AN ORTHOPAEDIC TRAINING PROGRAMME *

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Over the last few years and with increasing momentum and definition, the several specialist associations and the four Surgical Royal Colleges have made a complete re-examination of the British methods of surgical training. The result is likely to be one of the most revolutionary changes yet conceived in this sphere in this country. It is a reformation with a defined purpose; already a clear pattern has emerged and the major principles have been decided. The whole when put together promises to be one of the best balanced and excellent training programmes anywhere. It seems an essentially simple scheme, with many advantages over traditional training, and yet the time spent will be considerably shortened. There are, however, particularly when it comes to detailed policy and practice within our own speciality, reasons why we should now look carefully at the training programme we want and why we want it. Decisions are in the making both by the appropriate British Orthopaedic Association committees, the British Orthopaedic Association at large and by the Colleges of Surgeons. In attempting to clarify the major issues here, evolution of an acceptable training scheme may be accelerated and improved.

In contrast to the Continental hierarchical system the British method of surgical training is essentially a clinical apprenticeship to a consultant, who, traditionally independent, taught his younger surgical apprentice with varying effort, but frequently with great enthusiasm, all that he had learnt. Most men look back to the training with their "chief" as the formative and important years of their professional life, often immensely enjoyable years. Why is it that many, although not all, now feel that the method has become inadequate, and why has this conviction become so strong that amending regulations are already drafted which will change the whole structure?

The reasons are several but three are outstanding. Training has become too long and men are not reaching consultant responsibility in the more popular specialities until thirty-five to forty years of age, too late for their best years to be fruitful. This is an age when enthusiasm, drive and initiative are already on the wane, particularly if not nurtured by early, full responsibility; professional and domestic security remain too long uncertain. Much of the blame for this must be borne by the National Health Service, in which prospective planning for staffing needs has been conspicuously unsuccessful, though all of us appreciate that that is not an easy task.

The second reason is that few surgeons now cover the full range of even their own speciality. This is particularly true in the bigger, more highly differentiated teaching and training centres in which most will train. There is no longer one master for the apprentice but several, and each has many apprentices often for a very short time. The close personal relationship which bound it together and gave it much of its value has gone.

There being at present no criteria as to what constitutes a training centre, any registrar post is acceptable whether teaching occurs or not. This difficulty often arises in those hospitals where the senior men are most overloaded with routine work and experience in, and facilities for, teaching are absent. Promotion up the training ladder is essentially competitive—by and large an advantage. Training in these smaller centres counts little in this competitive selection, but despite this a study of those who come to registrar selection committees shows that many have

* Read at a Plenary Session of the Anglo-American Conference on Postgraduate Orthopaedic Training, Ditchley Park, Oxford, May 1968.

wasted years in posts useless to their training or promotion, often because they received no early advice or had conflicting advice from their seniors. There is opportunity for a complete difference of opinion amongst those who advise the trainee because there is no official pattern of training. Because of the little information they can glean, a number of good men are lost to orthopaedics because they are not presented with a plan of how to train. Many more whose ability is exceeded by their ambition waste valuable years in dead-end jobs, finally failing to achieve their hopes.

There is in Britain no end point to training; it finishes only when appointment to a consultant vacancy is achieved. Many work too long in large, busy out-patient clinics offering repetitive experience only, where the impetus of final consultant responsibility is missing and the sharp edge of learning is thus blunted. This is undoubtedly one of the potent factors in the steady emigration of would-be orthopaedic surgeons from this country.

The British system as it was, and indeed still is, has certain important advantages. Many people sought treatment from the voluntary hospitals long before the National Health Service, and now the vast majority of the British accept their right to free hospital treatment. This means that a vast opportunity for clinical experience for the trainee is available; indeed it can hardly be bettered. Although the trainee may now be overwhelmed by the load of work, he does not lack opportunity to learn by observation and practice. He gains a wide personal clinical experience and is tutored by men of clinical acumen; with the large amount of operating to be done he can be led from the simple to the difficult procedure—apprenticeship at its best.

