



## Review Article

# The Role of Simulated Laparoscopic Assessment for Trainee Progression and Certification

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## ABSTRACT

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The Joint Committee on Surgical Training (JCST) and the Royal Colleges of Surgery oversee the surgical training for surgical specialties. To join higher general surgery training for the full six years, trainees have to complete the Royal Colleges' membership exams (MRCS) and satisfactorily complete the core surgical training for two years. After completing 6 years of higher surgical training and the Royal Colleges' fellowship exam (FRCS), trainees are awarded the certificate of completion of training (CCT).

## Introduction

The Joint Committee on Surgical Training (JCST) and the Royal Colleges of Surgery oversee the surgical training for surgical specialties. To join higher general surgery training for the full six years, trainees have to complete the Royal Colleges' membership exams (MRCS) and satisfactorily complete the core surgical training for two years. After completing 6 years of higher surgical training and the Royal Colleges' fellowship exam (FRCS), trainees are awarded the certificate of completion of training (CCT)<sup>1</sup>.

Technical surgical skills are assessed in the UK and Ireland using the Intercollegiate Surgical Curriculum Programme (ISCP). Operative skills of the trainees are assessed using Procedure-Based Assessment (PBA) by observing the trainees operating in the clinical setting and rating them using a criterion-referenced global rating. Despite the

reliability of PBA as an assessment tool for specific procedures, there is variability in choosing the right time to do these PBA, and the perception and the feedback given to the trainees are discrepant<sup>1</sup>.

Most of the PBAs in the surgical curriculum are generic; very few indicate whether the procedure is performed laparoscopically or not. In addition, there are limited specialties –specific PBAs, specifically for lower and upper gastro-intestinal surgery trainees. The surgical curriculum is undergoing a transition from time-based to the competency-based curriculum which should provide trainees more flexibility to achieve their competencies<sup>2</sup>. With the current transformation of the UK surgical curriculum, simulation should be promoted as an adjunct tool for training and assessment to expand the training opportunities for the trainees. Furthermore, PBA should be updated in the curriculum to be more procedure- and specialty-

specific, with emphasis on minimally invasive surgery as it becomes a routine practice<sup>2</sup>.

The reduction of training opportunities is still an issue in surgical training. A survey has shown that only one-fifth of the general surgical training programs in the UK were adherent to the JSCT generic quality indicator in terms of operative exposure<sup>3</sup>. The ramifications of this scarce exposure will continue in these trainees' consultant life and will put them at a disadvantage with their peers. As a solution, simulation can play a role; 86.2 % of surveyed trainees support using simulation in training; however, there is a patchy pattern for exposure to simulation regionally in the UK, ranging from 27 % to 82 %<sup>4</sup>. This indicates that although simulation is a potential solution for the reduction in training opportunities, it is not without challenges, and further research and effort are needed to support this modality as an adjunct for clinical training.

#### **Simulation in surgery and laparoscopic surgery:**

Surgery is one of the specialties in medicine where simulation has been introduced to compensate for the reduction in operative experience for surgical trainees due to service provision, reducing trainees' working hours, and increasing the concern about patient safety. Simulation improves both technical and non-technical skills for surgical trainees in the operating theatre<sup>5</sup>.

Laparoscopic surgery is a demanding task, and it has a steep learning curve that requires many years of practice. This high level of technical skills is becoming an essential requirement for every surgical trainee to progress and achieve their competencies in most surgical specialties. Simulated laparoscopic surgery training was shown to be an effective method to improve surgical trainees' laparoscopic skills and performance in the operating theatre<sup>6</sup>.

Laparoscopic and robotic simulation has been used as a summative tool to certify surgeons in colorectal surgery; furthermore, the Fundamentals in Laparoscopic Surgery (FLS) examination has been used for laparoscopic certification in the USA, and there is good evidence of using FLS as a summative tool for certification<sup>7</sup>. Simulated laparoscopic surgical skills training are still limited to training courses as a formative tool in the UK Intercollegiate Surgical Curriculum Programme. There are several procedures that the trainees need to achieve to reach their competency in addition to a certain number of different assessors of formative PBAs. There are various methods in simulated laparoscopic assessment, yet we do not know whether there is enough evidence to support using laparoscopic simulation in assessment, and if there is one method that is superior to the others<sup>7</sup>.

A general positive attitude of surgical trainees and trainers toward using simulation as an assessment tool in surgical training<sup>8</sup>. However, the majority of the studies included in this review were surveys and questionnaires; only one interview was included. In addition, the ASiT survey for surgical trainees in the UK performed in 2012 showed that trainees did not support the use of simulation in certification. This is a 10-year-old view of the UK surgical trainees and culture changes.

