A total audit of preventive procedures in 45 practices caring for 430 000 patients

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Abstract

Objective—To develop and report the results of a system of audit of computer records in general practice.

Design—A retrospective audit of records in practices using the same computer system. Information about recorded preventive procedures was collected by sending the same audit program to each practice on floppy disk. Other characteristics of the practices were determined by postal questionnaire.

Setting—Forty five general practices, widely distributed in England and Wales.

Subjects—All 430 901 patients registered with the practices.

Main outcome measures—Within each practice the percentage of patients in specified age groups for whom certain preventive procedures were recorded as having been carried out. These measures were analysed in relation to practice characteristics.

Results—Practice characteristics and recording rates for preventive procedures varied over a wide range. Recording rates were higher in practices with computer terminals on every doctor's desk. Only one practice achieved the new contract target of 90% coverage for recorded primary immunisations, and fewer than two thirds recorded 80% coverage for cervical cytology in the past five years. Practices holding clinics did no better than those without. Smaller partnerships and smaller doctors' list sizes were associated with better performance.

Conclusions—Centrally programmed audit of computerised records is a feasible method of providing data on a regular basis for epidemiological purposes and for performance review. The fact that practices with smaller list sizes had higher levels of recorded preventive care suggests that the trend towards larger lists promoted by the new contract might militate against the intended effect of better preventive care.

Introduction

The comparison of recording rates for preventive procedures within and between practices has been a subject for audit throughout the 1980s. In 1981 Fleming and Lawrence reported a manual audit of 8500 records in 38 practices, showing wide variation in recording rates and major areas of deficiency.¹ The survey was repeated two years later and showed dramatic improvement, attributed to the educational exercise.² When the results of these audits were analysed in relation to practice characteristics certain features were associated with better performance, notably good organisation of records and smaller list sizes for each doctor.³

There remain major disadvantages to manual audits of records. They are very time consuming; they depend on sampling; they are liable to be set up slightly

differently on different occasions, undermining comparability both between practices and within practices over time; and they do not offer any help in improving clinical service once deficiencies are found.

A computerised audit of records held on computer can overcome these drawbacks. A preprogrammed audit supplied to all practices means that the procedure takes almost no time; the whole practice is covered without sampling; there is no difference in audit systems between practices or within a practice over time; and any block of patients revealed as lacking care—for example, children not fully immunised or women overdue for cervical smear testing—can be identified with their names and addresses. We present here the results of a computerised audit of preventive procedures across a range of general practices.

Method

The practices in the survey used the same computer system (VAMP). All practices which had run their computer for two years at the start of the project (two and a half years at the time of the survey) were invited by a single letter to participate in the study. Forty six of the 76 eligible practices agreed to take part.

The screen on which preventive procedures are entered is identical for all practices. One of us (ML) worked with the company to develop an audit program. This program was sent to all participating practices on a floppy disk. It runs on a single command and can proceed while the practice computer is being used for normal activity. The practice population is broken down by sex and age bands for list size and the recording of certain preventive procedures. The audit results are printed out for the practice and also transferred on to the floppy disk to be returned to the university department of general practice in Oxford. (A specimen audit printout is available on request.)

Recording of the following preventive procedures in the age groups given formed the basis of the analysis: complete diphtheria, typhoid, and polio immunisation and complete pertussis immunisation (children aged 1-3); measles immunisation (children aged 2-4); rubella immunisation or immunity (women aged 12-34); cervical cytology examination in the past five years (women aged 25-64 who had not undergone hysterectomy); tetanus immunisation in the past 10 years (adults aged 25-64); blood pressure measurement in the past five years (adults 35-64); smoking habit at any time (adults aged 20-64). For each practice the percentage of patients in the specified age group for whom the preventive procedure was recorded as having been carried out was referred to as a performance measure. The percentage of possible full courses of diphtheria-typhoid-polio, pertussis, and measles immunisations completed (corresponding to the composite measure of primary immunisation used

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for target payment in the new general practitioner contract) was also calculated.⁴

Further data about practice structure and process were collected by questionnaire, and the following practice characteristics formed the basis of the analysis: number of partners; number of sessions spent outside the practice for any reason (assuming that there were 11 possible sessions in the week we calculated the list size per 10 sessions); number of clerical staff (managers, receptionists, dispensers, secretaries, or records officers); nursing time available at practice premises, including time spent by a practice nurse or health authority nurse in the treatment room but excluding time spent in district nursing; health visiting hours dedicated to the practice's patients, as estimated by the partners; clinic hours provided for adult health checks, well woman checks, cervical smears, and child health surveillance. Since all practices need at least one terminal for administration, the measure used for the number of computer terminals in the practice was (total number of terminals - 1)/1000 patients, to avoid small practices seeming to have an unduly large number of terminals.

