

Geographical Variations in Surgery: Outpatient versus Inpatient Treatment

Variations géographiques en chirurgie : interventions en ambulatoire versus interventions en hospitalisation

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Summary

Medical practice varies according to time and place. Hospital utilisation, e.g. lengths of stay and surgery rates, differ at all geographical levels. New medical technologies, organisational changes in care delivery and their implementation play a role in explaining variations in medical practice. The research question of this article was: do variations in medical practice decline over time and what is the effect of organisational changes in treatment settings on this trend?

We used administrative hospital data from 25 Dutch Health Care Regions. Data analysis was performed for specific surgical procedures (e.g. appendectomy, caesarean section, hip replacement, cataract surgery, meniscectomy) using hospital admission data for 1980-1997 and outpatient surgery data for 1997.

The results showed that geographical variations in surgery declined slightly over time and that when surgery shifts from inpatient to outpatient surgery, regional disparities in inpatient surgery temporarily (at least) increase.

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Key Words: Geographical variations, surgery, outpatient, medical practice, hospital, outpatient surgery.

Résumé

La pratique médicale varie dans le temps et dans l'espace. Les pratiques hospitalières, comme par exemple les durées de séjour et les taux d'interventions chirurgicales, diffèrent selon les zones géographiques. Les nouvelles techniques médicales, les changements dans l'organisation des soins et leur mise en œuvre peuvent expliquer les variations de la pratique médicale. L'objectif de cet article était d'observer si ces variations de pratique médicale s'atténaient avec le temps et quel effet avaient les changements organisationnels de l'offre de soins sur cette tendance.

Nous avons utilisé les données administratives hospitalières de vingt-cinq régions sanitaires néerlandaises. L'analyse a porté sur des procédures chirurgicales spécifiques (par exemple, l'appendicectomie, la césarienne, la pose de prothèse de hanche, la chirurgie de la cataracte, la méniscectomie) et sur les données d'admission en hospitalisation (1980-1997) et de chirurgie ambulatoire (1997).

Les résultats ont montré que les variations géographiques en chirurgie ont légèrement diminué dans la période étudiée et que lorsque des transferts se faisaient de la chirurgie avec hospitalisation vers la chirurgie ambulatoire, les disparités régionales dans la chirurgie des malades hospitalisés augmentaient, temporairement au moins.

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Mots clés : Variation géographique, chirurgie, patient externe, pratique médicale, hôpital, chirurgie ambulatoire.

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INTRODUCTION

The frequency of most types of medical interventions in hospitals varies widely between geographical and organisational units, both within and among countries [1-4]. The phenomenon of variations in medical practice is an important health policy issue because it is often associated with inequality in care utilisation and inappropriate health care delivery. In the last decade much effort has been spent to answer questions like what is the gold standard for appropriate medical practice and which suppliers produce benchmarks of hospital care. Most research focused on which utilisation rate was best [4].

After twenty-five years of research in the field of regional variations in medical practice, one question has received little attention: do geographic disparities in medical practice decline over time? A review of the research literature on medical practice variations concluded that at present, studies using extensive longitudinal data on geographic disparities in medical practice are lacking [5, 6].

In the present study, we used geographical longitudinal data for hospital inpatient surgery. The main research question we tried to address was : do regional disparities in medical practice in hospitals decline over time and what is the effect of organisational changes in treatment settings on this trend? Since we used a time series analysis of almost 20 years, the effects of organisational changes in hospital care and treatment setting can be explored.

From a theoretical perspective, we expected that the medical profession has many incentives to rule out practice variations in order to preserve its future scientific status.

METHODS

We analysed Dutch hospital discharge data for the years 1980 through 1997 covering eighteen points in time (*). Specific procedure admission data was obtained in an aggregated age-gender format from twenty-five Dutch Health Care Regions (DHCR). Patients were counted according to their region of residence instead of the region where care was received. In 1990, there were an average of approximately five hospitals per DHCR with an average of half a million residents. Hospital discharge rates were calculated separately for each year and surgical procedure per 10.000 residents (Table 1). The coefficient of variation (CV) (**), adjusted for age and gender differences in the populations of the regions, was used to indicate the amount of regional variation.

