Higher surgical training in ophthalmology: trends in cumulative surgical experience 1993–2008

DG Ezra^{1,2,3}, A Chandra¹, N Okhravi¹, P Sullivan¹, P McDonnell⁴ and J Lee^{1,5}

Abstract

Introduction Recent years have seen significant changes in the provision surgical training for ophthalmology. The aim of this study is to establish the patterns in long-term trends of cumulative surgical experience of ophthalmology trainees in the United Kingdom.

Materials and methods Data were obtained from the department of training and education at the Royal College of Ophthalmologists (RCOphth). The cumulative surgical experience of all ophthalmology higher surgical trainees attaining accreditation, CCST, or CCT between 1993–2001 and 2005–2008 was included for descriptive analysis.

Results Cumulative cataract surgical experience per trainee has been relatively stable at levels between 500 and 600 for most years. The cumulative experience vitreoretinal and corneal graft surgery have historically been low with a large outlier effect, although trends demonstrate a decrease in the median numbers of procedures. Squint surgery has seen a downward trend with a decrease in the median numbers from 121 in 1993 to 43 in 2008. Oculoplastics procedures demonstrate a decrease in overall numbers from 46 in 1993 to 15 in 2001. A jump from 2005 coincides with changes in the definition of what is counted as an oculoplastics procedure. The role of the RCOphth in legislating minimum levels of experience has had an impact on the data distribution manifest by the truncation of the inferior quartile of many of the dataspreads.

Discussion These data demonstrate that although the cumulative experience of cataract surgery for trainees has remained stable, there has been a reduction in the median numbers

of subspecialty procedures performed over the past 15 years.

Eye (2010) 24, 1466–1473; doi:10.1038/eye.2010.54; published online 30 April 2010

Keywords: surgery; training; ophthalmology; resident; cataract

Introduction

The past 15 years have witnessed dramatic changes in the postgraduate environment for surgical trainees. The first major change was the introduction of the Specialist Registrar (SpR) grade in 1996 following recommendations of a government commissioned report into postgraduate training.¹ It was intended that a structured and more closely supervised training would compensate for a reduction in time spent in the registrar grade. The second major change was the implementation of the 'new deal' for junior doctors in 2000, which effectively saw a statutory limitation of working hours in accordance with the European working time directive (EWTD) which was phased in over a 9-year period.² Many specialties and trusts are continuing to grapple with the necessary changes in service and training provision that are required. The final change has been the introduction of Modernising Medical Careers (MMC) with a new run-through training in some specialties. MMC is continuing to evolve in the context of a competency-based curriculum.^{3,4}

As these changes have been implemented in the foreground, changes in the NHS service provision have also been taking place in the background. The introduction of independent sector treatment centres (ISTCs) and diagnostic treatment centres (DTCs) have pared common elective procedures away from many units

¹Department of Education, Moorfields Eye Hospital NHS Trust, London, UK

²Department of Cell Biology, UCL Institute of Ophthalmology, London, UK

³NIHR Biomedical research centre for ophthalmology, Moorfields Eye Hospital and UCL Institute of Ophthalmology, Moorfields Eye Hospital, London, UK

⁴Birmingham and Midland Eye Centre, Birmingham, UK

⁵Royal College of Ophthalmologists, London, UK

Correspondence: DG Ezra, NIHR Biomedical Research Centre for Ophthalmology, Moorfields Eye Hospital and UCL Institute of Ophthalmology, City Road, London EC1V 2PD, UK
 Tel: +07815 732 455;
 Fax: +0207 566 2334.
 E-mail: d.ezra@ucl.ac.uk

Received: 6 September 2009

Accepted in revised form: 17 March 2010

Published online: 30 April 2010

leading to a concentration of these cases into high volume centres^{5,6} which, in the case of ISTCs, are outside of the NHS training locus.

