Questioning behaviour in general practice: a pragmatic study

A Richard Barrie, Alison M Ward

Pontilen, Rhewl,
Ruthin,
Denbighshire
LL15 1UL

A Richard Barrie,
*continuing medical
education tutor for
general practice*

Department of
General Practice,
University of
Western Australia,
Perth, Western
Australia

Alison M Ward,
research fellow

Correspondence to:
Dr Barrie
rbarrie@pontilen.
demon.co.uk

BMJ 1997;315:1512-5

Abstract

Objective: To study the extent to which general practitioners' questioning behaviour in routine practice is likely to encourage the adoption of evidence based medicine.

Design: Self recording of questions by doctors during consultations immediately followed by semistructured interview.

Setting: Urban Australian general practice.

Subjects: Random sample of 27 general practitioners followed over a half day of consultations.

Main outcome measures: Rate of recording of clinical questions about patients' care which doctors would like answered; frequency with which doctors found answers to their questions.

Results: Doctors asked a total of 85 clinical questions, at a rate of 2.4 for every 10 patients seen. They found satisfactory answers to 67 (79%) of these questions. Doctors who worked in small practices (of one or two doctors) had a significantly lower rate of questioning than did those in larger practices (1.6 questions per 10 patients *v* 3.0 patients, $P=0.049$). No other factors were significantly related to rate of questioning.

Conclusions: These results do not support the view that doctors routinely generate a large number of unanswered clinical questions. It may be necessary to promote questioning behaviour in routine practice if evidence based medicine and other forms of self directed learning are to be successfully introduced.

Introduction

Evidence based medicine is a style of practice in which doctors manage problems by reference to valid and relevant information. It consists of five steps: formulating answerable questions, tracking down the best evidence to answer them, critically appraising the evidence, applying it in practice, and evaluating performance.¹ Much attention has been paid to the last four of these steps, but the first step—asking appropriate questions—has received less attention.

Current understanding of the questioning behaviour of doctors comes from research into information needs.²⁻⁹ Most studies of information needs have identified a substantial excess of unanswered questions.^{2-3,8} However, information needs differ importantly from questioning behaviour. Information needs may be recognised or unrecognised and are independent of the

doctor's behaviour—it is a normative concept. Questioning behaviour, however, is an empirical one: it is the process by which a doctor recognises the need for information. Studies focussing on information needs may therefore give an inaccurate picture of questioning behaviour.

The main aim of our study was to test the hypothesis that in routine practice doctors generate a large number of questions, many of which go unanswered. We also examined the possible influence of demographic factors on the questioning behaviour of general practitioners.

Methods

Subjects

The study population was a random sample of 35 of the 128 general practitioners in the Central Coastal Division of General Practice in Perth, Western Australia. We excluded general practitioners with teaching or research contracts at the University of Western Australia because we thought that their behaviour might differ from that of non-academic doctors. Of the 35 doctors selected, two had left the area, leaving an available population of 33, and 27 (82%) of these participated fully in the study.

Study design

The doctors were initially contacted by telephone. Those who agreed to participate were sent a letter asking them to "make a note through one clinical session of any questions which arise regarding the clinical care of each patient, to which you would like an answer" and a form on which to record their questions. The form was piloted with six members of the University Department of General Practice, which resulted in minor changes in wording. The doctors were reminded of their agreement to participate just before the designated session.

After the clinical session they were interviewed by ARB using a semistructured interview. They were asked which questions they had been able to answer during the session and what sources they had used. Questions that remained unanswered at the end of the session were followed up by telephone a week later to see if answers had been obtained.

The doctors were asked which sources of information they most commonly used in routine practice, and were provided with a prompt list of 10

Table 1 Characteristics of 27 general practitioners, analysed with respect to their average rates of recording of clinical questions during patient consultations (n=85)

Characteristic	No of questions asked per 10 patients
Personal and practice characteristics	
Sex:	
Men (n=15)	2.2
Women (n=12)	2.6
Working practice:	
Full time (n=15)	2.1
Part time (n=12)	2.7
Size of general practice:	
One or two doctors (n=12)	1.6
Three or more doctors (n=15)	3.0*
Education and training	
Years since graduation:	
≤18 (n=14)	2.4
≥19 (n=13)	2.4
Medical school:	
University of Western Australia (n=17)	2.2
Other (n=10)	2.7
Rate and volume of work	
Consultation rate:	
<16 minutes per patient (n=14)	2.6
≥16 minutes per patient (n=13)	2.1
No of patients seen in half day session:	
≥14 (n=13)	2.2
<14 (n=14)	2.7

*P=0.049

possible sources, although responses were not confined to these. We later condensed these 10 categories to six when it became apparent that the doctors used some of the categories interchangeably. Doctors twice cited the patient as a source of information, and four times they cited themselves, answering their own questions by recall of information or a trial of management. We included these answers in the "Doctor or patient" category.

We obtained demographic information to investigate whether questioning behaviour varied with doctors' characteristics, size of practice, or workload.