Associations between performance measures and practice characteristics were examined using the Spearman correlation coefficient (two tailed tests of significance).

Results

Of the 46 practices agreeing to take part, 45 sent data. The one practice which dropped out did so because the computer hard disk had inadequate space to run the audit program.

Practice characteristics—The practices were all in

England and Wales and ranged from Northumberland to Cornwall. Twenty four were training practices; six used deputising services. The total number of patient records audited was 430 901. Table I shows that the practice characteristics were very varied. There was an eightfold variation in nursing hours between the lowest and highest provision: 79% of all nursing hours were provided by practice employed nurses. Health visiting hours were difficult to estimate because some practices did not have attached health visitors.

There was a very large variation in the availability of terminals in the practices, with a tenfold difference between practices at the 20th and 80th centiles. Thirty one practices offered no well person clinics and 17 no well woman or cervical smear clinics.

Recording rates for preventive procedures—Only five practices had over 90% of children recorded as fully immunised for diphtheria-typhoid-polio, and only one had over 90% recorded as fully immunised for pertussis. This one practice was the only one of the 45 whose records would have qualified as meeting the 90% upper target for payment under the new contract; 23 of the 46 would not have attained the lower 70% target. Targets have also been introduced for preschool boosters⁴: no practice would have attained the upper target and fewer than 20% the lower.

The figures for cervical cytology for most practices were higher than for other preventive procedures, the 20th centile being 64.1% (table I). Fourteen of the 45 practices would have attained the 80% higher target under the new contract and only three would have failed to attain the 50% level. For the whole sample there were 108 826 women who had not had a hysterectomy, of whom 77 963 had had a smear recorded in the previous five years, a rate of 71.6%. A measure of practices' underrecording was indicated by the recording levels for hysterectomy, which varied from 0% to 12.8% of women aged 25-64, with a median of 6.4%. Doctors' figures for cervical cytology would probably be improved merely by their recording hysterectomies more completely.

Some practices had recording rates above 80% for both blood pressure and smoking habit, but several were clearly not using the computer for such recordings. For the whole sample of 156 271 adults aged 35-64, 55 340 (35.4%) had a blood pressure recording in the past five years and of the 271 347 adults aged 20-64, 77 869 (28.7%) had a record of smoking habits.

Interrelation of recording rates for different preventive procedures—There were significant associations between recording rates for the different preventive procedures (table II). The strongest associations were seen between the performance measures for rubella immunity, blood pressure recording, the recording of smoking habits, and tetanus immunisation.

Associations between practice characteristics—As the size of the practices became larger list sizes per doctor also rose, the number of clerical staff and nursing staff per thousand patients fell, and the number of terminals per 1000 patients fell (table III). Doctors with smaller list sizes employed more staff, but there was no association between doctors' list sizes and the availability of terminals.

Interrelations of practice characteristics and performance measures—There was a positive association between the number of terminals per 1000 patients and the performance measures (table IV). Performance measures were higher for those with terminals on every doctor's desk, significantly so for primary immunisation and blood pressure and smoking habit recording (table IV). There was a negative association between all the performance measures studied and both total practice list size and list size per doctor. The negative association with doctor's list size was even more clear when the subgroup of practices with a terminal on

TABLE I—Practice characteristics and recorded preventive procedures in 45 practices covering 430 901 patient records