Portentous warnings over the detrimental effects of Calmanisation of training,⁷ DTCs, ISTCs,⁸ and the impact of the EWTD⁹ on surgical experience across specialties have been made repeatedly. Specific concerns have been raised in ophthalmic surgical training despite a large increase in the numbers of cataract procedures being performed in the NHS (42% increase to 328 397 per year from 2000 to 2008¹⁰). There has been some suggestion that the advent of ISTCs may have altered the case mix of elective cataract surgery leading to a dearth of suitable cases for trainees.^{11,12} There has been some suggestion also that the numbers of surgical cases being performed by SpRs has been decreasing in some areas.¹³

Despite these concerns, there is little evidence describing how surgical training has been affected. Such analysis is difficult to formulate, as detailed data would need to be collected on different surgical procedures over long periods of time.

Requirements for completion of ophthalmology training in the United Kingdom have changed over the past 15 years. Before Calman reforms in 1996, accreditation was awarded on the basis of 3 years in the senior registrar grade. For new entrants from 1996 to 2007, ophthalmology higher surgical training has been set at 4 and a half years and requires exposure to all of the main subspecialties including anterior segment, neuro-ophthalmology, oculoplastics, strabismus, glaucoma, medical retina, and surgical retina. Trainees are required to achieve minimum numbers of surgical procedures at levels set by the Royal College of ophthalmologists. Satisfactory completion of training from 1996 up to 2005 was recognised by the award of the CCST (Certificate of Completion of Specialist Training) by the Specialist Training Authority. From 2005 the CCST was replaced by the CCT (Certificate of Completion of Training), which is awarded by the Postgraduate Medical Education and Training Board. Progression to CCST or CCT is time based and subject to satisfactory review at an annual record of in training assessment. In addition, since 2001 all SpRs are required to complete an exit examination to qualify for the award of CCST or CCT. Since 2007, all new trainees are to be assessed under a competency system in accordance with the principles of MMC.

The aim of this study is to establish the patterns in long-term trends in cumulative surgical experience of ophthalmology trainees in the United Kingdom.

Methods

Cumulative surgical data were obtained from the education department of the Royal College of

Ophthalmologists. These data have been collected by the Royal College of Ophthalmologists since responsibility for accreditation was transferred from the Royal College of Surgeons in 1993. Data up to 2001 were available in the form of chronological lists. Stratification of trainees by year was achieved using the date of entry onto the specialist register and also by direct contact with the trainees. Data from 2005 to 2008 were available on a dated basis. Data between 2002 and 2004 were lost and therefore not available for inclusion in this study.

Different categories of cumulative surgical experience were available. The categories included for analysis were as follows: cataract surgery, strabismus surgery, oculoplastics surgery, vitreoretinal procedures (VR), and corneal transplants. Only procedures performed as sole surgeon or performed under supervision were included for analysis. Procedures where trainees undertook assisting and observing roles were excluded.

Interquartile ranges for each surgical category were displayed as box and whisker plots using SPSS v. 16.0 (SPSS Inc., Chicago, IL, USA). Box and whisker plots demonstrate the quartile spread of the data distribution of cumulative procedures for each of the surgical subspecialties. The central box represents the central 2 quartiles and the whiskers represent the upper and lower quartiles. Outliers are represented by circles (within 1.5–3 box lengths of the central 2 quartiles) and extremes as asterisks (beyond 3 box lengths of the central 2 quartiles). Analysis was descriptive only. No ethical approval was required for this study.

Results

The number of trainees awarded CCST, CCT, or accreditation by the Royal College of Ophthalmologists has increased dramatically over the past 15 years. These were below 20 per year in 1993, increasing to between 62 and 70 per year in the years between 2005 and 2008. This is a manifestation of the Calman report recommendations that have led to a general expansion in consultant numbers and better-regulated workforce planning throughout the United Kingdom. These numbers are summarised in Figure 1.

The cumulative cataract surgical experience per trainee is represented in Figure 2. Of note is the stability of the median numbers of surgeries performed varying from a low of 522 in 2007 to a high of 695 in 1996, although these levels have fluctuated, they appear to have remained stable at between 500 and 600 for most years. A narrowing of the quartile ranges since 2005 is also noted.