We classified all questions asked into four categories: clinical, organisational, patient data, and ethical dilemmas—corresponding closely to Gorman's classification of medical information.⁹ Organisational questions concerned local information such as the address of a specialist. Dilemmas included, for example, how best to respond to a request for medical examination as part of an employee's apparently dishonest claim for compensation for occupational illness. We excluded the last three categories—organisational, patient data, and ethical dilemmas—from further analysis because they are unlikely to act as a starting point for practising evidence based medicine.

Statistical analysis

To examine whether certain characteristics were associated with higher or lower rates of questioning we divided the subjects into a number of dichotomous groups (see table 1). We analysed the data using SPSS for Windows, version 6.1.3, and used Student's *t* tests to examine differences.

Results

Table 1 shows the participating doctors' characteristics. Their average time since qualification was 19.2 years (range 12-38 years); the average number of doctors in their practices was 3.0; 44% of them were women; 44% were part time; and 63% were graduates of the University of Western Australia, the rest being from other schools in Australia (4), the United Kingdom (4), the Republic of Ireland (1), and Sri Lanka (1).

During the study, the doctors saw 376 patients over 95.4 hours of consulting, at an average rate of 16.8 minutes per patient. A total of 119 questions were recorded: 85 were clinical, 28 were organisational, 4 were patient data questions, and 2 were ethical dilemmas. This gives an overall rate of 3.2 questions per 10 consultations. The 85 clinical questions were asked at an average rate of 2.4 every 10 consultations, and 52 (61%) were answered during the consultation. Of the 33 that were not, 15 (18%) had been satisfactorily answered at follow up a week later, leaving 18 (21%) unanswered. Of these unanswered questions, 3 had been pursued unsuccessfully and 15 had not been pursued at all. This shows that 82% of the clinical questions were followed up, 79% successfully. Doctors in small practices (one or two doctors) asked significantly fewer questions per consultation than those in larger practices ($P<0.05$), and no other significant differences were found (table 1).

Table 2 shows the information sources the doctors used to answer their questions. "Desk top" references and human sources were used to answer 90% of questions answered. Textbooks and journals were little used. The three information sources that the doctors said they used most often were similar to the sources they actually used in the study, with the exception that they said they used general practitioner colleagues more than they actually did. In the interviews after the consulting sessions, it became evident that most of the doctors did not feel that they had a major need for new information sources. If information was really needed it was obtainable. When asked what information sources they would like but currently do not have, six (22%) doctors stated that they wanted no new sources. Of the 11 who mentioned a computer, most did not seem to have a precise idea of how it might be helpful.

Table 2 Sources of information used by 27 general practitioners to pursue answers to clinical questions during and after patients' consultations, and sources stated as most often used (15 of the 85 questions raised were not pursued by doctors)

Information source	Used during consultation	Used after consultation		Total	Stated as most often used*
		Successfully	Unsuccessfully		
"Desk top" references†	38	0	0	38 (54%)	42%
Other professionals‡	8	10	0	18 (26%)	22%
General practitioner colleagues	1	0	0	1 (1%)	18%
Textbooks	2	1	1	4 (6%)	13.5%
Journals	0	1	1	2 (3%)	3.5%
Doctor or patient	3	3	0	6 (9%)	0
Medline search	0	0	1	1 (1%)	1%
Total	52 (74%)	15 (21%)	3 (4%)	70	

*Frequency with which each was stated at interview to be among the three most common sources of information used.

†Such as *Monthly Index of Medical Specialties (MIMS)*, prescribers handbooks, guides on immunisation and travel.

‡Includes "Speak to a specialist" and "Refer to a specialist."

Key messages

- Doctors' abilities to formulate questions about their need for medical information in routine practice has been little studied and may be poorly developed
- We found that general practitioners asked clinical questions at a rate of 2.4 questions every 10 consultations and that doctors in small practices (one or two doctors) asked fewer questions
- The doctors found answers to most of their questions using easily available sources of information
- If evidence based medicine and other forms of self directed learning are to make substantial contributions to health care, factors which affect doctors' questioning behaviour need to be identified and ameliorated

Discussion

Questioning behaviour

In this study general practitioners recorded clinical questions at a rate of 2.4 questions every 10 consultations. This is substantially lower than the rates of questioning reported in previous studies, most of which have been concerned primarily with doctors' information needs.^{2 3 5 6} In our study the doctors recorded questions, as they arose, on a sheet of paper. There was no face to face contact with the observer until after the questions had been identified. Our intention was to influence routine behaviour as little as possible.

Previous studies have used various methods to identify questions, often involving the interrogation of the doctor by the observer. Thus Covell and Gorman interviewed doctors after each consultation,^{2 3} which may have acted as a stimulus to question forming. Timpka reviewed videotaped consultations with the doctor concerned,⁵ and Forsythe used ethnographic observation of ward rounds in a teaching hospital to record all verbal and non-verbal questioning.⁶ The rates of questions per 10 patients seen in these studies were 6.6,² 5.7,³ 18.5,⁵ and 57.7.⁶ Ely's study of family doctors, which had a far lower rate of questioning (0.7 per 10 patients seen), counted a question only when the doctor was observed seeking information.⁴

Questioning behaviour probably varies with the clinical setting, but the rate of questioning identified in any one study may also vary substantially depending on the method used to identify questions. Smith recently reviewed this literature and concluded that "when doctors see patients they usually generate at least one question."¹⁰ While it is clear that they could, and perhaps should, be generating questions at this rate, our study suggests that they do not actually do so.

