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Mansell SK, Thomas AJ, Barnfield E, et al. Simulation Based Education in pre-registration and postgraduate cardiorespiratory physiotherapy: An ACPRC commentary. *ACPRC Journal*. 2024;54(3):49-55. doi:10.56792/OIBW3257

Commentary

Simulation Based Education in pre-registration and postgraduate cardiorespiratory physiotherapy: An ACPRC commentary

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Keywords: Simulation based education, preregistration education, postgraduate education, cardiorespiratory physiotherapy

https://doi.org/10.56792/OIBW3257

Journal of the Association of Chartered Physiotherapists in Respiratory Care

Vol. 54, Issue 3, 2024

INTRODUCTION

Readers are encouraged to read this commentary alongside the ACPRC position statement and scoping review[1] on simulation based education (SBE) in cardiorespiratory physiotherapy. This commentary is designed to:

- Provide an introduction to SBE
- Discuss the importance of faculty training
- Discuss the outcome measures evaluating SBE within cardiorespiratory physiotherapy

Recommendations for future research have been made in the scoping review.[1]

WHAT IS SIMULATION BASED-EDUCATION

There are numerous definitions for simulation based education (SBE) across multiple settings.[2,3] Common amongst definitions is the principle that SBE is a learning technique with conditions resembling real life. SBE allows participants to practice analysing and responding to realistic situations without fear of negative consequences for patients.[3-6] SBE is associated with high levels of learner satisfaction.[7] Furthermore, SBE is underpinned by the philosophy of psychological safety, where learners are supported within a safe, educational environment facilitated by shared agreements, shared beliefs, confidentiality, fiction contracts and a flattened hierarchy.[8,9] Psychologically safe environments promote interpersonal risk-taking and positively impact collaborative learning and participant well-being.[10]

Various modalities are available to deliver SBE, providing varying degrees of fidelity (realism) and activity design. The modality, fidelity and simulation design selected should be determined by the intended learning outcomes.[11] Full-body computerised mannequins capable of real-time physiological parameters feature predominantly in uni-professional SBE for cardiorespiratory physiotherapists[12] and where physiotherapists were included in SBE for allied health[5] or interprofessional learning.[1] Other SBE modalities reported in cardiorespiratory physiotherapy include standardised patients, where learners interact with actors,[7] and part task trainers which facilitate deliberate practice of clinical skills.[12,13] Computer simulations have been reported within cardiorespiratory physiotherapy education,[14] but other immersive technologies, such as virtual reality (VR) and augmented reality (AR), have not yet appeared despite their uptake in other professions.[15]

In situation simulation ("in situ") refers to practicing a skill in the natural environment. In situ simulation training involves the actual multiprofessional team using equipment and resources available in their usual workplace.[8] In situ supports the capability of healthcare teams to manage high-risk clinical emergencies, with an emphasis on improving human factors skills.[12,16-18] In situ has not yet been described as a modality for uni-professional respiratory physiotherapy SBE.

There is growing interest in the application of SBE in the context of simulated practice learning (SPL) within Physiotherapy.[19] Systematic reviews suggest SBE may be just as, or more, effective than traditional clinical placement in meeting pre-registration proficiencies. The KNOWBEST Project[19] recommended that 25% of the 1000 hours pre-registration clinical practice hours be met through SPL.

INTERPROFESSIONAL SIMULATION BASED EDUCATION

SBE facilitates interprofessional education (IPE) through understanding roles and responsibilities, promoting teamwork and communication, thus improving patient outcomes.[20,21] Research into IPE including cardio-respiratory physiotherapists has predominantly been conducted in the pre-registration arena.[16] Common learning objectives for IPE SBE include interprofessional communication, teamwork, roles and responsibilities, values and ethics. The majority of research in IPE included physiotherapists within medicine and nursing specialities. Current educational theories encourage SBE be delivered in multi-professional ways, which more closely represent the clinical environment.[22-24]

LEARNING THEORIES

SBE is underpinned by a blend of learning theories[25] Notable among these is "constructivism", whereby learners construct knowledge and understanding through their experiences. "Experiential learning theory",[26] has the most resonance with SBE.[27] Experiential learning posits learning as a process incorporating concrete experience (the simulation itself), reflection on the experience (the early debrief), abstract conceptualisation (the latter debrief) and active experimentation (learning transformation into practice). Experiential learning theory also accommodates both reflection-on-action and reflection-in-action. There are limited examples in the physiotherapy simulation literature describing the application of learning theory to the design and delivery of SBE.

