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What is the role of surgical simulation on operative opportunity for the trainee ENT surgeon?

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Abstract

Objective. This study sought to assess the impact of simulation training in influencing trainees' initial surgical participation as perceived by experienced surgeon trainers.

Methods. Twenty ENT surgeons assessed how much of a given procedure they would expect to allow a trainee to perform for their first time. Responses were provided for trainees who had undergone a relevant simulation course and those who had not, and scored according to the eLogbook levels of involvement in surgery. This was completed for simulated procedures with validated models, across four grades of junior doctors.

Results. A total of 1120 judgements on the trainees' intended level of involvement were made. The median involvement score was higher in the simulation group versus the non-simulation group (Mann–Whitney U, $p = 0.0001$), corresponding to a translation in surgical opportunity from a primarily assisting role to an active role.

Conclusion. Trainer perception of a relevant ENT simulation course appears to positively impact on the initial surgical opportunities afforded to the trainee.

Main Article

Mr E J R Noon takes responsibility for the integrity of the content of the paper

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Introduction

The impact of simulation on surgical training has been examined in a variety of different environments, focusing on the positive effects on participant confidence and competence in task completion.[1,2] A key aspect yet to be evaluated extensively, however, is how participation in simulation directly affects initial trainee opportunities and surgical productivity in the operating theatre.

The literature on using simulation as a means to reduce surgical training time is widespread, but a core element to this is trainee exposure itself. Being able to perform a surgical procedure as a junior member of the team requires a large degree of entrustment by the supervising surgeon, and such a relationship understandably takes time to establish.

Currently in the UK, the effects of the coronavirus pandemic (COVID-19) have caused almost universal disruption to operative experience for surgical trainees, particularly with elective cases. Although the potential for increased training time requirement is acknowledged,[3] a further national consensus statement from ENT UK also points to the potential value of simulation in combating this difficulty.[4]

The importance of optimising factors to maximise active surgical participation is ever important, particularly when combined with the disappearance of the firm-based system of working, with juniors often working for numerous consultants within ever shorter training rotations.[5] One means of optimising operative experience is through participation in a high-quality simulation experience. We postulate that a main outcome in task-trainer simulation is the provision of expedited surgical opportunities, helping minimise delays in taking an active role in surgery.

We sought to examine the potential impact of simulation on perceived surgical opportunities for junior grade UK surgeons as perceived by an experienced cohort of senior ENT surgeons (senior specialty registrars and consultants). We aimed to establish whether surgical trainees' previous participation in a relevant simulated learning event changes how much of a procedure they are allowed to perform for their first time under senior surgeon supervision. In particular, we sought to quantify the extent to which simulation allowed the level of involvement in surgery to increase from passive (observing or assisting) to active, or indeed whether it would change the likelihood of the trainee performing the entire procedure. These are key measures of surgical involvement; in the UK, these measures are assessed in surgical trainees' yearly review, informing decision-making about their progression in training.

Materials and methods

A standardised questionnaire was provided to 20 UK ENT surgeons (Appendix 1). The questionnaire stipulated that it was the trainee's first time with the respondents (senior surgeons) in the operating theatre and enquired how much of a particular operation they would expect to

Table 1. eLogbook levels of involvement

Level	Passive versus active	Part versus whole
5	Trainee to perform whole procedure, supervisor unscrubbed*	Trainee to perform whole procedure, supervisor unscrubbed**
4	Trainee to perform whole procedure, supervisor scrubbed*	Trainee to perform whole procedure, supervisor scrubbed**
3	Trainee to perform part of procedure, supervisor scrubbed*	Trainee to perform part of procedure, supervisor scrubbed**
2	Trainee to assist in procedure‡	Trainee to assist in procedure†
1	Trainee to observe procedure‡	Trainee to observe procedure†

Based on supervisors' anticipations regarding trainees' roles, we determined whether simulation would elevate trainees' involvement to 'active' (*) from 'passive' (‡) during surgery, and whether they would perform 'part' or none of the operation (in the case of observing) (**) or 'all' of the operation (†). Specialty trainees were refined into two levels, 3 and 4.

allow the trainee to perform according to the eLogbook (elogbook.org) levels of involvement (Table 1). Ratings were given via a numerical value, ranging from 1 for observing to 5 for performing the whole procedure with the supervisor unscrubbed, further refined at the supervisor scrubbed level, to indicate whether the trainee would do part or all of the procedure. On analysing the results, we took these anticipated roles and determined whether simulation would elevate trainees' involvement to 'active' (indicated by '*' in Table 1) from 'passive' ('‡') during surgery, and whether they would perform 'part' or none of the operation (in the case of observing) ('†') or 'all' of the operation ('**').

Seven common ENT procedures with existing validated models were included. These were: tonsillectomy,[6] grommet insertion,[7] cortical mastoidectomy,[8] microlaryngoscopy and biopsy,[9] endoscopic nasal polypectomy, endoscopic sinus surgery (of any extent),[10] and surgical tracheostomy.[11]

The grades of trainee that respondents were asked to consider varied from one year following medical school (foundation year one doctor), to core surgical trainees, to first-year specialty registrars in ENT (five years following medical school, i.e. specialty trainee year 3).

