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Factors predicting differences among general practitioners in test ordering behaviour and in the response to feedback on test requests

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Background. In a population of 85 general practitioners diagnostic test ordering behaviour has been changed by means of repeated individual feedback provided since 1985.

Objectives. We studied practitioner and practice characteristics which may explain differences in test ordering behaviour and in the extent to which general practitioners tend to change their behaviour according to the feedback.

Method. In order to trace such variables, 75 general practitioners were interviewed. In our study request data from individual general practitioners were related to data from several questionnaires.

Results. We found no practice characteristics which were of influence on the number of test requests by the general practitioner. Explanatory practitioner characteristics for this were found to be years of experience and working hours per week in practice.

Conclusions. More years of experience as a general practitioner and a shorter duration of consultations correlated with a better response to advice given in the feedback.

Keywords. Feedback, test ordering behaviour, practice characteristics, practitioner characteristics.

Introduction

The use of diagnostic tests has been increasing for many years. There is a growing awareness that the use of diagnostic tests should be reduced.¹ To change test ordering behaviour several strategies have been tested. Studies have shown that restricting test availability and, more importantly, educational strategies to improve test ordering behaviour such as feedback or reminders can reduce the amount of (unnecessary) test requests leading to savings in medical costs.²⁻⁹ When interventions are

to be implemented to change test ordering behaviour it is crucial to be informed about factors influencing test ordering behaviour to link the interventions to these factors. Why do some general practitioners (GPs) change their behaviour pursuant to a strategy while others do not?

Test ordering behaviour varies among GPs. Various GP and practice characteristics such as diagnostic equipment in practice, the attitude to risk-taking, the practice type and the years of experience of the GPs are mentioned as possible causes for differences in test ordering behaviour.¹⁰⁻¹⁶ The results of the studies are, however, not consistent.

Like test ordering itself, the response to strategies to improve test ordering behaviour seems to vary among GPs. It is uncertain which factors can explain such differences. Virtually no studies have been performed on this issue so far. Information on factors explaining

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differences in behavioural change is important for implementing strategies to change test ordering behaviour. The study in this paper addressed the topic of variation in (change of) test ordering behaviour, carried out in the Maastricht region, The Netherlands.

In the Maastricht region, repeated individual feedback has been provided to all GPs since 1985. The aim of this feedback is to improve the rationality of requests and to reduce the number of unnecessary requests.¹⁷ Since the start of the feedback there has been a clear improvement of rationality and a reduction in the volume of tests ordered.^{18,19} The extent to which the GPs responded to the feedback clearly varied per GP.

In our study the following questions were addressed: (i) which factors explain differences in test ordering behaviour of GPs? and (ii) which factors explain the extent to which the GPs respond to the feedback on test requests?

Methods

Background

The Diagnostic Co-ordinating Centre Maastricht (DCC) processes all test requests of the present 85 GPs in the Maastricht region. Twice each year since 1985, the DCC has been providing these GPs with individual feedback. The critical comments in these written reports are based on the analysis of request forms which are completed by GPs when requesting a diagnostic test. The request form asks for additional information about the patient, such as signs, symptoms, possible diagnosis, medication and the reason for request. The comments given in the feedback are based on a comparison of the request (in combination with the accompanying clinical information on the patient) with accepted national and regional guidelines.²⁰

At the time of the study 83 GPs, regularly requesting diagnostic tests at our centre, were working in practice. They all received individual feedback reports regularly. One GP was excluded from participation in the study because he was involved in the development of the study. Four general practitioners were excluded because they had been working in the area for less than a year. The remaining 78 GPs were included.

Data about GP and practice characteristics were collected through interviews. The interview was chosen as a method to get the response and answers as complete as possible. Also, the chance of misinterpreting answers is decreased in this way. To receive answers as reliable as possible on sensitive subjects (practice size is such an issue in The Netherlands), a few questions were presented to the interviewed GP in an additional, mailed questionnaire. The interviews were held by an interviewer not related to the DCC, specially trained for this purpose. Pilot interviews were held with three GPs who did not participate in this study.

The questionnaires addressed the following topics.

