ORIGINAL ARTICLE

Medical student-led simulation in COVID-19 crisis

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Abstract

Background: Simulation training is an effective tool for improving confidence in healthcare workers. During the recent COVID-19 pandemic, large numbers of staff required re-training to manage unfamiliar situations. We present a set of medical student-led clinical simulation sessions and evaluate their effects on (i) confidence among redeployed healthcare workers managing COVID-19 patients and (ii) medical students' confidence as educators.

Methods: Half-day simulation training sessions consisting of three COVID-related clinical scenarios were devised by senior medical students and delivered to a group of approximately 150 healthcare workers over six repeated sessions prior to redeployment to COVID-19 wards. We distributed an anonymous pre- and post-simulation questionnaire to 36 participants in the final group exploring their experiences. The confidence scores were analysed using the Wilcoxon signed-rank test. Following the delivery of teaching, medical students completed a questionnaire assessing their personal experiences of designing and delivering the exercises.

Results: Data are available for 35/36 participants approached. Respondents reported being significantly more confident after the training in all aspects of managing COVID-19 patients, including triage, complex discharge, recognising deterioration, initiating basic life support, managing symptoms and advising on visiting policies ($p < 0.001$); 97% of respondents rated the training as useful. Thematic analysis of medical students' responses demonstrated mutual benefit.

Discussion: This study demonstrates the strengths of simulation training in helping to build staff confidence in a rapidly evolving situation and highlights the value of medical students in supporting a hospital's response to an outbreak. We recommend further studies of student-led simulation exercises, including longer-term follow-up.

1 | INTRODUCTION

The COVID-19 pandemic has posed multiple significant challenges to healthcare systems. Preparations for the expected rise in COVID-19-positive patients in March-April 2020 resulted in 6 out of 12 wards at University College Hospital in London being converted into COVID-19 wards. Many healthcare professionals, including paediatric nurses and neurosurgeons, were redeployed to ensure that wards were sufficiently staffed. The uncertainty of new roles, unfamiliar teams, personal risk and rapidly evolving guidelines led to significant anxiety about redeployment. To address this anxiety and prepare staff for working on the reconfigured wards, we designed a series of half-day clinical simulation sessions accessible to all healthcare professionals and evaluated their impact on participants' confidence.

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Simulation training is a powerful tool increasingly being used in clinical education. It uses practical scenarios and structured feedback to help participants develop new skills in a safe and supported learning environment. It has been shown to increase confidence in dealing with real-world events,[1] lead to a significant improvement in clinical knowledge and skills[2,3] and may help alleviate anxiety associated with managing acute scenarios.[4,5] Simulation training has been used to educate staff in wearing personal protective equipment during the recent Ebola and Influenza epidemics.[1,3] A significant barrier to delivering this type of training is the greater time commitment required compared to less interactive education methods, especially when health services are under pressure.

Medical students may be a valuable resource to facilitate simulation training in acute scenarios, given their understanding of healthcare and knowledge of clinical medicine. In crisis situations such as the COVID-19 pandemic, students are also a group largely available to support healthcare services. There is evidence that students can be effective facilitators in near-peer simulation training. House et al.[6] compared the effectiveness of peer-taught and physician-taught simulation and found that both methods led to an equal improvement in participants' knowledge. Previously, however, medical students' roles in simulation training for healthcare professionals have been limited to setting up stations, operating equipment or acting as patients.[7] Their involvement in design and delivery of simulation has only been reported in the context of near-peer teaching.[4,6] Specifically, a recent paper explored the benefits of 'simprovisation', where groups of medical students design simulation exercises for one another, finding this to be an effective form of learning.[8] However, evidence demonstrating that medical students can transfer these skills to effectively educate qualified healthcare professionals is lacking.

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In this paper, we describe a half-day clinical simulation exercise developed and delivered by penultimate year medical students and evaluate its effects on confidence levels in redeployed healthcare staff managing COVID-19 patients in a London hospital. We also explore the benefits of delivering this simulation training for medical students and their confidence as educators.

2 | METHODS

The simulation training was devised by 16 medical students, working with the infectious diseases (ID) team at University College Hospital in London in April 2020. The team was supervised by an ID consultant and a specialist registrar. All students received 'COVID-19 for the redeployed' general hospital training and had previous experience of peer teaching. Simulation training was proposed as a way to provide a safe learning environment and ease the anxiety of a group of paediatric nurses who were being redeployed to adult nursing on a new COVID-19 ward. The potential challenges related to opening of COVID-19 wards and staff redeployment were discussed between ward staff, the supervising clinicians and medical student facilitators. As a result, we identified areas on which the medical student educators based the simulation scenarios (see Table 1 for details). The content of the scenarios was based on hospital guidelines and evaluated by the supervising clinicians. Simulation training consisting of three different scenarios was delivered over half-day training sessions. Participants were from across the multi-disciplinary team, reflecting the reality of staff involved in managing COVID patients. Each participant rotated through three 50-minute scenarios in groups of 6–12. Students facilitated each scenario, introducing the situation, taking on acting roles as required and leading group debriefing sessions. We adopted a facilitator-guided debriefing method,[9] where medical student facilitators ensured that the learning objectives were discussed, allowing the simulation participants to reflect on their experiences. Each training session was overseen by a clinician.

