

Audit Reviewed: Does Feedback on Performance Change Clinical Behaviour?

M. W. MITCHELL, BA, *Research Officer*

F. G. R. FOWKES, MB, MRCP(UK), MFCM,* *Senior Lecturer in Epidemiology*
Department of Epidemiology and Community Medicine, University of Wales College of
Medicine, Heath Park, Cardiff

The purpose of medical audit should be to improve the effectiveness and efficiency of medical care. An audit that simply identifies poor practice, or has the sole objective of educating clinicians, may not lead to improvements which are assured only if the detection of inadequate care is followed by a change in clinical practice to correct observed deficiencies. Re-observation of practice may then be required to establish whether or not the desired improvements have taken place.

For an audit to lead directly to improvements in the effectiveness or efficiency of medical care it is necessary to (a) observe the practice; (b) set a standard of practice; (c) compare the observed practice with the standard; (d) implement change, and (e) re-observe practice. These actions form a cycle of audit[1] (Fig.1).

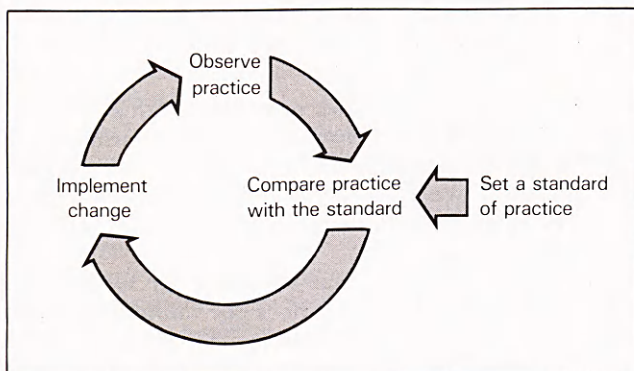


Fig. 1. *Cycle of audit.*

Often the cycle is incomplete because no attempt is made to change clinical practice. It is commonly assumed that the information produced by audit will naturally lead to change. In this article we review some past experiences with feedback of information and consider whether the evidence supports the assumption that the provision of information on performance changes clinical behaviour.

Information feedback can be divided into two broad

*Correspondence to: Dr F. G. R. Fowkes, MRCP(UK), Department of Community Medicine, University of Edinburgh, Usher Institute, Warrender Park Road, Edinburgh EH9 1DW.

categories—passive and active. Passive feedback consists of supplying information without any overtly evaluative material or suggestions for improvement. The information is usually relayed to clinicians in the form of statistics in newsletters or computer printouts. Often the statistics may be ranked according to the levels pertaining to the consultants or junior doctors in receipt of the information.

In contrast, active feedback of information includes some judgement of the behaviour being studied. The feedback may be combined with other forms of education such as seminars or the regular review of medical records by clinicians in a firm. Clinical guidelines or protocols may also be provided for clinicians participating in the feedback process.

Passive Feedback

Many of the trials of passive feedback have taken place in the USA, and most were concerned with the numbers and costs of diagnostic tests ordered. In one study designed to reduce the use of laboratory tests[2], clinicians were divided into several experimental groups. The 'cost education' group received a series of newsletters on cost containment and a list of charges for commonly used laboratory tests. The 'cost audit' group received passive feedback in the form of a weekly computer printout of tests and charges per patient generated by each clinician. Another group acted as a control. No change of practice was recorded in the 'cost education' or control groups. The 'cost audit' (passive feedback) group surprisingly increased total test use during the intervention period. Although education alone and feedback alone had no effect in reducing the use of diagnostic tests, a group of clinicians receiving both education and feedback showed a significant reduction in test usage.

Similar results were obtained in an out-patient clinic in Baltimore[3]. Feedback of haematological, biochemical and radiological tests ordered on each patient and the percentage of these tests found to be abnormal produced no effect on the use of tests over a period of one year. Indeed, the number of tests per patient increased from 0.7 to 1.5.

Schroeder *et al.* [4] included rankings of clinicians when feeding back statistics. They examined variations in the costs of laboratory tests and drugs used by internists at a university clinic. Rankings of physicians according to levels of laboratory and drug use were circulated among the clinicians, although each was only able to identify himself or herself on the list. Laboratory and drug charges were reviewed again, the clinicians being unaware that a repeat audit was taking place. In the first audit, large variations (17-fold) between doctors were reported for laboratory costs and less so for drug use (fourfold). Following distribution of the results of the first audit, there was a 29.2 per cent decrease in laboratory use but a 6.4 per cent increase in expenditure on drugs. The greatest reductions were attributable to the high-cost physicians.