Opinions on activities (such as feedback) of our centre: the extent to which one agrees with the given advice and guidelines, satisfaction with the centre and about individual feedback, (perception of) personally noticed effects of the feedback.

Practitioner characteristics: years of experience, conception of one's task, handling of guidelines, attitude to risk-taking, attending postgraduate education, keeping up with literature, mean duration of consultations and medical hobbies. The attitude to risk-taking and the conception of the GP's task were assessed by means of validated questionnaires from other studies.¹⁵

Practice characteristics: type of practice, practice size and test facilities in practice.

To determine test ordering behaviour per GP we used data from our centre; as a measure we took the total number of requests during the year prior to the interview. To determine the change in test ordering behaviour as a response to feedback, we calculated the change in terms of percentage of the number of requests per practitioner for 11 selected tests (haemoglobin, packed cell volume, erythrocyte sedimentation rate, erythrocyte count, leucocyte count, differential count, serum iron, serum urea, aspartate aminotransferase, alanine aminotransferase and lactate dehydrogenase). The change was determined by comparing the number of tests requested by each practitioner in the year before he/she received his/her first feedback report with the number of requests of those tests in the year prior to the interview. For these 11 tests a decrease in the number of requests, as a result of feedback, could be expected. Feedback on these 11 tests has been given to virtually all GPs repeatedly since 1985. GPs were advised to request these tests only for specific indications; a decrease in the number of requests for these 11 tests has been demonstrated.¹⁸

Analysis

Using correlation analyses (Spearman correlation coefficient r), variables were selected which had a significant relation to the differences in test ordering behaviour and in response to feedback. Multiple linear regression has been used additionally. Test ordering behaviour showed a non-normal and skewed distribution which was remedied using a log-transformation. For the same reason a log-transformation was applied to the response to feedback too.

Results

Of the 78 GPs included in the study, 3 refused participation. Therefore, the response was 96% (75 GPs). Table 1 shows that with regard to several characteristics the

TABLE 1 *Characteristics of the participating GPs in the Maastricht region compared to all Dutch GPs*

Variable	Maastricht region	Nationwide*
<i>n</i>	75	6595
Mean age	—	44**
Mean years in practice	15	—
Gender		
Male (%)	89	85
Female (%)	11	15
Practice setting		
Solo (%)	51	52
Group practice (%)	40	39
Health centre (%)	9	9
Urbanization		
City	68	25
Others	32	75
Mean number of patients	2250*	2310

* Source: data from general practitioners' registrations, NIVEL 1993, Utrecht.

** Estimation.

participants do not substantially differ from the whole population of Dutch GPs, with the exception of the degree of urbanization.

In general, the questionnaires were filled in almost completely, with the exception of some open questions concerning the number of patients, medical hobbies, postgraduate education activities and handling of medical guidelines and standards.

For a number of questions the answers did not spread enough (identical in more than 80% of cases). Therefore it was not possible to relate these variables to test ordering behaviour and the response to feedback. This was especially true for the questions concerning satisfaction about the working method of the DCC and the given feedback. Almost all responders (97%) indicated satisfaction with the centre.

Of all 75 interviewed GPs the test ordering behaviour could be determined. For six GPs a change in the number of requests for 11 selected tests, being an in-

indicator of the response to feedback, could not be determined since they had not been working long enough to expect a change in the number of requests. Therefore, for 69 of the 75 interviewed GPs it was possible to determine a change in request numbers due to the feedback.

Test ordering behaviour was related in the first place to the size of the practice. Practice size ranged from 1800 to 6900 and was not supplied in nine cases. The results of the Spearman correlation analyses are listed in Table 2. Test ordering behaviour had a significant positive relation to years of experience ($P < 0.01$), conception of task ($P = 0.03$) and hours per week in practice (manpower) ($P = 0.02$).

