



Simulated surgical workshops enhance medical school students' preparation for clinical rotation

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RESEARCH

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Abstract

Background

A major focus of the medical school curriculum is to ensure medical students are well prepared prior to entering clinical rotations, which includes the compulsory surgical rotation.

Objectives

The objective of this research was to design and formally evaluate a set of real-life surgical workshops aimed at better preparing medical students for their clinical rotation in surgery. These workshops would be incorporated into the pre-clinical medical school curriculum.

Method

Dedicated surgical workshops were introduced into the pre-clinical component of the Bachelor of Medicine/Bachelor of Surgery (MBBS) program at our University in 2009. These workshops encompassed training in the clinical skills needed in the perioperative and wider hospital setting. A survey comprising of eight to nine ranked questions (utilising a five-point Likert Scale) as well as three short answer questions was administered to the medical students

after they completed their compulsory surgical clinical rotation.

Results

The overall response rate to the survey evaluating the surgical workshops was 79% (123/155). The mean of the ranked questions ranged from 4.05 to 4.89 which indicated that the students found the workshops useful. When evaluating the short answer questions (via topic coding), additional information was provided that supported and explained the survey findings and also included suggestions for improvements.

Conclusion

The findings of the medical student survey demonstrated the value of incorporating dedicated preparatory surgical workshops in the medical school pre-clinical curriculum. However, further research is warranted to determine if this inclusion translated into improved student performance during the clinical surgical rotation.

Key Words

Medical student preparation, surgical rotation, simulation

What this study adds:

1. Medical students often feel underprepared for the surgical clinical rotation, and in particular find the operating room (OR) a challenging place in which to work and learn.
 2. Dedicated surgical workshops for pre-clinical medical students using simulation taught by a multidisciplinary team were rated highly by students as beneficial in preparing them for their surgical clinical rotation and wider hospital experience.
 3. More research is needed to determine if dedicated surgical workshops lead to improved student performance during their surgical clinical rotation.
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Background

The aim of university medical programs is to produce graduates with a broad generic skills base that prepares them for the intern year, Postgraduate Year 1 (PGY1). In Australia, the requirements for medical programs to be accredited are set by the Australian Medical Council (AMC), and reflect the Australian Curriculum Framework for Junior Doctors.¹ In order to prepare medical graduates with the requisite surgical knowledge, skills and behaviours required to work safely in Australian hospitals and other healthcare settings, university education providers need to ensure that medical students are well prepared prior to their surgical rotations, and receive on-going training and education while on surgical rotation. However, studies have highlighted that medical students often feel underprepared for the surgical rotation, and in particular find the operating room (OR) a challenging place in which to work and learn.²⁻⁵ Fundamental to any surgical rotation is the ability to perform practical tasks that involve various degrees of dexterity, interpretation of spatial anatomy and practical-based skills. Many learners find these skills difficult to gain mastery in, as their learning construct lends itself to more concrete, theory-based knowledge acquisition and is not kinaesthetic or practical. For this reason, simulation and scenario-based teaching at the undergraduate level provides an invaluable teaching methodology to aid these students in developing their practical skills in preparing them for surgical rotations in their future clinical environment.

The surgical environment is one that is continually changing: new technologies, shorter inpatient stay and more rapid patient turnover are factors that impact opportunities for accessing surgical learning experiences and consolidating learning. Moreover, these factors may be compounded in the current Australian context of medical education, with the increased numbers of medical students in training leading to increased demands for surgical placements.⁶⁻⁹

For example, a study by Health Workforce Australia in 2011⁶ reported that clinical placements are a major limiting issue for medical schools, as medical school student load is conservatively planned to grow from 14,803 estimated full-time students in 2009 to 16,573 in 2014. This growth would generate a need for approximately 128,913 additional clinical days in 2014 compared to 2009.

