Does a reduction in general practitioners' use of diagnostic tests lead to more hospital referrals?

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SUMMARY

Background. *Individual feedback on general practitioners' requests for tests can improve the quality of their test ordering behaviour. Little is known of the side effects on hospital referral behaviour when the use of tests is reduced through feedback.*

Aim. *A study was undertaken to explore changes in general practitioners' hospital referral rates in a region where their use of diagnostic tests is reduced through feedback.*

Method. *Trends in test requests and of first referrals to specialists were compared among 64 general practitioners in the Maastricht region of the Netherlands where routine feedback on test ordering behaviour is provided by the diagnostic coordinating centre.*

Results. *Reduction in diagnostic test use was not accompanied by a higher hospital referral rate, not even for specialties related to tests discussed in feedback. Good responders to feedback had decreased hospital referral rates in contrast to increased rates for poor responders (P<0.01).*

Conclusion. *Reducing the volume of general practitioners' diagnostic tests through feedback does not lead to more specialist referrals. Together with lower test use, fewer hospital referrals were seen.*

Keywords: hospital based diagnostic tests; patterns of work; utilization; referral of patients to hospital for investigation; referral rates.

Introduction

EXPENDITURE on health care is increasing. Measures to achieve a more efficient use of medical care are needed. Methods have therefore been developed to reduce the use of diagnostic or therapeutic facilities. One of the ways to change diagnostic test ordering behaviour by doctors is through feedback.[1-4] This method can reduce the number of tests requested leading to considerable savings in costs, although this is not necessarily a matter of course.[5,6]

One important factor seems not to be discussed regarding savings in costs through feedback, namely the fact that refraining from one action may lead to another action as a substitute. In primary health care such a substitute is possible by hospital referral. This can be explained as follows: fewer requests may lead to less certainty in the doctor's diagnostic work up.[7] When diagnostic testing is discouraged but more certainty is desired, alternative actions might be considered. Secondly, from the patient's perspective, when a demand for a test is not granted, a demand for a referral may occur. Finally, the increased consumption of medical care may lead to greater pressure of work, and thus to higher test request and referral rates.[8] More referrals are not automatically undesirable. In a situation, however, where tests can be left out without loss of diagnostic certainty, the occurrence of higher referral rates owing to fewer test requests can be considered as being an adverse side effect.

What is known of the relationship between test ordering behaviour and referral behaviour? Literature shows that general practitioners who request many diagnostic tests also refer patients more readily.[8] Regarding potential explanatory factors there is no clear evidence. Concerning practice, doctor and patient characteristics there is only limited and contradictory information.[8-11] Hartley and colleagues, for example, concluded that older doctors tended to request fewer tests but no significant correlation with referral rates was found.[8] Wilkin and Smith found that younger doctors made fewer referrals.[11] Mokkink found that doctors with an 'integrated' practice style had a patient- and goal-oriented approach and were reserved in the use of tests and referrals.[10]

What happens when test ordering behaviour is changed? If fewer requests led to more referrals, feedback might possibly do more harm than good. Although such a side effect was theoretically possible, we did not expect it to occur. Moreover, research has shown that, even after direct intervention, referral behaviour itself is difficult to change.[12]

Since 1985, the diagnostic coordinating centre in Maastricht, the Netherlands has been giving feedback on test requests to every general practitioner in the area. Overviews have shown a reduction in the volume of requested tests: tests frequently designated as inappropriate showed reductions of up to 95% after two years.[5] The effect on referral rates of the feedback was studied by analysing hospital referral patterns in the region over a period in which feedback had changed test ordering behaviour considerably. The following questions were addressed: What is the relationship between test ordering behaviour and referral behaviour? Is a reduction in the volume of test requests through feedback accompanied by a higher referral rate?

Method

Background

The diagnostic coordinating centre in Maastricht processes all the test requests of the 85 affiliated general practitioners in a catchment area of 187 000 patients. Feedback on test ordering behaviour is provided twice a year as a routine procedure. The feedback aims to improve the appropriateness of test ordering. In the feedback, comments are made about inappropriate requests, and recommendations are offered with regard to rational diagnosis, using accepted background information such as regional guidelines or standards set by the Dutch college of general practitioners (Nederlands Huisartsen Genootschap). The feedback is based on an analysis of request forms filled in by the general practitioner in the course of one month.[13] Appropriateness of the

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test request can be assessed since clinical data on the patient (complaints, signs, symptoms, possible diagnosis, and so on) are provided with each request.