In the multiple regression analysis we found positive relations of test ordering with practice size (for solo practices only) and with manpower. Corrected for these predictors, no other variables were significantly related with test ordering behaviour. For example, using regression, we found no significant relation to attitude to risk-taking ($P = 0.81$) nor conception of one's task ($P = 0.46$). In these analyses, two significant outliers (Bonferroni-corrected outlier test) were omitted.²¹

The response to feedback correlated significantly with years of experience and mean duration of consultations. There was a negative relation of log [response to feedback] to years of experience ($P < 0.001$). A positive relation was found between the response to feedback and duration of consultations ($P = 0.03$). In multiple regression analysis we found these same two to be significant predictors: more years of experience or a shorter mean duration of consultations meaning a better response to feedback. Corrected for these variables, no other potential predictors were significant.

Discussion

Like in other studies, few factors came forward from this study which show a relation to test ordering behaviour of GPs. Apart from years of experience and hours per week the GP worked in practice, no explanatory factors of test ordering behaviour were found.

TABLE 2 *Results from Spearman correlation analysis for practitioner and practice characteristics*

Variable	Test ordering behaviour			Response to feedback		
	Spearman <i>r</i>	<i>P</i>	<i>n</i>	Spearman <i>r</i>	<i>P</i>	<i>n</i>
Experience	0.33	<0.01	75	-0.42	<0.01	69
Duration of consultations	0.07	0.56	65	0.29	0.02	60
Conception of task	-0.26	0.03	75	0.07	0.57	69
Attitude to risk-taking	-0.16	0.18	75	0.09	0.45	69
Reading literature	0.15	0.21	74	0.13	0.29	69
Practice type	-0.04	0.76	75	0.21	0.08	69
Manpower	0.29	0.02	73	0.21	0.09	67
Use of own test facilities	0.01	0.94	74	0.04	0.76	68

Some factors, like diagnostic facilities in practice, attitude to risk-taking and practice type, which are described in the literature as being of influence on test ordering behaviour do not appear to be explanatory factors in our study. This is surprising since for the attitude to risk-taking in our questionnaire the same questions were used as in earlier studies.^{14,15} Comparing the different studies, it was not possible to find any explanation for the discrepancies in study findings. In earlier studies in which diagnostic facilities appeared to be a possible (but not significant) explanatory factor, however, the presentation of the questions was different.¹⁴ Therefore, the results may not be entirely comparable.

Practice size could be an important explanatory factor. Unfortunately, there is doubt on the reliability of answers to this question. Apart from the number of questionnaires in which practice size was not given (12%), a few GPs afterwards admitted that they filled in an incorrect number of patients. Practice size is a sensitive subject for many Dutch GPs.

Concerning the response to feedback, in our study years of experience and mean duration of consultations correlated well. The duration of consultation is related negatively to the response to feedback. A shorter duration of consultations may be caused partially by a higher work load. An explanation may be that when a GP is more experienced consultations take less time. Experience and duration of consultation correlate very well ($P < 0.01$). Thus, more experienced GPs seem to work faster.

Apart from this, our study results show no factors that explain differences in test ordering behaviour or the response to feedback. Also, there is still no evidence that factors explaining differences in diagnostic test ordering behaviour of GPs have any influence on the response to feedback.

The effect of feedback has been reported to depend on the degree in which the person who gives the feedback and the given feedback itself are appreciated.¹⁴ In our study, which was confined strictly to the DCC region, this could not be evaluated because only one person has been given feedback, according to a fixed pattern. In addition the great satisfaction about the feedback is satisfying in itself, but hindered further research into the influence of satisfaction.

For the study a good response in the interview was important, because a large number of variables had to be checked. This good response is probably a result of the generally high level of satisfaction of GPs with our centre and the feedback provided. This satisfaction has been expressed not only in this but also in earlier interviews.^{17,22}

Only a few explanatory factors for test ordering behaviour of GPs and for the response to feedback have come forward from our study. Test ordering behaviour may be determined by a complex range of factors, but

for the time being it is not very clear which factors are responsible. Obviously, the response to interventions to change test ordering behaviour is determined by many factors also. The results of various studies on test ordering behaviour are not unequivocal. Studies on this topic remain desirable, especially into factors which may influence effects of interventions. When explanatory factors for changes in test ordering behaviour as a response to strategies such as feedback are better known, better methods to change test ordering behaviour can be developed.

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