Squint surgery has seen a large downward trend with a decrease in the median numbers being performed from 121 in 1993 to 43 in 2008. Again, an increase in the outlier effect is observed in later years and also evident is a

Figure 1 Frequency histogram of the numbers of trainees achieving accreditation, CCST, or CCT. (CCT, Certificate of Completion of Training, CCST, Certificate of completion of Surgical Training). Note the significant increase in trainees in the years 2005–2008 in comparison to 1993–1996.

truncation of the lower quartile in the years between 2005 and 2008 (see Figure 3).

The cumulative experience for the subspecialties such as vitreoretinal and corneal graft surgery have historically been low with a large outlier effect, although trends demonstrate a decrease in the median numbers of procedures being performed and also a truncation of the lower quartiles in the years from 2005 to 2008 (see Figures 4 and 5).

The cumulative experience of oculoplastics procedures per trainee demonstrates a general decrease in overall numbers from 46 in 1993 to 15 in 2001. A sudden jump was then observed in 2005 onwards with medians increasing from 85 to 103. An increase in the outlier effect and a truncation of the lower quartiles is again observed in the years between 2005 and 2008 (see Figure 6).

Discussion

These data demonstrate that although the cumulative experience of cataract surgery for trainees has remained stable, there has been a reduction in the median numbers of subspecialty procedures performed over the past 15 years. Cataract surgery is the most commonly performed

ophthalmic surgical procedure, and despite significant increases in the numbers of trainees, the median levels of experience have varied between 500 and 600 operations for most years. This is an enviable number to have achieved during training and compares very favourably to other countries such as the United States where the American Council for Graduate Medical Education requires a minimum of 86 cataract procedures over the course of the residency period.¹⁴ Contrary to popular belief, surgical proficiency is not a direct result of intrinsic ability. Recent evidence has demonstrated that repeating a particular technique can allow a trainee to develop a high level of skill.^{15,16} This emphasises the importance of maintaining surgical experience in the context of the recent move from cumulative surgical requirements to competency-based training.

The decline in cumulative experience of subspecialist procedures is likely to be the result of these procedures being performed by trainees who have undertaken subspecialty fellowship training. There is a very well developed network of fellowships in ophthalmology that has been operating for a number of years. The effect of these fellowships is likely to be responsible for the progressively more pronounced outlier effect, which is

Figure 2 Cumulative cataract surgery experience for the years 1993–2008. Note the relative stability of the median numbers of procedures being performed. There is also a narrowing of the spread of the data indicating less variability in the numbers of procedures being performed.

Figure 3 Cumulative strabismus experience for the years 1993–2008. Note the steady decrease in the median numbers of procedures being performed along with a more dominant outlier effect.

Figure 4 Cumulative vitreoretinal (VR) surgery experience for the years 1993–2008. Although these numbers have been historically low, there has been a decrease in the median numbers of procedures. In addition, since 2005 there has been a truncation of the lower quartile indicating a cluster of trainees at this point. The outliers have been excluded to allow for scaling.

seen to be particularly dominant in the oculoplastics and strabismus subspecialties. This ‘fellow effect’ reflects the relatively small numbers of trainees opting for intensive subspecialty experience in these fields. The college requirements have changed over time to reflect this change with all trainees required to assist at and gain experience of the more complex specialist procedures rather than be the sole performer. The move to subspecialty training is consistent with widely accepted findings that higher surgeon volume and specialisation are associated with improved patient outcome.¹⁷

This study has limitations. The retrospective nature of the study is unable to account for heterogeneous training periods. The time in training will not have been consistent, especially for trainees accrediting before Calmanisation of training in 1996.

