Cover Page

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Author: Rolden, Hendrik Jan Albert (Herbert)
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Chapter 4

The association between expenses for general practice and other health care expenses later in time

H.J.A. Rolden, D. van Bodegom, R.G.J Westendorp

Abstract

Background: An effective primary care system holds potential to curb health care expenditure (HCE), as general practitioners (GPs) provide services that prevent utilization of other, often more costly health care services. However, there is insufficient evidence to support this claim. We aim to investigate whether HCE of older people decline when they make more use of GP services.

Methods: Data on medical care expenses and long-term care utilization from clients aged 65 and older were retrieved from a regional health care insurer and linked to data on long-term care fees from the Health Insurance Board, socio-economic status from the Netherlands Institute for Social Research, and other socio-demographic characteristics from Statistics Netherlands (n=16,433). The association between GP expenditure (first 18 months of follow-up) and expenses for other health services later in time (from 19th month onward) was analysed with generalized linear models and two-part models with standardization for mortality, baseline expenses for other health care services, socio-demographic characteristics and time variables.

Results: For every €10/month of GP expenditure, the expenses for other health care services later in time increase with €74/month (p<.001). Specifically, expenses increase with €27/month for hospital care (p<.001), €17/month for medical care expenditure other than GP and hospital care (mainly medication, physio- and psychotherapy, and instrumental aids), and €33/month for long-term care.

Conclusions: We found a positive association between GP expenditure and expenses for other health care services later in time in a cohort of Dutch older health insurance clients. The positive association can be explained by three dynamics: (1) expenses for GPs are automatically associated with expenses for other health care services because patients often receive or even require a referral from the GP before receiving specialist health care; (2) GPs could increase the overall level of HCE by improper diagnoses or unnecessary referrals; (3) our statistical methods did not adequately account for the likelihood that patients who have more health problems visit GPs *and* other health care providers more frequently.

Introduction

A strong primary care system is proposed as a policy-instrument for the many countries facing important challenges to their health care system, such as a higher share of older people, increasing life expectancy, rising levels of national health spending, growing inequity, and commercialization.[1,2] This beneficial effect is mainly based on the assumption that the general practitioner (GP) can serve as an effective gatekeeper. The GP acts as a coordinator of care, scrutinizing whether specialist treatment is necessary. If not, the patient can be reassured or a period of watchful waiting can commence. If specialist care is necessary, the GP can point out which specialist or health practice is best suited for provision. Another benefit is that GPs can offer basic treatments at low costs, without the need for further specialist visits, and are less inclined than specialists and therapists to engage in costly diagnostics or treatments. All in all, this implies that a strong position for the GP holds potential to reduce spending levels on health care. However, there are also reasons to believe a strong position for the GP could increase health care expenditure (HCE). If a disease that warrants specialist attention – such as cancer – is not diagnosed properly, a patient might not receive the necessary follow-up treatment, leading to a exacerbation of HCE later in life, or even fatality.[3,4] On the other hand, GPs can also be responsible for inappropriate or unnecessary referrals, again leading to increased HCE.[5,6]

Research on the net effect of a strong position for GPs on HCE is scant and contradictory. In two longitudinal analyses of health care costs in OECD countries, countries with a gatekeeping system were found to have slower growth in expenditure in some periods of time,[7] or for ambulatory care only.[8] A study performed in the US shows that health care utilization rates are lower in areas with relatively more GPs.[9] Results from other studies suggest that strong primary care systems increase public health and decrease avoidable hospitalizations, but at the cost of higher levels of national health spending.[10,11] In the Netherlands, frequent attenders to GPs (10% of GP visitors with the most visits) are found to have higher medical care expenses (MCE) when adjusting for possible confounding factors.[12] A systematic review of literature on national gatekeeping programmes yielded a small set of studies that incorporated HCE, which were found to be of poor quality.[13]

In this study, we aim to estimate how the expenses for GP services relate to expenses for health care services later in time. A database on 16,433 Dutch health insurance clients aged 65 and older from July 2007 through 2010 was at our disposal to analyse this association. We hypothesize that GP expenditure is inversely associated with expenses for other health care services later in time in a population of older people,

when adjusting for baseline expenses for other health care services, socio-demographic characteristics, and time variables. Understanding the effect of the gatekeeping role of the GP on HCE is important in a time where policy-makers are urged to curtail ever rising levels of health care spending.