At Flinders Medical Centre in Adelaide, Grivell *et al.* [5] also used rankings of medical specialists and identified them by name. The order used was total diagnostic costs per bed day incurred by the specialists. (This ranking was compiled after the complete failure to change practice by regular feedback to clinicians of their own use of tests.) The ranking information also had no effect on the ordering of tests by the specialists.

Passive feedback on aspects of clinical care other than the use of tests has also had only a limited effect on utilisation, for example on the use of drugs [6] and on the process of care for cholecystectomy patients [7]. However, feedback of tonsillectomy rates to surgeons in Vermont [8] was associated with a reduction in operating rates over and above that occurring in the USA as a whole.

Thus, with few exceptions, passive feedback has been shown in several studies to have almost no effect on clinical practice.

Active Feedback

In the commonest form of active feedback, information on the management of patients is provided during regular reviews of medical records by clinicians in a firm. In one trial attempting to modify the use of tests by residents in a hospital in Boston, Martin *et al.* [11] randomly allocated 24 junior doctors into three groups. The first group reviewed at weekly intervals the medical records of patients in their wards; the second group received a moderate financial incentive if they reduced their use of tests; the third group acted as a control. During the year of the study, the group reviewing medical records showed the greatest decrease in the numbers of laboratory tests ordered (a reduction of 47 per cent).

A regular audit of medical records in a Birmingham hospital, however, did not produce a greater reduction in numbers of tests ordered by clinicians participating in the audit than by those in a control group [12]. The author suggested that no substantial change took place because only emergency medical admissions were reviewed, and these patients were unlikely to have had many unnecessary investigations. Nevertheless the review did lead to changes in other aspects of care, namely an improvement in medical recording, a reduction in drugs prescribed on discharge, and better discharge summaries.

An American hospital study [13] tried to reduce the use of a wide range of clinical resources by means of feedback to junior staff during individual tutorials and seminars held in the wards and out-patient clinics of one medical department. Average length of stay was reduced by 21 per cent and the cost per admission in the department rose by only 4.3 per cent per annum compared with an average growth rate of 14.5 per cent in other departments. The number of out-patient laboratory tests decreased, thus reducing overall patient costs.

Change may be forthcoming if feedback is combined with general guidelines or specific protocols outlining recommended modes of practice. In a recent study in the UK (Fowkes, unpublished), surgeons and anaesthetists in one hospital were issued with the Royal College of Radiologists' guidelines on the use of pre-operative chest X-rays. Issuing the guidelines had only a minor effect on utilisation, but regular feedback to the clinicians on their own utilisation resulted in a 55 per cent decrease in the use of pre-operative chest X-rays over a period of one year (in comparison with no significant change in a control hospital).

In a Canadian study, the College of Physicians and Surgeons of Saskatchewan formulated a list of indications justifying hysterectomy. After hospitals were presented with data on their numbers of 'justified' and 'unjustified' hysterectomies according to the College's protocol, the numbers of 'unjustified' hysterectomies fell markedly [14].

As with other methods of active feedback, the provision of guidelines or protocols is an educational measure additional to that provided by feedback. Most educational measures combined with feedback do appear to have an impact on practice.

Discussion

From the results of studies presented in this review, it would appear that simply feeding back information on performance has almost no impact on changing clinical behaviour. However, feedback combined with other educational measures would appear to have some success in changing practice.

It is not surprising that the very act of providing clinicians with relevant data does not automatically initiate change. Experience of traditional postgraduate education would suggest that new knowledge by itself impinges very little on clinical behaviour. This has also been demonstrated in studies concerned with the adoption of innovations: only a few key individuals tend to respond to new information with some appropriate action [15]. Most people resist change, being concerned primarily with maintaining current practices. In the case of clinicians the picture is further confused by the large amount of information with which any individual is constantly presented. As the amount increases, choosing which pieces of information to ignore and which to act upon becomes increasingly difficult.

