Differences in production between medical specialists

An inventory based on claims data to identify potential areas for quality-improvement activities

ANTON F. CASPARIE, DOEKE POST, WIM H. VAN HARTEN, JAN W. GUBBELS *

Claims data from sickness funds were used to describe practice patterns of all physician partnerships of six medical specialties in a region of The Netherlands. The numbers of admissions to hospital, patient days, in-patient and out-patient procedures were compared per 1,000 insured persons. There were large differences among physicians within the same specialties. The non-surgical specialties had more variable practice patterns. Variation in use of specific procedures with a supposedly clear indication versus a less-defined indication was the same. We could not identify special areas with greater differences that should have a priority for quality-improvement activities. The use of sickness fund data in monitoring and decreasing variations in medical practice is discussed.

Key words: medical practice variations, quality assurance, claims data

Health care provision has been shown to differ among regions, institutions and physicians. Differences in health care provision can be due to population factors (e.g. levels of morbidity and the demand for care) and to systems factors (e.g. the facilities available and the practice styles of individual physicians) (Rosenblatt & Moscovice 1984). 'Uncertainty' may play a role: variation in the use of a procedure has been shown to be associated with the degree to which the indications for it are clearly defined (Keller et al. 1990). Reimbursement schemes and physician practice organization also influence physician practice style and, subsequently, the amount of health care (Rice 1983).

In The Netherlands, studies have compared the use of hospital facilities and geographical regions, with respect to admission rates and lengths of stay. The numbers of beds and medical specialists in a region partially explained the regional variation found (Van der Speld 1990).

We studied the variation in the use of health care facilities by medical specialists within one region in The Netherlands. Our purpose was to describe differences in health care provision in order to have a starting point for subsequent activities to improve the effectiveness and efficiency of health care and to illustrate the use of claims data in this respect.

* A.F. Casparie, D. Post, W.H. van Harten, J.W. Gubbels, Department of Health Policy and Management, Erasmus University, Rotterdam, Sickness fund 'Het Groeneland', Zwolle, and Health Care Insurance, Hengelo, The Netherlands

Correspondence: Prof. dr A.F. Casparie, Department of Health Policy and Management, Erasmus University, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands

METHODOLOGY

Data came from the 1986 reimbursement records of two sickness funds covering respectively 171,000 and 348,000 residents of one region (eastern) of The Netherlands. Approximately 70% of the population (those under a specified income) is covered by compulsory insurance with the sickness funds. These patients have access to hospitals and their out-patient departments, only through referral by general practitioners. General practitioners themselves do not have hospital admission privileges. In the region studied, there were 10 hospitals. Medical specialists practised full-time, usually in one hospital. They were organized into partnerships, mostly one partnership for one specialty per hospital.

The following production parameters were chosen: the number of admissions, patient days and in- and out-patient procedures. The choice of parameters was based on the availability and reliability of data in the sickness funds files. (Data concerning out-patient visits were available but they were not reliable during this period.) The specialties, internal medicine, general surgery, cardiology, pulmonology, ear–nose–throat medicine and gynaecology were chosen because they were available in all 10 hospitals. A procedure was defined as any diagnostic and therapeutic intervention that is reimbursed individually. The following specific procedures were chosen for study: radius fracture treatment, hearing improvement operations, tubalsterilization, cardioversion, cholecystectomy, nasal-septum correction, echocardiography, cardiac catheterization and hysterectomy. The first four procedures have well-defined indicators as compared with the latter five. The classification well-defined versus less-defined was made by the authors and the choice of these procedures was partly due to the availability of sufficient num-

bers of these procedures and the fact that the specified procedure is applied in only one specialty. In The Netherlands radius fracture treatment is normally done by general surgeons while cardioversion is done by cardiologists. The data is expressed per 1,000 insured persons. The factor used in the results is the ratio between the highest and the lowest number of admissions, patient days or procedures.

Persons insured through the sickness funds are assigned to a general practitioner practice. The number of insured patients per medical specialty partnership (its assigned population) is not determined geographically, but calculated on the basis of the flow of patients from a general practitioner to a partnership. The more a general practitioner refers to a partnership, the more a general practitioner's practice belongs to that partnership. The assigned population was calculated as follows: the total number of insured persons from a practice of a general practitioner belonging to a partnership, is the same as the percentage referred by this general practitioner to this particular specialty, multiplied by the total number of insured patients of the general practitioner's practice. The assigned population of the partnership concerned is equal to the sum of the patient groups of all general practitioner practices that are referred specifically to the partnership involved.

