the 35 who had moved into it (excluding the six children who had moved away or had no records).

Doctors who are enthusiastic immunisers in practices with a high turnover of children therefore have to work exceptionally hard, as immunised children who move away tend to be replaced by those who have not been immunised. Unfortunately, not even enthusiasts can give preschool boosters to children who have not completed the primary course.

The practice's overall uptake of the preschool booster was disappointing at 68%, well below that of the primary course, which then averaged 85% across the new contract's three immunisation groups. The uptake has since been improved to 77% and can no doubt be improved further. For many practices, however, a target of 90% seems even more unreasonable for the preschool booster than for the primary course.

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- 1 Lawrence M, Coulter A, Jones L. A total audit of preventive procedures in 45 practices caring for 430 000 patients. *Br Med J* 1990;300:1501-3. (9 June.)
- 2 Nicholl A, Elliman D, Begg N. Immunisation: causes of failure and strategies for success. *Br Med J* 1989;299:808-12.
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SIR,—We were encouraged that Dr Martin Lawrence and colleagues¹ have successfully used a method of audit of computer records that is similar to ours on a different computer system. Our work with an electronic questionnaire² is part of a larger project to investigate the potential of a "megapractice" based on a standard national computer system (GPASS). The megapractice concept, in which practice sets of data are combined to create a large database of over 100 000 patients, is likely to be of value only if there are sufficient data in a system to provide meaningful epidemiological information. The electronic questionnaire was designed primarily to assess the extent of computerisation in all practices using GPASS throughout Scotland.

Dr Lawrence and colleagues comment that a notable feature of our survey was the low level of completeness of the data. There are several major differences between our survey and theirs. Firstly, they studied only practices that had used a computer system for 2-5 years; our study included practices that had begun to use a computer system between 1984 and 1988. Secondly, we carried out our survey in 1988; the date of their survey was not disclosed. Thirdly, they found an association between the number of terminals in a practice and most of the practice's performance measures. In 1988 all sites using GPASS had only single terminals. Even our survey in 1990 of 554 Scottish practices that used GPASS showed that 78% had only one terminal (M W Taylor *et al*, unpublished data).

We used the method again in 1989 and have just issued the version for 1990, which extends into the additional topics of prescribing of a particular drug and morbidity coding. The results from 1989 show that the available database has expanded dramatically (table).

Preliminary work with the megapractice concept shows a very variable speed of data entry with practices taking on average three years to reach a full data set on repeat prescriptions or morbidity. Most practices enter repeat prescribing data first, and a majority are still in the data entry phase for morbidity coding, while screening information is increasing dramatically—probably as a direct result of the new contract.

Users of GPASS are under no obligation to

Volume of data held by combined database of practices in Scotland that use GPASS

	1988	1989
No of practices	154	251
No of doctors	759	1 217
No of patients	1 010 452	1 711 139
No of diagnoses	617 633	1 227 147
No of prescriptions	514 892	983 220
No of preventive items	295 355	601 337
No of repeat prescriptions/28 days	180 248	330 117

enter specific types of information into practice computers, and thus we are dealing with only working data that have been entered because they are useful to practices. We envisage that this method will be of increasing importance in accessing and maximising the epidemiological and audit potential of data in Scottish general practice at local, regional, and national levels.

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- 2 Taylor MW, Ritchie LD, Taylor RJ, *et al*. General practice computing in Scotland. *Br Med J* 1990;300:170-2. (20 January.)

Selecting patients for cerebral angiography before carotid endarterectomy

SIR,—With reference to the article by Dr Graeme J Hankey and Professor Charles P Warlow on selecting patients for carotid angiography¹ there is no doubt that Doppler flow duplex ultrasound scanning is accurate if used appropriately. But, as the authors state, it is very operator dependent and takes several months for an apprentice to learn. It is a difficult examination to pick up as you go along; in Britain it has been slow to catch on because several units have tried just this and abandoned it. The published work validating the technique is world wide; results obtained by me and my colleagues have confirmed this validation.²

I always use continuous wave Doppler flow to examine the flow patterns in the common, internal, and external carotid arteries throughout the neck before starting to image. Imaging only is fraught with danger. For instance, with a heavily calcified plaque it is impossible to grade the degree of stenosis or distinguish a stenosis from an occlusion. With very soft plaque the image may be entirely normal, even if the plaque is severe enough to cause a complete occlusion or tight stenosis. The Doppler flow examination of the carotid arteries throughout the neck will usually indicate the correct diagnosis.