Methods

Data sources

With the aim to perform multiple studies on the association between the life situation of older people and their health care expenditure (HCE), the Leiden Health care Costs in Old Age (LHCOA) study was started in 2011. For this study, data on HCE of clients aged 65 and older in a period of 42 months were retrieved from a regional Dutch health care insurer (*Zorg & Zekerheid*) and matched with data on socio-economic characteristics from Statistics Netherlands (*Centraal Bureau van de Statistiek*). Data were collected in the following steps:

1. After consulting the IRB (legal department) of the regional health care insurer, data on medical care expenditure (MCE) were retrieved from the health care insurer's management information system. Data were collected for the period July 2007 through 2010 for all persons who lived in the regions where the health care insurer acted as the long-term care office, and who reached the age of 65 before 2011. Addresses were linked with data on socio-economic status by postal code, provided by the Netherlands Institute for Social Research.
2. In accordance with the IRB of the health care insurer, data on long-term care utilization were collected from the EMEA Care Registration system (ECR), an information system which offers an oversight of all the coded messages that are sent between organizations active within the confounds of the EMEA. ECR messages designating the start and end of long-term care provision were linked with national average fees per volume unit, provided by the Health Insurance Board. The received volume of extramural treatment were unknown, and no expenses could be calculated for this service type.
3. After consulting the IRB of Statistics Netherlands a single transfer of data from the health care insurer to Statistics Netherlands was done over a secure line. CBS staff merged the data using citizen service numbers and dismissed any personal data afterwards. The authors could then only access the de-identified data in a secured

room of Statistics Netherlands. The authors had no access to identifying information. Any output destined for publication was first scrutinized by the IRB of Statistics Netherlands, so no output could be traced back to individuals.

Study design

The aim of this study was to investigate the effect of GP expenditure on expenses for other health care services later in time (oHCE). To capture a causal effect rather than just an association, we set up our study such that the outcome variable (oHCE) applied to a time period following that of the main determinant (GP expenditure). The mean follow-up per individual in the total study population (n=61,495) was ±36 months. GP expenditure was calculated over the first half (18 months) of follow-up. oHCE was defined as the mean monthly HCE – except for GP services – after the first 18 months. The database should therefore consist of subjects with at least 19 consecutive months of follow-up (n=16,433).

Statistical analyses

It is plausible that a positive correlation between GP expenditure and oHCE is found when morbidity is not adequately adjusted for: patients with higher morbidity simply require more services, and will therefore have higher expenses with regard to all services. However, because the health care insurer could not provide us with data on specific diagnosis codes of individuals due to privacy concerns, information on morbidity could not be acquired. Instead, we used 'baseline health care consumption' as a continuous variable in our regressions models to adjust for confounding by morbidity. Baseline health care consumption equals the monthly average of total expenses for all health care services except for GP care in the first 18 months of follow-up. A log scale was applied because of a lack of normal distribution. Log transformation resulted in a score ranging from 0 to 10 with a normal distribution.

Besides baseline health care consumption, we included mortality (as a dummy variable), age, gender, marital status, socio-economic status, and calendar time as determinants in our analysis. To measure the association between GP expenditure and oHCE, while adjusting for these other determinants, we used a generalized linear model (GLM) – either stand-alone or in a two-part model. A GLM had to be used to account for the skewed nature of the outcome variable. Two-part models needed to be used as a relatively large share of patients did not incur any expenses for some health care services. We also applied these models to separate forms of HCE, like expenditure for hospital care, or home care. The consequence of using two different models in our analyses

is that the model predictions of expenses for different health care services could possibly not completely add up to the prediction of oHCE.