#### **Using simulated laparoscopic surgery for skills assessment:**

Many factors influence surgical training; one of the main factors is working and training hours. Since the introduction of the European work directive (EWD) in 2009, there has been a limitation of working

hours for surgical trainees across Europe, including the UK, to a maximum of 48 hours per week. In addition to the advances in technology and increase in the complexity of operative procedures, this time limitation has impacted the training opportunity for the trainees; they are expected to be as competent, if not more competent than, their predecessors. In addition, the cost of training surgical trainees in an operative theatre in the USA two decades ago was more than 50 million Dollars per year; this adds a burden to surgical training<sup>9</sup>.

As a consequence, many education and health organizations have supported the role of simulation as an integrated part of the training process; the Food and Drug Administration (FDA) has supported the role of simulation for surgical procedures, and the American College of Surgeons has backed up the role of simulation during residency programs<sup>10</sup>.

The American Board of Surgery has agreed that finishing a simulated laparoscopic program developed by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), called the Fundamentals of Laparoscopic Surgery (FLS), is now part of the required competencies to complete the surgical training program. Such a concept, supported by a well-recognized surgical training program and respected committees, should have evidence of its effectiveness in terms of the consolidation and transferability of skills from training laboratories to the operating rooms<sup>10</sup>.

Both virtual reality and trainer's box have shown the effectiveness of transferability of laparoscopic skills to the operating theatre; the performance of simulation-trained candidates was better than that of conventionally trained candidates in terms of operative times, hospital costs, and surgical complications<sup>11</sup>. Many other studies have reported non-inferior performance of simulation-trained candidates in comparison to non-simulation-trained candidates; in fact, these studies have reported less operating time and intra-operative errors for the simulation-trained candidates. Examples of these studies included but not limited to Van Sickle<sup>12-14</sup>.

A meta-analysis compared virtual reality simulation with trainer box simulation, showing superior performance of candidates trained in virtual reality in terms of shorter operative time<sup>15</sup>. Assessments in a simulated environment can not reflect with high accuracy the performance in the real setting and the variability of assessment methods, which follows the nature of the variability of surgical procedures and reflects the complexity of assessing operative skills. Despite that, there is evidence endorsing the adaptation of simulation for assessment, and this evidence has shown fewer errors, less operative time, and reduced cost<sup>15</sup>.

Various assessment tools have been used in laparoscopic simulation assessments. Operative time has been the main indicative factor of surgical performance in the majority of technical skills research. Many tools were adopted by open surgery assessment and laparoscopic skills assessment, which has been validated in either operative theatre or simulation environment either by direct observation or video analysis, such as Global assessment of surgical skills (GAS), Procedure-based Assessment (PBA), On-Site Assessment and Training (OSAT), Colorectal, Global operative assessment for laparoscopic skills (GOALS), Structured Assessment of Laparoscopic Assistant Skills for Camera Navigation (SALAS),

Generic error rating tool (GERT) and Observational of Objective Clinical Human Reliability Analysis (OCHRA). Video analysis can be challenging and time-consuming task and rarely employed outside research, but it can be an effective tool for the trainees as part of their reflective practice if health organisation adopt mandatory recording of laparoscopic procedures for documentation and learning purposes. Despite huge work being done on developing and validating assessment tools, scores, and the evidence of effectiveness in terms of improving trainees' skills, these studies have some drawbacks. These studies are mostly single-center with small samples. In addition, the follow-up period is relatively short, and the outcomes examined were not directly linked to the important outcomes for patients and health care, such as oncological safety and mortality. Most of these assessment tools are designed for generic procedures, which makes it difficult to understand the nature of errors and link them with certain actions. With the advances in technology and accessibility of technology, there is potential to design more robust, procedure-specific, and well-appraised tools.

#### **The concept and characteristics of good assessment in using laparoscopic simulation as an assessment tool:**

Assessment is essential for the trainees, institution, and society and serves many purposes such as making informed decisions about trainees' capability, passing or failing the trainees, and contributes significantly to the education process as a whole. Assessment is a useful way to determine the mastery of the trainees, show them what an important, ranking trainee is, motivate them, and show their progress over time.

Assessment can be either formative to reinforce trainees' learning and provide them with constructive feedback or summative to decide their progress and certification. In the UK surgical curriculum, Procedure-Based Assessments (PBA) are a form of formative assessment tool to monitor the trainees' progression and provide them with constructive feedback; however, using PBAs for summative assessment might raise an ethical dilemma. Simulation can be a useful alternative tool for summative assessment, provided that it is carefully blueprint to match the curriculum requirements.

