The implementation of evidence-based medicine in general practice prescribing

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SUMMARY

Background. *Research on the implementation of evidence-based medicine has focused on how best to influence doctors through information and education strategies. In order to understand the barriers and facilitators to implementation, it may also be important to study the characteristics of those doctors and practices that successfully implement evidence-based changes.*

Aim. *To determine the relationship between practice and doctor characteristics and the implementation of recommended evidence-based changes in the area of prescribing.*

Method. *Visits were made to 39 practices in southern England. Audits of three key prescribing changes were carried out and amalgamated to produce an 'implementation score' for each practice. These scores were related to a wide range of practice and doctor variables obtained from a questionnaire survey of doctors and practice managers.*

Results. *There was wide variation between the practices' implementation scores (mean 67%, range 45% to 88%). The only factors that had a significant relationship with implementation of these important prescribing changes were an innovative approach among the doctors (most practitioners were cautious of change), and fundholding status. Use of clinical protocols, disease registers, or computers was not associated with overall implementation score, nor was the doctor's age. Doctors complained of information overload.*

Conclusions. *The emphasis on the need for evidence in medicine, and better transmission of information, needs to be balanced by a recognition that most general practitioners are pragmatic, averse to innovation, and already feel overwhelmed with information. Important advances in therapy may be crowded out. More attention should be given to the facilitation of priority changes in practices.*

Keywords: evidence-based medicine; prescribing; audit; general practitioners.

Introduction

ENSURING that the findings of research are implemented in clinical practice is a major challenge for the health service.[1-3] This is particularly relevant to prescribing by general practitioners (GPs), which consumes more than one-tenth of National Health Service (NHS) resources, and where there is scope for considerable health gain if patients receive the most appropriate treatment.[4] Previous research has concentrated on how best to use education and information to influence doctors.[5,6] GPs are inundated with advice, particularly about their prescribing. A better understanding may come from a study of the recipients of the information rather than on how the message is delivered. Why and how do some practices introduce change in response to evidence, when others do not?

Earlier work that studied the variation in GP prescribing habits using routinely available data has been inconclusive.[5] We were interested in prescribing as a model for the introduction of evidence-based change more generally, and used an in-depth approach with a small number of practices to examine a wide range of variables that might act as barriers or facilitators of change. These included issues of practice structure, working relationships, information, doctors' personal style and background, all assessed using quantitative methods. In addition, we used qualitative techniques to study the process of change and doctors' perceptions of factors that facilitate or hinder change. We compared doctors' perceptions about influences on prescribing, the characteristics of practices, and actual prescribing behaviour through a process of triangulation.

This paper presents the quantitative results. What are the characteristics of practices that successfully introduce evidence-based prescribing initiatives?

Method

Practices

The study was conducted between January 1996 and February 1997, among 39 general practices in North Thames, Buckinghamshire, Hertfordshire, and Berkshire. These areas encompass deprived, urban, suburban, and rural districts. Practices were randomly selected using a stratified sampling process according to fundholding, training, and dispensing status in order to obtain similar numbers of each type. Practices declining to participate were replaced by the next randomly selected practice of similar type. Single-handed practices and those without computerized prescribing systems were excluded.

Marker conditions

Four marker conditions were chosen as indicators of evidence-based practice. These fulfilled the criteria of reflecting a change that had been consistently recommended to GPs within the past five years — about which there was consensus that a change was needed based on research evidence — and were amenable to audit. The chosen markers were the use of warfarin or aspirin in patients with atrial fibrillation,[7] the use of ACE inhibitors in patients with heart failure,[8] the substitution of trimethoprim for co-trimoxazole,[9] and the identification and eradication of *Helicobacter* infection in patients with peptic ulceration.[10] The *Helicobacter* audit proved impractical, so further analysis was based on the remaining three audits.