The quantity of production data was corrected for the morbidity of the population. The percentage of persons 65 years of age and over and the percentage of women were taken as indicators for the morbidity of the insured population. Furthermore, the number of specialists in a partnership, as a hospital-related variable, was introduced as a factor because larger partnerships will treat patients with more severe conditions that require more procedures. The number of partnership members ranged from two to six.

Multiple linear regression analysis was used for measuring the combined influence of these factors as independent variables. The relative influence of the independent variables was measured as well. The adjusted R^2 was used as a more conservative estimate of the explained variance. Adjusted $R^2 = R^2 - (k-1)/N-k) \times (1 - R^2)$, where k is the number of independent variables in the regression equation and N is the number of cases.

Table 1 Number of admissions, patient days and procedures per 1,000 insured persons of 10 internal medicine partnerships in one region, before and after correction for independent variables

Partnership	Admissions		Patient days		In-patient procedures		Out-patient procedures	
	OD	E	OD	E	OD	E	OD	E
1	31.6	33.4	570	610	2.4	5.7	19.0	22.9
2	19.4	29.1	364	528	4.1	6.4	16.0	21.7
3	21.7	23.8	492	535	4.6	5.3	7.2	18.6
4	41.6	34.7	552	593	4.8	6.0	22.2	23.3
5	22.9	23.3	389	378	5.5	4.7	12.5	15.5
6	24.9	22.6	613	538	6.4	9.2	49.0	24.5
7	36.8	32.4	726	550	6.7	3.4	32.6	18.1
8	28.8	22.0	571	533	10.1	9.4	15.0	24.8
9	30.4	31.5	730	641	11.5	10.1	25.6	29.9
10	21.7	27.4	495	596	12.4	8.4	25.7	25.4
Mean	28.0	28.0	550	550	6.8	6.8	22.5	22.5
Minimum	19.4	22.0	362	278	2.4	3.4	7.2	15.5
Maximum	41.6	34.7	730	641	12.4	10.1	49.0	29.9
Difference	22.2	12.7	368	263	10.0	6.7	41.8	14.4
Factor	2.1	1.6	2.0	1.7	5.2	2.9	6.8	1.9
R^2 *	0.30		0.24		0.04		0.31	

OD: observed data; E: expected on basis of regression analysis

* Proportion of defined variance in OD, by percentage of ≥65 years of age and percentage women of the insured population and the number of specialists in the partnership

RESULTS

As an example, the production data of all 10 internal medicine partnerships in the region per 1,000 insured persons, before and after correction for the independent variables, is presented in *table 1*. The differences in observed admissions, patient days and in-patient and out-patient procedures between the partnerships with the highest and those with the lowest number amount to a factor of 2.0 for patient days and of 6.8 for out-patient procedures. After adjustment for the percentages of persons 65 years of age and over and of women in the insured population and the number of specialists in the partnership, the differences decrease to some extent, but remain substantial.

Table 2 shows the corrected maximum and minimum number of admissions, patient days and procedures per

Table 2 Number of admissions, patient days, and procedures per 1,000 insured persons in six specialties in one region, after correction for independent variables

Specialty	Admissions			R^2 *	Patient days			R^2 *	In-patient procedures			R^2 *	Out-patient procedures			R^2 *
	Min	Max	Factor		Min	Max	Factor		Min	Max	Factor		Min	Max	Factor	
Internal medicine	23.3	34.1	1.5	0.30	378	640	1.7	0.24	3.4	10.1	3.0	0.09	15.4	25.5	1.7	0.31
General surgery	18.9	35.2	1.9	0.07	267	505	1.9	0.09	18.7	32.9	1.8	0.13	15.4	70.9	4.6	0.19
Pulmonology	7.5	9.2	1.3	0.06	152	168	1.1	0.02	2.2	3.9	1.8	0.06	13.3	43.8	3.3	0.21
Cardiology	4.2	28.6	6.8	0 68	52	398	7.7	0.72	4.8	26.6	5.5	0.50	14.3	55.1	3.8	0.37
Gynaecology	15.4	24.3	1.6	0.40	124	189	1.5	0.26	20.3	25.8	1.3	0.32	21.1	39.2	1.9	0.15
Ear-nose-throat	5.2	11.0	2.1	0.36	36	94	2.0	0.39	3.6	13.0	3.6	0.54	17.7	100.0	5.6	0.51

* Proportion of explained variance, regression model as in *table 1*

Min: minimum, max. maximum

1,000 insured persons for the six specialties. The differences between medical specialties in these health care parameters were considerable. The differences in gynaecology are the least of all the specialties, with all factors <2, whereas the cardiologists show the greatest differences. However, substantial differences can be identified within all four parameters.

