

A Holistic Approach to Enhance FRCS General Surgery Examination Training Using Adult Learning Model: A Non-Profit Initiative

Rahul Winayak¹, Sanjay V. Joshi², Goran Ahmed³, Anne O'Neill⁴, Ishy Gurung⁵,
Muhammad Nadeem⁶, Muhammed Alwahid⁷, Sudeendra Doddi⁸,
Manas Kumar Dube⁹, Ahmad Mirza¹⁰, Rishabha D. Sharma⁴

¹Bristol Medical School, University of Bristol, Bristol, UK

²Medway Maritime Hospital, Gillingham, Kent, UK

³Frimley Park Hospital, Portsmouth Road, Camberley, UK

⁴University Hospitals Plymouth NHS Trust, Plymouth, UK

⁵Northern Devon Healthcare NHS Trust, Barnstaple, UK

⁶Yeovil District Hospital NHS Foundation Trust, Yeovil, UK

⁷Inverclyde Royal Hospital, Greenock, Scotland, UK

⁸Princes Royal University Hospital, Orpington, UK

⁹Sherwood Forest Hospitals NHS Foundation Trust, Mansfield, UK

¹⁰Augusta University Medical Center, Augusta, GA, USA

Email: srishabha@gmail.com

How to cite this paper: Winayak, R., Joshi, S.V., Ahmed, G., O'Neill, A., Gurung, I., Nadeem, M., Alwahid, M., Doddi, S., Dube, M.K., Mirza, A. and Sharma, R.D. (2023) A Holistic Approach to Enhance FRCS General Surgery Examination Training Using Adult Learning Model: A Non-Profit Initiative. *Surgical Science*, 14, 565-574.

<https://doi.org/10.4236/ss.2023.148061>

Received: July 24, 2023

Accepted: August 22, 2023

Published: August 25, 2023

Copyright © 2023 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Objectives: To evaluate the impact of adult learning and simulation-based learning (SBL) on surgical trainees' learning experiences and Fellowship of the Royal College of Surgeons (FRCS) Section 2 General Surgery examination pass rate. **Methods:** This was a cross-sequential study involving 148 surgical candidates (72 UK trainees, 75 non-UK trainees) who had attended our revision course (Phoenix FRCS Course) from June 2017 until 2023. Each course comprised a two-day weekend preparation with dedicated sections for clinical, viva, and academic reading, incorporating SBL as its key learning style. We maintained a prospective database of candidate and course details, examination results, and feedback since the course inception. **Results:** We found that 97% of candidates passed the FRCS examination after their first attempt. The course was attended once by 89% of candidates, and only 3 of the 148 candidates exhausted all four attempts at the examination. Candidate feedback for the course and its style of learning was positive, with simulation-based table viva sessions and virtual clinical sessions proving the most popular learning sessions (95% and 80% of candidates attending courses run

in December 2017, April 2018, and May 2021 rated them “Excellent” respectively). Conclusions: The course is centered around shared adult learning and mindfulness tools to encourage candidates to learn from each other and develop confidence and mastery in all domains of surgical practice. These methods have been shown to be effective in achieving high success rates in the Intercollegiate and International FRCS examinations for UK and overseas surgeons.

Keywords

Simulation-Based Learning (SBL), Adult Learning, Mindfulness Tools, FRCS Examination, Interleaving

1. Background

The Joint Committee on Intercollegiate Examinations (JCIE) supervises the standards, regulations, and professional conduct of the UK/Ireland Specialty Fellowship Examinations. The Joint Surgical Colleges’ Fellowship Examination (JSCFE) is organized into five specialties, including General Surgery. The Fellowship of the Royal College of Surgeons (FRCS) examination consists of a two-part assessment of trainee surgeons’ knowledge and skills required to achieve a Certificate of Completion of Training (CCT) for consultant application. Part 2 of the FRCS General Surgery is a two-day examination, comprising one full day of viva and another half day of clinical assessment. The viva consists of 4 stations assessing knowledge and application of general surgery, critical care, academic reading including foundations, and applicants’ sub-specialty of interest. The Section-2 assessment includes 50% general surgery and 50% sub-specialty test material and cases.

Specialty Trainees (ST) structured training and regular Annual Review of Competency Progression (ARCP) prepares the candidates with the necessary skills for clinical roles and the FRCS Examinations which are reflected in their higher pass rate of 92% for trainee candidates and 55% for non-UK trainees in the year 2022 [1]. Indeed, non-UK trainees find the examination challenging and at times devastating for career progression if they use up all four attempts.

