National Health Service (NHS) reference costs of minor surgery in general practice is £449.74 (SD:47.74) and £1222.24 (SD:23.24) for minor surgery in hospital care settings.²³ In the UK, an increase of 5% in GP minor surgery interventions for sebaceous cysts would result in a saving of about £3000. These calculations are based on a business-cost perspective and do not include potential consequences from diagnostic error from a societal perspective nor does it include indirect costs. However, it should be noted that performing minor surgery requires specific skills, which will not be present in all GP surgeries. So, stimulating GPs to perform more minor surgery may lead to an increase in general practices that already perform more minor surgery interventions, and where the monetary gain is much less than in the average general practice. Further, it should be mentioned that treating patients in general practice has additional advantages, over hospital settings, in terms of travel time and continuity of care. Another option to save resources could be to organize joint courses on the workplace, thereby improving alliance between GPs and hospital specialists, and improving minor surgery in primary care. A review of Akbari et al. showed that active local educational interventions involving secondary care specialists can impact on referral rates.²⁴

Strengths and limitations of the study

This study was based on a large dataset representing GP data relating to consultations, morbidity and referrals based on EMRs. This enabled us to analyse the effect of minor surgery on referrals for specific diagnosis groups and correct for the clustering of referrals within practices using multilevel analysis. However, our study has some limitations. First, only data were available on minor surgery for which money was claimed and not on minor surgery actually performed. GPs might perform more minor surgeries for which no money is claimed. This may have affected the associations in both directions. In addition, the severity of the episodes was unknown and may have influenced the association between minor surgery and referrals. We tried to solve this by determining the correlation between minor surgery and referrals on the level of the general practice, with the assumption that the severity of care episode did not differ between the practices. On average 65 (sebaceous cyst) to 157 (benign neoplasm skin/nevus) care episodes occurred per practice per year, which, it is suggested, should be enough to level out differences in severity.

Conclusions

Our study shows that the effect of minor surgery on the chance of referral was diagnosis specific. Patients with sebaceous cysts had a lower chance of referral if general practices perform more minor surgery. No (great) effects of minor surgery were found for benign neoplasm skin/nevus and lacerations/cut. Encouraging GPs to perform more minor surgery interventions for patients with sebaceous cysts has the potential to prevent specialist referrals and cost reduction. Future research is required to explore the cost-effectiveness of minor surgery in detail.

Acknowledgements

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Primary care nurses: effects on secondary care referrals for diabetes

3



Background

Primary care nurses play an important role in diabetes care, and were introduced in general practice partly to shift care from hospital to primary care. The aim of this study was to assess whether the referral rate for hospital treatment for diabetes type II (T2DM) patients has changed with the introduction of primary care nurses, and whether these changes were related to the number of diabetes-related contacts in a general practice.

Methods

Health care utilisation was assessed for a period of 365 days for 301 newly diagnosed and 2124 known T2DM patients in 2004 and 450 and 3226 patients in 2006 from general practices that participated in the Netherlands Information Network of General Practice (LINH). Multilevel logistic and linear regression analyses were used to analyse the effect of the introduction of primary care nurses on referrals to internists, ophthalmologists and cardiologists and diabetes-related contact rate. Separate analyses were conducted for newly diagnosed and known T2DM patients.

Results

Referrals to internists for newly diagnosed T2DM patients decreased between 2004 and 2006 (OR: 0.44; 95%CI: 0.22-0.87) in all practices. For known T2DM patients no overall decrease in referrals to internists was found, but practices with a primary care nurse had a lower trend (OR: 0.59). The number of diabetes-related contacts did not differ between practices with and without primary care nurses. Cardiologists' and ophthalmologists' referral rate did not change.

Conclusions

The introduction of primary care nurses seems to have led to a shift of care from internists to primary care for known diabetes patients, while the diabetes-related contact rate seems to have remained unchanged.

3 Primary care nurses: effects on secondary care referrals for diabetes

Van Dijk CE, Verheij RA, Hansen J, Van der Velden L, Nijpels G, Groenewegen PP, De Bakker DH. Primary care nurses: effects on secondary care referrals for diabetes. *BMC Health Services Research* 2010; 10:230.

BACKGROUND

Primary care nurses have established their position in general practice in several countries in the last decades. They play an increasingly important role in the care of type 2 diabetes (T2DM) patients, and in health promotion and routine management of these patients.¹⁻³ In the United Kingdom, Sweden and Finland, where nurses have traditionally been involved in primary care, their roles have widened in the last decade,⁴⁻⁶ and in countries with no tradition of nurses in general practice, like the Netherlands and Australia, nurses have been gradually introduced.^{7,8} The introduction or extension of the tasks of primary care nurses can be stimulated by the introduction of new contracts and regulations by governments. Three examples of countries where new contracts and regulation for primary care nurses were implemented are the United Kingdom, Australia and the Netherlands. In the United Kingdom, the introduction in 2004 of the Quality and Outcomes Framework (QOF) within the New General Medical Services Contract has resulted in an extension of the activities of primary care nurses in the management of chronic illnesses such as asthma and diabetes.^{5,9}

In Australia, the introduction of the Practice Incentives Program (PIP) with the Practice Nurse Incentive (PNI) in 2001 has encouraged general practices in rural and remote areas to employ primary care nurses. Primary care nurses must be engaged in a variety of activities including patient education, acute and chronic disease management, diagnostic services and clinical data management.^{10,11}

In the Netherlands, primary care nurses were introduced in the late nineties and were predominantly involved in care for chronically ill patients. Initially the increase in the number of primary care nurses was gradually and stopped when part of health insurance companies stopped providing new contracts for primary care nurses in 2004 (Appendix 3.1). In 2006 new contracts were provided again

and the funding system altered. Care provided by primary care nurses is funded from consultation fees equal to those of GPs whereas before 2006 primary care nurses were only funded from with a small supplement on the capitation fee for publicly insured patients (67% of the population). These measures have probably been the driving force behind the growth in primary care nurses in general practice between 2003 and 2007.

Reasons for stimulating the role of nurses can be found in the increasing demand for primary care services, combined with concerns about the supply of physicians and the increased pressure to contain costs.^{2,12} Higher demand for primary care services is the result of an ageing population, rising patient expectations, a growing number of chronically ill patients and the desire to shift care from hospital to primary care.^{12,13} Literature suggests that in general primary care nurses provide the same quality of care as general practitioners (GPs),^{5,12-16} but have not resulted in a lower workload for GPs.¹⁷ Primary care nurses seem to have strengthened primary care, especially for chronically ill patients. However, primary care costs have increased. These extra costs may be justified if the introduction of primary care nurses would result in a shift of care from hospital care to general practice, i.e. substitution, or has improved the quality of care. The Dutch situation provides a good test case for this hypothesis for diabetes type 2 (T2DM) patients since primary care nurses have been providing care to T2DM patients since the introduction.

Sibbald et al. (2004) stated in their review that changing workforce skill-mix is one strategy to improve the effectiveness and efficiency of health care.¹⁸ Changes in skill-mix may be brought about through enhancement, substitution, delegation or innovation. Research on substitution in general is, however, restricted to effects within primary care, and no previous research has addressed the possible effects of primary care nurses in terms of shifting care from hospital care to general practice.¹⁹

Since GPs act as gatekeepers in the Dutch health care system, referral rates can be used to measure substitution. The first research question to be answered is:

Did the referral rate for hospital treatment change for T2DM patients between 2004 and 2006 with the introduction of primary care nurses in general practice?

The years 2004 and 2006 were chosen since the increase in the number of primary care nurses working in general practice occurred in this timeframe, which enables us to compare practices with and without primary care nurses. The effect of the introduction of primary care nurses was expected to be different for internists, cardiologists, ophthalmologists, and mental health care. We expected the referrals to internists and cardiologists to be reduced with the introduction of primary care nurses, since primary care nurses generally follow the guidelines and generally provide more repeat consultations, which may result in better quality of care.^{12,20} Possible complications and comorbid conditions would be detected earlier and would be managed more often within general practice. Mental health care was included, since T2DM patients appeared to have a higher change of depression.²¹ For referrals to mental health care, our hypothesis was that patients within a practice with primary care nurses would be less often referred to mental health care since primary care nurses' consultation time is generally longer than that of GPs,¹² which could influence time involved in social support in the management of T2DM. Regarding the use of care by ophthalmologists an opposite effect was expected, since guidelines recommend yearly referral of T2DM patients to ophthalmologists for eye fundus examination if expertise to examine the eye fundus is not available in general practice.¹

Differences in trend found in referral rates could be an indirect effect of a higher consultation rate for diabetes within practices with primary care nurses. More consultations may lead to a better regulation of diabetes and quality of care. For that reason, we additionally answered the following research question:

Is the diabetes-related contact rate higher in practices with primary care nurses?

METHODS

Study design

In the Netherlands GPs are supposed to treat patients themselves unless referral to a medical specialist or other health care provider is needed. About

90% of all health problems presented in general practice is treated by the GP self. Referral rates to medical specialists thus are an indicator for what can be handled in general practice and what not. GPs provide community based family medicine and internists hospital based internal medicine.

To answer the research questions we analysed whether the referral rate to internists, ophthalmologists, cardiologists and mental health care changed from 2004 to 2006, and whether or not this was different for general practices with and without primary care nurses. We also examined whether the diabetes-related contact rate was different in practices with and without primary care nurses. The diabetes-related contact rate was only analysed in 2006, since no detailed information was available for 2004. A distinction was made between newly diagnosed and known T2DM patients. To convert the treatment of patients to primary care nurses is harder for patients who have been treated by GPs or internists for years, than for newly diagnosed patients.

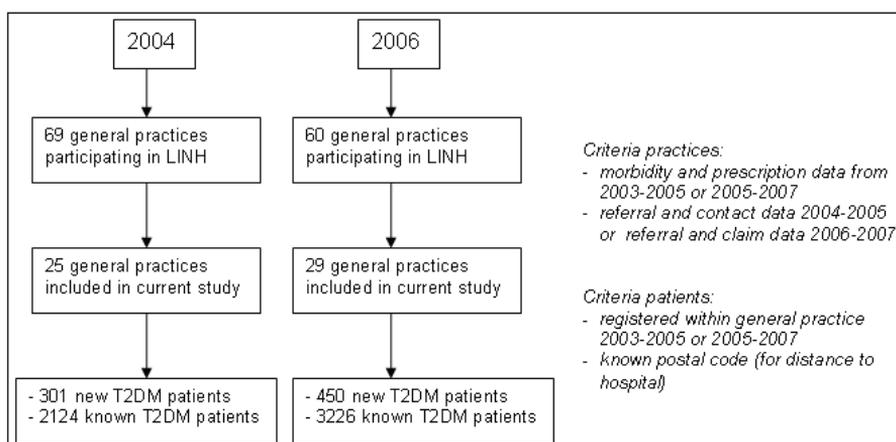
For the purpose of this study, we used data on health care utilization of newly diagnosed and known T2DM patients for a period of 365 days after the first diagnosis of T2DM (newly diagnosed T2DM patients) or after the first consultation or prescription for T2DM (known T2DM patients) in 2004 and 2006. T2DM patients were seen as newly diagnosed when patients had no diabetes record in GPs' electronic medical record (EMR) in the previous years (with minimum of one year). In total, 450 newly diagnosed and 3226 known T2DM patients in 2006 and 301 newly diagnosed and 2124 known T2DM patients in 2004 were included in the analyses.

Subjects

Data were derived from EMRs of general practices that participated in the Netherlands Information Network of General Practice (LINH).²² LINH is a representative sample of general practices in the Netherlands. Each year some minor changes in composition of practices occur due to natural turnover. The data hold information about morbidity (international classification of primary care (ICPC codes)²³), prescriptions, contacts and referrals. Medical ethical approval was not required for this research.

Figure 3.1 shows the inclusion criteria for general practices and patients in 2004 and 2006 and the number of practices and patients included. In 2004 25 practices and in 2006 29 practices were included. Most practices were excluded from the analyses owing to a poor recording of referrals. The selection of practices forms a representative sample of Dutch general practices with regard to practice type (single handed, duo, group or health centre), degree of urbanisation and province.

Figure 3.1: Flow chart of general practices and patients included in the study



T2DM patients were selected on the basis of the ICPC code for diabetes: T90. We were not able to distinguish T2 and T1 diabetes patients on the basis of the ICPC coding. For the purpose of this study, type I diabetes patients were excluded on the basis of prescription data (ATC-coded²⁴). Type I diabetes was characterised by diabetes patients with a prescription of insulin (ATC code A10A), but without oral anti-diabetic medication (ATC code A10B).²⁵

Measurements

Referrals

We analysed new referrals to internists, ophthalmologists, cardiologists or mental health care. A patient was considered as being referred (1) if a referral

had been recorded within 365 days after the first diagnosis or first consultation for diabetes (including this consultation). Referrals to mental health care included referrals to psychiatrists, psychologists or ambulatory mental health care.

It was unknown whether GPs could perform an eye fundus examination in their own practice and therefore not refer patients to ophthalmologists. Most of these GPs, however, probably perform only retina photography and leave the examination of this photo to ophthalmologists.

Diabetes-related contacts with general practice

Diabetes-related contacts were only assessed in 2006 and based on the number of claimed telephone and office consultations and home visits with an ICPC code T90 (diabetes). In 85.8% of all consultations and home visits the diagnosis was known in 2006 and 2007.

Primary care nurses

The presence of a primary care nurse was determined for all general practices on the basis of data from the EMR.

Covariates

We adjusted for factors that could affect the relation between referral rate and presence of a primary care nurse or the relation between diabetes contact and presence of a primary care nurse. These included comorbidity and distance to hospital apart from gender and age (continuous).

Comorbidity

Comorbidity was taken as covariate, since T2DM patients with comorbidity were assumed to be more likely to be referred to a medical specialist than patients without comorbidity²⁶ and may have more consultations. Using the ICPC codes in the EMR of the practices, we distinguished between diabetes-related comorbidity and unrelated comorbidity. Related comorbidity included heart diseases, stroke, retinopathy, nephropathy and diabetic foot. Non-related comorbidity included depression, lung diseases, musculoskeletal diseases, neurological diseases and cancer. Appendix 3.2 shows the ICPC codes and descriptions. Patients were regarded having related or unrelated comorbidity

(0/1) if s/he had consulted the GP or had a prescription for one of these diseases.

Distance to hospital

Distance to the nearest hospital for a patient might influence the referral behaviour of GPs, since they might be more reluctant to refer patients living further away from a hospital.²⁷ Road distance to the nearest hospital was based on distance from the centroid of the postal code of the patient's home to the nearest hospital.

Statistical analyses

To analyse the relation of the presence of primary care nurses with contacts with general practice and change in referral in T2DM patients, multilevel logistic regression analyses (referrals) and multilevel linear regression analyses (contacts) were conducted with MLwiN 2.02. Multilevel analysis corrects for the cluster effect of patients within general practices.²⁸

In analyses of referral rates between 2004 and 2006, time was included as a dummy variable representing 2006, with 2004 as reference category. For all analyses, first a model with only the dependent variables was analysed (model 1). Second, covariates were added to the model (model 2). Last, the interaction term 'primary care nurse in practice*year' was added to the referral analyses (model 3). Covariates in the referral analyses were age, gender, and related and unrelated comorbidity and distance to hospital. Covariates in the contact analyses were age, gender, and related and unrelated comorbidity. In addition, the effect of primary care nurses in practice was analysed separately for 2004 and 2006.

Analyses of referrals were performed separately for referrals to internists, ophthalmologists, cardiologists and mental health care. The significance level was set at $p < 0.05$. For the interaction 'primary care nurse in practice* year', significance level was set at $p < 0.10$ since this was measured on practice level and the number of practices is much smaller than the number of patients. The models were estimated with multilevel logistic regression analyses with second-order PQL (penalised quasi-likelihood), and multilevel linear regression analyses, both with only a random intercept.

RESULTS

Patient characteristics

In 2006, 39.6 per 1000 patients in general practice were identified with T2DM, 4.9 per 1000 of whom were diagnosed for the first time. For 2004, this was 33.1 and 4.1 per 1000 patients respectively. 72% (N = 21) of the general practices in 2006 and 52% (N = 13) of the practices in 2004 had a primary care nurse. Table 3.1 shows the patient characteristics of the newly diagnosed and known T2DM patients in 2006.

In 2006, 19.1% of the newly diagnosed T2DM patients and 19.6% of the known T2DM patients had related comorbidity and 39.3% and 35.1% respectively had unrelated comorbidity. The commonest diabetes-related comorbidity was heart disease (14.4% and 15.3%). For unrelated comorbidity, musculoskeletal diseases (28.4% and 25.1%) were the commonest, followed by lung diseases (10.0% and 8.7%). Patient characteristics did not differ significantly between 2004 and 2006, with the exception of related comorbidity in newly diagnosed T2DM patients. The number of patients with related comorbidity was higher in 2006 (19.1%) than in 2004 (13.6%).

Changes in referral rates between 2004 and 2006

Table 3.1 also presents the referral rates to internists, ophthalmologists, cardiologists and mental health care for newly diagnosed and known T2DM patients in 2004 and 2006. Referral rates were low for internists (5.3% for newly diagnosed and known T2DM patients) and seem to have decreased for newly diagnosed T2DM patients between 2004 and 2006. Newly diagnosed patients, not surprisingly, were referred twice as often to ophthalmologists as known T2DM patients (on average 27.2% vs. 11.6%). Furthermore, T2DM patients were hardly ever referred to mental health services: on average 1.3% for newly diagnosed patients and 0.9% for known T2DM patients. Due to the very low referral rate to mental health services, no further analyses were performed for mental health care.

Table 3.1: Patient characteristics and health care in 2006 and uncorrected number of referrals to internists, ophthalmologists, cardiologists and mental health care in 2004 and 2006 for newly diagnosed and known diabetes patients.

	Newly diagnosed diabetes patients		Known diabetes patients	
Patient characteristics				
Gender ² (male)	50.2%	(226)	47.2%	(1705)
Age ¹ (in years)	61.4	(SD:14.1)	67.1	(SD:11.9)
Distance to hospital ¹ (km)	8.6	(SD:6.9)	8.3	(SD:7.1)
Related comorbidity ²	19.1%	(86)	19.6%	(633)
Unrelated comorbidity ²	39.3%	(177)	35.1%	(1133)
Health care utilisation in 2006				
Diabetes guidance per year ²	21.1%	(95)	17.8%	(575)
Number of diabetes contacts				
Total ¹	1.8	(SD:1.04)	1.8	(SD: 0.98)
PCN-practice ¹	1.8	(SD:1.05)	1.8	(SD: 0.99)
Non-PCN-practice ¹	1.7	(SD:1.02)	1.6	(SD: 0.90)
Referral rates				
Internist ²				
2004	7.3%	(22)	5.7%	(121)
2006	3.3%	(15)	4.9%	(158)
Ophthalmologist ²				
2004	25.2%	(76)	10.4%	(221)
2006	29.1%	(131)	12.8%	(413)
Cardiologist ²				
2004	2.3%	(7)	3.1%	(66)
2006	3.3%	(15)	3.1%	(98)
Mental health care ²				
2004	0.7%	(2)	1.0%	(22)
2006	1.8%	(8)	0.7%	(24)

¹ Mean (standard deviation); ² Percentage (number).

Table 3.2 shows the results from multilevel logistic regression analyses for referrals to internists, ophthalmologists and cardiologists between 2004 and 2006. The referral rate for newly diagnosed T2DM patients to internists decreased more than 50% between 2004 and 2006 (OR:0.44; 95%CI:0.22-0.88;P < 0.05). However, the trend in referral rate between 2004 and 2006 did not differ between general practices with and without primary care nurses. The referral rate to internists for known T2DM patients did not change between 2004 and 2006 (OR:0.85;95%CI:0.65-1.11 P = 0.23). However, in general practices with a primary care nurse the trend in referrals to internists was lower than in general practices without a primary care nurse (OR:0.59;P < 0.1).

The trend in referral rate to ophthalmologists and cardiologists for newly diagnosed and known T2DM patients did not show any difference between 2004 and 2006 nor were differences found between general practices with and without a primary care nurse.

The presence of primary care nurses was not related to the referral rate to internists and ophthalmologists in both 2004 and 2006 together, but did affect the referral rate to cardiologists in newly diagnosed diabetes patients (OR:0.30; 95%CI:0.12-0.78; P < 0.05). Surprisingly, the effect of primary care nurses in general practice changed between 2004 and 2006 (Table 3.3). The presence of a primary care nurse affected the referral rate to internists for known T2DM patients in 2006 (OR: 0.61; 95% CI:0.39-0.95;P < 0.05), but not in 2004 (OR: 1.25; 95% CI: 0.80-1.96; P = 0.33). The presence of primary care nurses in general practice did not affect the referral rate to ophthalmologists and cardiologists in either 2004 or 2006

Table 3.2: Multilevel logistic regression analyses with dependent variables referrals to internists, ophthalmologists and cardiologists and as independent variable time and presence of primary care nurse for newly diagnosed and known diabetes patients in 2004 to 2006§

	Newly diagnosed diabetes patients						Known diabetes patients					
	Model 1		Model 2 [#]		Model 3 ^{*‡}		Model 1		Model 2 [#]		Model 3 ^{*‡}	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Internist												
Difference 2004-2006	0.44	0.22-0.88 ¹	0.42	0.21-0.85 ¹	0.12	0.02-1.00 ¹	0.85	0.65-1.10	0.87	0.66-1.14	1.31	0.76-2.28
Primary care nurse	1.24	0.58-2.67	1.24	0.58-2.67	0.87	0.35-2.12	0.85	0.60-1.21	0.85	0.60-1.21	1.11	0.71-1.75
PCN*Year [*]			4.52	0.48-42.32							0.59	0.31-1.11²
Ophthalmologist												
Difference 2004-2006	1.14	0.70-1.87	1.21	0.71-2.07	1.65	0.49-5.59	0.93	0.73-1.17	0.98	0.76-1.25	1.41	0.71-2.81
Primary care nurse	0.79	0.36-1.74	0.79	0.36-1.74	0.93	0.35-2.43	0.79	0.49-1.27	0.79	0.49-1.27	0.91	0.53-1.55
PCN*Year [*]			0.67	0.17-2.74							0.65	0.31-1.38
Cardiologist												
Difference 2004-2006	1.45	0.58-3.59	1.99	0.74-5.31	2.59	0.67-10.04	1.00	0.70-1.41	1.00	0.70-1.42	1.08	0.50-2.34
Primary care nurse	0.30	0.12-0.78¹	0.30	0.12-0.78¹	0.43	0.09-1.99	0.87	0.55-1.38	0.87	0.55-1.38	0.91	0.49-1.71
PCN*Year ¹			0.58	0.09-3.88							0.91	0.37-2.19

§ For both newly diagnosed and known diabetes patient separate analyses were performed for referrals to internists, ophthalmologists and cardiologist. This table shows the results of 18 analyses.

Adjusted for age, gender, distance to hospital, related and unrelated comorbidity.

* In addition primary care nurse included as variable in the analysis.

^{*} Interaction term presence primary care nurse and difference 2004-2006.

¹ Significant p<0.05.

² Significant p<0.1.

Table 3.3: Multilevel logistic regression analyses with dependent variables referrals to internist, ophthalmologist and cardiologist and as independent variable presence of primary care nurse for newly diagnosed and known diabetes patients, 2004 and 2006[§]

	Newly diagnosed diabetes patients			Known diabetes patients		
	Model 1		Model 2 [#]	Model 1		Model 2 [#]
	OR	95% CI	OR	95% CI	OR	95% CI
2004						
Internist	0.75	0.25-2.21	0.77	0.27-2.13	1.22	0.78-1.91
Ophthalmologist	2.09	0.59-7.35	1.84	0.56-6.08	1.36	0.67-2.72
Cardiologist	0.45	0.10-2.04	0.45	0.09-2.20	1.07	0.50-2.31
2006						
Internist	3.65	0.47-28.09	4.23	0.53-34.07	0.70	0.45-1.08
Ophthalmologist	0.85	0.19-3.87	1.85	0.39-8.66	0.62	0.24-1.59
Cardiologist	0.36	0.13-1.05	0.30	0.09-1.00	0.91	0.46-1.79

[§] For both newly diagnosed and known diabetes patient separate analyses were performed for referrals to internists, ophthalmologists and cardiologist and for both 2004 and 2006. This table shows the results of 24 analyses.

¹ Significant P<0.05.

[#] Referral analyses adjusted for age, gender, distance to hospital, related and unrelated comorbidity.

Contact with general practice

Table 3.4 presents the results of the multilevel linear regression analyses for diabetes-related contacts with general practices. The presence of a primary care nurse in a general practice was not related to the number of diabetes-related contacts in either known or newly diagnosed T2DM patients.