Simulation training was proposed as a way to provide a safe learning environment

Participants were from across the multi-disciplinary team, reflecting the reality of staff involved in managing COVID patients

3 | PARTICIPANTS

Approximately 150 healthcare professionals including doctors, nurses, healthcare assistants and domestic staff took part in the simulation training over a 2-week period, immediately prior to their

TABLE 1 The aims, learning objectives and methodology of the three simulation scenarios

Scenario	Aims	Methodology	Learning objective
1	To become familiarised with: 1. prioritising patients using the hospital's 'COVID decision aid' algorithm; 2. infection control with regards to taking and sending blood samples; 3. finding and understanding guidelines 4. discharge planning and precautions in the context of COVID-19.	(i) Role-play of a difficult conversation surrounding discharge and infection control with a non-clinical care home manager; (ii) A simulated patient for a difficult bed management scenario.	A Triaging COVID-19 patients according to UCLH ABCD categorisation A Discharging a COVID-19 patient with complex needs
2	1. To recognise a deteriorating patient with COVID-19; 2. The correct use of different oxygen devices; 3. Identifying the need to escalate for senior help;Practicing the hospital's algorithm for adult cardiac arrest in COVID-19 patients.	(i) A simulated patient, acted by one of the students; (ii) A resuscitation mannequin equipment for practicing CPR; (iii) An ID doctor to role-play the outreach team arriving on the cardiac arrest scene for handover	A Recognising deterioration and initiating resus in a COVID-19 patient
3	To develop an awareness of: 1. The hospital's pathways for patients approaching the end of life 2. Use of syringe drivers in a palliative patient 3. Ceiling of care and DNACPR conversations 4. The hospital's visiting policies, in the context of COVID-19 and palliative patients.	(i) Role-play of a visiting relative, acted by one of the students.	A Managing palliative care and symptom control in patients with COVID-19 A Visitor policies for COVID-19 patients, including at the end of life
1, 2 & 3	The correct use of PPE	PPE donning and doffing	A Awareness of PPE guidance and donning and doffing correctly

Abbreviations: CPR = Cardiopulmonary resuscitation, DNACPR = Do not attempt cardiopulmonary resuscitation, ID = Infectious diseases, PPE = Personal Protective Equipment, UCLH = University College London Hospital.

TABLE 2 Medical student questionnaire composition

Question	Answer options
Before this project, had you taken part in delivering any simulation training previously?	Yes/No
Before this project, had you taken part in delivering any medical education before?	Yes/No
If yes to the above question, what kind of education did you deliver?	Free text
How many simulation sessions did you attend?	One morning/afternoon/ One/ Two/ Three/ Four days/Developed the training only
Before delivering this training, how would you rate your confidence as an educator?	Very confident/Confident/Somewhat confident/Slightly confident/Not at all confident
After delivering this training, how would you rate your confidence as an educator?	Very confident/Confident/Somewhat confident/Slightly confident/Not at all confident
What do you think you gained from designing and delivering this training?	Free text
What were some of the challenges/barriers you faced?	Free text
How do you think this will affect your future practice?	Free text

redeployment to COVID-19 wards. Data presented in this paper were obtained from the final cohort of 36 staff members, who provided verbal consent for their experience to be evaluated prior to commencing the training. Verbal consent was also obtained from the medical student facilitators at the time of questionnaire completion.

4 | QUESTIONNAIRES

Using the experience of having delivered training to six cohorts of healthcare professionals, a paper questionnaire was developed by three of the students for the final group of participants. The

questionnaire was distributed before and after the simulation session. We used a 10-point Likert scale, ranging from 1 – 'not at all confident' to 10 – 'very confident' to evaluate the participants' self-reported confidence, satisfaction with the training and the usefulness of the session (Table 1). Data on the participants' job roles and previous experience of simulation training were also collected.

Furthermore, an online questionnaire was sent to the student facilitators to capture their experiences of designing and running the sessions (Table 2). A 10-point Likert scale captured their self-reported confidence as an educator, before and after the sessions. To ensure anonymity of participants, no identifiable information was collected as part of the study from either simulation participants or medical student facilitators.

5 | DATA ANALYSIS

Results were exported to SPSS (IBM SPSS 26, Armonk, NY, USA) for statistical analysis. Median pre- and post-training confidence scores were calculated for each domain. A Wilcoxon signed-rank was used to compare matched pre-and post-confidence scores for each domain.

