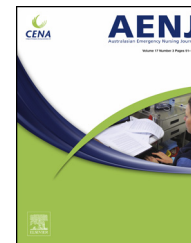




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Designing and implementing full immersion simulation as a research tool

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Received 11 November 2015; received in revised form 22 January 2016; accepted 24 January 2016

KEYWORDS

Patient simulation;
Research;
Education;
Nursing model;
Emergency nursing;
Emergency
Department

Summary Simulation is a valuable research tool used to evaluate the clinical performance of devices, people and systems. The simulated setting may address concerns unique to complex clinical environments such as the Emergency Department, which make the conduct of research challenging. There is limited evidence available to inform the development of simulated clinical scenarios for the purpose of evaluating practice in research studies, with the majority of literature focused on designing simulated clinical scenarios for education and training. Distinct differences exist in scenario design when implemented in education compared with use in clinical research studies. Simulated scenarios used to assess practice in clinical research must not comprise of any purposeful or planned teaching and be developed with a high degree of validity and reliability. A new scenario design template was devised to develop two standardised simulated clinical scenarios for the evaluation of a new assessment framework for emergency nurses. The scenario development and validation processes undertaken are described and provide an evidence-informed guide to scenario development for future clinical research studies.

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<http://dx.doi.org/10.1016/j.aenj.2016.01.001>

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Please cite this article in press as: Munroe B, et al. Designing and implementing full immersion simulation as a research tool. *Australas Emerg Nurs J* (2016), <http://dx.doi.org/10.1016/j.aenj.2016.01.001>

What is known

- Simulation is widely used as an education modality in healthcare, due to its effectiveness in improving learning outcomes and patient care.
- Full immersion simulation serves as a valuable clinical research tool used to evaluate the clinical performance of devices, people and systems.
- The literature on simulated design is focused on education and training with limited evidence on the development of simulated clinical scenarios for evaluating clinical practice in research studies.

What this paper adds?

- Highlights the differences in scenario design when implemented in education compared with use in clinical research studies.
- A new scenario design template for the evaluation of clinical performance in clinical research studies.
- An evidence-informed development and validation process to guide the design of valid and reliable clinical simulated scenarios for use in research.

Introduction

Over the past few decades, simulation has become increasingly popular as an education modality in healthcare. Simulation involves the use of a manikin or actor to represent a clinical situation.¹ There has been considerable focus placed on studies about simulation, with studies reporting its effectiveness in improving educational outcomes and patient care.^{2–4} The usefulness of simulation is not limited to education, but also serves as a valuable clinical research tool that may be used to investigate other research questions. Simulation enables the study of various aspects of clinical practice that may not otherwise be measurable and conditions may be controlled significantly more in the simulated setting.⁵ There is also the added benefit of ensuring no harm to patients, resolving ethical constraints of the clinical environment.⁶ Various studies have reported using simulation to assess device performance,⁷ technical and non-technical skills of clinicians^{8–11} and human factors affecting clinical performance.^{12,13} Simulation has also been used to discover potential threats to patient safety such as environmental factors.¹⁴

The simulated setting may be used to address factors unique to complex clinical environments such as the Emergency Department (ED), which make the conduct of clinical research studies challenging. In the ED, priority must be given to the most urgent patients who present seeking treatment and the delivery of care cannot be influenced by their eligibility for research participation.¹⁵ In addition, emergency clinicians often do not have the time or resources to assist with research activities.¹⁶ Studies which involve the consumption of ED personnel and resources are often unsuccessful.¹⁵ Simulated clinical scenarios may be designed to reflect the ED setting and used to assess the performance

of emergency clinicians without increasing clinician workloads or impeding on patient care.

The design of simulated clinical scenarios is complex and encompasses a wide range of components to replicate the clinical setting. There are a variety of modalities that may be employed including: part-task trainers designed to provide experience in specific skills;¹⁷ standardised patients which are individuals carefully trained to accurately and consistently role-play a patient with a health concern;¹⁸ and full-body simulators which are computer driven-mannequins with varying levels of fidelity.¹⁷ Literature relating to scenario design appears mostly focused on the development of simulated clinical scenarios for education and training purposes, with little discussion on how to design valid and reliable simulated clinical scenarios for clinical research studies. A systematic evidence-informed approach is needed to develop valid and reliable simulated clinical scenarios to be used as an evaluation method in research studies.

This paper highlights the differences in the design of simulated clinical scenarios when implemented as an investigative research tool to assess clinical performance compared with education and training. The importance of achieving validity and reliability when designing simulated clinical scenarios for research studies is presented and existing approaches to simulation design are reviewed. We present an evidence-informed approach to simulation design developed to evaluate a new emergency nursing assessment framework which may be used to guide scenario development in future clinical research studies.

Research versus education design features

Distinct differences exist between the design of simulated scenarios for clinical research studies compared with education and training. In a teaching and learning context, simulation may be used to facilitate learning and assess clinical competence which usually involves instruction and participant feedback as part of the overall simulation-based learning experience.¹⁹ When using simulation as a research tool to evaluate participant's behaviours and experiences, the simulation experience must not contain instruction as this may confound study findings. The key differences in designing simulated clinical scenarios for use in teaching and learning versus assessing participant performance in a research setting are outlined in Table 1. The differences are presented using the design constructs as identified in the NLN/Jeffries Simulation Framework including: facilitator; participant; simulation design characteristics; educational practices and outcomes.^{20,21} The NLN/Jeffries Simulation Framework is a theoretical model intended to inform simulation design for education and training and provides a consistent method for the development and implementation of simulation experiences.²²

Evaluation of the new emergency nursing assessment framework 'HIRAID'

HIRAID (History; Identify Red flags; Assessment; Interventions; and Diagnostics; reassessment and communication) is an evidence-informed systematic approach developed to guide the initial comprehensive nursing

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