HEDG Health, Econometrics and Data Group
THE UNIVERSITY of York

HEDG Working Paper 06/01

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February 2006

ISSN 1751-1976

york.ac.uk/res/herc/hedgwp

Why do patients bypass the nearest hospital?

An empirical analysis for orthopaedics care and neurosurgery in the Netherlands

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Abstract

Using individual patient level hospital utilisation data for 2003, we examine the decisions of Dutch patients to bypass the nearest hospital for orthopaedics and neurosurgery. During our sample period, health insurers did not steer patients to preferred hospitals and performance indicators were only scarcely available. Nevertheless, both for orthopaedics care (38%) and neurosurgery (54%) numerous patients did not visit the nearest hospital. From the estimation results of our logit model it follows that extra travel time negatively influences the probability of hospital bypassing. Good waiting time performance by the nearest hospital also significantly decreases the likelihood of a bypass decision. Patients seem to place a lower negative value on extra travel time for orthopaedics care than for neurosurgery. The valuation of shorter waiting time also varies between these two types of hospital care. A good performance of the nearest hospital on waiting time decreases the likelihood of a bypass decision most for neurosurgery. In both samples patients were more likely to bypass the nearest hospital when it was a university medical centre or a tertiary teaching hospital. Patient attributes, such as age and social status, were also found to significantly affect hospital bypassing.

Key words: health care, hospital bypassing, consumer choice, logit model

JEL classification: I11, C25, D12

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[‡] We thank Erik Schut for helpful comments. A first draft was presented at the 5th World Congress of the International Health Economics Association (iHEA) in Barcelona (10-13 July 2005).

1. Introduction

Patients' hospital choice has been debated in the health economics literature for several decades now. For example, more than thirty years ago Morill et al. (1970) explored the impact of racial, religious and income variations on patient movements to hospitals in Chicago. Such empirical studies were initially aimed at health planners and hospital administrators since effective planning and management of health care require models that explain and predict regional hospital utilisation (Lee and Cohen, 1985). In the late eighties, however, a wider range of people became interested in which factors influence patient choice among hospitals. Especially health insurers who are marketing health plans with a limited set of providers need to know the attributes that affect the choice of hospital. Since many developed countries experience the urgency of an incentive-based health system reform and start to deregulate hospital markets (Cutler, 2002), such knowledge is becoming increasingly important.[1]

When health insurers have to negotiate contracts with individual hospitals, their bargaining clout crucially depends on their possibilities to channel patients to hospitals with which favourable discounts have been negotiated (Sorensen, 2003). For patients, such channelling may imply that they have to bypass the nearest hospital and travel to a more distant hospital. As patients generally dislike travelling, it can reasonably be assumed they are only willing to bypass the nearest hospital for particular reasons. Higher quality of hospital care, shorter waiting times or premium discounts may compensate patients for the inconveniences of increased travel time.

In this paper we empirically examine patients' decisions to bypass the nearest hospital in the Netherlands using individual patient level hospital utilisation data for the year 2003. We estimate a logit model to assess which patient and hospital attributes affected hospital bypassing in a Dutch hospital market where patients

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[1] According to Cutler (2002), enthusiasm for (price) controls, rationing and expenditure caps has waned considerably over the past years for three reasons: limited supply is matched with unlimited demand, regulatory constraints do not provide incentives for service provision to be efficient and even in regulated systems health expenditure grew more rapidly than governments could afford.

did not (yet) face strong incentives to travel significant distances for hospital care. Health insurers were not allowed to selectively contract hospitals and information on (clinical) hospital performance was hardly available. To take the heterogeneity of hospital care into account, we analyse two different medical specialties: orthopaedics care reflecting a "regular" type of hospital care (secondary hospital care) and the more sophisticated medical specialty of neurosurgery (tertiary hospital care).[2] Differences in medical complexity between these two types of care can be illustrated by the percentage of total hospital visits that ultimately result in an inpatient hospital admission. In the Netherlands each year over 515,000 patients need specialised orthopaedics care of which only around 15 percent is admitted as inpatient. For neurosurgery the corresponding figures are approximately 30,000 and almost 40 percent, respectively. Our analysis indicates that for both medical specialties travel time, hospital attributes as well as patient attributes significantly affected patients' decisions to bypass the nearest hospital.

The remainder of this paper is structured as follows. In section 2 we discuss the previous empirical literature on hospital bypassing, after which in section 3 the scarcely available research for the Netherlands is analysed. Section 4 introduces our conceptual model and estimation method used. In section 5 we provide a description of our data. The estimation results are presented in section 6. The paper ends with some concluding remarks in section 7.

2. Previous empirical literature on hospital bypassing

Several previous papers examined patients' decisions to visit or bypass the nearest hospital. These papers were primarily aimed at assessing the likely effects of rural hospital closure in the United States. Bypassing of local hospitals by rural patients has raised concerns among US policymakers because of the potential financial strain it places on already fragile rural hospital systems. Since this may lead to further reductions in the service capacities of rural hospitals or even to additional closures of such hospitals, rural patients are at risk of facing greater access

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[2] Tertiary hospital care refers to relatively complicated services that are most often only provided by major hospitals, whereas secondary hospital care is generally provided by all general hospitals.

barriers for routine inpatient hospital care. This may particularly harm older persons who have already more difficulty travelling long distances (e.g. Buczko, 1994).

Bronstein and Morrisey (1991) study the decisions of rural pregnant women in the state of Alabama to bypass the nearest rural hospital providing obstetric services and seek care elsewhere in 1983 (n = 1,331) and 1988 (n = 1,168). Estimating separate binominal logistic regressions for both years, they find that for those who did choose to bypass, travel distances and hospital equipment (reflecting perceived quality differences) were important considerations in the choice of an obstetrics hospital. They find evidence that rural women with more resources travelled away from their nearest hospital towards hospitals in metropolitan areas, hospitals with high birth volumes, and those with so-called high-risk bassinets. Women without resources appeared to put a priority on finding economically accessible care.