Table 3.4: Multilevel linear regression analyses with dependent variable diabetes-related contacts with the general practice and as independent variable presence of primary care nurse for newly diagnosed and known diabetes patients, 2006[§]

	Newly diagnosed diabetes patients				Known diabetes patients			
	Model 1		Model 2 [#]		Model 1		Model 2 [#]	
	β	95% CI	β	95% CI	β	95% CI	β	95% CI
Primary care nurse	0.04	-0.35-0.43	0.04	-0.35-0.43	0.04	-0.31-0.38	0.03	-0.32-0.38

[§] For both newly diagnosed and known diabetes patient the number of diabetes-related contact with general practice was compared for practices with and without a primary care nurse.

[#] Analyses adjusted for age, gender, related and unrelated comorbidity.

DISCUSSION

The aim of this study was to assess whether the referral rate for hospital treatment changed for T2DM patients with the introduction of primary care nurses in general practice and whether such effects could be due to an increase in contact rate for diabetes in general practices with a primary care nurse.

On average, referral rates of newly diagnosed and known diabetes patients to internists (both 5.3%), cardiologists (2.8% and 3.1%) and mental health care (1.3% and 0.9%) were low. Referrals to ophthalmologists were more common and higher for newly diagnosed diabetes patients (27.2% vs. 11.6%). The referral rate to internists for newly diagnosed T2DM patients decreased in general practices both with and without a primary care nurse between 2004 and 2006, and the trend in referral rate to internists between 2004 and 2006 for known T2DM patients was lower in general practices with primary care nurses than in general practices without primary care nurses. The difference in trend in

referrals to internists for known T2DM patients did not seem to be related to a higher contact rate for diabetes in general practices with primary care nurses, since the diabetes-related contact rate did not differ between practices with and without a primary care nurse. The referrals to ophthalmologists and cardiologists for both newly diagnosed and known diabetes patients did not change between 2004 and 2006.

Strengths and limitations of the study

LINH provides a dataset based on consultations in general practice with data on diagnosis, treatment and referrals, as a result of which we could measure the effect of primary care nurses on referral rate in T2DM patients. This study had some limitations. General practices were selected on the basis of the quality of their EMR, and therefore selection bias may have occurred. The selection bias affected the registration of data in GPs' EMR as such, but was not expected to affect referral rates. Our study was an observational study, with no randomisation of general practices with and without primary care nurses. The results of our study could, therefore, be caused by other factors influencing the employment of primary care nurses. Primary care nurses were first introduced before our research timeframe. We are of the opinion that the period between 2004 and 2006 provides a good insight into the effect of primary care nurses, since the number of primary care nurses working in general practices increased tremendously between 2004 and 2006. Primary care nurses have been providing care to T2DM patients since the introduction, and therefore much experience has been gained. Further, the number of contacts was based on claims data, so contacts which were not claimed were not taken into account. In the Netherlands, general practices are reimbursed € 9-18 for consultations and € 13.5-22.5 for home visits. Therefore, their income is dependent on recording of contacts. For this reason it is not likely that many contacts have been missed. For known diabetes patients referrals outside the one-year period were not available and could have influenced the results. For newly diagnosed T2DM patients, this is no problem since patients need a referral to be treated by internists. Moreover, we had no other indications in the records of the GPs that the T2DM patients were under treatment by internists. Finally, we have analysed the effect of the presence of primary care nurses on referral to a specialist. This gives no indication about the number of consultations with medical specialists.

For instance, it could be that T2DM patients in 2006 were only referred for one consultation with a medical specialist.

Comparison with other research

Our results suggest that the introduction of primary care nurses in general practice may have resulted in a shift from care by internists to care by general practice for known diabetes patients. The shift of care from internists to general practice could not be linked to a higher number of diabetes-related contacts in general practices with a primary care nurse. The decrease in referral rate can also not be explained by an overall decrease in referral rate to internists, since the overall referral rate to internists was stable between 2004 and 2006.²¹ The number of diabetes-related contacts was not higher in practices with or without a primary care nurse. This seems to be contrary to results in the literature about contact rates of primary care nurses.¹² In our study, the diabetes-related contact rate in practices with primary care nurses consisted of contacts of T2DM patients treated by primary care nurses or GP, whereas other studies analysed diabetes-related contact rate of patients treated only by primary care nurses. Analyses within general practices with primary care nurses showed, however, higher consultation rates for diabetes patients under treatment by primary care nurses, which is in accordance with the literature (not shown). Still the average consultation rate of diabetes patients is low in our population in comparison to the diabetes guidelines which advises at least 4 contacts per year for diabetes.¹ Therefore, other characteristics of the care provided by practices with primary care nurses must have brought about this trend in referrals to internists. A recent study showed that diabetes patients more often receive optimal care, in terms of diabetes-related examinations, in primary care when a diabetes education programme is available or when yearly medical check-ups are done by both the GP and primary care nurse.²⁹ Further, primary care nurses generally provide longer consultations,¹² which may positively affect the quality of care for T2DM patients. Another intriguing finding for the referrals to internists was that the presence of primary care nurses affected the referrals to internists in 2006, but not in 2004. This was probably due to the increased number of primary care nurses working in general practices and their experience with diabetes care.

Our study showed no difference in referrals to cardiologists after the introduction of primary care nurses in general practice, whereas we expected the referral rate

to be lower in practices with primary care nurses. The reason could lie in the low overall referral rate of T2DM patients to cardiologists. The referral rate to cardiologists was lower in practices with primary care nurses in 2004 and 2006 in newly diagnosed patients, but the difference in referral between 2004 and 2006 was for practices with and without primary care nurses non-significant. A recent study found indications that primary care nurses follow the guidelines better for cardiovascular risk management than GPs. This study found a decrease in the mean level of risk factors in high-risk patients after 1 year of cardiovascular management, with a larger decrease in patients allocated to primary care nurses.²⁰

For ophthalmologists, we expected the referral rate to have increased after the introduction of primary care nurses, since guidelines recommend yearly referral to ophthalmologists for eye fundus examination, if expertise to examine the eye fundus is not available in general practice. Our results, however, showed no differences in the referral rate to ophthalmologists. Our results could be biased because some general practices may perform an eye fundus examination themselves or patients visit the ophthalmologist without a referral. Results from the Panel of Patients with Chronic Diseases (NPCD), based on patients' recall, showed that in the Netherlands 42% of the T2DM patients in 1998 visited an ophthalmologist³⁰ and 63% of T2DM patients visited one in 2008. In this study, we found a referral rate of 15% of the total T2DM population.

This study also found a higher prevalence of diabetes in 2006 compared to 2004. This higher prevalence might be explained by the increased attention for screening in general practice in 2006. In the Netherlands several campaigns have taken place to stimulate the screening for diabetes in 2006.

Conclusions

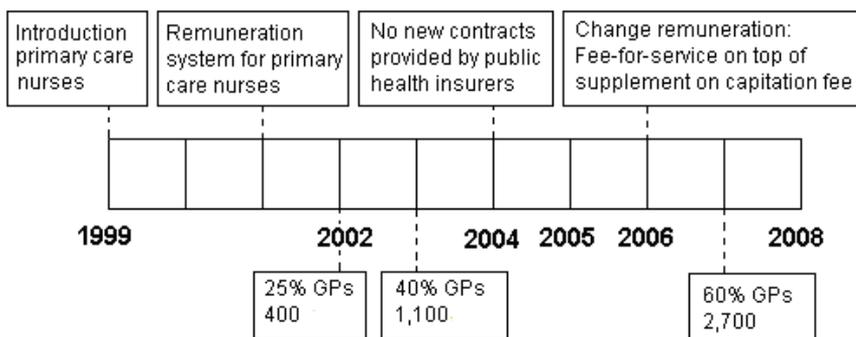
Our results suggest that the introduction of primary care nurses may have resulted in a shift in care from internists to primary care for known diabetes patients. This did not seem to be explained by more contacts for diabetes in practices with primary care nurses.

Acknowledgements

We would like to thank all staff at the practices of the Netherlands Information Network of General Practice for their cooperation.

Appendix 3.1: Introduction of primary care nurses in the Netherlands

Primary care nurses were introduced in 1999 and need to have a bachelor degree in nursing or are practice assistances who have followed extra education. They are predominantly involved in the care of chronically ill patients. In 2001, funding for general practices to employ primary care nurses was introduced. General practices with a primary care nurse received a supplement on the capitation fee for publicly insured patients (67%) and could claim a consultation fee for primary care nurses for privately insured patients. The introduction of primary care nurses went slowly with in 2002 400 primary care nurses working for 25% of GPs. In 2004, the gradual implementation stopped. Public health insurers did not provide new contracts for primary care nurses, but existing contracts were not cancelled. In 2006, a single universal basic health insurance was implemented for the whole population, abolishing the difference between privately and publicly insured patients. With the revised health insurance system, funding of primary care nurses changed to a mixed system for all patients with a supplement on the capitation fee and a fee for service. General practices could again arrange new contracts with health insurers for the employment of primary care nurses. In 2007, 60% of GPs had a primary care nurse working in the practice, an increase of 60% from 2003. More remarkably, the number of primary care nurses working in a general practice increased with 149% between 2003 and 2007 from 1,100 to 2,700.



Appendix 3.2: ICPC description codes related and unrelated comorbidity

ICPC-code	Description
<i>Related comorbidity</i>	
F83	Retinopathy
K74	Angina pectoris
K75	Acute myocardial infarction
K76	Ischaemic heart disease
K90	Stroke/ Cerebrovascular accident (CVA)
S97	Chronic ulcer skin
U99	Urinary disease other
<i>Unrelated comorbidity</i>	
B74	Malignant neoplasm blood other
D74	Malignant neoplasm stomach
D75	Malignant neoplasm colon/rectum
D77	Malignant neoplasm digest other/NOS
L01	Neck symptom/complain
L02	Back symptom/complaint
L03	Low back symptom/complaint
L08	Shoulder symptom/complaint
L13	Hip symptom/complaint
L15	Knee symptom/complaint
L84	Osteoarthritis spine
L86	Back syndrome with radiating pain
L89	Osteoarthritis of hip
L90	Osteoarthritis of knee
L91	Osteoarthritis other
N86	Multiple sclerosis
N87	Parkinsonism
N88	Epilepsy
P76	Depressive disorder
R84	Malignant neoplasm bronchus/lung
R91	Chronic bronchitis/bronchiectasis
R95	Chronic obstructive pulmonary disease
R96	Asthma
S77	Malignant neoplasm of skin
X76	Malignant neoplasm breast female
Y77	Malignant neoplasm prostate

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Moral hazard and supplier-induced demand: empirical evidence in general practice

4



Changes in cost sharing and remuneration system in the Netherlands in 2006 led to clear changes in financial incentives faced by both consumers and GPs. For privately insured consumers cost sharing was abolished while publicly insured never faced cost sharing. The separate remuneration systems for publicly insured consumers (capitation) and privately insured consumers (fee-for-service) changed to a combined system of capitation and fee-for-service for both groups. Our first hypothesis was that privately insured consumers had a higher increase in patient-initiated GP contact rates compared with publicly insured consumers. Our second hypothesis was that publicly insured consumers had a higher increase in physician-initiated contact rates. Data were used from electronic medical records from 32 general practices and 35,336 consumers in 2005-07. A difference-in-differences approach was applied to study the effect of changes in cost sharing and remuneration system on contact rates. Abolition of cost sharing led to a higher increase in patient-initiated utilisation for privately insured consumers in persons aged 65 and older. Introduction of fee-for-service for publicly insured consumers led to a higher increase in physician-initiated utilisation. This was most apparent in persons aged 25 to 54. Differences in the trend in physician-initiated utilisation point to an effect of supplier-induced demand. Differences in patient-initiated utilisation indicate limited evidence for moral hazard.

4 Moral hazard and supplier-induced demand: empirical evidence in general practice

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INTRODUCTION

Ex post moral hazard and supplier-induced demand (SID) are central issues in the health economics literature. Theoretical contributions include the work of Nyman,^{1,2} Pauly and Blavin³ and Zweifel and Manning⁴ for moral hazard and Labelle⁵ and De Jaegher and Jegers⁶ for SID. Ex post moral hazard results from the fact that insured people, *ceteris paribus*, demand more health care compared with uninsured.¹ Arrow pointed out that SID arises from information asymmetry between consumers and physicians.⁷ Because of this information asymmetry physicians can shift the demand curve of consumers, i.e. SID. Richardson defined SID as “physician’s ability, for better or worse, to shift a patient’s demand curve to the right”.⁸ We believe that shifting the demand curve to the left can also be considered as SID. Empirical evidence of ex post moral hazard and SID is hard to obtain, but is crucial for developing health policy. Getting the incentives right might prevent an unnecessary rise of health care expenditure and might even increase population health.

Empirical evidence regarding ex post moral hazard comes from the Rand Health Insurance Experiment (HIE) and natural experiments or makes use of comparing people with and without supplementary insurance. The HIE showed that outpatient visit rates to physicians and other health care providers was 66 percent higher in the free plan compared with the 95 percent co-insurance plan.⁹ Natural experiments generally show that consumers respond to an increase in cost sharing with a reduction in health care utilisation¹⁰⁻¹² or increase in health care utilisation with supplemental insurance.¹³ Fewer studies have used panel data to analyse ex post moral hazard using a treatment and control group. Cherkin et al. found a 8.2% higher decrease in total primary care visits compared with a control group after the introduction of a \$ 5 co-payment fee for surgery visits in a health maintenance organisation in the United States.¹⁴ However,

analyses were not controlled for health status. Chiappori et al. investigated the effects of the introduction of a 10% co-payment for physician visits in France compared to a control group, and found the number of consumers with general practitioner (GP) home visits was significantly affected by the introduction of the co-payment, but not GP surgery consultations.¹⁵ Although the separation in contact types was an interesting contribution to the moral hazard literature, it should be mentioned that the sample was not representative of the French population, nor was the analysis controlled for health status. Finally, Winkelmann analysed the effect of an increase in co-payment of DM 6 for prescription drugs in Germany (co-payment after reform: DM 9-13) on GP consultation rate.¹⁶ Controlling for several factors, including health status, Winkelmann found a reduction in the consultation rate of 10%.

Empirical literature on SID has mainly focused on the physician's response to changes in physician density or to changes in remuneration systems.¹⁷ According to McGuire's overview, studying SID in the context of changes in regulated fees has advantages over studying changes in physician density, since the first directly influences incentives to induce demand.¹⁷ Even more important, changes in remuneration system are exogenous to physician's supply and consumer's demand. Here, we only discuss literature on changes in regulated fees of studies using a treatment and control group. The majority of evidence about physicians' responses to changes in remuneration systems comes from natural experiments. One exception is the randomised study of Hickson et al. in the United States.¹⁸ They assigned paediatric residents (students) to either a salary or fee-for-service (FFS) and blinded patients to the manner of remuneration of their physician. Hickson et al. showed that physicians with FFS reimbursement missed fewer recommended visits and made more visits in excess of recommendations. This study was performed in students with different career objectives. Unfortunately, randomisation was not balanced in terms of students' career goals. Natural experiments show ambiguous results. Krasnik et al. investigated the six-month and twelve-month effect of a change in remuneration from capitation to a combined system of FFS and capitation compared with a control group on GPs' activities in Copenhagen, Denmark.¹⁹ Increase in contact rates was higher after the change in remuneration compared with the control group six months after the change but not after an one year period. The authors ascribed these results to a learning period for GPs about

their own preferences regarding income and leisure. Because data for the control group were not available on the individual doctor level, aggregated data were used, and not adjusted for other factors potentially influencing health care utilisation. Madden et al. investigated the effects on GP visiting rates of a change in remuneration system in Ireland in 1989 for medical card consumers from FFS to capitation while private consumers continued to pay on an FFS basis.²⁰ The authors used self-reported data and expected the differential in visiting rates between medical card consumers and private consumers to narrow between 1987 and 1995/2000 if SID played a major role prior to the change in remuneration system. However, no difference in trend between privately and medical card-insured consumers was found. A potential drawback of Madden et al. was that they could not distinguish between patient- and physician-initiated utilisation.

Although Arrow stressed that SID relates to information asymmetry,⁷ one could also argue that SID is just the standard neoclassical response to prices.^{5,6} Acknowledging the difficulties in disentangling both effects from an empirical point of view, there seems potential to do so as the crucial difference between the neoclassical and the SID-models is that within an inducement model, changes in utilization will be greater in consumers with a higher level of information asymmetry. We believe that this effect would not be expected in the neoclassical model. Consumers with chronic conditions could, for example, be classified as consumers with a lower level of information asymmetry compared with consumers without chronic conditions, since they generally have more knowledge about their disease and treatment options, resulting in less opportunities for physicians to induce demand.

Another point of concern with SID is that that changes in utilization after alterations in remuneration could result from rationing, as was stressed by Carlsen and Grytten.²¹ Rationing takes place when medical services are withheld from individuals who would probably benefit from utilisation. Certainty in a capitation system, without payment per service, physicians could lower demand by making use of the information asymmetry and influencing demand of consumers, i.e. SID.

This paper attempts to contribute to the health economics literature using balanced panel data from electronic medical records (EMRs) of GPs and a policy change that enable us to evaluate the effect of changes in cost sharing and GPs' remuneration system on utilisation of GP care. The diagnosis-coded contact data from EMRs enable us to distinguish between patient-initiated and physician-initiated services, and thereby, to analyse simultaneously the effect of changes in cost sharing (moral hazard) and remuneration system (SID). To differentiate between SID and a standard neoclassic response to a change in health care prices, we examined whether SID-effects varied according to the level of information asymmetry as proxied by comparing the effects of chronically ill versus non-chronically ill consumers.

INSTITUTIONAL BACKGROUND AND HYPOTHESES

Institutional background

In January 2006, the Dutch government introduced a new health insurance act based on the principles of managed competition.²² Before 2006, inhabitants had either compulsory social (sickness fund, 62%) or voluntarily private (36%) health insurance depending among others on income (below a gross annual income of € 33,000 people were publicly insured). This combined system of social and private health insurance was replaced by a compulsory single universal basic health insurance covering a legally defined package of basic benefits including GP care. GPs act as gatekeepers for secondary care, being the first point of contact in health care. The new health insurance system gives insurers flexibility to design their products to better appeal to consumers and the ability to selectively contract with health care providers as this is thought to improve the efficiency of the health care system.²³

With the introduction of the new insurance system, consumers' cost sharing arrangements and GPs' remuneration system changed. Publicly insured consumers did not face cost sharing for consulting their GP before 2006, but some privately insured consumers did (Table 4.1). Privately insured cost sharing depended on the particular insurance policy. Six percent of privately insured consumers had no insurance for GP care and 31% had cost sharing of over € 500 per year. Cost sharing for GP care was abandoned in 2006. It is worth

mentioning that all Dutch insured faced cost sharing (called no-claim) in 2006 and 2007 but GP care was excluded from cost sharing.

Table 4.1: Consumers' cost sharing arrangement and GPs' remuneration system before and since 2006 in the Netherlands

	Before 2006		Since 2006
	Publicly insured	Privately insured	All insured
Cost sharing arrangement	No	31.2% of consumers faced cost sharing > € 500 per year. 6% faced no insurance for GP care. Mean GP cost sharing care expenditure € 86 in 2003. ²⁴	No
Existence of cost sharing			
Remuneration system			
<i>Capitation fee</i>			
Basic capitation fee	€ 77.00 ¹	-	€ 52.00 ¹
<i>Fee-for-service</i>			
Per consultation unit	-	€ 24.80	€ 9.00 ¹

¹ The capitation fee and the fee of € 9.00 for every consultation unit is paid by the consumer's health insurer.

Before the insurance reform of 2006 an FFS remuneration was in operation for privately insured consumers and a capitation system for publicly insured consumers (Table 4.1). Three important actors, namely the National Association of General Practitioners, the Ministry of Health and Health Insurers Netherlands, negotiated about a new remuneration system. Health Insurers Netherlands suggested an FFS remuneration with negotiable fees for part of GP-services whereas the National Association of General Practitioners suggested a capitation system without negotiable fees. The negotiations resulted in a combined system of capitation and FFS based on negotiable fees for only a very small part of GP-services.

Hypotheses

The EMR-data enable us to separately compare changes in patient-initiated and physician-initiated utilisation. Our key assumption is that consumers initiate the first GP-contact per care episode, i.e. patient-initiated utilisation (estimating

moral hazard – effect of abolishment cost sharing), and that GPs might influence subsequent contacts, i.e. physician-initiated utilisation (estimating SID – effect of changes in remuneration).

Based on the moral hazard literature, we expected abolition of cost sharing for privately insured consumers to result in a higher increase in patient-initiated utilisation compared with publicly insured consumers (hypothesis 1a). With respect to moral hazard, most health care costs are spent on persons with a lower remaining expected lifetime,²⁵ of which age is an important factor. For this reason we expected the effect of moral hazard to be stronger in younger consumers (hypothesis 1b).

Although the empirical evidence of effects on changes in remuneration on the number of contacts physicians provide is mixed, we assume that GPs can shift consumers' demand curve. Literature suggest that an FFS system encourages GPs to provide services, whereas a capitation is thought to encourage providers to curtail services.^{26,27} Because the fee for privately insured consumers is much lower compared to the payment for privately insured consumers before the change in remuneration, our second hypothesis assumes that the change from a capitation system for publicly insured consumers and an FFS system for privately insured consumers to a combined system of capitation and FFS involves a higher increase in physician-initiated contacts for publicly insured consumers compared with privately insured consumers (hypothesis 2a). We expected this effect to be stronger in older consumers and in consumers without a chronic disease (hypothesis 2b), because we assume the GP's potential to exploit advantages in information asymmetry are larger in these groups. When offering more services, GPs are expected to provide these services to the neediest patients. Since health care utilisation and needs are generally higher in older age groups,²⁸ we expected the difference in trend of contacts to be greater for the older age groups. To differentiate between SID and a neoclassic response to a change in price for health care, we compared the difference in trend between chronically ill and non-chronically ill consumer.

METHODS

Data

Our sample consisted of general practices participating in the Netherlands Information Network of General Practice (LINH) from 2005 to 2007.²⁹ LINH holds panel data on morbidity, drugs prescriptions and referrals of around 90 general practices derived from EMRs. The network is a dynamic pool of practices with an annual change in composition of practices, with an average of thirteen mutations per year between 2005 and 2007.

Inclusion criteria for practices were availability of data on morbidity of clients for all three years and type of contact (known or new complaint) in more than 65% of the morbidity record. Type of contact is necessary to construct care episodes, which enable to distinguish between physician-initiated and patient-initiated utilisation (see explanation below). Fifty-one general practices had data for the total period 2005 to 2007 of which 32 (63%) had a type of contact registered in the morbidity records of above 65%.

Inclusion criteria for consumers were registration within general practices for the full period of 2005 to 2007 (all Dutch inhabitants are supposed to be registered with a general practice), age over 18 in 2005, and no missing value on any of the variables: a balanced panel. Consumers who died within this period were excluded. We lost a large number of respondents due to our selection criteria of availability of information on the variables, because income and nationality were not directly available in LINH. They were derived from the Statistics Netherlands database (CBS).³⁰ These variables were linked according to postal code, gender and date of birth: 94.9% or 74,142 could be linked. For 35,336 (45.2%) people of the matched consumers income data were available. This resulted in a net sample of 32 practices with 35,336 registered consumers.

Included general practices and registered clients are representative of Dutch general practices with regard to practice type (single handed, duo, group or health centre), degree of urbanisation and region and consumers' age and gender.

Variables

The effect of changes in cost sharing and remuneration was assessed with patient-initiated and physician-initiated contacts on the basis of care episodes. A care episode includes “all encounters for the management of a specific health problem”.³¹ An episode could be one contact or a sequence of contacts that reflects the course of a disease over time. Care episodes were constructed on the basis of EPICON, which is an algorithm to group ICPC coded contact records from EMRs in general practice into episodes of care. This algorithm calculates care episodes for each year separately. Thus, a care episode that persists over two years is counted as two care episodes: one in each year.³² The effect of changes in cost sharing was assessed with patient-initiated utilisation defined as the first GP contact ((telephone) consultations and home visits) for a specific health problem, i.e. the first contact in a care episode. The effect of changes in remuneration was assessed with physician-initiated utilisation defined as all other contacts for a specific health problem^a. Table 4.2 gives variable definitions and descriptive statistics.

Control variables potentially influencing health care utilisation included: age, gender, presence of chronic condition, comorbidity, level of urbanisation, nationality and income (consumer level) and practice size, primary care nurse and GP information system (general practice level).