The role of the Royal college of Ophthalmologists (RCOphth) in legislating minimum levels for cumulative experience appears to have had a significant impact on the data distribution. The truncation of the inferior quartile of many of the data spreads is evident. These truncation points are occurring at the level at which the RCOphth has set minimum requirements for surgical experience. These were recently altered in 2003 to reflect the changing expectations of numbers of procedures to

be performed. For squint procedures, it is set at 20, VR and corneal graft procedures at 0 (trainees are however required to assist in these procedures). Another important role of the RCOphth in modulating numbers of operations being performed lies in how a procedure is defined. For oculoplastics, the definition of what constitutes a procedure was changed to include minor procedures such as punctoplasty or chalazion curettage. This wider definition is likely responsible for the dramatic increase in numbers of recorded procedures being performed after 2003 in contrast to the decline in cumulative experience before this change in definition. In the context of the more recent move towards competency-based training, this focus on the breadth of surgical experience remains a key element in the way the College sets standards of ophthalmic practice and requires trainees and trainers to ensure that the wide surgical experience of the trainee continues.

Evidence of the impact of reforms of surgical training in the United Kingdom is limited with very few long-term studies having been conducted. In obstetrics and gynaecology, a study at a single unit showed a dramatic decrease in surgical procedures being performed by 73% between 1995 and 2005.¹⁸ Conversely, a national survey of cumulative paediatric surgery experience among

Figure 5 Cumulative corneal graft experience for the years 1993–2008. These numbers have been historically low. Since 2000 there has again been a truncation of the lower quartile indicating a cluster of trainees at this point. The outliers have been removed to allow for scaling.

Figure 6 Cumulative oculoplastics experience for the years 1993–2008. Note the gradual decrease in median numbers of procedures being performed until 2001 after which there is a large increase in procedures performed.

trainees between 1996 and 2004 found a modest increase in a surgical numbers being performed and did not endorse the view that surgical experience is declining.¹⁹ These findings are consistent with a national survey in the United States, which have shown that reduction in working times did not affect cumulative surgical experience over the transition period to a shorter working week.²⁰ It has been suggested that changes in training, an expansion of the roles of paramedical staff and IT innovations may help to shore up critical training areas.²¹ Training in cataract surgery in the United Kingdom has seen huge investment in recent years to maximise the efficiency of training. Surgery is better supervised and there have been infrastructure innovations to encourage real and simulated training environments to operate in parallel. A wide variety of simulated teaching strategies are being employed, including validated microsurgical skills courses,²² *in vitro* human and animal models, and computer-based virtual reality models.²³

The government's vision for the future of medical training suggests that the majority of trainees acquiring CCT become 'generalists' who will carry out common procedures and refer more specialist problems to colleagues undertaking high volumes of these cases,²⁴ however, concern has been raised about whether this can be adequately achieved in the context of changes in training environment.⁹ The data presented describing the evolution in surgical training in ophthalmology shows that this is achievable against a backdrop of reduced hours. Although these data demonstrate that this has been achievable with the reduction to 56 h per week, whether this can be maintained in the face of further working time constraints remains to be seen. The data also highlights the key role Medical Royal Colleges have in setting training standards and ensuring these standards are delivered resulting in the satisfactory completion of training.

Summary

What was known before

- There have been suggestions that surgical experience for trainees has been jeopardised by changes in working environment and curriculum requirements over the past 15 years.

What this study adds

- The numbers of cataract procedures performed by trainees in higher surgical training in the United Kingdom has remained stable over the past 15 years. The numbers of subspecialist procedures being performed has declined. The role of the Royal College of Ophthalmologists in setting training standards has had an impact on the cumulative surgical experience accrued by trainees. The impact of recent changes in training requirements and EWTD restrictions remains to be seen.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgements

We acknowledge financial support from the Department of Health through the award made by the National Institute for Health Research to Moorfields Eye Hospital NHS Foundation Trust and UCL Institute of Ophthalmology for a Specialist Biomedical Research Centre for Ophthalmology. The views expressed in this publication are those of the authors and not necessarily those of the Department of Health.