Using slightly over 156,000 patient discharges in California for the years 1985 and 1991, White and Morrisey (1998) calculate the percentage of patients bypassing their nearest hospital for some selected DRG-groups:[3] hernia repair, uncomplicated appendectomy, heart failure and shock, back and neck procedures, vascular surgery, joint surgery, open heart surgery and kidney transplants. They find that bypass rates are lowest for heart failure and shock. Also for hernia repair and appendectomy bypass rates are relatively low. In absolute terms, however, bypass rates for these procedures are fairly high. Even for heart failure over 60 percent of the patients does not visit the nearest hospital. Bypass rates are higher for more complex procedures (like back, joint and vascular surgery) and highest for highly complex procedures such as open heart surgery (nearly 85 percent) and kidney transplant (over 95 percent). Although the bypass rates reported by White and Morrisey suggest substantial differences in travel patterns by patient diagnosis, it can be questioned whether their results are really indicative for patients' willingness to travel as they do not control for individual service offerings by hospitals. That is, to some extent patients may simply have to bypass the nearest hospital because treatment required for their diagnosis is not provided there. Especially for more complex DRG groups their results may be misleading as it can reasonably be expected that only larger hospitals are able to provide these procedures. Despite this shortcoming, however, their analysis still provides useful insights into the potential impact of patient diagnosis on hospital bypass decisions.

Tai et al. (2004) use a multinominal logit model to examine how patient and hospital attributes and the patient-physician relationship influenced hospital choice of aged rural Medicare beneficiaries for the years 1994 and 1995. Their study sample consists of 1,702 hospitalisations. The estimation results reveal that distance, hospital attributes (greater size and scope) as well as patient attributes (age and income) had a substantial influence on hospital admission choices. They find that patients have strong preferences for closer hospitals and those of greater scale and service capacity. The study highlights that hospital choice of low-income and functionally impaired elderly Medicare beneficiaries was restricted relative to others. The authors conclude that the significant influences of patients' socio-economic, health, and functional status, their satisfaction with and access to primary care, and their strong preferences for certain hospital attributes should inform US federal program initiatives about the likely impact of policy changes on hospital bypassing behaviour.

3. Hospital choice in the Netherlands: stated preferences

Empirical research on hospital choice in the Netherlands is scarcely available and only analyses stated preferences, whereas this paper analyses revealed preferences. The most comprehensive study is ECORYS-NEI (2003). For this study more than 1,500 persons were asked by telephone which hospital attributes they value most. Both actual patients (n = 856) and potential patients (n = 780) participated in the research.[4] The study reveals that for around 25 percent of all

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[3] The DRG classification refers to Medicare's Diagnosis Related Groups.
[4] Potential patients are those respondents who were not actually admitted to a hospital during the past two years.

patients their general practitioner or physician alone decides which hospital to visit (Table 1). For both inpatient and outpatient hospital care the decision which hospital to visit is, however, most often made by patients themselves (around 40 percent) or jointly by patients and their general practitioner/physician (around 30 percent). Asked why they went to a particular hospital, several hospital attributes were mentioned by the respondents. It is apparent from Table 2 that travel time is the most important factor determining hospital choice, followed by (perceived) hospital expertise and own previous experiences with a hospital. Although waiting time may differ substantially between hospitals it is only mentioned by (less than) 10 percent of the respondents as an important decision-tool. Patients were also asked whether they considered an alternative hospital than the one they actually visited. Approximately 20 percent of them answered this question affirmative.

Van der Schee et al. (2005) also empirically analyse patients' hospital choice in the Netherlands. First, they asked 1,210 members of a consumer panel (the so-called 'Consumentenpanel Gezondheidszorg') in June 2002 for their ideal hospital. Based on the answers of 832 respondents, that hypothetical hospital has a good reputation, requires 15 minutes of travel time at most, has an 7x24 emergency department, guarantees each patient a regular physician, has sufficient parking facilities, participates in a regional network of health providers, and has short waiting times. Second, they applied a conjoint analysis by asking the members of the consumer panel to weigh eight different hospital attributes against each other.[5] From this analysis it followed that for patients who need hospital care immediately, the presence of an emergency department is the most important hospital attribute, followed by travel time. For non-emergency care patients especially seem to prefer hospitals that have a good reputation, while the other attributes (including travel time) are of minor importance to them.

Finally, to assess the potential anticompetitive effects of a proposed merger between two Dutch hospitals (hospital "Hilversum" and hospital "Gooi-Noord") the Netherlands Competition Authority asked SEO Economic Research to analyse

[5] These eight hospital attributes are: hospital size, travel time, parking facilities, 7x24 emergency department, regional collaboration, waiting times, reputation, and a regular physician.

patients' willingness to travel for care. The results of this research are summarised in NMa (2005).[6] From a conjoint analysis it followed that the respondents attach a higher value to quality indicators such as reputation than they do to travel time. A 10 percent increase in hospital reputation appears to increase patients' willingness to travel to that particular hospital by more than 20 percent; i.e. instead of half an hour, patients are then willing to accept almost 40 minutes of travel time. In addition, a fall of 10 percent in an important quality variable of a particular hospital (such as reputation) increases willingness to travel to an alternative hospital. It may therefore be argued that when hospitals improve quality, patients are willing to accept more travel time.

