of the technique and thought it should be continued. The most frequently mentioned advantage was the fact that the whole class could see a particular patient, and that the view on the screen was better than could have been obtained in any other way except by almost individual tuition at the bedside. The demonstration of physical signs was particularly well received, instruments and pathology specimens less so. Curiously, x-ray films, which after all are black-and-white in reality, were thought unsuitable for showing on television by 19 students. This is probably due mainly to the difficulty which many students have in learning to interpret x-ray films.

Nine students complained of difficulty in understanding the orientation of things shown on the screen. We found during the programmes, for example, that it was important when showing a close-up view of an abdomen to be sure that everybody knew which was the head end of the patient. If difficulty with orientation can be overcome, the selective view taken by the camera has a potential advantage in directing attention to the important points, to the exclusion of others. Several students commented on this, saying that their attention was held and that learning was made easy and enjoyable.

The remoteness of the patient evoked a good deal of comment. Lack of colour, lack of direct contact and personal relationship with the patient, and lack of tactile sense were all felt to be a disadvantage. But privacy for the patient and consequent freedom for discussion of pathology at any stage in the presentation somewhat offset this.

Conclusion

Television makes possible the presentation of many visual images in motion in a short space of time. We tried to exploit

this facility, with the result that 22 students complained that too much material was shown too rapidly. We also kept the lecture-room in darkness during actual demonstrations, not because this was necessary to see the screen, but to prevent immediate note-taking. There were complaints about this at the time, and in the written critiques. We wished, however, to try to ensure that students concentrated on the programme. We hoped that a single visual impression of this sort could be effective without further reinforcement, and without the use of lecture notes, which are such a feature of Scottish university education.

The relatively high scores obtained encourage us to think we have succeeded, especially with students of average ability, who, after all, constitute the bulk of any class.

Summary

An attempt has been made to evaluate the use of television in the teaching of some aspects of clinical surgery. A class of medical students taking surgery for the first time has been studied. The students' examination performance on material taught in the orthodox fashion has been compared with that on material taught by television. It appears that more than half the class benefited in their learning from the use of television. Teaching by television appears to help those outside the top 15% of performers as categorized by orthodox examination results.

We wish to acknowledge the assistance of Dr. A. L. Stalker, of the Department of Pathology, and of Dr. L. A. Gillanders, of the Department of Radiology, in this teaching experiment. We are indebted to the Court of the University of Aberdeen and the Board of Management of the Aberdeen Royal Infirmary for financial aid in obtaining the television equipment.

Student Opinion on General Practice Attachment

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Most medical schools offer senior students an opportunity of seeing general practice (British Medical Students' Association Report, 1961). Though some of these schemes have been running for a number of years, there have been few factual reports on their value to students. This paper presents the findings from questionnaires returned by 69 fifth-year students who had voluntarily spent an average of two weeks with general practitioners; most of these students had participated in the scheme run by the University of Aberdeen, but a few had made arrangements with doctors of their own choice in or near their home town.

The Aberdeen attachment scheme is voluntary on the part of both students and doctors. A list is maintained of general practitioners who are willing to take a student in either the spring or summer vacation; fifth-year students attending the course in social medicine are informed of the aims and methods of the attachment, and are shown the list of general-practitioner tutors. Choice of doctor is left to the student, who is then introduced by letter to his tutor and thereafter detailed arrangements are made at mutual convenience.

Of the 50 practices willing to take students in the north-east of Scotland the majority are outside the city of Aberdeen; this probably reflects the greater ability of doctors with smaller lists to give the time required for demonstration and explanation. Some of these rural and semi-rural doctors offer the student accommodation in their own homes, an offer that students much appreciate, since it enables them to get a more complete picture of the general practitioner's life.

Student Response to the Scheme

Data are not available for the early years of the scheme, but in 1963 and again in 1964 about one-half of the fifth-year class spent one or two weeks attached to a general practice. Persuading students to complete and return a questionnaire is rarely wholly successful, so a few who did not respond may in fact have arranged an attachment of their own. The 69 student replies analysed below do, however, represent over 90% of the students known to have taken part in these two years.