The assessment of clinical performance using SBE requires careful consideration. There is a historically problematic relationship between SBE and formative assessment.[28] Measures that provide formative assessment may support SBE participants to identify personal learning needs.[29] The use of SBE for summative or "high stakes" assessment needs careful management to protect learners' psychological safety and ensure the assessment retains the key features of SBE. The ASPIH standards[11] include recommendations for implementing SBE for summative assessment. Although there has been a reluctance to develop summative assessment within SBE performance, compared with traditional assessment methods, simulated clinical settings create controlled environments with standardised scenarios for all learners.[30]

FACULTY

The ASPIH Standards[11] refer to faculty as "individuals with experience in simulation-based practice and content experts in the subject being delivered". This includes technicians, simulated patients and facilitators.[11] However, the expertise of facilitators in utilising SBE can differ significantly.[31] Faculty training is widely recognised as being important in ensuring scenarios are well designed and delivered in a psychologically safe environment, with key learning opportunities identified within the debrief, which may need to include content experts. Specific faculty qualification requirements vary between organisations[11] and the Chartered Society of Physiotherapy (CSP) commissioned the development of the KNOWBest project to support physiotherapy educators in developing and delivering SBE.[19] Learning during SBE is highly reflective and requires a skilled faculty to ensure it is delivered safely and effectively.[32] Therefore, investment in appropriate training for both the debrief structure and cognitive and leadership skills, which create a psychologically safe environment, is key to ensuring learning opportunities are not missed. Faculty training is of particular importance in more complex interdisciplinary environments.[33] Simulation faculty need to be able to design scenarios curricula and understand learning needs across a spectrum of disciplines and settings to ensure SBE is fit for purpose.[34] Train the trainer courses, and meta-debriefing are recommended to enable faculty to refine their skills through guided reflection.[19] Continued investment in appropriate training is necessary as faculty development is a lifelong process and should be supported by mentorship to provide confidence among educators.[35] Currently, the lack of facilitators who have cardiorespiratory physiotherapy experience may limit access to SBE for cardiorespiratory physiotherapists.[35]

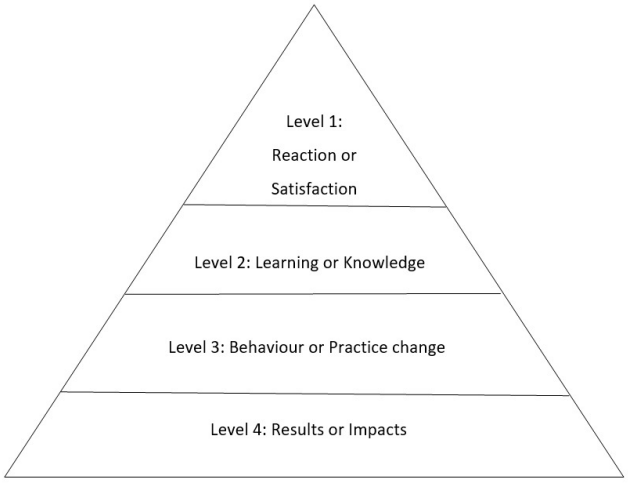

Figure 1. Kirkpatrick's framework

OUTCOME MEASURES

The educational value of SBE can be challenging to determine and is subject to a high degree of methodological variability in its application.[36] Learning outcomes associated with SBE can be classified according to cognitive, affective, or psychomotor learning that occurs as described by Bloom's Taxonomy[37]; or associated with Kirkpatrick's framework that classifies training outcomes into four levels of reaction or satisfaction, learning or knowledge, behaviour or practice change, and results or impacts.[38-40] The choice of evaluation should be determined by the aims of the SBE.[11]

Table 1. summarises outcome measures used within cardiorespiratory physiotherapy SBE.

In terms of learning domain, Kirkpatrick and Kirkpatrick[53] expand the Level 2 scope to include the extent to which participants "perceive" they will apply learnt knowledge or skills (confidence) or "intend" to apply knowledge/skills (commitment). Tools evaluating confidence require a pre/post design analysis and have been included in the "New World" Kirkpatrick Level 2 outcomes.[40,54]

What cannot be determined from an improvement in confidence or self-efficacy is the degree of competence of the participant. Kruger and Dunning[55] recognised that high self-efficacy can be associated with low competence (unconscious incompetence) and vice versa.

Evaluation of Kirkpatrick Level 3 clinical performance outcomes derived through SBE are limited in the cardiorespiratory physiotherapy literature by a lack of longitudinal