	Median	Range			
		Minimum	20th Centile	80th Centile	Maximum
Practice structure					
Total list	8184	2239	4702	13 079	24 080
List size/partner	1925	1151	1706	2237	2991
List size/10 sessions	2179	1578	1913	2521	2991
Hours/1000 patients/week:					
Clerical	27.7	15.6	24	32.4	40
Nursing	5.8	2.9	4.1	9.2	23.4
Health visitors	6.5	0	3.6	8.4	12.8
(Terminals - 1)/1000 patients	0.37	0	0.09	0.87	1.5
Clinics (h/10 000 patients/week)					
Adult health check	0	0	0	3.1	33.8
Well woman-smear	2.8	0	0	4.9	10.3
Child health	3.5	0	2.2	6.6	22.5
Child immunisation (rate/100 children in age group)					
Diphtheria-typhoid-polio complete	73.8	1.2	42.7	87.3	95.6
Pertussis complete	63.4	1.0	39.7	77.0	90.8
Measles	65.9	0.3	37.7	83.3	91.3
Composite primary immunisation	66.6	1.0	40.0	82.5	92.6
Preschool booster	30.6	0	15.2	67.1	87.5
Postschool booster	10.7	0.1	1.4	40.4	85.6
Adult prevention (rate/100 in age group)					
Tetanus immunisation	15.9	0	6.3	38.1	66.7
Rubella vaccination or immunity	23.4	0.8	9.2	55.9	88.5
Cervical smear in past 5 years	73.4	29.0	64.1	82.1	90.0
Hysterectomy	6.4	0	3.0	9.2	12.8
Smoking record	37.4	0	7.0	63.5	94.5
Blood pressure in past 5 years	41.1	0.6	14.3	64.8	83.8

TABLE II—Associations between performance measures

	Cervical cytology	Rubella immunity	Blood pressure recording	Smoking record	Tetanus immunisation
Primary immunisation	0.25	0.41**	0.18	0.39*	0.44**
Cervical cytology		0.53***	0.24	0.27	0.52***
Rubella immunity			0.60***	0.58***	0.75***
Blood pressure recording				0.89***	0.53***
Smoking record					0.62***

*p<0.05, **p<0.01, ***p<0.001.

TABLE III—Associations between practice characteristics

	List size per partner	List size per 10 sessions	Clerical hours	Nurse hours	No of terminals
Total list size	0.34*	0.32*	-0.40**	-0.38*	-0.40**
List size per partner		0.74***	-0.61***	-0.29	-0.07
List size per 10 sessions			-0.43**	-0.03	-0.13
Clerical hours				0.03	0.29
Nurse hours					0.20

*p<0.05, **p<0.01, ***p<0.001.

TABLE IV—Associations between practice characteristics and performance measures

	Primary immunisation	Cervical cytology	Rubella immunity	Blood pressure record	Smoking record	Tetanus immunisation
<i>All practices (n=45)</i>						
Nurse hours	0.09	0.13	-0.03	0.27	0.24	0.09
Clerical hours	0.28	0.24	0.26	0.20	0.34*	0.30*
No of terminals	0.46**	0.09	0.27	0.55***	0.62***	0.41**
Practice list size	-0.16	-0.07	-0.21	-0.48**	-0.50***	-0.34*
List size per partner	-0.29*	-0.32*	-0.31*	-0.09	-0.12	-0.26
<i>Practices with terminals on every doctor's desk (n=18)</i>						
List size per partner	-0.54*	-0.48*	-0.52*	-0.43	-0.46	-0.45
List size per 10 sessions	-0.46	-0.52*	-0.73**	-0.58*	-0.65**	-0.67**

*p<0.05, **p<0.01, ***p<0.001.

TABLE V—Performance measures in practices with and without a terminal on every doctor's desk. Results are percentages of patients in relevant age groups

	All doctors with terminal (n=18)		Not all doctors with terminal (n=27)	
	Mean	Median	Mean	Median
Primary immunisation	76	75	57	57*
Cervical cytology	74	71	72	74
Rubella immunity	38	21	28	26
Blood pressure record	52	58	32	34**
Smoking record	52	54	24	20***
Tetanus immunisation	27	29	18	15

Mann-Whitney U test (2 tailed) of differences between all with terminals and not all with terminals: *p<0.05, **p<0.01, ***p<0.001.

every doctor's desk was examined. There was no statistically significant difference in the recording rates for blood pressure, smoking habit, or tetanus immunisation between practices which did and did not run well person clinics. Indeed, the median rates for practices with such clinics were lower than for those without (36%, 36%, and 21% versus 43%, 38%, and 23% respectively).