Most of the questions were so framed as to allow students plenty of scope for comment, opinion, and impression. Though a few questionnaires consisted of rather stereotyped replies, most

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students, in fact, not only took considerable care in setting down their replies but often wrote with a wealth of detail about what they had seen—indeed, if the quantity of words on the questionnaire is a guide, this experience of general practice made a very strong impression on the majority of students.

Findings

Of the 69 students 55 (80%) described the attachment experience as "very interesting," 13 ticked the "quite interesting" row on the questionnaire, and one student wrote "revealing rather than interesting." Invited to select the most interesting area of their attachment the 69 students recorded 94 choices as follows:

General practitioner's way of life	...	...	...	...	31
Patients' home conditions	...	...	...	...	26
Patients' illnesses	...	...	...	...	20
Practice organization	...	...	...	...	17

Thus, contrary perhaps to expectation, these senior students were not so much concerned with diseases as with the social setting in which domiciliary medicine is practised. But it should be noted that some bias may have been introduced by the fact that the scheme and the questionnaire were organized by the Department of Social Medicine, in whose teaching programme considerable attention is given to the social aspects of general practice.

The following headings show the specific points on which information was requested.

Diagnosis Outside the Hospital

From the very often detailed replies the commonest observations covered three main points. Twenty-two students emphasized the skill of the general practitioner in reaching a probable diagnosis speedily in the absence of laboratory aids; 12 other students said either that they had learned the importance of thinking of common conditions first or had been impressed by the range of minor complaints brought to the doctor; and to 11 students the outstanding feature of diagnosis outside the hospital was that it so often had to be "symptomatic" or "empirical." Running through a number of these replies, but specifically given prominence by another seven students, was the contrast between what they had seen in practice and what they had seen or been taught in hospital. Other less common points made were the value of knowledge of the patient and his environment in reaching a diagnosis, the need to be on the look-out for serious disease, and the prevalence of chronic disease.

Though many of the replies overlapped, the most significant diagnostic lesson learned by the students seemed to be the importance in good general practice of clinical judgment unaided by many of the laboratory facilities available in hospital.

Treatment in General Practice

By far the commonest single comment made here (17 students) concerned the empirical or symptomatic nature of much of the general practitioner's treatment. Students seemed surprised by the frequency with which no precise diagnostic label could be attached to the complaints of many patients, and in this connexion reference was again made to the limited diagnostic aids available in practice compared with hospital. Next in order came the observation (12 students) that the doctor-patient relationship was important in therapy, and in this was included comment on the need to treat the whole patient in his natural environment. On the use of drugs in practice remarks varied: a few were critical of the number of proprietaries prescribed, rather more praised the policy of

using a few well-trying remedies, and three students were rather caustic about the failure of their hospital teachers to mention the drugs most useful in minor medical conditions.

On the whole, then, treatment in general practice was favourably viewed, and was seen as a useful extension to medical school and hospital teaching.

Preventive Medicine

Twenty students mentioned either antenatal care or immunization, or both, as the only preventive work they had seen. Another 18 said simply that the general practitioner did not have time to tackle much preventive medicine. There were, however, a few notable exceptions; in various ways eight students said how impressed they were with the preventive use good doctors could make of their intimate knowledge of the patient and his social circumstances, particularly in the mental health field.

These findings merely confirm an already well-known impression: the general practitioner usually has so much established disease to deal with that serious preventive effort, other than routine care of expectant mothers and immunization of children, is not feasible without some major change in practice conditions.

General Practice To-day

The questionnaire asked what the students had learned about the set-up in general practice to-day. Understandably, such a diffuse question evoked a wide range of comments. Fourteen students emphasized how overworked their tutors had been, and went on to stress the need for ancillary help; a similar theme was evident in the replies which underlined the value of group practice (9 students), the need for improved diagnostic facilities (5), and the lack of incentives to progressive medical care (5). Other points made were the heavier diagnostic responsibilities of the isolated rural practitioner, the limited understanding of general practice by some hospital staff, the need for secretarial help, and the value of good records.

From the fact that problems of remuneration and conditions of service were only rarely mentioned by students, it is evident that these general-practitioner tutors had not thought such matters very relevant to undergraduate teaching.

