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Implementing Guidelines in General Practice. Evaluation of Process and Outcome of Care in Chronic Diseases

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In a prospective longitudinal study over 21 months the performance of general practitioners and the disease status of their patients was measured during the formulation and implementation of guidelines on follow-up care. Data on 15 general practitioners and on 613 patients with hypertension, 95 with diabetes mellitus, 66 with chronic ischemic heart disease, 115 with chronic respiratory disease, and 17 with osteoarthritis were used for analysis. Performance measures were defined and for each disease a disease status indicator was used. The possibly modifying effect of compliance of the general practitioner, and of patient compliance with the guidelines was taken into account. The general practitioners formulated consensus guidelines on follow-up care and implemented these guidelines in their practices. The implementation was supported by peer review. The performance of general practitioners tended to conform more with the guidelines during the study period, especially with regards to actions

that should be performed routinely. There were no major changes in the disease status indicators. Compliant hypertensive patients had a normotensive status more frequently than non-compliant patients. Diabetic patients were more likely to be normoglycaemic when they received care according to guidelines. None of the differences were statistically significant over time.

Key words: Guidelines, general practice, chronic diseases, quality of care, peer review.

INTRODUCTION

Formulating guidelines for optimal care is an important step in the process of measuring and improving the quality of care. In The Netherlands the development of guidelines started in 1982 with consensus meetings on controversial issues in specialist care by the 'Centraal Begeleidingsorgaan voor de Intercollegiale Toetsing' (CBO). Since 1989 guidelines ('standards') for optimal general practice care have been developed by the Dutch College of General Practitioners (NHG).

Until now, the process of formulating guidelines and their implementation in daily practice has been evaluated mainly by an indirect approach, by interviewing physicians or by using data on a highly aggregated national level [1-4], rather than directly on the level of individual doctors and their patients [5,6]. This paper reports on the evaluation of the implementation in general practice of guidelines for the follow-up care of patients with chronic diseases. Our study preceded the publication of the first Dutch standard [7]. Traditionally, three aspects of quality of care are considered: structure, process and outcome [8]. In this study we

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evaluated aspects of process and outcome of care:

- did the actual care delivered by GPs tend to conform more to consensus guidelines for optimal care during their implementation, did it vary between GPs and between diseases?
- what was the course of disease status indicators of their patients during the implementation of guidelines, and was this course modified by patient characteristics and by compliance with the guidelines of GPs and of patients?

We assumed that GPs involved with the formulation and implementation of guidelines would increasingly perform according to these guidelines and that performance according to guidelines would result in a favourable course of disease status indicators in their patients.

METHODS

Design

Over 21 months from 1 January 1988, guidelines for optimal care were formulated, followed by their implementation in practice. During the whole period the GPs registered data on the actually delivered care, and of disease status indicators during all contacts with patients with selected chronic diseases. This evaluative study was of a prospective longitudinal descriptive nature.

Selection of GPs

The selection of practices and GPs has previously been described in detail [9]. In sum-

mary, 7 practices (with 15 GPs) were selected by convenience following their participation in the Dutch National Survey of General Practice [10]. The practices were located in the south-east part of the country. Two practices were staffed single-handedly, four had two GPs and one was a group practice with five GPs. Each GP had their own practice list. Five of the 15 GPs were women. Three practices were involved with vocational training for general practitioners, the others had no special relationship with a University Department of General Practice.

Selection of patients

The total list size of the practices at the start of the study amounted to 23,534 persons. The GPs identified in their practices all patients known to have one or more of the following diseases [9]:

- hypertension;
- diabetes mellitus;
- chronic ischemic heart disease (CIHD);
- chronic respiratory disease (asthma, chronic bronchitis, emphysema; CRD);
- osteoarthritis of knee and/or hip.

Baseline data [gender, age, and disease-specific data (date of diagnosis, doctor responsible for the follow-up care, blood pressure, and blood glucose)] were registered by the GPs at inclusion. For this study the patients had to satisfy two criteria: the diagnosis made before 1 January 1988, and a complete follow-up GP care during the study period. Table 1 lists the patient characteristics at baseline.