Audits

The extent to which practices had implemented prescribing change was assessed through audit of notes for the first two

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Submitted: 23 February 1998; final acceptance: 3 July 1998.

marker conditions, and from analysis of PACT data for the third. For the audits, an initial list was made of patients who had a computer diagnosis of atrial fibrillation or heart failure, or who were being prescribed digoxin or loop diuretics respectively. Although computer records of diagnoses may have been incomplete, most patients with atrial fibrillation or heart failure would be taking one of these drugs. This was followed by audit of the written and computer notes of these patients in order to identify those who were currently treated for heart failure or atrial fibrillation, had no contra-indications, and were eligible for treatment. If possible, the notes of all identified patients were audited. In large practices, notes were randomly selected until 60 patients with each condition were identified as eligible for the recommended treatment. The trimethoprim marker was assessed from the number of prescriptions for trimethoprim in relation to prescriptions for co-trimoxazole or trimethoprim in the six months ending June 1995, before the Committee on Safety of Medicines limited the use of co-trimoxazole. Each audit provided a proportion of patients receiving the recommended treatment; these three proportions were averaged for each practice to produce an 'implementation score'.

Practice and doctor variables

Information about practice structure and organization was obtained from questionnaires completed by all doctors and practice managers. These questionnaires included information about practice size, patient demographics, premises, use of computers, the practice team, practice meetings, and the use of clinical protocols and disease registers. Information about the characteristics of doctors included their age, sex, and qualifications. Measures of professional behaviour included questions about doctors' continuing education, reading habits, and perceived sources of influence. Finally, the doctors completed a personality measure: the Kirton Adaption-Innovation inventory (KAI).[11] The KAI is a validated measure of an individual's preferred approach to problem solving. It scores individuals on a scale from highly adaptive (people who prefer change that is a development of existing methods) to highly innovative (people who prefer change that is radical and novel). Individual scores can be averaged for a group to create a measure of 'cognitive climate'.[11] In addition, interviews were carried out with two doctors in each practice, which focused on the process of change, and the GP's approach to scientific evidence (these results will be published later).

Analysis

Data were analysed using SPSS. Continuous variables relating to individual doctors were averaged for each practice, so that the unit of analysis related to the practice for both prescribing scores and explanatory variables. The independent effect of variables on the implementation score was assessed using multiple regression analysis.

Results

Out of the 100 practices invited to participate, 44 agreed. Five fundholding practices were omitted because this category was over-subscribed, leaving 39 practices to visit. Comparison of practices agreeing or declining to participate showed similar proportions of fundholding and dispensing practices, but training practices were over-represented in the group agreeing to participate (54% [24/44] versus 25% [14/56] of practices who declined).

Audits

There was considerable variability between practices in terms of implementation score (Table 1), with a mean score of 67% (95% CI = 64% to 70%; range 45% to 88%). There was little correlation between performance in each audit.

Practice characteristics

Fundholding practices had slightly higher scores on all three audits, reflected in slightly higher overall implementation scores (69% [65% to 73%] versus 64% [59% to 68%]), but the difference was not significant ($P = 0.08$).

There was no significant relationship between training practice status and overall implementation score, although training practices did have slightly higher scores for the ACE inhibitor audit (mean 53% [45% to 61%] versus 43% [37% to 49%]; $P = 0.07$).

A number of questions in the questionnaire asked practices about their level of use of computers in various clinical activities, each scored from 1 (always use the computer) to 5 (never use the computer). A composite 'computer usage' score was calculated by averaging results from these questions. There was a significant correlation between computer usage and the atrial fibrillation audit (–0.39, $P = 0.01$) but not the other audits or the overall implementation score.

Practices who used disease management protocols did not achieve higher implementation scores. In several practices, the doctors did not all agree on whether or not they even had a practice protocol. In particular, the five practices with a protocol for heart failure achieved a score for the ACE inhibitor audit that was no higher than those without a protocol. Most responders (53% [86/163]) did, however, consider that protocols were 'often' useful, and a further 38% (62/163) said they were of 'occasional' use.