As a response to these issues, we developed a series of dedicated surgical workshops for medical students at Bond University, Queensland, aimed at increasing their preparation for the reality and complexity of the surgical clinical rotation. A previous study conducted at the Medical

School at the University of Aberdeen Scotland, identified that medical students' first choice of teaching method for surgical placement was a basic surgical skills workshop, but this was not considered feasible for their students due to demands for staff teaching time and perceived difficulties with simulating theatre etiquette, teamwork and protocols. However, we considered that it was feasible at our University to conduct effective preparatory surgical workshops due to the relatively small numbers of students in each year of the MBBS program (approximately 80 students in each year) and a 1:5 teacher-to-student ratio for clinical skills sessions. This paper briefly outlines the content and learning activities of the surgical workshops, and reports the evaluation data from the survey from two cohorts of medical students.

Method

Study setting

The dedicated surgical rotation is undertaken in year four of the four-year eight-month undergraduate MBBS program, and is of eight weeks duration. In 2009, we introduced a series of six dedicated surgical workshops in the final semester of the on-campus program aimed at better preparing students for the surgical rotation. These hands-on interactive workshops used a range of simulation strategies and skills training using task trainers and authentic equipment. The workshops were developed by the Faculty's Professor of Surgery, with teaching input from specialist medical practitioners, registered nurses with specialty qualifications in perioperative or critical care nursing, an ultra-sonographer, and product representatives from various surgical equipment companies. A brief overview of the six surgical workshops, their learning outcomes and where they reflect items on the Australian Curriculum Framework for Junior Doctors¹ is provided in Table 1.

The issue of including in the workshops advanced procedures such as intercostal catheter insertion and surgical airway is contentious. We made the decision to include these skills to demonstrate specific anatomical structures to further enhance students' knowledge and clinical application of anatomy.

To determine if these workshops were useful, in 2011 we undertook an evaluation survey of students after they had completed at least one year of the off-campus clinical placement, including the compulsory surgical rotation. The survey had the following aims:

1. To evaluate if the dedicated surgical workshops were useful in preparing them for their surgical rotation.



2. To evaluate if the dedicated surgical workshops improved their confidence for working in the off-campus clinical setting.
3. To evaluate if the dedicated surgical workshops improved their understanding of surgical practices in the clinical setting.
4. To evaluate if the dedicated surgical workshops assisted their transition from the University to the clinical setting.

Data collection

The survey was administered in November 2011 to medical students in years four and five. At this time all year four students had completed their surgical rotation, with the year five students having completed the rotation in 2010. The survey comprised two parts. The first part contained items that were ranked using a five point Likert scale. There were 10 items for year four students, and nine items for year five students as they did not receive the mock surgical ward round workshop (Item 6 on the survey). The second part of the survey contained three short answer questions asking students to comment on what they perceived were the strengths and weaknesses of the workshops, and to identify any gaps in content.

Following institutional ethics approval, all students in year four and five of the MBBS program in 2011 were invited to participate. The students were informed of the study via their year website, which contained the explanatory statement and survey. Students who agreed to participate and complete the survey placed it in a dedicated locked container located at the particular hospital where they were on clinical placement. Completed surveys were collected by an administrator not involved in the study, sealed in an envelope and then delivered to the study investigators. Student participants were not required to provide their names on the survey, therefore anonymity was ensured.

Data analysis

Survey data was analysed with non-parametric tests using IBM SPSS 18. A Mann Whitney U test was performed and showed no significance between the results of the two year groups. Written responses from the three short answer questions were collated using topic coding as outlined by Richards.¹² This is an appropriate method of organising and collating into discrete topics the written responses to short answer questions.

Results

The overall response rate was 79%. This comprised 60/73 students in year four, and 63/82 in year five. All respondents (n=123) completed the first part of the survey,

however not all respondents (n=73) completed the second part. Table 2 displays the results of the short item questions. Results from all questions were positive (either agree or strongly agree) with means ranging from 4.05 to 4.89. This finding indicated that these pre-clinical surgical workshops were perceived by the participants as useful in preparing them for off-campus surgical rotation, increased their confidence for working in the clinical setting and their understanding of surgical practices, and assisted their transition from the University to the hospital setting.