Data collection

Data on all test requests from all affiliated general practitioners were available. The centre has been recording every request from all individual general practitioners in the Maastricht region since 1983. The number of requests per year per general practitioner per test was calculated over the period 1986–91. Data on all referrals per general practitioner per specialty per patient (anonymously) were obtained from the regional health insurance service VGZ. In the Netherlands the first referral is usually initiated by the general practitioner, or sometimes requested by the patient. Repeated referrals are usually not initiated by the general practitioner. For the comparison of referral data with request data only first referrals were used. Data on first referrals were available over the period 1986–92. The health insurance service considers a referral to be a first referral when it is not preceded by a similar referral within the last 16 months.

Analysis

In a retrospective analysis, test request data and hospital referral data from the Maastricht region over the period 1986–91 were studied. For every year for each general practitioner the number of referrals was related to the number of requests, in order to determine the correlation between these two factors. The possibility that lower test use through feedback affected referral behaviour was studied on three different levels.

First, for every general practitioner the correlation between test request trend and hospital referral trend over the period 1986–91 was studied.

Secondly, referrals were analysed and compared for individual specialties. It was expected that any changes in referral patterns owing to feedback would occur particularly for internal medicine and, to a lesser extent, orthopaedics which are closely related to the clinical problems for which diagnostic tests are frequently requested. Referral trends for these specialties were compared with those of two specialties not closely related to tests discussed in the feedback, namely surgery and gynaecology. Trends of first referrals over the period 1986–92 were compared for these four specialties.

Finally, referral trends were compared for two groups of general practitioners. If present, a side effect of feedback on referral rates should be particularly evident for good responders to the feedback (good responders being general practitioners with the strongest change in test ordering behaviour according to the recommendations in the feedback). The response of each general practitioner to the feedback was assessed by determining the percentage decrease in the number of requests for 11 tests (1987 compared with 1984). In the feedback provided since 1985, on the basis of accepted regional guidelines, these 11 tests (haemoglobin concentration, packed cell volume, erythrocyte sedimentation rate, erythrocyte count, leucocyte count, differential count, alanine aminotransferase concentration, a spartate aminotransferase concentration, lactic dehydrogenase concentration, iron concentration and urea concentration) were frequently and repeatedly designated in the feedback as unnecessary or inappropriate for specific indications. Particularly in these cases, a decrease in test requests reflects a good response to the feedback. Based on the percentage decrease, general practitioners were divided into four quartiles. The referral patterns of the upper (good responders) and the lower quartile (poor responders) were compared for all four specialties, and for internal medicine separately, between 1986 and 1992.

Statistical analysis

The correlation between test ordering behaviour and referral behaviour in every year was determined by means of the Spearman rank correlation coefficient. Whenever the relationship between a change in test ordering behaviour and a change in referral behaviour was studied, trends were compared. Trends per general practitioner were taken to be the average change per year as calculated by linear regression of numbers of requests and referrals versus year.[14] The significance of the differences in trends per general practitioner between individual specialties was tested by means of the Wilcoxon signed rank test. The significance of the differences in trends between good and poor responders was tested by means of the Mann Whitney test. A two-sided significance level of 0.05 was used in all calculations.

Results

Of the 85 general practitioners affiliated to the centre, 82 agreed to the analysis of referral data. Several general practitioners retired from practice or started practice during the study and so were not working during the whole study period; their data were excluded. Finally, 64 general practitioners were included in the study.

The number of test requests by the 64 general practitioners were compared with their number of hospital referrals over the period 1986–91. A clear correlation was found in every year ($0.50 \leqslant r \leqslant 0.74$, $P<0.001$). The strongest correlation was found in 1986 (Figure 1). The scatterplot shows a relatively linear correlation; thus in the Maastricht region those who ordered most tests were also those with the highest referral rates.

The possibility of a higher referral rate owing to a lower use of diagnostic tests was studied. The number of first referrals appeared to decrease with a decrease in the use of tests (regression coefficient –0.68, standard error 0.13, $P<0.001$).