4. Conceptual model and estimation method

Our model of patients' decisions to bypass the nearest hospital for specialised health care takes the general form

$$B_i = \alpha + \beta T_i + \delta X_i + \lambda Z_i$$

where B_i is a dummy variable equal to one when patient *i* bypassed the nearest hospital providing the medical specialty analysed and zero otherwise; T_i reflects extra travel time that is minimally required for patient *i* to reach the nearest-next hospital providing the medical specialty analysed; X_i is a vector of patient attributes; and Z_i is a vector of attributes of the nearest hospital providing the medical specialty analysed.[7]

Since the dependent variable of our conceptual model only takes on values of zero and one, a simple linear regression of patient and nearest hospital attributes on the variable *Bypass* is not appropriate. The fitted value of the dependent variable from a simple linear regression, for example, is not restricted to lie between zero and one. We therefore use an estimation method that is designed to handle the specific

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[6] Unfortunately, more detailed results from this study are not publicly available.
[7] Note that because all patients in our sample are fully insured for hospital care and co-payments are absent, the price paid at hospital *i* can be omitted from the conceptual model.

requirements of binary dependent variables; the logit specification. The logit model is based on the cumulative logistic function and is specified as

$$\Pr_i^{bypass} = F(B_i) = \frac{1}{1+e^{-(\alpha+\beta T_i+\delta X_i+\lambda Z_i)}}$$

where $\Pr_i^{bypass}$ is the probability that patient *i* will decide not to use the nearest hospital that provides the particular medical specialty analysed; and F is the cumulative distribution function for the logistic distribution.

We estimated the coefficients of our logit model by using iterative procedures and the maximum-likelihood estimation technique. Interpretation of the coefficient values from a logit specification is complicated by the fact that estimated coefficients from a binary model cannot be interpreted as the marginal effect on the dependent variable. The direction of the effect of a change in one of the explanatory variables, however, directly follows from the sign of the estimated coefficient. A positive sign implies that an increase in this variable will make a bypass of the nearest hospital more likely, while a negative sign implies the opposite. The marginal effect of the *j*-th continuous variable in the vector X_i on the probability of a patient's decision to bypass the nearest hospital, for example, is given by

$$\frac{\partial \Pr(B_i = 1)}{\partial x_{ij}} = f\left(- X_i^{'}\beta\right)\beta_j$$

where *f* denotes the density function corresponding to the cumulative logistic distribution function F. To compute the marginal effect of a particular discrete explanatory variable, we subtracted the mean fitted probability when all observations for that variable have value one by the mean fitted probability when all observations have value zero. That is, the marginal effects of the dummy variables indicate the results of switching zeroes to ones.

5. Data

Our principal data source is the Agis Health Database. From this database we obtained detailed confidential information on 1,010,160 actual first hospital outpatient visits (so-called "eerste polikliniek bezoeken"; i.e. EPBs) by socially insured Agis' enrollees during the year 2003.[8] The available data include patient's age, gender, zip code, social status, and administration number; the medical specialty attended; and the zip code and name of the hospital used. We extracted observations on patients admitted to orthopaedics services (n = 62,213) and neurosurgical services (n = 5,648). From these samples we omitted all observations on patients younger than 18 years (orthopaedics sample: n = 6,821; neurosurgery sample: n = 240) as it can reasonably be assumed that the decision which hospital to visit is not made by themselves but by their parents. Patients older than 90 years (orthopaedics sample: n = 332; neurosurgery sample: n = 8) were also excluded from our sample, because the (medical) condition of such patients is most often highly specific. We also omitted all observations on patients who actually travelled more than 60 minutes (orthopaedics sample: n = 1,354; neurosurgery sample: n = 258), because it is likely that such patients were away from home when they needed hospital care. The resulting study sample contained 53,307 EPBs for orthopaedics care and 5,168 EPBs for neurosurgical care. Table 3 reports the descriptive statistics of all variables that are included in our model.

Bypass

The dependent variable was simply assigned the value one when patient i used the nearest hospital and the value zero otherwise.[9] To determine whether a patient bypassed the nearest hospital we computed travel time by car between each patient's zip code and all hospitals providing the medical specialty analysed using the Geodan Drive Time Matrix. This matrix provides the fastest route from every

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[8] Agis is one the largest Dutch health insurers representing approximately 1.7 million customers of which in 2003 more than 85 percent was enrolled in social health insurance (called "ziekenfonds").

[9] To test the robustness of our results, we tried an alternative definition of the dependent variable; i.e. assigning the value one to *Bypass* only when patients bypassed the nearest hospital by travelling at least 5 minutes extra. This did not significantly alter the estimated coefficients.

4-digit zip code to any other 4-digit zip code in the Netherlands.[10, 11] As Geodan takes into account the average speed assigned to particular road types, a reliable estimate of total travel time between all Dutch zip codes is ensured.[12]

On average patients in our sample travelled 15.7 minutes for an orthopaedic EPB and 18.4 minutes for a neurosurgical EPB (Table 4). Although the average travel time to the nearest hospital providing orthopaedics care and neurosurgery is only 11.9 and 12.6 respectively, for both medical specialties a substantial number of patients went to a more distant hospital.[13] For orthopaedic services almost four out of every ten patients were not admitted to the nearest hospital. The percentage of patients who bypassed the nearest hospital is even higher for neurosurgical services. Over 50 percent visited a more distant hospital than strictly necessary. For those patients who decided to bypass the nearest hospital, travel time on average increased by 10.0 minutes in case of an orthopaedic EPB and by 10.8 minutes in case of a neurosurgical EPB.