If asking questions is a part of good practice it is important to identify factors that may enhance or inhibit questioning behaviour. We looked at a number of factors. Working in a small practice was associated with a significantly lower rate compared with practising in a larger one. This is consistent with the findings of Ely's study of rural doctors⁴ and possibly supports concerns about doctors practising in isolation.

Answering of questions

The second part of our hypothesis concerned the success with which doctors are able to answer their

questions. In this study the doctors had obtained an answer to most (61%) of their clinical questions by the end of the consulting session. A further 18% were answered within a week of the consultation. In all, 79% were answered by the end of the study. This is similar to Ely's findings of 88%.⁴ By contrast, Covell found that only 30% of questions were answered at the time of the consultation, although the doctors expected to find an answer to more than half of their questions later.² Gorman found that only 30% of questions were pursued at all.³ Smith concluded that "most of the questions generated in consultations go unanswered."¹⁰ The excess of unanswered questions in other studies may be partly due to the stimulation of questions by the study, which doctors were consequently less motivated to seek an answer.²

Study limitations

Our study was limited by the small number of doctors who participated (27), and further research is needed to confirm these findings. We have not solved the problem of how to identify questions without either stimulating or missing them.⁹ Our reliance on the doctors to write down questions unaided may have been less reliable than a face to face approach. The method is also likely to function as an educational intervention, making repeat testing problematic. In this study we did not attempt repeat testing, but, were the method to be used to evaluate an intervention, a good control group would be essential.

Use of information sources

Australian cities have a relatively high provision of both general practitioners and specialists compared with Britain. General practitioners do not have fixed lists of patients and so have a limited "gatekeeping" role. These factors may partly account for the frequent use of specialists for information. The sources of information used to answer questions follow the pattern described in other studies.^{2-4 7 8 11-13} "Desk top" references and human sources were used far more than textbooks, journals, and electronic sources. This is consistent with the belief that accessibility is a major factor in determining doctors' choice of information source.¹²⁻¹⁴ It may also reflect doctors' need for what Forsythe described as "informal information."⁶ This concerns "how to apply the rules and about exceptions to them" and requires judgment, which human sources are most likely to offer.

Evidence based medicine advocates formal appraisal of the validity and relevance of evidence.¹ Adopting evidence based medicine therefore implies a change towards sources of information whose validity can be formally assessed. Doctors may be reluctant to make this change if they value the human judgment and accessibility of their current sources more highly than the more transparent validity of alternatives.^{13 14}

Factors that might motivate doctors to change the sources of information they use include an excess of unanswered questions and a dissatisfaction with their current sources. We found little evidence of either. Rather, the picture this study presents is of a stable system in which doctors find answers to most of their clinical questions and seem reasonably happy with the sources of information they currently use. Evidence based medicine may therefore make slow progress

until doctors become more questioning in their routine practice. The skill of asking the right questions deserves as much attention as the skills of information searching, critical appraisal, and audit have received.

We thank the general practitioners of the Perth Central Coastal Division for their willingness to participate in this study. We also thank Max Kamien, Jim Dickinson, and Frank Mansfield of the Department of General Practice, University of Western Australia, and Ian Russell, Clare Wilkinson, and other members of the North Wales General Practice Research Club for their help and support.

Funding: Extended study leave payments from the NHS; Glaxo Medical Fellowship; Travel Grant from Department of Postgraduate Studies, University of Wales College of Medicine; Lilly Pharmaceuticals; and RCGP Travel Scholarship.

Conflict of interest: None.

- 1 Sackett DL, Rosenberg WMC. The need for evidence-based medicine. *J R Soc Med* 1995;88:620-4.
- 2 Covell DG, Uman GC, Manning PR. Information needs in office practice: are they being met? *Ann Intern Med* 1985;103:596-9.
- 3 Gorman PN, Helfand M. Information seeking in primary care: how physicians choose which clinical questions to pursue and which to leave unanswered. *Med Decis Making* 1995;15(2):113-9.