In addition to the difficulties in overcoming a natural resistance to change, the failure of passive feedback may be due in part to the recipients' perceptions of the

information and of the system for supplying it. A survey of consultants' opinions of the Scottish Consultant Review of Inpatient Statistics (SCRIPS)[16] showed that 61 per cent thought it was of no value, 44 per cent found it difficult to understand, 46 per cent thought there was too long a delay in the provision of data and 64 per cent were concerned with the extent of errors. However, 82 per cent said that in future they would like to receive routine data of some sort. Thus most consultants were not opposed to the idea of receiving information but they did not approve of the SCRIPS system. The lack of involvement of consultants in the planning and provision of data was probably a major factor contributing to the system's failure. The system was undoubtedly perceived as an external review of clinical practice and was counterproductive in motivating change.

The individuals providing feedback may be crucial to success in promoting change. Martin *et al.*[11] thought that one reason for the success of their weekly chart reviews in reducing the use of diagnostic tests was that the reviews were led by senior clinicians whose views were respected by junior staff. Eisenberg *et al.*[17] postulated that one of the reasons they failed to reduce the inappropriate use of tests for lactate dehydrogenase (LDH) in a hospital was because feedback was provided by junior and not senior staff in the hospital. They thought that house officers would be more likely to respond to figures of authority. Feedback of information must also be directed to the most appropriate person. Grivell *et al.*[18] suggested that a major reason for the lack of effect of feeding-back data on numbers and costs of tests was because the feedback was presented to senior staff when in fact the junior staff ordered tests.

In the UK, one of the most ambitious programmes of information feedback to consultants was conducted by the Information Services Division of the Scottish Health Service in the form of Scottish Consultant Review of Inpatient Statistics (SCRIPS)[9]. Statistical information on numbers of discharges, diagnoses, ages of patients, and lengths of stay, was provided regularly to consultants on patients discharged from their wards. This feedback of information had almost no effect on clinical practice and was subsequently withdrawn.

In a more recent experiment in Brent Health District[10] consultants were provided with monthly reports of their use and costs of diagnostic and other services. The information was also presented intermittently to divisions; this allowed consultants to compare their own firm's performance with that of colleagues. After three years, there was no evidence to suggest that any consultant's pattern of work or expenditure had changed markedly.

Restuccia[19] conducted a study in which the persons providing feedback undertook different roles. The purpose of the feedback was to reduce the number of days in which patients remained inappropriately in hospital. Clinicians in four hospitals were provided with different forms of feedback on selected groups of patients. 'Direct' feedback, in which a nursing officer automatically informed clinicians that patients were in hospital inappropriately, resulted in the greatest change in terms of

reduced length of stay and decrease in inappropriate days in hospital. 'Judgemental' feedback in which the nursing officer first had to decide whether to inform doctors about inappropriately located patients, also had a positive effect on length of stay. 'Indirect' feedback to medically qualified 'advisers', who were then responsible for contacting the clinicians in charge of patients, proved ineffective as the 'advisers' appeared unwilling to confront their clinical colleagues.

The success of active feedback is undoubtedly due to the combination of feedback with other educational interventions. The education may not simply provide the logic for change, but may ensure a more personal environment between provider and recipient than is the case with passive feedback. The recipient may feel more involved and responsive to suggestions for change. Awareness of peer pressure may also be greater than that provided by sheets of statistics distributed by colleagues.

Although active feedback may be successful in initiating change, sustaining this change over a period of time is a major difficulty. Martin *et al.*[11] documented a continuing reduction in use of diagnostic tests for four months after stopping their weekly chart reviews, but other studies have not found this to be the case. For example, Rhyne and Gehlbach[20] combined feedback to residents on their use of thyroid function tests with an educational seminar. This reduced use for three months but, with no further feedback, use then returned to pre-intervention levels. The stimulus for change has to be sufficient to sustain change and to overcome the danger of recipients becoming immune to the stimulus. To sustain change over a long period of time, active feedback may have to be accompanied by a variety of educational interventions or some form of financial incentive or sanction[10].

In conclusion, there have been relatively few trials of the effect of feedback on performance in changing clinical behaviour. Active feedback in its variety of forms appears to be moderately successful but the lack of appropriate research design in many studies and the varying enthusiasm of researchers and participants make it difficult to decide on the most appropriate methods of feedback. Methods used in the future to feed back information on performance should be implemented on an experimental basis and should be carried out for a sufficiently long time to establish that any change is indeed longstanding and not just a short-term response to a new initiative.