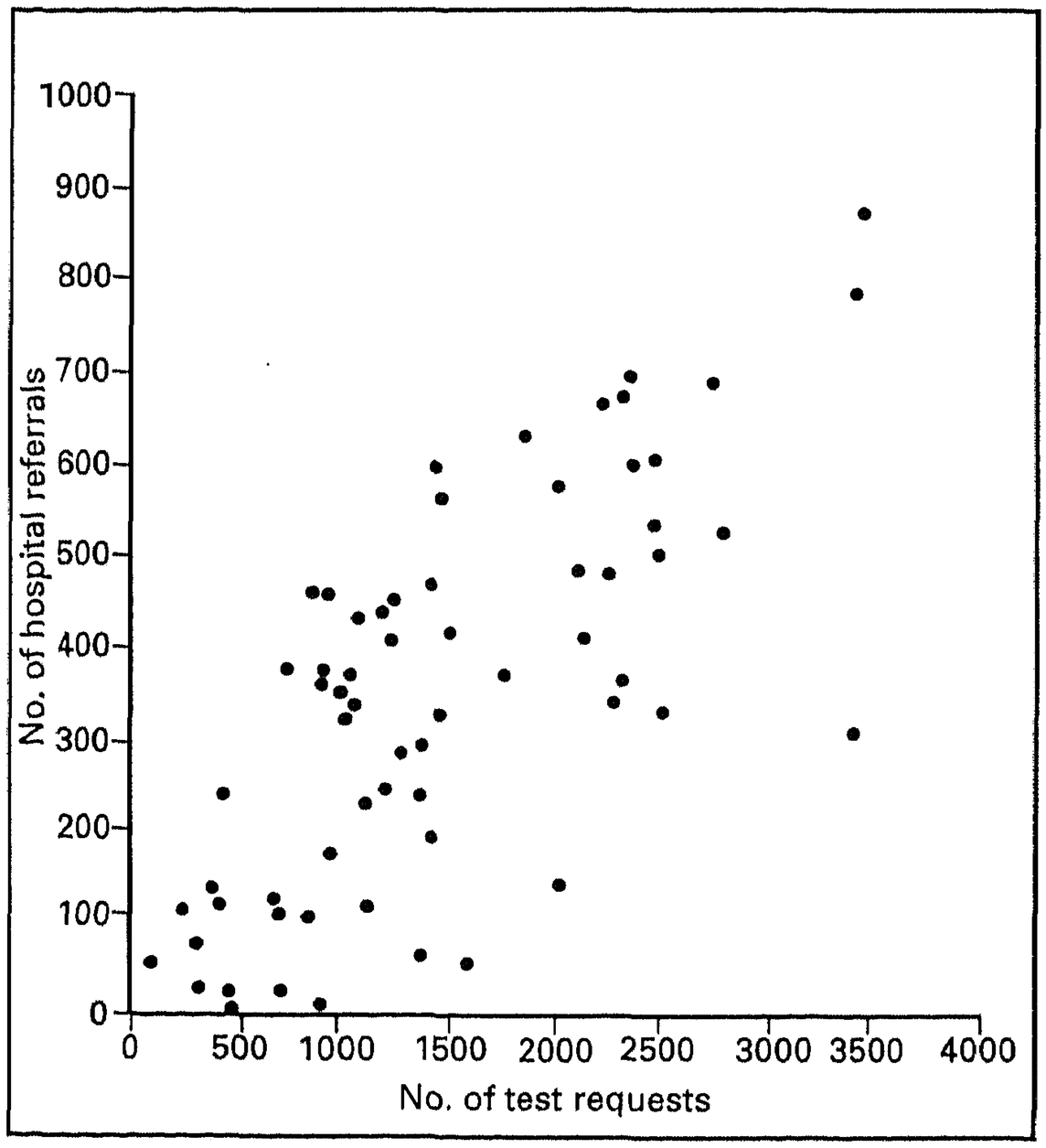

Figure 1. *Number of test requests per practitioner versus the number of first referrals per practitioner for the 64 general practitioners in 1986.*

The trends in referrals to internal medicine, surgery, orthopaedics and gynaecology between 1986 and 1992 are shown in Figure 2. Although the absolute numbers of referrals were different, no differences in trends were identified.

When the referral trends to all specialties of the 16 good responders to feedback were compared with those of the 16 poor responders, a small but significant difference was seen (Table 1). The general practitioners who responded best to the feedback on test requests showed a decrease in the number of referrals they made between 1986 and 1992, whereas those who responded poorly showed a slight increase. The difference in the trends of the two groups was significant ($P<0.01$).

