**40-4-40: Educational and economic outcomes of a free, international surgical training event**

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**Main Messages**

* 40-4-40 represents the largest and most geographically diverse surgical training event ever to have been held on a single day, and was run by a voluntary faculty, outside of the Surgical Royal Colleges, or UK Surgical Training Programme.
* For ASiT ‘Foundation Skills in Surgery’ courses, significant improvement in the confidence and competence of early-years (medical student and PGY1-2) trainees was demonstrated.
* By using a near-peer, volunteer faculty, and gathering industry support, ASiT made a total cost-saving of £231,462.37 for surgical trainees, or a mean of £350.70 per registered delegate.

**Research Questions**

* Is it possible to extrapolate this training model to other specialty organisations within the UK and Ireland, or internationally to comparable health systems?
* Can specialty associations increase recruitment and retention to specialty training programmes with similar national/international initiatives?
* Can surgical training courses show demonstrable and sustainable improvement in their delivery as a result of feedback from 40-4-40?

**Abstract**

*Purpose of Study*

To demonstrate a model for delivery of an international surgical training event, and demonstrate its educational and economic outcomes.

*Study Design*

The Association of Surgeons in Training (ASiT) ran a course series on January 16th 2016 across the UK and Ireland. A mandatory, self-reported, online questionnaire collected delegate feedback, using 5-point Likert scales, and a NetPromoter® feedback tool. Pre and post-course matched questionnaires were collected for ‘Foundation Skills in Surgery’ courses. Paired economic analysis was performed. Statistical analysis was carried out using RStudio (V3.1.1 Boston, MA).

*Results*

Forty courses were held across the UK and Ireland (65.0% technical, 35.0% non-technical), with 184 faculty members. Of 570 delegates, 529 fully-completed the feedback survey (92.8% response rate); 56.5% were male. The median age was 26 years (range:18-67 years). The mean overall course NetPromoter® score was 8.7 out of 10. On logistic regression high NetPromoter® score was associated with completing a Foundation Skills in Surgery course (R=0.44, OR: 1.49, P=0.025) and having clear learning outcomes (R=0.72, OR: 2.04, P=0.029) but not associated with specialty, course style or teaching style. For Foundation Skills in Surgery courses, delegates reported increased commitment to a career in surgery (p<0.001), confidence with basic surgical skills (p<0.001), and confidence with assisting in theatre (p<0.001). A comparable cost saving of £231,462.37 was calculated across the 40 courses.

*Conclusion*

The ASiT ‘40-4-40’ event demonstrated the diversity and depth of surgical training, with 40 synchronous technical and non-technical courses, demonstrable educational benefit and a significant cost-saving to surgical trainees.

**Introduction**

*Association of Surgeons in Training (ASiT)*

Founded in 1976, ASiT is a professional body and educational charity (Registered Charity number 274841) working to promote excellence in surgical training across all ten surgical specialties in the UK and Ireland1. ASiT is independent of the Surgical Royal Colleges, National Health System and training regulators (General Medical Council, Joint Committee on Surgical Training), and is run by trainees for trainees.

*Surgical training pathway in the UK and Ireland*

Since 2008, the UK surgical training pathway has followed a structure outlined in ‘modernising medical careers’ (MMC2). Briefly, surgical training follows a 2-year postgraduate ‘Foundation’ (PGY1-2) programme, a 2-year ‘Core Surgical Training’ (PGY3-4) programme, followed by a 5, or 6-year ‘Specialist Training’ (PG5-10) programme. Within neurosurgery and cardiothoracic surgery, ‘Specialist Training’ begins at an earlier (PGY3) phase. In England, Wales, Scotland and Northern Ireland surgical education is managed regionally by Local Education and Training Boards (LETB). In the Republic of Ireland, training is managed by the Royal College of Surgeons in Ireland and follows a comparable model, except for a one-year intern year instead of a two-year foundation programme3. For both the UK and Ireland, the Joint Committee on Surgical Training (JCST) are responsible for curriculum development and quality assurance of all the surgical training programmes in the ten defined surgical specialities (cardiothoracic, general surgery, neurosurgery, oral and maxillofacial surgery, otolaryngology, paediatric surgery, plastic surgery, trauma and orthopaedics, urology and vascular surgery)4. The end of training is marked by award of a ‘certificate of completion of training’ (CCT), which requires completion of both the intercollegiate membership and fellowship examinations, completion of surgical training competency based assessments and logbook evidence as outlined by the JCST.