- 4 Ely JW, Burch RJ, Vinson DC. The information needs of family physicians: case-specific clinical questions. *J Fam Pract* 1992;35:265-9.
- 5 Timpka T, Arborelius E. The GPs dilemmas: a study of knowledge need and use during healthcare consultations. *Methods Inf Med* 1990;29(1):23-9.
- 6 Forsythe DE, Buchanan BG, Osheroff JA, Miller RA. Expanding the concept of medical information: an observational study of physicians' information needs. *Comput Biomed Res* 1992;25:181-200.
- 7 Dee C. Information needs of the rural physician: a descriptive study. *Bull Med Libr Assoc* 1993;81:259-64.
- 8 Timpka T, Ekstrom M, Bjurulf P. Information needs and information seeking behaviour in primary health care. *Scand J Prim Health Care* 1989;7:105-9.
- 9 Gorman PN. Information needs of physicians. *J Am Soc Inf Sci* 1995;46:729-36.
- 10 Smith R. What clinical information do doctors need? *BMJ* 1996;313:1062-8.
- 11 Gruppen LD, Wolf FM, Van Voorhees C, Stross JK. Information seeking strategies and differences among primary care physicians. *Mobius* 1987;7(3):18-26.
- 12 Gruppen LD. Physician information seeking: improving relevance through research. *Bull Med Libr Assoc* 1990;78:165-71.
- 13 Connelly DP, Rich EC, Curley SP, Kelly JT. Knowledge resource preferences of family physicians. *J Fam Pract* 1990;30:353-9.
- 14 Curley SP, Connelly DP, Rich EC. Physicians use of medical knowledge resources: preliminary theoretical framework and findings. *Med Decis Making* 1990;10(4):231-41.

(Accepted 23 September 1997)

What can PACT tell us about prescribing in general practice?

Azeem Majeed, Norman Evans, Paula Head

Prescribing is important to general practitioners. Most consultations with a general practitioner result in a prescription being issued, and in 1995 general practitioners in the United Kingdom issued about 550 million prescriptions. The total cost of these prescriptions was £4700m, 11% of all NHS spending in 1995. Unsurprisingly, the general practice prescribing budget is seen by many managers and health economists as an area where there is scope for considerable savings through more cost effective prescribing.^{1,2} Hence, general practitioners are likely to be increasingly called on to defend their prescribing patterns.

In England the main source of information on general practitioners' prescribing is PACT (prescribing analyses and cost), and similar schemes exist in Scotland and Wales. Although PACT was first introduced in 1988, many general practitioners have made little use of PACT data. Because of the importance and potential value of such data, general practitioners need to be aware of the information available via PACT and how this information is used by health authorities' medical and pharmaceutical advisers. Moreover, as more general practitioners become involved in commissioning health services, either as fundholders or through local commissioning, they will need to make greater use of PACT data to audit their prescribing and help ensure that their prescribing is economical.

What information is available

The Prescription Prescribing Authority (PPA) collects information on all prescriptions issued by general practitioners that are dispensed by community pharmacists, dispensing general practitioners, or appliance contractors. The information collected includes the name and cost of the drug and the number of items

Summary points

PACT (prescribing analyses and cost) data are derived from prescriptions issued by general practitioners

PACT data have been used by health authorities as a managerial tool, by health services researchers, and, more recently, by general practitioners to audit and to help improve their prescribing

The recent availability of electronic PACT data on the prescribing of individual drugs has allowed health authorities to look at prescribing in more detail and to develop prescribing indicators

To make more effective use of PACT, general practitioners who wish to examine their prescribing in more detail should be given access to electronic PACT data and be trained in its analysis and interpretation

dispensed (an item is defined as each preparation on the prescription). The drugs dispensed are then used to calculate the cost of each item, and the information is entered onto computer by the PPA. Drugs are categorised by the section of the *British National Formulary* that they fall in. Hence, information is available for individual drugs (such as salbutamol), for categories of drugs (such as bronchodilators), or for therapeutic areas (such as respiratory drugs). This information is available at individual practice level, health authority level, and national level, allowing different analyses (box 2).

Division of General Practice and Primary Care, St George's Hospital Medical School, London SW17 0RE

Azeem Majeed, senior lecturer in general practice

Merton, Sutton and Wandsworth Health Authority, Wilson Hospital, London CR4 4TP

Norman Evans, pharmaceutical adviser

Kingston & Richmond Health Authority, 22 Hollyfield Road, Surbiton KT5 9AL

Paula Head, head of pharmacy

Correspondence to: Dr Majeed a.majeed@sghms.ac.uk

BMJ 1997;315:1515-9

Box 1: Definitions of key terms

PACT—Prescribing analyses and cost. Information on general practitioners' prescribing obtained from prescriptions dispensed by community pharmacists, dispensing general practitioners, and appliance contractors
PPA—Prescription Prescribing Authority. Located in Newcastle, the PPA is the source of PACT data

PUs—Prescribing units. A measure of patients' needs for prescribed drugs weighted for age; patients aged under 65 years count as one unit, patients aged 65 and over count as three units

ASTRO-PUs—Age, sex, and temporary resident originated prescribing units. A more sophisticated measure of patients' needs for prescribed drugs than prescribing units

STAR-PUs—Specific therapeutic group age-sex related prescribing units. Measures of patients' needs for prescribed drugs in specific therapeutic areas. These are not yet in widespread use

Defined daily doses—A measure of the amount of drug prescribed based on standard therapeutic units. The number of defined daily doses is calculated by dividing the total amount of a drug prescribed by the defined daily dose for the drug. For example, the defined daily dose of ranitidine is 300 mg. If a practice prescribed a total of 186 000 mg of ranitidine, this would equal 620 defined daily doses (186 000/300)

PACTLINE—An electronic link between health authorities and the PPA which allows health authorities to download computerised prescribing data about the prescribing of their general practices