We carried out thematic analysis of the free text comments on the medical students' experiences according to the steps described by Guest et al.[10] Following the initial read of the raw data, we identified the initial themes. The comments were re-read by two independent reviewers (A.L.S. and J.O.E.) until no further codes needed to be added to the framework. Themes and subthemes were organised into a flow diagram (Figure 1).

6 | RESULTS

Out of 36 participants approached, 35 completed pre- and post-training questionnaires. This included doctors (n = 16), nurses (n = 15) and allied health professionals (n = 4), similar to the composition of participants in other sessions delivered. Data on previous experience with simulation training were missing from 12 participants; aside from this, all of the questionnaire items were completed in full. Out of 23 participants who responded to this question, only 10 (43.5%) indicated that they had previously taken part in simulation training.

There were significant differences between the pre- and post-training confidence ratings across all six domains (Table 3, learning objectives A-F). The median and interquartile range (IQR) for each domain are shown in Table 3. Following training, survey respondents felt more confident about triaging COVID-19 patients, discharging complex cases, recognising rapidly deteriorating patients and basic life support (BLS), palliative care and symptom control and the hospital's visiting policies (all at p < 0.001). Where responses were available, 33/34 (97%) of participants reported finding the session useful.

Interquartile range; ↑using Wilcoxon signed-rank.

All 16 students involved in designing and delivering the training completed the questionnaire regarding their experiences. After delivering the simulation sessions, 10/16 students rated themselves as 'confident' educators and 2/16 as 'very confident'. Improvement in confidence was also highlighted as a common theme in the thematic analysis of students' free text comments (Figure 1).
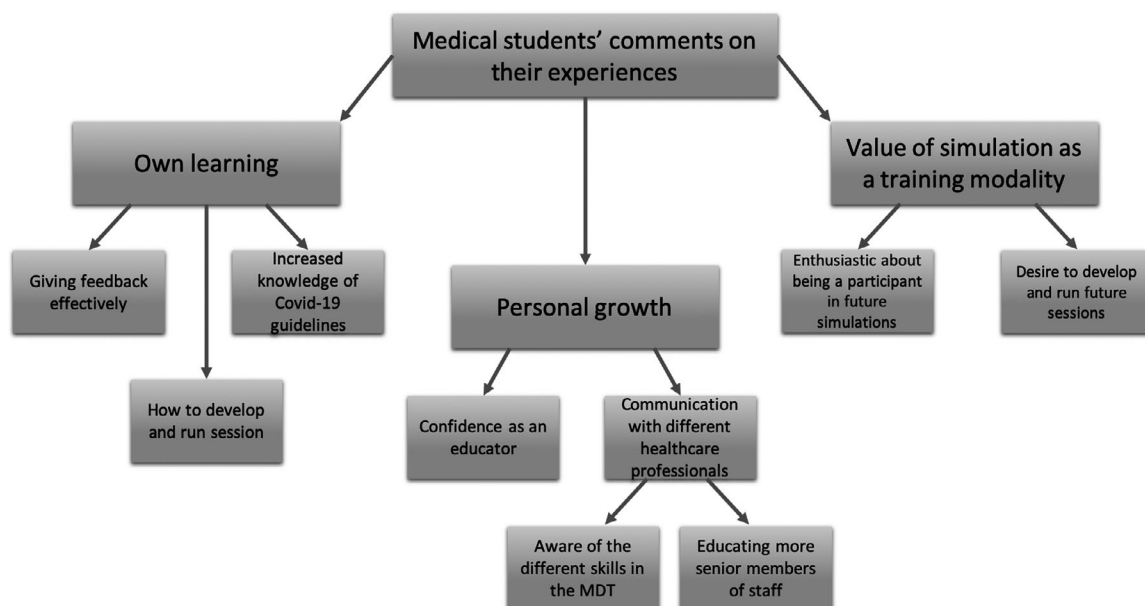

FIGURE 1 Thematic analysis of medical student questionnaires (n = 16)

THE CLINICAL TEACHER

TABLE 3 Summary of participant evaluation responses

	Confidence score		
	Pre-training	Post-training	Pre- vs post-training
Learning objective	Median (IQR)		p value↑
Triaging COVID-19 patients according to UCLH ABCD categorisation	3 (2–5)	8 (7–9)	<0.001
Discharging a COVID-19 patient with complex needs	3 (2–5)	8 (7–9)	<0.001
Recognising deterioration and initiating resus in a COVID-19 patient	5 (4–6.5)	8 (7.5–9)	<0.001
Managing palliative care and symptom control in patients with COVID-19	5 (4–7)	8 (7–9)	<0.001
Visitor policies for COVID-19 patients, including at the end of life	6 (5–7)	8 (7.5–9)	<0.001
Awareness of PPE guidance and donning and doffing correctly	6 (5–7.5)	9 (8–10)	<0.001

Abbreviations: IQR = Interquartile range, ↑ = using Wilcoxon signed-rank.