Table 3 displays the coded data from the short answer questions that included specific examples by participants to explain and support the survey findings. Participants commented that the workshops helped prepare them well for the rules and regulations of the OR, and provided a good opportunity to become familiar with some of the surgical equipment. However, they perceived there were insufficient opportunities to further revise and practise the skills learnt.

Discussion

Findings from our study indicate that the pre-clinical surgical workshops were perceived by the medical student participants to be beneficial in preparing them for their surgical rotation and wider hospital experience. These findings support our overall aim, which was to increase medical student preparation for surgical rotation by simulating clinical reality where possible. The positive response to the workshops may reflect the strategies we utilised that included simulation, interprofessional teaching and opportunities for guided practice, which reflect current trends in medical education.

Simulation in medical education

Simulation is increasingly being used to help overcome barriers to learning in the surgical environment and prepare students in a safe environment for the realities of clinical practice.^{13,14} Simulation-based medical education (SBME) is seen as any educational activity that utilises simulation aids such as task trainers, high fidelity manikins and simulated patients, to enable medical educators to enhance the education message and present patient problems authentically.¹⁵ Research has shown that it has a role particularly in the development of psychomotor and communication skills.¹⁶ Furthermore, a recent report by Health Workforce Australia¹⁷ found that simulation was a suitable technique for teaching medical students patient management.

Our surgical workshops incorporated a range of simulation modalities—from task trainers such as airway models through to simulated patients undergoing examination with



an authentic ultrasound machine, to provide a highly realistic replication of some of the procedures that students will regularly encounter in the hospital. Moreover, several of the tasks the students completed as part of their suite of surgical workshops involved the conceptual understanding of spatial anatomy and the ability to visualise structures three dimensionally. Neuro-physiological studies have shown experience manipulating 3D objects facilitates future mental rotation of objects in the mind's eye.¹⁸ For tasks such as the targeted abdominal ultrasound or flexible laryngoscopy, the development of a 'mental picture' of the anatomy and appreciation of the changing image produced on manual manipulation is clearly crucially important.

Interprofessional teaching

Utilising teaching staff from a number of disciplines, as well as product specialists, to deliver these workshops is worth considering. Clinical skills training of medical students is often conducted by a range of health professionals including doctors, nurses and allied health persons, as multiple perspectives help to validate the curriculum and may better prepare students for interprofessional practice.¹ Teaching staff for our workshops were chosen to reflect contemporary practice and the multidisciplinary nature of healthcare delivery. Although we did not seek specific feedback on individual teachers, this may be an area worth exploring further, as there is limited literature on the benefits and barriers of interprofessional teaching and training.

The importance of practice

One factor identified by students in our study was the need for on-going and for repetitive practice. A BEME systematic review of simulation-based medical education²⁰ identified that repetitive practice and timely feedback were significant features in improving learning. Therefore, it is important to continue to provide on-going opportunities for practice and feedback across the continuum of medical student training.

Study limitations

There are some limitations to the study. Firstly, we sought the perceptions of students the utility of the workshops, thus using self-report data only. Therefore, it cannot be determined if student perceptions are indicative of improved performance on surgical rotation. Secondly, we did not seek the views of their surgical clinical supervisors to evaluate whether the workshops did improve student preparation and performance, although anecdotal feedback indicates this to be the case. Although the study is based on pre-clinical surgical teaching at one university only, the results may provide a useful framework for other medical education providers.

Conclusion

The suite of dedicated pre-clinical surgical workshops provided to medical students at our University was perceived by the students as beneficial in enhancing their preparation for the off-campus surgical rotation and wider hospital experience. This is an important finding, as previous studies have indicated that medical students often feel underprepared for the surgical rotation. The incorporation of simulation, interprofessional teaching and providing opportunities in the workshops for guided practice reflect current trends in medical education and may explain the positive findings. Further evaluation studies would be useful to determine if these views are supported by the medical students' surgical supervisors, and if improved preparation translates to improved student performance.

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PEER REVIEW

Not commissioned. Externally peer reviewed

CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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No funding was sought for this study.

ETHICS COMMITTEE APPROVAL

Ethics approval was obtained from Bond University's Ethics Committee. Approval number RO 1368.