*Challenges facing UK surgical training*

Applications to UK surgical training pathways are diminishing fast. Within the last five years the competition ratios for PGY3 surgical training programmes has fallen from 3.7:1 (2011), to 1.6:1 (2016)5. The UK faces a variety of challenges to recruitment and retention within surgical specialties.

Firstly, surgical training is associated with a significant financial burden at the expense of the trainee, with expenditure on exams, conferences, mandatory and non-mandatory courses6,7,8. Secondly, morale amongst UK surgical trainees is at an all-time low. Top-down reforms of pay structures and working hours have led to widespread disillusionment in the trainee workforce. For example, in 2016, the British Medical Association oversaw the first outright junior doctor strike to occur in 40 years of National Health Service9. Early-years surgical trainees (PGY3-4) report the lowest job satisfaction and quality of training across all specialties in the UK10. Thirdly, with the implementation of European Working Time regulations, surgeons now have fewer working hours available in which to achieve procedural competency11. The surgical trainee in 2016 has less procedural training time at the point of CCT compared consultant counterparts, graduating from the traditional ‘Calman’ system of training12,13. Simulation and use of technical skills courses are increasingly being used as an adjunct to training. However, currently there is widespread variation in access to and cost of simulation facilities and courses14. Training regulators and surgical associations have a joint responsibility to find urgent solutions to these emerging issues.

*ASiT 40-4-40 Event*

To celebrate the 40th anniversary since its establishment, ASiT held 40 courses across the UK and Ireland on Saturday 16th January 2016. All 40 courses were run free of charge to ASiT members. To the best of our knowledge, this was the largest, and most geographically diverse surgical training event ever to have been held on a single day. ‘40-4-40’ aimed to bolster recruitment to surgical careers, retention and morale for trainees, and to support a skilled and healthy future surgical workforce. This event also aimed to demonstrate whether it was possible to deliver training events at low, or no cost to trainee delegates. This paper will describe the model for delivery of this 1-day international surgical training event, and describe its educational and economic outcomes.

**Material and Methods**

*Recruitment*

Delegates were recruited via an online mailing list, and a dedicated social media campaign. ASiT’s panspecialty committee gave penetrance into all Local Education and Training Boards within the UK and Ireland. Specialty interest societies (e.g. Rouleaux Club (Vascular), Dukes’ Club (Colorectal)) were engaged to distribute materials amongst their memberships. Other interdisciplinary collaborations were also initiated (e.g. Society of Radiologists in Training). A press release was distributed to the UK Press Association, generating international media interest15. Volunteer course faculty were derived from ASiT’s national and panspecialty council, subspecialty societies and local, word-of-mouth recruitment. Faculty members came from expert (consultant), near-peer (trainee, one or more years senior), and peer-led (trainee, same training level) groups16.

*Costing*

Registration was managed via an EventBrite® server17. The courses were run free of charge to all ASiT members. A small (£50GBP, ~$70USD) deposit was collected at the point of registration, intending to maximise course attendance. This was refunded upon successful attendance to all ASiT members. Deposit contributions from delegates who did not attend the event were collected to cover running costs, and to make a charitable donation.

*Courses*

The ASiT Foundation Skills in Surgery Course18 is the cornerstone of the Association’s educational calendar, aimed at medical students (penultimate and final year) and PGY1-2 doctors. The course covers common general surgical skills, including medical record keeping, aseptic technique, suturing technique and non-technical skills. This course formed the backbone of this free international training event. A delegate slideset and instructor notes were provided for uniformity. Other courses were selected from ASiT’s catalogue of pre-conference educational courses. Interdisciplinary and industry collaboration was harnessed to deliver novel, subspecialty courses. A maximum central funding limit of £100 per course was set. To minimise other course costs, local faculty were recruited, refreshments were not provided (unless supported by a sponsor), and sponsorship from Universities, training centres and industry was found where possible.