Table 3 shows the data for nine specific procedures, four with a supposedly clear and five with a less-defined indication. There is apparently no obvious distinction in health care differences per 1,000 insured persons between these two groups of procedures. In the group of well-defined indications, the differences in corrected numbers of procedures between the partnerships with the highest and those with the lowest number range from a factor of 1.4 to a factor of 10.5, while in the less-defined group the factors range from 1.3 to 11.5. Also the differences between the partnerships concerning the two diagnostic procedures (echocardiography and cardiac catheterization) are of the same magnitude as the differences in the remaining seven therapeutic procedures.

The influence of the correcting factors, both together and individually, depends on type of specialty and type of procedure. No consistent pattern could be discerned. However, the number of partnership members seems to have the most significant influence, that is a larger partnership has a higher production of health care per 1,000 insured persons (data available on request).

DISCUSSION

This study shows that within one region, substantial differences exist between medical specialists within the same specialty in their health care provision. Although these differences decrease after correction by some demographic factors (percentage of 65 years of age and over and percentage of women) and with the size of the partnership, they remain substantial. The differences apply to all four parameters studied: within the in-patient procedures there are as many differences as there are within the admissions. Of the six specialties studied, gynaecology exhibits the lowest and cardiology the highest differences in health care production data. Overall, the specialties without surgical procedures show greater differences. The hypothesis that variation in use is greater in the case of procedures with a less-defined indication, could not be confirmed. The ratios between the lowest and the highest health care production rates are of the same magnitude in both types of procedures. This finding is in contrast with the conclusion of Keller et al. (1990) that the major reasons for the variations appeared to be related to lack of agreement about optimum treatment.

Although the raw data could be corrected for only a few factors, the differences in health care production rates are so great that it is unlikely that they will be completely explained by the difference in morbidity and the demand for care in the patient population. Some of the differences must be based on variation of practice style between medical specialists. Therefore, these data will make physicians aware of potential areas for improving effectiveness and efficiency in their provision of health care. In this study we could not identify special areas in which the necessity for quality-improvement activities seems the greatest.

Sickness fund data can be useful for the purpose of monitoring variations in practice and in giving feedback to physicians. Some studies show that monitoring practice performance and giving feedback are effective in changing medical practice (Berwick & Coltin 1986, Keller et al. 1990, Winkens et al. 1992). However, other studies on the effect of feedback were less positive (Lomas et al. 1989, Parrino 1989). Feedback is probably most influential when it is combined with audit and peer review (Grol et al. 1988). However, it must be realized that for changing the daily practice of a physician, a combination of interventions, such as face to face education, reminders and barriers to performance is usually the most effective (Grol 1992). Data of the type used in this study can give rise to these interventions.

Furthermore, routinely collected sickness fund data, which are easy to obtain at no additional expense, could also be used to monitor the effects of various community interventions designed to alter physician practice. In The Netherlands, examples of such interventions are the developing of guidelines by medical societies (Casparie 1991) and the budgeting of hospitals (Casparie & Hoogendoorn 1991).

Table 3 Number of procedures per specialty partnership per 1,000 insured persons after correction for independent variables

Procedure	Min	Max	Factor	R^2 *
Well-defined indication				
Hearing improvement operation	0.5	1.0	2.0	0.22
Radius fracture treatment	2.5	3.6	1.4	0.01
Cardioversion	0.1	0.3	3.0	0.56
Tubal sterilization	1.1	2.2	2.0	0.49
Less-defined indication				
Cholecystectomy	0.8	1.0	1.3	0.07
Nosal septum correction	0.9	2.0	2.2	0.37
Echocardiography	1.5	17.3	11.5	0.56
Cardiaccatheterization	1.2	5.2	4.3	0.53
Hysterectomy	1.0	1.3	1.3	0.10

* Proportion of explained variance, regression model as in *table 1*
Min: minimum, max: maximum

This study was supported by a grant from the Dutch Ministry of Welfare, Health and Culture.

REFERENCES

Berwick D, Coltin K (1986). Feedback reduces test use in a health maintenance organization. JAMA 255:1450-4.

Casparie AF, Hoogendoorn D (1991). Effects of budgeting on health care services in Dutch hospitals. Am J Public Health 81:1442-7.