Social Aspects of Medicine

In response to a question on patients' use of medical care, 32 students said that they had seen little or no abuse. Eleven, however, were quite emphatic that a small minority of patients demanded too much from the doctor, particularly for trivial ailments or by calling him to the house when quite fit to attend the surgery. Five others remarked on the variation between patients in the degree of illness that brought them to the doctor. Finally, a small group of replies emphasized the doctor's own responsibility in this question of demand for medical care, and thought that "firm but kindly discipline" was necessary to ensure that abuse by a minority did not interfere with proper medical care of the majority.

On home conditions of patients students had plenty to say: 14 said these were on the whole good, 12 were struck by the variety of homes within a practice, while 13 used such expressions as "an eye-opener," "a revelation," "never knew such shocking conditions existed." There was, however, a quite noticeable caution about concluding that the illnesses observed were necessarily caused by poor housing; on the other hand, the consequences of adverse home conditions on management of patients were often referred to, especially in relation to illness among the elderly living alone or to nursing sick children.

Among many other comments recorded in this section of the questionnaire were the value in good medical care of the personal approach of the doctor who knew his patients well, and of the regular visiting of elderly people. Indeed, the frequent references to the aged suggested that many students had not appreciated their significance in domiciliary medical practice to-day.

Career Choice

Finally, each student was asked whether the attachment experience had influenced his or her decision about choice of career. To this 30 students replied "yes," 36 said "no," and 3 either left the space vacant or expressed doubt.

The supplementary question, "In what way has your choice of career been influenced?" produced these comments from the 30 students who said their decision had been affected by the attachment.

(a) 21 students influenced towards general practice:	
Now I feel I want to go into general practice	7
Willing to consider it now	5
Look more favourably on it now (4) provided not single-handed practice (3)	7
Before attachment I vowed not to go into general practice, but now it attracts me	1
Now I see what postgraduate training I should do to equip myself	1
(b) 9 students influenced away from practice:	
More satisfaction from hospital work	2
May end up in general practice, but dissuaded by the attachment	1
Discouraged from going into practice	3
Second thoughts about it now	1
Good medical care penalized by the system	1
Not interested before the attachment and it has not attracted me to general practice	1

Too much must not be made of these findings, but, despite the small numbers and the doubtful predictive value of statements made so many years before career decisions have to be taken, it seems reasonable to draw two tentative conclusions. First, the knowledge gained through this attachment experience appears to have influenced the choice of career of nearly half the group of participating students, a finding which indicates the serious interest taken in this voluntary addition to the medical course. Secondly, the effect of the experience is more often in favour of general practice than against it; as the pre-attachment attitudes of this self-selected group of students to general practice were not known it is obvious that there is a risk of *post hoc ergo propter hoc* error—some students probably had already made up their minds before the attachment, but most of the 21 who said the attachment had influenced them towards general practice were quite explicit about its decisive value. This finding supports the view often expressed that, without some teaching in general practice, undergraduates may not be able to make a sound choice of graduate career.

Against these potential recruitment gains must be set the smaller potential losses to general practice. Since time allowed each student to see only one practice, and because there are considerable variations between practices, it might be thought that the nine students whose reaction was to avoid general practice had simply been unfortunate in the one practice they had observed. Assessment of the quality of general practice is not easy, and in the absence of anything but personal impressions it is even more hazardous. All that can be said on this point is, first, that these nine students were not attached to practices that differed in any obvious way from the rest, and, secondly, the reasons given by them for rejecting general practice were concerned with the system of practice to-day and were quite noticeably free of comments on the individual practitioner. Of course, to provide proof of this would require an elaborate investigation quite beyond the scope of the present paper.

Discussion

It now seems likely that quite soon voluntary student attachments to general practice will be either reinforced or replaced by more formal teaching. Whatever shape this new general-practice teaching takes it seems important to build into it from the start such methods of evaluation as are available. In particular an effort must be made to distinguish between the educational and the vocational aims of the exercise. An introduction to general practice can help to teach the student several important things: the wider range of illness seen outside hospital, the special medical skills of the family doctor, the interaction of health and environment, and the relationship between health and social services. Observing and participating in these aspects of domiciliary medicine is part of student education in applied scientific method, and is not primarily a vocational experience.