^a For example: a consumer visits a GP three times for diabetes and two times for bronchitis in 1 year. The consumer has therefore two care episodes: one for diabetes and one for bronchitis. The first contact for diabetes is a patient-initiated contact, just like the first bronchitis contact. The second and third contacts for diabetes and the second contact for bronchitis are physician-initiated contacts. For this consumer, the number of patient-initiated contact is two, and the number of physician-initiated contacts is three. Therefore, the number of patient-initiated contacts equals the number of different complaints and illnesses of a consumer in a specific year for which a GP is consulted.

Table 4.2: Variable definitions and descriptives

Variable	Definition	2005	2006	2007
<i>Consumer level (n=35,336)</i>				
Patient-initiated utilisation ¹	Continuous variable indicating all first contacts of a consumer for health problem; percentage of consumers with patient-initiated contacts	2.38; 74.5%	2.59; 76.0%	3.02; 76.8%
Publicly insured		2.58	2.81	3.28
Privately insured		2.03	2.22	2.58
Physician-initiated utilisation ¹	Continuous variable indicating all repeat visits for health problems; percentage of consumers with physician-initiated contacts	1.75; 51.9%	2.09; 55.5%	2.54; 59.0%
Publicly insured		1.90	2.27	2.79
Privately insured		1.46	1.75	2.06
Time _{dum1} ²	1 data from 2006, 0 otherwise	0%	100%	0%
Time _{dum2} ²	1 data from 2007, 0 otherwise	0%	0%	100%
Insurance ²	1 if privately insured, 0 if publicly insured			36.8%
Time _{dum1} *insurance ²	1 if data from 2006 and privately insured	0%	36.8%	0%
Time _{dum2} *insurance ²	1 if data from 2007 and privately insured	0%	0%	36.8%
Age ²				
18-24 years	Reference category	10.2%	8.8%	7.4%
25-34 years	1 if consumer is 25-34 years of age	15.9%	15.5%	15.1%
35-44 years	1 if consumer is 35-44 years of age	20.6%	20.3%	19.9%
45-54 years	1 if consumer is 45-54 years of age	19.9%	20.2%	20.4%
55-64 years	1 if consumer is 55-64 years of age	16.1%	16.8%	17.5%
65-74 years	1 if consumer is 65-74 years of age	10.0%	10.4%	10.7%
75 or older	1 if consumer is 75 years or older	7.4%	8.2%	9.0%
Gender ²	1 if female, 0 if male			51.4%
<i>Consumer level (n=35,336)</i>				
Chronic diseases ²				
Cardiovascular diseases	1 if consumer has a cardiovascular disease	16.7%	17.3%	20.0%
Asthma/COPD	1 if consumer has asthma or COPD	4.7%	4.7%	5.7%
Diabetes mellitus	1 if consumer has diabetes mellitus	4.5%	5.0%	5.9%
Depression/ Anxiety disorder	1 if consumer has a depression or anxiety disorder	6.6%	6.7%	7.5%
Comorbidity ²	1 if consumer has 2 or more chronic diseases	5.4%	6.1%	7.3%
Nationality ²				
Indigenous/Dutch	Reference category		86.5%	
Foreign western nationality	1 if a foreign western nationality		8.4%	
Foreign non-western nationality	1 if a non-western nationality		5.1%	
Standardised income ²				
€ 0-11,999	Reference category		10.3%	
€12,000-13.999	1 if income is between € 12,000-13,999		8.7%	
€14,000-17,999	1 if income is between € 14,000-17,999		21.4%	
€18,000-21,999	1 if income is between € 18,000-21,999		19.3%	
€22,000-27,999	1 if income is between € 22,000-27,999		19.9%	
€28,000 or more	1 if income is between € 28,000 or more		20.3%	

¹ Mean.

² Percentage.

Table 4.2: Variable definitions and descriptives (continued)

Variable	Definition	2005	2006	2007
Level of urbanisation ²				
Extremely urbanised	Reference category; 2500 or more addresses per square km		18.1%	
Strongly urbanised	1 if 1500 -2499 addresses per square km		18.2%	
Moderately urbanised	1 if 1000-1499 addresses per square km		19.3%	
Hardly urbanised	1 if 500-999 addresses per square km		14.8%	
Not urbanised	1 if <500 addresses per square km		29.6%	
<i>Practice level (n=32)</i>				
Practice size ¹	Continuous variable ranging from 1,873- 9,727 clients	4052	3675	3552
Primary care nurse ²	1 if practice nurse working in the practice	46.9%	56.3%	50.0%
GPinf _{dum1} ²	1 if practices changed in the specific year to an episode-based system	0%	18.8%	15.6%
GPinf _{dum2} ²	1 if used year-round an episode-based system	0%	0%	18.8%

¹ Mean.

² Percentage.

The presence of one out of four chronic conditions (cardiovascular diseases, asthma or COPD, diabetes mellitus and depression or anxiety disorder) is a proxy for health status. The presence of each condition was separately determined on the basis of ICPC-codes. Comorbidity was defined as the presence of two or more of the four mentioned conditions. Level of urbanisation was assessed in five categories, and was included since research has shown that health care utilisation increases with higher urbanisation.³³ Nationality and income were derived from the Statistics Netherlands database (CBS). Health care utilisation has been shown to differ between ethnic groups.³⁴⁻³⁵ Nationality was divided into Dutch, foreign western nationality and foreign non-western nationality. Income was based on the standardised household incomes in 2006, which is the after-tax household income adjusted for household size and composition, age of children and one- or two-earner households^b. Income was added to the model as a categorical variable, and divided into six separate

^b Based on an internal memo and available on request from the first author. Note that we used household income instead of a consumer's income, and therefore, consumers with a high household income could still have social insurance and vice versa.

categories based on the distribution of income in the Dutch population. The presence of a primary care nurse was taken into account since research shows that contact rate within a general practice increases with the presence of a primary care nurse.³⁶ Changes in the GP information system were taken into account as sub-analyses showed that changing to an episode-based GP information system changed the registration utilisation pattern (not shown). The covariates were centred on the basis of variables in 2005, with the exception of the GP information system^c.

Econometric methodology

We separately compare changes in patient-initiated (moral hazard) and physician-initiated utilisation (SID). For changes in patient-initiated utilisation, we are clearly able to identify a treatment (privately insured) and a control (publicly insured) group, as well as a treatment (post-2006) and a control (pre-2006) period and therefore apply a difference-in-difference approach/estimation. For physician-initiated utilisation only a control period can be defined but no treatment and control group. We believe that comparing changes in contacts between publicly and privately insured consumers can still be informative as it gives an indication about the effect that changes in remuneration have on physician-initiated utilisation. Equations for patient-initiated and physician-initiated utilisation are similar. The basic equation for analysing the impact of changes in cost sharing and remuneration is:

^c We did not centre the GP information system because in 2005, no episode-based GP information system was in operation.

$$\log(E(y_{ij} | \beta_{0-i})) = \beta_0 + \beta_1 \cdot \text{timedum1}_{ij} + \beta_2 \cdot \text{timedum2}_{ij} + \beta_3 \cdot \text{insurance}_{ij} + \beta_4 \cdot \text{timedum1} \cdot \text{insurance}_{ij} + \beta_5 \cdot \text{timedum2} \cdot \text{insurance}_{ij} + \beta_{0x0} X_{ij} + \beta_{00z} Z_{ij} + \mu_{t0j} + \varepsilon_{t0ij}(1)$$

y_{ij} number of consultations (patient - initiated or physician - initiated)

t = time 2005,2006,2007

i = patient 1, n

j = practice 1.....N

timedum1_{ij} difference between 2006 and 2005

timedum2_{ij} difference between 2007 and 2005

insurance insurance type in 2005

X patient level covariates (estimated on patient level β_{0x0})

Z practice level covariates (estimated on practice level β_{00z})

μ_{t0j} full yearly between practice variance/covariance matrix (normal distribution)

ε_{t0ij} full yearly between patient variance/covariance matrix within practice (extra Poisson distribution)

Data were analysed using iterative generalized least squares estimation. We used Poisson multilevel repeated measurement regression analyses with extra Poisson variation to account for over-dispersion (MLWin 2.02 software). The Poisson models were fitted with the second-order PQL estimation, with estimated co-variances and variances (per year) on consumer and practice level. Multilevel analyses were used to correct for the hierarchical structure of the data with level 1 being time, level 2 consumers and level 3 general practices (Rice and Jones, 1997³⁷ - here estimating random intercept). Co-variances and variances on consumer and practice level were estimated because variances and co-variances of the outcome variable varied over time.^{38,d} Consumer and practice covariates (X and Z) are centred around the sample averages of covariates in the first year (2005), and thereby represents the average publicly insured consumer in 2005. The scores per individual could differ between years (for instance, age (+1 per year) and presence of chronic diseases) or be constant (for instance, gender). The consumer level covariates (X) and practice level covariates (Z) were estimated across years, assuming that the effect is constant over time, i.e. having diabetes mellitus in 2005 had the same effect on

^d Co-variances and variance matrixes are available on request from the first author.

utilisation as having diabetes in 2007. This assumption is necessary since consumers' health status can vary over time, affecting utilisation.

Differences in the number of contacts are denoted by the relative risk (RR), with the equation for RR being $RR=e^{\beta x}$. The RR shows the chance of the outcome (contacts) in one group compared with another group or in case of a continuous variable the change of the outcome with one step.

We included two dummy variables for waves, with *Timedum1* indicating the difference between 2005 and 2006 and *Timedum2* the difference between 2005 and 2007. Since the effects of changes in remuneration system and cost sharing might take time, we estimated one-year and two-year differences. We were mainly interested in the differences in trends between publicly and privately insured consumers in time, which is included in the variable *timedum1·insurance* for the difference in trend between 2005 and 2006 and *timedum2·insurance* for the difference in trend between 2005 and 2007. For our variable of interest, *timedum1·insurance*, an RR of 0.80 indicates a 25% ($1/0.80$) higher increase in GP contacts in 2006 compared with 2005 for publicly insured consumers compared with privately insured consumers. To test for SID in physician-initiated utilisation (hypothesis 2), we examined whether estimates varied according to the level of information asymmetry employing the information on the four chronic conditions as described earlier and for non-chronically ill consumers.

EMPIRICAL RESULTS

Poisson multilevel regression analyses were first performed without any covariates (model 1). In the second model all covariates were added (model 2). In addition, interaction between the interaction term (time*insurance) and age or presence of chronic disease were estimated (model 2), to check for differences in effects between age groups and presence of chronic disease.⁶ To test whether results differed if a larger dataset was used (sensitivity analyses), model 1 was also estimated for the same dataset before linking to the Statistics Netherlands database.

⁶ Estimated by: $EXP(\text{Insurance} \cdot \text{time} + (\text{Insurance} \cdot \text{time} \cdot \text{cardiovascular diseases}))$

Patient-initiated health care utilisation

Our first hypothesis was that abolition of cost sharing for privately insured consumers led to a higher increase in patient-initiated utilisation compared with publicly insured consumers. There seems no statistically significant evidence for difference-in-differences effects in any of the models (Table 4.3). Table 4.4 showed, however, a statistically significant difference-in-differences effect in the majority of age categories. We found a higher increase in patient-initiated utilisation for privately insured consumers within the age groups of 65 and older. In the age category 65-74, privately insured consumers had a 5% higher increase in patient-initiated contacts than publicly insured consumers between 2005 and 2006 and a 10% higher increase between 2005 and 2007. In younger age categories there seemed to be a decrease in contacts of privately insured consumers compared with publicly insured ones. Please note that the finding that utilisation of older age categories goes up and younger age categories goes down is not something that is by definition determined in the regression analysis, since covariates were centred on the basis of variables in 2005, with the exception of the GP information system. Analyses for age groups could, however, be affected by the fact that consumers aged 75 and older could not move to other age groups and therefore provided an underestimation. It is worth noting that analysing model 1 with a larger dataset ($n=78,127$) showed similar results (Timedum1*insurance: 1.00 (ns); Timedum2*insurance: 1.01 (ns)).

Patient-initiated utilisation increased between 2005 and 2006 and between 2005 and 2007 by 7% for both publicly and privately insured consumers. After controlling for characteristics like health care needs, age ranges and nationality, privately insured consumers had statistically significantly fewer patient-initiated contacts compared with publicly insured consumers over the three-year period. Many of the other results are comparable with the literature:^{39,40} patient-initiated utilisation of GP care was higher for older consumers, the presence of a chronic condition, foreign western or non-western nationality and for females.

Table 4.3: Relative Risk (RR) for total patient-initiated utilisation of GP, 2005-2007 (n=35,336).

	Patient-initiated utilisation	
	Model 1	Model 2
Time _{dum1} (Difference 2005-2006) ¹	1.05 *	1.07 **
Time _{dum2} (Difference 2005-2007) ¹	1.10 ***	1.07 *
Insurance	0.78 ***	0.91 ***
Time _{dum1} *insurance (Insurance*2005-2006) ²	1.00	0.98
Time _{dum2} *insurance (Insurance*2005-2007) ²	1.01	1.00
Gender (0=men)		1.44 ***
Age (0= 18-25 years)		
25-34 years		1.05 ***
35-44 years		1.05 ***
45-54 years		1.11 ***
55-64 years		1.16 ***
65-74 years		1.30 ***
75 or older		1.49 ***
Chronic disease		
Cardiovascular diseases		1.70 ***
Asthma/COPD		1.64 ***
Diabetes mellitus		1.55 ***
Depression/ Anxiety disorder		1.71 ***
Comorbidity		0.78 ***
Nationality (0= indigenous)		
Foreign western nationality		1.04 **
Foreign non-western nationality		1.24 ***
Income, categorical (0 = € 0-11,999)		
€12,000-13,999		1.03
€14,000-17,999		1.00
€18,000-21,999		0.97
€22,000-27,999		0.96 *
€28,000 or more		0.91 ***
Urbanisation (0 = extremely urbanised)		
Strongly urbanised		1.03
Moderately urbanised		1.04 *
Hardly urbanised		1.06 *
Not urbanised		0.99
Practice size		1.00
Primary care nurse		0.96

¹ Differences between 2005-06 and 2006-07 were estimated with two dummy variables for time.

² Insurance*2005-06 and insurance*2005-07 represent the difference in trend between privately and publicly insured consumers.
Significant difference of * p<0.05 ** p<0.01 *** p<0.001.

Table 4.4: Difference-in-differences effect for patient-initiated utilisation per age group^{§#}.

	Insurance* 2005-2006 ¹	Insurance* 2005-2007 ¹
18-25 years	1.00	0.91*
25-34 years	0.92*	0.89*
35-44 years	0.92*	0.96*
45-54 years	0.96*	0.98
55-64 years	1.00	1.06*
65-74 years	1.05*	1.10*
75 or older	1.12*	1.14*

¹ Insurance*2005-06 and insurance*2005-07 represent the difference in trend between privately and publicly insured consumers.

[§] Age 18-25 years was used as the reference category.

* Significant difference of $p < 0.05$.

Model estimations available on request.

Physician-initiated health care utilization

Our second hypothesis was that the change from a capitation system for publicly insured consumers and an FFS system for privately insured consumers to a combined system of capitation and FFS involved a higher increase in physician-initiated utilisation for publicly insured consumers. In line with our expectations, the statistically significant interaction term suggests an effect of changes in GPs' remuneration on physician-initiated health care utilisation (Table 4.5). Differences in trend between privately and publicly insured consumers between 2005-06 and 2005-07 were both 0.95. This means that publicly insured consumers had a 5.3% (1/1.05) higher increase in physician-initiated contacts than privately insured consumers as a consequence of exogenous changes in the remuneration system. Physician-initiated contacts rose by approximately 19% between 2005 and 2006 and 21% between 2005 and 2007 for publicly insured consumers and by 13% and 15% respectively for privately insured consumers. This increase occurred predominantly between 2005 and 2006. Privately insured consumers again had significantly lower physician-initiated contacts over the three-year period. Many of the other results are in line with the literature:^{39,40} physician-initiated utilisation was higher for females, persons with a chronic condition, increased age, and foreign non-western nationality and lower income. Analysing model 1 with a larger dataset (n2005=58,085; n2006=58,874;

n2007=59,623) showed similar results, but between 2005 and 2007 significant results (Time_{dum1}*insurance: 0.99 (ns); Time_{dum2}*insurance: 0.96 (p<0.05)).

Table 4.5: Relative Risk (RR) for total physician-initiated utilisation of GP, 2005-2007. (n₂₀₀₅=26,315; n₂₀₀₆=26,858; n₂₀₀₇=27,128)

	Physician-initiated utilisation	
	Model 1	Model 2
Time _{dum1} (Difference 2005-2006) ¹	1.13 **	1.19 **
Time _{dum2} (Difference 2005-2007) ¹	1.25 ***	1.21 **
Insurance	0.75 ***	0.92 ***
Time _{dum1} *insurance (Insurance*2005-2006) ²	1.01	0.95 *
Time _{dum2} *insurance (Insurance*2005-2007) ²	0.97	0.95 *
Gender (0=men)		1.27 ***
Age (0= 18-25 years)		
25-34 years		1.17 ***
35-44 years		1.33 ***
45-54 years		1.62 ***
55-64 years		1.79 ***
65-74 years		2.08 ***
75 or older		2.33 ***
Chronic disease		
Cardiovascular diseases		2.36 ***
Asthma/COPD		1.81 ***
Diabetes mellitus		2.39 ***
Depression/ Anxiety disorder		1.93 ***
Comorbidity		0.67 ***
Nationality (0= indigenous)		
Foreign western nationality		1.03
Foreign non-western nationality		1.17 ***
Income, categorical (0 = € 0-11,999)		
€12,000-13,999		0.94 *
€14,000-17,999		0.90 ***
€18,000-21,999		0.88 ***
€22,000-27,999		0.86 ***
€28,000 or more		0.78 ***
Urbanisation (0 = extremely urbanised)		
Strongly urbanised		1.07 *
Moderately urbanised		1.11 **
Hardly urbanised		1.05
Not urbanised		1.05
Practice size		1.00
Primary care nurse		0.96

¹ Differences between 2005-06 and 2006-07 were estimated with two dummy variables for time.

² Insurance*2005-06 and insurance*2005-07 represent the difference in trend between publicly (reference) and privately insured consumers.
Significant difference of * p<0.05; ** p<0.01 *** p<0.001.

We expected that the difference in trend would be greater (lower RR) for older age groups. Table 4.6 shows no evidence for this hypothesis.

Table 4.6: Difference-in-differences effect for physician-initiated utilisation per age group^{§#}.

	Insurance*2005-2006 ¹	Insurance* 2005-2007 ¹
18-25 years	0.96	0.98
25-34 years	0.89*	0.79*
35-44 years	0.91*	0.93
45-54 years	0.88*	0.90*
55-64 years	0.96	0.93*
65-74 years	0.98	1.07
75 or older	1.22*	1.15*

¹ Insurance*2005-06 and insurance*2005-07 represent the difference in trend between publicly and privately insured consumers.

[§] Age 18-25 years was used as the reference category

* Significant difference of $p < 0.05$.

[#] Model estimations under request available.

To differentiate between SID and the neoclassic response to changes in price for health care, we examined whether effects varied according to the level of information asymmetry: chronically ill versus non-chronically ill consumers. Table 4.7 suggests that the statistically significant differences in trend in physician-initiated contacts were only apparent in consumers without chronic disease, indicating to SID response rather than a neoclassic response. Differences in trend between privately and publicly insured consumers with no chronic disease between 2005-06 and 2005-07 were 0.88 and 0.89. This means that publicly insured consumers had a 13.6% (05-06) and 12.4% (05-07) higher increase in physician-initiated contacts than privately insured consumers as a consequence of exogenous changes in the remuneration system. Note that also the category asthma/COPD shows similar non-significant differences in trend in physician-initiated contacts. Other research showed that only 17% of health care utilization in COPD-patients is specifically for COPD.⁴¹ So, in the main part of all encounters COPD-patients do not have a lower information asymmetry.

Table 4.7: Difference-in-differences effect for physician-initiated utilisation to chronic disease[#].

	Insurance*2005-2006 ¹	Insurance*2005-2007 ¹
No chronic disease	0.88*	0.89*
Cardiovascular disease	1.00	0.98
Asthma/COPD	0.88	0.91
Diabetes mellitus	1.05	1.06
Depression/Anxiety	1.06	0.94

¹ Insurance*2005-06 and insurance*2005-07 represent the difference in trend between publicly and privately insured consumers.

[§] No chronic disease was used as the reference category

* Significant difference of $p < 0.05$.

[#] Model estimations under request available.

DISCUSSION AND CONCLUSION

The purpose of this study was to test empirically whether GPs' and consumers' behaviour changed following a change in financial incentives as a result of a policy change. We investigated whether a change in cost sharing and GP reimbursement resulted in changes in patient-initiated and physician-initiated utilisation. Our hypothesis was that abolition of cost sharing for privately insured consumers would result in a higher increase in patient-initiated utilisation for privately insured consumers compared with publicly insured consumers, indicating at ex-post moral hazard. This hypothesis was rejected although we did find an ex-post moral hazard effect in consumers aged 65 and older.

We hypothesised that the change from a capitation system for publicly insured consumers and an FFS system for privately insured consumers to a combined system of capitation and FFS involved a higher increase in physician-initiated utilisation for publicly insured consumers compared with privately insured consumers. Empirical results seems to support our hypotheses as publicly insured consumers had a 5.3% higher increase in physician-initiated contacts than privately insured consumers. Further analyses suggested that the higher increase in physician-initiated utilisation for publicly insured consumers was only apparent in non-chronically ill consumers. This indicates at SID.

A number of points should be noted. First, included GPs could represent a highly motivated part of Dutch GPs. This could have affected their medical ethics. Effects of changes in physician-initiated health care utilisation could therefore be larger in the Dutch GP population compared with our sample, although other Dutch GPs show similar contact rates.⁴² We were also unable to distinguish between necessary and unnecessary health care utilisation. An increase in utilisation could imply better quality and accessibility of GP care. For instance, GPs could have rationed health care services for publicly insured consumers before the insurance reform. As Labelle et al. pointed out, SID includes care that might contribute positively to consumer health and therefore SID can be positive.⁵ Third, our main assumption was that the first contact was patient-initiated and follow-up contacts were physician-initiated. This distinction might however be less straightforward than appeared at first. Previous experiences with general practice could influence patient-initiated utilisation and consumers could demand extra contacts. In addition, there could be registration bias. Since 2006, GPs have been reimbursed for every service, which motivates them to record correctly every service provided. In LINH, we prevented this by recording instructions for participating general practices. Further, first and follow-up contacts were based on care episodes. Care episodes do not take into account that consumers might visit the general practice with more than one health problem during one contact. Alternatively, without the construction of care episodes, we would not have been able to distinguish between patient- and physician-initiated contacts which we believe was a valuable contribution to the literature.

Patient-initiated utilisation increased between 2005 and 2007. The increase was similar for publicly and privately insured consumers, suggesting the absence of ex post moral hazard. This is contrary to our hypothesis and to some other studies.^{9,14} The absence of ex post moral hazard may be because of the low costs of GP care for privately insured consumers. In 2005, the price of a GP consultation was €24.80, which may be too low to avoid ex post moral hazard for the average privately insured patient. The overall increase in patient-initiated utilisation might be the result of realisation of unmet needs and better accessibility of GP care in the general population.

The increase in physician-initiated utilisation was higher in publicly insured consumers between 2005 and 2007 as expected. GPs seem to react to a change in remuneration from capitation to a combined system of FFS and capitation. The number of physician-initiated contacts increased for both publicly and privately insured consumers, which might partly be explained by the increased attention to chronically-ill patients in primary care. Between 2005 and 2007, several measures and campaigns have encouraged diabetes mellitus patients to be treated in primary care in the Netherlands. The care for diabetes involves numerous follow-up contacts, which could explain the overall increase in physician-initiated utilisation, although we corrected for chronic conditions.

The 2006 insurance reform in the Netherlands involved changes in remuneration and cost sharing systems. These changes seem not to have resulted in changes in patient-initiated health care utilisation but in a limited change in physician-initiated utilisation, which could be ascribed to SID. Our main contribution was to disentangle the changes in health care utilization due to demand and supply side financial incentives. In this respect we have provided empirical evidence on part of the health policy reform puzzle, which was outlined by Maynard.⁴³ Although our results seem to suggest that policy makers better focus on supply side incentives instead of demand side if they wish to influence utilization. Our empirical contribution should ideally be complemented with evidence on the impact of changes in health care utilization on patients' health and other outcomes to get a glance of the total picture.