He is likely, however, to have but little other content to his training. Systematic clinical teaching, organised tutorials, library facilities, journal clubs, lectures in ancillary subjects are absent from many centres which train, and unimportant in all but few. An intensive systematic tuition of the speciality, a theoretical partner to the practical training, is almost a new concept in Britain.

These are the virtues and disadvantages of the training system which has served us so well but which only a few now even of the older generation feel is adequate whilst almost none of the younger thinks that it suffices.

In remarkable contrast we have the American system of Board Certification in which almost every feature is the opposite of the British method, in so far as the latter is definable. In the United States a man becomes a fully responsible consultant in private practice at thirty years of age or a little later. After one year as an intern (pre-registration year) and then beginning training in his speciality it is four years before he can enter private practice and another two years before he can sit his Final Board examination. In Britain the average cannot be less than ten years.

American training is by a regulated series of rotations in clinical orthopaedics, the minimal requirements being nine months in adult orthopaedics, nine months in children's orthopaedics, nine months in fractures and trauma, six months basic science training, six months elective. During this period there must be included a significant experience of surgery of the hand. This rotation must be preceded or followed by one year in an orthopaedic department, in general surgery, in neurological surgery, plastic surgery or as an intern. An approved year of research may be accepted. The inflexibility of the first years of the American pattern has proved a serious problem which has become appreciated in the last few years, and the rotation outlined above is the very recent attempt to make this less rigid. The British system is anarchic, the American inflexible.

The organised training is intensive. Because he appreciates that this valuable training period is short, the young surgeon works long hours and often seven days a week. During training he is educated by a series of lectures and tutorials in anatomy, physiology, in clinical subjects and in pathology, biochemistry, biomechanics, radiology, etc. He is frequently involved in a period of research. A specimen week's programme is appended by permission of Dr J. Leonard Goldner, Chairman of the Division of Orthopaedics of Duke University.

ORTHOPAEDIC TRAINING PROGRAMME

Monday

- 8.00 a.m. Journal Club. Senior resident does *Journal of Bone and Joint Surgery*.
- 9.00 a.m. Hand Conference, eighteen to twenty patients.
Every fifth week, this period is used to cover elective hand problems.
- 10.45 a.m. Amputee clinic.
- 12 noon Veterans Hospital: combined plastic and orthopaedic rounds.
- 2.00 p.m. Out-patients: first seen by residents followed by the staff and two students.
- 6.00 p.m. Pre-operation conference.

Tuesday Operating.**Wednesday**

- 8.00 a.m. Grand rounds: eight patients.
- 9.00 a.m. Veterans Hospital: grand rounds.
- 10.30 a.m. Basic science lectures.
Sixteen weeks, topics such as immunology, rheumatoid arthritis, radiotherapy, calcium balance.
- 2.00 p.m. Out-patients.
Every other Wednesday evening one and a half hours of biomechanics and prosthetics.

Thursday Operating.

- 7.00 p.m. Anatomy one hour and half hour dissection.
Pathology one hour.

Friday

- 8.30 a.m. Fractures: question and answer period.
- 10.00 a.m. Ward round.
- 2.00 p.m. Out-patients.

Saturday Operating.**Sunday** Two hours teaching from consultants.

Each resident writes a paper once a year and each is allowed time off to do research.

The American resident, knowing that his training is short, wastes none of it because, since he must generally expect to go into private practice in a small town with a few colleagues, his experience after training will be notably less educative than that of his British counterpart.

The American resident's disadvantage, in addition to the very short training period, is the relative paucity of clinical material. In some centres "charity" patients may comprise no more than 10 per cent of the patient load; in such a situation the resident is responsibly involved in the care of private patients. He does not have, however, the enormous clinical opportunity of his British colleague. For instance, it is unusual and considered almost unethical for the American consultant to operate on a hospital patient however difficult, though he will of course scrub, help and supervise. This is entirely related to the lack of operative work available to the resident. The American training programme is also very short on the preliminary phase in other branches of surgery.