*Logistics*

Preparation for 40-4-40 courses began six months prior to the event date. Event planning was led by a team of three core coordinators, with a support structure of individual course organisers. The core coordinators managed event oversight, national promotion, publicity, core funding, ticket sales and refunds, content management and troubleshooting. Individual course organisers were responsible for local venue coordination, advertising, course set-up, course content and seeking local sponsorship. Venues were approached with a stock email describing the initiative, the ethos of the organisation and specific course requirements. Reciprocal promotion was offered where appropriate (for example, a free mailshot to the organisation mailing list). This was followed up with a telephone meeting, or face-to-face discussion with a venue representative to ensure the course venues were appropriate for hosting. A central peer-accessible hosting platform (Google Drive©) with documents, spreadsheets and course maps was made available to all organisers. Course equipment and material was source from specialised venues, and supporting external suppliers for free, or a low-cost where possible. Waste disposal was managed as per local protocol.

*Feedback*

An online, 35-point feedback questionnaire was mandated for all course delegates, incentivised by award of certification. The tool collected demographic data and specialty interests, as well as domain-specific feedback using 5-point Likert scales. A validated NetPromoter® score19 (out of 10) was collected as a marker of overall course feedback, with respondents grouped into ‘promoters’ (9-10 out of 10), ‘passive’ (7-8 out of 10), or ‘detractors’ (0-6 out of 10). Positively and negatively framed statements with item randomisation was used to avoid acquiescence bias. For delegates undertaking a Foundation Skills in Surgery course, an additional self-reported, matched, pre- and post-course confidence across three key domains using 5-point Likert scales was collected.

*Ethics*

No ethical issues were identified. Completion of feedback forms was interpreted as permission for use of anonymised data for subsequent publication.

*Economic analysis*

Variable and fixed costs of course delivery were collated centrally following submission of receipts of purchase. Comparable costs of similar technical and non-technical courses were calculated with reference to alternative UK-based providers (Royal College of Surgeons of England, Edinburgh and Ireland) via their websites, and multiplied by the number of delegates per course.

*Analysis*

Data analysis was undertaken using RStudio statistics package (V3.1.1, Boston, MA). Internal consistency for Likert scales was calculated using Chronbachs alpha, with >0.500 taken as acceptable. P-values for ordinal data were calculated using Chi-square with Yates’ correction as appropriate (reported as Chi-square, p-value) and comparative p-values for non-parametric, continuous data with related-samples Wilcoxon Signed Ranked Test with α-level of 0.05 (Foundation Skills in Surgery course only). Univariate and multivariate logistic regression models were used to find associations between pre-defined explanatory factors that predicted overall course feedback score, likelihood of becoming/remaining an ASiT member, and likelihood of attending an ASiT conference.

**Results**

*Courses and faculty*

Forty courses were held across 31 venues. A map and list of the courses and locations can be found in Figure 1, and Table 1. A majority of courses (n=26, 65.0%) were ‘technical’ and 14 (35.0%) were ‘non-technical’. Eleven (27.5%) of these were ‘expert-led’, 25 were ‘near-peer’ (62.5%) and 4 were ‘peer-led’ (10.0%) taught by a total of 184 volunteer faculty members.

*Delegates and demographics*

Of 645 registered for the 40 courses, 570 delegates attended. 554 delegates provided feedback, of which 529 fully-completed feedback responses were included in analysis (92.8% response rate). 56.5% of these were male (299/529), and 43.5% were female (230/529). The median age of delegates was 26 years (range: 18 to 67 years).