Minimum extra travel time

We expect that the decision to bypass the nearest hospital is affected by travel time to the nearest-next hospital. Using the Geodan Drive Time Matrix, we therefore calculated the extra time that is minimally required to reach another hospital in case a patient would decide to bypass the nearest one. On average, patients who would decide not to use the closest hospital for orthopaedics care or neurosurgical services would have to travel at least 6.8 minutes or 5.8 minutes extra, respectively. We expect the minimum extra travel time to negatively affect

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[10] Note that the fastest route may differ from the shortest route.
[11] As Dutch zip codes consist of four numbers followed by two letters (e.g. 3000 DR), the inaccuracy in distance between this point and the actual starting point could be about 250 meters in urban areas and 1,000 meters in rural areas.
[12] The optimal routes are computed by Geodan as follows. The centre of the addresses that share the first four numbers of the zip code is taken as the location of the 4-digit zip code. From this centre point the route to or from the main road network is simulated by virtual lines to which a lower average speed is assigned. The main road network contains all the A- and N-roads and all other through roads in the Netherlands. These roads are typified according to a corresponding average speed. The network used covers all 4-digit zip codes in the Netherlands.
[13] Note that in contrast to White and Morrisey (1998) we explicitly control for individual hospitals' service offering. Orthopaedics care is provided by all Dutch hospitals (n = 102 in our sample), whereas neurosurgical services are offered by 66 hospitals.

the probability that a patient bypasses the nearest hospital, because patients generally dislike travelling. The more distant the nearest-next hospital, the less likely we expect patients to bypass the nearest one.

Nearest hospital attributes

Although it can be expected that there is a trade-off between travel time and quality of care (e.g. Tay, 2003), we were not able to include output quality measures as an explanatory variable. We do not believe that this is a serious deficiency, because performance indicators were not publicly available in 2003. Both Dutch patients and their referrers therefore were not able to use easily accessible and observable information on possible differences in hospital quality when deciding which hospital to visit. We incorporate the following attributes of the nearest hospital in our model: type of hospital, hospital size, and waiting time performance.

Type of hospital is captured by two dummy variables. First, we constructed a variable that has value one when the nearest hospital is part of a university medical centre and value zero otherwise. Nationwide there are eight academic hospitals in the Netherlands. In both samples for less than 10 percent of the patients the nearest hospital providing the medical specialty analysed was a university hospital. Second, we constructed a variable that has value one when the nearest hospital is a tertiary medical teaching hospital and zero otherwise. In the Netherlands there are nineteen large teaching hospitals providing highly specialised medical care in addition to the required basic medical care. For approximately 20 percent of the patients the nearest hospital providing orthopaedic services was a tertiary teaching hospital. As could be expected on beforehand, in the neurosurgery sample this percentage is even larger; more than 30 percent. Because of perceived (or expected) quality differences, we anticipate that patients are less likely to bypass these larger and more sophisticated hospitals.

Data on hospital size is obtained from the Dutch Ministry of Health, Welfare and Sports (VWS). To capture possible diagnosis-specific size effects we did not only include the number of beds in the nearest hospital in our model, but also the annual number of EPBs for the medical specialty analysed. Average size of the nearest hospital is nearly 550 beds and more than 6,000 EPBs in the orthopaedic sample and more than 600 beds and almost 600 EPBs in the neurosurgery sample. We expect a negative sign for these explanatory variables as we assume that patients prefer larger hospitals because of perceived quality differences.[14]

Waiting time may serve as an important determinant of patients' hospital bypass decisions. Data on individual hospital waiting times, however, is only scarcely available for the year 2003 since it was not compulsory for Dutch hospitals to report waiting times. As a result it is not surprising that the data obtained from the Netherlands Hospital Association (called "NVZ vereniging van ziekenhuizen") contained many missing values. Not only with respect to the number of hospitals who actually reported waiting times in 2003, but also with respect to the number of monthly observations per hospital. We therefore constructed a dummy variable to test whether patients were indeed less likely to bypass hospitals with shorter waiting times.[15] This variable has value one when the average EPB waiting time for the nearest hospital was known to be below the national average waiting time that we computed using the available data (4.5 weeks in the orthopaedics sample and 4.3 weeks in the neurosurgery sample) and zero otherwise. In both the orthopaedic sample and the neurosurgery sample for less than half of the nearest hospitals average waiting time in 2003 was known to be below the national

[14] An issue that may arise in estimation of our logit model is whether it is smaller hospital size that increases the likelihood of hospital bypassing or higher bypass rates that lead to smaller hospital size. In this paper, however, we treat hospital size as exogenous. The fact that our model is static and does not deal with dynamic issues supports this assumption. Especially since it takes some time to expand or reduce hospital capacity (e.g. equipment has to be purchased and installed), the possible impact of patients' decisions to bypass the nearest hospital is a function of the cumulative number of patients over the past years. Particularly the total number of hospital beds takes time to develop due to regulatory restraints.

[15] One could argue that it is *ex ante* unclear whether hospitals with low waiting times attract fewer patients or that such hospitals have low waiting times because they attract less patients. Despite this argument, this paper treats hospital waiting time as exogenous because it uses a static model of hospital bypassing. In addition, since estimation of our model reveals that in both samples patients are less likely to bypass the nearest hospital when its waiting time is relatively low, we conclude that the latter effect is absent or at least not dominant.

average. For the remaining hospitals waiting time was either unknown or known to be above the national average.