HEAPACT—Health authority electronic PACT. An enhanced version of PACTLINE which allows health authorities to obtain computerised information about the prescribing of individual drugs

EPACT—Electronic PACT. A unified system that will replace PACTLINE and HEAPACT

After analysis, the data are fed back to both health authorities and general practitioners. General practitioners generally only receive a printed version of the analysis. This information (the standard PACT report) contains information on the practice's rates and costs of prescribing along with comparative information. General practitioners can ask for more detailed information but this more detailed report is very unwieldy. By contrast, health authorities receive both printed reports on general practices' prescribing and also have access to computerised PACT data (PACTLINE). Recently, the PPA has also developed HEAPACT (health authority electronic PACT). This allows health authorities' pharmaceutical advisers to obtain information on the prescribing of specific drugs directly from the PPA via a modem link. With

HEAPACT, health authorities can look at prescribing in great detail. For example, the prescribing of new classes of drugs such as selective serotonin reuptake inhibitors can be examined to determine which general practices are the first to make major use of them.

How is PACT used

Traditionally, PACT has been mainly used as a financial tool to help health authorities set and monitor general practice prescribing budgets. However, PACT is now increasingly used for other purposes, including audit and research, improved methods of funding high cost drugs, and the development of practice formularies. Because prescribing is heavily influenced by general practices' demography, weightings for age and sex have been developed so that rates and costs of prescribing in different practices or health authorities can be compared.^{3 4}

Budget setting*Health authority budgets*

The NHS Executive has recently begun to use PACT data to develop a formula for allocating prescribing budgets to health authorities.⁵ Variables were used to develop a statistical model that could be used to explain variations in prescribing costs between health authorities. Variables that were found to be associated with prescribing costs included the age and sex weighted population (measured with ASTRO-PU), cross boundary flows (patients living in one health authority but registered with a general practice in another health authority), and the percentage of people in a health authority with permanent sickness (obtained from the 1991 census). Health authorities that were more than 2% below their predicted spending were given a larger increase in their prescribing budget than other health authorities. The NHS Executive is now encouraging health authorities to consider using similar methods when they in turn allocate budgets to practices.

General practice budgets

PACT data are used by health authorities to help set and monitor general practices' prescribing budgets. For many years, these budgets were based on prescribing units, but most health authorities now use ASTRO-PU as these provide better weightings for age and sex than do prescribing units. Because there is no valid capitation based formula for allocating prescribing budgets to practices, health authorities have to use their judgment when allocating budgets. In effect, this means that practices with a good grasp of their past and current PACT data are likely to be able to argue a better case than other practices and hence obtain a larger prescribing budget.

Health services research

PACT data have been widely used by researchers to investigate variations and trends in prescribing costs.⁶ For example, studies that have examined differences in prescribing costs between fundholding and non-fundholding practices have generally used PACT data.^{7 8} Studies of the management of conditions such as asthma, comparing admission rates with prescribing rates, have also generally used PACT data.⁹

Box 2: Units of analysis and levels of PACT data**Unit of analysis**

- 1 England
- 2 Health authority
- 3 General practice

Level of analysis

- 1 Total prescribing, prescribing by *British National Formulary* chapters
- 2 Prescribing by subsections of *British National Formulary* chapters
- 3 Prescribing of individual drugs

PACT includes information on prescribing costs, the number of items prescribed, and generic prescribing. This information can be looked at using different units of analysis or different levels of prescribing data. General practitioners will be mainly interested in their own practice's PACT data and how their prescribing compares with other practices in their health authority. Health authorities will want to know how they compare with other health authorities and about the prescribing of their general practices. The NHS Executive will want to know about prescribing at national and health authority levels.

Prescribing indicators

A relatively new development is to use PACT data to develop prescribing indicators. Many health authorities now do this, often in consultation with general practitioners, and a large number of indicators have been developed (box 3).¹⁰ The assumption is that these indicators can be used to measure the quality or prescribing in general practice. Some indicators, such as the ratio of inhaled corticosteroids to inhaled bronchodilators, are considered to measure good prescribing while other indicators such as the rate of prescribing of appetite suppressants are considered to measure bad prescribing.

Health authorities currently use many different indicators, but they are largely unvalidated and an important subject for further research will be to see if these indicators are valid measures of the quality of general practitioners' prescribing. Much of the research in this subject has tried to validate indicators by examining their association with other process measures. For example, several researchers have looked at the association between the ratio of inhaled corticosteroids to inhaled bronchodilators and admission rates for asthma.¹¹⁻¹³ The next step in this research will be to validate the indicators against better quality measures.