Referral trends to internal medicine specialists were analysed separately (Table 1). In the years that the feedback was provided, a small decrease was seen in the number of referrals by the good responders while the number of referrals increased slightly for the poor responders. The difference between the referral trends of good and poor responders was significant ($P<0.01$).

Evidence of an increase in referral rates owing to fewer test requests could have been hidden by a nationwide trend of decreasing referrals. Therefore, the trend of all referrals to all specialties in the Netherlands (only the total for all Dutch general practitioners together was available) was compared with the same trend in the Maastricht region. The referral trend in the Maastricht region was not found to be different from the overall national referral trend (Table 2).

Discussion

The results show a strong correlation between number of test requests and number of hospital referrals, and statistically significant differences in the referral patterns of good and poor responders to the feedback. Moreover, the differences suggest that when numbers of test requests are reduced through feedback, numbers of referrals decrease as well. Some aspects need further consideration.

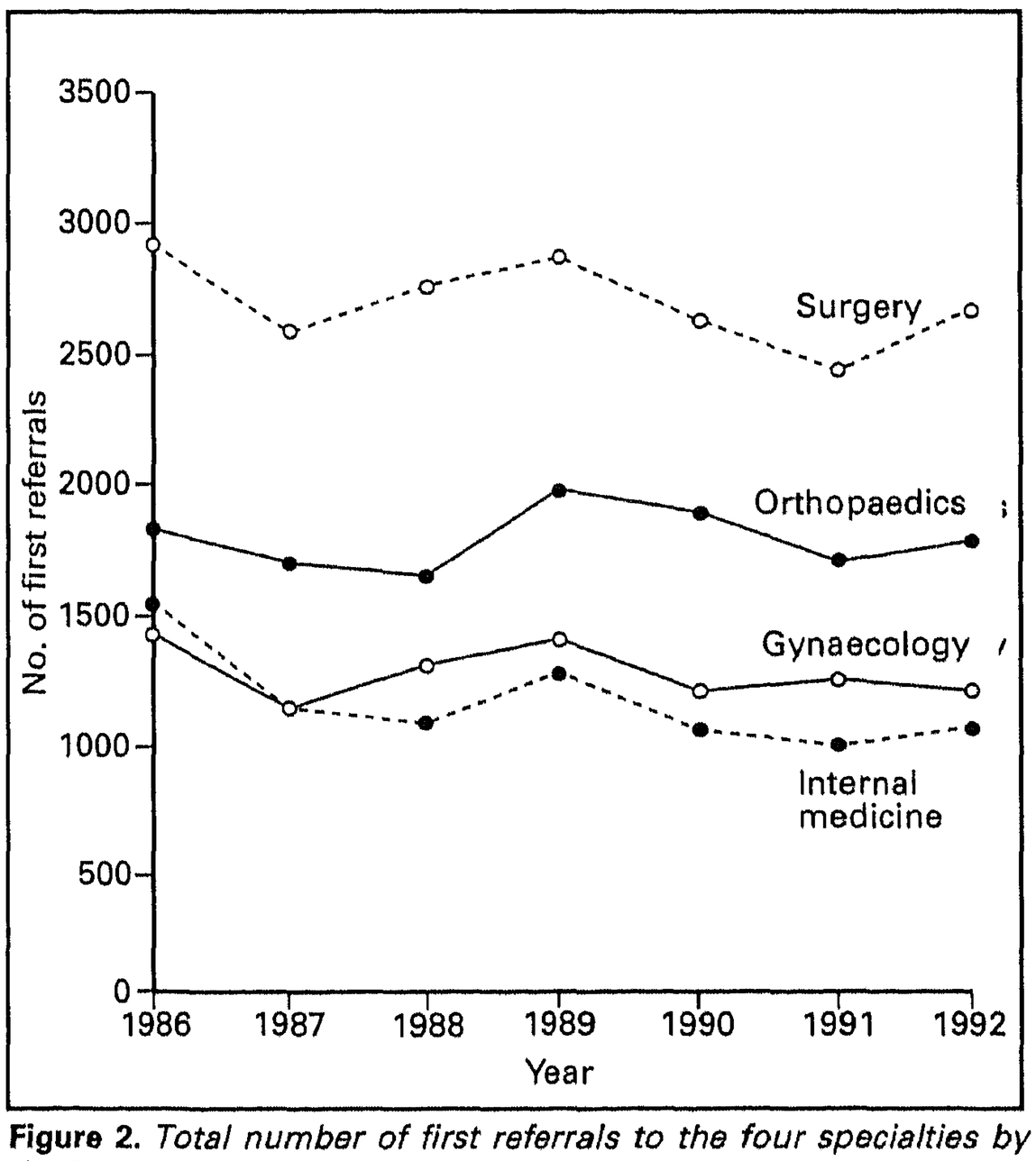

Figure 2. *Total number of first referrals to the four specialties by the 64 general practitioners, 1986–92.*

Table 1. Total number of first referrals to all four specialties and to internal medicine, for those who were good responders and poor responders to feedback, 1986–92.