Health care services with a high share of zero expenses in the total study population were hospital care (16.2%), home care (80.1%), care and nursing homes (92.6%), other forms of long-term care (95.4%), and total long-term care (75.2%). Low shares of zero expenses were observed in non-hospital forms of medical care (2.3%), total medical care (1.9%), and oHCE (1.6%). We used a two-part model with logit model in the first part of the model, and a GLM with gamma distribution and log link in the second part.[14,15]

Results

Table 1 shows the characteristics of the study population. In this study, because of our selection age, there are more women than men (61% vs. 39%). Overall, the subjects have a relatively high socio-economic status: 70% of the study population lives in an a postal area where the average socio-economic status is above the median.

Table 1. Characteristics of the study population (n=16,433).

	n (%)
Gender	
Men – No. (%)	6,346 (39)
Women	10,087 (61)
Age	
65-79	12,228 (74)
80+	4,205 (26)
Marital status	
Married	8,416 (51)
Divorced	1,748 (11)
Widowed	5,316 (32)
Never married	953 (6)
Socio-economic status	
Lower	4,850 (30)
Higher	11,583 (70)
Deceased during follow-up	1,354 (8)

Table 2 shows the association of GP expenditure, socio-demographic variables, time variables, mortality, and baseline health care consumption with oHCE.

Table 2. The association between GP expenditure and total other health care expenses later in time, corrected for socio-demographic characteristics, time variables, and baseline health care consumption. Results are from a multivariate generalized linear model.

	Expenditure for all health care services other than GP, later in time (=oHCE)[1]		
	€/month	95% CI	p
GP expenditure[2]			
Per €10/month	+74	+48 to +100	<.001
Baseline health care consumption[2]			
Per level (ascending, total of 10)	+301	+278 to +323	<.001
Gender			
Male	*Ref*		
Female	−58	−113 to −4	.037
Age			
65-79	*Ref*		
80+	+364	−294 to +433	<.001
Marital status			
Married	*Ref*		
Divorced	+143	+60 to +225	.001
Widowed	+149	+86 to +212	<.001
Never married	+366	+257 to +374	<.001
Socio-economic status			
Lower	*Ref*		
Higher	−97	−154 to −40	.001
Calendar year			
2009	*Ref*		
2010	−4	−6 to −2	<.001
Seasons			
Spring and summer	*Ref*		
Autumn and winter	+1	−2 to +4	.380
Mortality			
Survived	*Ref*		
Deceased	+1,091	+880 to +1,303	<.001

[1] Applies to the 19th month of follow-up and after.

[2] Applies to the first 18 months of follow-up.

There is a significant association between GP expenditure and oHCE: for every €10/month of GP expenditure, there is a €74/month increase in oHCE (p<.001). Baseline health care consumption also has a significant impact on oHCE, with €301/month for every level of health care consumption on a 10-point scale (p<.001). Overall, oHCE of women is lower than that of men (−€58/month; p=.037). oHCE of the older age group (aged 80 years and older) is €364/month higher than their younger counterparts (aged from 65 through 80 years).

Subjects that are not or no longer married have higher oHCE than married subjects: this is +€143/month for those divorced (p=.001), +€149/month for those widowed (p<.001), and +€366/month for those never married (p<.001). Subjects with a higher socio-economic status have a lower level of oHCE (−€97/month; p=.001). If a subject dies during the second period of follow-up, his or her oHCE are €1,091/month higher than if he or she survives (p<.001). Calendar year has a very low but significant impact on oHCE (−€4/month lower in 2010 compared to 2009). Seasonal changes did not have a significant impact on health care expenses in this analysis.

Table 3 shows a further specification of the associations between GP expenditure and expenses for different other health service types later in time, standardized for socio-demographic variables, time variables, mortality and baseline health care consumption. There is a significant association between GP expenditure and expenses for all other different health services later in time, and all associations are positive.

Table 3. The association between GP expenditure and monthly expenses for other health care services later in time.

