The Success and Evolution of a Urological "Boot Camp" for Newly Appointed UK Urology Registrars: Incorporating Simulation, Nontechnical Skills and Assessment

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BACKGROUND: Urological training has dramatically changed in recent years. Training durations are shorter and a drive toward consultant led care has reduced trainees experience. Within the UK, approximately 50 registrars annually embark on a 5-year Urology training programme, with variable levels of basic urological experience.

OBJECTIVE: To describe a simulation programme aimed at delivering the knowledge and skills necessary to safely and effectively start working as a registrar in Urology by intensive training with a 1:1 faculty to delegate ratio.

DESIGN, SETTING, AND PARTICIPANTS: Our course content mirrors the UK training syllabus for junior Urology registrars. We delivered 8 modules over a 4-day programme with a fifth day of assessments. Delegates level of urological knowledge, operative competency and confidence pre-, immediately post-training and at 3-months postcourse were assessed. Objective delegate and faculty feedback was also collected. Technical skills modules include; inguinoscrotal surgery, ureteroscopy, transurethral resection, urodynamics, and Botox administration as well as basic reconstructive and laparoscopic operative skills. "Nontechnical" skills included simulated ward round, out-patient, and emergency scenarios.

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RESULTS: Feedback from delegates and faculty members has been overwhelmingly positive. We have used this feedback to tailor the content of the course for following years. An increased knowledge level (based on mean examination scores [precourse 55.5%, postcourse 70.1%]) and operative competency was observed in all skills assessed (transurethral resection of the prostate, transurethral resection of bladder tumor, Ureteroscopy, laparoscopic skills, and instrument assembly). Operative confidence was increased immediately and at 3-months postcourse.

CONCLUSIONS: Our "boot camp" course provides a realistic introduction and foundation to begin Urological practice. Being delivered at the beginning of the training scheme, prior to intensive patient exposure, registrars are in an optimum position to develop their newly acquired knowledge and skills to enhance training and intends to improve patient safety and satisfaction. (J Surg Ed 76:1425−1432. © 2019 Published by Elsevier Inc. on behalf of Association of Program Directors in Surgery.)

KEY WORDS: Simulation, urology, technical skills, nontechnical skills

COMPETENCIES: Patient Care, Medical Knowledge, Professionalism, Interpersonal and Communication Skills, Practice-Based Learning and Improvement

INTRODUCTION

Within the United Kingdom (UK), significant challenges currently exist in the delivery of high-quality urological training. Financial pressures on the National Healthcare Service (NHS), a drive to deliver consultant-lead care and reducing trainee working hours due to the introduction of the European Working Time Directive have greatly reduced the amount of exposure and experience trainees receive.[1,2] The impact of the UK leaving the European Union in 2019 with regards to the ongoing roll of the European Working Time Directive and surgical trainee numbers remains to be seen.

The current duration of "Higher Speciality Training" (HST) for urology in the UK is 5 years, rotating through different subspecialties within Urology and following a prescriptive curriculum set out by the Joint Committee on Surgical Training (JCST).[3] Having successfully completed this period of training the registrar is deemed competent to practice as a General Consultant Urologist.

Historically, prior to being appointed to a "HST" position (registrar) the trainee would have successfully complete 2 years of Foundation Training, 2 years of Core Surgical Training and often completed a higher degree in an appropriate field of research or gained further experience in Urology by undertaking nontraining clinical fellowship posts. This anecdotally culminates in over 10,000 hours of experience prior to becoming a Consultant Urologist.

Some argue that as competition for acute surgical specialties has reduced,[4,5] so too has the necessity for gaining this further experience.[4] Despite this, the competition for Urology registrar posts remains tough, with a ratio of 3:1 for applicants to posts available. On an annual basis, approximately 50 new registrars are selected across the UK to this 5-year training programme, with a variable level of basic urology experience.

