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Recognising and responding to acute patient deterioration in the perioperative environment – A simulation-based learning approach to meeting National Healthcare Standards criteria

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ABSTRACT

Background: Deterioration in acute healthcare settings is associated with serious adverse sequelae. A National Standards framework for healthcare facilities in Australia has mandated that such facilities provide evidence that satisfies criteria relating to acute deterioration recognition and response. Whilst education and training of healthcare practitioners have been prominent since National Standards inception, state-wide mandatory training programs have not been sensitive to the perioperative context.
Aim: To evaluate the effectiveness of a perioperative simulation-based learning program in building capacity for perioperative staff in acute patient deterioration recognition and response.
Methods: A multiple group post-test design using quantitative measures was undertaken. Participants were a consecutive sample of perioperative nursing staff (n=56) employed across three hospitals in Sydney who self-enrolled in simulation-based learning workshops. Each six-hour workshop focussed on four acute deterioration scenarios: Anaphylaxis, Malignant Hyperthermia, Post-Partum Haemorrhage, and Local Anaesthetic Systemic Toxicity. Simulation effectiveness was measured using the 19-item Simulation Effectiveness Tool–Modified. Descriptive statistics were calculated, and qualitative content analysis was used for an open-ended question.
Findings: All 19 items elicited a high degree of 'strongly agree', ranging from 57.1% to 89.6%, with only four of the 19 items achieving less than 80% 'strongly agree'. Content analysis generated two primary categories: *'Self-efficacy enabling professional autonomy'* and *'Relevant and authentic representation'*.
Discussion: Perioperative simulation-based learning can enhance clinical proficiency and professional autonomy, whilst developing clinical reasoning, teamwork, and delegation skills.
Conclusion: Perioperative simulation-based learning was perceived as effective in preparing nursing staff working in the perioperative specialty for real-world clinical emergencies.

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Summary of relevance

Problem or Issue

Existing mandatory training programs on acute patient deterioration and response are not sensitive to acute deterioration in the perioperative context.

What is already known

Healthcare facilities in Australia are required to provide evidence of recognition and response systems for acute physical deterioration to address the principles and elements contained within the National Safety and Quality Health Service Standards framework.

What this paper adds

This novel study reinforces the need for specialty-specific education in addressing the nuances of acute deterioration in the perioperative context, which can be replicated elsewhere by other perioperative services.

1. Introduction

In April 2010, the National Consensus Statement '*essential elements for recognising and responding to clinical deterioration*' was endorsed by Australian Health Ministers. This framework, as it were, subsequently informed the inaugural National Safety and Quality Health Service Standards in 2012 (Australian Commission on Safety and Quality in Healthcare, 2012) and its 2017 second-edition successor (Australian Commission on Safety and Quality in Healthcare, 2017) for recognising and responding to acute patient deterioration, a component of a broader National Standards framework. Healthcare facilities were thus required to provide evidence of recognition and response systems for acute physical deterioration to address the principles and elements contained within this framework. Unsurprisingly, education and training of healthcare staff in relation to patient deterioration has been prominent since.

In January 2010, the New South Wales Ministry of Health implemented a state-wide mandatory training program (DETECT) for nursing and medical staff in response to a Commission of Inquiry that identified failure to recognise and respond appropriately to deteriorating patients as an issue within healthcare organisations. The aim of DETECT was to improve early recognition and response to clinical deterioration, thus reducing the number of serious adverse events and potentially preventable deaths via simulated scenarios. Four patient deterioration scenarios are clinically simulated in DETECT: sepsis, chest pain, respiratory distress, and delirium. However, it was identified locally that DETECT was not sensitive to specific needs in the perioperative setting, as it primarily focuses on a physical A-G assessment and specific escalation processes for conscious patients who are deteriorating. In the perioperative setting, patients are mostly anaesthetised and, therefore, unconscious. Whilst an A-G assessment can be utilised in this setting, escalation processes are different. In addition, there are crisis management algorithms specific to medical emergencies relating to anaesthesia, which the DETECT state-wide program is not sensitive to. A perioperative-specific training program was therefore absent.

