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A brief comparison of orthopaedic training in English-speaking countries

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ABSTRACT

The purpose of this article is to examine current orthopaedic training in the UK and objectively compare this with other English-speaking countries.

KEYWORDS

Orthopaedics – Training

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In the face of dramatic increases in the scope and volume of orthopaedic practice, as well as decreasing working hours, effective and focused orthopaedic surgical training has become essential. The quality of future orthopaedic surgeons depends on the ability of today's trainees, who can only be as good as the training environment in which they have evolved.

Until the mid-1970s, doctors world-wide (especially the former Commonwealth countries) were attracted to the UK by the promise of orthopaedic training unmatched anywhere else. However, the late 1980s and early 1990s ushered in a new era of politicisation within the NHS, and a shift in attitudes, geared towards meeting targets, increasing cost-effectiveness and throughput, and ever-increasing bureaucracy. After the implementation of the European Working Time Directive, the working lives of all orthopaedic trainees have changed. The effects of other developments such as the implementation of *Modernising Medical Careers*, and the transfer of routine cases to independent sector treatment centres will have an effect on the quantity and quality of orthopaedic training. Since many within the profession question whether these cumulative changes amount to an improvement in training, it may be useful to know if our system of orthopaedic training is still seen as favourable compared to those in other countries.

The purpose of this article is to examine current orthopaedic training in the UK and objectively compare this with other English-speaking countries. It is important to bear in mind that whilst we express our own opinions throughout this article, as concerned 'consumers' of the current system, by doing so, we hope it may be possible to highlight strengths and deficiencies in our own and other systems. We also recognise that our knowledge of orthopaedic training in other countries is limited to the information gathered from relevant orthopaedic associations and surgical colleges of the countries in question.

Orthopaedic training in the UK

As a result of a major re-organisation of junior doctor training under the banner of *Modernising Medical Careers* (MMC) implemented since August 2007, the orthopaedic surgical pathway has potentially been shortened by some years. The shortest length of time taken from basic medical qualification to becoming an orthopaedic consultant in the new system is, theoretically, about 10 years (Table 1), although the exact duration of training required to become a specialist is presently unclear. It can be seen from Table 2 that the abandoned training structure, prior to MMC, entailed a longer period of time spent in the senior house officer (SHO) grade (equivalent to FY2 to ST2 years) as well as the registrar grade (ST3 to ST8 years).

MMC entails a 2-year Foundation programme (FY1 and FY2 years) following qualification after medical school which consists of 4 months each in a broad range of disciplines to include medical specialties such as general practice.

After successful completion of the FY1 and FY2 years, the trainee is required to compete for Specialty Training (ST) which is currently a 'run-through' programme of 8 years' duration. Alternatively, the candidate may only be successful in obtaining a training post for a fixed term (FTSTA) of not more than 2 years; however, the FTSTA post-holder may subsequently apply for training on the aforementioned run-through programme.

The ST years are currently divided into three phases. The first phase is of 2 years' duration (ST1 and ST2) and consists of 4 or 6 month rotations in surgical specialties, the expectation being that the membership of The Royal College of Surgeons' examinations be completed within this time-frame. During this period, a broad range of experience is acquired by working in various specialties. Particularly

Table 1 Ideal career progression from graduation to completion of specialty training under MMC

Year after graduation	Grade	Details
1	FY1	4-month rotations in medical and surgical specialities
2	FY2	
Formal application process/competitive entry		
3, 4	ST1	4 or 6 monthly postings in accident and emergency, general surgery, orthopaedics,
	ST2	vascular, cardiac, plastic surgery, paediatric surgery, ITU and neurosurgery
MRCS examinations		
5–8	ST3	Trauma and orthopaedics
	ST4	
	ST5	
	ST6	After ST6, eligible to sit FRCS(Orth) specialty examinations
FRCS(Orth) examinations		
9, 10	ST7	Certificate of Completion of Training (CCT)
	ST8	Subspecialty fellowship in UK or abroad
Formal application/competitive entry		
11	Consultant	Independent practitioner

relevant to the orthopaedic trainee are plastic surgery, neurosurgery and cardiothoracic surgery, as well as experience in the accident and emergency department.

The second phase (ST3 to ST6) is to be spent in higher specialist orthopaedic training and after the fourth year (ST6) of registrar (equivalent) training, the trainee is eligible to sit the final intercollegiate specialty examination (FRCS[Orth]), which is comparable to the American board examination.

The third phase (ST7 and ST8 years) is to be spent gaining subspecialty experience. The successful trainee will be entitled to the Certificate of Completion of Training (CCT) and may apply for a consultant post. Notably, the ST7 and ST8 years entail a fellowship within a subspecialty centre of excellence in the UK or abroad.