Over the last 2 decades, medical and surgical education has embraced the development of "simulation training" to enhance trainees' level of knowledge and skills prior to— and alongside— clinical exposure.[6-11]

Many urological procedures lend themselves to virtual reality simulation and the advent of simulators for procedures such as transurethral resection of the prostate (TURP) and ureteroscopy has been hugely beneficial for trainees to perfect their skills prior to operating on patients.[12-15]

Numerous technical and nontechnical skills courses have also been developed for trainees to hone their surgical and communication skills.[6,9-11] Most of these courses are often specific to 1 or 2 procedures or skills and are delivered at various locations across the UK over a 1 or 2-day period.

MATERIAL AND METHODS

Over the last 4 years, our aim was to design and develop a course, with endorsement from the British Association of Urological Surgeons, that covers all the key skills that would be required for a first- or second-year urological registrar based on the current JSCT urological training curriculum and provide a standardized foundation of knowledge and skills for newly appointed registrars across the UK.

This is an intensive 5-day "boot camp" style course delivered in a dedicated simulation center in a large university teaching hospital centrally located within the UK. The course has grown from an initial delegate number of 16 in 2015, to 32 in 2016, to a current delegate capacity of 48. The over-riding aim of this course was to provide high quality simulation training in 1:1 faculty to delegate training ratios in a dedicated simulation and training suite.

A course fee of £500 was covered by the training budget for each delegate, therefore, not financially impacting on the trainee. The course was delivered voluntarily by consultant urologists from across the UK (in excess of 50) and was financially supported by a number of industry sponsors (see acknowledgments). The overall cost of the course for 48 delegates was approximately £75000, with £24000 directly from course registration fees.

Precourse Assessments

Prior to attending the course, delegates completed an online 40 question multiple-choice (MCQ) examination (designed by the course lead [CSB and SJ]) to gauge a baseline level of knowledge. This MCQ was designed to cover general urological knowledge and was not specific to knowledge covered on the course. Delegates were also required to complete a Likert scale questionnaire relating to their operative experience and their confidence at performing these operations and other non-technical skills, such as leading a urology ward round.

Course Content and Intracourse Assessments

The course consists of 8 practical modules (Supplementary File 1), lasting half a day (4 hours training) each. These topics were selected by a committee of Consultant Urologists with an interest in surgical training to mirror the training syllabus for first and second year registrars' training in the UK.[3] The final day culminates in practical and written assessments.

Each technical module (modules 1, 2, 3, 4, 6, 8) began with a short lecture to introduce the concepts and rationale for each procedure. Delegates had been provided with in-depth written and interactive video information via an online portal prior to attending the course which was derived from the JCST Urology HST curriculum. The aim of this portal was to maximize "hands-on" training, with an over-arching emphasis on a one-to-one faculty to delegate ratio. These short introductory lectures lasted only 20 to 30 minutes and were aimed to recap the detailed information that was already provided to the delegates through the online portal. During each module, faculty member ensured that a participant should complete a simulated procedure/technical skill at least once. We aim that by the end of the course, majority of trainees should have done 5 TURP, TURBT, and ureteroscopic procedures as these are basic procedures done by a new urology trainee. Delegates were assessed on their technical ability and surgical skills throughout the technical skills modules as detailed in Supplementary Table 1.

The final (fifth) day of the course was for technical skills assessment (Supplementary File 2). Skills assessed on the final day were:

- TURP
- Endoscopic instrument assembly
- E-BLUS laparoscopic skills
- Pelvic examination and urodynamics
- Rigid ureteroscopy

Delegates also received workshops and lectures throughout the course. Workshops included topics on quality improvement, investigating incidents and the role of audit in Urology. A lecture on "pediatric urology for the general urologist" was also delivered to tie in several curriculum topics in the UK set out by the JCST for urology trainees.