7 | DISCUSSION

In this paper, we demonstrate that medical students can rapidly design and deliver clinical simulation training sessions for a multi-disciplinary team of hospital staff, leading to a significant increase in the confidence of participants in a time of crisis. There were also reciprocal benefits for the medical students involved, with students reporting a variety of benefits including increased confidence as educators.

> *There were also reciprocal benefits for the medical students involved*

To the best of our knowledge, no prior studies have examined the effectiveness of medical student-led simulation training of healthcare professionals in times of crisis. The simulation sessions were set up over the course of a few days as part of a large-scale local reorganisation in response to the rapidly evolving pandemic. Recently deployed healthcare staff from a variety of backgrounds were all offered the opportunity to participate before starting work with COVID-19 patients.

As such, this is a unique demonstration of how students can contribute to the training of healthcare professionals in times of rapid change. Due to the speed at which the training was developed and put into practice, there are limitations to our evaluation of its effectiveness. Despite this, our findings are consistent with the wider literature on the beneficial effects of simulation training, with a clear demonstration of improved confidence in healthcare professionals following the sessions.

> *students can contribute to the training of healthcare professionals in times of rapid change*

A limitation of the current study was that we did not collect responses from all 150 staff members who participated over the 2-week period, leaving us with a small sample size. It should also be noted that we only evaluated confidence among participants as a proxy for learning. Prior literature has shown that self-evaluation instruments such as confidence scales are not an accurate reflection of one's objective performance.[11] Statistical evaluation of learning is outside the scope of this study. This paves the way for further evaluation of medical student-led simulation in larger cohorts. Future studies might assess if improvements in confidence observed were sustained over time, and whether the training had impacts on healthcare practice and knowledge.

8 | CONCLUSION

This pilot study demonstrates that senior medical students are able to successfully design and deliver simulation training in an 'upward reversal of teaching roles' during the COVID-19 pandemic crisis, leading to increased confidence among multi-disciplinary hospital staff and reciprocal benefits for the student trainers.

9 | COMPETING INTEREST

The authors declare that there are no conflicts of interest.

ETHICAL APPROVAL

This study falls under the University College London Research Ethics Committee exemption category 4; therefore, ethical approval was not required.

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REFERENCES

1. Phin NF, Rylands AJ, Allan J, Edwards C, Enstone JE, Nguyen-Van-Tam JS. Personal protective equipment in an influenza pandemic: a UK simulation exercise. J Hosp Infect [Internet]. 2009;71(1):15–21. https://doi.org/10.1016/j.jhin.2008.09.005

2. Alanazi AA, Nicholson N, Thomas S. The use of simulation training to improve knowledge, skills, and confidence among healthcare students: a systematic review. Internet J Allied Heal Sci Pract. 2017;15(3):2.

3. Biddell EA, Vandersall BL, Bailes SA, Estephan SA, Ferrara LA, Nagy KM, et al. Use of simulation to gauge preparedness for ebola at a free-standing children's hospital. Simul Healthc. 2016;11(2):94–99.

4. Cash T, Brand E, Wong E, Richardson J, Athorn S, Chowdhury F. Near-peer medical student simulation training. Clin Teach. 2017;14(3):175–179.

5. Ignacio J, Dolmans D, Scherpbier A, Rethans JJ, Chan S, Liaw SY. Stress and anxiety management strategies in health professions' simulation training: a review of the literature. BMJ Simul Technol Enhanc Learn. 2016;2(2):42–46.

6. House JB, Choe CH, Wourman HL, Berg KM, Fischer JP, Santen SA. Efficient and effective use of peer teaching for medical student simulation. West J Emerg Med. 2017;18(1):137–141.

7. Viggers S, Østergaard D, Dieckmann P. How to include medical students in your healthcare simulation centre workforce. Adv Simul. 2020;5(1):1–6.

8. Babla K, Lipton J, Williams S, Chopra P, Thenabadu S. Simprovisation: A model for student-led simulation. Clin Teach. 2020;17(1):64–69.

9. Abulebda K, Auerbach M, Limaiem F. Debriefing Techniques Utilized in Medical Simulation. In: StatPearls [Internet]. StatPearls Publishing; 2019.

10. Guest G, MacQueen KM, Namey EE. Introduction to applied thematic analysis. Appl Themat Anal. 2012;3:20.

11. Stewart J, O'Halloran C, Barton JR, Singleton SJ, Harrigan P, Spencer J. Clarifying the concepts of confidence and competence to produce appropriate self-evaluation measurement scales. Med Educ. 2000;34(11):903–909.