Training, however, can be given only in centres repeatedly inspected and approved on strict criteria. The criteria include the number of beds, out-patients and in-patients, the number of surgeons, the programme of clinical teaching and the overall training programme provided including clinical conferences, tutorials, journal clubs. There must be access to pathology, research facilities and a good library.

The British programme with its excellent pre-orthopaedic rotation in several fields of surgery and plentiful clinical orthopaedic experience but short on formal training and extending over too many years is, in every aspect, the opposite of the American method. Training may

occur anywhere, be complete or incomplete. The lack of approved training centres is not so serious as it may seem to the outsider, because each step up the training ladder is highly competitive and is more than anything else based on the quality of previous training. But there is no end point to training, no certification, and this is a special problem for the overseas men who in consequence prefer the American centres to gain Board certificates as evidence of training before they go home.

It is obvious to even superficial study that the two systems are complementary. The virtues and defects are almost all mutually contrasted. If we take the best of each system to create a combined scheme it is easy to arrange that it has the virtues of both and the defects of neither. It is the purpose of this paper to enquire into the pattern and criteria that might be suitable as a training programme in Britain, embodying these aims. Whatever training programme is adopted it must be an evolution from previous ways and be suitable for the medical and hospital organisation of this country.

Already much has been achieved. Sir Frank Holdsworth when President of the British Orthopaedic Association initiated discussions concerning the basic training of the surgeon and, largely through his efforts on the Council of the Royal College of Surgeons of England, these proposals have been accepted by the several Royal Colleges of Surgeons and by all the specialist surgical associations. When the new surgical training is in being surgeons of all specialities will owe him a great debt.

By regulation shortly to be enforced all future British surgical trainees must complete in an approved post a rotation in various specialities of surgery. A typical programme might be: one year of general surgery; six or twelve months of orthopaedic and accident surgery; six months neurosurgery; six months plastic surgery. Alternative rotations could be in thoracic, paediatric or urological surgery. On completion of this basic training in the general principles of surgery the examination for the Final F.R.C.S. may be taken.

Thereafter, training in the chosen speciality is undertaken. In proposed regulations of the Colleges of Surgeons training in any chosen branch is now defined and regulated. Speciality training is to be undertaken only in an approved centre. The regulations will include requirements such as the equivalent of two years in traumatic orthopaedic surgery and two years in elective orthopaedic surgery.

If a period was spent in orthopaedic or accident orthopaedic surgery during the three-year training for the F.R.C.S. it may count as part of the speciality four-year training.

One year in a basic science relevant to orthopaedics or one year in research relevant to orthopaedics may be permitted as an alternative, as may one year in an overseas post previously approved by the Specialist Advisory Committee in Orthopaedic Surgery. At the end of this training the surgeon will be certificated by the Specialist Advisory Committee in Orthopaedics of the Colleges (with a large British Orthopaedic Association representation) as a specialist, without examination but based on interview, evaluation of the training and his teacher's reports.

Certification has been suggested rather than an examination at the end of training: three major examinations during the postgraduate training period is too much to consider happily. The author, although not others, feels that certification as proposed may prove difficult to work, and the time may come when the Primary F.R.C.S. is abolished as such and into the examination in the general principles of surgery at the end of the third year would come a simpler examination in the principles of the basic sciences relevant to all surgery.

Into an examination after the four-year speciality training might come questions on anatomy, physiology, biochemistry and pathology relevant to orthopaedics which indeed are part of this period of training.

On the basis of trying to combine and continue the best of North American and British methods of training a four-year training scheme was initiated in Edinburgh in 1967. Whilst a desire to bring together the best of the two methods was paramount it has also been designed,

without difficulty, to accord with the proposed four-year training programme of the Colleges. This programme, which is obviously experimental, may prove valuable to others in planning their own schemes. Also it provides a trial scheme from which the criteria required for approval of the training centre may be assessed—the most important problem of the near future.