A majority of delegates were doctors in postgraduate clinical training (70.5%, 373/529). One hundred and ninety-eight delegates were foundation doctors (37.4%, PGY1-2), 116 were core surgical trainees (21.9%, PGY3-4), 41 were higher surgical trainees (7.8%, PGY5-11) and 3 were consultant doctors (0.6%). Fifteen were of a non-training grade (2.8%). One hundred and fifty-seven delegates were medical students (one hundred and fifty undergraduate years 4 to 6; seven undergraduate years 1 to 3). 26.4% (140/529) were in, or planned to follow an integrated academic-clinical training pathway.

An international distribution of delegates was seen, with representation from all Local Medical Education and Training Boards in the UK & Republic of Ireland, as well as delegates from overseas including Kuwait and Australia. The regions with the most registered course delegates were: South London (n=54), Scotland (n=53), South West England (n=49), Wales (n=46) and North West England (n=43). The delegation reported a broad spread of specialty interests across the ten JCST surgical specialties. The most common specialties of interest were General Surgery (n=167, 31.5%), Trauma and Orthopaedic Surgery (n=110, 20.8%) and Plastic Surgery (n=64, 12.1%). 61 wanted to pursue non-surgical specialties, of which the most common interests were Emergency Medicine (n=15), and Obstetrics and Gynaecology (n=15).

*Delegate feedback*

Mean overall course NetPromoter® score was 8.7 out of 10 (range: 2 to 10, out of 10). There were 324 promoters (61.2%), 178 passive respondents (33.6%), and 27 detractors (5.1%). A summary of the mean scores across feedback domains (out of 5) can be found in Table 2. Delegates responded particularly positively about the value for money (4.6/5), style of teaching (4.5/5) and knowledge of the faculty (4.5/5). The lowest scoring domain was clarity of learning outcomes (4.2/5). The internal consistency of responses was acceptable (α=0.79).

On univariate logistic regression analyses of delegate factors, ‘promoter’ status on overall course feedback was associated with completing a Foundation Skills in Surgery course (R=0.44, OR: 1.49, z=2.24, P=0.025), but not associated with age, sex, grade, specialty, academic training, pre-existing ASiT membership status, or specialty.

In a multivariate logistic regression model of course factors, ‘promoter’ status on overall course feedback was strongly associated with perceived high educational value (R=2.68, OR: 14.67, z=2.21, P=0.027), and clear learning outcomes (R=0.72, OR: 2.04, z=2.17, P=0.029), with a reasonable model fit (C statistic=0.62). ‘Promoter’ status was not associated with course, or course style (large group; small group), or teaching style (near-peer; peer-led; expert-led).

*Economic outcomes*

Venue and materials costs were provided free of charge in 28 of 40 (70.0%) courses, supported by Universities, or training centres. Seven courses gained industry sponsorship to meet the events cost. Of the 8 centrally-funded courses the total cost was £481.38. A further £500.00 was spent on publicity, and £806.25 on event hosting (Eventbrite®) (total expenditure = £1787.63). The mean cost per course therefore was £44.69. Deposit contributions (£50.00 per person) from 75 delegates who did not attend an event, generated income of £3,750.00. Of the total surplus (£1962.37), £1000 was donated to charity (Lifebox Foundation; Transplant Sports) and £1000 was used to support an ASiT Foundation Skills in Surgery course at the University of Rwanda, Kigali, Rwanda.

*Benefits to Surgical Trainees*

Feedback was received from 167 delegates who undertook FSS courses (31.6% of total delegates). Delegates reported perceived improvement across all three tested domains; commitment to a career in surgery (V=14, p<0.001), confidence with basic surgical skills (V=247, p<0.001), and confidence with assisting in theatre (V=73, p<0.001)*.* The ‘40-4-40’ courses (Table 1) accrued to a total comparable cost of £233,250.00, representing a cost saving of £231,462.37 to surgical trainees across the event, or a mean of £350.70 per registered delegate (n=660).