Patient attributes

In addition to hospital attributes we also include patient attributes in our model. From the Agis Health Database we were able to specify patient demographic variables for age, gender, social status, and their total number of hospitalised EPBs in 2003. We expect both older patients and patients on social assistance to be less likely to bypass. In addition to the continuous explanatory variable *Age*, we also included a dummy variable to capture the possible effect of retirement. This dummy has the value one for patients who receive state pension as well as for patients who retired early and are still in their fifties or early sixties. Gender is included as an explanatory variable to test whether hospital bypass decisions differ between male and female patients. In both the orthopaedics sample and the neurosurgery sample, most patients are female (approximately 60 percent) and older than 50 years. The percentages of patients who are unemployed and self-employed are also similar for both samples. Both the percentage of patients who are incapacitated for work and the percentage of patients on social assistance, however, are higher in the sample for neurosurgical EPBs. The reverse holds for the percentage of patients who are retired. To test whether the likelihood of bypassing the nearest hospital is affected by the frequency of hospital visits, we also specified for each individual patient a variable indicating the total number of first hospital outpatient visits in 2003. Using data from Statistics Netherlands (CBS) we specified a multinominal discrete variable to test for the effect of ruralness. This variable was assigned the value 1 (very urban areas), 2 (urban areas), 3 (moderate urban areas), 4 (rural areas) or 5 (very rural areas). We expect patients who live in more rural areas to be less likely to bypass the nearest hospital providing the type of care they need. In contrast to previous studies on hospital bypassing, we are not able to include income as an explanatory variable. We do not consider this a serious shortcoming, since all patients in both our samples are enrolled in social health insurance. Their annual income in 2003 therefore did not exceed 31,750 euros.

6. Estimation results

The empirical results of our logit model are presented in Table 5. In this section we first discuss the estimation results for the orthopaedics sample, followed by the estimation results for the neurosurgery sample. Finally, the most interesting differences we found between patients' bypass decisions for both medical specialities are discussed.

Orthopaedics care

Our estimated model predicts patients' hospital bypass decisions for orthopaedics care fairly good. It correctly predicts 67 percent of the observations. The findings confirm the expected negative relationship between the extra travel time required to reach the nearest-next hospital and the decision to bypass the nearest hospital. Holding all patient and hospital attributes constant, the results suggest that patients were more than 10 percent less likely to bypass their nearest hospital if going to an alternative hospital implies at least 5 minutes of extra travel time.

The patient attributes gender, unemployment and social assistance do not significantly affect the decision to bypass or use the nearest hospital for orthopaedic services. The likelihood of bypassing the nearest hospital decreases with patients' age. As expected on beforehand, older patients are less likely to bypass the nearest hospital. When patients retire, however, the probability that they use an alternative hospital increases. The same holds for patients who are entitled to an allowance because they are incapacitated to work. Self-employed are also more likely to bypass the nearest hospital just like patients who are admitted to a hospital more frequently and patients who live in rural areas. The latter result conflicts with our *ex ante* expectation. Apparently patients in rural areas are less averse to travel for orthopaedics care than patients in urban areas. Perhaps this can be explained by the fact that those patients are already more used to travel for specific services like specialised health care, since these services are most often not locally available.

We were surprised to find that, holding all other attributes constant, patients were almost 35 percent more likely to bypass the nearest hospital when this hospital was a university medical centre. The marginal effect for tertiary teaching hospitals is much smaller, but still positive and significant. The probability of a bypass increases with almost 6 percent when the nearest hospital is a tertiary hospital. To our opinion there are two plausible explanations for these counterintuitive results. First, although patients may prefer admittance to these hospitals because of perceived quality differences, general practitioners may be reluctant to refer patients to these sophisticated hospitals for their first hospital visit. Research by the weekly magazine Elsevier in 2003 revealed that Dutch physicians, nurses and hospital managers did not classify university medical centres among the best hospitals they know, despite their excellent medical expertise. It appeared that according to the respondents university hospitals especially suffered from bureaucracy (Elsevier, 2003). Second, patients themselves may prefer admittance to a general hospital for their first hospital visit because of (perceived) quality differences that are particularly relevant to them; such as doctor communication skills and hospital staff's responsiveness (e.g. Sofaer et al., 2005). They may, for example, expect to get more personal attention in a general hospital than in a relatively large university medical centre that is aimed at scientific research. In addition, in the latter type of hospital it is far more likely for patients to be (initially) treated by a medical resident instead of a fully qualified physician. Patients, however, seem to prefer larger general hospitals over smaller ones. Hospital size, measured by the number of beds and the annual number of orthopaedic EPBs, significantly affects patients bypass decisions. Although the estimated marginal effect is rather small, on average patients are less likely to bypass the nearest hospital when it has more beds or treats more patients.

As expected on beforehand, patients are significantly less likely to bypass their nearest hospital when they know its waiting time for an orthopaedic EPB is lower than the national average. The marginal effect of this hospital attribute, however, is quite small. A good waiting time performance of the nearest hospital decreases the probability of a bypass by around 2 percent.

Neurosurgery

Also for the neurosurgery sample our model does fairly well at predicting the actual decisions of patients to bypass or use the nearest hospital. For almost 70 percent of all observations patients actually made the decision to which the model assigns the highest probability. The estimated marginal effects reveal that patients are less likely to bypass the nearest hospital when travel time to the nearest-next hospital increases. A minimum extra travel time of 5 minutes decreases the probability of a bypass by approximately 6.5 percent. Patients' gender does not significantly affect their hospital bypass decisions. The same holds for social assistance and self-employment. Holding all other attributes constant, older patients are less likely to travel further for neurosurgical hospital care than necessary. The likelihood of a bypass decision decreases with age. The opposite is true, however, once patients retire. After retirement the probability of bypassing the nearest hospital increases with almost 5 percent. Unemployed patients in need of neurosurgical hospital care are also more likely to bypass the nearest hospital. Patients who are incapacitated to work are also more likely to bypass. The degree of ruralness has a significant and negative effect on patients' decisions not to visit the nearest hospital. Patients living in more rural areas are less likely to bypass the nearest hospital providing neurosurgery. This is not surprising because travel time is already relatively high for these patients as neurosurgical services are only available in larger (regional) hospitals. The total number of hospital admissions in a year, measured by EPBs per patient, does not significantly affect patients' bypass decisions for neurosurgical care. Patients who are admitted to a hospital more frequently in 2003 are as likely to bypass the nearest hospital as patients who are hospitalised only once.

