Scottish anaesthetists to surgeons it could be expected that the proportion of surgeons to anaesthetists in training had been reduced to allow the staff ratios to correct themselves; this is far from the case (Table VI).

The ratios of junior surgeons to anaesthetists are higher than the consultant ratios and are even higher in Scotland than in England. This lack of balance gives reason for grave concern for the future careers of the excess of junior surgeons who are being trained to work without the concomitant training of the essential anaesthetic staff to back them up.

Use of Subconsultant Grade

As a possible solution to anaesthetic shortages one could consider the increased use of "medical assistants," with a period of training cut to about three years, to allow more "anaesthetists" to be trained. The use of such grades has strong opposition from the profession as it is too obvious that they could be abused, as was the previous senior hospital medical officer grade, with the appointees finding themselves performing unsupervised consultant work without consultant pay. A further problem to such grades is that as they require consultant supervision they may occupy positions which could otherwise be used for much-needed training appointments.

In the U.S.A. and Sweden the problem of anaesthetist shortages has been solved by the use of "nurse anaesthetists" in some areas. As with the use of medical assistants this solution also has strong opposition from the profession, and it appears more expedient than desirable in those countries in which it has occurred. The use of nurse anaesthetists is not likely to be a solution to anaesthetic staffing problems in Scotland, as nurses are in very short supply; in addition, to deploy a supervised team of nurse anaesthetists efficiently necessitates large modern operating-theatre suites, which we lack.

Though nurse anaesthetists administering anaesthetics do not provide a solution to our shortages "anaesthetic nurses" trained to help in the anaesthetic room, theatre, and recovery area have a valued place, and it is regrettable that the current nursing shortage is restricting expansion in this field.

Recommendations

An increase of anaesthetic junior staffing is urgently needed, as without this we can never hope to achieve the increased number of anaesthetists needed. The size of the increase is dictated to some extent by the number of surgeons in training. While the numbers of surgeons in training are correctly balanced to the number of surgical consultant vacancies there should be at least one anaesthetist in training for every two surgeons. While awaiting the necessary increases in anaesthetic staffing, both senior and junior, existing training appointments must be efficiently used and recommended day release or study leave provided. There are several excellent reports giving guidance in the application of anaesthetic training schemes and concurrent maintenance of the best service for the patients.
situation one should give anticoagulants. The risk of an embolus is higher when fibrillation is intermittent.

HOUSE PHYSICIAN: He was easily controlled on phenindione, but two years later, in 1964, he was becoming more breathless, and having some ankle swelling at night. He had a successful mitral valvotomy, although there was minimal regurgitation after the operation. He remained in atrial fibrillation, but the ventricular rate was easily controlled with digoxin, 0.25 mg twice daily.

DR. WOOD: May I inject a word of warning here. Some patients are sensitive to the vagal effects of digoxin and have a slow rate at rest on a low dose of digoxin. On exercise or after atropine the rate may be totally uncontrolled (Fig 1). One should aim at a rate of less than 80 at rest and under 110 on exercise before accepting that the drug has controlled the rate.

![Fig. 1](image.png)

**FIG. 1**—An excessive rise in ventricular rate on exercise—a sign of inadequate digoxin dosage on atrial fibrillation.

HOUSE PHYSICIAN: He did not stay on digoxin. Three months after valvotomy it was stopped and elective cardioversion successfully returned him to sinus rhythm.

STUDENT: How is this done?

**TECHNIQUE OF DEFIBRILLATION**

DR. PETRIE: The problem in atrial fibrillation is that the tissue is electrically desynchronized. Electroschock causes all the muscle elements to be discharged simultaneously, and this gives the normal pacemaker a chance to initiate and maintain sinus rhythm in a favourable environment.

The technique itself is safe if you take the right precautions. A drip should be running and an anaesthetist should be available. The patient is lightly anaesthetized with diazepam, 10 mg intravenously. A shock is delivered, using the E.C.G. monitor to trigger the shock on the R wave of the E.C.G., thus avoiding the period (the T wave) when ventricular fibrillation may be produced. The energy needed is usually quite low—often less than 20 joules. Sometimes over 100 joules are necessary to convert the rhythm, but you should remember that the technique is not always successful.

**USE OF ANTICOAGULANTS**

PROFESSOR MACGREGOR: This is a familiar problem and the hope must be to make him well enough for surgery. But the risks are now greater than they were two years ago. I see he is no longer on an anticoagulant. Why not?

DR. PETRIE: Primarily because he is an unreliable patient and ignores most of the advice he is given. He was on warfarin for a few months last year in spite of some dyspeptic symptoms, but he was forever taking aspirin—which increases the action of warfarin by displacing it from protein-binding—and was also intermittently using his wife’s barbiturate sedatives—which increase the metabolism of warfarin. His prothrombin times were varying from short to excessively long. I felt that the risk of haemorrhage was greater than that of an embolus and stopped the drug.

DR. WOOD: The atrial appendage was removed at valvotomy, so one could argue that the likeliest source of an embolus had been removed.

PROFESSOR MACGREGOR: What about his rapid ventricular rate?