The Phoenix FRCS Course was initially run by non-UK trainees motivated to share their experiences and help others. Each course comprised a two-day weekend preparation session with dedicated sections for clinical, viva, and academic reading. The core values of the course were collaboration, peer support, and imparting knowledge. Our common mission was to provide a learning environment comprising simulation practice, formative feedback, role-playing, and candidate self-assessment. This has been validated by several studies in adult learning [2]. Over time, the course gained popularity among trainees and non-trainees alike.

Simulation-based learning (SBL) aims to develop health professionals’ know-

ledge, skills, and attitudes while ensuring patients are protected from unnecessary risks. Experiential learning is an active learning process by which one may develop new skills and knowledge through direct experiences [3]. Simulation, a form of experiential learning, is a powerful learning tool that replicates experiences based on real-life scenarios with the aim to apply it in an interactive teaching environment [4] [5]. Simulation as a teaching and learning tool has been widely incorporated in a wide range of high-risk professions including aviation, the military, and medicine [5]. It provides a safe, risk-free, and controlled environment.

Learners are allowed to experiment with and apply new and existing knowledge. They also reflect on their performance with the availability of immediate feedback and assessment of their clinical performance [5] [6]. It allows errors to be made in the decision-making process in a controlled environment that does not have clinical consequences [7]. Our course incorporated SBL to train and prepare UK and non-UK surgical trainees for Section 2 of the domestic and international FRCS examinations. This study aimed to evaluate the impact of SBL on participants' learning experiences and FRCS Section 2 pass rates.

2. Methods

This was a cross-sequential study involving 148 surgical candidates (72 UK trainees, 75 non-UK trainees) who had attended our revision course (Phoenix FRCS Course) from June 2017 until 2023. We maintained a prospective Excel database of all candidates, course attendance, and FRCS attempt status with a log of all sessions (in-person and virtual) conducted. Examination results, number of attempts, and feedback were collected via emails, WhatsApp messages, posts, and phone calls. Each course was delivered in three phases: pre-course preparation, a two-day weekend course, and a post-course consolidation phase. During the COVID-19 pandemic, we facilitated remote teaching through Skype and FaceTime sessions. Our course website: <https://www.phoenixfrcscourse.com>, went live in February 2019, providing continual support for attendees and resource allocation for faculty. Additionally, participants were given access to resource accounts on <https://www.slideshare.com>, <https://www.evernote.com>, and SoundCloud to consolidate course material. We emphasized five key objectives in all our sessions:

- 1) Use thoughtful landing statements, likened to the landing of a plane, to start any answer at the Membership of the Royal College of Surgeons (MRCS) level, enabling candidates to frame their answers and later build upon them to pitch at the FRCS level.

- 2) 0 - 60 mph concept-encouraged candidates to pick up the pace and be succinct and efficient in moving on from MRCS to FRCS level with smooth and graduated progression.

- 3) This course applied the Model for Investigation of Simulation-based Teaching Environments and their Results (MISTER) model to frame SBL.

- 4) Interleaving is a method of learning that involves revising several topics simultaneously. Using this approach, candidates learn to make connections between different general surgical disciplines.

5) Maintaining grace and coherence under pressure by improving vagal tone. Participants learned this through nasal breathing and mindfulness exercises during structured breaks.

The course was run over two days and included learning through model scenarios, table viva, academic reading, and virtual clinics following the JCIE marking descriptors for assessment and timely feedback. The post-course consolidation was a half-day session summarizing the key concepts covered, and further steps candidates should take to improve performance. The whole process was spread over 6 - 8 weeks to provide continual support and track progress.

3. Results

The first course took place in June 2017 and since then we have run 13 courses, both face-to-face (F2F) and virtual. As shown in **Table 1**, 8 courses have been F2F, each with a total of 15 hours over one weekend. There have also been 5 virtual courses, using Zoom, each varying in the total number of hours per course. The total number of hours run since the inception of the course is 246. There were 35 faculty members in total, with 17 being prior candidates.

A total of 148 candidates participated: 73 trainees and 75 non-trainees. One hundred thirty-eight candidates took the Intercollegiate FRCS examination; 10 were overseas and took the International FRCS examination. Number of unsuccessful attempts, number of Phoenix courses attended, and pass rates are tabulated below in **Table 2**.

One hundred thirty-one candidates took the course once, and 17 took it multiple times. Ninety-nine candidates had previously sat the FRCS examination before attending our course. One hundred thirty-five passed the FRCS examination

Table 1. Table showing the number and type of courses run, including relevant hours.

