The Impact of Simulation-Based Education on Nurses’ Perceived Predeployment Anxiety During the COVID-19 Pandemic Within the Cultural Context of a Middle Eastern Country

Jacqueline Sullivan1, Alanoud Al-Marri1, Emad Almomani1 and Jesveena Mathias1

1Hamad Medical Corporation, Doha, Qatar.

ABSTRACT: Anxiety related to the COVID-19 pandemic is prevalent among the nursing workforce and has the potential to affect well-being and performance in the workplace. This paper reports on a joint education/nursing and midwifery workforce quality improvement initiative in the State of Qatar to address an urgent need for COVID-19 preparedness during the second wave of infection. A Simulation-Based Education (SBE) program was developed and delivered over a period of 2 months (February to April 2021) to prepare nurses for deployment to COVID-19 facilities. Perceived anxiety scores related to COVID-19 deployment were collected from 121 nurses before and after SBE attendance. The data demonstrates that SBE is an effective method to reduce deployment-related anxiety among registered nurses.

KEYWORDS: high-fidelity simulation training, pandemics, anxiety, patient simulation

Background

The COVID-19 pandemic continues to be an anxiety-provoking event that has a major impact on healthcare services around the world.1 The psychological effect of the pandemic on frontline workers, including nurses, has been severe enough to significantly affect their mental health.2–4 Anxiety levels resulting from accumulated psychological pressure and rapidly increasing workloads can be further exacerbated by an intense fear of dying.5,6 Studies consistently reveal clinical staff express fears related to becoming infected, wearing heavy personal protective equipment (PPE) for extended periods, lack of PPE, possible termination if infected, uncertainty of epidemic duration, transmitting the virus to family members, social distancing, and isolation.1,2,6–9 More than 90% of frontline nurses stated they were not fully prepared either for deployment from their original place of work to COVID-19 facilities or to safely manage the care for COVID-19 patients.9

The World Health Organization (WHO) reports on both the short and long-term effects on the mental well-being of healthcare workers as a result of COVID-19, with clinical staff at risk of developing dysfunctional anxiety, a persistent or uncontrollable fear that interferes with daily life and has the potential to negatively affect performance at work.10 Anxiety prevalence among frontline nurses during COVID-19 has been reported at levels as high as 23.2%, which is significant enough to warrant investigation.11 This significant risk factor underlines the need for education and workforce teams to develop collaborative strategies which promote mental, psychological, and emotional well-being.4,11–13

Increased levels of personal resilience, organizational and social support for nurses are associated with decreased levels of COVID-19-related anxiety.14,15 Promoting the mental well-being of clinical staff through well-designed educational programs and pastoral support is essential if healthcare providers are to mitigate against the development of complex anxiety and depression among frontline staff.6

Previous studies have shown Simulation-Based Education (SBE) to be effective in addressing and managing specific fears such as readiness to practice.16–20 SBE promotes patient safety and reduces errors in practice,21 while increasing interaction and learner engagement through the use of guided experiences.17–19,22,23 It contributes to the development and evaluation of nursing knowledge, attitudes, technical and non-technical skills, including but not limited to clinical procedures, teamwork, communication skills, situational awareness, task and time management, critical thinking, clinical reasoning, and decision-making.17,24

This paper reports on a joint education and workforce team COVID-19 quality improvement clinical preparedness initiative, developed and delivered by the State of Qatar’s major healthcare provider, Hamad Medical Corporation, in which SBE was implemented to prepare nurses and address anxieties prior to deployment to COVID-19 facilities.

Methods

Hamad Medical Corporation’s (HMC) corporate Nursing Education and Midwifery Department (NMED), in collaboration with HMC’s Nursing and Midwifery Corporate Workforce and Wellbeing team (NMCWW), who have
overall responsibility for corporate-wide workforce planning and management, co-developed a deployment strategy, which encompasses an SBE program to prepare nurses for transfer from non-COVID-19 to COVID-19 facilities. An anonymized pretest-posttest method to gather data on nurses’ perceived predeployment anxiety levels was undertaken, using a valid numeric scale from 121 learners at two points: before and after attending SBE. Following SBE attendance, learners were surveyed to explore their perceived levels of confidence and competence and their achievement of the SBE learning objectives.