In Edinburgh there are over 400 orthopaedic beds in four main hospitals: the Royal Infirmary and the Western General Hospital are general teaching hospitals, and in these orthopaedic trauma receives its primary treatment, the Royal Infirmary being the Central Accident Unit and the Western General an Accident Unit for the city. Elective orthopaedic out-patients are also seen, a convenience to patients and undergraduate teaching. The Children's Hospital plans a similar role. The Princess Margaret Rose Orthopaedic Hospital, four miles from the centre of the city, has 280 beds for elective orthopaedics. All orthopaedic surgeons in the South-East region of Scotland are on the staff of this hospital. The population of the whole region is a million and a quarter and the population served by those orthopaedic surgeons in Edinburgh is about 700,000. All the orthopaedic surgery of Edinburgh comes within the one department with a divisional form of organisation. There are eight orthopaedic surgeons, three senior university staff, four senior registrars, two university lecturers, five orthopaedic registrars, one Commonwealth registrar post and three pre-F.R.C.S. rotation registrars.

The work involves all forms of adult and children's orthopaedics both traumatic and elective. Out-patient attendances number nearly 60,000 and admissions over 5,000 patients annually. Special units associated with the department include rheumatoid arthritis, spinal injuries unit, limb service, and thalidomide unit. There are special clinics for hand surgery (20 per cent of trauma), peripheral nerve injury, spina bifida, metabolic bone diseases, scoliosis, congenital dislocation of the hip, cerebral palsy, amputees and rheumatoid arthritis.

These special units and clinics have been encouraged to improve both registrar training and to increase research facilities.

The clinical rotation has been devised on a six-monthly basis providing experience in adult trauma, adult elective orthopaedic surgery, children's elective orthopaedic surgery (and shortly trauma), hand surgery, rheumatoid arthritis, paraplegia and prosthetics. In the four years there can be eight rotations within the Department for each trainee.

It is hoped that the last two years at least will be spent as a senior registrar. However, the difference between registrar and senior registrar will almost certainly disappear as men enrol in a four-year training programme and become first, second, third and fourth year trainees with appropriate pay. This particular status symbol may then no longer be relevant.

The rotation as outlined above is essentially of the traditional pattern except that a variety of consultants will be responsible for training rather than one or two individuals. Clinical training in this period will be closely supervised to ensure that as complete an experience as is possible is obtained within the four years by each individual. A small training committee will supervise the individual's experience; particularly in the initial years, some men will enter the programme with much previous training but also defects in this experience which must be remedied.

In shortening the clinical training to four years the training is intensified by formal teaching of the following pattern:

- A weekly clinical conference including films and short papers and contributions from visitors.

- A weekly consultant clinical teaching ward round.

- A weekly orthopaedic clinical lecture.

- A monthly evening Journal Club and reports by staff on visits to orthopaedic meetings.

- A monthly evening symposium on pathology, research or allied subjects by registrars who are given six months to prepare. These are printed and remain in the orthopaedic

library. These have been in being for a number of years and have been particularly successful.

Twice monthly evening lectures by paraclinical colleagues in biochemistry, pathology, genetics, radiology, biomechanics, etc.

The draft programme in a typical year is appended.

LECTURES ON CLINICAL SUBJECTS

General subjects

Wound excision.
Shock.
Circulatory problems, traumatic and degenerative.
Bone growth, repair and grafting.
Osteoarthritis.

Rheumatoid arthritis (2).
Generalised bone disease (2).
Peripheral nerve injury.
Bone tumours.

Lectures on hand surgery

Principles of management of the injured hand.
Management of fractures of bones of the hand.
Management of tendon injuries of the hand.

Management of infections and minor lesions of the hand.
Dupuytren's contracture.

Children's orthopaedics

Congenital dislocation of the hip.
Congenital club foot.
Perthes' disease and slipped upper femoral epiphysis.