Courses Dates	Face-to-face (F2F)/Virtual	Number of hours
June 2017	F2F	15
December 2017	F2F	15
April 2018	F2F	15
July 2018	F2F	15
December 2018	F2F	15
August 2019	F2F	15
January 2020	F2F	15
October 2020	F2F	15
May 2021	Virtual	30
August 2021	Virtual	24
January 2022	Virtual	28
December 2022	Virtual	24
February 2023	Virtual	20

after their first attempt, with the remainder either awaiting their test date/results, passing after two, or running out of attempts. The successful FRCS attempt number for both candidates having previously attempted the examination and first-time attempt candidates can be seen in **Table 3**.

Candidate feedback for the courses run in December 2017, April 2018, and May 2021 can be seen in **Table 4** below. 20 out of 53 candidates provided feedback for the course and 75% rated the content of the course as “Excellent”, with the remaining 25% rating it as “Good”. Table viva sessions and virtual clinical sessions were the most popular, with 95% and 80% rating “Excellent”.

Table 2. Tables showing the number of FRCS examination attempts undertaken by candidates before and after our course.

FRCS Attempts Before Attending Phoenix Course	Number of Candidates	FRCS Attempts After Attending Phoenix Course	Number of Candidates
0 Attempts	59	Passed at First Attempt	1
1 Attempt	13	Passed at Second Attempt	3
2 Attempts	19	Ran Out of Attempts After	5
3 Attempts	8		

Table 3. Table showing overall successful FRCS attempt.

Overall Successful FRCS Attempt	Number of Candidates
Passed at 1st Attempt	54
Passed at 2nd Attempt	63
Passed at 3rd Attempt	16
Passed at 4th Attempt	8
Exhausted all Attempts	3
Awaiting Test Date or Result	4

Table 4. Candidate feedback for December 2017, April 2018, and May 2021 Phoenix FRCS courses.

Candidate Feedback December 2017, April 2018, May 2021	Not Applicable (%)	Poor (%)	Average (%)	Good (%)	Excellent (%)
Course content				25	75
Table viva sessions				5	95
Virtual clinical sessions			5	15	80
Examiner’s drill sessions			10	30	60
Academic reading			10	20	70
Quality of visual aids, material and website	10			45	45
Administration/ Zoom management			10	25	65

4. Discussion

The Phoenix FRCS Course has effectively assisted surgical trainees in passing their FRCS General Surgery Section 2 examination, as evidenced by the high first-attempt pass rate of 97%. Indeed, 89% of candidates only attended the course once, and only 3 of the 148 candidates exhausted all four attempts at the examination.

According to Malcolm Knowles' Andragogy, effective adult learners exhibit 5 key characteristics. First, learners must take ownership of their learning: the "Self-concept". Secondly, "Adult Learner Experience" is gained over time through repeated effective learning. Crucially, learners must have a "Readiness to Learn", learn through application and problem-solving rather than memory: have an "Orientation to Learning", and have a strong "Motivation to Learn" [8]. It is most likely that in signing up for the course, candidates already exhibit a readiness and motivation to learn, but may not inherently possess other adult learner characteristics. The Phoenix FRCS Course aims to develop candidates into complete adult learners by providing a framework for surgical trainees to learn from their peers, consolidate what works and unlearn what does not in a simulation setting. This format of experiential learning seeks to actively identify trainees' knowledge gaps, recurring self-defeating patterns, and performance-based biases. These are then outlined to trainees and remedial actions are sought together, enabling trainees to self-master concepts they find difficult. By the end of the course, their "Orientation to Learning" will be practical, problem-based rather than topic-based, with SBL providing an arsenal of experience for them to be confident in their knowledge and understanding.

It has been shown in many settings that SBL can incorporate learning from all styles and therefore be effective for all learners. In adopting an SBL-based learning model, The Phoenix FRCS Course too draws upon all learning styles: visual, auditory, reading and writing, and kinesthetic. In the course, visual learners benefit from formal PowerPoint sessions; auditory learners from table viva sessions; reading and writing learners from academic reading stations, and kinesthetic learners from model scenarios. Based on Edgar Dale's Cone of Experience model, the integration of holistic learning with SBL in the course accommodates candidates' needs and optimizes performance in the examination, where they may be similarly assessed. Additionally, the course had no didactic lectures, with the time saved allocated to one-to-one mentoring.