A COVID-19 SBE education scientific planning committee, with representation from nurse educators and frontline clinical staff, designed and developed a blended learning program in line with contemporaneous infection control restrictions. To minimize contact and maintain social distancing, nurses were required to complete a Web-Based Training (WBT) package that included an introduction to COVID-19, as well as the underpinning theory for the SBE sessions. Following successful completion of the WBT, learners were requested to sign an electronic confirmation of completion which was monitored by senior nurse educators.

After completion of the WBT package, learners were required to attend a 1-day, face-to-face SBE at HMC’s state-of-the-art simulation center. The SBE focused specifically on COVID-19-related clinical skills, practice, and competencies. At each one of the four SBE practice stations, learners were allocated to small groups of four learners and one instructor to ensure compliance with COVID-19 infection control measures.

The SBE provided learners with the opportunity to become familiar with COVID-19-related skills and practice, with the aim of reducing anxiety levels and increasing psychological preparedness prior to COVID-19 deployment. The interactive and dynamic SBE sessions began with demonstrations of COVID-19-related skills by senior simulation nurse educators and clinical facilitators, including ABCDE assessment, hemodynamic monitoring, care of invasive lines, respiratory assessment and care, and tracheostomy care. Learners were then given the opportunity for return demonstration. This was followed up with reflective learning conversations, selected as a teaching and learning methodology to encourage learners to explore and analyze essential elements of clinical practice, and to provide a forum for learners to address their COVID-19 practice and deployment concerns in a safe and protected environment.

Learners were asked to rank their perceived anxiety levels on a numerical scale of 0 to 10 before and after attending SBE. The numerical scale of 0 to 10 was deemed to be valid to assess anxiety for children between 7 and 13 years, adolescents, and adults. To evaluate the tool’s reliability for use in this study, it was piloted among a group of 30 nurses who were then excluded from the study census and data analysis. Anxiety levels before, and after simulation-based intervention was gathered. The reliability of the tool was tested and assured using Cronbach’s alpha (0.783) and intraclass correlation (0.785). In addition to the assessment tool, an anonymized feedback questionnaire survey was conducted to capture nurses’ reflections on predeployment fears. The resulting data were entered into SPSS V23. Descriptive analysis and paired t-tests were performed to compare anxiety scores before and after SBE attendance. In addition, a descriptive analysis was conducted for the data obtained via questionnaire survey to evaluate learners’ perceived confidence and competence after SBE attendance.

Results
Demographic data revealed that nurses who attended the SBE came from varying backgrounds and specialties. From a total of 121 nurses, 60% were male and 40% were female, representative

Table 1. Predeployment clinical specialties.

| SPECIALTY         | FREQUENCY | PERCENTAGE | VALID PERCENTAGE | CUMULATIVE PERCENTAGE |
|-------------------|-----------|------------|------------------|-----------------------|
| ED                | 14        | 11.6       | 11.6             | 11.6                  |
| Critical care     | 28        | 23.1       | 23.1             | 34.7                  |
| Pediatric         | 9         | 7.4        | 7.4              | 42.1                  |
| Medical           | 11        | 9.1        | 9.1              | 51.2                  |
| Surgical          | 7         | 5.8        | 5.8              | 57.0                  |
| Older people      | 9         | 7.4        | 7.4              | 64.5                  |
| EMS paramedic     | 10        | 8.3        | 8.3              | 72.7                  |
| Operating theaters| 23        | 19.0       | 19.0             | 91.7                  |
| PACU              | 10        | 8.3        | 8.3              | 100                   |
| Total             | 121       | 100.0      | 100.0            |                       |
of the regional and cultural demographics. One hundred percent were with a bachelor’s degree and 20% with 2 to 5 years of experience while 80% with more than 5 years of experience. Predeployment clinical specialties are presented in Table 1.