References

1. Fowkes, F.G.R. (1982) *Medical Education*, **16**, 228.
2. Everett, G., de Blois, S., Chang, P. F. and Holets, T. (1983) *Archives of Internal Medicine*, **143**, 942.
3. Pozen, M. W. and Gloger, H. (1976) *Social Science and Medicine*, **10**, 491.
4. Schroeder, S. A., Kenders, K., Cooper, J. K. and Piemme, T. (1973) *Journal of the American Medical Association*, **225**, 969.
5. Grivell, A. R., Forgie, H. J., Fraser, C. G. and Berry, M. N. (1982) *Medical Journal of Australia*, **2**, 326.
6. Brown, C. R. and Uhl, H. S. M. (1970) *Journal of the American Medical Association*, **213**, 1660.

7. Mitchell, J. H., Hardacre, J. M., Wengel, F. J. and Lohreny, F. N. (1975) *Medical Care*, **13**, 409.
8. Wennberg, J. E., Blowers, L., Parker, R. and Gittelsohn, A. M. (1977) *Pediatrics*, **59**, 821.
9. Heasman, M. A. (1970) *Scottish Medical Journal*, **15**, 386.
10. Wickings, I., Coles, J. M., Flux, R. and Howards, L. (1983) *British Medical Journal*, **226**, 575.
11. Martin, A. R., Wolf, M. A., Thibodeau, A. L., Dzau, V. and Braunwald, E. (1980) *New England Journal of Medicine*, **303**, 1330.
12. Heath, D. A. (1981) *Journal of the Royal College of Physicians of London*, **15**, 197.
13. Lyle, C. B., Bianchi, R. F., Harris, J. H. and Wood, Z. L. (1979) *Journal of Medical Education*, **54**, 856.
14. Dyck, F. J., Murphy, F. A., Murphy, J. K. *et al.* (1977) *New England Journal of Medicine*, **296**, 1326.
15. Rogers, E. and Shoemaker, F. (1971) *Communication of innovations*. New York: Free Press.
16. Parkin, D. M., Clarke, J. A. and Heasman, M. A. (1976) *Health Bulletin*, **5**, 273.
17. Eisenberg, J. M., Williams, S. V., Garner, L., Viole, R. and Smits, H. (1977) *Medical Care*, **15**, 915.
18. Grivell, A. R., Forgie, H. J., Fraser, C. G. and Berry, M. N. (1981) *Clinical Chemistry*, **27**, 1717.
19. Restuccia, J. D. (1982) *Medical Care*, **20**, 46.
20. Rhyne, R. L. and Gehlback, S. H. (1979) *Journal of Family Practice*, **8**, 1003.

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epidemic was due to the planets and added that the plague only attacked 'persons of narrow souls and understandings'; 'those of a more refined reason' escaped. Indeed reason, abetted by money, made many flee the City. A good many physicians left urgently for the country where they joined their rich patients. On July 9th Rev. Josselin wrote 'The plague feares the London. They flie before it and the country feares all trade with London . . . The Lord stay his heavy hand.'

The Lord did not stay his heavy hand. During August and September there was a period of 30 days when over a thousand died each day in the City. Many churchmen thought the plague was a punishment from God, as shown in a book titled *God's Terrible Voice*; while 'Theological Queries' contained advice on the ethics of fleeing the plague or visiting the sick, it also advised the taking of tobacco in the morning against the infection. Of more medical importance was the quick reprinting of Dr Francis Herring's book on the plague which he had published in 1628, his advice then being the same as that given officially by the College.

By early winter the worst was over in London. The

plague still ravaged Essex towns. Josselin recorded this, adding in wonderment 'yett Colne, sinful Colne, is spared'. But it was not until 1st February 1666 that the King returned to Whitehall. He made some modest awards for service during the great plague when he met his Privy Councillors on May 16th. The College was not mentioned and only two physicians, Drs Astell and Inard, neither Fellows of the College, received a piece of inscribed plate to the value of £10. The Council was still uncertain as to the cessation of the plague, as it continued to prohibit public burials 'during the time of infection'. Plague of course did return to London that summer of 1666 but was never severe. More was seen in the country. In July Josselin wrote 'A very hot season. Plague rageth at Braintree, Colchester. At London abated . . .'

Of course the whole City of London was to change in terms of density of population and plague. On Sunday, 2nd September 1666, the first flames of the Great Fire started to purge the City of infection. The coming of winter as usual brought the plague to a halt in other towns. Wrote Josselin: 'Nov. 25. A very wett morning. The country clear of the plague.'