(*) Data provided by Prismant, Utrecht.

(**) The coefficient of variation is defined as: $CV = (\text{Standard deviation} / \text{mean}) * 100$. The unit of analysis is the region with 25 observations (mean surgical rate) per year and per procedure.

The surgical procedures included in the analysis were : appendectomy, hip replacement, caesarean section, cataract surgery and meniscectomy. The first three are typical inpatient procedures in the Netherlands. In other words, these disorders were never treated with outpatient surgery. During the research period (1980-1997), the latter two procedures shifted from inpatient to outpatient surgery. The gradual change in the case of cataract surgery started in the early nineties while the shift in meniscectomies began much earlier: the middle eighties.

RESULTS

Table 1 shows the incidence of hospital admissions for the five procedures in 1980, 1989 and 1997. The incidence of appendectomy declined (-25%) while the incidence of caesarean section, hip replacement and cataract treatment increased sharply between 1980 and 1997. Finally, the inpatient treatment of injuries to the meniscus almost disappeared, declining 70%.

Table 2 demonstrates spatial disparities in inpatient surgery with a downward trend for typical hospital inpatient procedures: appendectomy, total hip replacement and caesarean section (Figure 1). Between 1980 and the end of the nineties, the coefficient of variation for these three procedures (appendectomy, total hip replacement and caesarean section) declined 2.8 percent per year on the average. Between 1980 and 1997, the total decline (CV) for the three procedures was 28, 39 and 47 percent respectively. Simultaneously, the regional variations in cataract treatment between 1980 and 1993 decreased. After 1993, regional variations increased (Figure 1). The regional variations in meniscectomies increased between 1984 and 1997.

Figures 2 and 3 show the per capita time trend for each region concerning meniscectomy and cataract treatment.

Figure 2 illustrates the number of inpatient meniscectomies per 10.000 population per region from 1980 to 1997. The data are adjusted for regional differences in age and gender. One can clearly see that regional disparities in inpatient surgery were greater during the end of the eighties than in the early eighties and that, after 1994, regional differences quickly diminished once again. The increase in regional variations in the middle years of the graph indicates that some regions adopted outpatient surgery earlier than others and that the whole process of shifting from inpatient to outpatient surgery took roughly eight years. The result of the organisational shift was a temporary rise in regional disparities. The graph also shows that the use of the coefficient of variation is inappropriate when the incidence rate drops below 3 per 10.000. Compa-

Table I
Number of cases per surgical procedure in 1980, 1989 and 1997 per 10.000 population-at-risk in DHCR of residence

Surgical procedure	1980 mean \pm sd	1989 mean \pm sd	1997 mean \pm sd
Appendectomy	13.9 \pm 2.4	11.7 \pm 1.9	10.4 \pm 1.3
Caesarean section	24.1 \pm 4.3	36.4 \pm 7.2	52.8 \pm 5.9
Hip replacement	5.0 \pm 0.9	7.9 \pm 1.0	10.8 \pm 0.9
Cataract	6.9 \pm 1.8	17.2 \pm 3.7	17.0 \pm 6.3
Meniscus extirpation	9.4 \pm 1.9	8.6 \pm 2.6	2.8 \pm 1.2

Table II
Coefficient of variation per surgical procedure in 1980, 1984, 1988, 1992 and 1997, average yearly change, n = 25

	1980	1984	1988	1992	1997	Yearly change
Appendectomy	18	17	17	12	13	-2,5
Caesarean section	18	17	17	16	11	-3,9
Hip replacement	17	14	14	12	9	-4,8
Cataract	26	27	19	18	37	1,2
Meniscus extirpation	20	23	30	41	42	3,8