Current NHS information systems make it straightforward for health authorities to produce a large number of prescribing indicators, and care is needed in deciding how indicators are selected and used. Ideally, prescribing indicators should be used to improve the quality and effectiveness of prescribing in general practice and not simply to reduce prescribing costs.¹⁴ Furthermore, like all indicators of performance, prescribing indicators can create perverse incentives, and it would be fairly straightforward for practices to improve their performance as measured by many of the indicators without improving their clinical management of patients.¹⁵ For example, a practice with a low ratio of inhaled corticosteroids to inhaled bronchodilators could improve its ratio by indiscrimi-

Box 3: Prescribing indicators commonly used by health authorities

Markers of good prescribing

- Rate of generic prescribing
- Frusemide and bendrofluazide as a percentage of diuretic drugs
- Ratio of bendrofluazide 2.5 mg to bendrofluazide 5 mg
- Atenolol and propranolol as a percentage of β blockers
- Ratio of inhaled corticosteroids and cromoglycate to inhaled bronchodilators
- Cimetidine as a percentage of H_2 receptor antagonists
- Generic antibiotics as a percentage of all antibiotics

Markers of bad prescribing*

- Diuretic potassium combinations
- Cerebral and peripheral vasodilators
- Appetite suppressant
- Topical non-steroidal anti-inflammatory drugs
- Benzodiazepines
- Cough mixtures and decongestants

*Usually measured as number of items per ASTRO-PU

nately increasing its prescribing of inhaled corticosteroids without improving other aspects of patient management such as patient education or adequate record keeping.

Despite their limitations, however, prescribing indicators do offer potential benefits to general practitioners. For example, general practitioners can use them to set and monitor their practice's progress towards a target rate of prescribing generic drugs.

Identifying expensive drugs

Patients who need expensive drugs can substantially increase a practice's prescribing costs. Some general practitioners may therefore be concerned that having too many patients who need expensive drugs on their list will prevent their practice from remaining within its prescribing budget. With PACT data, however, it is possible to separate the costs of expensive drugs from other prescribing costs. This information can then be used to adjust general practices' prescribing budgets to take into account the cost of these drugs.

This approach has now been adopted by many health authorities. For example, Kingston and Richmond Health Authority has used PACT data in combination with notifications from general practices to identify patients taking any drug costing more than £1500 a year (table 1). Patients who need a drug that costs more than £2000 a year have the cost of the drug met from a special health authority budget for expensive drugs. One byproduct of this is that the health authority has been able to produce a database of patients who need expensive drugs including information on diagnosis. This information can then be fed back to local practices to help them manage their prescribing budgets and to plan the clinical management of these patients. The register also has other potential uses: for example, it can be used to identify patients with specific conditions and hence can be used to identify samples of patients for audit and research.

At present, it is much easier to identify expensive drugs than to identify expensive patients, as high cost drugs can be identified through PACT data. Unfortunately, patients who require multiple low cost drugs and who therefore have high overall drug costs cannot be identified through the PACT system. This is because PACT can not yet provide patient based data.

Table 1 Annual cost of expensive drugs (drugs costing more than £1500 a year) in one general practice in Kingston and Richmond Health Authority

Patient	Diagnosis	Drugs	Annual cost (£)
A	Asthma	Budesonide	1 628
B	Cystic fibrosis	Aztreonam	2 255
		Dornase alfa	7 442
C	Growth hormone deficiency	Somatropin	16 688
D	Growth hormone deficiency	Somatropin	13 350
E	Growth hormone deficiency	Somatropin	11 140
F	Renal transplant	Cyclosporin	4 602
G	Renal transplant	Cyclosporin	4 686
H	Prostate cancer	Bicalutamide	1 668
		Goserelin	1 590
I	Prostate cancer	Goserelin	1 590
J	Prostate cancer	Goserelin	1 590
K	Prostate cancer	Goserelin	1 590
L	Prostate cancer	Leuprorelin	1 630

The practice has a list size of 8800 patients (33 000 ASTRO-PUs). The total annual prescribing budget for the practice is £537 227, of which drugs costing more than £1500 cost £71 449. Six patients in the practice are taking drugs that cost more than £2000 a year. The prescribing costs of these drugs (£60 163, 11.2% of the practice's total prescribing budget) are reimbursed separately from the rest of the practice's prescribing costs. Similar data are available for all 61 practices in Kingston and Richmond Health Authority. A preliminary analysis of this data has revealed the increasing number of patients with prostate cancer who are being treated with hormone therapy.

Analysing prescribing in therapeutic areas

The recent development of HEAPACT (health authority electronic PACT) allows health authority medical and pharmaceutical advisers to download from the PPA detailed information on the prescribing of general practices. Through HEAPACT, information is available on the prescribing of individual drugs. This offers both health authorities and general practitioners a number of opportunities. For example, it is possible to examine prescribing in specific therapeutic areas in order to develop practice formularies, rationalise prescribing, and cut prescribing costs (table 2). HEAPACT also allows the identification of practices that are prescribing new, expensive drugs that cost more than older drugs of similar efficacy or drugs that are known to be ineffective. Although some practices now have access to and are using data derived from HEAPACT, many practices are not aware of this development or of the benefits it could offer their practices (see box 4).