Postcourse Assessment

A postcourse 40-question MCQ examination was also part of the final assessment using the same set of questions used during the precourse assessment. Delegates were asked their confidence levels immediately after the course for the same core urological skills questions in the precourse Likert-scale questionnaire. This Likert-scale questionnaire was then repeated at 3-months following the course to determine whether any increased levels of confidence were maintained over time.

Technical skills assessment—we selected 5 technical skills (EBLUS exercises, TURP, Botox, Assembling instruments, and ureteroscopy for assessment). Participants were divided into 2 groups (24 in each group). Participants were not aware of skills to be examined during the modular training. At each assessment station, a faculty member was present with a procedure-specific scoring sheet. These forms were used during the modular teaching, therefore, all examiners were familiar with the scoring system. In addition, examiners were blinded about the individual score during the modular training. While one group was going through the assessment, the other group attended the Quality Improvement Workshop. The assessment

TABLE 1. Delegate Course Feedback Over the 3-Year Evolution Period Relating to How Well the Course Meet the Delegate's Expectations (Strongly Disagree [SD], Disagree [D], Neutral [N], Agree [A], Strongly Agree [SA])

Year (Number of Participants)	I Feel That My Personal Learning Objectives Were Met (%)					The Training has Equipped Me With Enhanced Knowledge, Understanding and/or Skills (%)					The Training Covered Everything I Had Expected (%)				
	SD	D	N	A	SA	SD	D	N	A	SA	SD	D	N	A	SA
2015 (16)	0	0	0	18.7	81.2	0	0	0	6.25	93.75	0	0	0	18.7	81.2
2016 (34)	0	0	8.82	32.35	58.8	0	0	5.88	14.7	79.4	0	0	2.9	41.1	55.9
2017 (48)	0	0	3.8	29.8	66.4	0	0	2.6	22.1	75.3	0	0	1.3	36.4	62.3

TABLE 2. The Delivered Curriculum by Course Year. Text in ***Italics*** Received Either Negative Feedback From Either Delegate and/or Faculty or Were Incorporated Into an Alternative Module to Broaden the Curriculum the Following Year

	2015 Curriculum	2016 Curriculum	2017 Curriculum
Module 1	Inguinoscrotal surgery • *Circumcision* • Scrotal examination • Testicular fixation • Hydrocele • *Suprapubic catheterization*	Inguinoscrotal surgery • Priapism • Penile fracture • Scrotal examination • Testicular fixation/hydrocele • Catheter troubleshooting and SPC • *Outpatient consultation skills and stepping up to ST3*	Inguinoscrotal surgery • Priapism • Penile fracture • Scrotal examination • Testicular fixation/hydrocele • Catheter troubleshooting and SPC
Module 2	Reconstructive urology • Bowel anastomosis • Stoma formation • Bladder and ureteric repair	Reconstructive urology • Bowel anastomosis • Stoma formation • Ileal conduit diversion • Ureteric reimplantation • Bladder repair	Reconstructive urology • Bowel anastomosis • Stoma formation • Ileal conduit diversion • Ureteric reimplantation • Bladder repair
Module 3	Laparoscopy • Basic laparoscopic skills—E-BLUS	Laparoscopy • Basic laparoscopic skills—E-BLUS	Laparoscopy • Basic laparoscopic skills—E-BLUS
Module 4	Endourology 1 • TURP • TURBT • *Greenlight laser* *All virtual reality simulators*	Endourology 1 • TURP—wet and electronic simulators • TURBT • Instruments • Bladder washout	Endourology 1 • TURP—wet and electronic simulators • TURBT • Instruments • Bladder washout
Module 5	Scenarios: • Infected obstructed kidney • Pelvic fracture/urethral injury • Renal trauma • Pneumothorax	Scenarios 1 • Infected obstructed kidney • Pelvic fracture/urethral injury • Autonomic dysreflexia • Renal trauma • Pneumothorax	Scenarios 1 • Infected obstructed kidney • Pelvic fracture/urethral injury • Autonomic dysreflexia • Renal trauma • Pneumothorax
Module 6	Female/functional urology • Urodynamics • Mid-urethral tapes • Botox administration • Urethral bulking agents	Female/functional urology • Urodynamics • Mid-urethral tapes • Botox administration • Urethral bulking agents	Female/functional urology • Urodynamics • Mid-urethral tapes • Botox administration • Urethral bulking agents
Module 7	*Technology and stent insertion* • *Energy Source* • *Equipment* • *Cystoscopy/stent* • *Cystoscopy/washout*	Scenarios 2 • Simulated ward round • Communication scenarios/ outpatients	Scenarios 2 • Simulated ward round/emergency scenarios • Communication scenarios/ outpatients
Module 8	Endourology 2 • Ureteroscopy	Endourology 2 • Cystoscopy • Stent insertion • Ureteroscopy (rigid/flexible)	Endourology 2 • Cystoscopy • Stent insertion • Ureteroscopy (rigid/flexible)
Evening/ additional sessions	• Mediolegal lecture • *Informal talk on professionalism and ISCP curriculum* • *Human factors* • *Consent, capacity, leadership* • *Stepping up from CT to ST*	• *Mediolegal lecture* • *Consent, capacity, leadership* • *Laser and ionizing radiation* • *Uroradiology* • *Human factors*	• Pediatric urology • Talk on professionalism from RCS • BUJI knowledge session • Quality improvement and audit