It is not surprising that entry into the ST run-through programme is extremely competitive. Historically, career progression was a *fait accompli* once postgraduate examinations had been completed; this is no longer the case.

Assessment of trainees in the ST and FTSTA will be by use of a standardised proforma and Annual Review of Competence

Table 2 Ideal career progression from graduation to completion of specialty training under Calman, pre-MMC system

Year after graduation	Grade	Details
1	PRHO	6 months' medicine, 6 months' surgery
Formal application process/competitive entry		
2–5	SHO	6-month posts in accident and emergency, general surgery, orthopaedics, vascular, cardiac, plastic surgery, paediatric surgery, ITU and neurosurgery
MRCS examinations		
Formal application process/competitive entry		
6–12	SPR	Trauma and orthopaedics. Experience of all aspects of management of trauma and elective orthopaedics. After year 4, eligible to sit FRCS(Orth) specialty examinations
FRCS(Orth) examinations		
13	Post CCST, senior fellow	Subspecialty fellowship in UK or abroad
Formal application/competitive entry		
14+	Consultant	Independent practitioner

Progression (ARCP). This assessment is performed on a 6–12-monthly basis, in the presence of a number of consultant trainers. Current annual assessment entails the regional in-training assessment (RITA) which collates the yearly performance in research, audit, and logbook record. All candidates are required to present their portfolio consisting of the above work as well as procedure-based assessment, and learning objectives for the forthcoming period.

Due to the huge upheaval in the implementation of MMC, which many in the profession felt was 'too much too soon', an independent review was arranged under the auspices of Professor Sir John Tooke. Among many recommendations were the shortening of the Foundation Programme to 1 year, and the 'decoupling' of ST years 1 and 2 from ST years 3–8. It is possible that the system described above may evolve following these recommendations. Significantly, under MMC, the senior-most trainees are at ST3 level at the time of writing, and any assessment of the new training system is speculative.

Orthopaedic training in Australia

Being a previous member of the Commonwealth, the orthopaedic training system in Australia has been markedly similar to that of the UK.

The geographic nature of the country has meant that orthopaedic services have been concentrated in urban areas, at the expense of the more rural parts, and this remains an important issue. The ratio of orthopaedic surgeons per population varies from 1 in 16,400 in Adelaide to 1 in 133,200 in South Australia. This problem was dealt with by initiatives to exchange surgeons from teaching hospitals to rural hospitals for a fixed period of time. In terms of training, this has meant a more varied approach to postgraduate training as well as a flexible career progression.

In 2001, an anonymous survey of advanced Australian surgical trainees showed that only 46% of orthopaedic trainees reported 'very adequate' consultant supervision at trauma operations. Further, of the orthopaedic trainees, nearly 80% of responders had been present at 12 or fewer trauma resuscitations.

Undergraduate teaching of orthopaedics takes place within the hospital environment, generally by academic orthopaedic surgeons, and occasionally by non-surgical orthopaedic physician practitioners. Following graduation from medical school, the trainee must complete at least 3 years of work in appropriate specialties, first as an intern and then as a resident. The first part of the Fellow of the Royal Australasian College of Surgeons (FRACS) examination must be completed within this period of time. This is historically similar to the first part of the UK Royal Colleges examinations, consisting of the basic medical sciences. The aspiring trainee is then eligible to apply for an accredited training post in orthopaedics; however, it may be desirable to acquire experience in purely service grade posts until such a time.

Throughout surgical training, there is an emphasis on the management of trauma. Within the last 10–12 years, the introduction of academic clinical titles similar to those seen in the US has meant that teaching is given an important role.

As of 1996, there were 109 accredited orthopaedic trainees throughout Australia, and 129 accredited training posts. This 'slack' in the numbers of posts was to allow for immediate expansion in numbers of trainees if required.

Once the position of accredited registrar is achieved, the successful candidate is able to train in a designated programme of 4 years' duration. Training posts vary between hospitals and, interestingly, can include posts in private or public hospitals. In the first year of training, the Orthopaedic Principles and Basic Science (OPBS) examination is given. In the fourth year of accredited training, the final fellowship specialty examination is taken, and this has a pass-rate of over 90%. Thus, the shortest time possible from graduation to completion of training is 7 years. As in the UK, the bottle-neck occurs in the transition to accredited registrar. The trainee may have to spend 2 years or more in the orthopaedic service post before obtaining a place in the accredited registrar programme. Realistically, time from graduation to entry into unsupervised practice is quoted as being around 10 years. A system of surgeon appraisal is also in place, which is rather more euphemistically described as an audit of activity and this is linked to accreditation.

An increasing proportion of Australian orthopaedic registrars partake in clinical and research fellowships abroad, the main issue of contention being funding for these posts. These fellowships are undertaken at year 4 or later.