Simulated Laparoscopic assessments motivate the trainees to learn what they are supposed to learn, and guide them to the important skills, knowledge, and psychomotor skills they need to learn and evaluate their learning process; but this is not without drawbacks such as using methods different from their learning objectives, assessment can generate kind of competition among trainees and trainers might not appreciate the importance of criteria of good assessment.

Criteria for an effective laparoscopic assessment tool would not deviate from the general criteria for good assessment<sup>14</sup>. Validity, reliability, and equivalence have been defined as essential minimal criteria for a good assessment<sup>14</sup>.

The importance of the assessment is how these results truly reflect the trainees' ability and match the level of skills expected from the trainees at their stage. To increase assessment validity, it is important to generate a suitable mix of skills to be tested; sufficient sampling of these skills and the contents of this assessment should match the curriculum objectives. Factors such as poorly trained examiners, inappropriate complexity of skills to be tested, an unrepresentative sample, and trainee stress can threaten assessment validity<sup>14-15</sup>.

## **Discussion**

Procedure-Based Assessments (PBAs) are currently the only assessment accredited by the UK surgical curriculum to assess the operative skills of the trainees. PBAs have been extensively researched in terms of their validity, reliability, and generalizability. PBAs have shown acceptable reliability and validity<sup>15</sup>; however, there is no clear-cut answer whether PBAs are a summative or formative assessment, and a conflict of interest is raised as an issue if the assessor is the same teacher.

Schools of surgery and deaneries might need to clarify the role of PBAs in the surgical curriculum and consider them a summative tool for the assessment of laparoscopic skills.

Laparoscopic simulation has shown improvement in surgical trainees' technical and non-technical skills. The UK surgical curriculum still lacks laparoscopic simulation in both formative and summative forms. Literature has shown the transferability of laparoscopic skills, such as suturing, to the operating theatre; the performance of simulation-trained candidates was better than conventionally trained candidates and this was shown in terms of operative times, hospital costs, and surgical complications; laparoscopic simulation is an adjunct to surgical training and its role is not to replace the patients but to enhance the experience and improve patients' outcomes.

Simulated laparoscopic assessment as part of the curriculum is well established in many surgical training programs. The current UK surgical curriculum is lagging in comparison to other programs in terms of the introduction of laparoscopic simulation as a training and assessment tool. Joint Association of Gastroenterologists (JAG) currently utilises formative and summative assessment tools for certification in many relevant settings (endoscopy), which supports the argument of introducing simulated laparoscopic assessments. There is an attempt by the Association of Laparoscopic Surgeons in Great Britain and Ireland (ALSGBI) to introduce LapPass, which is a form of basic laparoscopic skills certificate passport from an accredited organisation and can be used as a summative proof of surgical resident skills; however, it is still not widely applied<sup>13-15</sup>.

There is broadly a positive perception among surgical trainees regarding using simulated assessment for selection, certification, and credentials. Interestingly, senior trainees in the study were more conservative about introducing such an assessment. Most of the studies in the literature showed that most general surgical trainees would rather be assessed on real patients and did not support the idea of using laparoscopic simulation for selection and progression assessments; trainers shared the same view.

Many of the studies were done a decade ago when the simulated modules were primitive; developments in technology and culture shifts in surgical society have changed since and an in-depth study of the role of laparoscopic assessment in the surgical curriculum is warranted<sup>15</sup>.

Having a well-trained surgeon would improve patient outcomes; not supervising this was the opinion of many interviewees. Studies have supported that simulated trained surgeons have fewer complications than conventionally trained surgeons.

Re-structuring the NHS and tension between service provision and training have been long-standing issues; this has always impacted

surgical training in general and made expanding surgical training to include simulation in the curriculum a low-priority issue.

A culture shift is usually a difficult task to do, especially in a surgical society. Surgeon personality usually tends to be more resistant and assertive, which makes change a challenging task. However, in the current era where the world is changing quickly and significantly, the response to innovative ideas has become widely accepted. Using simulated laparoscopy skills assessment for certification would be a reasonable start for low-income countries as a starting point, especially in view of the massive move to robotic surgery, where simulation has more to say.

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#### Conflict of Interest

The author declares no conflicts of interest related to this work.

#### Data availability

No datasets were generated or analyzed during the preparation of this review.

#### Author Contributions

The author performed the literature review, revised the manuscript, and approved the final version.

The author meets the ICMJE criteria for authorship and agrees to be accountable for all aspects of the work.

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