*Benefits to ASiT*

Following attendance, 440 delegates (83.2%) reported that they would become, or stay an ASiT member as a direct result of attending a 40-4-40 course, and 344 (65.0%) reported that they would attend an ASiT conference. In multivariate logistic regression, becoming/staying an ASiT member was associated strongly with overall course NetPromoter® score (R=1.09, OR: 2.98, z=4.34, P<0.001), and ASiT’s promotion of external courses (R=0.65, OR:1.91, z=2.17, P=0.029), with a reasonable fit (C statistic=0.71). Those who were ‘promoters’ on their overall course NetPromoter® score were over twice as likely to attend a future ASiT conference (R=0.79, OR:2.20, z=4.11, P<0.001), with an acceptable model fit (C statistic=0.64).

**Discussion**

Surgical trainees currently bear considerable costs for technical and non-technical skills courses. This paper demonstrates a tangible, economically viable model for the delivery of free, international surgical training events with significant educational benefits to surgical trainees. Courses were globally of high quality, with a high mean overall NetPromoter® score, and no significant differences found between course styles (large group *vs*. small group), teaching styles (near-peer, peer-led, expert-led), or specialty groups. All courses were provided free of charge, with a mean comparable saving of £350.70 per delegate. The model also demonstrated benefit for our training organisation, including bolstering membership and conference attendance.

Highest scoring feedback was received when consideration was given to the style of teaching, experience and appropriateness of the faculty, learning outcomes frameworks, and the educational content of a course. Few other published examples exist of single-day surgical technical training courses across multiple specialties. Parent *et al.*, (2015) describe an education randomised trial of intensive skills training (3-days) against a control group, showing acceleration along a procedural learning curve20. No published literature to date describes sustained benefit of undergraduate ‘bootcamps’ through to PGY1-4 training21. Careful consideration of educational theory and how this might influence skills acquisition in a shorter time frame should be given in future iterations of similar, single-day events22. This might include increased emphasis on practical skills, and responsiveness to varied learning needs23.

Feedback from FSS courses demonstrated that over a single-day course it was possible to significantly increase the confidence and competence of early-years surgical trainees in basic practical skills. As an acute and craft-based specialty, surgery has been particularly challenged by a reduction in procedural learning time over the past 10 years11. In a 2015 survey, 86% of UK surgical trainees (n=1348) believed that it would be impossible to achieve competence as an independent practitioner in a shorter period of time than is currently required12. Our findings invite similar efforts from associations globally to provide free-of-charge, one-day, practical skills simulation sessions to bolster procedural learning, particularly for early-years trainees. Such courses may also improve morale by increasing delegate confidence in their technical skills14. ASiT have now published an FSS handbook to enhance procedural learning (RRP: £3.99GBP, ~$5USD)18.

Attendance at an FSS course demonstrated a tangible increase in the desire to pursue a surgical career. A recent survey by ASiT found that only 61% of surgical trainees believed that core surgical training (PGY3-4) was a valuable learning experience24, and 80% stated that it needed improvement, with greater access to the operating room and clinics.This was reflected in the GMC 2014 survey results, where surgery showed the lowest satisfaction ratings across all specialties; worse at Core level (77%) than Higher Specialist Training level (85%).Our findings suggest that international, high-profile training events such as ‘40-4-40’ may have a benefit to early recruitment into surgical careers.

The ‘40-4-40’ event provided 40 free courses, and made a cost saving of £350.70 per registered delegate in comparison to equivalent courses from other providers. In a 2011 ASiT survey, 89% of respondent surgical trainees (n=1085) felt financially pressured by extracurricular training costs. 78% of these trainees reported graduating with debt, which has been reported as high as £81,916 at the point of graduation. Increasing costs of Royal College membership fees, Joint Committee for Surgical Training administration fees, courses, conferences and examinations have been mirrored by a decline in educational funding6. ‘40-4-40’ demonstrated that high-quality training can be provided without prohibitive costs to the trainee, and providing a surplus for reinvestment in the charitable activity of the Association.