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Changes in remuneration system for general practitioners: effects on contact type and consultation length

5



In the Netherlands, the remuneration system for GPs changed in 2006. Before the change, GPs received a capitation fee for publicly insured patients and fee for service (FFS) for privately insured patients. In 2006, a combined system was introduced for all patients, with elements of capitation as well as FFS. This created a unique opportunity to investigate the effects of the change in remuneration system on contact type and consultation length. Our hypothesis was that for former publicly insured patients the change would lead to an increase in the proportion of home visits, a decrease in the proportion of telephone consultations and an increase in consultation length, relative to formerly privately insured patients. Data were used from electronic medical records from 36 to 58 Dutch general practices and from 532,800 to 743,961 patient contacts between 2002 and 2008 for contact type data. For consultation length, 1994 videotaped consultations were used from 85 general practices in 2002 and 499 consultations from 16 general practices in 2008. Multilevel multinomial regression analysis was used to analyse consultation type. Multilevel logistic and linear regression analyses were used to examine consultation length. Our study shows that contact type and consultation length were hardly affected by the change in remuneration system, though the proportion of home visits slightly decreased for privately insured patients compared with publicly insured patients. Declaration behaviour regarding telephone consultations did change: general practices more consistently declared telephone consultations after 2006.

5 Changes in remuneration system for general practitioners: effects on contact type and consultation length

Van Dijk CE, Verheij RA, Te Brake H, Spreeuwenberg P, Groenewegen PP, De Bakker DH. Changes in remuneration system for general practitioners: effects on contact type and consultation length (submitted).

INTRODUCTION

Rising health care cost and concerns about the accessibility and quality of care have brought about health care reforms in several countries. Changes in the remuneration system for physicians are recognised as an important element in these reforms,¹ and are assumed to affect GPs' behaviour.²⁻¹⁰ The three main remuneration systems with many combinations, are the fee-for-service (FFS) system (including pay for performance (P4P)), the capitation-based system and the salary system. In an FFS system physicians are paid per item or performance; in a capitation-based system physicians receive an annual capitation fee per patient; and in a salary system physicians receive a fixed salary. In an FFS system, a clear relationship exists between workload and income, whereas in a capitation system income is related to the number of registered patients. In a salary system, income is neither directly linked to workload nor to patient-list size.

Literature suggests that primary care physicians paid under an FFS system have longer working hours, provide more contacts, initiate fewer hospital referrals and issue fewer repeat prescriptions compared with physicians paid under a capitation system.^{2,6,11-13} Compared with a salary system, GPs remunerated under FFS have been found to make more home visits.^{7,8,11} Most evidence, however, comes from international comparisons or cross-sectional comparisons within countries. Most of these studies on the effects of actual changes in remuneration system on physician services do not include a control group, making it difficult to draw inferences regarding the causality of the relations found. The few studies that do include a control group suggest that changes in remuneration system do not necessarily lead to changes in contact rate and if they do effects are small.^{4,6,14,15} Other aspects of care, however, such as type of contact or consultation length, might be more easily influenced by physicians.

Kristiansen and Holtedahl and Kristiansen and Mooney investigated the influence of remuneration system (FFS or salary) in Norway on type of GP contact (surgery vs. home) and consultation length.^{7,8} In a cross-sectional study, they found that doctors paid on an FFS basis had a higher proportion of home visits, especially scheduled home visits, and shorter consultation length. The existence of a causal relationship however remained unclear.

In this article, we try to gain more insight into the relationship between remuneration system and type of contact and length of consultation by comparing GPs' allocation of time to patients who were formerly publicly insured and formerly privately insured, before and after changes in the reimbursement system. We used data from GPs' electronic medical records (EMRs) with respect to contact type and videotaped consultations to assess consultation length to address the following question: to what extent has GPs' allocation of time changed in terms of contact type (consultations, home visits or telephone consultations) and length of consultation for privately and publicly insured patients between 2002 and 2008 as a result of changes in their remuneration system?

BACKGROUND TO THE DUTCH HEALTH CARE SYSTEM AND HYPOTHESES

In January 2006, the Dutch government introduced a new health insurance act based on the principles of regulated competition.¹⁶ The former system, where each inhabitant, mainly depending on income, was either publicly (sickness fund, 63%) or privately (37%) insured, was replaced by a single generic compulsory basic health insurance. The aims of the reform consisted of growth in efficiency and improved quality of the health care system and to turn the system more patient-centred while keeping it accessible to all.¹⁷ With the revised health insurance system, the GP remuneration system changed. In short, a system with FFS for privately insured patients and capitation payments for publicly insured patients was replaced by a system combining both capitation and FFS. The differentiation in remuneration between publicly and privately insured patients was thought to be undesirable, as it could result in differences in the provision of GP care between these patient groups.^{18,19} Also, GPs believed the former

remuneration system of capitation for publicly insured patients did not reward their time investment. The aim of the new remuneration system was to combine the good features of both systems: on the one hand a capitation system through which a strong relationship between a patient and GP could be established and on the other hand, an FFS system to realise financial compensation for work performed, but with a modest fee per service to prevent overproduction. For privately insured patients before 2006 and all patients since 2006, the amount of the remuneration depended on the type of contact and the length of that contact. For home visits, the remuneration was higher than for consultations and the longer a home visit or consultation the higher the remuneration. The financial consequences of these changes are shown in Table 5.1. In the Dutch health care system, GPs act as gatekeepers for, among others, medical specialists. Some of the privately insured patients could visit a medical specialist without referral before 2006, however.²⁰

Hypotheses

Given the fact that – at the onset of the remuneration change – GPs were uncertain about the consequences of the change in reimbursement system for their turnover, we assume that GPs tended to intend to maximise their turnover. This will be reflected in both the consultation types (hypotheses 1 and 2) and consultation length (hypothesis 3). These are clarified below.

Consultation type

The difference in revenue of GPs for privately insured patients between home visits, consultations and telephone consultations decreased after the reform (Table 5.1). Before 2006, the revenue was almost three times higher for all services than after the reform. The financial compensation for the extra time involved in home visits relative to practice consultation and practice consultation relative to telephone consultation decreased. We therefore expected GPs to become less inclined to provide the more time-consuming contact types. The introduction of FFS for publicly insured patients in 2006 was expected to make GPs more inclined to provide more time-consuming contact types for these patients. Within a capitation system, an extra consultation or home visit only generates more work for the same income, whereas in an FFS system an extra consultation is rewarded with extra income. We expected that GPs would shift their services to publicly insured patients towards more consultations and home

visits. In sum, we hypothesised that the proportion of home visits would decrease for privately insured patients compared with publicly insured patients between 2002 and 2008 (hypothesis 1). Additionally, we hypothesised that the proportion of telephone consultations would increase for privately insured patients compared with publicly insured patients (hypothesis 2).

Table 5.1: GPs' remuneration in the Netherlands before and after the change in remuneration

	Before change (2005)		After change (2006 and onward)
	Publicly insured	Privately insured	All insured
Remuneration system			
<i>Capitation fee</i>			
Basic capitation fee*	€ 77.00	-	€ 52.00
<i>Fee-for-service</i>			
Consultation <20 minutes	-	€ 24.80	€ 9.00
Consultation >20 minutes		€ 49.60	€ 18.00
Home visit <20 minutes		€ 37.20	€ 13.50
Home visit > 20 minutes		€ 62.00	€ 22.50
Telephone consultation		€ 12.40	€ 4.50

Consultation length

In general, we expected consultation length to have increased between 2002 and 2008. The population ages, and GPs are more often faced with patients with multi-morbidity which involves more consultation time.^{21,22} Also, general tendency rose to deal with chronic patients and prevention predominantly in a primary care setting, and to limit the role of medical specialists, which was expected to influence the consultation length in both publicly and privately insured patients. We hypothesised that the consultation length had increased more for publicly insured patients than for privately insured patients (hypothesis 3). For publicly insured patients, GPs only received a capitation fee for every patient before the reform, which gave no incentive for long consultations. Since 2006, GPs have received a fee for every consultation and the amount of the remuneration is dependent on the consultation length. For privately insured

patients the fee was dependent on the consultation length before as well as after 2006, and therefore no difference in consultation length was expected.

METHODS

Data

Contact type

To analyse the effect on contact type, data were used from EMRs of general practices that participated in the Netherlands Information Network of General Practice (LINH).²³ The LINH database holds longitudinal data on contacts, morbidity, prescriptions and referrals. The network is a dynamic pool of practices, with annual changes in composition. LINH is registered with the Dutch Data Protection Authority; data are handled according to the data protection guidelines of the authority. For the purpose of this study, we used data from general practices that recorded their contact data (2002-05) or claim data (2006-08) adequately throughout the year of measurement and where patients' (former) health insurance type (publicly or privately) was known. As LINH consists of a dynamic pool of practices, the number of practices varied between the years. In 2002, 36 general practices and 580,646 contacts were included, in 2003 51 and 688,965, in 2004 46 and 658,451, in 2005 45 and 695,199, in 2006 61 and 743,961, in 2007 58 and 659,434 and in 2008 47 general practices and 532,800 contacts. Overall these general practices were representative of Dutch general practices with respect to degree of urbanisation and region, but not with respect to practice type (single, dual, group or health centre). The LINH database holds more data from GPs in a group or health centre than single-handed GPs.

Consultation length

For the analysis of consultation length, data were used from videotaped consultations collected in the second Dutch National Survey of General Practice (DNSGP-2)²⁴ and LINH. For consultation length in 2002, data were used from videotaped consultations in DNSGP-2 and for 2008 from LINH. One hundred and forty-two of the GPs (73%) in the DNSGP-2 gave permission for the consultations in their surgery to be videotaped. These GPs were representative of the Dutch GP population with respect to age, gender and urbanisation.²⁵ Of

the patients, 88% gave informed consent to participate in the study. Approximately 20 consultations of every GP were recorded between 2000 and 2002. For videotaped consultation in 2008, 40 GPs within 21 practices (43%) gave permission for the consultation in their surgery to be videotaped. These GPs were representative of the Dutch GP population with respect to sex and urbanisation. Approximately 20 consultations of every GP were recorded between July 2007 and May 2008. Only consultations where patients' characteristics (age, gender and (former) health insurance type) were known were included in the analyses. In total, 1994 videotaped consultations in 85 practices in 2002 and 499 consultations in 16 practices in 2008 were analysed (five practices which first participated after 2006 could not supply any health insurance type for patients in 2005 and were therefore excluded). In this study, the consultation length in minutes and dichotomised consultation lengths shorter and longer than 20 minutes were used. For privately insured patients before 2006 and all patients since 2006, the amount of the remuneration depended on the type of contact and the length of that contact, with 20 minutes as a cut-off point.

Measures

Dependent variables

Contact type

Three contact types were distinguished: consultations (in surgery), home visits and telephone consultations.

Length of consultation

Length of consultation was based on the videotaped consultations. Consultation length was measured with a stopwatch, starting at the first verbal expression and stopping after the last verbal expression. Interruptions in the consultation were subtracted from the total consultation length. Length of consultations was analysed as a continuous variable and also as a dichotomised variable dividing consultations shorter and longer than 20 minutes. A cut-off point of 20 minutes was adopted since the price of consultations shorter and longer than 20 minutes differs (Table 1).

Independent variables

Health insurance type

For each patient the health insurance type was determined within the specific year from 2002 to 2005. Since 2006, one basic health insurance has been introduced without differentiation between publicly and privately insured patients. For patients in 2006, 2007 and 2008 the last known health insurance type was preserved.

In all analyses, we controlled for possible differences in age and gender composition of patients between the years. Age was included as polynomial confounder in the analyses (age, age2 and age3). The Dutch population is aging, a phenomenon that is known to affect contact type and consultation length.^{26,27}

Statistical analyses

To analyse the trend in consultation type between 2004 and 2007 (hypotheses 1 and 2), a multilevel repeated multinomial regression analysis was conducted comparing three types of patient contact: (1) practice consultation, (2) home visit and (3) telephone consultation. Home visits (2) and telephone consultations (3) were regarded as 'treatment groups' and were compared with consultations (1). In the multilevel analysis three levels were distinguished: contacts within patients, and patients within general practices. It was not possible to distinguish GPs within general practices. The dependent variable in the analysis was the contact type. Year and health insurance type were included as independent variables. The analysis was corrected for differences in age and gender composition of patients. Co-variances and variances on patient and practice level were estimated because variances and co-variances of the outcome variable varied over time, which is often the case with longitudinal data.²⁸ To test whether or not the insurance effect changed over time (indicating a difference in trend between privately and publicly insured patients and the effect of the change in remuneration) a chi squared test was performed on the difference between 2004/05 and 2006/07. The patient level co-variates (age, gender and health insurance type) were estimated across years, assuming that the effects were constant over time. The significance level was set at $p < 0.01$.

The trend in consultation length between 2002 and 2008 (hypothesis 3) was analysed with a multilevel linear regression analysis (continuous outcome) and a multilevel logistic regression analysis (dichotomised outcome). Consultation length was taken as the dependent variable, and year and insurance type as independent variables. Since consultation length was not normally distributed, the natural logarithm of consultation length was used and geometric means were calculated in the multilevel linear regression analysis. The analyses were corrected for differences in age and gender composition. The interaction term year*insurance type was added to analyse whether the trend in consultation length differed between publicly and privately insured patients. Co-variances and variances on practice level were estimated. The significance level was set at $p < 0.10$ and $P < 0.05$. Owing to the limited number of patients in 2008 and the cluster effect within the 16 practices the power of the analyses is limited. Therefore, clinically relevant differences of $p < 0.10$ were also seen as significant. Multilevel analyses were conducted with MLwiN 2.02.

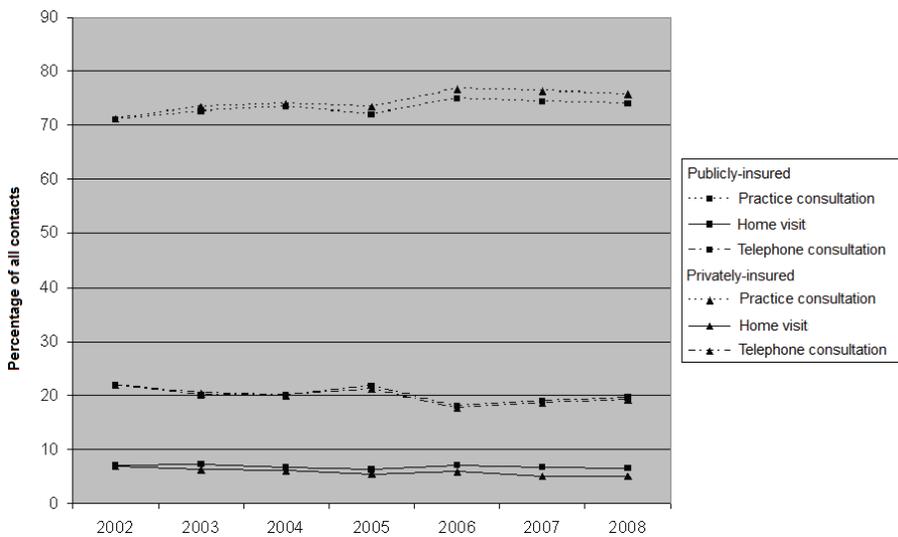
RESULTS

Contact type

Figure 5.1 shows the contact type for publicly and privately insured patients adjusted to the age and gender composition of publicly insured patients in 2002. The percentage of consultations ranged between 71% and 75% for publicly insured patients and between 71% and 74% for privately insured patients. The percentage of home visits ranged between 6% and 7% and 5% and 7% respectively and telephone consultations between 18% and 22% for both publicly and privately insured patients. Table 5.2 shows the results of the multilevel repeated multinomial regression analysis. The percentage of consultations, home visits and telephone consultations did not change significantly between 2004 and 2007 for publicly insured patients or for privately insured patients. Privately insured patients in all years had a lower percentage of home visits than publicly insured patients, but the ratio of consultations and home visits significantly decreased after the insurance reform to odds of 0.77 in 2007 ($P < 0.01$). In other words, the change from capitation for publicly insured patients and FFS for privately insured patients to a combined system of capitation and FFS resulted in a higher decrease in the proportion of home visits

for privately insured patients compared with publicly insured patients. Privately insured patients had a lower percentage of telephone consultations in 2005 and 2007, but the ratio of telephone consultations and home visits did not change between 2004 and 2007. Another finding in the multilevel repeated multinomial regression analysis was the smaller variation between general practices concerning telephone consultations after 2006 (smaller ICC in Table 2). It seems that general practices have claimed or registered more telephone consultations since 2006.

Figure 5.1: Contact for (former) publicly and privately insured patients in 2002-08, adjusted to the age and gender composition of publicly insured patients in 2002.



Consultation length

The length of consultations increased between 2002 and 2008 for both publicly and privately insured patients ($p < 0.1$). The geometric mean consultation length in minutes, without controlling for age, gender and health insurance type, length (for patients with an average age of 44.4 years) changed for publicly insured patients from 8.52 to 9.28 minutes per consultation and for privately insured

patients from 9.16 to 9.32 minutes per consultation. Although the increase in consultation length seems to be greater for publicly insured patients than for privately insured patients, this difference was not significant ($P=0.48$).

Also, the overall percentage of consultations longer than 20 minutes significantly increased between 2002 and 2008 ($P<0.05$). The percentage of consultations longer than 20 minutes (for patients with an average age of 44.4 years) increased for publicly insured patients from 3.8% to 7.3% and for privately insured patients from 5.2% to 7.0%. The difference in trend between former publicly and former privately insured patients was not significant, however ($p=0.48$).

DISCUSSION

We investigated whether GPs' use of time changed in terms of contact type and consultation length as a result of the change in the remuneration system of GPs in the Netherlands in 2006. Our first hypothesis was that the proportion of home visits had decreased more for former privately insured patients than for former publicly insured patients between 2002 and 2008. This was confirmed. Second, we hypothesised that the proportion of telephone consultations had increased more for former privately insured patients than for former publicly insured patients. This hypothesis was rejected. Our third hypothesis was that the consultation length had increased more for publicly insured patients than for privately insured patients between 2002 and 2008. The consultation length did increase in general between 2002 and 2008, but no difference in the trend of consultation length was found between publicly and privately insured patients. Further, our study showed that general practices had more consistently claimed or registered telephone consultations since the health insurance reform for both publicly and privately insured patients.

Table 5.2: Multilevel repeated multinomial regression analysis for home visits and telephone consultations in comparison with practice consultations, 2004-07[§]

	Home visits vs. practice consultations				Telephone consultations vs. practice consultations			
	2004	2005	2006	2007	2004	2005	2006	2007
	OR (99% CI)				OR (99% CI)			
Year	0.02 (0.02-0.03)	0.02 (0.01-0.02)	0.02 (0.02-0.02)	0.02 (0.02-0.02)	0.17 (0.12-0.25)	0.20 (0.14-0.28)	0.19 (0.16-0.21)	0.20 (0.17-0.22)
Insurance (reference publicly insured patients)	0.85 (0.79-0.91)	0.87 (0.81-0.93)	0.80 (0.74-0.85)	0.77 (0.72-0.83)	0.98 (0.95-1.00)	0.95 (0.92-0.97)	0.98 (0.96-1.00)	0.97 (0.94-0.99)
Gender [†] (reference male)	1.30 (1.26-1.34)				1.21 (1.20-1.22)			
Age [‡]	1.04 (1.04-1.05)				1.00 (1.00-1.00)			
Age ^{‡#}	1.00 (1.00-1.00)				1.00 (1.00-1.00)			
Age ^{‡##}	1.30 (1.26-1.34)				1.00 (1.00-1.00)			
	Variance (SE)				Variance (SE)			
Between-patients variance	7.20 (0.06)	6.88 (0.06)	6.62 (0.06)	6.93 (0.07)	0.75 (0.01)	0.59 (0.01)	0.50 (0.01)	0.50 (0.01)
Between general practice variance	0.26 (0.06)	0.23 (0.05)	0.20 (0.04)	0.21 (0.04)	0.84 (0.17)	0.76 (0.16)	0.16 (0.03)	0.15 (0.03)
ICC [†]	0.02	0.00	0.03	0.04	0.16	0.14	0.02	0.02
95% range on general practice	0.01-0.03	0.01-0.02	0.01-0.04	0.01-0.03	0.04-0.82	0.05-0.83	0.11-0.32	0.11-0.34

[§] Covariance and correlation between home visits and telephone consultation are available on request; [#] Gender, age, age² and age³ were estimated across years, assuming that the effect was constant over time; [†] Intra-class correlation between the two upper levels (patients and general practice); the ICC is the relative contribution of patient and general practice variance.

Strengths and limitations of the study

A number of points should be noted. General practices were selected on the basis of the quality of their EMR and may represent the more motivated Dutch GPs. This could have an effect on the medical ethics of GPs. Effects of the remuneration system on consultation length and type could therefore be different in the Dutch GP population compared with our sample, although other Dutch GPs show similar contact rates and types.²⁹ In addition, there could be a registration bias. Since 2006, GPs have been reimbursed for every service for both privately and publicly insured patients, whereas before 2006 GPs were only reimbursed for every service for privately insured patients. FFS stimulates GPs to correctly record every provided service. In LINH registration bias is counteracted by the recording instruction for participating general practices and the inclusion of general practices with a complete registration of data. The intra-class correlation of telephone consultations decreased, however, between 2005 and 2006 from 0.14 to 0.02, which indicates that GPs declared more consequently telephone consultations after the reform. This suggests registration bias before the reform regarding telephone consultations. Analysis of telephone consultations showed no difference in trend between privately and publicly insured patients, indicating that GPs had not consequently claimed or registered telephone consultation for both publicly and privately insured patients before the reform. The registration bias therefore did not affect the difference in trend analyses. Group practices are overrepresented in LINH, which could have affected our results in both directions. Last, the analyses were based on a dynamic population and therefore the general practices included in the analyses varied between the years, which could have affected the results. For this reason, we performed multilevel analyses to correct for variations in participating practices between the years.

Comparison with other research

Our results show that the change in remuneration system from FFS for privately insured patients and capitation for publicly insured patients to a combined capitation and FFS system for all patients resulted in a higher decrease in the proportion of home visits for privately insured patients compared with publicly insured patients. This difference is relatively small. Our results are similar to, although less strong than, the cross-sectional study of Kristiansen and Holtedahl that showed that home visits were nearly twice as likely to have been carried out

by FFS doctors than salaried ones.⁷ The proportion of home visits did not significantly decrease for publicly and privately insured patients between 2004 and 2007. An earlier study in the Netherlands showed that the proportion of home visits by Dutch general practitioners decreased between 1987 and 2001 from 14.1% to 7.4%.²⁶ Our results show that this decrease did not continue.

We expected the proportion of telephone consultations to increase for privately insured patients compared with publicly insured patients. This hypothesis was rejected. The odds of telephone consultation between privately and publicly insured patients were stable at around 0.95 to 0.98 between 2004 and 2007. The absence of difference in trend between privately and publicly insured patients could be ascribed to the limited number of diagnoses for which telephone consultations are an option. The most often recorded diagnoses for telephone consultations are urinary tract infection and cough.²³ For more serious health complaints telephone consultation is not an option and patients will visit the GP at the surgery. The proportion of telephone consultations might for that reason not depend on GPs' remuneration system.

Another finding of our study was that the consultation length increased for both publicly and privately insured patients between 2002 and 2008. The reason for this overall increase could be the increased role of GPs in preventive activities and the increased number of patients with multi-morbidity. We expected a higher increase in consultation length for former publicly insured patients. This did not, however, appear to be the case. The trend in consultation length did not differ between publicly and privately insured patients. An explanation for the absence of this effect could be the prescheduled consultation which most general practices offer. Patients, whether privately or publicly insured, are booked for a specific time slot (usually 10 minutes) by the GP's assistant. Our results are contrary to the study of Kristiansen and Mooney,⁸ which found consultations to be 0.7 minutes longer for salaried doctors than for FFS-paid doctors, but is consistent with van der Berg et al.,⁹ who found no influence of the part of patients with capitation in general practices on consultation length. The percentage of consultations longer than 20 minutes is not in agreement with claims data for 2008.²³ Our study found long consultations of 7% in 2008, in comparison with almost 14% in claims data from LINH practices. This difference could partly be explained by the fact that consultations of patients with

psychosocial problems take longer³⁰ and patients of this group could be less willing to give informed consent to participate in a study using video-recording.³¹

Our study overall shows that the change in the system of reimbursement barely affected GPs' use of time in terms of contact type and consultation length, but it did change claim or registration behaviour with regard to telephone consultations. The proportion of home visits decreased more among former privately insured patients than former publicly insured patients, but the absolute difference in proportion of home visits was small. Prior to the change in reimbursement in 2006, the lack of financial compensation for work with publicly insured patients was seen by GPs as unfair. Interestingly, the change has not actually affected their allocation of time. A reason for the absence of effects could be that almost all Dutch citizens were originally publicly insured, since younger people have lower incomes, and only in older age, with rising incomes, did some of them become privately insured. Our results suggest that GPs do not think it ethically correct to change the manner of health care provision in terms of contact type and length for the same person when their payment system is changed. Overall this study showed that financial incentive only had a limited impact on the type of contact and no impact on consultation length. GPs seem to operate according to their best knowledge, irrespective of the way in which they are remunerated.