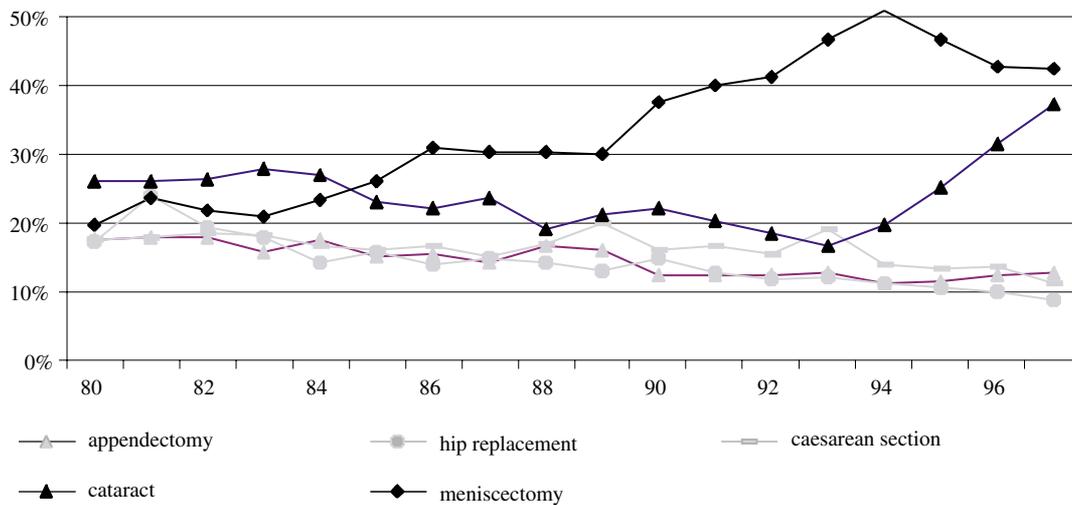


Figure 1. Geographical variations in (inpatient) surgery between 1980-1997; coefficient of variation adjusted for age and sex

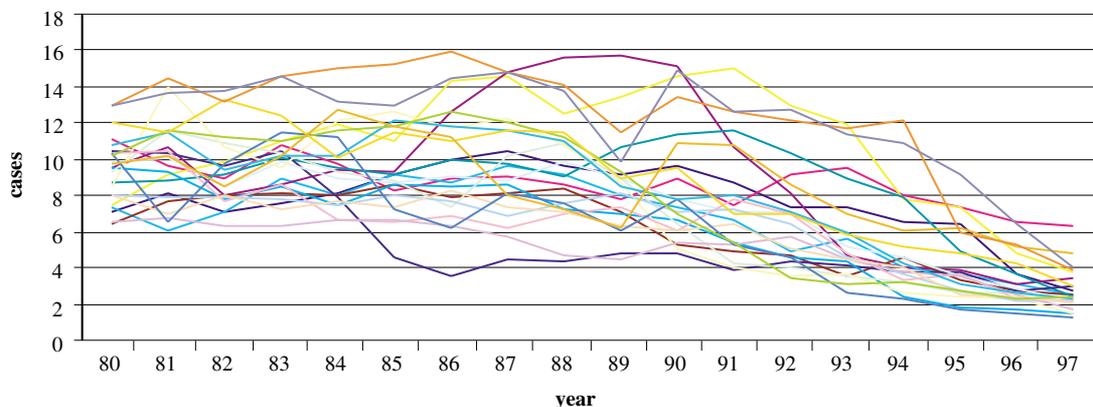


Figure 2. Geographical variations in (age/sex adjusted) number of cases per 10.000, inpatient treatment, Meniscectomy