Finally, delegates who provided the best course feedback (9, or 10 out of 10 overall) were twice as likely to become, or remain ASiT members, and attend the ASiT conference than those who were ‘passive’ or ‘detractors’. Other associations and training providers may reflect the intrinsic benefits of the delivery of high-quality, low-cost training as a method of sustaining their future membership

**Conclusion**

Modern surgical trainees face a number of challenges, and surgical associations hold a joint responsibility to find support networks and solutions. The ASiT ‘40-4-40’ event demonstrated the diversity and depth of surgical training, through 40 synchronous technical and non-technical courses, with demonstrable educational benefit and a significant cost-saving to surgical trainees.

**Contributions**

JG acts as overall guarantor for this study. All authors (JG, PS, HM, RH, 40-4-40 Course Organisers) contributed to review and refinement of the final manuscript. Headline authors contributed specifically to directing the international training programme (JG, PS, RH); delivering the training courses (40-4-40 Course Organisers); designing the study tool (JG, PS, RH); statistical analysis (JG, RH); drafting the manuscript (JG).

**References**

[1] Association of Surgeons in Training (ASiT). (2016). *Association of Surgeons in Training (ASiT).* Available: www.asit.org. Last accessed 25th January 2017.

[2] Health Education England. (2016). Surgery: Training & Development. Available: https://www.healthcareers.nhs.uk/explore-roles/surgery/general-surgery/training-and-development. Last accessed 25th January 2017.

[3] Royal College of Surgeons of Ireland. (2016). Surgical Training Pathway. Available: http://www.rcsi.ie/surgical-training-programmes. Last accessed 25th January 2017.

[4] Joint Committee on Surgical Training. (2016). Specialty Advisory Committees (SACs). Available: http://www.jcst.org/committees/specialty-advisory-committees-sacs-1. Last accessed 25th January 2017.

[5] Linney L, Cattermole H. (2016). Core surgical training: an interview guide for entry in 2016. Available: http://careers.bmj.com/careers/advice/Core\_surgical\_training%3A\_an\_interview\_guide\_for\_entry\_in\_2016. Last accessed 25th January 2017.

[6] JM O’Callaghan, HM Mohan, A Sharrock, VJ Gokani, JE Fitzgerald, AP Williams, RL Harries (2017). A cross-sectional study of the financial cost of training to the surgical trainee in the United Kingdom and Ireland. [unpublished]

[7] L Stroman, S Weil, K Butler, CR McDonald. (2015). The cost of a number: can you afford to become a surgeon? The Bulletin, Royal College of Surgeons of England. 97 (3), 107-111.

[8] Ercolani M, Vohra R, Carmichael F, Mangat K, Alderson D. The lifetime cost to English students of borrowing to invest in a medical degree: a gender comparison using data from the office of National Statistics. BMJ Open 2015;5:e007335 doi:10.1136/bmjopen-2014-007335

[9] BBC News. (2016). Junior doctors' row: The dispute explained. Available: www.bbc.co.uk/news/health-34775980. Last accessed 25th January 2017.

[10] General Medical Council. (2016). National training survey 2014: Key findings. Available: http://www.gmc-uk.org/NTS\_2014\_\_KFR\_A4.pdf\_56706809.pdf. Last accessed 25th January 2017.

[11] Fitzgerald JE, Caesar BC. The European Working Time Directive: a practical review for surgical trainees. Int J Surg. 2012;10(8):399-403

[12] Harries RL, Williams AP, Ferguson HJ, Mohan HM, Beamish AJ, Gokani VJ; Council of the Association of Surgeons in Training.. The future of surgical training in the context of the 'Shape of Training' Review: Consensus recommendations by the Association of Surgeons in Training. Int J Surg. 2016 Nov;36 Suppl 1:S5-S9. doi: 10.1016/j.ijsu.2016.08.238. PubMed PMID: 27562689.

[13] Mayor S. (2005). UK surgeons report that EU directive has cut training time. BMJ. 330 (7490), 499

[14] Khera G, Milburn J, Hornby S, Malone P. (2011). Simulation in Surgical Training: a statement from the Association of Surgeons in Training. Available: http://www.asit.org/assets/documents/Simulation\_in\_Surgical\_Training\_\_\_ASiT\_Statement.pdf . Last accessed 17th October 2016.