In addressing the viva section of the FRCS Section 2 examination, the course emphasizes two key concepts: using thoughtful landing sentences and accelerating fast in a 0 - 60 mph concept. This unique approach enables candidates to structure their answers in a coherent and fluent manner while demonstrating a progression in their understanding and expertise from MRCS to FRCS level. Knowledge at the FRCS level is required to score highly in the viva section of the examination, and experience has shown that candidates take too long to progress their answers to the FRCS level. This approach has been acknowledged by can-

didates as useful for framing their answers, with one commenting in 2020 “quite rightly, the first minute of a viva question determines the trajectory of a viva scenario”. Moreover, one successful first-attempt candidate in 2019 attributed the success of his examination to these concepts: “‘Landing sentences’ and ‘0 - 60 mph’ have left an indelible mark on my inward eye and were concepts which I utilized to full effect throughout my exam”.

One of the frameworks used for delivering SBL in the course was the MISTER model. The Phoenix FRCS Course believes peer-to-peer learning is the best means of considering student factors and putting trainees at the heart of their learning. Candidates alternated between examiner and examinee to practice asking and answering examiners’ drill questions. The examiners’ drill was an effective way for candidates to simulate the FRCS examination, learn from their peers, and understand and apply the concepts in simulated viva sessions. SBL proved popular among candidates, with 89% rating viva and virtual clinical sessions as “Excellent”.

Indeed, The Phoenix FRCS Course believes strongly in shared learning and success. Recent successful candidates are invited to represent faculty and share their experiences. This approach maintains diversity and fosters dynamism: our trainees always have access to the latest guidance for the examination. Social networking events like course dinners are frequently organized to help build and strengthen trainee relationships.

Interleaving was an effective strategy whereby multiple diverse topics were interlinked and practiced concurrently during problem-solving. Interleaving has been shown to increase learning when compared to more traditional methods, such as block practice. Furthermore, interleaving facilitates memory retrieval and promotes long-term retention and effective transference of knowledge [9] [10]. Following an interleaving strategy to enhance their learning, trainees were given random scenarios in each session to test their knowledge gaps and understanding of the depth and breadth of the JCIE syllabus. This approach helps candidates build connections between different general surgical specialties and reflects real-life practice where concepts are shared between surgical disciplines. Indeed, the concept of accumulative and varied learning is reflected in Sir Dave Brailsford’s philosophy of the Aggregation of Marginal Gains, which describes the overwhelming benefit of multiple small improvements from different domains, a mindset that transformed the British cycling team to achieve multiple gold medals [11].

Aside from core content teaching, The Phoenix FRCS Course adopted a mindfulness approach in preparing candidates to perform well under pressure. Deep diaphragmatic breathing, with a long, slow exhale, is key to stimulating the vagus nerve and slowing heart rate and blood pressure, especially during performance anxiety. As Stephen Porges’ Polyvagal theory describes, the vagus nerve is responsible for the parasympathetic nervous system (the digest and rest system) and the social engagement system, which determines the ability to fine-tune the activating sympathetic nervous system [12]. Activating the vagus

nerve would thereby give more control of performance situations requiring controlled sympathetic activation. By understanding the incredible power of the vagus nerve, one can practice ways to flex its inhibitory strength to keep one mellow in times of distress [13]. It is part of the course curriculum for trainees to learn, practice and master these habits to metabolize performance anxiety to their benefit positively. One candidate from 2022 commented, “I found these extra tips (such as psychology tips and lifestyle advice) particularly informative. These helped with managing nerves and stress leading up to the exam.”

5. Limitations

One of the limitations of this study is the lack of a comparative group, which would enable a more accurate assessment of the course. In addition, many non-trainee attendees formed their own revision groups upon completion of the course and before the examination. Therefore, whilst the course provided a foundation for candidates by teaching core principles and innovative techniques, it should be acknowledged that other factors are attributable to candidates' success. Furthermore, studies like this are prone to selection bias as candidates attending any course are likely to be more diligent and knowledgeable than their peers. One way of overcoming this would be to assess candidates before, during, and after the course to ascertain baseline performance and observe relative performance changes.

Finally, although written feedback has been provided across the courses, the lack of a large quantitative data set limits representativeness. Indeed, grouping and analyzing numerical data from all courses was impossible, as the feedback forms were not standardized across all courses. To address this, the faculty will create a standardized numerical feedback form. Faculty will actively encourage candidates to provide contemporaneous feedback for maximum effectiveness.

Although simulation is a powerful learning tool, it is important to recognize the possible limitations when setting up an effective simulation-based training program. Acquisition of trained educators, setting up a suitable venue, and providing course materials may incur significant financial costs and time constraints. However, due to the peer-to-peer nature of the course, expenses are limited compared to other didactic courses, which may impose extra costs in acquiring lecturers. Nonetheless, the above expenses may be justified by the potential improvement in trainees' knowledge, skills, and confidence for the FRCS examination, as well as the consequent reduction in patient morbidity in the clinical environment [14].