On the other hand, senior students must be given sufficient insight into the various careers open to them on qualification if they are to make a sensible personal choice. The urgency of this for recruitment to general practice needs no emphasis. At the undergraduate stage perhaps the most important vocational consideration is an appreciation not only of what general practice has to offer to-day but also what it could be like in the foreseeable future. Students should certainly learn at first hand the satisfactions and the frustrations of general practice as it is now, and they need opportunity to observe and discuss its problems, but they must also be made aware of the "winds of change" blowing through general practice to-day.

The attachment scheme which has been crudely evaluated in this paper has its merits, both educationally and vocationally. It suffers, however, from a number of severe limitations; it is not compulsory, and therefore makes no impression on at least one-half of the students; since no payment is made to the tutors some competent doctors may not volunteer; there are so many doctors involved that even brief uniform guidance in advance is difficult; only one practice can be seen by each student; in such a short attachment active participation by the student is scarcely feasible. These are but a few of the shortcomings of such schemes.

That even a brief contact with general practice is thought by so many students to be well worth while—for reasons given in the foregoing analysis—is surely an encouraging foundation on which to build in the planning of new curricula. But much careful thought is still required in the actual specification of the aims and methods of general-practice teaching; this in part reflects the current uncertainties about what general practice really is and should be. One thing seems clear, and that is the importance in planning of the need to define and measure the actual contribution which general-practice teaching can make in the undergraduate period of—lifelong—medical education.

Summary

Sixty-nine senior medical students recorded their opinions of a voluntary two-week attachment to general practice. Eighty per cent. of the group described the experience as "very interesting," and all but a few wrote a detailed account of their observations.

Students were impressed by the skill of the general practitioner in diagnosis and treatment of a wide range of illness and by the contrast between the facilities available to medical practice inside and outside the teaching hospital. It was felt that, given more time, there are good opportunities for more preventive medicine in general practice, and to this end most students thought that adequate ancillary help in domiciliary medicine is an urgent priority.

When asked whether the attachment had affected their choice of career, 30 (43%) students said it had, and 21 of these were favourably influenced towards general practice. This suggests that a general-practice attachment scheme, though primarily

an educational experience, may also have important vocational consequences.

I am grateful to all the students who made this report possible, and to my colleagues, Dr. C. J. H. Mann and Professor E. Maurice Backett, for their helpful comments on the manuscript. On behalf of the Faculty of Medicine in the University of Aberdeen

I warmly thank all the general practitioners who acted as honorary tutors and who gave so generously of their time for the benefit of the students.

REFERENCE

British Medical Students' Association (1961). Report on the General Practice Attachment Schemes in British Medical Schools.

National Institute for Medical Research

On 30 June the Medical Research Council held an open day for the press at the National Institute for Medical Research at Mill Hill. There were four main demonstrations. In the first, Dr. AUDREY SMITH, of the division of experimental biology, gave an account of the storage and grafting of cartilage. Individual cartilage cells could be isolated from their tough surrounding matrix by treatment of cartilage with enzymes derived from plants, bacteria, and moulds. The cells were stored by freezing to -79°C . in the presence of 10% dimethylsulphoxide, and after thawing their viability (as shown by their movement and capacity to take up vital dyes) was apparently normal. Good results had also been obtained in dogs after grafting the cartilaginous cap of the head of the femur which had been frozen for 24 hours. Dr. J. FARRANT described new methods of cooling cells and tissues with dimethylsulphoxide which maintained their content of salt at a constant level.

International Standards

Dr. D. R. BANGHAM said that the division of biological standards at Mill Hill is one of the two international laboratories started 40 years ago in London and Copenhagen to establish standards for biological substances used in treatment, prophylaxis, diagnosis, and research. The division is now under the supervision of the World Health Organization, and an expert committee meets once a year to decide on which substances require an international standard. After this, and before an international standard can formally be established, large batches of the substances are prepared, distributed into ampoules under exacting conditions, and sent for bio-assay to several participating laboratories. Once standardized, the substance is kept in ampoules in cold store and is available on request to any scientist in the world. In addition, these standards are used as master standards to calibrate national and pharmacopoeial standards. Some idea of the amount of work involved in the department can be gained from some statistics quoted for comparing the present international standard for insulin with the previous standard. This required the preparation of 1.5 kg. of crystalline insulin and the use of 23,000 mice and 4,500 rabbits. In 1963-4 the division undertook work on 42 preparations (20 antibiotics, 15 hormones, 5 immunological, and 2 enzyme), and at present it is handling over 60 different substances and their assays.