[15] Glasbey J, Sinclair P, Harries RH. (2015). Surgical Support. RCS(Edinburgh) Surgeons' News. Dec 2015 Edition (1), 50-51.

[16] Bulte C, Betts A, Garner K, Durning S: Student teaching: views of student near-peer teachers and learners. Medical Teacher. 2007, 29 (6): 583-590. 10.1080/01421590701583824.

[17] Glasbey J. (2015). Eventbrite:My Events. Available: http://asitofficial.eventbrite.com/. Last accessed 25th January 2017.

[18] Mittapali D, Bosanquet D, McElnay P (2016) Handbook: Foundation Skills in Surgery (FSS). 1st Edition. Hive(ePublisher), East Sussex, UK.

[19] Netpromoter (2015). What is Netpromoter? Available: https://www.netpromoter.com/know/. Last accessed 25th January 2017.

[20] Parent RJ, Plerhoples TA, Long EE, Zimmer DM, Teshome M, Mohr CJ, Ly DP, Hernandez-Boussard T, Curet MJ, Dutta S. Early, intermediate, and late effects of a surgical skills "boot camp" on an objective structured assessment of technical skills: a randomized controlled study. J Am Coll Surg. 2010 Jun;210(6):984-9. doi: 10.1016/j.jamcollsurg.2010.03.006. PubMed PMID: 20510808.

[21] Neylan CJ, Nelson EF, Dumon KR, Morris JB, Williams NN, Dempsey DT, Kelz RR, Fisher CS, Allen SR. Medical School Surgical Boot Camps: A Systematic Review. J Surg Educ. 2016 Dec 6. pii: S1931-7204(16)30258-6. doi: 10.1016/j.jsurg.2016.10.014. [Epub ahead of print] PubMed PMID: 27939818.

[22] Cleland J, Walker KG, Gale M, Nicol LG. Simulation-based education: understanding the socio-cultural complexity of a surgical training 'boot camp'. Med Educ. 2016 Aug;50(8):829-41. doi: 10.1111/medu.13064. PubMed PMID: 27402043.

[23] Singh P, Aggarwal R, Pucher PH, Darzi A. Development, Organisation and Implementation of a Surgical Skills 'Boot Camp': SIMweek. World J Surg. 2015 Jul;39(7):1649-60. doi: 10.1007/s00268-015-2972-1. Review. PubMed PMID: 25665671.

[24] Harries RL, Rashid M, Smitham P, Vesey A, McGregor R, Scheeres K, Bailey J, Sohaib SM, Prior M, Frost J, Al-Deeb W, Kugathasan G, Gokani VJ. What shape do UK trainees want their training to be? Results of a cross-sectional study. BMJ Open. 2016 Oct 7;6(10):e010461. doi: 10.1136/bmjopen-2015-010461. PubMed PMID: 27855084; PubMed Central PMCID: PMC5073519.