Orthopaedic training in Canada

The Canadian healthcare system represents a unique combination of government and privately funded hospitals. A residency programme similar to that in the US exists, with comparably high levels of competition for places. Candidates usually apply for places on orthopaedic residencies at graduation from medical school, through a matching scheme. Selection criteria include medical school record and personal evaluations. There is a degree of provincial autonomy and variation. Quebec has a rather more European view of selection, perhaps due to the number of practising surgeons who undertook part of their training in continental Europe. The numbers of available training places are determined by the individual provinces, rather than a specialist advisory group.

After graduation, the aspiring Canadian candidate must complete 2 years of internship. The Orthopaedic Residency

Table 3 General outline of career progression from graduation to completion of specialty training under US system

Year after graduation	Grade	Details
Formal application process/competitive entry		
1	Intern	Multidisciplinary, including surgical and acute medical specialities
2–5	Resident	Orthopaedics and trauma experience in all areas of elective and emergency care
American Board of Orthopedic Surgery (ABOS, 'Board') examination, Part 1		
6, 7	Fellow	Independent practitioner
American Board of Orthopedic Surgery (ABOS, 'Board') examination, Part 2		
8+	Board certified	

Training Program in Canada generally consists of 5 years of postgraduate clinical training as well as 1 year of compulsory research training. The compulsory research year can be taken at any stage in the programme, and may be selected from an area covering basic science, epidemiology, or education. The 5 years of clinical training includes a compulsory minimum of 3 years in orthopaedics and 1 year in non-specialty training.

Unlike in the UK, Canadian orthopaedic residency training programmes are financed by the universities, although some special events are financed by conglomerates or individual attending surgeons. There are two main examinations during the residency years. The first, a Principles of Surgery examination is taken at the end of the second year of training. The final examination (the Comprehensive Objective examination in Orthopaedics) is a combined written and oral exam, taken at the end of the fifth year. Once trainees have successfully completed the fellowship examinations of the Royal College of Surgeons of Canada, they are eligible for a license to practice.

Orthopaedic training in the United States of America

The recent over-expansion in the number of practising surgeons in the US (3.6 per 100,000 in 1970 to 7.1 per 100,000 in 1998) has meant that, as of 2000, there was an excess of 3546 orthopaedic surgeons.

The nature of the American medical colleges means that the prospective doctor embarks on a medical career later than in the UK (age 28 or 29 years as compared to age 23 or 24 years). This is offset by a more rapid and organised career progression as well as the fact that residency programmes in orthopaedics are chosen at a relatively early stage following graduation. The early emphasis on basic sciences nurtures an informed approach to research and these form pillars on which postgraduate training is based. Stringent selection criteria (including medical school record, research experience, extracurricular activities and letters of recommendation) and extreme competition usually result in highly motivated, pro-active trainees. Most orthopaedic residencies last 5 years although some may take 6 years or more. Initial training (the PGY1 or 'internship') involves experience in general surgery as well as plastic surgery, emergency medicine, ITU and anaesthesia among others, although all training programmes differ slightly in make-up. From PGY2 and above, trainees are supervised by the chief (PGY5) resident; this largely involves practical experience in the emergency room and the operating theatre. All residents are expected to prepare formal teaching for medical students and nurses. Once the chief resident year is attained, the trainee is not only able to provide his or her patients with primary orthopaedic care with negligible supervision from the director, but also to act as an independent practitioner and offer consultation and advice to other medical services.

Formal training is highly developed. Residents are subject to continuous in-training assessment as well as yearly examinations every November (Orthopaedic In-Training Exam, OITE); these are compared and audited nationally. Orthopaedic diagnosis and treatment are taught through discussion of specific cases and this is done on a daily basis. Most residency programmes comprise a research project, involving either clinical or laboratory work, to be presented nationally and published at the end of the residency programme.

On completion of the accredited residency, the candidate has the choice of attending an accredited sub-specialty fellowship. This may be a route to an academic career, which is a significantly popular choice, or a route to further sub-specialisation. The American Association of Orthopedic Surgeons (AAOS) holds an annual meeting, in which instructional courses entitled *Key issues in Choosing and Starting Your Orthopedic Practice: There is Life after Residency* and *Forum for Young Orthopedic Surgeons* are

held. Demand is high. These courses are aimed at offering support and advice for surgeons who have completed, or nearly completed, residency programmes, and provide an opportunity for trainees to discuss practical issues.

It is well-documented that the issue of limited work-hours is also an important area of concern for American orthopaedists. A study published in 2003 reported the mean number of hours per week worked by residents in trauma amounted to over 80 h, despite the 2003 Accreditation Council on Graduate Medical Education work-hours duty policy limiting resident work hours to 80 h per week. In the same study, 87% of the surgical faculty felt that reducing resident work-hours would compromise training.

