have no history of cysts; these patients should be referred to hospital. Mammography is the first investigation that should be performed in a woman in the age range affected by cysts because it provides useful diagnostic information in patients with a breast mass; roughly 1% of patients with a cyst have a breast cancer at the time that they present with the cyst, and this can be identified on mammography; prior needle aspiration increases the pain and discomfort associated with mammography; and fine needle aspiration performed before mammography may cause a haematoma, which mammographically may mimic a breast cancer.[2]

Results of mammography in series of 500 symptomatic patients

Mammographic diagnosis	Final pathological diagnosis	
	Malignant	Benign
Malignant	75	4
Suspicious	11	36
Benign or normal	14	360

Sensitivity (includes malignant and suspicious diagnoses) = (75+11)/100=86%.
Specificity=360/400=90%.
Positive predictive value of a malignant diagnosis=75/(75+4)=95%.

James W T Chalmers and David Breen make several errors in their back calculation of the sensitivity, specificity, and positive predictive value of tests used to diagnose breast cancer.[3] The table presents results of mammography in a series of 500 patients; the results are classified as malignant, suggestive of malignancy, or benign or normal. The figures show how, with a prevalence of breast cancer in this group of 20%, it is possible to obtain a sensitivity of 86%, a specificity of 90%, and a positive predictive value of a malignant diagnosis of 95%. Chalmers and Breen calculate that, to obtain these results (which are the same as those set out in our article[4]), there had to be a prevalence of malignant disease of 69%. Their calculations are incorrect. In our view the results given for the accuracy of investigations of symptomatic breast disease[4] should be attainable in units seeing appreciable numbers of patients with breast problems.

J MICHAEL DIXON
Consultant surgeon

Department of Surgery,
University of Edinburgh,
Royal Infirmary,
Edinburgh EH3 9YW

R E MANSEL
Professor of surgery

University of Wales College of Medicine,
Cardiff CF4 4XN

1 Foster J. Referral of women with breast lumps. *BMJ* 1995;**310**: 331. (4 February.)
2 Sickles EA, Klein DL, Goodson WH, Hunt TK. Mammography after fine needle aspiration of palpable breast masses. *Am J Surg* 1983;**145**:392-7.
3 Chalmers JWT, Breen D. Positive predictive value of tests for breast disease. *BMJ* 1995;**310**:331. (4 February.)
4 Dixon JM, Mansel RE. ABC of breast diseases: symptoms, assessment and guidelines for referral. *BMJ* 1994;**309**:722-6. (17 September.)

Medical informatics

EDITOR,—We agree with Anthony Nowlan that "technological advance alone is not sufficient because much of the hard part is bound up with the way in which we practise medicine, and this cannot be addressed only by the medical profession."[1] The conference "The heart of the matter," organised jointly by the British Medical Informatics Society and the BMA last December, showed that there is a lot of interest in medical informatics, but discussion there emphasised the need to address the lack of education for both students and clinicians.

Other countries have taken a lead in tackling this at the national level by making substantial changes to medical education. For example, medical informatics has been included in the nationally regulated medical curriculum in Germany since 1980.[2] In the mid-1980s the Association of American Medical Colleges recommended that "medical schools should designate an academic unit for institutional leadership in the application of information science and computer technology to the general professional education of physicians and promote their effective use."[3]

The changes to the undergraduate medical curriculum that are currently being planned in most medical schools in Britain offer an ideal opportunity to review the place of medical informatics in the curriculum and in universities. We believe that medical informatics should be integrated as a core part of a problem based approach to medical education and that each university with a medical undergraduate course needs a group, unit, or department of medical informatics in recognition of the future role of the discipline. This unit would not necessarily be located solely in the medical faculty but might also have roots in computing or information science.

RAY JONES
Senior lecturer in health informatics
SUE KINN
Research fellow, postgraduate medical education
FELICITY GRAINGER
Medical librarian

University of Glasgow,
Glasgow G12 8RZ

1 Nowlan A. Medical informatics: the professional challenge. *BMJ* 1994;**309**:1385-6. (26 November.)
2 Haux R, Dudeck J, Gaus W, Leven FJ, Kunath H, Michaelis J, *et al.* Recommendations of the German Association for Medical Informatics, Biometry and Epidemiology for education and training in medical informatics. *Methods Inf Med* 1992;**31**: 60-70.
3 Executive Council of the Association of American Medical Colleges. Evaluation of medical information science in medical education. *J Med Educ* 1986;**61**:487-543.