Service type	*€/month*	*95% CI*	*p*
All health care services other than GP	**+74**	**+48 to +100**	**<.001**
Medical care	**+37**	**+23 to +51**	**<.001**
Hospital	+27	+18 to +36	<.001
Other medical care	+17	+10 to +24	<.001
Long-term care	**+33**	**+25 to +42**	**<.001**
Home care	+20	+15 to +25	<.001
Care/ nursing home	+15	+10 to +20	<.001
Other long-term care	+7	+4 to +10	<.001

Shown is the change in health care expenses per month after the 18th month of follow-up for every €10/month of GP expenditure in the first 18 months of follow-up, standardized for baseline health care consumption, mortality, socio-demographic characteristics, and time variables.

For every €10/month of GP expenditure, medical care expenses later in time are €37/month higher (p<.001), and long-term care expenses are €33/month higher (p<.001). When GP expenditure increases with €10/month, hospital expenses later in time increase with €27/month (p<.001). Expenses for other medical care services – such as medication, physiotherapy, and instrumental aids – increase with €17/month (p<.001). There is an increase in expenses for home care with €20/month (p<.001), for care and nursing homes with €15/month (p<.001), and for other long-term care services with €7/month (p<.001).

Discussion

We found that older people who have higher expenses for services from general practitioners (GPs), in turn also have higher health care expenditure (HCE) for other health services later in time. All in all, for every ten euro spent on GP care, expenditure for other health care services later in time is €74 higher. The positive association can be explained by three dynamics. First, expenses for GPs are automatically associated with expenses for other health care services because patients often receive or even require a referral from the GP before receiving specialist health care. Second, GPs could increase the overall level of HCE by improper diagnoses or unnecessary referrals.[3-6] However, we could not distinguish between necessary vs. unnecessary referrals, or improper vs. proper diagnoses. Third, the positive association may reflect health care 'patterns' in the population of older patients. In other words, it is possible that patients who visit GPs more often, have more health problems than those who visits GPs less frequent, and that these patients have higher expenses for GPs and the bulk of other health care services.

The hypothesis we set out in the introduction – that GP expenditure is inversely associated with expenses for other health care services later in time in a population of older people, when adjusting for baseline health care consumption, socio-demographic characteristics, and time variables – was not corroborated by the results of our analysis. We reasoned that through selective referral to specialists, restricted use of costly diagnostics,[16] watchful waiting,[17] and the ability to provide basic medical services at lower expenses, the GP improves efficiency and allocation of hospital care. If such an effect is present, it is possible that we could not discern it because we lacked specific data, mainly in terms of morbidity.

Patients with a higher level of morbidity will make use both the GP and other health care services more often than those with a lower level of morbidity. If morbidity

is not adequately adjusted for, it is a logical consequence that one will found a positive correlation between GP expenses and HCE for other services. In our analysis, we tried to adjust for morbidity by including baseline health care consumption and the risk of mortality in our analyses: both determinants will most likely rise when a subject's morbidity level is higher. Another reason to include mortality was the considerable impact of proximity to death on health care expenses.[15,18-20] It cannot be ruled out that more specific data is needed to adequately account for morbidity, such as disease-specific diagnoses and severity of the diseases. Because the health care insurer could not provide us with data on specific diagnosis codes of individuals due to privacy concerns, such information on morbidity could not be acquired.

The finding that married subjects and those with a higher socio-economic status have lower health care expenses than single subjects and subjects with a lower socio-economic status confirms findings in other studies incorporating these determinants.[21-28] Calendar year was included as a determinant as this reflects the influence of changes in policy and health care prices, as well as general inflation.

As our investigation could not ascertain a cause-and-effect association between the use of GP services and HCE for other services, further research is needed to answer the question whether GPs can curtail HCE. Specifically, more studies are needed that effectively account for morbidity. Further research is imperative, as the stability of many health systems are threatened by financial, demographic and cultural challenges, such as rising pressure on public finances, growing shares of older people, and increasing patient demandingness. It has been suggested that the GP could play a pivotal role in facing these challenges, however we were not able to substantiate this in this study.

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