Casparie AF (1991). Guidelines to shape clinical practice. The role of medical societies: the Dutch experience in comparison with recent developments in the American approach. Health Policy 18:251-9.

Grol R, Mokkink H, Schellevis F (1988). The effects of peer review in general practice. J R Coll Gen Pract 38:10-3.
Grol R (1992). Implementing guidelines in general practice care. Qual Health Care 1:184-91.
Keller RB, Soule DN, Wennberg JE et al. (1990). Dealing with geographic variations in the use of hospitals. J Bone Joint Surg 72-A:1286-93.
Lomas J, Anderson GM, Dominick-Pierre K et al. (1989). Do practice guidelines guide practice? The effect of a consensus statement on the practice of physicians. N Engl J Med 321:1306-11.
Parrino T (1989). The non-value of retrospective peer comparison feedback in containing hospital antibiotic costs. Am J Med 86:442-8.
Rice TH (1983) The impact of changing Medicare reimbursement rates on physician induced demand. Med Care 21:803-15.
Rosenblatt RA, Moscovice IS (1984). The physician as gatekeeper: determinants of physicians' hospitalization rates. Med Care 22:150-9.
Van der Speld G (1990). Regionale verschillen in gebruik ziekenhuizen (Regional differences in the use of hospitals). Medisch Contact 45:215-7.
Winkens R, Pop P, Grol R et al. (1992). Effect of feedback on test ordering behaviour of general practitioners. Br Med J 304:1093-6.

Received 27 April 1992, accepted 28 February 1993

ANNOUNCEMENT
CALL FOR NOMINATIONS/APPLICATIONS FOR THE IVO-AWARD FOR YOUNG RESEARCHERS IN THE FIELD OF ADDICTION

The European Addiction Research Institute of the Erasmus University of Rotterdam (IVO) is calling for nominations/applications for the IVO-AWARD on Addiction Research.
The Award aims at stimulating young European scientists to conduct high quality research in the field of addiction. It is a periodical award and consists of a cash grant of Dfl 25.000,-. The grant is financed by the 'Stichting Volksbond Rotterdam', a private foundation with the objective of stimulating the research into the problems of addiction. Fiscal consequences are not the responsibility of the 'Stichting Volksbond Rotterdam'.
Candidates considered eligible for the award are individuals who conduct research into the use of substances such as alcohol, tobacco and drugs as well as research into problems associated with substance use. Researchers who study other forms of addiction, such as gambling addiction, are also considered eligible.
Studies may originate from different disciplinary backgrounds (i.e. social research, epidemiology, medicine).

CANDIDATES
Candidates must be currently employed and/or conduct their research in Europe. The candidate will not be older than thirty-five (35) years of age (on February 1, 1994). Candidates must apply or be nominated on the basis of their scientific publication(s) which must be in the English language.
An individual researcher can apply by himself, or a researcher can be nominated by other individual(s), in which case the nominee has to give his written consent for nomination.
Former or present staff members, board members and members of the scientific board of IVO are excluded from nomination or application.
The nomination/application period starts October 1, 1993 and ends February 1, 1994.

JURY
A Jury of three European experts in the field of addiction research will judge the nominations/applications. The Jury consists of Dr K. Mäkelä (Helsinki, Chairman), Dr G. Bühringer (Münich) and Mr J. Moskalewicz (Warsaw). The Jury holds office at the address of IVO.
The Jury will independently of any 'external influences' choose the winning candidate on the basis of his/her scientific publication(s). The decision of the Jury has to be unanimous. There will be no correspondence about the results.
The Jury will decide within a period of two (2) months after the end of the nomination/application period.
The winning candidate will be expected to receive the IVO-award in person in Rotterdam and give a lecture in English at the award ceremony (travel and hotel expenses will be reimbursed). The lecture may be published by IVO. The winning candidate will guarantee the IVO from claims of third parties on copyrights or on intellectual property.

PROCEDURE
Nominations/applications can be sent to the secretary of the Jury: Prof.Dr H.F.L. Garretsen, Director European Addiction Research Institute, Essenlaan 4, 3062 NM Rotterdam, the Netherlands, tel. +31 10 2121699, fax +31 10 2122814.
Nominations/applications must include four copies of: i) name, address, professional status and date of birth of the candidate; ii) reasons for nomination/application; iii) (main) publications (maximum 3) of the candidate ('grey' literature, in-house series included); iv) a curriculum vitae and a list of publications; v) a written consent of the candidate.