process lasted for approximately 3 hours. After a short break, groups were swapped (Supplementary File 2).

Formal written feedback (in the form of a Likert-scale questionnaire and free-text responses) was required from delegates and faculty for each module via the online course portal immediately after completion of that session (Supplementary File 2, Table 2).

Following successful completion of the course delegates were provided with a detailed "trainee summary report" at the end of the course to plan and focus their

TABLE 3. MCQ Results for Both the Pre- and Postcourse Examination Over the Evolution Period of the Course

Year	Mean Precourse MCQ Result	Mean Postcourse MCQ Result
2015	54.3%	69.8%
2016	52.6%	70.3%
2017	55.5%	70.1%

placement training requirements with their Academic Educational Supervising Consultant. This report aggregated "final competence grade" and "competence progression" during the course.

RESULTS

Our course has grown from a pilot scale national course (n = 16) in 2015, to mandatory national course (n = 34 in 2016 and n = 48 in 2017) over a 3-year period.

Throughout the 3-year evolution of the course, feedback has always been very positive (Table 1), with delegates overwhelmingly "agreeing" (6.25%-41.1%) or "strongly agreeing" (55.9%-93.75%) on a Likert scale that the course met their learning objectives and provided necessary knowledge and skills. Curriculum delivery has been driven and altered based on any negative feedback or constructive criticism provided from both delegates and faculty members to continually sculpt the curriculum delivered and ensure it matches with delegates' expectation and follows the JSCT curriculum for first and second year urology trainees in the UK.

Examples of changes in curriculum based on delegate feedback included circumcision and suprapubic catherization (2015) being regarded as skill already attained in Core Surgical Training, with delegates preferring a session on catheter trouble shooting/difficult catheterization (2016 and 2017). The technology module (module 7,2015, Table 2) was incorporated into other modules to make way for a simulated ward round in 2016 and 2017 (Table 2), a change that was incredibly well received by both delegates and faculty. Formal evening lectures after 8 hours of simulation training were less well received and evolved into interactive discussions and workshops for the 2017 course.

An increased level of knowledge was observed following completion of the course based on the mean MCQ examination results. This was the case for all 3 years the course has been running (Table 3), with mean precourse scores ranging from 52.6% to 55.5% and postcourse scores ranging from 69.8% to 70.3%.