Anxiety scores before SBE attendance based on the 0 to 10 scoring system were clustered around 5 to 10 out of 10 (79.3%). In comparison, anxiety scores after SBE were clustered around 0 to 5 out of 10 (78.5%). Out of 121 nurses, 19% reported a 0 out of 10 anxiety score after attending SBE. Three percent of learners reported no anxiety at all, with a 0 score out of 10 both before and after SBE, and 3% reported a higher anxiety score after SBE.

A paired t-test was performed using SPSS software V23 to compare anxiety levels for the 121 learners before and after SBE (Table 2). There was a significant difference (3.18) in anxiety scores before attending SBE ($M = 6.80$, $SD = 2.81$) and after SBE ($M = 3.61$, $SD = 2.86$) conditions: $t_{10.5} = 10$, $P < .000$. These scores indicate a significant reduction in the anxiety level following the completion of SBE (Table 2).

The Post SBE feedback questionnaire survey revealed that 95% of learners were satisfied they had achieved the SBE learning objectives, 96% perceived SBE as an effective method for upskilling and preparation for COVID-19 deployment, 96% perceived themselves as competent to deliver COVID-19-related care, and 97% expressed their confidence to safely deliver care for COVID-19 patients in a critical care setting (Table 3).

**Discussion**

The COVID-19 pandemic continues to challenge and stretch healthcare services around the world. As a result, nurses are required to respond flexibly to meet the rapid expansion of service capacity, while ensuring the delivery of safe, confident, and compassionate care, in unfamiliar anxiety-provoking clinical settings, beyond their usual specialty or scope of practice. In line with previous studies,27 this quality improvement initiative showed SBE as an effective strategy to expose and prepare clinical staff for both routine practice and exceptional events, such as the response to COVID-19. The value of SBE in reducing predeployment anxiety is reflected in a previous study among undergraduate nursing students which revealed increased learner self-confidence following SBE.28 Targeted and relevant, rather than generic educational activities are shown to not only support the delivery of care in the context of COVID 19, but also to promote staff well-being.29

Simulation immerses learners in scenarios that mimic clinical situations, simultaneously mitigating safety risks and

---

**Table 2. Paired samples t-test.**

| PAIR 1 | PAIRED DIFFERENCES | T | DF | SIG. (TWO-TAILED) |
|--------|---------------------|---|----|------------------|
|        | MEAN    | STD. DEVIATION | STD. ERROR MEAN | 95% CONFIDENCE INTERVAL OF THE DIFFERENCE | Lower | Upper |
|        | Before SBE anxiety | 3.18182 | 3.31160 | 0.30105 | 2.58575 | 3.77788 | 10.569 | 120 | 0.000 |
|        | After SBE anxiety |                     |                     |                     |                     |         |         |         |         |

SBE: Simulation-Based Education.

---

**Table 3. Summary of postcourse evaluation.**

| STATEMENT                                                                 | PERCENTAGE |
|---------------------------------------------------------------------------|------------|
| The facilitator(s) utilized appropriate teaching strategies to achieve objectives. | 98%        |
| Time allocated for the training was enough.                                | 93%        |
| The overall purpose of the activity was clearly communicated to me.        | 94%        |
| I was able to achieve the overall intended objectives and outcomes of the activity. | 95%        |
| I was told what was expected from me to successfully complete the activity. | 100%       |
| I was actively engaged throughout the overall activity.                    | 97%        |
| The facilitator(s) offered balanced information and content based on the best evidence. | 97%        |
| The physical environment was conducive for learning.                       | 100%       |
| The simulation is an effective method for skills upskilling.               | 96%        |
| The simulation-based training approach is an efficient short track education. | 94%        |
| The simulation-based training improved my competency level.                | 96%        |
| The simulation-based training improved my confidence level.                | 97%        |
| I am confident to apply what I have learnt in practice.                    | 97%        |
| This activity will positively impact on my practice in terms of competence or performance. | 95%        |
| I am going to recommend this activity to my colleagues.                    | 98%        |
| I am committed and motivated to apply what I have learnt in everyday practice. | 92%        |
increasing standardization across educational activities,\textsuperscript{30} in a managed and safe environment. As a result, SBE can assist health care professionals to overcome the emotional strain of their situation, and enhance competence and confidence.\textsuperscript{31,32}