6. Conclusion

The Phoenix FRCS course thoroughly prepares candidates for the FRCS examination by incorporating the basic tenets of SBL, adult learning and mindfulness to equip trainees with the necessary skills to perform their best on the examination day. The course is centered on active and shared learning to encourage candidates to learn from each other and develop confidence and mastery in all the

domains of surgical practice. These methods have been shown to be effective in achieving high success rates in the Intercollegiate and International FRCS examinations for UK and overseas surgeons.

Acknowledgements

Dr. Serena Rose Strickland (Assistant Course Director);
 Dr. Muzina Akhtar (Website & Manuscript Editor);
 Miss Shreya Joshi (Course Coordinator);
 Mrs. Madhulika Joshi (Catering & Support);
 Mr. Aditya Sharma (Content Writer and Web Support);
 Mr. Rahul Winayak (Content Writer and Technical Support);
 Mr. Ravi Acharya (Content Provider);
 Mr. Mallikarjun Sajjanshetty (Domain Name and Web Hosting Support);
 Mr. Shirish Tewari (Faculty & Content Provider);
 Mr. Goran Ahmed (Faculty & Content Provider);
 Miss Lorraine Nazer (Scenario Writer/Editor);
 Miss Mandeep Sandhu (Zoom Teaching Support);
 Dr. Mo Aldin (Facilitator in Bristol Course);
 Mr. Rajkumar KS (Faculty & Content Provider);
 Mr. Muhammad Faisal Khan (Faculty & Content Provider);
 Mr. Rajesh Shetty (Faculty & Content Provider).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] JCIE Examination Results. <https://www.jcie.org.uk/content/content.aspx?ID=9>
- [2] Knowles, M. (1984) *The Adult Learner: A Neglected Species*. 3rd Edition, Gulf Publishing, Houston. (Andralogy)
- [3] Maran, N. and Glavin, R. (2003). Low-To High-Fidelity Simulation—A continuum of Medical Education? *Medical Education*, **37**, 22-28.
<https://doi.org/10.1046/j.1365-2923.37.s1.9.x>
- [4] Lamé, G. and Simmons, R.K. (2020) From Behavioural Simulation to Computer Models: How Simulation Can Be Used to Improve Healthcare Management and Policy. *BMJ Simulation and Technology Enhanced Learning*, **6**, 95-102.
<https://doi.org/10.1136/bmjstel-2018-000377>
- [5] Aggarwal, R., Mytton, O.T., Derbrew, M., *et al.* (2010) Training and Simulation for Patient Safety. *BMJ Quality & Safety*, **19**, i34-i43.
<https://doi.org/10.1136/qshc.2009.038562>
- [6] Issenberg, S.B., Gordon, M.S., Gordon, D.L., Safford, R.E. and Hart, I.R. (2001) Simulation and New Learning Technologies. *Medical Teacher*, **23**, 16-23.
<https://doi.org/10.1080/01421590020007324>
- [7] Sarker, S.K. and Patel, B. (2007) Simulation and Surgical Training. *International Journal of Clinical Practice*, **61**, 2120-2125.

- <https://doi.org/10.1111/j.1742-1241.2007.01435.x>
- [8] The Adult Learning Theory—Andragogy—of Malcolm Knowles. <https://elearningindustry.com/the-adult-learning-theory-andragogy-of-malcolm-knowles>
- [9] Tutticci, N., et al. (2016) High-Fidelity Simulation: Descriptive Analysis of Student Learning Styles. *Clinical Simulation in Nursing*, **12**, 511-521. <https://doi.org/10.1016/j.ecns.2016.07.008>
- [10] Weinstein, Y., Madan, C.R. and Sumeracki, M.A. (2018) Teaching the Science of Learning. *Cognitive Research*, **3**, Article No. 2. <https://doi.org/10.1186/s41235-017-0087-y>
- [11] The Most Mentally Tough People Apply the 1% 'Marginal Gains' Rule, says Performance Expert—Here's How It Works. CNBC Make It. <https://tinyurl.com/mr38d9cs>
- [12] Polyvagal Theory in Practice. *Counseling Today*. <https://ct.counseling.org/2016/06/polyvagal-theory-practice/>
- [13] Bergland, C. (2013) The Neurobiology of Grace under Pressure: 8 Habits That Stimulate your Vagus Nerve and Keep you Calm, Cool, and Collected. *Psychology Today*.
- [14] Dunkin, B., Adrales, G.L., Apelgren, K. and Mellinger, J.D. (2007) Surgical Simulation: A Current Review. *Surgical Endoscopy*, **21**, 357-366. <https://doi.org/10.1007/s00464-006-9072-0>