2. Literature review

Deterioration without recognition and early response in acute care settings is associated with serious adverse sequelae, such as intensive care admission, prolonged hospital stays, cardiac arrest, and death (Brekke, Puntervoll, Pedersen, Kellett, & Brabrand, 2019). Education of health practitioners, and in particular nurses, has seen a significant focus on optimising acute deterioration recognition and response with both technical and nontechnical skills identified as educational priorities. The increased risk of morbidity and mortality from clinical deterioration has resulted in the emergence of an array of rapid response applications within acute care settings, which include vital signs monitoring, early warning scores, and decision support tools. Consequently, significant attention in and around these systems has been prominent within educational pursuits, with the literature suggesting that these applications are often challenging to use but clinically useful if they are user-friendly, connected, and interoperable (Baig, GholamHosseini, Afifi, & Lindén, 2021).

Unsurprisingly, knowledge, confidence, skill acquisition, and clinical decision-making in relation to recognition and response of acute deterioration have seen simulation education used widely in this context, preparing health practitioners for managing medical emergencies. Posited benefits include increased rapid response team activations and reduced code blue team activations (Norris, New, & Hinsberg, 2019). The opportunity for role play, reflection, and debriefing in a simulated environment has been demonstrated to benefit teamwork, knowledge, and self-confidence in nursing students (Sapiano, Sammut, & Trapani, 2018). Similarly, in the preparation of nursing students, the use of virtual simulation found significant increases in student self-efficacy and confidence in managing patient deterioration (Goldsworthy et al., 2022).

Elsewhere, a study of web-based versus face-to-face simulations for patient deterioration found significant and sustained improvements across both groups in relation to assessment and observation and the escalation of care (Kinsman et al., 2021). In situ simulation, defined as simulation that takes place in participants' actual work environment (Kurup, Matei, & Ray, 2017), has also been found to enhance critical thinking, communication and teamwork, knowledge, and skill acquisition, as well as increased confidence in recognition and response to patient deterioration (Lee et al., 2019).

Despite efforts to improve recognition and response to clinical deterioration through standards, guidance, and training programs, 'failure to rescue' remains a pervasive issue in global healthcare settings, with realised improvements falling short of expectations. This term, defined variably, generally denotes a failure or delay in identifying and addressing healthcare deterioration or complications, leading to serious adverse events, including death (Ervin et al., 2023). International studies indicate that a significant proportion of hospitalised patients experience adverse events (4%–12%), with up to half deemed preventable (Sujan et al., 2022). Recent research across 11 US hospitals revealed nearly one in four patients experiencing adverse events, a quarter of which argued to be preventable (Bates et al., 2023). Previous Australian data have suggested a higher prevalence of preventable adverse events occurring in surgical admissions, inclusive of the perioperative setting (7.7 per 100 separations) (Australian Institute of Health and Welfare, 2018), underscoring the importance of clinical deterioration recognition and response endeavours within the specialty.

Although limited, recent published research specific to crisis management in the perioperative environment has suggested the positive benefits of using simulation-based learning (SBL). For example, in a study by Gros et al. (2021), interdisciplinary in situ SBL, which included a crisis scenario, yielded significant increases in presimulation to postsimulation scores across the following four principles: using effective communication, utilising resources well, establishing role clarity, and using effective situational awareness. Thus, participant confidence increased, and the authors suggested the in situ simulation as an effective way to evaluate system competence and interdisciplinary dynamics within the specialty.

An integrative review of interdisciplinary simulation training in the perioperative environment identified improvements in teamwork and communication, as well as teamwork behaviours and attitudes in included studies, correlating with improved patient safety (Hibberson, Lawton, & Whitehead, 2021). The authors recommended simulation training as an effective method of training perioperative teams and further research on perioperative simulation within the Australian context. Considering the benefits proposed in SBL, the

New South Wales state-wide DETECT simulation program described earlier was therefore adapted to provide perioperative nursing staff with the skills, knowledge, and confidence to recognise and respond to acute deterioration, specifically within the perioperative environment.