Table 1: Overview of surgical workshops

Surgical Workshop	Duration	Learning Outcomes	Associated item in the Australian Curriculum Framework for Junior Doctors ¹	Teaching Staff
<p>1. Surgical Scrubbing, Gowning and Gloving</p> <p>Description: We used authentic equipment and scrub sinks.</p>	1.5 hours	Demonstrate the skills of surgical scrubbing, gowning and gloving in accordance with ACORN ¹⁰ Surgical Scrubbing Standards.	Skills and Procedures/Surgical/Scrub, gown and glove	RN with postgraduate qualification in peri-operative nursing
<p>2. Suturing workshop (third workshop in MBBS program)</p> <p>Description: We used an overhead camera linked to a large television screen to demonstrate procedure</p>	2 hours	<p>Demonstrate beginning skills in performing a simple skin excision and repair on a pig's trotter.</p> <p>Demonstrate correct techniques for administering local anaesthetic for this procedure.</p> <p>Demonstrate safe practice in infection control and sharps safety.</p>	<p>Skills and Procedures/Surgical/Simple skin lesion excision</p> <p>Skills and Procedures/Surgical/Local Anaesthesia</p> <p>Clinical Management/Safe Patient Care/Infection Control</p>	Professor of Surgery RNs with postgraduate qualifications in peri-operative nursing and/or suturing experience
<p>3. Minimally invasive surgical procedures</p> <p>Description: We used a specially designed box that allowed students to navigate through different compartments to finally identify a target organ</p>	2 hours	<p>Demonstrate beginning ability to handle and manipulate flexible endoscope and laparoscope.</p> <p>Demonstrate beginning ability to perform a targeted abdominal ultrasound on a simulated patient.</p>		Professor of Surgery Product specialist from endoscope company Ultra-sonographer SP
<p>4. Emergency surgical scenarios</p> <p>Description: Task trainers and authentic equipment were used for all procedures</p>	2 hours	<p>Explain the indications for performing emergency cricothyroidotomy.</p> <p>Demonstrate beginning ability to perform a radial artery puncture and obtain a sample for testing.</p> <p>Explain the indications for performing intercostal catheter insertion.</p>	<p>Clinical Management/Emergencies/Advanced Life Support/Identifies the indications for advanced airway management</p> <p>Skills and Procedures /Cardiopulmonary/Arterial blood gas sampling</p> <p>Skills and Procedures/Trauma/ Intercostal catheter insertion (ADV.)</p>	Professor of Surgery Intensive Care Specialist RNs with postgraduate qualifications in critical care nursing
<p>5. Mock surgical ward rounds</p> <p>Description: The workshop was introduced in 2010. For the post-operative visit, students received handover from the attending RN (clinical tutor). Simulated patients equipped with a variety of wounds, drainage devices and intravenous therapies were utilised to provide greater authenticity.</p>	2 hours	<p>Demonstrate beginning ability to perform a simple pre-operative assessment of a patient prior to a hip replacement.</p> <p>Demonstrate beginning ability to perform a routine post-operative ward round for a patient following a hip replacement.</p>	<p>Clinical Management/Patient Assessment/History and Examination</p> <p>Clinical Management/Skills and Procedures/ Post-procedure/Monitors the patient and provides appropriate aftercare</p> <p>Communication/Working in teams/Respects the roles and responsibilities of team members (RNs)</p>	Professor of Surgery RNs with postgraduate qualification in peri-operative nursing and/or critical care nursing SPs