DR. WOOD: Well, on digoxin 0.25 mg thrice daily he had a ventricular rate of 120/min with a lot of ventricular ectopic beats. Quite clearly he cannot go on with that dose. As he is in heart failure the sympathetic tone is high and that is the main reason why digoxin is not slowing atrioventricular conduction. Although the serum potassium level is normal he probably does have a total body deficit of potassium. This in itself makes the myocardium inefficient and reduces the dose of digoxin required to initiate toxic arrhythmias (Fig 2). Sometimes increasing the dose of digoxin in these patients actually intensifies the heart failure or, if a breakaway rhythm arises in the atrioventricular node, a rapid and regular nodal or junctional rhythm may develop.

HOUSE PHYSICIAN: So what can now be done for him?

DR. PETRIE: Rest in bed is important. The diuretic regimen will have to be improved, and this will probably mean that spironolactone must be added, in a dose of 100-200 mg a day.
Adequate potassium supplements must be given, though of course the aldosterone antagonist will help conserve potassium. After a few weeks he may have regained some cardiac reserve and digoxin will then control the ventricular rate more satisfactorily. Then, though the risk is daunting, valve replacement offers the only hope of worthwhile survival.

**DR. WOOD:** I would certainly have one myself in this predicament. Today most people think that it is never too late to do valve replacement, and some case reports have been published that support this claim.

**STUDENT:** Nobody has suggested bringing the ventricular rate under control with propranolol in this case. Presumably that is because this patient is dependent on his sympathetic drive and would go into worse congestive failure if he were given propranolol.

**PROFESSOR MACGREGOR:** That is absolutely right. This patient could not possibly tolerate propranolol. May we see the last case now.

**Case 4—Myocardial Infarction**

**HOUSE PHYSICIAN:** This 62-year-old man was admitted with a classical history of central chest pain followed by palpitations. He was in atrial fibrillation at a ventricular rate of 160/min on admission and had a low blood pressure of 100/70 mm Hg and rather cold hands and feet. The E.C.G. did not initially confirm myocardial infarction but within 24 hours changes did develop in the leads reflecting the anterolateral surface of the heart.

**STUDENT:** Was he in heart failure?

**DR. WOOD:** Yes. A chest film a few hours after admission showed moderate pulmonary congestion. It is always well worthwhile x-raying the chest in patients who have had acute myocardial infarction because radiological features are often present before crepitations can be heard, or the jugular venous pressure is raised.

**PROFESSOR MACGREGOR:** The low blood pressure and heart failure are at least partly due to poor ventricular filling on account of the rapid rate. No one likes using a glycoside acutely after a myocardial infarction, knowing that even in therapeutic dosage digoxin helps create the environment in which ventricular extrasystoles can occur. But here there was no alternative.

**STUDENT:** Why not use direct-current shock?

**DR. PETRIE:** The fibrillation usually recurs because you don't change the environment which favoured the development of fibrillation.

**STUDENT:** So you give digoxin to slow the ventricular rate and this lets the cardiac output recover?

**PROFESSOR MACGREGOR:** That is correct. But curiously enough sinus rhythm is often re-established soon after giving the digoxin.

**HOUSE PHYSICIAN:** Does that not rather contradict what has already been said about digoxin favouring the continuation of fibrillation.

**PROFESSOR MACGREGOR:** It does: Dr. Wood, can you explain.

**DR. WOOD:** I think so. Our patient is in acute cardiac failure because of the insult of the infarct and of the haemodynamic effects of the very rapid ventricular rate. These factors, plus the pain and agitation, made for very high sympathetic tone—a state in which the atria, as we heard earlier, are intensely prone to re-excitation. Digoxin, by slowing the ventricular rate, relieves the acute failure and reduces sympathetic tone. This effect prolongs atrial refractoriness more than the direct vagal effects shorten it. The net effect—in this patient—opposes fibrillation.

**DR. PETRIE:** This patient returned to normal sinus rhythm after 16 hours. Just before the reversion the fibrillation became very coarse. He had had a total of 1.25 mg digoxin in divided doses and this had brought the ventricular rate from 160 to 90/min. He has remained in sinus rhythm ever since and is now making a rapid recovery and is off all drugs.

**PROFESSOR MACGREGOR:** Did you give the initial dose of digoxin intravenously?

**HOUSE PHYSICIAN:** Yes, but I gave it very slowly, over 5-10 minutes, with an eye on the E.C.G. monitor.

**WARNING OF FIBRILLATION**

**STUDENT:** Do you ever get any warning that atrial fibrillation is going to complicate a myocardial infarction?

**DR. PETRIE:** It happens generally in patients with quite severe infarctions who have high adrenergic drive. Sinus tachycardia with multiple supraventricular ectopics often precedes atrial fibrillation, and some people look upon this as an indication to give digoxin.

**DR. WOOD:** Yes, I prefer to give the drug by mouth before the need is desperate rather than intravenously, as in this case, when the situation is critical. Theoretically, though I have not seen this suggested, once the ventricular rate in atrial fibrillation is controlled, an injection of atropine will remove the action of digoxin that favours the rhythm. I have tried this a few times in this sort of case and I have always had sinus rhythm minutes afterwards.