Respondents stated an expected level of involvement for trainees who had undertaken a simulation course and those who had not, for each procedure. The simulation course was a high-quality, well-established course that utilised a validated model (cadaveric, animal model or a custom three-dimensional simulator); the course had been completed within the previous two weeks. The senior surgeon was not expected to have observed the trainee in the simulation course personally.

Results

Twenty responses were collected from 13 consultants and 7 specialty registrars. These individuals provided an intended level of involvement for four grades of surgical trainees with and without prior simulation experience, for seven procedures. This resulted in a total of 1120 'judgements' on the trainees' intended level of involvement for analysis.

Half the respondents were from Greater London and the remaining from the Greater Manchester area. Respondents' personal involvement in simulation as faculty staff was variable, with nine participants, of which six were consultants, declaring no regular involvement in delivering simulation-based training. The mean time the respondents had spent in their role was 4.35 years for registrars and 10.38 years for consultants.

Overall, we saw a statistically significant difference in median involvement scores between the non-simulation and simulation group ($p = 0.0001$) according to Mann–Whitney U testing. The median score of 3 in the simulation group suggests expected trainee involvement would be greater; specifically, trainees would perform part of the procedure with the senior colleague scrubbed, as opposed to assisting for those in the non-simulation group with a median score of 2. In 59 per cent of the 560 paired simulation versus non-simulation ratings, there was a perceived increase in intended participation as a result of preceding simulation training.

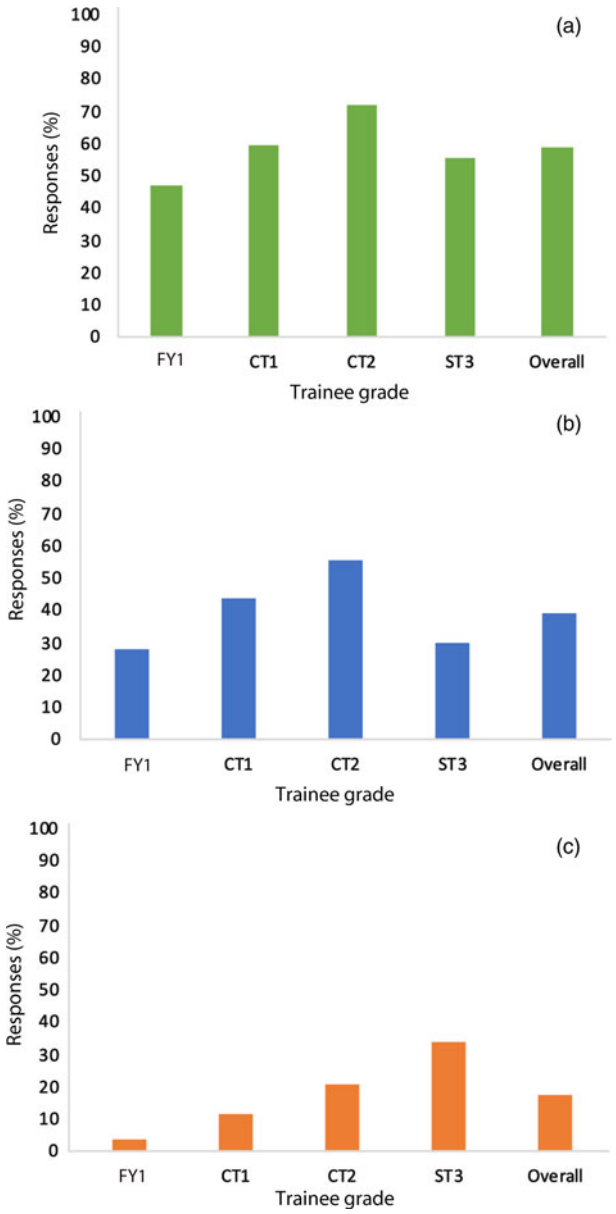

Fig. 1. Percentage of responses that indicated an elevated level of involvement in surgery (scores 1–5) when comparing the no-simulation versus simulation groups: (a) for any increase in participation; (b) from passive (scores 1–2) to active roles (scores 3–5); and (c) from performing part (score 3) to the whole procedure (scores 4–5). FY1 = foundation year one; CT1 = core trainee year one; CT2 = core trainee year two; ST3 = specialty trainee year 3

On reviewing the elevation in expected involvement following simulation training, there was a change from a passive

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surgical role (scores 1 and 2) to an active one (scores 3–5) (whereby trainees would be expected to perform at least part of the procedure) for 39 per cent of trainees. However, expected involvement increased from performing part (score 3) to the whole of the procedure (scores 4–5) for only 17 per cent of trainees (Figure 1).