Figure 1 highlights the self-reported level of confidence (Likert scale) before, immediately following attending the boot camp and at 3-months after the course. There was an increase in mean level of confidence from precourse (ranging from 1 to 4.7) to postcourse (ranging from 1.9 to 4.8) values. Most procedures observed at least a 1-point Likert scale increase in confidence following training. For some of the procedures performed less frequently by trainees, such as bladder repair, stoma formation and bowel

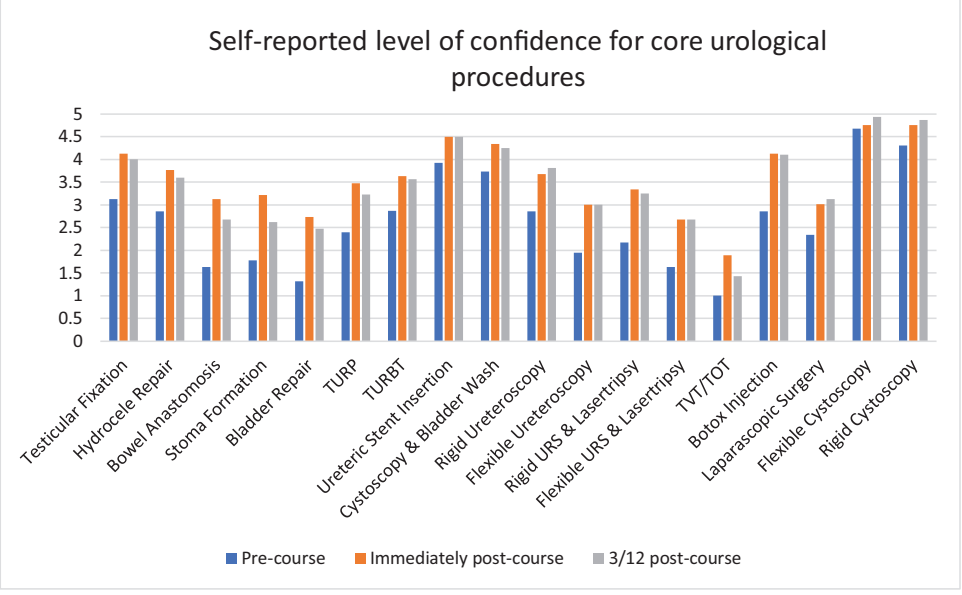

FIGURE 1. Self-reported mean procedural confidence (combined data for 2015 to2017) for all procedures covered on the course (0/5 — not confident at all, 5/5 = very confident).

TABLE 4. Mean Scores for Technical Skills Assessed During the Course and on the Formal Assessment Day (2015-2017 Combined Data). Graded on a Scale of 1 to 5 (Poor-Excellent)

	Module Mean Score (During Training)	Assessment Mean Score (After Training)	Significance (Students *t*-Test)
TURP	2.87	3.55	<0.00001
Rigid ureteroscopy	3.23	3.42	0.0402
Laparoscopic skills (EBLUS)	2.64	3.17	0.0275
Instrument assembly	3.65	4.66	<0.00001
Urodynamics/botox	2.95	3.65	0.0055

anastomosis, a slight reduction in confidence was noted after 3-months. However, for most of the core skills a junior registrar is expected to be able to perform, Likert scale level of confidence was maintained at 3-months following completion of the course.

Technical ability was assessed for the skills highlighted in Table 4. These skills were graded by an experienced Consultant Urologist on a scale of 1 to 5 (poor-excellent [level expected for certificate of completion of training]) at the time of teaching the module to assess a baseline score and then again on the final assessment (Supplementary Table 1).

Table 4 demonstrates a progression in technical ability for the core operative skills assessed during the course. Initial mean competency ranged from 2.64 to 3.65 and increased to 3.17 to 4.66 following 1:1 faculty to delegate training over a half-day (approximately 4 hour) period. All skills were found to have a statistically significant improvement in ability (based on Student *t*-test analysis with significance defined as $p < 0.05$).