TABLE 1. Characteristics of five patient groups with chronic diseases at the start of the study

	Hypertension (N = 613)	Diabetes Mellitus (N = 95)	CIHD* (N = 66)	CRD (N = 115)	Osteoarthritis (N = 17)
Male (%)	31	33	49	58	18
Age (mean)	60	66	69	49	65
Initial BP (diastolic—mean—mmHg)	106				
Baseline BP (diastolic—mean—mmHg)	92		82		
Baseline blood glucose (mean—mmol/l)					
fasting		8.3			
non-fasting		10.9			

* CIHD=chronic ischemic heart disease; CRD=chronic respiratory disease; BP=blood pressure.

Process of formulating and implementing guidelines

Monthly meetings (except in July and in August) of 60–90 min were held with the participating GPs during the entire study period. These meetings were held in two, sometimes three subgroups. Attendance of all participating GPs was requested. When this was impossible, attendance of at least one representative per practice was urged. The first seven meetings in each subgroup of GPs were aimed at formulating consensus guidelines of optimal follow-up care for each of the five chronic diseases mentioned above. Because the subgroups did not discuss the five diseases in the same order, the first 7 months should be considered as one 'formulation phase'. For each disease the same procedure was followed. A summary of the 'state of the art' follow-up care and a draft version of proposed guidelines, both produced by the first author, were sent to the participants one week before each meeting. All subgroups received the same material. During the meeting the proposed guidelines were discussed and amended. A written report was prepared of each meeting and discussed and accepted in the next meeting. The presence of the first author at each meeting guaranteed that differences between the subgroups were discussed and that finally, identical guidelines were unanimously adopted. Table 2 (left column) lists the items of these guidelines for each of the five chronic diseases. All participating GPs explicitly stated their intention to act according to these guidelines and to motivate discrepancies between the guidelines and the actually delivered care.

During the subsequent meetings ('implementation phase') the GPs received written individual feedback on their actually delivered care. This information was derived from the data registered by the GPs themselves (see further). In each meeting discrepancies between the guidelines and the actual care regarding one disease were discussed using the method of peer review [11]. Again, a written report was made of these meetings, mailed to the participants, and discussed and approved at the next meeting.

The mean attendance rate of the individual GPs at the meetings was 68%. When computed

on the practice level (attendance of at least one GP per practice) the mean attendance rate was 79%.

Measurements

Data on actually delivered care were recorded by the GPs on special forms during all consultations with the included patients over 21 months. These data included:

- diagnosis made during the consultation;
- performance of each of the following procedures (Yes/No): physical examination, blood pressure reading, measurement of body weight, blood glucose, serum creatinine, urine albumin excretion, ophthalmological examination (fundoscopy by the GP or referral to the ophthalmologist), influenza vaccination;
- making a follow-up appointment, defined in a term in weeks or months or by a specific date (Yes/No).

Diagnoses were coded by trained clerks according to the International Classification of Primary Care (ICPC) [12]. The diagnoses were clustered into disease episodes ('a problem or illness in a patient over the entire period of time from its onset to its resolution' [13]). At the first consultation of each episode it was indicated whether the episode was 'new' (disease never presented before) or 'old'.

Data on the disease status of the patients were registered on the same forms. These data included results of examinations and laboratory tests. Blood pressure was measured by the GPs with a sphygmomanometer or a digital manometer gauged at the start of the study. Diastolic blood pressure was read at the disappearance of the sounds (Korotkoff phase V). Blood glucose levels were generally measured in the office, using blood test strips and a reflectometer, or occasionally in a regional laboratory.