References

- 1 Calman K. *Hospital Doctors: Training for the Future. The Report of the Working Group on Specialist Medical Training*. HMSO: London, 1993.
- 2 Pickersgill T. The European working time directive for doctors in training. *Br Med J* 2001; **323**: 1266.
- 3 Donaldson L. *Unfinished Business: Proposals for Reform of the Senior House Officer Grade: A Paper for Consultation*. Department of Health: Great Britain, 2002.
- 4 Tooke J. *Aspiring to Excellence: Findings and Recommendations of the Independent inquiry into Modernising Medical Careers led by Professor Sir John Tooke*. MMC Inquiry: London, 2007. p 189.
- 5 Health, Department of Growing capacity. *Diagnostic and Treatment Centres*. HMSO, 2003.
- 6 Guly C, Sidebottom R, Hakin K, Bates K. Challenges of private provision in the NHS: treatment centres and their effect on surgical training. *Br Med J* 2005; **331**: 1338.
- 7 Collins R. Surgeons and the new deal—good deal or raw deal? *Ann R Coll Surg Engl* 1995; **84**: 345–347.
- 8 Clamp JA, Baiju Sr D, Copas DP, Hutchinson JW, Rowles JM. Do Independent Sector Treatment Centres (ISTC) impact on specialist registrar training in primary hip and knee arthroplasty? *Ann R Coll Surg Engl* 2008; **90**: 492–496.
- 9 Chikwe J, de Souza AC, Pepper JR. No time to train the surgeons. *Br Med J* 2004; **328**: 418–419.
- 10 NHS hospital episode statistics. The NHS information centre for health and social care. <http://www.ic.nhs.uk>.
- 11 Barsam A, Heatley CJ, Sundaram V, Toma NM. A retrospective analysis to determine the effect of independent treatment centres on the case mix for microsurgical training. *Eye* 2008; **22**: 687–690.
- 12 Kelly SP. Cataract care is mobile. *Br J Ophthalmol* 2006; **90**: 7–9.
- 13 Au L, Saha K, Fernando B, Atallah S, Spencer F. 'Fast-track' cataract services and diagnostic and treatment centre: impact on surgical training. *Eye* 2008; **22**: 55–59.
- 14 http://www.acgme.org/acWebsite/RRC_240/240_MinimumsOperativeTable.pdf, accessed 19th April 2010.
- 15 Ericsson K. Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Acad Med* 2004; **79**: S70–S81.
- 16 Hamstra SJ, Dubrowski A, Backstein D. Teaching technical skills to surgical residents: a survey of empirical research. *Clin Orthop Relat Res* 2006; **449**: 108–115.

- 17 Chowdhury MM, Dagash H, Pierro A. A systematic review of the impact of volume of surgery and specialization on patient outcome. *Br J Surg* 2007; **94**: 145–161.
- 18 Elbadrawy M, Majoko F, Gasson J. Impact of Calman system and recent reforms on surgical training in gynaecology. *J Obstet Gynaecol* 2008; **28**: 474–477.
- 19 Youngson GG, Adams S, Winton E. Paediatric surgery: trends in UK surgical trainees' operative experience. *J Pediatr Surg* 2006; **41**: 372–376.
- 20 Mendoza KA, Britt LD. Resident operative experience during the transition to work-hour reform. *Arch Surg* 2005; **140**: 137–145.
- 21 Wallack MK, Chao L. Resident work hours: the evolution of a revolution. *Arch Surg* 2001; **136**: 1426–1431; discussion 32.
- 22 Ezra DG, Aggarwal R, Michaelides M, Okhravi N, Verma S, Benjamin L *et al*. Skills acquisition and assessment after a microsurgical skills course for ophthalmology residents. *Ophthalmology* 2009; **116**: 257–262.
- 23 Henderson BA, Ali R. Teaching and assessing competence in cataract surgery. *Curr Opin Ophthalmol* 2007; **18**: 27–31.
- 24 Modernising medical careers. *The Response of the Four UK Health Ministers to the Consultation on Unfinished Business: Proposals for Reform of the Senior House Officer Grade*. Department of Health: London, 2003; 1 folded sheet (6 p.).