Access to disease registers did not appear to influence implementation scores, except that those practices that were able to obtain a register of patients with atrial fibrillation achieved higher scores for the audit of aspirin/warfarin (mean score 70% [65% to 74%] versus 55% [44% to 66%]; $P = 0.04$).

No relationships were found between implementation scores and the number or type of staff in the practice team, or the frequency of team meetings.

General practitioner characteristics

Completed questionnaires and KAI scores were obtained from 180 (98%) of the 184 doctors in the 39 study practices.

There was a significant relationship between the mean age of the practice doctors and the implementation score for ACE inhibitors ($r = –0.33$, $P = 0.04$), but not with the other audits or overall implementation score.

Sources of information

The most frequently read source of prescribing information was the *Drug and Therapeutics Bulletin*, but there was considerable variation in the numbers of GPs claiming to read original research or review articles on a regular basis. When asked to agree or disagree with a number of statements about sources of information, 71% (127/180) of doctors agreed that 'there is too much information available on prescribing changes to assimilate', and 76% (136/180) agreed that 'under present working conditions, I do not have enough time to keep abreast of recent recommendations in drug usage'.

General practitioners were also asked which sources of advice about prescribing they found most useful (Table 2).

Cognitive style

The results of the analysis of cognitive style show that GPs were inclined to an adaptive, cautious approach, with a mean score on

Table 1. Audits: proportion of patients receiving recommended treatment for marker conditions.

	Proportion of patients receiving recommended treatment (%)			Audits: number of cases identified and eligible for treatment in each practice
Implementation score	Mean	SD	Range	Median (range)
ACE inhibitor	48	16.3	20–94	59 (10–71)
Stroke prophylaxis in atrial fibrillation	66	15.6	10–96	48 (4–67)
Trimethoprim	85	16.9	28–100	254 (52–601)
Overall implementation	67	9.4	45–88	–

Table 2. Perceived usefulness of advice or information from the following sources in terms of developing prescribing habits (scored from 1 = always useful, to 5 = never any use).

Source	Mean score	95% CI interval
British National Formulary	1.60	1.48–1.72
Fellow GPs in your practice	1.71	1.61–1.81
Clinical reviews		
e.g. Drugs & Therapeutics Bulletin	2.06	1.94–2.18
Postgraduate meetings	2.20	2.10–2.30
Local hospital consultants	2.23	2.11–2.35
Practice meetings	2.41	2.27–2.55
Locally developed guidelines	2.55	2.39–2.71
Professional journals e.g. BMJ	2.64	2.50–2.78
Nationally developed guidelines	2.67	2.53–2.81
FHSA pharmaceutical advisors	2.80	2.64–2.96
GPs outside your practice	2.85	2.69–3.01
Trade press e.g. Pulse	2.95	2.81–3.09
Practice nurses	2.98	2.84–3.12
Patients	3.10	2.96–3.24
Drug representatives	3.28	3.14–3.42
FHSA medical advisors	3.31	3.15–3.47

Table 3. Multiple regression to show the relationship between independent variables and the implementation of marker prescribing changes.

Factor	Beta coefficient (standard error)	Significance
GP KAI score	0.45 (0.19)	0.024
Fundholding practice	5.92 (2.84)	0.045
Adjusted $r^2 = 0.16$		

Excluded variables: total list size, training practice status, mean age of partners, practice formulary, protocols for both hypertension and diabetes, protocol for heart failure, disease register for atrial fibrillation, 'use of computer' score.

the KAI of 91.9 (95% CI = 89.5 to 94.3; SD = 16.1; n = 180), compared with a mean score for the general population of 96 (95% CI = 94.5 to 97.5; SD = 17.5).[11] Scores below the mean are adaptive, those above are innovative. There was a significant correlation between implementation score and mean practice KAI score (r = 0.33; P = 0.04).