<p>6. The Bond Mock Theatre</p> <p>Description: The culmination of the surgical workshops was our mock theatre – a ‘real life’ operating room session where students scrubbed up, handled instruments and assisted with an abdominal surgical procedure on a simulated patient. We used a rubber pad that was placed on the SP and could be cut and sutured.</p>	<p>2 hours</p>	<p>Demonstrate correct procedure for surgical scrubbing and gowning.</p> <p>Demonstrate beginning understanding of safety aspects in patient identification procedures in the operating room in accordance with WHO standards¹¹.</p> <p>Demonstrate beginning understanding and application of safety aspects in patient care in the operating room including: the surgical count, the sterile environment and sterile field, and correct handling of sharps in accordance with ACORN Standards¹⁰.</p> <p>Demonstrate developing ability to suture a simple wound.</p>	<p>Skills and Procedures/Surgical/Scrub, gown and glove</p> <p>Clinical Management/Systems/ Uses mechanisms that minimize error e.g. checklists</p> <p>Skills and Procedures/Surgical/Assisting in the operating theatre</p> <p>Communication/Working in Teams/ Identifies the healthcare team most appropriate for a patient</p> <p>Skills and Procedures/Surgical/Simple wound suturing</p>	<p>Professor of Surgery RNs with postgraduate qualification in peri-operative nursing and/or critical care nursing SP</p>
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Key: RN Registered Nurse SP=Simulated Patient



Table 2: Survey results of pre-clinical surgical workshops from year four (n=60) and year five medical students (n=63)

		<u>Year</u>		<u>Mean</u>
		4	5	
1	The Mock Operating Theatre session was useful in preparing me for clinical placement.	4	5	4.29 4.28
2	The Surgical Scrubbing, Gowning and Gloving session was useful in preparing me for clinical placement.	4	5	4.33 4.42
3	The Advanced Suturing Workshop (mole excision and skin graft) was useful in preparing me for clinical placement.	4	5	4.29 4.30
4	The Minimal Invasive Workshop (endoscopy, laparoscopy, abdominal ultrasound) was useful in preparing me for clinical placement.	4	5	4.35 4.89
5	The Emergency Scenario Workshop (cricothyroidotomy, chest drain insertion and radial artery cannulation) was useful in preparing me for clinical placement.	4	5	4.26 4.23
6	The Surgical Ward Round was useful in preparing me for clinical placement.	4		4.05
7	Overall, the surgical skills workshops improved my confidence for working in the clinical setting.	4	5	4.08 4.17
8	Overall, the surgical skills workshops improved my understanding of surgical practices in the clinical setting.	4	5	4.26 4.25
9	Overall, the surgical workshops assisted my transition from the university to the hospital setting.	4	5	4.17 4.32

Key 1=Strongly disagree, 2=Disagree, 3=Neither agree nor disagree, 4=Agree, 5=Strongly agree



Table 3: Topic codes of written responses from year four (n=42) and year five medical students (n=31)

Short Answer Questions	Topic Code and Examples
Question 1: Perceived strengths of surgical workshops	<p>Increased preparedness</p> <p>Prepared me for realities of practice. Paying strict attention to proper protocols in operating room and surgical scrub. (Year 4 student)</p> <p>Provided me with an opportunity to become familiar with the various forms of equipment prior to being confronted with them in the clinical arena. (Year 4 student)</p> <p>Increased understanding</p> <p>Gave me a better understanding of various procedures that I later saw in my rotation. (Year 5 student)</p> <p>Felt I had a much better understanding of what was involved in surgery rotation after the workshops. (Year 4 student)</p> <p>Really useful to know how an operating theatre is set up and not to contaminate sterile field and instrument table! (Year 5 student)</p> <p>Increased confidence</p> <p>I'm glad I had those workshops as it made it less daunting when I first went into theatre. (Year 4 student)</p> <p>I felt a lot more confident than other students [from another university] who hadn't had these workshops to help prepare them beforehand. (Year 5 student)</p>
Question 2: Perceived weaknesses of surgical workshops	<p>Insufficient opportunities for practice</p> <p>Some sessions were a bit rushed and we would have liked more time to practice. (Year 5 student)</p> <p>Some sessions didn't give us enough time to practice - would have liked more time with ultrasound as it is really helpful to know this stuff (Year 5 student)</p>
Question 3: Further suggestions and feedback for teaching staff	<p>More opportunities for revision and ongoing practice</p> <p>Would like more of these sessions so we can revise and do more practising. (Year 4 student)</p> <p>More of these sessions would be even more helpful to further consolidate understanding. (Year 4 student)</p>