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**Appendix 1**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Location | Course Title | Cost Estimate |
| 1 | Aberdeen, Scotland | ASiT Foundation Skills in Surgery | 650 |
| 2 | Abergavenny, Wales | Preparing for a Career in Orthopedic Surgery | 200 |
| 3 | Bath, England | The ABC…to Z of Trauma! | 700 |
| 4 | Belfast, NI | ASiT Foundation Skills in Surgery | 650 |
| 5 | Birmingham, England | Core Surgical Training Interview Workshop  | 200 |
| 6 | Birmingham, England | STARSurg/ASIT Research Skills Course | 150 |
| 7 | Birmingham, England | Cognitive Simulation for Surgical Trainees | 200 |
| 8 | Birmingham, England | Preparing for a Career in Plastic Surgery | 200 |
| 9 | Brighton, England | ASiT Foundation Skills in Surgery | 650 |
| 10 | Cambridge, England  | ASiT Foundation Skills in Surgery | 650 |
| 11 | Cardiff, Wales | ASiT Trainees Engaging As Clinical Healthcare EducatoRs (TEACHER) | 900 |
| 12 | Cardiff, Wales | ENT Operations: Bridging the Gap  | 200 |
| 13 | Cardiff, Wales | CuRES/ASiT Academic Perioperative Care Symposium | 100 |
| 14 | Cardiff, Wales | ASiT Foundation Skills in Surgery (Sponsor: WIMAT) | 650 |
| 15 | Cardiff, Wales | Introduction to Gastrointestinal Endoscopy (Sponsor: WIMAT) | 700 |
| 16 | Chelmsford, England | Essentials of Plastic Surgery  | 300 |
| 17 | Dublin, ROI | Gastrointestinal Anastomosis Course (Sponsor: Covidien) | 700 |
| 18 | Dundee, Scotland | ASiT Foundation Skills in Surgery | 650 |
| 19 | Edinburgh, Scotland | ASiT Foundation Skills in Surgery (Sponsor: EOSurgical) | 650 |
| 20 | Edinburgh, Scotland | Core Laparoscopic Skills (Sponsor: EOSurgical) | 700 |
| 21 | Exeter, England | ASiT Foundation Skills in Surgery & Human Factors in Surgery | 750 |
| 22 | Exeter, England | Statistics for Surgeons | 250 |
| 23 | Leeds, England | ASiT Foundation Skills in Surgery | 650 |
| 24 | Liverpool, England | Advances in Benign Coloproctology (Sponsor: THD and BK Ultrasound) | 1100 |
| 25 | Liverpool, England | Journal Club: Advanced Critical Appraisal for Surgical Practice | 200 |
| 26 | London, England | ASiT/ASC Introduction to Systematic Review and Meta-Analysis | 100 |
| 27 | London, England | Basic Orthopedic and Trauma Skills | 300 |
| 28 | London, England | Applied Surgical Anatomy for the MRCS  | 400 |
| 29 | London, England | ASiT Foundation Skills in Surgery (Imperial College London) | 650 |
| 30 | London, England | ASiT Foundation Skills in Surgery (University College London) | 650 |
| 31 | London, England | Radiology Survival Guide for Surgical Juniors (Sponsor: Society for Radiologists in Training) | 100 |
| 32 | London, England | Core Surgical Training Interview Preparation | 250 |
| 33 | London, England | Advances in Global Surgery & Safety (Sponsor: Lifebox) | 100 |
| 34 | Manchester, England | Radiology for Surgeons | 200 |
| 35 | Manchester, England | ASiT Foundation Skills in Surgery | 650 |
| 36 | Newcastle, England | ASiT/NUSurgSoc Foundation Skills in Surgery | 650 |
| 37 | Nottingham, England | Preparing for your Consultant Career | 500 |
| 38 | Sheffield, England | Sheffield Gastrointestinal Anastomosis Workshop (Sponsor: Covidien) | 700 |
| 39 | Sheffield, England | Core Skills in Gastrointestinal Surgery | 600 |
| 40 | Southampton, England | ASiT Foundation Skills in Surgery | 650 |

**Table 1.** List of 40-4-40 courses provided across the UK & ROI, with comparable cost from alternative UK-based providers e.g. Royal College of Surgeons of England/Edinburgh/Ireland (£GBP/delegate)

|  |  |
| --- | --- |
| **Feedback domain** | **Mean score (/5)** |
| The course was well organised | 4.3 |
| The course was of educational value | 4.5 |
| The course had clear learning outcomes | 4.2 |
| The course met its learning outcomes (reversed) | 4.3 |
| The course was suitable for my level of training (reversed) | 4.3 |
| The course length was appropriate (reversed) | 4.3 |
| The faculty were knowledgeable about the course topic | 4.5 |
| The style of teaching (e.g. small, large group) was appropriate | 4.5 |
| The faculty: delegate ratio was sufficient | 4.4 |
| The venue was appropriate for this course (reversed) | 4.4 |
| The course was good value for money (reversed) | 4.6 |

**Table 2.** Mean 40-4-40 course feedback scores, by domain