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Impact of remuneration on guideline adherence:
empirical evidence in general practice

6



Background and objective

Changes in the Dutch GP remuneration system provided the opportunity to study the effects of changes in financial incentives on the quality of care. Separate remuneration systems for publicly insured patients (capitation) and privately insured patients (fee-for-service) were replaced by a combined system of capitation and fee-for-service for all in 2006. We investigated the effects of these changes on the quality of care in terms of guideline adherence.

Design and setting

A longitudinal study from 2002 to 2009 using data from patient electronic medical records in general practice. A multilevel (patient and practice) approach was applied to study the effect of changes in the remuneration system on guideline adherence.

Subjects

21,421 to 39,828 patients from 32 to 52 general practices.

Main outcome measure

Sixteen guideline adherence indicators on prescriptions and referrals for acute and chronic conditions.

Results

Guideline adherence increased between 2002 and 2008 by 7% for (formerly) publicly insured patients and 10% for (formerly) privately insured patients. In general, no significant differences in the trends for guideline adherence were found between privately and publicly insured patients, indicating the absence of an effect of the remuneration system on guideline adherence. Adherence to guidelines involving more time investment in terms of follow-up contacts was affected by changes in the remuneration system. For publicly insured patients, GPs showed a higher trend for guideline adherence for guidelines involving more time investment in terms of follow-up contacts compared to privately insured patients.

Conclusion

The change in the remuneration system had a limited impact on guideline adherence.

6 Impact of remuneration on guideline adherence: empirical evidence in general practice

Van Dijk CE, Verheij RA, Spreeuwenberg P, Van den Berg MJ, Groenewegen PP, Braspenning J, De Bakker DH. Impact of remuneration on guideline adherence: empirical evidence in general practice (submitted).

INTRODUCTION

The literature suggests that a fee-for service (FFS) system encourages health care providers to provide services and not to delegate to other health care providers, while a capitation and salary system encourages providers to curtail services and more often refer to other health care providers.¹⁻⁶ The effects of these remuneration systems on the quality of care are less often discussed. It has been argued that health care providers under a capitation or salary system have a limited incentive to improve the quality of services, as their payment (per patient) is effectively guaranteed in advance, while in an FFS system, providers have an incentive to improve the quality of services, as patients may be discouraged from attending a provider if they have experienced inadequate care.⁷ However, it has also been suggested that the incentive to provide more services in an FFS system might come at the expense of quality.⁸

In a review on the effects of remuneration on the quality of care, it was shown that only two studies used a rigorous design.³ One of these studies concluded that paediatric residents (students) with an FFS reimbursement missed fewer recommended visits compared with residents with a salary;⁹ the other study found no differences in hospital admissions and days comparing FFS only to a capitation system with an additional incentive payment for low hospital utilisation rates.¹⁰ More recently, the effects on the quality of care with a change from a capitation system with additional fees for certain services and target levels of services to a salary system in general practice was compared to a control group with continued capitation;¹¹ no differences were shown in the trends between general practices on the quality of care in terms of access, communication, overall satisfaction, continuity of care and co-ordination of care.

Changes in the remuneration system of general practitioners (GPs) in the Netherlands provided a unique opportunity to study the effects of changes in financial incentives on quality of care, and thereby to contribute to the scarce literature. Most GPs are free entrepreneurs in the Netherlands;¹² their income depends on the applicable remuneration system. Traditionally, the Dutch GP remuneration system was dependent on the type of insurance carried by the patient: public (63%) or private (37%). Below a gross annual income of € 33,000, people were publicly insured. For publicly insured patients, remuneration was based on a capitation system, whereas for privately insured patients, an FFS system was in operation. GPs act as gatekeepers for secondary care, being the first point of contact for medical care in the Netherlands. In 2006, the Dutch government introduced a new Health Insurance Act based on the principles of regulated competition,¹³ which abolished the differentiation between publicly and privately insured patients. With the revised health insurance system, the GP remuneration system changed to a combined capitation and modest FFS system for all patients (Table 6.1). The differentiation in remuneration between publicly and privately insured patients was thought to be undesirable, and could lead to differences in the provision of GP care between these patient groups.^{14,15} Also, GPs believed the former remuneration system of capitation for publicly insured patients did not reward their time investment.

The aim of this paper was to investigate the effects of changes in the GP remuneration system on the quality of care in terms of guideline adherence using longitudinal data from the electronic medical records (EMRs) of GPs. Changes in the remuneration system of GPs in the Netherlands were not directed to improve the quality of care or adherence to specific guidelines, such as in a pay-for-performance system where GPs are rewarded for meeting pre-established targets. However, alterations in the remuneration system changed the incentives for providing services to both publicly and privately insured patients, with an increased incentive to provide services for publicly insured patients and a decreased incentive to provide services for privately insured patients. The number of provided services may impact on the quality of care. Therefore, we expected an increase in guideline adherence indicators for publicly insured compared to privately insured patients (hypothesis 1); this effect may be greater for indicators involving more time investment (hypothesis 2).

Table 6.1: GP remuneration system in 2005 and since 2006 in the Netherlands

	2005		Since 2006
	Publicly insured	Privately insured	All insured [§]
Remuneration system			
<i>Capitation fee</i>			
Basic capitation fee*	€ 77.00	-	€ 52.00
<i>Fee-for-service</i>			
Consultation <20 minutes	-	€ 24.80	€ 9.00
Consultation >20 minutes		€ 49.60	€ 18.00
Home visit <20 minutes		€ 37.20	€ 13.50
Home visit >20 minutes		€ 62.00	€ 22.50
Telephone consultation		€ 12.40	€ 4.50

* Additional capitation fee for older people and people living in a deprivation area.

§ Payments in 2006.

MATERIAL AND METHODS

Study design and population

This was a longitudinal study analysing differences in the trends for guideline adherence from 2002-2008 between publicly and privately insured patients. Data from 2002-2008 were used from the EMRs of general practices that participated in the Netherlands Information Network of General Practice (LINH).¹⁶ The LINH database contains longitudinal data on the patient level in terms of contacts, morbidity, prescriptions and referrals. The network is a dynamic pool of practices, with yearly small changes in composition. The LINH is registered with the Dutch Data Protection Authority; data are handled according to national data protection guidelines.

For guidelines regarding prescriptions, we only included data from practices that passed a number of checks regarding the quality of data on morbidity and prescription and where the patient's (former) health insurance type was known. For guidelines related to referral data, an additional inclusion criterion was the availability of adequate referral data throughout the year. Table 6.2 shows the number of general practices, patients and decisions (each time a GP can decide to adhere to a specific guideline) per year for both selections. Overall, these

general practices were representative of Dutch general practices with respect to the degree of urbanization and region, but not with respect to practice type (overrepresentation of group practices or health centres and underrepresentation of single-handed practices).

Table 6.2: Number of general practices, patients and decisions about guideline adherence included in the analyses

	2002	2003	2004	2005	2006	2007	2008
<i>Data regarding guidelines related to prescriptions</i>							
General practices	44	52	36	32	52	45	35
Patients (with decisions)	29,704	34,449	23,851	21,421	39,828	32,453	26,722
Decisions	40,582	47,276	33,155	29,718	55,011	45,178	37,891
<i>Data regarding guidelines related to referrals</i>							
General practices	38	37	28	27	39	38	30
Patients (with decisions)	8,632	8,373	6,313	5,582	9,427	7,293	5,752
Decisions	9,027	8,815	6,632	5,828	9,873	7,569	5,958

Measures

Decision in accordance with guidelines

Sixteen guideline adherence indicators were used, based on clinical guidelines.¹⁷⁻¹⁸ The condition-specific guidelines comprise a range of recommendations and considerations that are related to each other and that are often ordered in a decision tree. Based on the key recommendations that were easy to extract from EMRs, quality indicators were developed. Table 6.3 shows the list of included indicators.

Health insurance type

For each patient, the health insurance type in 2002 to 2005 was used within the specific year. For patients in 2006, 2007 and 2008, the last known health insurance type was used.

Time investment

The amount of time associated with guideline adherence was based on research by van den Berg et al..¹⁹ Workload was divided into the expected workload effect

in the actual consultation (short-term) and the expected long-term workload effect (long-term). Van den Berg et al. asked an expert panel of three practising GPs, working in different practices, whether the amount of work in an actual consultation and/or the likelihood that the patient will return after this decision was likely to be greater, equal or smaller when adhering to the guideline. All indicators were given a score on the basis of the majority of the expert ratings. In the case of three different scores, the indicator was scored as 2. On the basis of the expected workload in actual consultation and long-term workload effect, we discerned nine categories (see Table 6.5). Table 6.3 shows the distribution of the indicators in the categories of expected workload.

Statistical analyses

We analysed the effects of changes in the remuneration system on guideline adherence for all 16 indicators separately, as well as the overall score, and a comparison was carried out between indicators which differed with regard to the expected short- and long-term workload.

Differences in the trends for adherence to 16 separate guidelines between publicly and privately insured patients were analysed by multilevel logistic regression analyses, using a compound-symmetry model with three-level hierarchically structured data (decisions nested within patients, and patients nested within general practices) using MLWin 2.02.²⁰ Variation between practices can vary between years, and therefore practice variation was estimated for each year separately. Adherence to guidelines was taken as the dependent variable. We included one dummy variable for year, with a score of '0' for the years before the change in remuneration (2002-2005) and a score of '1' for the years after the change in remuneration (2006-2008). Publicly insured patients were taken as the reference group in the analyses (variable *insurance*). We captured the effect of changes in remuneration between publicly and privately insured patients as the difference in trends between publicly and privately insured patients over time: *year*insurance*. The use of the interaction term means that both group-specific and time-specific factors were controlled for, and therefore only the effect of the changes in remuneration system was estimated. In these analyses, the variable *year* captured the difference in guideline adherence between 2002-2005 and 2006-2008 for publicly insured patients, as publicly insured patients were the reference group. Additionally, to

Table 6.3: Guideline Adherence Indicators and their expected workload effect in actual consultation and expected long-term workload effect

Guideline Adherence Indicator	Expected workload effect in actual consultation	Expected long-term workload effect
<i>Indicators prescription</i>		
1. Prescribing nitrofurantoin or trimethoprim for patients older than 12 years of age with uncomplicated cystitis	Smaller	Equal
2. <u>Not</u> prescribing antibiotics for patients with acute sore throat	Greater	Smaller
3. Prescribing narrow spectrum instead of broad spectrum penicillin when prescribing antibiotics for patients with acute sore throat	Smaller	Greater
4. <u>Not</u> prescribing antibiotics for patients with sinusitis	Greater	Smaller
5. Prescribing first choice antibiotics (before 2006: ciprofloxacin & doxycycline; from 2006: ciprofloxacin & amoxicillin) when prescribing antibiotics for patient with sinusitis	Smaller	Greater
6. Prescribing diuretics to patient with uncomplicated hypertension instead of other hypertension medication.	Equal	Equal
7. Prescribing a lipid modifying agent for patient with diabetes	Equal	Equal
8. Prescribing an antithrombotic agent for patients with angina pectoris	Equal	Equal
9. Prescribing an antithrombotic agent for patients with a transient cerebral ischaemia	Equal	Equal
10. Prescribing parasympatholytics and/or beta-2-sympathomimetics without corticosteroids for patients with chronic obstructive pulmonary disease (COPD).	Equal	Smaller
11. <u>Not</u> prescribing a proton pump inhibitor to patients with a-specific stomach complaints	Equal	Equal
<i>Indicators referrals</i>		
12. <u>Not</u> referring patients with traumatic knee problem to an orthopaedic surgeon	Greater	Greater
13. <u>Not</u> referring patients with osteoarthritis of the knee to an orthopaedic surgeon	Greater	Smaller
14. <u>Not</u> referring patients with acute otitis media to an ENT specialist	Smaller	Smaller
15. <u>Not</u> referring patients with otitis externa to an ENT specialist	Smaller	Smaller
16. <u>Not</u> referring patients with atopic eczema to a dermatologist	Greater	Greater

(reference: Braspenning et al. 2004; Braspenning et al., 2006)

estimate the difference in guideline adherence for privately insured patients, we additionally performed analyses with privately insured patients as the reference group.

The trend in adherence to all guidelines together was analysed by cross-classified logistic regression using a compound-symmetry model developed by van den Berg et al.¹⁹ Decisions were nested within patients and patients within general practices, but decisions were also nested within the different guidelines. The dependent and independent variables in the analysis were equal to the analyses of individual guideline adherence indicators.

To investigate whether trend differences in guideline adherence between publicly and privately insured patients differed with regard to the expected short- and long-term workload, three-way interactions were included in separate analyses (for example: *insurance*year*smaller short-term workload*). This way, the difference in the trend for guideline adherence between publicly and privately insured patients was determined for seven of the nine categories of labour intensity (two were excluded since these combinations were not available in the 16 included indicators; see Table 6.5)

All analyses were corrected for differences in age and gender composition. Age was included as a polynomial to yield a model that fits the data better (age, age² and age³).

RESULTS

Trends in guideline adherence (2002-2005 versus 2006-2008)

Guidelines related to referrals were generally more often adhered to than guidelines related to prescriptions (Table 6.4). In general, guideline adherence increased between 2002-2005 and 2006-2008 for both publicly and privately insured patients ($p=0.08$). Additional analyses estimating the linear trend between 2002 and 2008 showed significant trends for both publicly and privately insured patients (not included). Analyses of separate indicators showed that especially indicators related to chronic diseases and cardiovascular diseases showed an increase in adherence (numbers 6, 7, 8 and 10). Guideline

adherence with regard to prescribing first choice antibiotics for patients with sinusitis showed a sharp decline since the reform, simultaneous with the change in recommended first choice antibiotics in the guideline, which had nothing to do with the reform. Also, indicators related to a-specific stomach complaints and osteoarthritis of the knee showed a decrease in adherence between 2002-2005 and 2006-2008.

Effect of the remuneration system on guideline adherence

For guideline adherence in general, no differences in the trends (estimated by the variable *insurance*year*) between publicly and privately insured patients were found (Table 6.4), contrary to hypothesis 1. For 13 out of the 16 indicators, no differences in trends were found between publicly and privately insured patients. For indicators regarding the prescription of first choice antibiotics for sinusitis and uncomplicated hypertension, a greater increase in adherence was found for privately insured patients. In other words, the changes from capitation for publicly insured patients and FFS for privately insured patients to a combined system of capitation and FFS resulted in a greater increase (in the case of hypertension) or a smaller decrease (in the case of sinusitis) in guideline adherence for privately insured patients compared to publicly insured patients, whereas for the indicators regarding referral for traumatic knee problems, the opposite effect was found.

Effect of remuneration on guideline adherence to short- and long-term workload

For guidelines that were expected to involve a greater long-term investment (a greater chance that the patient would return to the practice), consistently significant lower trends for privately insured patients were found in comparison to publicly insured patients (Table 6.5). In other words, guidelines that involve a higher chance that patient would return to the practice were significantly more adhered to since the change in remuneration in publicly insured patients compared with privately insured patients, as was postulated in hypothesis 2. Also, for guidelines that were expected to involve a lesser short-term investment (less work in the actual consultation), significantly lower trends for privately insured patients were found in comparison to publicly insured patients.

Table 6.4: Descriptive information on guideline adherence and results of multilevel logistic regression analyses

	Percentage of guideline adherence per period and insurance status				Model				
	2002-2005		2006-2008		Trend (2002-2005 vs. 2006-2008) for publicly insured patients		Trend (2002-2005 vs. 2006-2008) for privately insured patients		Difference in trend between publicly and privately insured patients (reference publicly insured patients)
	Publicly insured	Privately insured	Publicly insured	Privately insured	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	
<i>Adherence to guideline indicators prescription</i>									
1. Uncomplicated cystitis	67.8	67.4	68.8	65.8	1.07 (0.93-1.22)	1.02 (0.88-1.19)	0.96 (0.87-1.06)		
2. Acute sore throat	81.3	78.2	80.8	79.9	0.80 (0.67-0.95)	0.91 (0.74-1.10)	1.13 (0.96-1.34)		
3. Acute sore throat: narrow spectrum	40.3	37.8	38.3	38.6	0.95 (0.73-1.23)	1.07 (0.78-1.48)	1.13 (0.83-1.56)		
4. Sinusitis	26.1	25.2	26.6	26.7	1.01 (0.85-1.21)	1.08 (0.89-1.30)	1.06 (0.94-1.20)		
5. Sinusitis: first choice antibiotics	65.6	63.8	26.0	25.6	0.14 (0.11-0.17)	0.16 (0.13-0.20)	1.17 (1.02-1.34)		
6. Uncomplicated hypertension	48.3	39.6	51.3	46.0	1.23 (1.04-1.45)	1.42 (1.20-1.69)	1.16 (1.05-1.27)		
7. Diabetes	35.8	35.9	60.6	61.3	5.86 (5.03-6.84)	6.25 (5.21-7.50)	1.07 (0.92-1.23)		
8. Angina pectoris	66.3	66.6	71.1	72.7	1.23 (1.06-1.43)	1.48 (1.18-1.84)	1.20 (0.96-1.51)		
9. Transient cerebral ischaemia	86.5	89.6	85.1	86.8	0.87 (0.69-1.11)	0.79 (0.54-1.16)	0.90 (0.58-1.39)		
10. COPD	90.1	86.9	93.5	91.7	1.48 (1.20-1.81)	1.72 (1.20-2.45)	1.16 (0.78-1.73)		
11. A-specific stomach complaints	47.1	45.2	29.4	29.9	0.49 (0.42-0.58)	0.53 (0.44-0.65)	1.08 (0.91-1.29)		
All guideline indicators prescription	54.1	50.4	55.0	51.7					

Table 6.4: Descriptive information on guideline adherence and results of multilevel logistic regression analyses (continued)

	Percentage of guideline adherence per period and insurance status				Model					
	2002-2005		2006-2008		Trend (2002-2005 vs. 2006-2008) for publicly insured patients		Trend (2002-2005 vs. 2006-2008) for privately insured patients		Difference in trend between publicly and privately insured patients (reference publicly insured patients)	
	Publicly insured	Privately insured	Publicly insured	Privately insured	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
<i>Adherence to guideline indicators referrals</i>										
12. Traumatic knee problem	82.9	84.3	81.6	78.7	0.91 (0.75-1.11)	0.67 (0.52-0.86)	0.74 (0.55-0.98)			
13. Osteoarthritis of the knee	87.2	84.7	83.4	80.6	0.70 (0.57-0.87)	0.69 (0.50-0.96)	0.98 (0.68-1.43)			
14. Acute otitis media to an ENT specialist	95.7	95.9	95.0	94.7	0.84 (0.68-1.04)	0.78 (0.59-1.02)	0.92 (0.66-1.28)			
15. Otitis externa	96.4	96.9	96.3	96.4	0.96 (0.77-1.22)	0.83 (0.61-1.14)	0.87 (0.60-1.24)			
16. Atopic eczema	95.6	96.2	95.4	95.9	0.91 (0.70-1.18)	0.85 (0.61-1.18)	0.94 (0.65-1.36)			
All guideline indicators referrals	93.6	94.4	92.9	92.9						
All indicators	60.2	59.1	60.1	58.8	1.07 (0.99-1.14)	1.10 (1.02-1.19)	1.03 (0.99-1.08)			

Table 6.5: Estimation of differences in the trend between publicly (reference) and privately insured patients for each combination of expected short- and long-term workload 2002-2005 vs. 2006-2008

Expected long-term workload	Expected short-term workload		
	Smaller	Equal	Greater
Smaller	0.72 (0.64-0.81)	0.98 (0.87-1.12)	1.13 (1.05-1.21)
Equal	0.91 (0.84-0.98)	1.24 (1.18-1.30)	n.a.
Greater	0.43 (0.40-0.47)	n.a.	0.68 (0.60-0.76)

DISCUSSION

The purpose of this study was to analyse whether the quality of care measured with the aid of guideline adherence indicators changed as a result of changes in the remuneration system of GPs in 2006. In general, changes in the Dutch remuneration system of GPs did not affect guideline adherence, contrary to our first hypothesis. Adherence to guidelines involving more time investment in terms of follow-up contacts occurred more often since the reform in publicly insured patients compared with privately insured patients, in accordance with our second hypothesis.

Strengths and limitations

We made use of a unique natural experiment regarding changes in the GP remuneration system and made use of EMR of GPs, excluding potential socially-desirable responses in the case of, for example, written questionnaires. A number of points should be considered regarding our study. First, general practices were selected on the basis of the quality of their EMR and may represent a more motivated portion of Dutch GPs. The effects of the remuneration system on adherence to guidelines could therefore be different in the Dutch GP population, although other Dutch GPs showed similar contact rates and types.²¹ Second, the analyses were based on a dynamic population and therefore the general practices included in the analyses varied between years, which could have affected the results. For this reason, we performed multilevel analyses to correct for variations in participating practices between years. Finally, our data contained only cases that could be measured by an indicator. The content of the guidelines encompasses many more

recommendations that were not measured, due to the simple fact that not all GP actions were recorded in a structured way in their EMR.

Literature

Adherence to guidelines increased between 2002 and 2008, especially for chronic and cardiovascular diseases. The increase in guideline adherence was similar for publicly and privately insured patients, suggesting the absence of an effect of the change in remuneration system on guideline adherence. This is contrary to our first hypothesis, but in accordance with some other studies on aspects of the quality of care.^{10,11} The effect that guideline adherence was better for performances involving follow-up contact supports a study in which the number of recommended visits increased due to remuneration.⁹ In addition, these results are in accordance with previous research on changes in the GP remuneration system in the Netherlands using LINH data as well, which showed a higher trend of follow-up contacts for publicly insured patients in comparison to privately insured patients.²² The absence of an effect of changes in remuneration system on guideline adherence suggests that other non-financial factors, such as medical ethics may have played a more important role with regard to GPs' behaviour.

The increase in adherence to guidelines related to chronic disease and cardiovascular diseases between 2002 and 2008 might be explained by the increased attention to these diseases. In this time period, chronic diseases such as diabetes mellitus and COPD as well as cardiovascular diseases received a lot of attention. For example, since 2006, general practices have been able to arrange new contracts for primary care nurses, who are especially involved in patients with chronic diseases and cardiovascular diseases.¹⁶ Increases in adherence to guidelines related to chronic diseases were also found in the United Kingdom.²³ We showed that changes in the guidelines, as demonstrated by the first choice antibiotic for sinusitis, led to a drop in guideline adherence. It seems that GPs do not automatically adjust their practice style to changes in guidelines, which has also been shown in other studies.^{24,25}

Conclusion

To a large extent, GPs seem to do what they need or have to do, irrespective of the way they are remunerated. However, guidelines involving a greater long-term

workload in terms of additional changes to follow-up contacts were affected by the remuneration system.

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7



7 | Summary and discussion

SUMMARY

Background, aim and study design

Specific characteristics of health care, such as the uncertainty of health care needs and information asymmetry between general practitioner (GP) and patient, result in GPs being able to influence the demand for health care.¹⁻³ The remuneration system of GPs is seen as an important instrument for overcoming the problems regarding these specific characteristics, as income is thought to be one of the elements, besides leisure and medical ethics and guidelines, comprising the utility function of GPs.⁴ Cost sharing arrangements for patients are seen as a solution to the fact that insured patients demand more health care compared with uninsured patients.⁵ Changes in GPs' remuneration system and patients' cost sharing in the Netherlands in 2006 led to the unique opportunity to study the effects of changes in financial incentives for both GPs and patients.

A capitation system for publicly insured patients and a fee-for-service (FFS) system for privately insured patients was replaced by a combined system of capitation and FFS.⁶ For privately insured patients before 2006, and all patients since 2006, the level of remuneration was dependent on the type and length of contact.⁷ The new remuneration system included a relatively small reimbursement system for services (modernisation and innovation services) that were expected to improve the quality of care or encourage substitution from secondary to primary care. Funding of primary care nurses also changed accordingly. Since 2006, care provided by primary care nurses has been funded by consultation fees equal to those of GPs and an additional capitation fee, whereas before 2006 primary care nurses were only funded by a supplement on the capitation fee for publicly insured patients.^{6,7} For privately insured patients cost sharing was abolished, whereas it never existed for publicly insured patients.

Study aim

The aim of this thesis was to investigate the effects of changes in the GP payment system in terms of their remuneration system and patients' cost sharing arrangements for GP care in the Netherlands in 2006 on aspects of affordability, accessibility and quality of health care. These three aspects are important elements for the solidarity and (cost)efficiency of a health care system.

Affordability

Health care expenditure on GP care exceeded the budget in 2006 and spending on GP care increased on average by 3.1% annually between 2006 and 2009.^{8,9} The increase in expenditure on GP care could result from the changes in the remuneration system or could indicate an overall increased demand for GP care. The capitation system before 2006 for publicly insured patients may have resulted in GPs being reluctant to initiate follow-up contacts for these patients. We investigated the effect of changes in the remuneration system on the number of physician-initiated contacts in general practice.