Table 1. Summary of outcome measures used in SBE cardiorespiratory physiotherapy

Name of Tool	Type	References
INTERPROFESSIONAL EDUCATION AND TEAM WORK SCALES		
Interdisciplinary Education Perception Scale (IEPS)	Self-report	Wellmon et al (2017)[41] Lefebvre et al (2015)[42]
Readiness for Interprofessional Learning Scale (RIPLS)	Self-report	Wellmon et al (2017)[41] Rossler et al (2016)[23] Lefebvre et al (2015)[42]
Attitudes toward Health Care Teams Scale (AHCTS)	Self-report	Wellmon et al (2017)[41] Lefebvre et al (2015)[42]
The Health Professional Collaboration Scale [HPCS)	Self -report	Rossler et al (2016)[23]
The Team Skills Scale (TSS)	Self-report	Lefebvre et al (2015)[42]
Interprofessional Collaborative Competencies Attainment Survey (ICCAS)	Self-report	King et al (2016)[43]
SIMULATION EXPERIENCE SURVEYS		
Self-Report Simulation Effectiveness Tool – Modified (SET-M) questionnaire	Self-report	Roos et al (2022)[44]
Satisfaction with Simulation Experience Scale (SSES)	Self-report	Ohtake et al (2013)[45]
Student satisfaction and self confidence in learning scale	Self-report	Wellmon et al (2017)[41]
ACUTE CARE CONFIDENCE, PREPAREDNESS, SELF EFFICACY AND SELF EVALUATED COMPETENCE		
Acute Care Confidence Survey	Self-report	Sliberman et al[46]
ACPRC Respiratory/On Call self-evaluation of competence questionnaire	Self-report	Mansell et al[29]
Clinical Confidence Measure	Self-report	Wright et al[47]
Self-perceived level of clinical preparedness.	Self-report	Silberman et al[24]
Self-Efficacy Scale (SES)	Self-report	Jones and Sheppard[48]
SUPERVISOR RATING OF PERFORMANCE		
Assessment of Physiotherapy Practice (APP)	Supervisor completed rating	Wright et al[47] Jones et al[49] Jones and Sheppard[48] Blackstock et al[50]
THEMATIC ANALYSIS TECHNIQUES		
Video Analysis	Videos were watched several times, and coded to describe the content. Similar codes were grouped to form categories, similar categories, then were grouped to form themes	Thackray and Roberts[6]
Think out Loud Analysis	Verbal data was transcribed and managed using a framework approach	Thackray and Roberts[6]
Focus Groups		Silberman et al[46] Mansell et al[29]

INTERPROFESSIONAL EDUCATION AND TEAM WORK SCALES		
		Rossler and Kimble[23]
Semi structured interviews		Thackray et al[6]
Nominal Group Technique		Roos et al[44]
RESEARCHER DEVELOPED TOOLS		
Researcher Developed Tools Author Generated Outcome Measure	Self report preparedness for practice Clinical Instructor Surveys of students preparedness University Simulation Laboratory Questionnaire – self report Open ended questions for thematic Analysis Student confidence, usefulness of the SBE – self report Educators impression of performance and patient impression of communication Self-Assessment of Confidence and Interest in Acute Care – self report Educational benefit of simulation	Thomas et al[20] Nithman et al[51] King et al[43] (2016) Roos et al[44] Silberman et al[24] Blackstock et al[50] Bednarek et al[52]

studies exploring the impact of SBE on sustained transferability and longer-term skill retention.[56]

Kirkpatrick Level 4 evaluates whether learning transferred to the clinical setting improves patient outcomes. None of the SBE cardiorespiratory physiotherapy literature reports impacts on patient or organisational quality or safety metrics. Level 4 outcomes may be evaluated with patient satisfaction survey, review of critical incidents, complaints, and serious untoward incidents in participant clinical settings.[28] Unlike literature concerning SBE in medical and nursing cohorts, there are few examples in the cardiorespiratory physiotherapy SBE literature that specifically propose to advance knowledge or performance of the behavioural skills inherent for safe and effective healthcare. Jepsen et al.[57] reviewed the development of 23 instruments used to assess behavioural skills in healthcare settings but reflects that allied health professions are under-represented in both development and application cohorts.

Although the use of standardised outcome measures is considered best practice in research design[58]The cardiorespiratory physiotherapy SBE literature presents numerous measures that have been generated by authors (Table 1.) It is likely that only face validity exists within author-generated measures, which otherwise lack psychometric development and evaluation.[21]

Therefore, future research in SBE in cardiorespiratory physiotherapy is recommended to address outcomes that explore the impact on the translation of knowledge learnt in SBE into clinical practice. Readers are encouraged to review the previous scoping review,[1] providing further context and direction to future research opportunities. The publication of standardised reporting guidelines for healthcare simulation research,[59] which details elements to include in relation to data sources/management, is also a useful guide for advocating for clear and concise reporting that will support maximising the quality of SBE studies.

SUMMARY

In summary, simulation-based education should be facilitated using standards and guidelines. Simulation faculty should undergo appropriate training to ensure safe and effective delivery of SBE. Simulation-based education should be evaluated using outcome measures appropriate to the intervention with adequate psychometric properties.

FUNDING

This work was unfunded

ACKNOWELDGEMENTS

Association of Chartered Physiotherapists in Respiratory Care editorial board.

Submitted: February 01, 2024 GMT, Accepted: June 05, 2024 GMT

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