Limitations of PACT

Although PACT data have many uses, they do have some important limitations, the most important being that the data provide only a narrow range of information, mainly on what drugs were prescribed and how much the prescribed drugs cost. Secondly, the data cannot be linked to demographic or clinical data on patients. Hence, they cannot be used to calculate age and sex specific prescribing rates or to look at prescribing rates for specific conditions. This is why ASTRO-PUs and STAR-PUs were derived from the computerised prescribing records of general practices and not from PACT data. Thirdly, because they are based on dispensed NHS prescriptions, they do not include private prescriptions or prescriptions that a patient does not have dispensed.¹⁶ Fourthly, the number of items prescribed is not always an accurate measure of the amount of a drug actually prescribed.¹⁷ Defined daily doses (which can be calculated from PACT data) can be used to overcome this problem and provide a more accurate measure of the amount of a drug prescribed than the number of items. Finally, PACT tells us only about the prescribing carried out in

Table 2 Example of the use of HEAPACT data to analyse prescribing of a class of drugs in a general practice*

Drug	No of items	Cost per item (£)	Total cost (£)
Fluoxetine	144	25.97	3 740
Paroxetine	112	28.42	3 183
Sertraline	100	47.87	4 787
Venlafaxine	43	32.30	1 389
Nefazodone	15	18.20	273
Fluvoxamine	7	13.29	93
Citalopram	5	27.60	138
Total	426	31.93	13 603

*Number of prescriptions of selective serotonin reuptake inhibitors and related antidepressants (*British National Formulary* section 4.3.3) for one practice (list size 5600) in Merton, Sutton, and Wandsworth during 1996. The practice prescribed all seven drugs in this category, with a total cost of £13 603. Three drugs (nefazodone, fluvoxamine, and citalopram) were prescribed relatively infrequently, and one drug (sertraline) cost substantially more than the others. The data suggest that the doctors in the practice should discuss whether they need to use all the drugs in *British National Formulary* section 4.3.3 and whether savings could be made by reducing the prescribing of sertraline. In the same period the practice prescribed tricyclic and related antidepressants (*British National Formulary* sections 4.3.1 and 4.3.2) 747 times at a total cost of £2960 (average cost per item £3.96). Hence, some discussion is also required on what the balance of prescribing should be between the newer antidepressants and the older (and substantially cheaper) tricyclic and related antidepressants.

general practice and does not contain any information on prescribing in hospitals.

Making PACT more accessible

Most general practitioners currently receive their PACT data from the PPA in the form of a booklet. Many health authorities are also producing prescribing indicators for feedback to their general practitioners, and in some cases these indicators are distributed in electronic format. In some areas general practitioners have also been given access to their entire PACT data in electronic format. The next step in making PACT data more accessible will be to extend this initiative and to provide PACT data in electronic format to all practices that want this. However, to make effective use of electronic PACT data, general practitioners will need training in how to analyse, interpret, and use PACT data appropriately.

Improving PACT

There are two developments that would substantially improve the usefulness of PACT data. The first would be to include a unique patient identifier (such as the NHS number) on the prescription. This would allow prescriptions to be linked to individual patients, leading to patient based PACT data and the calculation of age and sex specific prescribing rates. It would also allow general practices and health authorities to identify patients who have high drug costs and thus lead to more reliable setting of prescribing budgets. The use of a unique patient identifier would also allow PACT data to be linked to other data sets, such as data on hospital admissions.

The other major development that would improve PACT would be to include diagnostic data (perhaps in the form of a Read code) on the prescription. This would allow prescribing for specific clinical conditions to be analysed. Because many drugs, such as β blockers and angiotensin converting enzyme inhibitors, have more than one indication, PACT data cannot currently be used for this.

Neither of these developments would be easy to implement and, realistically, would not be feasible until

Box 4: Potential uses of level 3 PACT data to general practitioners

- Provide baseline data on prescribing to help in preparation of a practice formulary
- Determine what percentage of drugs prescribed are in the practice formulary
- Monitor progress towards prescribing targets
- Identify areas in which practice prescribing differs greatly from health authority average
- Identify therapeutic areas in which greater use of generic drugs is possible
- Identify areas where there is scope for therapeutic substitution—for example, using frusemide and bendrofluazide in place of more expensive diuretics
- Identify prescribing of drugs of limited therapeutic value such as cough mixtures and decongestants
- Help standardise the quantity of drugs prescribed—for example, for 28 days versus 30 days
- Allow calculation of defined daily doses instead of the number of items as a measure of the amount of a drug prescribed

all general practices are fully computerised and issue virtually all prescriptions with their practice computers. Including clinical data on the prescription form would also raise issues about confidentiality, and this might prevent the implementation of this measure. However, as well as improving the usefulness of PACT data, these developments, especially the use of a unique patient identifier, could lead to a lower level of prescription fraud and thus yield some financial savings.

- 1 Audit Commission. *A prescription for improvement: towards more rational prescribing in general practice*. London: HMSO, 1994.
- 2 Freemantle N, Henry D, Maynard A, Torrance G. Promoting cost effective prescribing. *BMJ* 1995;310:955-6.
- 3 Roberts SJ, Harris CM. Age, sex and temporary resident originated prescribing units (ASTRO-PU): new weightings for analysing prescribing of general practices in England. *BMJ* 1993;307:485-8.
- 4 Lloyd DCEF, Harris CM, Roberts DJ. Specific therapeutic age-sex related prescribing units (STAR-PU): weightings for analysing general practices' prescribing in England. *BMJ* 1995;311:991-4.
- 5 Reeves CL. *Prescribing expenditure: guidance on allocations and budget setting for 1997/98*. NHS Executive: Leeds, 1996. (EL(96)107.)
- 6 Morton-Jones T, Pringle M. Explaining variations in prescribing costs across England. *BMJ* 1993;306:1731-4.