3. Objective

This study aimed to evaluate the effectiveness of a perioperative DETECT SBL program in building capacity for perioperative staff in recognition and response to acute patient deterioration.

4. Methods

4.1. Design

Multiple group post-test design using a quantitative measure of participants' perception of SBL experiences.

4.2. Participants and setting

Participants were any perioperative nursing staff employed across three hospitals in Sydney, self-enrolling in perioperative DETECT workshops aligned with mandatory state-wide training requirements. A consecutive sample of 56 participants enrolled between December 2021 and November 2022.

4.3. Intervention

Perioperative DETECT is a six-hour workshop for perioperative nurses to recognise and respond to acute deterioration and crisis management in the perioperative environment. The design and facilitation of the program aligned with that of the recently published 'Healthcare Simulation Standards for Best Practice' (Watts et al., 2021). Each workshop was facilitated by two senior perioperative nurses and involved prereading, face-to-face prebriefing, four patient deterioration simulations, and simulation debriefing. The following four scenarios were selected for their relevance within the perioperative acute deterioration context: Anaphylaxis, Malignant Hyperthermia (MH), Post-Partum Haemorrhage (PPH), and Local Anaesthetic Systemic Toxicity (LAST) (See Supplementary Materials: Simulation scenario summaries).

Anaphylaxis is a potentially fatal allergic reaction after exposure to a range of medications used in this setting and is the leading cause of anaesthesia-related death. MH, triggered by certain anaesthesia medications, poses a significant fatality risk. Although rare (incidence estimates between 1:5000 and 1:150,000), the likelihood of death from MH is high if not diagnosed and managed efficiently. PPH, affecting 5–15% of women in Australia and New Zealand, is the leading cause of maternal death globally. LAST is also rare (incidence of around 1.8 per 1000 blocks), but potentially life-threatening, with prevention focusing on correct usage of local anaesthetics and immediate treatment. These conditions highlight the need for perioperative staff to be vigilant regarding triggers, diagnosis, and treatments.

4.4. Instrument

The 19-item Simulation Effectiveness Tool–Modified (SET-M) (Leighton, Ravert, Mudra, & Macintosh, 2015) is a validated tool aligned with international healthcare consensus and best practice standards for simulation and was used for evaluating the perioperative DETECT. The SET-M includes questions related to prebriefing (two questions), scenario learning and confidence (twelve questions), and debriefing (five questions). Questions are scored on a 3-point scale: 'do not agree', 'somewhat agree', and 'strongly agree'. Original psychometric testing of the SET-M found a very good level of internal consistency reliability for the overall 19 items and for all four subscales, and permission to use within this study was granted by Leighton and colleagues.

4.5. Data collection

Data were collected between December 2021 and November 2022. Participants were asked to complete the 19-item SET-M following completion of the workshop. The following demographic variables were also collected: age, position, length of experience in perioperative nursing and length of experience in healthcare, clinical specialty (e.g., anaesthetics, instrument circulating nurse, or both), and previous attendance at the original DETECT program or previous attendance at clinical simulations or anaesthetic crisis management in the perioperative environment. Finally, an open-ended question was also asked: *Would you like to say anything about today's simulated clinical experience?*

4.6. Ethical considerations

The study was approved by the Local Health District Human Research Ethics Committee (2021/ETH01436). Participants in the mandatory workshops were informed that participation in the study and questionnaire completion was voluntary and that all data would be deidentified. Informed consent was implied following the completion and return of the SET-M.

4.7. Data analysis

Descriptive statistics were calculated using IBM SPSS Statistics (v27.0) and were used in relation to participants' demographic variables. Categorical variables were calculated using numbers and percentages, with continuous variables expressed as range, mean, and standard deviation (SD). Participants' evaluation of the prebriefing, learning and confidence, and debriefing (SET-M) were calculated using number, percentage, median and interquartile range. Cronbach's alpha internal consistency reliability was calculated for the overall SET-M and its individual subscales, and comparisons were made with the original (Leighton et al., 2015) and a recent (Moloney et al., 2022) study (see Table 1). The following alpha guide by Fein, Gilmour, Machin, and Hendry (2022) was considered: .71–.80 = Acceptable, .81–.90 = Good, and .91–.95 = Excellent. Finally, textual data were analysed using Qualitative content analysis

Table 1
Internal consistency reliability.