The new remuneration system also involved measures to encourage a shift from secondary to primary care and thereby contain overall health care expenditure: specific services that were thought to substitute for secondary care (modernisation and innovation services) and the increased contribution of primary care nurses. Since the introduction of a new funding system for primary care nurses, their number has shown a rapid growth. We examined whether these elements in the new remuneration system resulted in a shift from secondary to primary care.

Accessibility

Accessibility was operationalised as the extent to which patients initiate contacts with their general practice and the degree of different contact types (home visits, consultations, telephone consultations) provided to patients. Cost sharing for privately insured patients before the change in 2006 was expected to limit the accessibility of GP care. The limited remuneration system for former publicly insured patients was expected to have limited time-consuming services, such as home visits.

Quality

In this thesis, quality of care was investigated in terms of the degree of guideline adherence and length of consultations. Although the remuneration system is not directly linked to quality of care, we expected that changes in remuneration would change the time-investment in terms of follow-up contacts, which was thought to affect the quality of care.

Study design and data

A difference-in-difference approach was used to answer research questions about the effects of changes in the remuneration system and cost sharing for publicly and privately insured patients. The use of a difference-in-difference approach means that both group-specific factors (difference between publicly and privately insured patients) and time-specific factors are controlled for, leaving only the effect of the change in remuneration. Possible substitution effects of modernisation and innovation services were analysed cross-sectionally. To investigate possible substitution effects of the contribution of primary care nurses, we analysed whether changes in the referral rate for specialist treatment for type II diabetes mellitus patients between 2004 and 2006 were due to the contribution of primary care nurses in general practice.

For this study, longitudinal data were used from electronic medical records (EMRs) derived from general practices participating in the Netherlands Information Network of General Practice (LINH) from 2002 to 2008.¹⁰ The LINH database holds longitudinal data on contacts, morbidity, prescriptions and referrals of around 90 general practices and 350,000 patients derived from EMRs. Diagnoses are coded by means of the ICPC classification (International Classification of Primary Care).¹¹ The network is a dynamic pool of practices, with annual changes in composition.

Main findings

Affordability

Effects on the number of physician-initiated contacts

First, effects on affordability of health care were investigated by estimating the effect of changes in the GP remuneration system on the number of contacts in general practice. Based on the theory on remuneration systems, we hypothesised that publicly insured patients had a higher increase in contacts

initiated by GPs than privately insured patients. For publicly insured patients an FFS system was introduced in addition to capitation, which was thought to encourage GPs to provide services. The fee for privately insured patients was much lower than for privately insured patients before the change in remuneration. In other words, we expected GPs to respond to changes in the remuneration system by inducing or reducing the demand for health care, i.e. supplier induced demand (SID). Physician-initiated contacts were defined as all follow-up contacts for a specific health problem.

The number of physician-initiated contacts rose for both publicly and privately insured patients between 2005 and 2007. Former publicly insured patients had a 5.3% higher increase between 2005 and 2007 in physician-initiated contacts than privately insured patients as a consequence of changes in the remuneration system, in line with our hypothesis. One could argue that SID is just the standard neoclassical response to prices.^{12,13} In the neoclassical theory, one assumption is that people maximise their utility, of which income is one element. So, when providing physicians with a (higher) price per service they are expected to increase the number of provided services. A basic assumption in the literature on SID is that SID will be greater in consumers with a higher level of information asymmetry. We assumed that patients with chronic conditions could be classified as patients with a lower level of information asymmetry compared with patients without chronic conditions, since they generally have more knowledge about their disease and treatment options, resulting in fewer opportunities for physicians to induce demand. Therefore, we additionally analysed whether effects of changes in the remuneration system of GPs varied according to the level of information asymmetry as proxied by comparing the effects for chronically ill patients versus non-chronically ill patients. These further analyses showed that the higher increase in physician-initiated contacts for publicly insured patients was only apparent in non-chronically ill patients, indicating SID. We concluded that changes in the GP remuneration system resulted in a limited change in physician-initiated contacts, which could be ascribed to SID.

Substitution effects

Second, effects on affordability of health care was investigated by estimating possible substitution effects of the modernisation and innovation service 'minor surgery' and the contribution of primary care nurses in general practice. In some

specific interventions, there is a choice for GPs to perform interventions to patients themselves instead of referring patients to a specialist. Since prices for services are generally much lower in primary care compared to secondary care, stimulating these services in general practice is expected to contribute to the affordability of health care. We hypothesised that the extra remuneration for the modernisation and innovation service 'minor surgery' had resulted in a shift from secondary care to primary care. Referral rate to dermatology or (plastic) surgery varied according to the diagnosis, with 1.0% for laceration/cut, 8.2% for sebaceous cysts and 8.9% for benign neoplasm skin/nevus. Also, the percentage of minor surgery performed differed greatly, with minor surgery in 8.9% of the care episodes of laceration/cut, 26.4% of the care episodes of sebaceous cyst and 27.4% of the care episodes of benign neoplasm of skin/nevus. Our results showed that general practices that performed more minor surgery interventions had a lower referral rate for patients with a laceration/cut and those with a sebaceous cyst, but not for people with benign neoplasm skin/nevus. The decrease in referral rate appeared to be relevant only for sebaceous cysts, since the overall referral rate for laceration/cut was low. Performing five more minor surgery interventions per 100 care episodes could result in 4.3 fewer referrals for sebaceous cysts, which is cost-effective from the perspective of health care. We concluded that the possible substitution effect of minor surgery varied between diagnoses, and in this case was only visible in minor surgery for people with sebaceous cysts.

Since the new funding system for primary care nurses came into play in 2006, the number of primary care nurses has shown a rapid growth. From 2003 to 2007 the number of primary care nurses rose from 1100 to 2700, which may be ascribed to the new funding system. Primary care nurses were thought to improve the care for chronically-ill patients and to reduce GPs' workload, thereby stimulating substitution from secondary to primary health care. For possible substitution effects of the contribution of primary care nurses in general practice, we hypothesised that the increased number of primary care nurses in general practice had resulted in a shift from secondary to primary health care for type II diabetes mellitus patients. We showed that the referral rate for newly diagnosed type II diabetes mellitus patients to internists decreased by more than 50% between 2004 and 2006 from 7.3% to 3.3%. The trend in referrals between 2004 and 2006, however, did differ between general practices with and without

primary care nurses, not indicating a substitution effect of primary care nurses for newly diagnosed diabetes patients. The referral rate to internists for known type II diabetes patients did not significantly change between 2004 and 2006, but a lower trend in referral rate to internists between 2004 and 2006 was found for practices with a primary care nurse compared with practices without a primary care nurse, indicating a limited substitution effect. We did not, however, calculate the cost-effectiveness of the contribution of primary care nurses in general practice. We concluded that the introduction of primary care nurses seems to have led to a limited shift of care from internists to primary care for known type II diabetes patients.

Accessibility of care

Accessibility was operationalised by the extent to which patients initiate contacts with their general practice and the proportion of different contact types (home visits, consultations, telephone consultations) provided to patients. Our hypothesis was that abolition of cost sharing for privately insured patients had resulted in a higher increase in the number of patient-initiated contacts for these patients compared with publicly insured patients. Patient-initiated contacts were defined as the first GP contact for a specific health problem. The number of patient-initiated contacts rose for both publicly and privately insured patients between 2005 and 2007. Our hypothesis was not confirmed by the empirical results. We did not find a difference in the trend in patient-initiated contacts between publicly and privately insured patients for the overall population, but did find a difference in trends in patients aged 65 and older. We concluded that the cost sharing for GP care for privately insured patients may have been too low to deter these patients from consulting their general practice, as accessibility of GP care did not seem to be limited by cost sharing.

With regard to the type of contact, we hypothesised that the proportion of home visits had decreased and the proportion of telephone consultations had increased for privately insured patients compared with publicly insured patients. The difference in revenue of GPs for privately insured patients between home visits, consultations and telephone consultations decreased after the reform. We therefore expected GPs to become less inclined to provide more time-consuming contact types such as home visits. For publicly insured patients an FFS system was introduced, which was thought to make GPs less reluctant to provide more

time-consuming contact types for these patients. Almost three-quarters of contacts involved consultations, five to seven percent home visits and 20% of the contacts involved telephone consultations. Our results showed that contact type was hardly affected by the change in remuneration system, though the proportion of home visits slightly decreased for privately insured patients compared with publicly insured patients. We concluded that the changes in the GP remuneration system had barely altered GPs' allocation of time with regard to contact type.

Quality of care

Quality of care was operationalised by the degree of guideline adherence and by the length of consultations. Although the remuneration system is not directly linked to quality of care, the expected increase in time investment for publicly insured patients in terms of contacts (see affordability of care) was expected to improve the quality of care for these patients. We hypothesised that the change from a capitation system for publicly insured patients and an FFS system for privately insured patients to a combined system of capitation and FFS, had led to a higher increase in guideline adherence for publicly insured patients compared with privately insured patients. Our results showed an increased guideline adherence for both publicly and privately insured patients between 2002 and 2008. In general, no differences in trend in guideline adherence were found between publicly and privately insured patients, thereby rejecting our hypothesis. For publicly insured patients, however, GPs showed a higher increase in adherence to guidelines involving more time investment in terms of follow-up contacts compared with privately insured patients. These results are in agreement with the increase in physician-initiated contacts for publicly insured patients compared with privately insured patients. We concluded that the change in the GPs' remuneration system had a limited impact on guideline adherence.

With regard to the length of consultations, we expected a higher increase for publicly insured patients than for privately insured patients. For publicly insured patients, the level of the remuneration became dependent on the consultation length since the change in the remuneration system. This is thought to encourage longer consultations. The level of remuneration has always been dependent on the consultation length for privately insured patients. We showed that the consultation length increased for both publicly and privately insured

patients, but no difference in trend of consultation length was found between the two patient groups. Therefore, we concluded that the change in GPs' remuneration had no effect on consultation length.

Overall, our study showed that the change from a capitation system for publicly insured patients and an FFS system for privately insured patients to a combined system of capitation and FFS had led to a limited higher increase in physician-initiated contacts, a slightly increased proportion of home visits and a higher increase in adherence to guidelines involving more time investment in terms of follow-up contacts for publicly insured patients compared with privately insured patients. Changes in the remuneration did not affect consultation length and overall guideline adherence. Abolition of cost sharing for privately insured patients did not result in a higher accessibility of GP care compared with publicly insured patients. Finally, the remuneration system for minor surgery and contribution of primary care nurses in general practice appeared to have some substitution effects but these were limited to certain diagnoses and patient groups.

DISCUSSION

Methodological reflections

In this thesis, we made use of a unique natural experiment regarding changes in GPs' remuneration system and patients' cost sharing in the Netherlands, and longitudinal data from EMRs of general practices participating in LINH. The combination of the natural experiment and available longitudinal data enabled us to draw causal inferences about the effects of remuneration systems and cost sharing arrangements. LINH is a comprehensive database based on data from EMRs from general practices. The database holds longitudinal data on contacts, morbidity, prescriptions and referrals that are recorded in a structured way in the EMR of general practices. General practices receive instructions and manuals about recording information in their EMR to ensure a high level of accuracy. In addition, every year all data are checked for accuracy and completeness. Data from general practices that do not satisfy requirements are excluded. Comparison of LINH data with the national insurance claims database of Vektis shows similar contact rates, although the number of consultation and home visits

longer than 20 minutes is slightly lower in LINH.¹⁴ The use of data from EMRs of general practices has the advantage that it makes use of routine recording by GPs, excluding potential socially desirable responses such as those in written questionnaires. Also, LINH data have advantages compared with the insurance claims database of Vektis as LINH data contain more detailed information on the reason for GP visits and contact related data for publicly insured patients before the health insurance reform. Insurance claims data for publicly insured patients did not exist, as a result of the capitation system that was in place. For example, with this extra information it was possible to distinguish between patient- and physician-initiated contacts and to investigate the effect of changes in the remuneration system on guideline adherence.¹⁴ Furthermore, the database enables us to include data both before and after the changes in the remuneration system and cost sharing, allowing us draw conclusions about the causes and effects of relationships.

The use of data from LINH also has some limitations, which require further discussion. First, the included GPs could represent a highly motivated group of Dutch GPs, since data from general practices are selected for their completeness and recording accuracy. All GPs in the Netherlands record their patient information electronically, but not all GPs do so in a structured way. This may have affected their behaviour. Effects of changes in the GP remuneration system could therefore exist or be larger in the Dutch GP population compared with our sample, although other Dutch GPs show similar contact rates and types.^{14,15} Also, the overall increase in contact rate in 2006 was similar to the average Dutch GP.¹⁴ The structured recording of patient data and their health care utilisation has become more important in general practice as a whole. In 2004, the Dutch College of General Practitioners (NHG) introduced the guideline for adequate recording within electronic medical records (in Dutch: richtlijn adequate dossiervoering met elektronische medische dossiers) to standardise the recording within EMRs.¹⁶ Also, sharing of EMR data between different health care providers has become more important, with a uniform recording of data within EMRs as a prerequisite. Therefore, the routine recording of data within the EMR is not unique to highly motivated part of GPs.

Our second limitation involves the usefulness of LINH data. Within LINH, not all GPs actions were recorded in a structured way in their EMR and could not be

incorporated in our analyses for that reason. We did not have information about the exact content of the consultations in general practice and do not know whether lifestyle advice was given, for example, nor were structured clinical outcome data available. For this reason, the data presented in this thesis consist of health care utilisation data only. The effects of changes in the remuneration system or cost sharing arrangement on health care utilisation provide useful information but do not give full information about the appropriateness of care provided. Information on whether changes in the provision of services affected patient outcomes is unfortunately not available within the current LINH data.

Finally, there could be a recording bias. Since 2006, GPs have been reimbursed for every service provided to both privately and publicly insured patients, whereas before 2006 GPs were only reimbursed with a fee for every service for privately insured patients. FFS encourages GPs to record every provided service correctly. In LINH, we prevented this by recording instructions for participating general practices and the inclusion of general practices with complete recording of data. The changes in the remuneration system, however, changed the recording of, for example, repeat prescriptions and consultations and home visits longer than 20 minutes. Part of the rise in health care expenditure could be explained by the high number of repeat prescriptions and long consultations and home visits, which was independent of the former insurance status of patients.^{17,18} The data included in the analyses were recorded in fairly similar ways before and after the changes, to prevent our analyses being affected by differences in recording of GPs in their EMR. For example, data on repeat prescriptions were, for this reason, excluded from analyses and also analyses on long consultation and home visits were not performed.

Theoretical reflections and interpretation of findings

This thesis addresses the effects of changes in the GP remuneration system and patients' cost sharing on affordability, accessibility and quality of care. Comparing these results with those of other countries should be done with caution, since any remuneration and cost sharing system is embedded in a broader institutional context.¹⁹ Whether GPs have a gatekeeper function, how other health care providers are paid and the current development of medical guidelines could all influence the effects of a remuneration system. Taking these

differences in institutional context into account, our findings present valuable information about the effects of changes in GPs' remuneration system.

Comparison with literature

As shown by several reviews, research on remuneration systems that do satisfy high methodological standards and criteria is scarce.^{20,21} Randomised trials are often not suitable for investigating changes in remuneration systems, since physicians may be reluctant to take part in a study which could ultimately decrease their income. Also, changes in remuneration usually affect the whole health care system with the consequence that there is no control group with which to compare changes. Therefore, available research is predominantly based on natural experiments, which occur relatively seldom. For this reason our results can only be compared with a limited number of studies.

Our finding, that changes in remuneration system do not necessarily lead to big changes in provision of health care is in line with other studies.²²⁻²⁶ Changes in the remuneration system so far have only led to limited changes in physician-initiated contacts, proportion of home visits and adherence to guidelines. Health care costs exceeded the budget in 2006 and spending on GP care increased by 3.1% annually between 2006 to 2009.^{8,9} How can this increase in expenditure be explained? The increase in health care expenditure was mostly due to a rise in repeat prescriptions and long consultations and home visits claimed.^{17,18}

In the theory of the incomplete principal-agent relationship of GP to patient, GPs are expected to have room to influence the demand for health care.¹ Decisions to influence the health care provided are dependent on the utility function of GPs, which we assumed consists of medical ethics and guidelines, income and leisure.⁴ Since the remuneration system affects income, we expect the remuneration system of GPs to be an important element for controlling the health care provided, even though effects might be limited because of the medical ethics and guidelines in operation. The fact that changes in provision of health care after changes in remuneration were limited could be explained by the more important role of medical ethics and guidelines in the utility function of GPs or the limited effect of changes in remuneration on GPs' income.

Medical ethics and guidelines

Medical guidelines play an important role in Dutch general practice. The development of guidelines is at high level, and revisions are made every few years.²⁷ In general, guidelines recommend a reserved referral and prescription of drugs policy. The availability of medical guidelines gives health insurers and other parties the possibility to control for the appropriateness of care, although deviation from the medical guidelines may be necessary from a medical perspective. However, health insurers hardly use medical guidelines in this way at the moment. When medical guidelines are available the so-called diagnosis-determinedness is assumed to be higher and possibilities to influence demand for health care are expected to be smaller. Diagnosis-determinedness is a measure developed by Flierman indicating the degree to which a specific diagnosis determines the provision of care in terms of prescription of medication, interventions or referrals to other health care providers.⁴ For example, in the case of uncomplicated cystitis the medical standard advises the prescription of nitrofurantoin or trimethoprim, leaving less room for GPs to influence demand.²⁸

Medical ethics may also have played a role in the behaviour of GPs towards patients who switched insurance before the change to a uniform insurance system. Before 2006, with the differentiation between publicly and privately insured patients, almost all Dutch citizens were first publicly insured, since younger people generally have lower incomes. Only in older age, with rising income, did some of them become privately insured. The fact that effects of changes in the remuneration system were limited suggests that GPs may not see it as ethically correct to change the manner of health care provision when patients become privately insured.

Revenue and income

The fact that changes in provision of health care due to changes in remuneration were limited may also be explained by the minimal effect of changes in remuneration on GPs' income and the relatively high income of GPs in the Netherlands. In other words, the change in utility from income might not have been large enough to influence the care provided by GPs. The income of GPs in the Netherlands is one of the highest in Europe,²⁹ which may have counteracted large differences in the GPs' behaviour with regard to the provision of care. When the remuneration system of GPs changes, large decreases in revenue of

GPs are thought to be undesirable, since they generally lead to resistance in the GP population. On a practice level, changes in remuneration for both publicly and privately insured patients may not have had a high impact on the revenue of practices as a whole. The revenue for each service provided to an individual patient largely changed and was much lower in the new system for privately insured patients. The question is whether GPs were aware of the degree to which the changes in the remuneration system affected their total revenue. An earlier study showed that a new remuneration system involves insecurities with regard to income, and showed that GPs alter their behaviour with regard to the services provided directly after the change in remuneration. Only after having experienced the effects of changes in remuneration on revenue, did GPs alter their practice style.²³ So, especially after one year GPs were expected to be influenced by changes in the remuneration system. Our findings showed that changes in the provision of care predominantly occurred in the first year after changes in remuneration. In the second year, when GPs knew that their income was stable within the new remuneration system, they did not change their provision of health care services back to the old level. Consequently, we expected changes to be large enough to impact on GPs' behaviour, but non-financial incentives, such as medical ethics and guidelines, seem to have counteracted such differences.

Quality

The limited change in guideline adherence may be the result of a lack of incentives in remuneration systems to improve quality of care. In the literature, no agreement exists on the effects of changes in remuneration systems on quality of care.^{12,30} This is not unexpected, as improvement of quality of care is not a specific goal in these remuneration systems. At the utmost, changes in remuneration system influence quality of care through changes in the number of contacts. Our findings suggest that changes in remuneration systems without direct incentive for quality improvement only affected adherence to guidelines involving more contacts. Any change in financial incentives could, however, have unintended effects. Our findings did not indicate unintended effects on the quality of care.

Substitution effects

The remuneration and funding system for minor surgery and primary care nurses in general practice showed limited substitution effects from secondary to primary health care. These effects were also limited to certain diagnoses and patient groups. In the light of the theory on incentives of remuneration systems, we expected that extra payments for minor surgery and funding for primary care nurses would discourage GPs from delegating to other health care providers (outside practice).^{21,31-34} Explanations for the limited substitution effects may lie in the task definition in general practice and the risk adjustment system of secondary care for health insurers. In most cases, GPs will also perform certain services when not specifically being remunerated for these services (intrinsic motivation). This could be the case for patients with lacerations or cuts. Performing minor surgery for lacerations and cuts is a basic task for GPs, which hardly involves any additional education and skills. GPs may already have performed minor surgery for laceration and cuts in general practice before specific remuneration for this service was implemented. For this reason, specific remuneration for minor surgery for laceration and cuts did not show high substitution effects. Primary care nurses are generally involved in the routine management of chronically ill patients, which is the case in known chronically ill patients. For newly diagnosed patients primary care nurses play a less important role, since there is generally no routine management yet. For this reason, it is not surprising that limited substitution effects were only found in known diabetes patients.

The fact that substitution effects were limited could also be owed to the lack of risk-bearing for secondary care by health insurers. Medical specialists are being remunerated with a specific amount per care episode, which is assumed to stimulate production. One might think that health insurers would benefit from substitution effects, but the current ex post risk adjustment system largely involves care by medical specialists and no primary care services.³⁵ This lack of risk-bearing for health insurers for care of medical specialists does not give health insurers incentives to control costs in secondary care. This could in turn affect the control by health insurers of the referral behaviour of GPs and the fulfilment of specific services for specific remuneration. Given the fact that our findings indicate limited substitution effects and the fact that medical ethics and guidelines seem to have a strong impact on the provision of health care by GPs,

specific financial incentives for substitution in primary care may not be the solution to containing health care costs in secondary care. A more simple remuneration system such as a capitation system or integrated capitation system for more primary care, health care providers with incentives aimed at medical ethics and guideline, such as education programmes, may be more fruitful. Also, ex post risk adjustment system might need to involve less care of medical specialist to give health insurers incentives to control costs in secondary care.

Consequences for theory

Overall, in the case of changes in the remuneration system in the Netherlands, medical ethics and guidelines seem to have been strong enough to counteract the undesirable effects of changes in financial incentives. These results suggest that the incentives with regard to medical ethics and guidelines play a more important role in the utility function of GPs than is generally assumed in the health economics literature. Initiatives that focus on medical ethics and guidelines may therefore be a better instrument for overcoming the problems of an incomplete GP to patient agency relation. As mentioned earlier, the income of GPs in the Netherlands is high in comparison with most other European countries. Changes in financial incentives in, for example, Belgium, with a relatively low GP income, may have bigger effects on the provision of health care, although other studies on changes in remuneration system do not find large difference in the provision of health care.²²⁻²⁶ It should be kept in mind that these results provide a snapshot of the situation between 2002 and 2008. As mentioned in the economic theory of personal motivation by Bruno Frey, the use of monetary incentives may crowd out the intrinsic motivation (medical ethics) of GPs to provide health care services.³⁶ Through their intrinsic motivation, GPs are expected to do (part of) their work when paid a decent income without direct financial incentives. When, however, GPs are confronted with a focus on financial incentives, such as in an FFS system, besides their intrinsic motivation, they are expected to be 'over-motivated' as they would still do (part of) the work if financial incentives were reduced. Within the theory of personal motivation, GPs respond by reducing the motivation that is under their control: the intrinsic motivation. In a recent article, Lester and colleagues showed that removing financial incentives for two performance indicators, screening for diabetic retinopathy and cervical cancer, resulted in a fall of screening rates below the starting point of the financial incentives for these indicators, showing a crowding-

out effect.³⁷ When monetary incentives become more important in the personal motivation of GPs, it could eventually result in higher payment for services and higher health care costs.

Patients' cost sharing

Abolition of cost sharing for privately insured patients did not improve the accessibility of care. This is not in line with other studies³⁸⁻⁴⁰ or with the theory of cost sharing. The theory of cost sharing implies that unnecessary demand can be prevented by introducing cost sharing for patients. Explanations for the lack of effect of cost sharing can be found in the relatively rich population, low cost sharing and being previously publicly insured. Privately insured patients consisted of a population with a relatively high income, since being publicly or privately insured was dependent on among others income. The relatively low cost sharing may not have limited the health care seeking behaviour of privately insured patients. In addition, as mentioned earlier, most privately insured patients were previous publicly insured patients. It may be that patients, initially publicly insured, were used to visiting a GP and owing to their relatively high income were not counteracted by cost sharing to do the same when privately insured. These results seem to show that cost sharing for an affluent population does not limit accessibility of care, which is in line with other research.⁴¹ As mentioned by Ros and colleagues two approaches are commonly used to prevent unnecessary demand: 1) introducing cost sharing for services of directly accessible health care providers and 2) having a GPs act as gatekeeper to more specialised and more costly care.⁴² As GPs already have a gatekeeper function for more specialist care in the Netherlands, cost sharing arrangements for GP care are thought to be undesirable and unnecessary.