	No. of first referrals made to			
	All four specialties		Internal medicine	
Year	Good responders (n = 16)	Poor responders (n = 16)	Good responders (n = 16)	Poor responders (n = 16)
1986	8309	8309	586	586
1987	6815	8840	440	565
1988	6587	8555	380	609
1989	6899	9905	469	788
1990	6243	9020	363	633
1991	5688	8665	339	548
1992	5717	8553	377	612

n = number of general practitioners.

No pre-feedback data on first referrals were available. Nevertheless, data on referrals to all specialties per 1000 patients give the impression that referral trends were stable shortly before and during the whole feedback period. Separate data show that in Maastricht the numbers of referrals were stable in the period 1983–86 (data not presented owing to different presentation)(Jaarboeken LISZ/IBIS. Zeist, 1983–91).

Health insurance service data do not automatically reflect the whole population. In the Netherlands more than 60% of the population are compulsorily insured by the health insurance service, according to level of annual income. The remainder are insured by private insurance companies. Referral behaviour is independent of the type of health insurance of the patient and, therefore, referrals of the health insurance service patients can be considered to be representative of the referral behaviour of general practitioners.

The results show that those who ordered a high number of diagnostic tests were also those with high hospital referral rates. This is in accordance with the findings of others.[8] In a separate analysis, no practice or practitioner characteristic was found (including experience, attitude to risk taking, conception of task and practice type) that explained why some doctors ordered more tests or referred more patients than others (unpublished data).

There was a wide range in the number of test requests and hospital referrals ordered by the doctors. Although not presented in the results here, the general practitioners with low numbers of tests requests and referrals were mainly located at the borders of the catchment area of the diagnostic centre and the regional health insurance service. These doctors therefore also referred patients to another hospital and diagnostic centre. Test requests and referral trends for these doctors did not change between 1986

Table 2. Number of referrals to all specialties per 1000 patients over the period 1985–90 in the Maastricht region and in the whole of the Netherlands.

	No. of referrals to all specialties per 1000 patients in	
Year	Maastricht	Netherlands
1985	454	455
1986	455	459
1987	441	452
1988	426	479
1989	450	455
1990	451	461

and 1991. Test request and hospital referral trends therefore do not depend on practice location.

Changes in test use and referral rates could have been caused by changes in practice size. Although not presented in the results, there was no indication that in the good responders group the number of patients had decreased between 1986 and 1992 or that in the poor responders group the number of patients had increased. The differences between both groups therefore cannot be explained by changes in practice size. During the study no other interventions were taking place which could have changed referral behaviour.

The results reveal a remarkable effect: where higher hospital referral rates were theoretically possible, the reduction in the volume of test requests was in fact accompanied by a reduction in the number of referrals. This suggests that test ordering behaviour and referral behaviour correlate even more than had previously been expected.

Feedback should aim primarily at improving the appropriateness of test ordering behaviour. When advice is followed, this does not lead to more uncertainty and hence to a higher hospital referral rate. The study's findings cannot be applied automatically to feedback that aims solely at reducing the volume and/or expense of diagnostic testing. It cannot be ruled out completely that an unselective reduction in the number of test requests will lead to more uncertainty and thus to more referrals.

The absence of side effects of test feedback on hospital referral rates has important financial consequences. If referral rates had increased owing to feedback, the possible financial benefits of feedback, that is lower expenditure on diagnostic tests, would have been negated. The data from the present study suggest that the decrease in the volume of test requests through feedback is more likely to be accompanied by a lower hospital referral rate, resulting in even greater savings in costs.

The findings permit the following conclusions. When feedback is used to improve the quality of test ordering behaviour of general practitioners and the number of test requests consequently decreases, this change is not accompanied by a higher hospital referral rate. Whether the same holds true when feedback is provided merely to reduce the volume or cost of requests is not known.

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