Outcome measures

For each of the five chronic diseases performance measures were defined, reflecting the extent of agreement of actual performance with performance according to the guidelines for each disease (Table 2, right column). The performance measures were first computed at the

TABLE 2. Guidelines on and measures of performance of general practitioners in the management of five chronic diseases

Guidelines	Performance measures
<i>Hypertension</i>	
<ul style="list-style-type: none"> ● blood pressure measuring at each control visit ● urine albumin measurement once a year ● follow-up appointment after each control visit 	<ul style="list-style-type: none"> ● percentage control visits in which blood pressure was measured ● percentage of hypertensive patients whose urine albumin was measured during the study period ● percentage control visits finished by a follow-up appointment
<i>Diabetes mellitus</i>	
<ul style="list-style-type: none"> ● taking recent history of signs and symptoms related to diabetes mellitus ● blood glucose measurement at each control visit ● body weight measurement at each control visit ● blood pressure measuring once a year ● influenza vaccination once a year ● serum creatinine measurement every three years ● ophthalmological examination every three years 	<ul style="list-style-type: none"> ● percentage control visits in which blood glucose was measured ● percentage control visits in which body weight was measured ● percentage of diabetic patients whose blood pressure was measured during the study period ● percentage diabetic patients who were vaccinated against influenza during the study period ● percentage diabetic patients whose serum creatinine was measured during the study period ● percentage diabetic patients who underwent ophthalmological examination during the study period
<i>Chronic ischemic heart disease (CIHD)</i>	
<ul style="list-style-type: none"> ● taking recent history of signs and symptoms due to CIHD ● in case of hypertension: blood pressure measurement at each control visit ● in case of obesity: body weight measurement at each control visit 	<ul style="list-style-type: none"> ● percentage CIHD control visits in patients with hypertension in which blood pressure was measured ● percentage CIHD control visits in obese patients in which body weight was measured
<i>Chronic respiratory disease (CRD)</i>	
<ul style="list-style-type: none"> ● taking recent history of signs and symptoms due to CRD ● lung examination at each control visit ● influenza vaccination once a year 	<ul style="list-style-type: none"> ● percentage control visits in which lungs were examined ● percentage CRD patients who were vaccinated against influenza each year
<i>Osteoarthritis hip/knee</i>	
<ul style="list-style-type: none"> ● taking recent history of signs and symptoms due to osteoarthritis ● joint examination at each control visit 	<ul style="list-style-type: none"> ● percentage control visits in which joint examination took place

TABLE 3. Disease status indicators, and patient and care characteristics

Disease status indicators	Patient and care characteristics
<i>Hypertension</i> % of patients with diastolic blood pressure <95 mmHg	sex age initial blood pressure baseline blood pressure patient compliance received care: agreement with guidelines
<i>Diabetes mellitus</i> % of patients with blood glucose fasting <8.0 mmol/l or non-fasting <10.0 mmol/l	sex age baseline blood glucose patient compliance received care: agreement with guidelines
<i>Chronic ischemic heart disease</i> % of patients with diastolic blood pressure <95 mmHg	sex age baseline blood pressure patient compliance
<i>Chronic respiratory disease</i> incidence of exacerbations	sex age
<i>Osteoarthritis</i> incidence of joint related problems	sex age

patient level and then aggregated to the GP level.

Disease status indicators were defined for each of the five studied diseases and are listed in Table 3. For hypertension, diabetes mellitus, and CIHD these indicators were also mentioned as targets in the guidelines. For CRD and osteoarthritis episodes of exacerbations (acute bronchitis for CRD and joint related problems for osteoarthritis) were chosen as indicators. Exacerbations of chronic respiratory disease were defined as new episodes of acute bronchitis (ICPC code R78). Joint related problems were defined as new episodes of pain in knee/hip or myalgia (ICPC codes L13, L14, L15, or L18). Incidences were expressed in percentages of patients affected.

Potentially modifying variables

The potentially modifying variables were also listed in Table 2. Patient characteristics, such as

age and diastolic blood pressure at the start of the study were dichotomised at the median of each disease group separately. Baseline blood glucose was dichotomised at 8.0 mmol/l for the fasting patient status or at 10.0 mmol/l for the non-fasting status. Initial diastolic blood pressure (measured in diagnosing hypertension) was dichotomised at 105 mmHg. Patient compliance was defined as the attendance at the minimum number of control visits according to the guidelines and dichotomised on the basis of the frequency distribution: 100% compliance vs less than 100%. A variable indicating received care was computed only for the cases of hypertension and diabetes mellitus, the number of cases in the other disease groups being too small. This variable reflected the agreement between the actual GP performance and the guidelines (observed vs expected) in each patient, viz the frequency of measurement of blood pressure in hypertensive patients and measurement of blood glucose in diabetic

patients. This variable was also dichotomised on the basis of the frequency distribution: 100% agreement vs less than 100%.