Following completion of the orthopaedic residency programme, the candidate is eligible to acquire board certification. The American Board of Orthopedic Surgery is the body responsible for maintenance of educational standards and is involved with examinations to acquire board certification, as well as revalidation which is required for all surgeons who were board-certified after 1986. Upon completion of an accredited residency, the candidate may sit the Part 1 examination which is purely written. In order to sit the Part 2 examination, they must have been practising for 22 months and have completed the Part 1. Part 2 consists of oral examinations, in addition to which candidates must submit a list of all their surgical procedures performed during a defined 6-month period. These lists must be certified as authentic and all these cases are stored in an online database. Twelve cases are selected for deeper scrutiny by the examiners.

Although board certification is entirely voluntary and 98% of all candidates take the Part 2 examinations within 5 years of completing residency programmes, as of 1999, 74% of all practising orthopaedic surgeons in the US were board-certified.

Teaching and academic appointments are held by 42% of orthopaedic surgeons. In summary, the progression from graduation through training and residency, to satisfactory completion of continuous assessment, with a 'seamless' approach to the training programme is achieved.

Discussion

Entry into orthopaedic surgical training is highly competitive irrespective of location, and trainees wishing to enter such a career are invariably committed, motivated and hard-working. Entry into orthopaedic training programmes in the US and also, to some extent, in Canada depends very much on academic scores and overall performance during the medical school years. In contrast, UK candidates apply for orthopaedic training after a period of time spent working in junior grades. As a result, medical school performance, whilst not completely irrelevant, is not given as heavy a weighting as it is in North America. Rather, as in Australia,

Table 4 Comparison of salient features of training systems of English-speaking countries

	UK	US	Canada	Australia
Youngest age at start of orthopaedic training (years)	27 (ST3)	27–28	27	27
Shortest time from graduation to completion of training (years)	11	6–7	7–8	7
Duration of training programme (years)	6	5	5	4
Specialty examinations	**FRCS(Orth) after year 4 (written and oral)**	**ABOS Part 1 after year 5 (written); Part 2 after year 7 (oral)**	**Principles of Surgery examination after year 2; Part 2 after year 5**	**FRACS OPBS after year 1; Part2 after year 4**
Yearly assessment format	RITA interview	Orthopaedic in-training examination		Audit of activity
Research component	Encouraged but not compulsory	Yes, must be published by postgraduate year 5	Yes, compulsory	Yes, compulsory to sit part 2
Average hours per week	56 maximum	66–80	60 excluding on-call	58–80
Training programme financier	Government	Hospital/university	University/Government	Government

completion of postgraduate examinations and additional evidence of commitment to the specialty are requirements for entry into orthopaedic training in the UK.

The duration of formal orthopaedic training programmes is similar across the US, Canada and Australia being between 4 and 5 years. After the introduction of the UK training grades, orthopaedic training (*i.e.* from ST3 to ST8) comprises 6 years. Whilst the UK-trained surgeon will have a basic training in 'surgery in general', this is still 1 year longer than the longest training system elsewhere.

Furthermore, unlike other systems discussed here, the UK does not include any compulsory research component. Of course, all orthopaedic trainees in the UK will have been involved in research of some form to satisfy RITA requirements, but this is more likely to be clinical in nature, and certainly not a long-term on-going project across a period of years, as in the US and Canada. Presently, perhaps due to the additional time and expense required, it is only a minority of UK orthopaedic trainees who complete higher degrees (such as MSc, MD or PhD) although this may change.

In 2003, orthopaedic resident work-hours in the US were reduced to a maximum of 80 h per week and this has been shown to cause a significant reduction in training opportunities, particularly operative experience. One study found that residents were exposed to 20% fewer cases per posting than previously. Another study published in March 2007 revealed that 23% of American orthopaedic residents polled felt that an 80-h working week was appropriate and an additional 34% felt that 80 h per week was not sufficient.

In 2001, an Australian work-force survey found that 54% of Australian orthopaedic trainees were working an average of 85 h per week. Bearing this in mind, UK trainees are currently limited to 56 h per week and this is due to fall even further to 48 h per week in 2009. This alone should be a significant cause for concern for UK trainees, with the unspoken implications of decreased skill level, the transfer of operating workload to senior colleagues, or the necessity of even greater length of time spent in training grades.

Assessment of trainee progress in the UK and Australian programmes are similar, entailing a combination of tools, including operative logbook experience, research experience, and formal competency assessments of various procedures. The US residency programmes employ an annual standardised national examination.

Conclusions

The authors feel that it is a worthy exercise to compare the UK training environment with those of other countries. It can serve to identify important similarities worth preserving. Concomitantly, it brings aspects such as working hours into stark relief. Awareness of the training system and working patterns for orthopaedic trainees in North America and Australia should motivate professional over-view bodies, trainers and trainees to ensure orthopaedic training in the UK remains comparable to the best the rest of the world can offer.

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