A multivariate analysis was carried out to assess which factors were related to the implementation scores, independently of the other variables (Table 3). The presence of more innovative partners in practices and fundholding status appeared to be most important, although the final model only explained 16% of the variance.

Discussion

Implications

This research has shown a wide diversity between practices in the implementation of important evidence-based changes in prescribing practice. Only a small proportion of this variation could be explained by structural and organizational differences, which is in keeping with previous research.[12,13] The only structural variables that appeared to be relevant were practice fundholding status, training practice status, the use made of computers, and the mean age of the practice partners. Even these factors were not consistently influential for all marker conditions.

One reason for this lack of clear explanations may lie in the importance of the GP's personality. It appears that differences in cognitive style may be more important than variables derived from practice structure or doctors' sociodemographic characteristics. The GPs' mean KAI score of 92 was below the mean for the general population. Professional groups with similar 'adaptive' scores include bank managers and maintenance engineers; by contrast, scores above the mean are typical of those in management, marketing, and academia.[11] This suggests that most GPs would be more inclined to implement small changes that they consider as evolving and improving on current treatment, and would be resistant to novel ideas. In the context of GPs trying to apply an avalanche of information to complex decisions under constant pressure of time, it is perhaps not surprising that doctors show pragmatic, adaptive characteristics.

We intended decisions about prescribing to be a model for the implementation of evidence-based medicine. A particular finding, in view of the importance attached to clinical guidelines, protocols, and disease registers, was how little an effect they had on the implementation of recommended prescribing regimes. This suggests that one should not overestimate the likely impact of sending GPs further guidelines and protocols. At present, GPs are being bombarded with advice, and their reaction is to ignore most of it. In addition, our qualitative analysis of interviews with doctors from the practices in this study shows that they doubt the credibility and relevance of the advice they receive — this is further explored elsewhere. This may mean that the up-take of highly significant and well-validated innovations is much slower than is desirable. For example, less than half of the patients with heart failure in this study were receiving the benefit of treatment with ACE inhibitors, which corresponds with other research.[8] The sheer volume of possible innovations and guides to good practice may be crowding out really important changes.

Methodological issues

This research raises several methodological issues. The response rate of 44% is unsurprising in view of the intensive practice investigation required, but may mean that the practices included were unrepresentative. This risk was lessened by the stratified sample technique, which tended to balance numbers of training, dispensing, and fundholding practices. Secondly, the audits were difficult to conduct and may have overlooked some patients. This is, in itself, a relevant finding, since the practices themselves

would have difficulties in identifying those who needed a change in treatment. Thirdly, our prescribing markers were assessed at practice level, and variables relating to individual doctors were aggregated within practices. This is realistic, as a patient's treatment may reflect decisions made by several different doctors as well as practice policy, but may mask the influence of characteristics such as the doctor's age.

Conclusion

The challenge for those seeking to influence GPs is to provide practical sources of advice that acknowledge the realities of practice life and the adaptive cognitive style of most GPs. For example, practical and instantly available information transmitted through integration with clinical computer systems may be more useful than relatively inaccessible written guidance.[14,15] Educational material should be responsive to an understanding of the cognitive approach of most GPs. Emphasizing the novelty of recommended changes in treatment based on evidence may be counter-productive, and advice should instead show how new therapies improve on existing ones. Information overload should be avoided by prioritizing new recommendations. The facilitation of change in response to evidence should be given at least as much attention as the transmission of information.

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Acknowledgements

We thank the doctors and staff in all participating practices; Phillipa Lockstone, Ana Rebola and Cindy Rajpaul for carrying out the audits; the Prescription Pricing Authority for providing PACT data; Prof. Michael Kirton and Dr Ray Clapp for advice about the KAI theory; Luke Whittaker for statistical advice; and three anonymous referees for their constructive criticism. This study was funded by the NHS Executive, North Thames Research Implementation Committee.

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