**DR. PETRIE:** The objection to giving atropine is that you partly undo the beneficial effect of digoxin in slowing the ventricular rate, but there is some experimental evidence.
to suggest you are right. By using atropine you discriminate between a wanted and an unwanted effect of digoxin.

PROFESSOR MACGREGOR: The problem of atrial fibrillation complicating myocardial infarction is not at all unusual, and although it is reasonable to leave the rhythm untreated for a few hours (provided the patient is tolerating it), digoxin often has to be given. One way to reduce slightly the dangers of digoxin is to give ouabaine, knowing that that drug is excreted unchanged in a very few hours, whereas digoxin has a half life in the body of about one-and-a-half days. However, it is a long time since a patient like this had a cardiac arrest in this ward, and I do think that the advantages of digoxin therapy must outweigh the risks.

In summary, we have seen today what a diverse and difficult problem atrial fibrillation can be. To treat it satisfactorily one must have a clear concept of its aetiology and a basic understanding of the mode of action of digoxin.

Vocational Training in General Practice

VII—Manchester

FROM A SPECIAL CORRESPONDENT

Manchester University Medical School opened a Department of General Practice in 1969, but since 1954 all medical students have spent at least a fortnight at the Darbishire House Health Centre. The pioneering experience acquired in introducing medical students to general practice proved a valuable foundation for the vocational training scheme, which was launched in Manchester in 1969. Relatively few family doctors in the Manchester area had had trainees under the old scheme, a result no doubt of large lists and heavy work load, and the Director of the Department initially turned to those principals who had been training undergraduates and invited them to take part in the postgraduate scheme. The response was good and with the original core of trainers now expanded to include family doctors in the outer ring of Manchester the scheme is well under way, though it is not without its headaches. Ambitiously it aimed at admitting 20 trainees a year to two centres in the middle and south of the region, with their course based on Manchester, and 10 in the north with Lancaster as the base. Unfortunately too few candidates applied for the posts available and in September this year only 16 vacancies are being offered in the Manchester area. So far 10 of these have been filled. Nevertheless, those that have joined the course, as in the other schemes, have generally been well motivated to general practice. A few have dropped out and one or two were seduced into a specialty during the course.

Local Problems

One of Manchester's biggest problems, the Director told me, is the industrial depression affecting many parts of the South-west Lancashire connurbation, and the state of many of the hospitals reflects this situation. The University and the medical school were lively enough, he said, but elsewhere poor buildings, insufficient and heavily overworked staff, many from overseas, were commonplace. Furthermore, the medicosocial problems, associated with industrial depression, compounded the difficulties. So despite the number of hospitals in the Manchester area it had been difficult to arrange suitable hospital posts for the trainees in the scheme. The service load was too heavy to allow time for adequate teaching, and the tendency had been to offer posts where the hospital saw an advantage in having a British-trained graduate or where it regarded the scheme as a heaven-sent solution to filling unpopular posts. This type of post, needless to say, did not always offer the trainee the right experience, and on occasion had led to a trainee withdrawing from the scheme or asking for a transfer to another hospital.

The undergraduate teaching hospitals, the Director continued, were loth to release posts to the scheme because these were regarded primarily for training future specialists, while the Director himself was opposed to supernumary appointments as he thought that these offered the trainee too little experience. On the other hand, he admitted that a young doctor in a regular hospital post did not always find it easy to take time off. This caused difficulties because apart from attendance at the day-release course on general practice run in Manchester, during the hospital period the trainees were encouraged to meet their future practice trainer regularly. Nevertheless, despite all these obstacles sufficient hospital posts have been negotiated, owing mainly, I suspect, to the persuasive persistence of one man.

The Curriculum

The Manchester trainees spend two years in hospital posts—which are fitted to the trainee's needs as far as practicable—and one year in general practice. Those trainees attending the northern hospital groups—for example, Barrow, Preston, and Lancaster—also start with two years in hospital, but the first four weeks are spent in an introductory, residential course at Lancaster. The final year is spent in a practice in the area. The Department of General Practice organizes an extended sandwich course, comprising half a day per week for three ten-week terms. As at Ipswich (19 June, p. 704) and Wessex (3 July, p. 41) this course was valued by the trainees. The opportunity of meeting their fellows and the wider perspective of medicine provided by the course were especially welcome. Trainees also have the opportunity to see various types of practice, some practice swapping is arranged, and they visit local health departments, occupational health schemes, and the like.

Talking to one trainee, who had graduated from a London medical school where there was no student contact with family doctors, he told me that the advertisement for the Manchester scheme had alerted him to the potential of research in general practice. He welcomed the period of stability which the course offered, though it was a pity that the trainees' accommodation could not be arranged for the whole three years; he suggested that "trainee flats" might be built into health centres. The amount of formal teaching he had received during his period in hospital had been minimal, and he regretted that the opportunities for meeting fellow trainees had been negligible. The financial differential between young principals and trainees was well recognized as a problem by everyone I met, though at this early stage the enthusiasm of the trainees seemed to outweigh this.