Common orthopaedic problems in children.
Scoliosis.
Leg lengthening.

Neurological problems in orthopaedic surgery

Spina bifida.
Cerebral palsy.

Poliomyelitis.
Muscular dystrophy and other problems.

Infections

Osteomyelitis.

Tuberculosis.

Common orthopaedic problems

Management of back pain.
Management of the painful knee.
Management of cervico-brachial pain.

Diagnosis of the painful knee.
Management of the painful hip in the adult.
Prolapsed intervertebral disc.

Principles of management of trauma (eight lectures)

Amputation (two lectures)

POSTGRADUATE PATHOLOGY MEETINGS

Tutorials in Para-clinical Subjects

Histology

- i) Histology of normal cartilage and bone.
- ii-v) Demonstrations arranged in the Pathology Department.

Radiology and radiotherapy

- i) Technical aspects of radiology.
- ii-iii) Diagnostic radiology.
- iv) Radiotherapy.

Biochemistry

- i) Bone mineralisation.
- ii) Calcium metabolism.
- iii) Aspects of endocrinology related to bone metabolism.

Biomechanics

- i) The biomechanics of bone and joints.
- ii) Structure and properties of foreign materials used in orthopaedic surgery.

Applied anatomy lectures

Haematology tuition dealing with haemophilia and anticoagulation

Bacteriology and chemotherapy

- i) The use of antibiotics.
- ii) Osteomyelitis.

Genetics**Experimental orthopaedics**

The purpose of all these activities is to ensure that in so far as is practicable the trainee coming to orthopaedics after three years in a rotating surgical post and with the F.R.C.S. is, within four years, fully trained in the practice and theory of orthopaedic surgery and ready for certification as an orthopaedic specialist by the Colleges at the age of approximately thirty-one to thirty-three years. In so far as seems possible it is continuing the long established British clinical training of proven value and combining it with the North American supervised, intensive shorter training.

From this discussion it is possible to consider the criteria by which the Colleges may eventually approve centres of training. Logically, the number of registrars taken into training in these centres each year should only slightly exceed the number of consultant vacancies expected at the time of their certification. Men entering a training centre are to be required to register with the College and the number will be accurately known. Time spent outside an approved training centre will not count towards the four-year training. It has been a totally false assumption not to regard the registrar as a trainee. The number of training centres need not be large. With the F.R.C.S. completed and with effective selection in the initial pre-F.R.C.S. three years, "wastage" should be minimal and largely composed of men who emigrate or take other than the usual National Health Service consultant careers.

In due time the College committees must judge the centres for training. American and Canadian experience is now extensive and much may be learnt by a review of their criteria. Some centres will have no difficulty in meeting these criteria, but for others the requirements will be met only by several hospitals grouping themselves together to provide the necessary width of clinical experience and facilities. The following are the criteria suggested.

SUGGESTED CRITERIA FOR APPROVAL OF TRAINING CENTRES**Clinical training**

Total beds in rotation scheme

Annual out-patient attendance: New Old

Number of operations

Availability of: 1) adult orthopaedics; 2) children's orthopaedics; 3) trauma in adults and children; 4) hand surgery, etc.

Number of:

consultants	senior registrars	registrars	university staff	research staff.
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Rotation programme for the four years training period.

Associated general, plastic and neurosurgical units in the accident departments.

Theoretical training

Organisation of clinical conferences; clinical and paraclinical lectures; and Journal Club.

Provision of:

Orthopaedic library.

Research facilities.

Access to pathological and radiological teaching material.

Time for study.

To keep the programme flexible it would probably be wise to determine by inspection that an approved training centre had the facilities, but thereafter to leave the clinical experience and programming to the teachers in the centre rather than detailing exact criteria which may prove stultifying. Is this not what the General Medical Council has done with medical schools and has it not proved a stimulus to innovation?

With the remarkable progress made by the Colleges in revising the whole concept of surgical training it is now essential for British orthopaedic surgeons to decide what they must prescribe for their speciality training.