Implications for policy

How should the remuneration system for GPs be designed to overcome the problems of an incomplete agency relation of GP to patient? This is a question difficult to answer and the answer is highly dependent on among others the current situation in health care, financial possibilities and dominant opinions of political parties, health insurers and health care providers. Here, we will discuss the implications of our findings for professional organisations, health insurers and government.

Our findings point to well-functioning general practice with high appreciation of medical ethics and guidelines, also shown in Gaal's recent thesis.⁴³ Our research indicates that financial incentives had a limited role in the provision of GP care, which also partly could explain the limited changes in quality of care. These financial incentives seem to be counteracted by other non-financial incentives. For professional organisations, health insurers and government, these results point to the importance of non-financial incentives in their policy. GPs should be encouraged with non-financial incentives to improve their provision of care.

Professional organisations

In current general practice, professional organisations play a stimulating role with regard to the development of medical guidelines and improvement of the quality of care. For instance, professional GP organisations developed various manuals for the recording of patient data in EMRs of GPs (in Dutch: richtlijn Adequate Dossievorming met het Elektronisch Patiënten Dossier) and developed a quality mark for practices working on quality improvement in their practice (in Dutch: NHG Praktijk Accreditatie). These non-financial incentives of GP organisations' initiatives may have contributed to the appreciation of medical ethics and guidelines. This implies that similar non-financial incentives may be useful in stimulating further improvements in primary care, in which GP organisations could play an important role. To stimulate these non-financial incentives, the Ministry of Health might want to compensate GP organisations financially for their extra efforts.

Health insurers

The limited role of financial incentives in the provision of care by GPs indicates the importance of non-financial incentives in negotiations between GPs and health insurers. In the last years, the focus of negotiations was predominantly on financial incentives for the provision of health care, which, as shown in this thesis, seem to have limited impact. Health insurers should focus more on non-financial incentives such as quality improvement programmes based on benchmarking or on building more trust between health insurers and GPs. More and more, health insurers focus on non-financial incentives and trust. For example, one health insurer introduced their own benchmarking system and another health insurers obliged GPs to have a quality mark for general practices

working on quality improvement. The focus toward non-financial incentives should be stimulated.

Government

At the moment, the Dutch Healthcare Authority is responsible for determining the majority of tariffs, although increasingly more tariffs are becoming freely negotiable. At government level, decisions are made with regard to the kind of remuneration system and cost sharing for patients. In the last few years, several alterations have been made to the reimbursement system of GPs, the most important being the nationwide introduction of disease oriented funding (in Dutch: integrale bekostiging) for type II diabetes mellitus, COPD and vascular risk management in 2010.⁴⁴ Disease oriented funding means that all health care with regard to a specific disease is organised from one negotiable budget for all health care providers. Disease oriented funding is expected to stimulate multidisciplinary collaboration and the shift from secondary to primary care. GPs play a central role in disease-oriented funding. More recently, overspend on the total budget for general practice has prompted the Minister of Health to reconsider the GP remuneration system.⁴⁵ A system without a capitation fee is seen as an option for the Minister also, and could be regarded as remarkable as regards the central position of GPs in the system. Also, the Minister of Health recently pointed out the need for more substitution from secondary to primary care.⁴⁶ In the light of these current developments, our results could give some indications with regard to the design of a new GP remuneration system.

Our findings show limited differences in effects on care provided between remuneration systems and the importance of other non-financial incentives. When differences between the remuneration systems are limited, other factors with regard to these systems play a role. With respect to a full capitation system and combined capitation and FFS or full FFS system, differences exist in the financial compensation for work performed, the planning of health care budgets and the administrative burden on health care providers and health insurers. With regard to these factors a capitation system is preferable for the planning of health care budgets and easing the administrative burden, whereas an FFS system is preferable when financial compensation for work performed plays an important role. The central role of GPs in the Dutch health care system, however, and the close relation between GP and patient, might be the most

important factor in designing a remuneration system. Because of the limited differences in effects between remuneration systems, we recommend a simple remuneration system with financial incentives to establish good GP-patient relationships: a capitation system for general practice or, preferable, an integrated capitation system for more primary health care providers, also known as population based payments.

The system of integrated capitation could be seen as the next stage after disease oriented funding and in the light of the development of more collaboration between primary health care providers.⁴⁷ Coordination between primary health care providers and limited vertical integration with secondary care have been seen as weak points in the Dutch system.⁴⁸ An integrated capitation system may stimulate both the coordination within primary care and the vertical integration with secondary care. Also, the increasing number of patients with multimorbidity shows the need for a more patient-oriented approach instead of a disease-oriented approach.⁴⁹ Within integrated capitation, a network of primary health care providers receives one fee for the organisation of all primary health care for a patient. The integrated capitation system should be risk-adjusted for patient age and (chronic) diseases, and should also include supplements to the capitation fee for specific regional needs. The distribution of the integrated capitation fee among health care providers may differ with regard to the health problems within the specific population, and needs to be developed in close collaboration with involved health care providers in order to secure a fair distribution of the fee. For the implementation of integrated capitation a broad and possibly closed network of providers should be established in primary care. When expertise on certain treatments is not available in the collaboration, patients could be referred to other health care providers outside the collaboration. It is, however, very important to develop a list of performances that need to be performed within the integrated capitation fee. To ascertain transparency and public information on quality of care, benchmarking on performance should be developed and be available to both patients and health insurers. This could help patients to make informed choices about their care and give health insurers more tools to improve health care.

The remuneration system of GPs in particular and primary health care providers in general is embedded in a broader institutional context. Especially with regard

to the need for a move from secondary to primary health care, as urged by the Minister of Health, harmonisation of all incentives in secondary and primary care is needed. Problems identified in the theoretical considerations are the remuneration system of medical specialists, which stimulates production and the ex post risk adjustment for medical specialists' care, which does not give health insurers incentives to control cost in secondary care. Without a proper risk-bearing system for health insurers in both primary and secondary care and a remuneration system with less incentives for production, substitution may be limited. Therefore, when the remuneration system for GPs or all primary health care providers is changed, parallel focus should be on the reimbursement system for medical specialists.

Recommendations for future research

First, we recommend further investigation of the effect of remuneration systems on patient outcomes. Our study showed a limited change in physician-initiated contacts due to the changes in the remuneration system, which could be ascribed to SID. Publicly insured patients showed a higher increase in contacts initiated by GPs compared with privately insured patients. It is, however, unclear whether this has contributed to patients' health.¹² Further research should address the question of whether this change in physician-initiated contacts did indeed contribute to patient health.

Second, our analyses on possible substitution effects were based on the referral data of general practices. GPs have a gatekeeper function in the Dutch health care system, and therefore referral data is a good indicator for treatment in secondary care. One shortcoming is the lack of information on people's treatment in secondary care. For this reason we recommend future research on substitution effects using combined data on general practice and secondary care. As regard to the development of more integrated primary health care, an EMR for all primary health care providers is desirable for more insight into the shift from secondary to primary health care.

Furthermore, we recommend investigation of other aspects of accessibility and quality of care. In this thesis effects on the accessibility of health care were determined by the extent to which patients initiate contact with their general practice and the proportion of different contact types provided to patients.

Accessibility is a much broader concept and also contains aspects such as costs, travel distance, waiting time and the level at which the supply satisfies the demand or preferences of patients. With respect to quality of care, we investigated guideline adherence and length of consultations. Further research should address other aspects of quality, such as patient outcomes and patient satisfaction.

Fourth, this thesis showed that medical ethics and guidelines seem to have been strong enough to counteract the effects of changes in financial incentives. The exact way in which medical ethics affected GPs' behaviour is unknown. Unravelling the ways in which medical ethics influences physicians' behaviour and the professional culture could be very useful in the development of educational programmes and interventions for both GPs and medical specialists.

Last, increasing numbers of GPs are employed in general practice and remunerated with a salary.⁵⁰ Being employed provides other incentives compared with being self-employed. A salary system, as a capitation system, is thought to encourage providers to curtail services and refer more often to more specialist health care providers.^{21,31-33} A previous study showed that self-employed medical specialist induced more demand than medical specialist under salary in the Netherlands.⁵¹ It is unknown, however, whether GPs under salary and self-employed GPs are equally affected by medical ethics and guidelines. This should be addressed in future research.

CONCLUSION

This thesis showed that changes in the payment system of GPs, in terms of GPs' remuneration system and patients' cost sharing arrangements for GP care, only had limited effects on the affordability, accessibility and quality of care. Medical ethics and guidelines in Dutch general practice seem to have counteracted large differences in the provision of health care.

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Samenvatting (summary in Dutch)



Samenvatting (summary in Dutch)

SAMENVATTING

Achtergrond, doel en onderzoeksopzet

De markt van de gezondheidszorg wordt gekenmerkt door onzekerheid over de vraag naar zorg en informatieasymmetrie tussen arts en patiënt. Patiënten zijn sterk afhankelijk van het oordeel van artsen voor het verkrijgen van zorg. Verder is het erg onvoorspelbaar wanneer ze zorg nodig zullen hebben en wat de uitkomst ervan zal zijn. Deze karakteristieken maken het voor een arts mogelijk de vraag naar zorg te beïnvloeden. Het honoreringssysteem van artsen wordt gezien als belangrijk instrument om negatieve effecten van deze karakteristieken tegen te gaan, omdat inkomen wordt gezien als een van de elementen in de utiliteitsfunctie van huisartsen, naast vrije tijd en professioneel moraal (medische ethiek en richtlijnen). Utiliteit is een theoretisch concept dat wordt gebruikt als maat voor welzijn, waarbij mensen streven naar maximalisatie van utiliteit. Eigen bijdragen voor patiënten worden gezien als oplossing voor het feit dat patiënten met een zorgverzekering meer zorg vragen dan wanneer zij onverzekerd zijn. Veranderingen in de honorering van huisartsenzorg en eigen bijdragen voor deze zorg in Nederland in 2006 hebben geleid tot de unieke gelegenheid om de effecten te bestuderen van veranderingen in financiële prikkels voor zowel huisartsen als patiënten.

In 2006 werden het abonnementstarief voor ziekenfondsverzekerden en het verrichtingsstelsel voor particulier verzekerden vervangen door een gecombineerd systeem met een abonnementstarief en een verrichtingsstelsel voor iedereen. Voor particulier verzekerden vóór 2006 en alle patiënten sinds 2006 is de hoogte van de vergoeding aan huisartsen afhankelijk van het type contact (o.a. telefonisch consult, consult of visite) en de duur van het contact. Het nieuwe honoreringssysteem bevat ook een relatief beperkt vergoedingssysteem voor verrichtingen waarvan werd verwacht dat zij de kwaliteit van zorg verbeteren of substituerend zijn voor zorg in de tweede lijn (modernisering en innovatie verrichtingen). Ook de financiering van praktijkondersteuners in de huisartsenpraktijk veranderde in 2006. Van 2006 tot

2011 werd de zorg verleend door praktijkondersteuners gefinancierd met een verrichtingsstelsel gelijk aan huisartsen en een toeslag op het abonnementstarief^a. Vóór 2006 werden praktijkondersteuners enkel gefinancierd met een toeslag op het abonnementstarief. Ook wat betreft eigen betalingen waren er veranderingen. Voor 2006 waren niet alle particulier verzekerden verzekerd voor huisartsenzorg en degenen die dat wel waren hadden vaak een eigen risico voor huisartsenzorg. De eigen bijdragen voor huisartsenzorg voor particulier verzekerden zijn afgeschaft in 2006. Ziektefondsverzekerden hadden nooit eigen bijdragen voor huisartsenzorg.

Het doel van dit proefschrift was om de effecten te onderzoeken van veranderingen in het honoreringssysteem van huisartsen en eigen bijdragen voor patiënten op de betaalbaarheid, toegankelijkheid en kwaliteit van zorg. Deze drie aspecten zijn belangrijk voor de solidariteit en (kosten)effectiviteit van zorg.

Voor dit onderzoek werd gebruik gemaakt van longitudinale data van 2002 tot en met 2008 uit elektronische patiëntendossiers van huisartsenpraktijken die deelnamen aan het Landelijk InformatieNetwerk Huisartsenzorg (LINH). De LINH-database beschikt over longitudinale gegevens over morbiditeit, voorgeschreven geneesmiddelen, verwijzingen en declaraties van ongeveer 90 huisartsenpraktijken en 350.000 patiënten. Het netwerk is dynamisch, met in elk jaar kleine wijzigingen in de deelnemende huisartsenpraktijken. Diagnoses worden geregistreerd met de 'International Classification of Primary Care' (ICPC).

Belangrijkste resultaten

Betaalbaarheid van zorg: zorggebruik

De uitgaven aan huisartsenzorg overschreden het beschikbare budget in 2006 en de uitgaven zijn tussen 2006 en 2009 jaarlijks met 3,1 procent toegenomen. De toename in uitgaven aan huisartsenzorg kan het resultaat zijn van veranderingen in het honoreringssysteem en of de afschaffing van eigen

^a Vanaf 2011 krijgen huisartsenpraktijken alleen een vast bedrag per patiënt vergoed (abonnementstarief) voor de inzet van een praktijkondersteuner.

bijdragen of kan wijzen op een algemene toename in de vraag naar huisartsenzorg. Wij onderzochten eerst of en in welke mate de veranderingen in het honoreringssysteem hebben geresulteerd in veranderingen in het aantal contacten in de huisartsenpraktijk die door huisartsen werden geïnitieerd. Gebaseerd op de theorie over honoreringssystemen verwachtten wij dat het aantal huisartsgeïnitieerde contacten sterker is toegenomen voor ziekenfondsverzekerden vergeleken met particulier verzekerden. Voor ziekenfondsverzekerden kregen huisartsen naast het abonnementstarief vanaf 2006 ook een vergoeding per verrichting. In de theorie over honoreringssystemen stimuleert een verrichtingensysteem huisartsen tot het verlenen van meer contacten. Met andere woorden: wij verwachtten dat huisartsen reageren op een verandering in het honoreringssysteem door de vraag naar zorg te beïnvloeden, ook bekend als aanbodgeïnduceerde vraag. Het aantal huisartsgeïnitieerde contacten steeg tussen 2005 en 2007 voor zowel ziekenfonds- als particulier verzekerden. Deze stijging was groter bij voormalig ziekenfondsverzekerden dan bij particulier verzekerden, wat in overeenstemming was met onze hypothese. Het effect van veranderingen in het honoreringssysteem voor huisartsenzorg op huisartsgeïnitieerde contacten kan theoretisch zowel wijzen op aanbodgeïnduceerde vraag als op een respons op veranderingen in prijzen. De neoklassieke theorie gaat uit van een maximalisatie van de persoonlijke utiliteitsfunctie, waarin inkomen één element is. Een verhoging van de prijs per contact zal daarom resulteren in een toename van contacten en daardoor inkomen. Een belangrijke aanname in de theorie van aanbodgeïnduceerde vraag is dat deze groter is bij patiënten met een grotere informatieasymmetrie. Wij veronderstelden dat patiënten met een chronische aandoening kunnen worden geclassificeerd als patiënten met een geringere informatieasymmetrie vergeleken met patiënten zonder chronische aandoening. Over het algemeen hebben zij meer kennis over hun ziekte en behandelmogelijkheden. Hierdoor hebben huisartsen minder mogelijkheden om vraag te induceren. Daarom onderzochten wij aanvullend of het effect van veranderingen in het honoreringssysteem op het aantal huisartsgeïnitieerde contacten varieerde tussen patiënten met en zonder chronische aandoeningen. Deze analyses lieten zien dat het effect op het aantal huisartsgeïnitieerde contacten alleen zichtbaar was voor patiënten zonder chronische aandoeningen, wat wijst op aanbodgeïnduceerde vraag.

Betaalbaarheid van zorg: substitutie

Het nieuwe honoreringssysteem bevat ook elementen om substitutie te bevorderen van de tweede naar de eerste lijn en daardoor de algehele gezondheidszorguitgaven te beheersen (bij flankerend beleid in de tweede lijn): aparte tarieven voor substitutiegevoelige verrichtingen en structurele financiering voor praktijkondersteuners. Wij onderzochten of deze elementen in het nieuwe honoreringssysteem hebben geleid tot een verschuiving van zorg van de tweede naar de eerste lijn.

Bij sommige patiënten hebben huisartsen de keuze om een bepaalde interventie zelf uit te voeren of deze patiënt te verwijzen naar een andere zorgverlener buiten de praktijk. Omdat de kosten voor verrichtingen in de eerste lijn over het algemeen een stuk lager zijn dan in de tweede lijn is de verwachting dat het stimuleren van deze verrichtingen in de huisartsenpraktijk leidt tot lagere kosten in de gezondheidszorg als geheel (bij flankerend beleid in de tweede lijn). Wij verwachtten dat de extra vergoeding voor de modernisering en innovatie verrichting 'kleine chirurgische ingrepen' geassocieerd was met minder verwijzingen naar de tweede lijn. Het betreffende cross-sectionele onderzoek liet zien dat huisartsenpraktijken die meer kleine chirurgische ingrepen verrichten minder patiënten verwezen naar de tweede lijn bij patiënten met een snij- of scheurwond en bij patiënten met een atheroomcyste, maar niet voor patiënten met een benigne neoplasma van de huid/subcutis of moedervlek. Doordat het aantal verwijzingen voor patiënten met een snij- of scheurwond laag was (slechts 1,0%), was het stimuleren van kleine chirurgische ingrepen bij deze patiënten niet kosteneffectief. Dit was wel het geval bij kleine chirurgische ingrepen voor patiënten met een atheroomcyste. Wij concludeerden dat mogelijke substitutie-effecten van kleine chirurgische ingrepen verschillend zijn voor verschillende diagnoses en in dit geval alleen zichtbaar waren voor patiënten met een atheroomcyste.

Het aantal praktijkondersteuners nam toe van 1100 tot 2700 tussen 2003 en 2007. Deze toename kan wellicht worden verklaard door het nieuwe financieringssysteem voor praktijkondersteuners in 2006. Tot 2006 was de financiering afhankelijk van de verzekeraar, vanaf 2006 is de financiering landelijk geregeld met een apart (consult)tarief. Praktijkondersteuners worden voornamelijk ingezet in de zorg voor patiënten met chronische aandoeningen.

De vergrote inzet van praktijkondersteuners zou de kwaliteit van zorg voor chronisch zieke patiënten moeten verbeteren en de werkdruk van huisartsenzorg verminderen en daardoor meer ruimte geven voor substitutie van de tweede naar de eerste lijn. Wij lieten zien dat het aantal verwijzingen naar internisten voor nieuw gediagnosticeerde patiënten met type II diabetes mellitus met de helft afnam tussen 2004 en 2006, van 7,3% naar 3,3%. Deze daling kon echter niet worden toegeschreven aan een toename van het aantal praktijkondersteuners in de huisartsenpraktijk, wat wijst op de afwezigheid van een substitutie-effect. Het aantal verwijzingen naar internisten voor bestaande diabetespatiënten liet geen significante daling zien tussen 2004 en 2006. Maar er werd wel een grotere daling in verwijzingen naar internisten gevonden voor praktijken met een praktijkondersteuner vergeleken met praktijken zonder praktijkondersteuners, wat wijst op een beperkte substitutie van de tweede naar de eerste lijn. Wij concludeerden dat de verdere toename in het aantal praktijkondersteuners heeft geresulteerd in een lichte verschuiving van zorg van internisten naar huisartsenpraktijken voor bestaande type II diabetes patiënten.

Toegankelijkheid van zorg

De toegankelijkheid van zorg is geoperationaliseerd als de mate waarin patiënten contacten initiëren in de huisartsenpraktijk en de verhouding tussen verschillende contacttypes (visites, consult, telefonisch consult) verleend aan patiënten. De verwachting was dat de toegankelijkheid van huisartsenzorg voor particulier verzekerden voor 2006 beperkt was door eigen betalingen. Daarnaast verwachtten wij dat het abonnementstarief voor ziekenfondsverzekerden meer tijd kostende verrichtingen, zoals visites, aan deze patiënten zou hebben beperkt. Onze hypothese was dat de afschaffing van eigen bijdragen voor particulier verzekerden zou resulteren in een toename van het aantal door de patiënt geïnitieerde contacten van particulier verzekerden vergeleken met ziekenfondsverzekerden. Het aantal patiëntgeïnitieerde contacten steeg tussen 2005 en 2007 voor zowel ziekenfonds- als particulier verzekerden. Onze hypothese werd niet bevestigd. Wij vonden geen verschil in toename in patiëntgeïnitieerde contacten tussen ziekenfonds- en particulier verzekerden. We concludeerden dat de eigen bijdragen voor huisartsenzorg voor particulier verzekerden wellicht relatief te laag waren om patiënten ervan te weerhouden de huisartsenpraktijk te bezoeken.

Onze hypothese was verder dat de veranderingen in het honoreringssysteem van huisartsen zou resulteren in een kleiner aandeel visites en een groter aandeel telefonische consulten voor particulier verzekerden vergeleken met ziekenfondsverzekerden. Het verschil in opbrengst tussen visites, consulten en telefonische consulten is na de hervorming een stuk kleiner dan het was voor particulier verzekerden vóór de stelselwijziging. Om deze reden, verwachtten wij dat huisartsen minder geneigd zijn om meer tijd kostende contacten, zoals visites, te verrichten na de hervorming. Voor ziekenfondsverzekerden werd een verrichtingensysteem geïntroduceerd, waarvan verwacht werd dat het meer tijd kostende contacten zou stimuleren. Bijna driekwart van de contacten betrof consulten, 5 tot 7 procent visites en 20% van de contacten betrof telefonische consulten. Uit de resultaten bleek dat het type contact nauwelijks werd beïnvloed door veranderingen in het honoreringssysteem van huisartsen, alhoewel het aandeel visites een lichte daling liet zien voor particulier verzekerden ten opzichte van ziekenfondsverzekerden. Wij concludeerden dat de veranderingen in het honoreringssysteem van huisartsen nauwelijks de keuze tussen type contacten heeft beïnvloed.

Kwaliteit van zorg

Kwaliteit van zorg is in dit proefschrift geoperationaliseerd als de mate van het volgen van richtlijnen en de duur van een consult. Alhoewel de honoreringssystemen (voor en na stelselwijziging) niet direct gerelateerd zijn aan de kwaliteit van zorg hadden wij de verwachting dat de extra tijdsinvestering voor ziekenfondsverzekerden in termen van contacten (zie betaalbaarheid van zorg) heeft geresulteerd in een verbetering van de kwaliteit van zorg voor deze patiënten. Onze hypothese was dat de verandering van een abonnementstarief voor ziekenfondsverzekerden en een verrichtingensysteem voor particulier verzekerden naar een gecombineerd systeem met een abonnementstarief en verrichtingensysteem heeft geresulteerd in een toename in het volgen van richtlijnen voor ziekenfondsverzekerden vergeleken met particulier verzekerden. De resultaten uit dit deelonderzoek laten zien dat huisartsen voor zowel ziekenfonds- als particulier verzekerden steeds vaker de richtlijnen volgen. Over het algemeen werden geen verschillen gevonden in trend in het volgen van richtlijnen tussen ziekenfonds- en particulier verzekerden. Dit is niet in overeenstemming met onze hypothese. Echter, huisartsen volgden voor ziekenfondsverzekerden vaker richtlijnen die een grotere tijdsinvestering op de

langere termijn vergen in termen van vervolcontacten vergeleken met particulier verzekerden. We concludeerden hieruit dat de verandering in honoreringssysteem van huisartsen een beperkte invloed had op het volgen van richtlijnen.

Onze hypothese betreffende de consultlengte was dat de veranderingen in het honoreringssysteem voor huisartsen hebben geresulteerd in langere consulten voor ziekenfondsverzekerden vergeleken met particulier verzekerden. Sinds de honoreringsveranderingen is de hoogte van de vergoeding voor ziekenfondsverzekerden afhankelijk van de consultduur. In de theorie omtrent honoreringssystemen wordt verwacht dat deze vergoeding naar consultlengte leidt tot langere consulten. Met video-opnamen van spreekuurconsulten bij een representatieve groep huisartsen en hun patiënten lieten wij zien dat de duur van een consult steeg tussen 2002 en 2008 voor zowel ziekenfonds- als particulier verzekerden. Er werden geen verschillen gevonden in de trend in consultlengte tussen ziekenfonds- en particulier verzekerden. Zodoende concludeerden wij dat er sprake was van een algemene trend en de verandering in het honoreringssysteem van huisartsen geen effect heeft gehad op de consultlengte.