Again the likelihood that a particular patient bypasses the nearest hospital strongly increases when this hospital is a university medical centre or a tertiary medical teaching hospital. These hospital attributes have positive marginal effects of almost 30 percent and 10 percent, respectively. As mentioned before, we are not sure whether this effect reflects general practitioners' referral practices or patients' preferences based on perceived quality differences. Just like we find for the orthopaedics sample, patients on average prefer larger general hospitals for neurosurgical services. They are less likely to bypass the nearest hospital that provides these services when it has more beds and more admitted EPBs for neurosurgery.

For neurosurgical hospital services we find a strong negative relationship between hospital waiting time performance and the likelihood of hospital bypassing. Holding the other attributes constant, patients were even more than 10 percent less likely to bypass the nearest hospital that provides neurosurgery when its waiting time was known to be shorter than the national average waiting time for a neurosurgical EPB.

Summary

To summarise our estimation results and identify the most interesting differences between the marginal effects estimated for the two medical specialities, we classified these effects as very strong (+++ or ---), strong (++ or --), moderate (+ or -) or statistically insignificant (0). Table 6 and Figures 1, 2 and 3 reveal similarities as well as dissimilarities regarding the factors affecting patients' hospital bypass decisions for orthopaedics care and neurosurgery. The first striking dissimilarity between the two medical specialties analysed in this paper refers to patients' attitude towards extra travel time. Although for both samples patients are less likely to bypass the nearest hospital when travel time to the nearest-next hospital is increases, this effect is much stronger for orthopaedic EPBs than for neurosurgical EPBs. This result suggests that in the case of more complex treatments patients place a lower negative value on extra travel time. Another interesting dissimilarity concerns the estimated marginal effect for ruralness. Whereas we find that patients from rural areas are more likely to bypass the nearest hospital for orthopaedics care, we find the opposite for neurosurgery. Our explanation for this result is that in rural areas a substantial amount of patients already has to bypass the closest hospital because it does not offer neurosurgical services. These patients are therefore less likely to bypass the nearest hospital providing the care they need than patients in the orthopaedics sample, as for the latter admission to the nearest hospital is always an option. The third dissimilarity that catches the eye is perhaps the most interesting one. Hospital waiting time performance appears to have a much stronger effect on patients' bypass decisions for neurosurgical services than for orthopaedic services. Apparently, the valuation of shorter waiting time varies with types of hospital care. The importance of waiting time as a determinant of hospital bypass decisions seems to be more important for complex procedures.

7. Conclusion

Numerous Dutch patients in 2003 bypassed the nearest hospital for both orthopaedics care (38 percent) and neurosurgery (54 percent). The estimation results of our logit model reveal that extra travel time and hospital waiting time performance significantly affect the decisions made by patients to visit or bypass the hospital closest to their homes. As expected we find a negative relationship between extra travel time and hospital bypassing. Good waiting time performance by the nearest hospital also significantly decreases the likelihood of a bypass decision. Patients, however, seem to place a lower negative value on extra travel time for orthopaedics care than for neurosurgery. The valuation of shorter waiting time also varies between these two types of hospital care. A good performance of the nearest hospital on waiting time decreases the likelihood of a bypass most for neurosurgery. We are surprised to find that in both samples patients were more likely to bypass the nearest hospital when this was a university medical centre or a tertiary teaching hospital. Apparently patients and their referrers did not prefer admission to such hospitals. In addition to travel time and hospital attributes, patient attributes, such as age and social status, also significantly affected hospital bypass decisions. From our analysis we conclude that both patient and hospital care heterogeneity should be taken into account by health planners, hospital administrators as well as health insurers who are marketing health plans with a limited set of providers to properly assess the substitutability of hospitals.

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Table 1: Hospital choice in the Netherlands

	Inpatient	**Outpatient**	**Total**
Joint decision by patient and his GP/physician	32%	33%	33%
Patient's own decision	38%	41%	40%
GP/physician's own decision	27%	24%	25%
Do not know	3%	2%	2%
Total	100%	100%	100%
Number of respondents	265	591	856

Source: ECORYS-NEI (2003)

Table 2: Principal determinants of hospital choice in The Netherlands

	Actual patients		Potential patients		
	Outpatient	Inpatient	Outpatient	Inpatient (1 night)	Inpatient (5 nights)
Travel time to hospital	38%	40%	40%	39%	35%
Hospital's expertise	23%	28%	38%	34%	33%
Own previous experiences	20%	19%	3%	4%	6%
None/do not know	11%	12%	4%	5%	6%
Hospital's waiting time	10%	9%	3%	4%	6%
Previous experiences in family	8%	3%	2%	1%	2%
Availability of information	7%	5%	8%	8%	4%
Number of respondents	435	186	780	780	780

Note: Percentages refer to stated preferences for non-emergency hospital care; respondents were allowed to give multiple answers.
Source: ECORYS-NEI (2003)

Table 3: Descriptive statistics database

	Orthopaedics				Neurosurgery			
	Mean	S.D.	Min	Max	Mean	S.D.	Min.	Max.
Bypass nearest hospital	0.38	0.49	0	1	0.54	0.50	0	1
Minimum extra travel time	6.77	5.90	0	54	5.76	5.43	0	51
Nearest hospital attributes:								
University medical centre	0.07	0.26	0	1	0.09	0.29	0	1
Tertiary teaching hospital	0.22	0.41	0	1	0.32	0.46	0	1
Hospital beds (x100)	5.42	2.28	1	14	6.14	2.03	2	14
Relevant EPBs (x100)	62.27	22.65	4	227	5.87	4.08	0	24
Waiting time below average	0.49	0.50	0	1	0.43	0.50	0	1
Patient attributes:								
Gender	0.63	0.48	0	1	0.60	0.49	0	1
Age	53.65	18.13	18	90	52.56	15.13	18	90
Unemployed	0.02	0.14	0	1	0.02	0.14	0	1
Incapacitated for work	0.17	0.37	0	1	0.25	0.43	0	1
Retired	0.35	0.48	0	1	0.26	0.44	0	1
On social assistance	0.04	0.21	0	1	0.06	0.24	0	1
Self-employed	0.02	0.14	0	1	0.02	0.14	0	1
Total EPBs in 2003	1.18	0.45	1	5	1.25	0.50	1	4
Degree of ruralness	2.38	1.24	1	5	2.15	1.18	1	5

Note: Both samples only include patients aged between 18 and 90, who travelled at most 60 minutes for their first hospital visit.