Discussion

The journey of surgical competency from theoretical through to being able to perform a procedure unsupervised involves implicit trust from the supervisor in this learning process. The pathway to achieving competency can be divided into defined steps. Hence, 'competence' may be assessed in the form of entrustable professional activities, defined as the 'responsibilities or tasks that must be done in patient care'.[12] Such tasks may be delegated for learning purposes to a trainee. In surgery, these tasks may range from making the first incision, to inserting a drain, to performing the whole procedure. These are all entrustable professional activities, as the supervisor entrusts the trainee with the responsibility, wherein the highest level of entrustable professional activity as the trainee is being able to supervise a more junior learner.

An entrustment decision about whether a learner will be able to safely perform a task is based not just upon ability, but their perceived integrity, reliability and humility.[13] Furthermore, entrustable professional activity decisions depend upon a wide range of factors. Recent literature suggests trainee and supervisor factors as influencers, as well as the task itself, the workload, the institution's teaching culture,[14] and the learner–teacher relationship over time.[15]

- The coronavirus disease 2019 pandemic has resulted in reduced operative exposure for surgical trainees
- Simulation may act as a useful adjunct to supplement this deficiency, a practice supported by ENT UK in a recent consensus statement
- Recent participation in ENT surgery simulation courses elevates likely involvement in surgery for junior trainees
- Simulation appears to transform trainees' initial involvement from observing or assisting to an active role

The potentially positive effect seen here following a simulation course may represent the preparation the trainee has made prior to performing their first case. Such 'groundwork', regardless of its form, may encourage the supervisor to allow the trainee to perform at a higher level. Other preparatory work may include a discussion about the procedure with the supervisor, evidence of supplementary reading, or even watching an instructional video.[16]

Simulation training appears to have a 'psychological nudge' effect that can influence surgical opportunity. This may act as a 'foot in the door' at a time when there are many reasons that can prevent the trainee from undertaking an operation, not just the trainee's unfamiliarity with the procedure and a new supervisor–trainee relationship. Because increased pressure on service delivery can inhibit training for junior trainees, simulation places the onus on the trainer to facilitate the ongoing progression of the trainee. Having previously demonstrated an active role in the procedure (in simulation), there would seemingly need to be a specific reason why the trainee may not be permitted to take part in a procedure in this case.

The limitations of this study include that it is based on the respondents' likely actions, rather than evaluation of actual supervised procedures, which is an intended further area of assessment. There is a degree of fluidity to surgical supervision such that the actual involvement the trainee has during a procedure may change rapidly based on immediate supervisor observations of a trainee's aptitude, or in the event of unanticipated difficult anatomy or bleeding. An operation whereby it was intended the trainee would lead may not necessarily mean that the trainee will complete the procedure. Despite this, there is value in further assessing 'training intention' of more senior trainers, as it potentially allows calibration of expectations of junior surgeons, and provides a greater understanding of why trainers may limit active surgical participation.

Conclusion

Simulation in ENT may elevate the involvement of junior surgical trainees undertaking an operation for their first encounter with a new surgical trainer. This occurred overall in 59 per cent of the encounters described.

Undertaking a high-quality, recent simulation course would appear to be a valuable form of preparatory training for the junior surgeon prior to an index operative experience. In light of recent disruption from the Covid-19 pandemic, facilitation of simulation appears to offer a mechanism to improve junior surgeon involvement within the operating theatre environment in the face of increasingly limited opportunity. The provision of simulation is supported as a useful adjunct by ENT UK to supplement the reduced hands-on experience that trainees are experiencing currently.[4]

Competing interests. None declared

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Appendix 1. Simulation questionnaire

London North West Healthcare NHS
NHS Trust

We want to learn more about whether a previously simulated learning event changes how much of a procedure you would allow a trainee to perform *for their first time* under your supervision. The following assumptions should be applied.

Simulation context
The simulation should be assumed to involve a high-quality, well-established course using a validated model which may be purpose-built, animal or human cadaveric. You do not necessarily have to have observed the trainee in simulation personally.

Timing of simulation
Assume the simulated learning event took place within the last 2 weeks of the proposed procedures below.

Please indicate how much of the procedures below you would allow the trainee to perform *for their first time* using the given scale

Trainee to perform *whole* procedure, ST-U	5
Trainee to perform *whole* procedure, ST-S	4
Trainee to perform *part* of procedure, ST-S	3
Trainee to assist in procedure, A	2
Trainee to observe procedure, O	1

ST-U = supervised, trainer unscrubbed; ST-S = supervised, trainer scrubbed

Grade:	F1		CT1		CT2		ST3	
	Without simulation	After simulation	Without simulation	After simulation	Without simulation	After simulation	Without simulation	After simulation
Grommet								
Tonsillectomy ties								
Cortical mastoidectomy								
Endoscopic nasal polypectomy								
FESS								
ML and biopsy								
Tracheostomy								

About you:

What grade of surgeon are you?

How many whole years have you been a consultant or registrar?

Are you male or female (circle)?

Do you currently take part in simulation in a training capacity (circle)? Yes or No

If so, how often (circle) - once or twice per year, 3-4 times per year, 5-6 times per year, more often?

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