SET-M Subscales	Number of items	Related questions	Current study Cronbach's α	Benchmark data from Leighton et al. (2015) original study Cronbach's α	Data from Moloney et al. (2022) study Cronbach's α
Prebriefing	2	Q1-Q2	.924	.833	.827
Scenario	12	Q3-Q14	.851	Not reported	.739
Learning	6	Q3-Q8	.731	.852	.557
Confidence	6	Q9-Q14	.749	.913	.658
Debriefing	5	Q15-Q19	.908	.908	.888
Total SET-M Survey	19	Q1-Q19	.896	.936	.824

SET-M, Simulation Effectiveness Tool–Modified.

Table 2
Demographic data.

		N	%
Age	Range	24-63	
	Mean (SD)	35.05 (9.613)	
Current position	Nurse Unit Manager	1	1.8
	Clinical Nurse	5	8.9
	Specialist Registered Nurse	50	89.3
LOE Perioperative	Range	1–30	
	Mean (SD)	7.77 (6.628)	
LOE Healthcare	Range	1–30	
	Mean (SD)	10.05 (7.569)	
Clinical specialty	Anaesthetics	24	42.9
	Instrument/	26	46.4
	Circulating	6	10.7
	PACU		
Simulation experience	Yes	40	71.4
	No	16	28.6
Attendance at DETECT	Yes	21	37.5
	No	35	62.5

LOE, length of experience; PACU, postanaesthetic care unit; SD, standard deviation.

methods (Neuendorf, 2017). Data were coded and categorised separately by the first and second authors before a consensus meeting. Final categories were then discussed with all authors, refined, and agreed upon.

5. Results

A total of eight workshops were facilitated during the study period with all participants (n=56) completing and returning questionnaires. Internal consistency reliability of the overall SET-M was .896 and ranged from .851–.924 across the three subscales (prebriefing, scenario, and debriefing), demonstrating good to excellent reliability. Thus, the internal consistency reliability of the SET-M in this study was comparable with other studies.

Demographic characteristics highlighted that age ranged between 24 and 63 (mean = 35.05; SD = 9.613). The majority were registered nurses (89.3%) specialising in different subspecialties within the perioperative environment. Length of experience in the perioperative environment and healthcare ranged between 1 and 30 years, respectively, with respective means of 7.77 (SD = 6.628) and 10.05 (SD = 7.569). Most respondents had experience attending clinical simulation training previously, with a little over a third having attended the standard mandatory DETECT training previously (37.5%) (Table 2).

As shown in Table 3, all 19-item frequencies of the SET-M elicited a high degree of 'strongly agree', ranging from 57.1% to 89.6%, with only four of the 19 items achieving less than 80% 'strongly agree'. In the prebriefing subscale (q1 and q2), most students strongly agreed that the prebriefing increased their confidence and was beneficial to their learning (83.9% and 87.5%, respectively). The scenario subscale assessed learners' learning and confidence (q3–q14). As can be seen in the six items pertaining to learning, feeling empowered to make clinical decisions (89.6%) and having the opportunity to practice clinical decision-making skills (87.5%) had the highest frequency of strongly agree. The questions relating to developing a better understanding of medications (66.1%) and pathophysiology (71.4%) elicited the lowest strongly agreed responses. The remaining six items on the scenario subscale highlighted that confidence in the ability to report information to the health care team (85.7%) and confidence in providing interventions that foster patient safety (83.9%) produced the highest rates of strongly agree. The lowest percentage of strongly agree within the confidence section related to both communicating with patients (66.1%) and the ability to teach patients about their illness and interventions (57.1%). Finally, in the debriefing subscale (q15–q19), most students responded with strongly agree to the five items in this subscale (ranging from 82.1% to 89.3%).