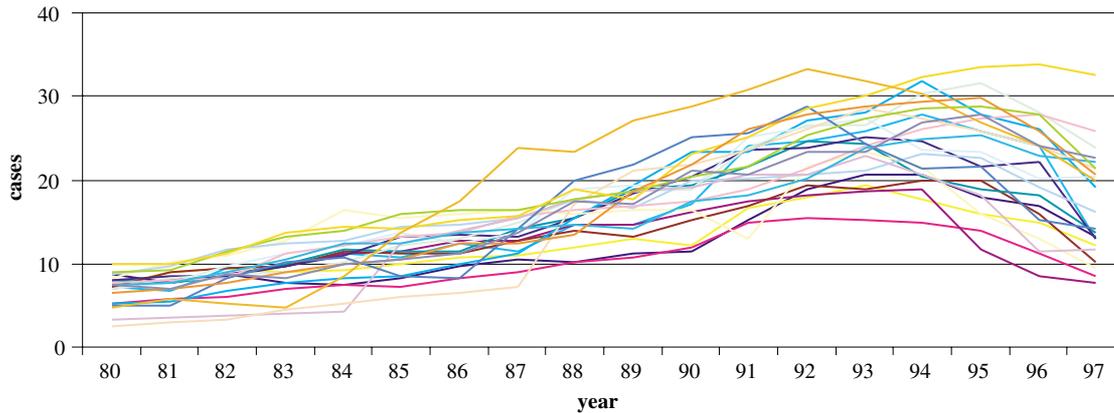


Figure 3. Geographical variations in (age/sex adjusted) number of cases per 10.000, inpatient treatment, Cataract

ring figure 1 and figure 2 inevitably leads to the conclusion that regional variations in inpatient meniscectomy is not increasing, but that in fact the procedure moved to another treatment setting. In 1997 the incidence of meniscectomy in outpatient surgery plus inpatient surgery was 18 per 10.000, meaning that in 1997, 85% of these procedures were performed in outpatient surgery.

Figure 3 shows that in cataract surgery, as previously noted, in the early nineties regional variations in inpatient treatment substantially increased. It is well established that during this period the organisational setting for cataract treatment changed from inpatient to outpatient surgery.

This observation was further analysed by collecting additional regional data on cataract treatment in outpatient surgery for 1997 (*). The correlation between the volume of inpatient and outpatient cataract surgery was negative, just as expected: when fewer cases in a DHCR were treated in an inpatient setting, more were treated in outpatient surgery (and vice versa). This was indeed the case since Pearson's correlation was -0.69 ($p < .01$). During the next few years, the situation is expected to become comparable to meniscectomy: a much lower inpatient volume and declining regional disparities.

DISCUSSION

This study showed that geographical variations in medical practice for three typical inpatient procedures (e.g. appendectomy, hip replacement, caesarean section) declined in the last two decades of the 20th century.

A disadvantage of the regional data used in the current study is the high level of aggregation. Each region has an average of half a million citizens and five hospitals. An analysis involving smaller hospital mar-

ket areas would probably have shown larger regional disparities [7]. Due to 'privacy' regulations, applied by the data provider, data at the level of single hospitals are not available in the Netherlands at the present time.

A second finding was that when surgery starts to shift from inpatient to outpatient surgery, regional disparities in inpatient surgery show (at least) a temporary increase.

Because the actual shift from inpatient to outpatient surgery differs among regions as well as countries [8], any analysis of regional variations in surgical rates should include all cases treated. In the current study, cataract surgery and meniscectomy need to be analysed in this way. If omitted, spatial disparities in surgery rates will be confused with spatial differences in treatment settings.

Finally, a study by McPherson et al. [9] in 1982 showed that geographic variations in medical practice are consistently found in different countries. The authors compared New England (US), Norway and the West-Midlands (UK). The observed regional disparities in the use of common surgical procedures appeared to be more a characteristic of the procedure itself than of the health system in the country where it was performed. The authors reported that there was relatively little variation in the use of appendectomy in each country, and that the mean rates of distribution were similar, suggesting similar incidence rates of appendicitis. "Appendectomy is generally recognised the only acceptable treatment for this acute condition", they state. The Netherlands fits remarkably well into this observation. In the early eighties, those three countries and the Netherlands treated on the average between fifteen and eighteen cases per 10.000 population. Surprisingly, France is an exception since the number of cases treated in France (1993) was 35 per 10.000 [10]. If the surgical treatment of appendicitis can be used as an empirical gold standard for acceptable variations in medical practice, a replication of

(*) Data provided by Prismant, Utrecht.

McPherson's international study (including France) using regional data could be very informative.

NOTE

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