Table 4: Patients' travel time and hospital bypass rates

	Orthopaedics	**Neurosurgery**
Actual travel time (min.):		
- mean	15.7	18.4
- standard deviation	10.4	12.1
- maximum	60.0	60.0
- minimum	0.0	0.0
Travel time to nearest hospital (min.):		
- mean	11.9	12.6
- standard deviation	7.1	7.6
- maximum	56.0	47.0
- minimum	0.0	0.0
Travel time to nearest-next hospital (min.):		
- mean	18.7	18.3
- standard deviation	8.0	8.7
- maximum	70.0	61.0
- minimum	3.0	4.0
Patients bypassing the nearest hospital:		
- number of patients	20,143	2,813
- bypass rate	38%	54%
- mean extra travel time (min.)	10.0	10.8
Number of observations	53,307	5,168

Note: Both samples only include patients aged between 18 and 90, who travelled at most 60 minutes for their first hospital visit.

Table 5: Factors affecting patient's decision to bypass the nearest hospital

	Orthopaedics			Neurosurgery		
	Coeff. (s.e.)		Marginal effect	Coeff. (s.e.)		Marginal Effect
Minimum extra travel time	-0.111 (0.002)	***	-2.27%	-0.065 (0.008)	***	-1.33%
Nearest hospital attributes:						
University medical centre	1.592 (0.048)	***	34.21%	1.785 (0.214)	***	29.81%
Tertiary teaching hospital	0.274 (0.026)	***	5.70%	0.486 (0.106)	***	10.02%
Hospital beds (x100)	-0.098 (0.007)	***	-2.01%	-0.218 (0.025)	***	-4.45%
Relevant EPBs (x100)	-0.004 (0.001)	***	-0.08%	-0.104 (0.013)	***	-2.13%
Waiting time below average	-0.107 (0.024)	***	-2.19%	-0.490 (0.096)	***	-10.39%
Patient attributes:						
Gender	0.009 (0.021)		0.18%	-0.092 (0.067)		-1.88%
Age	-0.013 (0.001)	***	-0.26%	-0.012 (0.004)	***	-0.24%
Unemployed	0.047 (0.075)		0.97%	0.671 (0.251)	***	13.03%
Incapacitated for work	0.207 (0.030)	***	4.31%	0.303 (0.087)	***	6.14%
Retired	0.152 (0.041)	***	3.13%	0.229 (0.133)	*	4.63%
On social assistance	-0.021 (0.051)		-0.43%	-0.191 (0.145)		-3.92%
Self-employed	0.163 (0.072)	**	3.39%	0.320 (0.228)		6.41%
Total EPBs in 2003	0.250 (0.022)	***	5.14%	0.102 (0.068)		2.08%
Degree of ruralness	0.143 (0.011)	***	2.73%	-0.123 (0.036)	***	-2.48%
Constant	0.731 (0.072)	***		2.916 (0.248)	***	
Included observations	48,778			4,545		
Correct predictions:						
- bypass = 0	87%			53%		
- bypass = 1	33%			79%		
- overall	67%			68%		

Note: Estimated standard errors are in parentheses; *** denotes significance at 1%; ** denotes significance at 5%; and * denotes significance at 10%. To account for unobserved geographic differences we also included dummy variables capturing patients' province of residence. These estimation coefficients are available on request. Exclusion of these provincial dummy variables did not significantly alter the estimation results. Correct predictions are obtained when the predicted probability is less than or equal to 50% and the observed bypass = 0, or when the predicted probability is greater than 50% and the observed bypass = 1.

Table 6: Classification marginal effects on hospital bypass decisions

	Orthopaedics	**Neurosurgery**
Minimum extra travel time (per 5 minutes)	---	--
Nearest hospital attributes:		
University medical centre	+++	+++
Tertiary teaching hospital	++	+++
Hospital beds (per 100 beds)	-	-
Relevant EPBs (per 100 EPBs)	-	-
Waiting time below average	-	---
Patient attributes:		
Gender	0	0
Age (per year)	-	-
Unemployed	0	+++
Incapacitated for work	+	++
Retired	+	+
On social assistance	0	0
Self-employed	+	0
Total EPBs in 2003 (per extra EPB)	++	0
Degree of ruralness	+	-

Note: +++ = very strong positive marginal effect ≥ +10%
++ = +5% ≤ strong positive marginal effect < +10%
\+ = 0 < moderate positive marginal effect < +5%
0 = statistically insignificant marginal effect
\- = 0 > moderate negative marginal effect > -5%
-- = -5% ≥ strong negative marginal effect > -10%
--- = very strong negative marginal effect ≤ -10%