Participants were given the opportunity to provide qualitative feedback on the simulation experience: *Would you like to say anything about today's simulated clinical experience?* Thirty-three participants (59%) provided responses and, whilst limited, highlighted support for the simulation training. Despite the brevity of responses, the qualitative content analysis generated two primary categories: *'self-efficacy enabling professional autonomy'* and *'Relevant and authentic representation'*.

The first category highlighted the positive impact of the simulations on learner self-efficacy and professional autonomy, by building upon confidence, critical thinking, knowledge, and skills. Respondents described a valuable learning experience that increased

Table 3
SET-M frequencies, percentages, median, and interquartile range.

	Strongly agree N (%)	Somewhat agree N (%)	Do not agree N (%)	Median (IQR)
Prebriefing:				
Q1. Prebriefing increased my confidence	47 (83.9)	9 (16.1)	0 (0)	3 (0)
Q2. Prebriefing was beneficial to my learning.	49 (87.5)	7 (12.5)	0 (0)	3 (0)
Scenario:				
Q3. I am better prepared to respond to changes in my patient's condition.	48 (85.7)	8 (14.3)	0 (0)	3 (0)
Q4. I developed a better understanding of the pathophysiology.	40 (71.4)	14 (25)	2 (3.6)	3 (1)
Q5. I am more confident of my nursing assessment skills.	45 (80.4)	11 (19.6)	0 (0)	3 (0)
Q6. I felt empowered to make clinical decisions.	39 (89.6)	17 (30.4)	0 (0)	3 (1)
Q7. I developed a better understanding of medications. (Leave blank if no medications in scenario)	37 (66.1)	19 (33.9)	0 (0)	3 (1)
Q8. I had the opportunity to practice my clinical decision making skills.	49 (87.5)	7 (12.5)	0 (0)	3 (0)
Q9. I am more confident in my ability to prioritize care and interventions	45 (80.4)	11 (19.6)	0 (0)	3 (0)
Q10. I am more confident in communicating with my patient.	37 (66.1)	18 (32.1)	1 (1.8)	3 (1)
Q11. I am more confident in my ability to teach patients about their illness and interventions.	32 (57.1)	21 (37.5)	3 5.4)	3 (1)
Q12. I am more confident in my ability to report information to health care team.	48 (85.7)	8 (14.3)	0 (0)	3 (0)
Q13. I am more confident in providing interventions that foster patient safety.	47 (83.9)	9 (16.1)	0 (0)	3 (0)
Q14. I am more confident in using evidence--based practice to provide nursing care.	45 (80.4)	11 (19.6)	0 (0)	3 (0)
Debriefing:				
Q15. Debriefing contributed to my learning.	48 (85.7)	8 (14.3)	0 (0)	3 (0)
Q16. Debriefing allowed me to verbalize my feelings before focusing on the scenario	46 (82.1)	10 (17.9)	0 (0)	3 (0)
Q17. Debriefing was valuable in helping me improve my clinical judgment.	46 (82.1)	10 (17.9)	0 (0)	3 (0)
Q18. Debriefing provided opportunities to self--reflect on my performance during simulation.	49 (87.5)	7 (12.5)	0 (0)	3 (0)
Q19. Debriefing was a constructive evaluation of the simulation.	50 89.3)	6 10.7	0 (0)	3 (0)

IQR, interquartile range.

confidence in voicing concerns in relation to clinical care, helping anaesthetic teams during clinical deteriorations, and assessing and providing appropriate responses during emergency situations. One respondent stated: *"Feeling much more confident in detecting clinical deterioration in theatre setting. Feel like I can take more imitative now in crisis management in theatres"*. The practical element of simulation was also perceived positively. For example, respondents identified feeling better prepared to be actively involved in a range of crisis situations and reported developing delegation skills with the 'hands-on' experience. One respondent commented: *"Great opportunity in a small group to be really involved, especially getting a chance to be a team leader"*, highlighting the value of developing leadership attributes in a controlled and safe environment.