In this instance, of note was the 3\% of nurses who reported their anxiety score as 0 before and after SBE attendance. Further investigation into this group’s demographics revealed previous critical care experience and deployment to a COVID-19 facility during the first wave. This could be suggestive of a key factor that influenced this group’s reported anxiety levels when compared to nurses from other specialties.\textsuperscript{33} Critical care is recognized as a high work intensity setting, with complex patient care needs and, as a result, staff with previous critical care experience may be better equipped to manage the anxieties, and uncertainties of redeployment during a pandemic.\textsuperscript{34}

The 3\% of the respondents who reported higher anxiety scores after SBE attendance is also noteworthy. The demographics of this group reveal a pediatric critical care or pediatric emergency care background, with 80\% female and 20\% male. This group attended SBE to prepare them for deployment to adult COVID-19 facilities. The transition from pediatric to an adult scope of practice could be a significant influencing factor resulting in higher anxiety levels after SBE attendance.\textsuperscript{35}

This group’s responses highlight the impact of previous clinical background and possibly the potential effect of gender on pre-deployment anxiety.\textsuperscript{33,34}

The project limitations are as follows:

–Future exploration using larger sample size is recommended to enhance the generalizability level and address the impact of the gender demographics in this setting. This project could be considered as a valid starting point to expand the exploration with a bigger sample scale.

–The study sample was nurses working in the Gulf area of the Middle East. The contributing factors to anxiety may differ in other cultural contexts around the globe. Therefore, a multisite international level study is highly recommended.

–The study sample (100\%) was nurses with a bachelor’s degree. Educational level could be a contributing factor to perceived anxiety. A bigger sample size including nurses with different qualification levels may enhance the generalizability level of findings.

–Seniority level and years of experience may be contributing factors to anxiety. As 80\% of the study sample was senior, experienced staff, further studies which include a representative sample of different seniority levels are recommended.

\section*{Conclusion}

COVID-19 has led to significant levels of predeployment anxiety among nurses globally. Implementation of a joint education and workforce SBE program to prepare Qatar’s frontline nurses for deployment and promote their well-being during COVID-19 as an effective strategy to reduce anxiety. While this was a small, single study conducted over a limited time, it reflects previous research that supports the continued use of SBE, not only to develop knowledge and competence, but also to provide a safe space for staff to reflect on and address practice-related anxieties. In light of participant feedback regarding increased or unchanged levels of anxiety following SBE in some learner groups, plans for future studies include further investigation into the impact of gender and previous specialty nursing practice on anxiety and well-being in the clinical setting.

\section*{Ethical Approval}

This work is a COVID-19 quality improvement project, approved by the head of the Education and Professional Development Committee of Hamad Medical Corporation (HMC).

\section*{Informed Consent}

Not applicable, because this article does not contain any studies with human or animal subjects.

\section*{Trial Registration}

Not applicable, because this article does not contain any clinical trials.