Analysis

Analysis was performed per disease. The entire study period was divided in periods and the results were presented as repeated measurements. For patients with diabetes five 4-month periods and for the others three 6-month periods were distinguished according to the guidelines on the frequency of follow-up visits. As mentioned above, the first 6–8 months can be regarded as the phase of formulation of guidelines, the following period as the implementation phase.

The performance measures of the GPs ($N = 15$) were presented as medians. Inter-doctor variation was expressed by computing the 33- and 67-percentile value.

The disease status indicators were presented as proportions of the patients. Subgroups were defined on the basis of the potentially modifying variables for bivariate analyses. Confidence intervals (CI) were computed at the 95% level. The analyses were carried out with SPSS-X and SPSS-PC.

RESULTS

Performance

Hypertension. The GPs conformed increasingly to the guidelines during the study period with a decrease in variation between GPs in measuring blood pressure, and making an appointment (Table 4). This was reflected in a narrowing of the range between the 33 and 67 percentiles and in the results on the level of individual GPs: five GPs had a maximum score on both performance measures in the first period and these remained maximal, measuring blood pressure increased at least 10% in six GPs, and making a follow-up appointment increased at least 10% in five GPs.

Measurement of albuminuria was rarely performed during the study period: once in 60 of the 613 patients and twice or more in eight patients, never in the remaining patients.

Diabetes mellitus. The fraction of control visits in which blood glucose was measured

TABLE 4. Performance measures of general practitioners ($N = 15$) in patients with hypertension. Median percentages and 33- and 67-percentiles) per 6-month period

Mean number of patients per GP: 40.9 (range 1–111)

Period	Measuring blood pressure		Making appointment	
	%	(33–67 perc)	%	(33–67 perc)
1	90.2	(84.7–97.0)	83.5	(72.2–95.7)
2	98.9	(97.1–100.0)	92.6	(90.9–99.3)
3	99.6	(98.2–100.0)	92.3	(85.1–100.0)

TABLE 5. Performance measures of general practitioners ($N = 15$) in patients with diabetes mellitus. Median percentages and 33- and 67-percentiles per 4-month period

Mean number of patients per GP: 6.3 (range 1–16)

Period	Measuring glucose		Measuring body weight	
	%	(33–67 perc)	%	(33–67 perc)
1	76.5	(66.7–81.0)	50.5	(31.8–52.8)
2	82.1	(68.8–85.7)	52.1	(30.0–54.2)
3	85.7	(78.6–87.5)	64.3	(35.0–66.7)
4	83.3	(77.1–83.3)	44.4	(12.5–47.2)
5	89.6	(80.0–91.8)	55.0	(25.8–56.3)

increased steadily from 75 to 90% with a decrease in the range between the 33 and 67 percentiles (Table 5). The change in performance measures of individual GPs varied: two GPs had a maximum score in the first period which remained stable, and five GPs showed an increase of at least 10% between the first and the last period. The performance measures of the others remained stable at a lower level or decreased. Measuring body weight was less frequently performed and the increase was marginal: the measure of two GPs increased, of another two GPs decreased, and the others remained stable. All GPs but one measured the blood pressure of their diabetic patients twice or more during the study period. Only three GPs vaccinated all their diabetic patients against influenza. Serum creatinine was measured during the study period at least once in 24% of the diabetic patients. When extrapolated to 3 years (according to the guidelines), two GPs would be fully compliant in the measurement of serum

TABLE 6. Performance measures of general practitioners ($N = 15$) in patients with chronic respiratory disease. Median percentages and 33- and 67-percentiles per 6-month period

Mean number of patients per GP: 7.7 (range 1–22)

Period	Lung examination %	(33–67 perc)
1	92.1	(72.7–100.0)
2	98.6	(75.0–100.0)
3	93.8	(80.0–95.4)

creatinine of all their diabetic patients once in three years. Ophthalmological examinations were carried out in 26% of the patients at least once during the 21 months. One GP would reach an extrapolated measure of 100% of his diabetics undergoing an ophthalmological examination in 3 years.