- 7 Wilson RPH, Hatcher J, Barton S, Walley T. Influences of practice characteristics on prescribing in fundholding and non-fundholding general practices: an observational study. *BMJ* 1996;313:595-9.
- 8 Harris CM, Scrivener G. Fundholders' prescribing costs: the first five years. *BMJ* 1996;313:1531-4.
- 9 Griffiths C, Sturdy P, Naish J, Omar R, Dolan S, Feder G. Hospital admissions for asthma in east London: associations with characteristics of local general practices, prescribing and population. *BMJ* 1997;314:1482-6.
- 10 Bateman DN, Eccles M, Campbell M, Soutter J, Roberts SJ, Smith JM. Setting standards of prescribing performance in primary care: use of a consensus group of general practitioners and application of standards to practices in the north of England. *Br J Gen Pract* 1996;40:20-5.
- 11 Shelley M, Croft P, Chapman S, Pantin C. Is the ratio of inhaled corticosteroid to bronchodilator a good indicator of the quality of asthma prescribing? Cross sectional study linking prescribing data to data on admissions. *BMJ* 1996;313:1124-6.
- 12 Aveyard P. Assessing the performance of general practices caring for patients with asthma. *Br J Gen Pract* 1997;420:423-6.
- 13 Griffiths C, Naish J, Sturdy P, Pereira F. Prescribing and hospital admissions for asthma in east London. *BMJ* 1996;312:481-2.
- 14 Baker SJ. Use of performance indicators for general practice. *BMJ* 1996;312:58.
- 15 Majeed FA, Voss S. Performance indicators for general practice. *BMJ* 1995;311:209-10.
- 16 Heath I. The creeping privatisation of NHS prescribing. *BMJ* 1994;309:623-4.
- 17 Bogle SM, Harris CM. Measuring prescribing: the shortcomings of the item. *BMJ* 1994;308:637-40.

(Accepted 22 October 1997)

Netlines

World wide web course tools

- Medical educationalists may wish to evaluate WebCT, a tool to help non-technical users create sophisticated web based educational environments. It can be used to create entire online courses or just to publish extra material for existing courses. Check it out on <http://homebrew1.cs.ubc.ca/webct/>.

Neurolink web site

- Neurolink, an independent educational programme to support those involved in the management and treatment of people suffering from depression has just launched a website on <http://www.neurolink.co.uk>.

Orthopod mailing list

- Chris Oliver has set up an electronic mailing list on orthopaedics. See the web page for details (<http://www.mailbase.ac.uk/lists/orthopod/>) or, to subscribe, send a message to mailbase@mailbase.ac.uk with this command in the body of your message "join orthopod [first name] [last name] stop."

Uronet

- Uronet (<http://uronet.org>) provides an educational service, an information resource, and an interactive forum for discussion on prostate cancer for urologists worldwide.

Royal College of Radiologists on line

- Several people commented on my omission of the Royal College of Radiologists from the online medical establishment. The college can be found in cyberspace on <http://www.rcr.ac.uk/enquiries>.

Coombe Women's Hospital on line

- The Coombe Women's Hospital in Dublin now has a web site (<http://www.coombe.ie/>), which includes an annual clinical

report, patient information leaflets, and a maternity information booklet.

Merck manuals on line

- The *Merck Manual of Diagnosis and Therapy* and the *Merck Manual Home Edition* are available on line on the Merck website: (<http://www.merck.com>). You can even read them in Japanese.

Virtual course on structure based drug design

- It is not too late to register for a self paced online course on structure based drug design, which started in October and which will run for between one and two years. See <http://www.vsms.nottingham.ac.uk/vsms/sbdd/advert.html> for details.

Virtual environments

- To see an impressive website housing virtual conferences on biomolecular sciences and bioinformatics, including demonstrations and using the latest plug-ins, visit the Virtual Environment Interactive site on <http://lasher.vei.co.uk/>.

Eurosurveillance weekly

- Eurosurveillance weekly (<http://www.eurosurv.org>) is an electronic bulletin, which, its authors boast, is updated at least weekly so you can hear about outbreaks as they unfold.

Grand rounds in cyberspace

- Sound recordings of the Johns Hopkins grand rounds are broadcast live and then archived for later access on <http://www.audionet.com/edu/jhmr/archives>, but you will need a RealAudio plug-in (<http://www.realaudio.com>) to hear them. Also worth a visit is Cyberounds on <http://www.cyberounds.com/>.

Compiled by Mark Pallen
email m.pallen@qmw.ac.uk
web page <http://www.qmw.ac.uk/~rhbm001/mpallen.html>