DISCUSSIE

De resultaten van dit proefschrift laten zien dat de verandering in het honoreringssysteem voor huisartsenzorg van een abonnementstarief voor ziekenfondsverzekerden en een verrichtingsstelsel voor particulier verzekerden naar een gecombineerd systeem met een abonnementstarief en een verrichtingsstelsel leidde tot een beperkte toename in het aantal huisartsgeïnitieerde contacten, een lichte toename in het aandeel visites en een toename van het volgen van richtlijnen die een grotere tijdsinvestering vergen voor ziekenfondsverzekerden vergeleken met particulier verzekerden. De veranderingen in het honoreringssysteem hadden geen invloed op de consultlengte en het volgen van richtlijnen in het algemeen. Afschaffing van eigen bijdragen voor particulier verzekerden resulteerde niet in een beter toegankelijke huisartsenzorg. Ten slotte lieten het specifieke vergoedingssysteem voor kleine chirurgische ingrepen en de toename van

praktijkondersteuners slechts in beperkte mate substitutie zien van zorg van de tweede naar de eerste lijn.

Wetenschappelijke implicaties en interpretatie van de resultaten

In dit proefschrift zijn we ervan uitgegaan dat de keuze van huisartsen om de zorg voor patiënten te beïnvloeden afhangt van datgene waaraan huisartsen welzijn ontleen, utiliteitsfunctie van huisartsen. Wij hadden de veronderstelling dat huisartsen hun gedrag aanpassen op basis van de combinatie van inkomsten, vrije tijd en professionele moraal, zowel ethisch als inhoudelijk (richtlijnen). Doordat het specifieke honoreringssysteem van invloed is op het inkomen van huisartsen, verwachtten wij dat het honoreringssysteem een belangrijk instrument is om het gedrag van huisartsen te beïnvloeden, alhoewel effecten wellicht beperkt worden door de medische ethiek en richtlijnen. De beperkte veranderingen in de geleverde zorg kunnen wellicht worden verklaard door de grotere rol die de medische ethiek en richtlijnen hebben in de utiliteitsfunctie van huisartsen dan we verwacht hadden, of beperkte effecten van veranderingen in het honoreringssysteem op het inkomen van huisartsen.

Medische ethiek en richtlijnen: professioneel moraal

Richtlijnen spelen een belangrijke rol in de Nederlandse huisartsenpraktijk. De ontwikkeling van richtlijnen ligt op een hoog niveau. De aanwezigheid van richtlijnen geeft huisartsen houvast bij het verlenen van zorg. Richtlijnen kunnen daarmee wellicht hebben gezorgd dat de ruimte voor huisartsen om de vraag naar zorg te beïnvloeden beperkt was. Verder kan de medische ethiek een rol hebben gespeeld in het gedrag van huisartsen ten opzichte van patiënten die wisselden van verzekering voor de hervormingen. Voor 2006 waren de meeste mensen eerst ziekenfondsverzekerd, omdat jonge mensen over het algemeen lagere inkomens hebben. En alleen op latere leeftijd, met een toename in inkomen, werd een deel van de mensen particulier verzekerd. Het beperkte effect van de veranderingen in de honorering van huisartsen suggereert dat huisartsen het wellicht niet ethisch correct vonden om de manier van zorgverlening te veranderen wanneer patiënten veranderen van een ziekenfondsverzekering naar een particuliere verzekering.

Inkomen

Huisartsen in Nederland hebben een relatief hoog inkomen vergeleken met hun collega's in Europa. Dit hoge inkomen kan wellicht als verklaring dienen voor beperkte effecten van de veranderingen in het honoreringssysteem. Op praktijkniveau hebben veranderingen in het honoreringssysteem geen grote invloed gehad op de opbrengst van een huisartsenpraktijk in het algemeen. Echter de opbrengst van een aparte verrichting voor een individuele patiënt is sterk veranderd met de hervormingen. De vraag is of huisartsen zich ervan bewust zijn in welke mate veranderingen in een honoreringssysteem de totale opbrengst van hun praktijk beïnvloeden. Een eerdere studie laat zien dat huisartsen zich hiervan niet bewust lijken te zijn en voornamelijk in het eerste jaar na invoering hun inkomen proberen te garanderen door meer contacten te verlenen of beter te declareren. Bij onzekerheid gaan ze eerder meer verrichtingen uitvoeren of declareren dan minder. Ons onderzoek laat zien dat de beperkte veranderingen inderdaad hebben plaatsgevonden in het eerste jaar na invoering van een nieuw honoreringssysteem. Om deze reden verwachtten wij dat de veranderingen in financiële prikkels groot genoeg waren om huisartsen te beïnvloeden, maar dat andere prikkels dan financiële, zoals medische ethiek en richtlijnen, grote verschillen tegengingen.

Substitutie

De beperkte effecten van de extra vergoeding van kleine chirurgische ingrepen en grotere inzet van praktijkondersteuners in de huisartsenpraktijk kan wellicht worden verklaard door de taakopvatting van huisartsen en het ex-post risicovereveningssysteem voor zorg van medisch specialisten. In veel gevallen zullen huisartsen ook bepaalde verrichtingen uitvoeren als zij daar niet specifiek voor worden betaald (intrinsieke motivatie/professioneel moraal). Dit kan het geval zijn voor patiënten met snij- en scheurwonden. Het verrichten van kleine chirurgische ingrepen voor snij- en scheurwonden is een basistaak van huisartsen, waar nauwelijks extra educatie en vaardigheden voor nodig zijn. Verwijzingen voor patiënten met snij- en scheurwonden komen dan ook nauwelijks voor. Om deze reden lieten kleine chirurgische ingrepen voor snij- en scheurwonden waarschijnlijk geen verschuiving zien van zorg van de tweede lijn naar de eerste lijn. Daarnaast zijn praktijkondersteuners over het algemeen betrokken bij de routinematige controle van chronische zieke patiënten, wat voornamelijk het geval is bij patiënten die al jaren een chronische aandoening

hebben. Voor nieuw gediagnosticeerde patiënten spelen praktijkondersteuners een kleinere rol, omdat er vaak nog geen routinematige management van zorg mogelijk is. Het is daarom niet vreemd dat het beperkte substitutie-effect alleen werd gevonden voor bestaande type II diabetespatiënten.

Het geringe substitutie-effect kan ook worden verklaard door het beperkte risico dat zorgverleners lopen voor medische specialistische zorg. Medisch specialisten worden vergoed met een specifiek bedrag per zorgepisod, een vergoedingssysteem waarvan wordt verwacht dat het productie van zorg stimuleert. Men zou verwachten dat zorgverzekeraars profiteren van substitutie van zorg van de tweede naar de eerste lijn. Echter, het ex-post risicovereveningssysteem geldt voor een groot deel van de zorg van medisch specialisten en niet voor eerstelijns zorg. Om die reden is het vanuit een financieel perspectief niet erg interessant voor zorgverzekeraars om substitutie van de tweede naar de eerste lijn te stimuleren. Gegeven onze resultaten van beperkte substitutie-effecten en het feit dat medische ethiek en richtlijnen een sterke invloed hebben op de verleende zorg door huisartsen, zijn specifieke financiële prikkels in de eerste lijn alleen niet de oplossing om de zorg in de tweede lijn te beperken. Een simpeler bekostigingssysteem zoals een abonnementstarief of populatiegerichte bekostiging voor de eerste lijn met prikkels gericht op de medische ethiek kan wellicht meer opleveren. Daarnaast dient het ex-post risicovereveningssysteem minder zorg van medisch specialisten te bevatten om zo substitutie van de tweede naar de eerste lijn te stimuleren.

Implicaties voor de theorie

In het algemeen lijken de medische ethiek en richtlijnen in Nederland sterk genoeg te zijn om negatieve effecten van de veranderingen in financiële prikkels tegen te gaan. Deze resultaten suggereren dat prikkels gericht op professionele moraal, medische ethiek en richtlijnen, een grotere rol spelen in de utiliteitsfunctie van huisartsen dan over het algemeen wordt gedacht. Initiatieven die meer focussen op de medische ethiek en richtlijnen zouden wellicht een beter instrument zijn om het gedrag van huisartsen te beïnvloeden. Het is echter belangrijk te beseffen dat deze resultaten slechts een momentopname zijn van de situatie tussen 2002 en 2008. Zoals wordt beschreven in de economische theorie over persoonlijke motivatie van Bruno Frey, kan de intrinsieke motivatie

(professionele moraal) worden overschaduwd wanneer er sterk gericht wordt op financiële prikkels (externe motivatie). Door hun intrinsieke motivatie zullen huisartsen (een deel van) de zorg ook verlenen wanneer ze niet direct worden gestimuleerd door financiële prikkels (zoals in een abonnementstarief). Wanneer huisartsen stelselmatig worden geconfronteerd met een focus op financiële prikkels (bijvoorbeeld in verrichtingensysteem) naast hun intrinsieke motivatie, wordt vanuit de theorie van Frey verwacht dat huisartsen over-gemotiveerd zijn, omdat zij een deel van de zorg ook zouden verlenen als de financiële prikkels minder zouden zijn. Op basis van de theorie over persoonlijke motivatie zullen huisartsen reageren door de motivatie te verminderen die onder hun eigen controle is: de intrinsieke motivatie. Door een verminderde intrinsieke motivatie zullen huisartsen minder zorg willen verlenen zonder dat er een financiële compensatie is. Deze effecten zijn onlangs ook gevonden in internationaal wetenschappelijk onderzoek. Door een honoreringssysteem sterk te richten op financiële prikkels kan de intrinsieke motivatie van huisartsen verminderen, waardoor waarschijnlijk uiteindelijk meer via specifieke financiële prikkels zal moeten worden gewerkt.

Eigen bijdragen

De afschaffing van de eigen bijdragen voor particulier verzekerden heeft de toegankelijkheid van zorg voor deze patiënten niet verbeterd. Dit kan worden verklaard door de relatief welvarende populatie, lage eigen bijdragen en het feit dat veel van hen eerder verzekerd waren in een ziekenfonds. Particulier verzekerden representeerden een relatief welvend deel van de Nederlandse bevolking. De relatief lage eigen bijdragen hebben wellicht niet geleid tot een beperking van de consumptie van zorg. Daarnaast waren de meeste particulier verzekerde patiënten eerst ziekenfondsverzekerd. Als ziekenfondsverzekerde waren zij gewend om gebruik te maken van huisartsenzorg en werden zij door de beperkte eigen bijdrage niet gestopt om hiermee door te gaan wanneer zij een particuliere verzekering kregen. In de literatuur worden twee benaderingen genoemd om het gebruik van onnodige zorg te beperken: 1) het introduceren van eigen bijdragen voor zorg die direct toegankelijkheid is en 2) het hebben van een huisarts als poortwachter voor de meer gespecialiseerde en kostbare zorg. Omdat huisartsen in Nederland als poortwachters functioneren voor specialistische zorg, worden eigen bijdragen voor huisartsenzorg over het algemeen onwenselijk en onnodig bevonden.

Implicaties van de onderzoeksresultaten voor beleid

Hoe dient het honoreringssysteem van huisartsen eruit te zien? Dit is een vraag die moeilijk kan worden beantwoord en die sterk afhankelijk is van onder andere de huidige situatie in de gezondheidszorg, financiële mogelijkheden en de dominante visie van politieke partijen, zorgverzekeraars en zorgverleners. Wij zullen de implicaties van onze bevindingen bespreken voor huisartsenorganisaties, zorgverzekeraars en de overheid.

Onze onderzoeksresultaten wijzen op een goed werkende huisartsenpraktijk met een hoge professionele moraal in termen van medische ethiek en richtlijnen. Financiële prikkels lijken een beperkte rol te spelen in de verlening van huisartsenzorg. Immateriële prikkels lijken een belangrijkere rol te hebben in de beïnvloeding van huisartsen. Voor huisartsenorganisaties, zorgverzekeraars en de overheid wijzen deze resultaten op het belang van immateriële prikkels in hun beleid. Huisartsen zouden gestimuleerd moeten worden met immateriële prikkels om de kwaliteit van zorg te verbeteren.

Huisartsenorganisaties

In Nederland spelen huisartsenorganisaties een stimulerende rol in de ontwikkeling van medische richtlijnen en in de verbetering van de kwaliteit van zorg. Het Nederlands Huisartsen Genootschap (NHG) heeft bijvoorbeeld verschillende richtlijnen ontwikkeld voor het uniform registreren van patiëntengegevens in het EPD van huisartsen (ADEPD: Richtlijn Adequate dossiervorming met het EPD) en voor de benchmarking van de kwaliteit van verleende zorg (NHG Praktijk Accreditatie). Onze resultaten impliceren dat soortgelijke immateriële prikkels wellicht bruikbaar zijn om verdere kwaliteitsverbetering in de zorg te stimuleren, waarin huisartsenorganisaties wellicht een belangrijke rol kunnen spelen.

Zorgverzekeraars

De beperkte rol van financiële prikkels in de zorgverlening door huisartsen wijst op het belang van immateriële prikkels in de onderhandelingen tussen huisartsen en zorgverzekeraars. Zorgverzekeraar zouden zich meer moeten richten op immateriële prikkels zoals bijvoorbeeld programma's om de kwaliteit van zorg te verbeteren op basis van benchmarking of het stimuleren van vertrouwen tussen zorgverzekeraars en huisartsen. Steeds vaker richten

zorgverzekeraars zich op immateriële prikkels en vertrouwen. Zo heeft bijvoorbeeld een zorgverzekeraar een eigen systeem van benchmarking ontwikkeld en heeft een andere zorgverzekeraar huisartsen verplicht om deel te nemen aan de NHG Praktijk Accreditatie. Deze focus op immateriële prikkels zou meer moeten worden gestimuleerd.

Overheid

Op dit moment is de Nederlandse Zorgautoriteit verantwoordelijk voor het vaststellen van de meerderheid van de maximum tarieven, alhoewel steeds meer tarieven vrij onderhandelbaar zijn. Op het niveau van de overheid worden beslissingen genomen over het honoreringssysteem van huisartsen en eigen bijdragen voor patiënten. In de laatste jaren hebben zich een aantal veranderingen voorgedaan in de bekostiging van huisartsenzorg, met als belangrijkste verandering de introductie van integrale bekostiging voor type II diabetes mellitus, COPD en patiënten met een verhoogd risico op vasculaire aandoeningen. Binnen integrale bekostiging wordt alle zorg voor een specifieke aandoening georganiseerd vanuit een onderhandelbaar budget voor alle zorgverleners (exclusief medicatie). Integrale bekostiging beoogt de multidisciplinaire samenwerking te stimuleren en een verschuiving van zorg van de tweede naar de eerste lijn te bewerkstelligen. Huisartsen spelen een centrale rol binnen integrale bekostiging. Onlangs heeft de Minister van Volksgezondheid, Welzijn en Sport aangegeven het honoreringssysteem van huisartsen onder de loep te nemen na een overschrijding van het budget voor huisartsenzorg. Verder heeft de Minister onlangs gewezen op de noodzaak van een grotere verschuiving van zorg van de tweede naar de eerste lijn. In het licht van deze ontwikkelingen kunnen onze onderzoeksresultaten aanwijzingen geven voor het ontwerp van een nieuw honoreringssysteem van huisartsen.

Onze onderzoeksresultaten wijzen op beperkte verschillen in verleende zorg tussen de verschillende honoreringssystemen en het belang van immateriële prikkels. Wanneer verschillen tussen honoreringssystemen beperkt zijn, spelen andere factoren een rol in de keuze van een honoreringssysteem. Een volledig abonnementstarief, gecombineerd abonnementstarief en verrichtingensysteem en een volledig verrichtingensysteem verschillen in de financiële compensatie naar werk, planbaarheid van gezondheidszorguitgaven en administratieve lasten voor zorgverleners en zorgverzekeraars. Betreffende deze factoren heeft een

abonnementstarief de voorkeur als het om de beheersing van gezondheidszorguitgaven en administratieve lasten gaat. Daarentegen heeft een verrichtingsstelsel de voorkeur wanneer er veel waarde wordt gehecht aan inkomen naar werk. Echter, de centrale positie van huisartsen in het Nederlandse zorgstelsel en de hechte relatie tussen huisarts en patiënt zijn wellicht de belangrijkste factoren in de keuze voor een honoreringssysteem. Door de beperkte verschillen in effecten tussen de honoreringssystemen heeft een simpel honoreringssysteem met financiële prikkels om een goede relatie tussen huisarts en patiënt te bewerkstelligen wellicht de voorkeur: een abonnementstarief voor huisartsenzorg, of nog liever, een geïntegreerd abonnementstarief voor meer eerstelijnszorgverleners, dan wel populatiegerichte bekostiging, waarin ook (delen van) de tweedelijnszorg kan worden opgenomen.

Een populatiegerichte bekostiging voor eerstelijnszorgverleners kan worden gezien als een vervolgstap na integrale bekostiging van ziektespecifieke ketenzorg en in het licht van de groeiende samenwerking tussen verschillende zorgverleners in de eerste lijn. Zorgcoördinatie tussen eerstelijnszorgverleners en de beperkte verticale integratie met tweedelijnszorg worden gezien als een zwak punt in het Nederlandse systeem. Een geïntegreerd abonnementstarief kan de samenwerking in de eerste lijn nog meer stimuleren en de integratie met de tweede lijn bevorderen. De toename van het aantal patiënten met multimorbiditeit wijst op de noodzaak van een meer patiëntgerichte aanpak in plaats van een ziektegerelateerde aanpak. Binnen een geïntegreerd abonnementstarief ontvangt een groep van eerstelijnszorgverleners een vergoeding voor het verlenen van alle eerstelijnszorg voor een patiënt. De hoogte van het geïntegreerde abonnementstarief moet afhankelijk zijn van de leeftijd van de patiënt en de (chronische) aandoeningen die de patiënt heeft. Daarnaast dient er ook een mogelijkheid te zijn voor toeslagen op het abonnementstarief afhankelijk van regionale verschillen in de zorgvraag. De verdeling van het geïntegreerde abonnementstarief tussen de zorgverleners kan verschillen naar gelang de gezondheidsproblemen in een specifieke populatie, en dient in samenwerking met alle zorgverleners te worden bepaald. Voor de implementatie van een populatiegerichte bekostiging is een breed en mogelijk gesloten netwerk van zorgverleners noodzakelijk. Wanneer de kennis over bepaalde behandelingen niet aanwezig is binnen het netwerk, kunnen patiënten worden verwezen naar andere zorgverleners buiten de samenwerking. Het is

echter heel belangrijk om een prestatiebeschrijving op te stellen van prestaties die vanuit de populatiegerichte bekostiging dienen te worden geleverd. Om de transparantie van zorg en publieke informatie omtrent de zorg te waarborgen dient benchmarking te worden ontwikkeld omtrent de kwaliteit van zorg. Dit kan patiënten helpen bij een weloverwogen keuze van zorg en geeft zorgverzekeraars meer handvaten om de zorg te verbeteren.

Het honoreringssysteem van huisartsen specifiek en zorgverleners in de eerste lijn in het algemeen, is ingebed een bredere institutionele context. Voornamelijk voor substitutie van zorg van de tweede naar de eerste lijn is harmonisatie van prikkels tussen de tweede en eerste lijn noodzakelijk. Eerder vermelde problemen hieromtrent zijn het honoreringssysteem van medisch specialisten dat productie van zorg stimuleert, en de ex-post risicoverevening voor medisch specialistische zorg, die zorgverzekeraars geen prikkels geeft om kosten te beheersen in de tweede lijn. Zonder een gepast risicodragend systeem voor zorgverzekeraars in zowel de eerste als de tweede lijn en een honoreringssysteem voor medisch specialisten zonder prikkels voor productie, zal substitutie beperkt zijn. Zodoende dient er ook aandacht te worden besteed aan het honoreringssysteem van medische specialisten wanneer veranderingen worden ingevoerd in de honorering van huisartsen of alle zorgverleners in de eerste lijn.

Voorstel voor toekomstig onderzoek

Allereerst adviseren wij vervolgonderzoek naar de effecten van honoreringssystemen op patiëntuitkomsten. Ons onderzoek liet onder andere een beperkte verandering zien in het aantal huisartsgeïnitieerde contacten en volgen van richtlijnen door veranderingen in het honoreringssysteem. Het is echter onduidelijk of deze veranderingen invloed hebben gehad op patiëntuitkomsten. Deze gegevens waren helaas niet beschikbaar in de LINH-data.

Ten tweede zijn onze analyses omtrent mogelijke substitutie-effecten gebaseerd op verwijzdata van huisartsenpraktijken. Huisartsen hebben een poortwachterfunctie in het Nederlandse systeem, waardoor het verwijscijfer een goede indicatie is voor behandeling in de tweede lijn. Een tekortkoming is echter dat wij geen gegevens hadden over het aantal contacten in de tweede lijn. Om

deze reden adviseren wij vervolgonderzoek naar substitutie-effecten waarbij gebruik wordt gemaakt van gecombineerde data uit de eerste en tweede lijn. Betreffende de ontwikkeling naar een meer geïntegreerde eerste lijn, is een EPD voor alle zorgverleners in de eerste lijn en een combinatie met gegevens over tweedelijns zorggebruik wenselijk om meer inzicht te krijgen in mogelijke substitutie-effecten van de tweede naar de eerste lijn.

Verder adviseren wij om in vervolgonderzoek andere aspecten van toegankelijkheid en kwaliteit van zorg te onderzoeken. In dit proefschrift werd het effect van veranderingen in bekostiging van huisartsenzorg bepaald aan de hand van de mate waarin patiënten contacten initiëren en het aandeel van verschillende contacttypes die werden verleend aan patiënten. Toegankelijkheid van zorg is een veel breder concept, en bestaat uit aspecten als kosten, reisafstand, wachttijden en de mate waarin het aanbod voldoet aan de vraag of voorkeuren van patiënten. Betreffende de kwaliteit van zorg onderzochten wij in hoeverre het volgen van richtlijnen en lengte van consulten werden beïnvloed door veranderingen in het honoreringssysteem van huisartsen. In vervolgonderzoek zouden aspecten van kwaliteit als patiëntuitkomsten en patiënttevredenheid meer aandacht moeten krijgen.

Dit proefschrift laat zien dat de professionele moraal in termen van medische ethiek en richtlijnen sterk genoeg was om grotere veranderingen door financiële prikkels tegen te gaan. De manier waarop medische ethiek het gedrag van huisartsen precies beïnvloedt is onbekend. Het ontrafelen van de manier waarop de professionele moraal het gedrag van artsen beïnvloedt kan zeer nuttig zijn voor de ontwikkeling van educatieprogramma's en interventies voor huisartsen, maar ook voor medisch specialisten.

Tenslotte zijn steeds meer huisartsen in Nederland in dienst van een huisartsenpraktijk en worden zij betaald met een (vast) salaris. De praktijk als totaal wordt dan nog steeds met een gemengd systeem van abonnementstarief en verrichtingsysteem betaald, maar opbrengsten per praktijk worden op een andere wijze verdeeld. Een dienstverband bij een huisartsenpraktijk geeft een huisarts andere prikkels dan een eigen praktijk. In de literatuur omtrent honoreringssystemen wordt ervan uitgegaan dat een salarissysteem, net als een abonnementstarief, zorgverleners stimuleert het aantal contacten te beperken en

vaker te verwijzen naar andere zorgverleners buiten de praktijk. Het is echter onduidelijk in hoeverre het gedrag van huisartsen met een salaris wordt beïnvloed door de professionele moraal in termen van medische ethiek en richtlijnen. Dit zal in vervolgonderzoek moeten worden onderzocht.

CONCLUSIE

Dit proefschrift laat zien dat de veranderingen in het bekostigingssysteem van huisartsen, in termen van het honoreringssysteem van huisartsen en eigen bijdrage van patiënten, slechts een beperkt effect heeft gehad op de betaalbaarheid, toegankelijkheid en kwaliteit van huisartsenzorg. De invloed van medische ethiek en richtlijnen op het handelen van Nederlandse huisartsen lijkt grote verschillen in de verleende zorg te hebben tegengegaan.

Dankwoord (acknowledgements)



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Curriculum Vitae



Curriculum Vitae

Christel van Dijk was born on the 1st of February 1984 in Hoorn, the Netherlands. She completed secondary school in 2002 at the RSG Wiringherlant in Wieringerwerf. After finishing secondary school, she studied Health Sciences at the VU University in Amsterdam. In 2007 she obtained a Master of Science in Public Health Research. After graduating she started working at NIVEL (Netherlands Institute for Health Services Research), where she was involved in research based on data from the Netherlands Information Network of General Practice (LINH). Her work has resulted in many national and international publications, including this PhD thesis. Since 2010, she has been involved in research on disease oriented funding (in Dutch: integrale bekostiging).

List of publications





List of publications

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