Any department setting up this type of examination should be aware of these potential problems. It is easy when you see a good image to convince yourself that the artery is normal when, in fact, it may be abnormal. In the early stages the results of duplex ultrasound scanning should be validated against carotid angiography in cases in which this would have been indicated clinically if ultrasonography had not been available.

Finally, it is also important to stress the need for accurate clinical assessment before surgery. As one who runs a clinic for Doppler flow duplex ultrasound scanning I can verify that a large percentage of patients referred for carotid ultrasonography do not have carotid ischaemic events. About 7% of the population over 65 have an asymptomatic bruit, and it is all too easy to hear a carotid bruit when the patient has vertebralbasilar

transient ischaemic attacks or some other unrelated condition.

Winslow *et al* from the Rand Corporation in the United States have shown that in a group of patients undergoing carotid endarterectomy the technique was performed for appropriate clinical symptoms in only 35%; it was completely inappropriate in 32% and of dubious indication in 32%.³ It would be a shame if market forces and a lack of careful clinical assessment, even in the presence of reliable duplex ultrasound scanning, led to the same sequence in Britain.

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- 1 Hankey GJ, Warlow CP. Symptomatic carotid ischaemic events: safest and most cost effective way of selecting patients for angiography, before carotid endarterectomy. *Br Med J* 1990;300:1485-91. (9 June.)
- 2 Humphrey P, Sandercock P, Slattery J. A simple method to improve the accuracy of non-invasive ultrasound in selecting TIA patients for cerebral angiography. *J Neurol Neurosurg Psychiatry* (in press).
- 3 Winslow CM, Solomon DH, Chassin MR. The appropriateness of carotid endarterectomy. *N Engl J Med* 1988;318:721-7.

Medical audit data: counting is not enough

SIR,—Ms Cynthia Lyons and Mr Robert Gumpert have certainly provoked thought with their implication that counting is not enough in presenting medical audit data.¹ I feel that the implication "you only get out as good as you put in" may have been more appropriate.

I would be surprised if anyone judged the quality of surgical care purely on the rate of return to theatre, which, as the paper points out, is often not due to avoidable factors. Further information must be put in at source regarding the reasons for return to theatre.

The use of the BUPA code for differentiating between surgical operations would seem a little unwise as it has no information on the type or complexity of the surgery but is related more to time and cost factors.

The authors point out that some of the problem may be associated with poor data collection, and I note, also, that the study was carried out over one year, whereas the original study on audit using Dunnfile was over five years.²

I wonder if the main lesson from this paper is that audit by computer needs much planning, staff training, and practice in its use before its usefulness can be assessed.

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- 1 Lyons C, Gumpert R. Medical audit data: counting is not enough. *Br Med J* 1990;300:1563-6. (16 June.)
- 2 Dunn D. Audit of a surgical firm by microcomputer: five years' experience. *Br Med J* 1988;296:687-91.

AUTHORS' REPLY,—Firstly, we agree that people who are informed would not judge the quality of surgical care purely by the rate of return to theatre. Our paper points to the problem of the uninformed doing so.

The BUPA classification does take into consideration the complexity of the surgery performed as well as time and cost factors. Indeed, all are inextricably linked.

Dr Voss refers to the problems associated with poor collection of data. The completeness of data is not always obvious, and it is conceivable that studies—whatever the duration—overlook this.

The fact that the computer system used was Dunnfile is irrelevant when considering the problems of interpretation and presentation of audit data in general.