Figure 1: Marginal effect minimum extra travel time on probability bypass

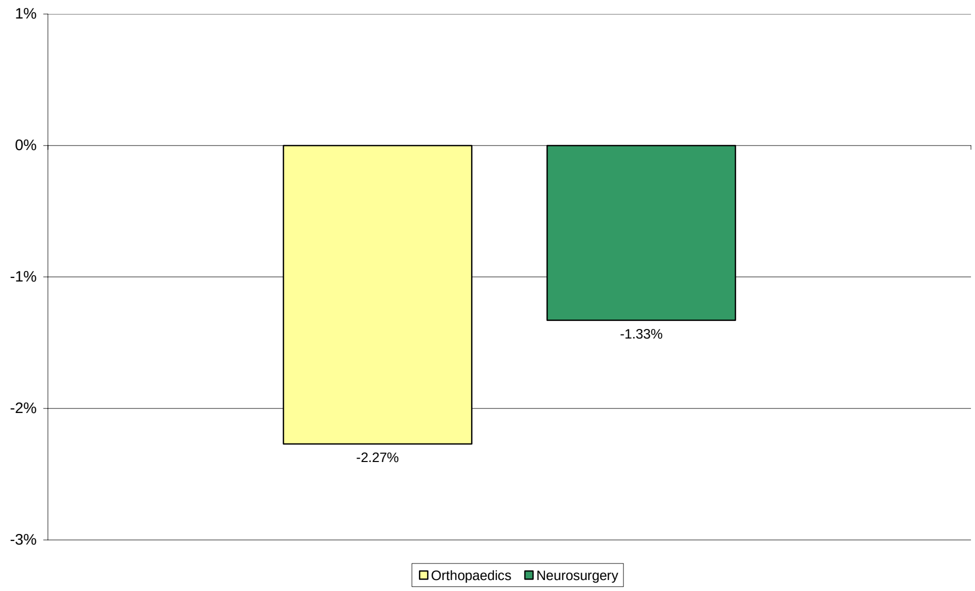


Figure 2: Marginal effects nearest hospital attributes on probability to bypass

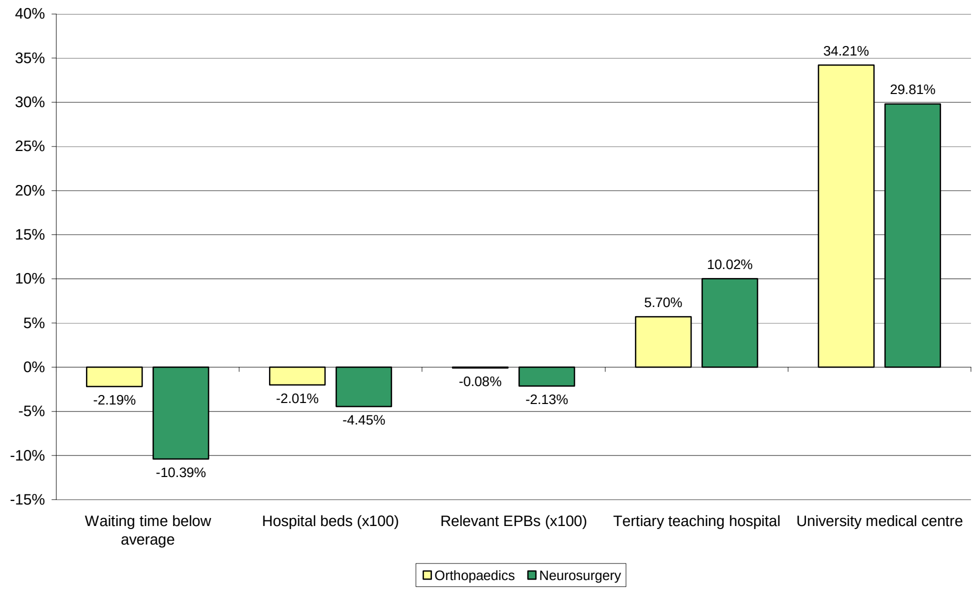
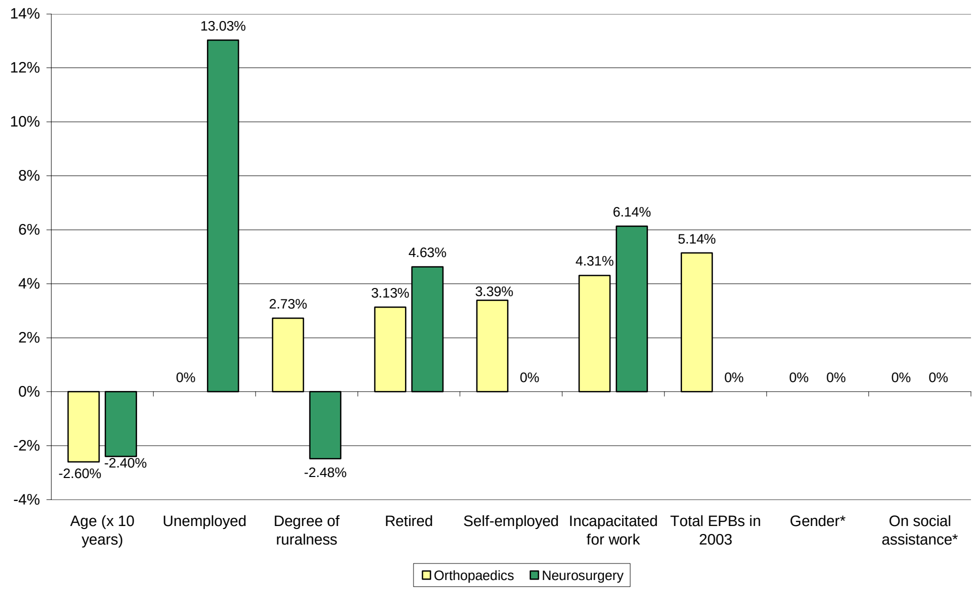


Figure 3: Marginal effects patient attributes on probability to bypass



Note: * denotes statistical insignificance at 10% for both orthopaedics and neurosurgery.