DISCUSSION

Stepping up from a Core Surgical Trainee to the challenges of a Urological Registrar can be a daunting experience, especially from trainees who have had limited clinical experience. There are multiple influences to shaping modern surgical training and therefore innovative methods are needed to equip trainees to be able to provide high quality urological care; therefore, the simulation methods used throughout our boot camp provide an excellent method in training urologists to start confidently and competently.[9-15]

Over the last 3 years, our intensive training "boot camp" has successfully evolved into a mandatory national training scheme that has now been validated and funded for the training of all newly appointed urological registrars within the UK by the British Association of Urological Surgeons and theJCST. It reflects the curriculum outlined by the JCST for first and second year trainee, covering a broad spectrum of technical and nontechnical skills.

Delegates have reported a high degree of satisfaction having completed the 5-day course (Table 1), reflecting that the course offers a realistic syllabus for new urology registrars. Delegates levels of knowledge also improved following completing the course.

The importance of collecting formal feedback from both delegates and experienced trainers throughout the development of a urology "boot camp" course cannot be over-emphasized. It has allowed us to make meaningful changes to the curriculum and to the delivery of modules to enhance trainee satisfaction.

Our course has also been shown to improve delegated level of confidence in performing core urological procedures (Fig. 1). This improved level of confidence was sustained at 3-months following the course for most of the procedures taught. A reduction in confidence was most notable in mid-urethral tape insertion and stoma/conduit formation. These are procedures that are less frequently performed by trainees and therefore a reduction in confidence over time is expected.

Technical ability was assessed for core urological procedures and a significant improvement was observed for all skills assessed following completion of the course (Student *t*-test analysis, Table 4). Improved competency when performing core urological procedures in a simulation environment was noted for all procedures taught, supporting the evidence in contemporary literature that surgical simulators (high or low fidelity) are important tools in acquiring these basic urological skills.[8,12-14] We have previously published data supporting the fact that an intensive "boot camp" leads to improved Likert scores for competency progression.[16]

Delegate feedback for the nontechnical skills scenarios was also very positive. Delegates found they were able to build on skills such delegation, prioritization, communication and organization in a safe and nonconfrontational environment. Using a validated tool (NOTSS) for the analysis of modules 5 and 7 allowed for a meaningful discussion and "freeze-frame" debrief during and after the scenario.[9] This was well received by delegates, who were then able to reflect on their practice and communication skills in preparation for their new registrar roles.

The use of our "Trainee Summary Report" for reporting a candidate's performance at a simulation course by aggregating "final competence grade" and "competence progression" provides a trainee and their educational supervisor an instant appreciation of their performance amongst other candidates of similar ability and career aspirations (Supplementary File 3). This evidence attained by multiple expert assessments over a 5-day simulation course is invaluable and may be used in the clinical setting to guide trainees with their future training needs.

CONCLUSIONS

It is our belief that our intensive simulation boot camp provides a realistic reflection of the skills a newly appointed registrar will require. By attending the course at the start of the training programme, trainees are in the optimum position to put into practice their newly acquired knowledge and skills to improve their training experience and reduce anxiety levels. The data that we have collected over the last 3 years supports this.

Our course fills a void in training opportunities for new Urology registrars by offering all the core technical and nontechnical skills training in an intensive and centrally located manner. It also gives new trainees a chance to meet their colleagues from across the country with whom they will be working alongside for the next 5 years. This style of training is applicable to many surgical specialities, not just urology.

LIMITATIONS

We accept that our assessment of confidence, knowledge, and technical ability was made on the final day of the course, when new knowledge will be well retained by delegates. Our 3-month analysis of confidence may be affected by several factors including clinical and operative exposure whilst undertaking a training placement. Well supported trainees in a well-organized training placement may have reported elevated levels of confidence and technical ability for these reasons rather than as a direct impact of our boot camp course.

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SUPPLEMENTARY INFORMATION

Supplementary material associated with this article can be found in the online version at doi: 10.1016/j.jsurg.2019.04.005.