Discussion

This study confirms the findings of the Scottish survey using the general practice administration system for Scotland (GPASS)⁵ that data held on computers in general practice can be systematically and uniformly collected for analysis and feedback.

A notable feature of the Scottish survey was the low level of completeness of the data (practices showed a mean of only 31% of patients having any morbidity data, 23% with any smear record, and only 12% with any blood pressure record).⁵ Such data are not useful for educational audit or epidemiology because there is clearly a large recording deficit (a deficit which has been shown before^{6,7}). The recording rates in this survey also fell below those expected. This was particularly so for primary immunisation and rubella immunity, probably because many general practitioners have up to now accepted that health visitors keep child records and that the schools health service is responsible for rubella immunisation. Despite this, the rates recorded here were comparable to or better than those in most other surveys.^{1,5,8,9}

Practitioners may claim that it is the clinical activity and not its recording which is important in patient

care. Yet without a record the general practitioner cannot be responsible for seeking out those who have missed preventive procedures, so the record itself is a measure of care. This study has identified practice characteristics associated with better recorded preventive care.

The principal practice characteristics associated with better performance measures were a smaller partnership size, smaller doctors' list sizes, more ancillary staff, and more terminals available. It is not possible to say from these data whether these characteristics are the cause of better performance or features of motivated practices. Large partnerships were associated with adverse factors: bigger list sizes, fewer staff, fewer terminals, and worse performance measures. Increased employment of clerical staff tended to be associated with other favourable characteristics.

A notable feature was the association between the number of terminals in the practice and most of the performance measures. Ease of recording may have enabled the records to correspond more closely to actual clinical care, or the availability of information may have prompted more clinical activity.

The negative association between list size per partner and performance measures lends support to previous evidence that better quality of care is associated with smaller list sizes.^{3,10-12} The importance of assessing the time made available to patients by each doctor is supported by the finding that the list size per 10 sessions was even more closely associated with performance than the list size per partner.

Our findings have important implications for the debate on the new contract. We did not expect that so few practices would have records which could support a claim for attaining the higher immunisation or cervical cytology targets; nor did we expect that running well person or well woman clinics would have so little effect on performance measures. There is a fear that increased payment for capitation will encourage larger list sizes and that the need to share the increased administrative costs necessitated by the new contract may encourage doctors to form larger partnerships. Both these developments would adversely affect care.

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- Fleming DM, Lawrence MS. An evaluation of recorded information about preventive measures in 38 practices. *J R Coll Gen Pract* 1981;31:615-20.
- Fleming DM, Lawrence MS. Impact of audit on preventive measures. *Br Med J* 1983;287:1852-4.
- Fleming DM, Lawrence MS, Cross KW. List size, screening methods, and other characteristics of practices in relation to preventive care. *Br Med J* 1985;291:869-72.
- Health Departments of Great Britain. *General practice in the National Health Service. The 1990 contract*. London: HMSO, 1989.
- Taylor MW, Ritchie LD, Taylor RJ, et al. General practice computing in Scotland. *Br Med J* 1990;300:170-2.
- Coulter A, Brown S, Daniels A. Computer held chronic disease registers in general practice: a validation study. *J Epidemiol Community Health* 1989;43:25-8.
- Jamieson M, Griffiths J. *Health for all in the Oxford region*. Oxford: Oxford RHA, 1987.
- Ritchie LD, Currie AM. Blood pressure recording by general practitioners in north east Scotland. *Br Med J* 1983;286:107-9.
- Freeling P, Littlejohns P. Counselling cigarette smokers in general practice. *Maternal and Child Health* 1989;14:394-7.
- Butler JR. *How many patients?* London: Bedford Square Press, 1989.
- Morell DC, Roland MO. How can good general practitioner care be achieved? *Br Med J* 1987;294:161-2.
- Wilkin D, Metcalfe DAH. List size and patient contact in general medical practice. *Br Med J* 1984;289:1501-5.

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