The second category highlighted the benefit of contextualising SBL to the specialty nuances of the perioperative environment. The combination of scenarios and theory aligned to perioperative care provided relevance and authentic representation, which consequently maximised the learning experience and understanding of responsibilities. One respondent articulated: *"I think it was good to rotate through roles, focus on A-G assessments and cover multiple simulations……Very helpful to tailor DETECT to the Periop Environment"*. The simulations were perceived as beneficial to both experienced and less experienced perioperative nurses, providing refresher education to those returning to the specialty after an absence and insight into clinical deterioration for those new to the specialty.

Finally, respondents commented on their enjoyment of the workshop format and the expertise of the facilitators, noting their energy and enthusiasm throughout. The focus on A-G physical assessments was positively noted by some participants, perhaps benefiting from simulating the nuances of this assessment in the perioperative setting for anaesthetised patients, as opposed to the standard A-G assessment in conscious patients (See Supplementary Materials: Comparison of A-G physical assessment in a conscious v anaesthetised patient). Three respondents also suggested the inclusion of paediatric simulations in future iterations of the workshop, reflecting the context and nuances of a specialty, which sees both adults and children in their care.

6. Discussion

The provision of structured education for recognising and responding to acute deterioration and working effectively in teams are fundamental to the provision of evidence-based, person-centred care. Simulation has become a valuable and widely used educational method, including for low-volume-high-risk situations, in an effort to provide safe practice and increase confidence in managing an array of crises and deteriorating patient situations (Lee et al., 2019), and was thus examined here.

Findings from this study align with those in the broader simulation literature that simulation is an effective education intervention in preparing for real-world clinical situations. Consistent with perioperative literature, participation in this novel simulation workshop appears to have enhanced clinical reasoning awareness, skills, and attributes (Shailaja et al., 2019), which are fundamental to patient safety in emergency situations in this setting (Cunha, Pestana-Santos, Lomba, & Reis Santos, 2022). The opportunity afforded participants to apply theoretical knowledge and critical thinking whilst practicing decision-making and problem-solving skills within a controlled, safe, and facilitated environment was integral to the development of participant clinical reasoning (Persico, Belle, DiGregorio, Wilson-Keates, & Shelton, 2021).

Qualitative feedback highlighted that SBL provided authentic and realistic learning experiences in a safe environment. Thus, learners can manage crises without causing harm, even if mistakes are made. SBL can improve patient safety by identifying system and process errors before they happen, whilst affording opportunities to correct or mitigate them (Dubé et al., 2020). This authenticity and safety net, as it were, are key attributes in developing participant skills and confidence (Coyne, Calleja, Forster, & Lin, 2021), as is the teamwork, which is enhanced via group SBL (Wooding, Gale, & Maynard, 2020). Teams that train together are arguably more likely to apply learning in real-life situations. Team learning in the perioperative context is critical, as this environment sees continuous multidisciplinary care involvement before and after surgery. Effective teamwork is achieved via the increased understanding of team member roles and responsibilities and the development of leadership and delegation skills gained during SBL (Kleib, Jackman, & Duarte-Wisnesky, 2021).

The SET-M allows for different aspects of simulation and scenario effectiveness to be discretely examined. The prebriefing subscale findings suggested that participants were prepared for and understood the purpose, objectives, and expectations of the simulations (McDermott, Ludlow, Horsley, & Meakim, 2021), which helps reduce anxiety and creates psychological safety in learners. This, along with the transparency of roles, responsibilities, and relevant protocols to be followed, which prebriefing affords, aligns with increased confidence and enhanced learning in preparation for real-world experiences (Sterner, Nilsson, & Eklund, 2023).

The learning and confidence subscale demonstrated an increase in confidence and potential clinical competency in emerging perioperative crises. Participation in the simulations enabled the development of clinical specialty proficiency via repeated skill and knowledge application in safe, supportive, and relevant contexts (Moloney et al., 2022). This clinical proficiency development enhances participant self-efficacy and professional autonomy, as highlighted in the qualitative responses. Consequently, improved patient outcomes and clinical performance, as well as improved workforce-related issues such as morale, job satisfaction, and retention, can ensue from the learning and confidence achieved via simulation (Graham, 2020). These workforce issues are particularly prominent within the perioperative specialty as the COVID-19 pandemic saw a high prevalence of moral distress (Fagerdahl, Torbjörnsson, Gustavsson, & Älgå, 2022), professional burnout (Mohammadi, Tehranineshat, Bijani, Oshvandi, & Badiyepeymaiejahromi, 2021), and intention to leave (Raso, Fitzpatrick, & Masick, 2021).