\section*{REFERENCES}

\begin{enumerate}
  \item Chen Q, Liang M, Li Y, et al. Mental health care for medical staff in China during the COVID-19 outbreak. Lancet Psychiatry. 2020;7(4):15–16. doi:10.1016/S2215-0366(20)30078-X
  \item Liu CY, Yang YZ, Zhang XM, et al. The prevalence and influencing factors in anxiety in medical workers fighting COVID-19 in China: a cross-sectional survey. Epidemiol Infect. 2020;148(9):1–7. doi:10.1017/S0950268820001107
  \item Maben J, Bridges J. Covid-19: supporting nurses’ psychological and mental health. J Clin Nurs. 2020;29(15):2742–2750. doi:10.1111/jocn.15307
  \item Mo Y, Deng L, Zhang L, et al. Work stress among Chinese nurses to support Wuhan in fighting against COVID-19 epidemic. J Nurs Manag. 2020;28(5):1002–1009. doi:10.1111/jonm.13104
  \item Montemuro N. The emotional impact of COVID-19: from medical staff to common people. Brain Behav Immun. 2020;87(1):23–24. doi:10.1016/j.bbi.2020.03.032
  \item Pouralizadeh M, Bostani Z, Maroufzadeh S, et al. Anxiety and depression and the related factors in nurses of Guilan University of Medical Sciences hospitals during COVID-19: a web-based cross-sectional study. Int J Afric Nurs Sci. 2020;13(1):1–6. doi:10.1016/j.ijans.2020.100233
  \item Du Toit A. Outbreak of a novel coronavirus. Nat Rev Microbiol. 2020;18(3):123–123. doi:10.1038/s41579-019-0332-1
  \item Shanafeh T, Ripp J, Trockel M. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. JAMA. 2020;323(21):2133–2134. doi:10.1001/jama.2020.5893
  \item Simonetti V, Durante A, Ambroso R, et al. Anxiety, sleep disorders and self-efficacy among nurses during COVID-19 pandemic: a large cross-sectional study. J Clin Nurs. 2021;30(9-10):1360–1371. doi:10.1111/jocn.15685
  \item World Health Organization. Clinical management of severe acute respiratory infection when novel coronavirus (2019-nCoV) infection is suspected: interim guidance. 2020. World Health Organization; 2020. Available from https://apps.who.int/iris/ handle/10665/330893 (Accessed on 10.11.2021).
  \item Papppa S, Nella V, Giannakas T, Giannakoudis VG, Papoutsi E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. Brain Behav Immun. 2020;88:901–907. doi:10.1016/j.bbi.2020.05.026
  \item Zheng R, Zhou Y, Qiu M, et al. Prevalence and associated factors of depression, anxiety, and stress among Hubei pediatric nurses during COVID-19 pandemic. Compr Psychiatry. 2021;104(1):1–8. doi:10.1016/j.comppsych.2020.152217
\end{enumerate}
13. Tan BY, Chew NW, Lee GK, et al. Psychological impact of the COVID-19 pandemic on health care workers in Singapore. Ann Intern Med. 2020;173(4):317–320. doi:10.7326/M20-1083

14. Hu D, Kong Y, Li W, et al. Frontline nurses’ burnout, anxiety, depression, and fear statuses and their associated factors during the COVID-19 outbreak in Wuhan, China: a large-scale cross-sectional study. EClinicalMedicine. 2020;24(1):1–10. doi:10.1016/j.eclinm.2020.100424

15. Luo M, Guo L, Yu M, Jiang W, Wang H. The psychological and mental impact of coronavirus disease 2019 (COVID-19) on medical staff and general public—a systematic review and meta-analysis. Psychiatry Res. 2020;291(1):1–9. doi:10.1016/j.psychres.2020.113190

16. Aldekhyl SS, Arabi YM. Simulation role in preparing for COVID-19. J Simul. 2020;14(1):1–2. doi:10.1186/s12909-020-02427-4

17. Almornani E, Sullivan J, Hajjieh M, Leighton K. Simulation-based education program: upskilling non-critical care nurses for COVID-19 deployment. BMJ Simul Technol Enhanc Learn. 2020;6:1-9. doi:10.1111/bmst.12424

18. Andreade MH, Dudak A, Cherian V, et al. Data and debriefing observations on healthcare simulation to prepare for the COVID-19 pandemic. Data Brief. 2020;31(1):1–16. doi:10.1016/j.dib.2020.106028

19. Beneria A, Arnedo M, Contreras S, et al. Impact of simulation-based teamwork training on COVID-19 distress in healthcare professionals. BMC Med Educ. 2020;20(1):1–4. doi:10.1186/s12909-020-02578-9

20. Currie CS, Fowler JW, Kotiadis K, et al. How simulation modelling can help reduce the impact of COVID-19. J Simul. 2020;14(2):83–97. doi:10.1080/17477778.2020.1751570