Adenoviruses and Worms

Dr. H. G. PEREIRA and Dr. R. C. VALENTINE, of the division of bacteriology and virus

research and biophysics, had correlated the ultrastructure of the adenovirus with its antigenic properties. Studies with the electron microscope had shown that there were two types of antigen on the surface of the virus. The first, type A, was a simple round structure, while the second, type B, had a round head of about the same size as A but also had a tail four times as long, which projected outwards from the surface of the virus. The surface of one adenovirus was made up of 240 type-A units and 12 type-B units, which were situated at the corners of the virus. The A antigen was common to all adenoviruses, but the B antigen was type-

specific and its tail structure was probably implicated in the attachment and penetration of the cells infected by the virus.

Dr. S. R. SMITHERS and Dr. BRIDGET OGILVIE, of the division of chemotherapy and parasitology, had found that many animals respond to infection by worm parasites by producing large amounts of reaginic antibodies—antibodies that characteristically attach themselves to skin. The presence of these antibodies seemed to correlate with resistance by the host to reinfection by the worm. In rats reaginic antibodies gave a well-defined protection against reinfection by schistosoma, and these results might possibly be important in schistosomiasis in man—though preliminary work in monkeys had so far given disappointing results.

McIndoe Burns Centre

An experimental unit specially designed for the treatment of severely burned patients was opened on 5 July at the Queen Victoria Hospital, East Grinstead, by H.R.H. Princess Marina, Duchess of Kent. The unit is dedicated to the late Sir Archibald McIndoe.

Elaborate precautions have been taken to exclude infection, and the complex system of air-conditioning enables the 12 single-bedded wards that make up the unit to be supplied with filtered air at temperatures that can be individually controlled for each suite. The air-conditioning plant is electronically programmed with heating, filtration, and refrigeration facilities, and allows for 24 changes an hour at positive pressure. The pressure can be adjusted where appropriate. Each ward unit is self-contained, with its own barrier-nursing section. There are two nursing stations. Staff enter through an air-lock, with quadruplicate changing suites for staff entering the building or working in the theatre. Dry goods are admitted through a corridor irradiated with ultra-violet light and containing an air-lock.

Round the periphery of the building runs a corridor for visitors, from which each patient can be seen through double-glazed panels. Patients and visitors can talk to each other by means of a two-way electronic device. There is accommodation for visitors who need to stay overnight. Patients are admitted to an infra-red heated ambulance bay that leads to the admission and resuscitation rooms.

The operating-theatre suite is windowless, with a hydraulic table-trolley system and piped anaesthetic gases. The treatment room is similar, with a saline bath and a hydraulic device for lifting patients.

The overall cost of the building was about £250,000, and it has been financed by a generous donation from Mr. and Mrs. Neville Blond and their family. Equipment has been donated by the Peanut Club—an organization originally composed of ex-patients of the hospital. The unit will serve the whole of the south of England and will collaborate closely with the McIndoe Research Unit Laboratories.

Postgraduate Medical Centre at Edinburgh

On 2 July a new centre for postgraduate medical students at Edinburgh was opened by H.R.H. the Duke of Edinburgh. The centre, which is called the Pfizer Foundation, is part of a trust of £250,000 which has been made available by Pfizer Ltd. over a 25-year period to cover the cost of the centre and of future symposia, conferences, and seminars. The four-story building (the site for which was given by the Royal College of Surgeons of Edinburgh) contains a conference room, library, common-room, tutorial rooms, guest

bedrooms, and offices, and will act as a headquarters for postgraduate medical students, over half of whom come from abroad. The Foundation will be governed by three trustees—Professor Emeritus Sir Derrick Dunlop; the Acting Principal of the University, Professor Michael Swann; and the research director of Pfizer, Dr. James Morrison—while its day-to-day administration will be supervised by the director of Edinburgh's Postgraduate Board of Medicine, Professor Emeritus D. E. C. Mekie.