The learning and confidence subscale, perhaps unsurprisingly, saw some of the lower scores in relation to strongly agree. These are related to developing a better understanding of pathophysiology and medications, confidence in communicating with patients, and confidence in the ability to teach patients about their illness and interventions, which can arguably be easily explained within the perioperative context. For example, the simulations focus on early detection and acute deterioration, rather than on pathophysiology, which may explain this lower score (Table 3 q4). Similarly, although information and resources about medications are provided in pre-reading and prebriefing stages, medication administration rarely features, if at all, within routine practice for instrument/circulating nurses, whose tasks primarily relate to maintaining the sterile field, checking instrumentation and ensuring all equipment is available and accounted for. Thus, this may account for reduced attention to this component of learning within this program (Table 3 q7).

Regarding '*confidence in communicating with patients*' (Table 3 q10) and in *'ability to teach patients about their illness and interventions'* (Table 3 q11), perioperative nurses (with the exception of those working in recovery) generally have no interactions with patients where these components are feasible. What little interaction exists would be in the context of patients still under the effects of anaesthesia, upon handing over to the team in recovery. Likewise, lower scores may reflect this context, as these components were not salient features of the learning scenarios.

The debriefing subscale highlighted that participation in SBL is an effective way of self-reflecting on performance, receiving feedback from facilitators and peers on strengths, and identifying areas for

change or improvement. This bringing together of the learning helps cement the integration of new knowledge, skills, and attributes (Bortolato-Major et al., 2019), in turn, aiding the transfer of learning to real-life clinical emergencies and acute deterioration in the perioperative setting. This opportunity to reflect and discuss also helps foster greater collaboration and teamwork in the real world, where a greater understanding, acknowledgement, and respect for different roles and responsibilities are acquired (Feitosa & Fonseca, 2020).

6.1. Study limitations

Some limitations should be considered when contextualising the study findings. Firstly, the study involved a relatively small sample working within a single specialty across three sites, with no control group, and used a post-test design only with limited additional qualitative responses. However, a valid and reliable instrument was used with acceptable internal consistency reliability demonstrated in this study. Social-desirability bias of participants is another consideration, as two of the researchers and facilitators of the intervention are senior colleagues of research participants. Finally, the study involved simulated clinical experiences with participant evaluation, suggesting the development of cognitive, affective, and psychomotor skills. It should be cautioned, however, that these may not necessarily transfer from the simulated environment to actual clinical emergencies in the 'real-world' perioperative setting.

7. Conclusion

This novel study reinforces the need for specialty-specific education in addressing nuances of acute deterioration in the perioperative context. SBL was perceived as an effective education intervention in preparing for real-world clinical situations, enhancing clinical proficiency and professional autonomy, whilst developing clinical reasoning, teamwork, and delegation skills. Future iterations should consider an additional scenario in a paediatric patient, as subtle differences in recognition and response exist here. Future iterations should also include multidisciplinary members present during perioperative crises to enhance teamwork across disciplines and crisis management roles. Finally, future research should explore the impact and transfer of the SBL in actual crisis situations via qualitative inquiry, to examine any theory-practice gap which may exist with this type of intervention.

Authorship contribution statement

Scott Lamont: Conceptual design, Data analysis, Principle writer, Manuscript writing and review. Zoe Kumar: Conceptual design, Data collection, Data analysis, Manuscript writing and review. Pooja Bhusal: Conceptual design, Data collection, Manuscript writing and review.

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Ethical statement

This research involved human subjects and was approved by the South Eastern Sydney Local Health District Human Research and Ethics Committee on the 5th of August 2021. The reference for this approval is 2021/ETH01436.

Conflict of interest

None of the authors have any competing or conflicting interests.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.colegn.2024.12.002.

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