21. Leighton K, Foisy-Doll C, Mudra V, Ravert P. Guidance for comprehensive health care simulation program evaluation. Clin Simul Nurs. 2020;48(1):20–28. doi:10.1016/j.ecns.2020.08.003

22. Llababidi HM, Alhoraigi U, Almarshed AA, et al. Simulation-based training programme and preparedness testing for COVID-19 using system integration methodology. BMJ Simulation and Technology Enhanced Learn. 2021;7(3):1–7. doi:10.1161/bmstel.2020-000626

23. Oriot D, Alinier G, Alinier G. Pocket Book for Simulation Debriefing in Healthcare. Springer International Publishing; 2018.

24. Hung CC, Kao HF, Liu HC, Liang HF, Chu TP, Lee BO. Effects of simulation-based learning on nursing students’ perceived competence, self-efficacy, and learning satisfaction: a repeat measurement method. Nurse Educ Today. 2021;97(1):1–10. doi:10.1016/j.nedt.2020.104725

25. Crandall M, Lammers C, Senders C, Savedra M, Braun JV. Initial validation of a numeric zero to ten scale to measure children’s state anxiety. Ann Behav Med. 2007;33(5):1250–1253. doi:10.1016/j.ame.2000284700.59988.8b

26. Karvounides D, Simpson PM, Davies WH, Khan KA, Weissman SJ, Hainsworth KR. Three studies supporting the initial validation of the stress numerical rating scale–11 (Stress NRS–11): a single item measure of momentary stress for adolescents and adults. Pediatr Dimens. 2016;14(9):105–109. doi:10.15761/PD.1000124

27. Dubé M, Kaba A, Cronin T, Barnes S, Fuselli T, Grant V. COVID-19 pandemic preparation: using simulation for systems-based learning to prepare the largest healthcare workforce and system in Canada. Adv Simul. 2020;5(1):1–2. doi:10.1186/s41077-020-00138-w

28. Zapko KA, Ferranto ML, Blasimain R, Shelestak D. Evaluating best educational practices, student satisfaction, and self-confidence in simulation: a descriptive study. Nurse Educ Today. 2018;60(1):28–34. doi:10.1016/j.nedt.2017.09.006

29. Hofmeyer A, Taylor R. Strategies and resources for nurse leaders to use to lead with empathy and prudence so they understand and address sources of anxiety among nurses practising in the era of COVID-19. J Clin Nurs. 2021;30(1):288–305. doi:10.1111/jocn.15520

30. Brooks A, Brahman S, Kapralos B, et al. Enchanced reality for healthcare simulation. Recent advances in technologies for inclusive well-being virtual patients. Gamifict Simul. 2020;196(1):103. doi:10.1080/01.17477778.2020.1751570

31. Dieckmann P, Tørgersen K, Qvindesland SA, Thomas L, Bushell V, Langli Ersdal H. The use of simulation to prepare and improve responses to infectious disease outbreaks like COVID-19: practical tips and resources from Norway, Denmark, and the UK. Adv Simul. 2020;5(1):1–10. doi:10.1186/s41077-020-00121-5

32. Kimran LC. Evaluating competence and confidence using simulation technology. Nursing. 2018;48(10):45. doi:10.1097/01.NURSE.0000545022.36908.f3

33. Jakimowicz S, Perry L, Lewis J. Compassion satisfaction and fatigue: a cross-sectional study. Aust Crit Care. 2018;31(6):396–405. doi:10.1016/j.aucc.2017.10.003

34. Al Ma’riri Q, Sharour LA, Al Omari O. Fatigue, burnout, work environment, workload and perceived patient safety culture among critical care nurses. Br J Nurs. 2020;29(1):128–34. doi:10.12968/bonjr.2020.29.1.28

35. Deep A, Knight P, Kernie SG, et al. A hybrid model of pediatric and adult critical care during the coronavirus disease 2019 surge: the experience of two tertiary hospitals in London and New York. Pediatr Crit Care Med. 2021;22(2):125–134. doi:10.1097/PCC.0000000000002584