Memory of intraoperative events

EDITOR,—We were disappointed to read in J G Jones's editorial on memory of intraoperative events that Jones believes that the isolated forearm technique is "unsuitable for prolonged monitoring because of the risk of ischaemia in the isolated arm."[1] We have described how prolonged monitoring is easily achieved simply by releasing the forearm cuff after 20 minutes and then reinflating it some minutes later if further muscle relaxation is required.[2,3] This cycle of isolation of the forearm and release can then be maintained indefinitely. Using "train of four" nerve stimulation in more than 100 cases, we have found that although releasing the tourniquet after 20 minutes results in some reduction in muscle power, this is not sufficient seriously to impair the capacity for forearm responses. This technique assumes the use of a non-depolarising muscle relaxant such as atracurium or vecuronium in appropriate doses (the technique is not viable with pancuronium).

We are puzzled by the anaesthetic community's continued resistance to the more widespread use of the isolated forearm technique, despite Jones's description of the method as the gold standard against which other methods of detecting awareness need to be evaluated.[4] This may have something to do with contemporary anaesthetic culture, in which simple clinical methods are overlooked in favour of high tech monitoring techniques. Even if a reliable monitoring device became commercially available in the near future (and this is unlikely) the cost of equipping every operating theatre in Britain with such a machine would be exorbitant. For example, at £5000 per machine (a conservative estimate) the total cost to the NHS would be in the region of £20m—an unrealistic prospect in today's cost cutting, accountancy led service. This potential expense is in stark contrast to that of the isolated forearm technique, which uses equipment readily available in every operating theatre. With a relatively low but persistent incidence of awareness with postoperative recall, often associated with the threat of litigation, can anaesthetists afford to remain complacent about these matters?

Jones also states that "the psychological consequences of conscious awareness with explicit memory of pain are not known." Although a definitive follow up study of a sizeable cohort has yet to be published, there are numerous reports of small groups and single cases. When appreciable psychological distress is evident it inevitably falls within the parameters of post-traumatic stress disorder, being characterised by symptoms of excessive autonomic arousal (including panic, anxiety, and fear), intrusive re-experiencing of the original trauma (for example, flashbacks and nightmares), and avoidance (for example, the development of phobic disorder and attempts to avoid reminders of the trauma). These disturbances commonly last for years rather than months. What certainly is unknown is the psychological effect of intraoperative awareness and pain without explicit postoperative recall. Many people assume that this has no consequence, but this has yet to be proved. There are anecdotal suggestions that such experiences may have serious and enduring psychological sequelae.[5]

MICHAEL WANG
Clinical director

Clinical Psychology Unit,
University of Hull,
Hull HU6 7RX

IAN F RUSSELL
Consultant anaesthetist

Department of Anaesthesia,
Hull Royal Infirmary,
Hull HU3 2JZ

1 Jones JG. Memory of intraoperative events. *BMJ* 1994;**309**: 967-8. (15 October.)
2 Russell IF. Conscious awareness during general anaesthesia. In: Jones JG, ed. *Depth of anaesthesia: Ballière's clinical anaesthesiology*. London: Ballière-Tindall, 1989:511-32.
3 Wang M, Russell IF, Charlton FC, Conlon J. An experimental simulation of anaesthetic awareness and validation of the isolated forearm technique. In: Sebel P, Bonke B, Winograd E, eds. *Memory and awareness in anaesthesia*. Englewood Cliffs, NJ: Prentice-Hall, 1993:434-46.
4 Jessop J, Jones JG. Conscious awareness during general anaesthesia—what are we attempting to monitor? *Br J Anaes* 1991;**66**:635-7.
5 Tunstall M, Lowit IM. Sleep phobia after awareness during general anaesthesia. *BMJ* 1982;**285**:865.

Preventing suicide

EDITOR,—Andrew Warsop is to be congratulated for having the courage to put his head above the parapets in the challenging debate about the rights of individuals and the duty of doctors with regard to suicide.[1] This debate, however, does not belong to the medical profession alone. For over 40 years the Samaritans has offered emotional support to those for whom life may have become too much to bear. The question about the rights of individuals to self determination continues to be a constant source of debate. One of the fundamental principles that governs the way in which the Samaritans works states, "A caller does not lose the freedom to make his own decisions, including the decision to take his own life, and is free to break contact at any time."

Principles, however, are one thing (as guidelines, codes of ethics, etc may be), but practice presents the stark reality of decisions that need to be made and assumptions that have to be taken. For example, who can possibly tell (within the time available for a decision to be made) that a person who is unconscious, having apparently taken an overdose, really does want to die? Death is irreversible, whereas someone who is resuscitated will