Chronic ischemic heart disease (CIHD). The performance measures regarded only 41 of the 66 CIHD-patients, namely those with hypertension ($N=17$) and those with obesity ($N=24$). No clear trend was detectable in measuring blood pressure in hypertensive CIHD patients (mean percentages in period 1, 2 and 3: 100, 75, 80% of the visiting patients) and in measuring body weight in obese patients (27, 60 and 50% of the visiting patients, respectively). Aggregation on the GP level resulted in too small, and therefore unreliable, figures.

Chronic respiratory disease (CRD). Compliance with the guidelines regarding lung examination remained stable between 80 and 85% during the study period (Table 6) with a decrease of the interdoctor variation: five GPs

remained on their maximum score, and four GPs showed an increase of at least 10%. Of the 115 patients 31% were vaccinated against influenza; the vaccination rate per GP ranged from 0 to 60% of the CRD patients.

Osteoarthritis. The agreement of GP performance with the guidelines on the follow-up of osteoarthritis patients, expressed in the fraction of control visits in which joints were examined, decreased during the study period from 72 to 59%. These figures are based, however, on limited numbers of patients and control visits. Therefore, aggregation to GP level has not been executed.

Disease status indicators

Hypertension. The proportion of hypertensive patients with a diastolic blood pressure below 95 mmHg did not change during the study period (Table 7). This course was not modified by sex, age, initial blood pressure, and baseline blood pressure. Whether the GP measured the blood pressure at each control visit or not did not modify the course of the number of normotensive patients (Table 7). There was a decreasing trend in the number of normotensive patients in the non-compliant patient group.

Diabetes mellitus. The proportion of diabetic patients with a normoglycaemic status fluctuated during the five 4-month periods with a marked dip in the fourth period (Table 8). This proportion tended to increase in females, older diabetics, and patients who were hyperglycaemic at baseline. In the subgroup in which the GP measured the blood glucose at each control visit the number of diabetics with a normoglycaemic

TABLE 7. Proportion of hypertensive patients with diastolic blood pressure <95 mmHg during three 6-months period in total, and controlled for GP care and patient compliance

Period	Total ($N = 613$) % (95% CI)	Received care: agreement with guidelines		Patient compliance	
		<100% ($N = 78$) % (95% CI)	100% ($N = 500$) % (95% CI)	<100% ($N = 183$) % (95% CI)	100% ($N = 414$) % (95% CI)
1	74 (70.0–78.0)	76 (63.4–86.4)	74 (69.2–77.8)	79 (69.6–87.1)	73 (68.2–77.2)
2	71 (66.4–74.6)	67 (54.0–78.7)	71 (66.5–75.2)	63 (52.2–73.3)	72 (67.7–76.5)
3	74 (70.2–78.2)	77 (62.5–87.2)	74 (69.5–78.1)	65 (54.1–74.6)	77 (72.2–80.9)

control period before intervention were included [20]. However, it was reasoned that neither approach would have provided a valid control. A control group of GPs would have consisted of doctors who continued to deliver their usual care during the same period without the influence of attending educational programs, reading publications or discussing problems on these subjects with colleagues. This would have created an artificial environment, which would no longer represent daily practice. A control group as well as a 'before and after' design would have included registration of actions during consultations on detailed research forms, without influencing the nature of delivered care. Such registration would undoubtedly have evoked the performance of actions mentioned on the forms, and thus the control group or control period would not have represented the usual care situation. The alternative of collecting information on delivered care from the patients' records would have been unsatisfactory because these are usually restricted to outcome measures relevant for the follow-up of the patients.

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