Collegian (2014) 21, 257—265

Available online at www.sciencedirect.com

SciVerse ScienceDirect

journal homepage: www.elsevier.com/locate/coll

An evaluation of advanced simulation in nursing: A mixed-method study

Vico C.L. Chiang, PhD, MHA, Grad Dip Mgmt Studies, BN, RN, MACN, FHKAN (Critical Care)[a,*], Sophia S.C. Chan, PhD, MPH, MEd, PRDHCE (Nursing), DNA, RTN, RSCN, FFPH (RCP) (UK), FAAN[b]

[a] *School of Nursing, Faculty of Health and Social Science, The Hong Kong Polytechnic University, Hong Kong Special Administrative Region*
[b] *School of Nursing, LKS Faculty of Medicine, The University of Hong Kong, Hong Kong Special Administrative Region*

Received 6 November 2012; received in revised form 3 May 2013; accepted 7 May 2013

KEYWORDS
Advanced simulation;
High-fidelity;
Human patient simulator;
Critical thinking;
Experiential learning;
Mixed-study

Summary
Purpose: This study aimed to evaluate the development of critical thinking disposition and skills of nursing students and to identify their issues and experience with the application of advanced simulation for experiential learning.
Design: The study was conducted with a mixed-method design.
Methods: Quantitative and qualitative data were respectively collected through pre-post questionnaires and focus group interviews over two semesters from a class of 132 undergraduate pre-registration nursing students in Hong Kong, who practised clinical skills with human patient simulator (HPS) during two adult nursing care courses.
Findings: Although there were significantly increased analyticity, confidence and overall critical thinking disposition scores, inquisitiveness decreased after the study period. From the qualitative results, advanced simulation with HPS was overall recognized to be interesting, useful, welcomed and preferred by students in this study.
Conclusions: While the result of overall critical thinking disposition score of students in this study showed a significantly increase ($p = 0.000$) after two semesters, outcomes might improve with higher frequencies of the advanced simulation exercises and measures taken to consider cultural background of the students in such teaching and learning process.
Clinical relevance: With the quantitative results and overall positive feedback from students, advanced simulation is reasonably considered for inclusion as a value-added adjunct to clinical learning.

* Corresponding author at: Room GH515, School of Nursing, The Hong Kong Polytechnic University, Hung Hom, Hong Kong Special Administrative Region. Tel.: +852 2766 6683; fax: +852 2364 9663.
E-mail addresses: hsvicoch@polyu.edu.hk, Vico.Chiang@polyu.edu.hk (V.C.L. Chiang), nssophia@hku.hk (S.S.C. Chan).

1322-7696/$ — see front matter © 2013 Australian College of Nursing Ltd. Published by Elsevier Ltd.
http://dx.doi.org/10.1016/j.colegn.2013.05.003

Background and aims

The use of the high-fidelity human patient simulator (HPS) in medical education had demonstrated promising evidence regarding the development of better learning outcomes (Steadman et al., 2006). Unlike the medical discipline, the evaluation of such advanced simulation for teaching and assessment in nursing education has a relatively shorter history. In 2002, Nehring, Lashley, and Ellis emphasized the use of advanced simulation technology that aided teaching and learning in nursing education, and objectively measured competence in the application of knowledge and clinical skills by baccalaureate and graduate students. Advanced simulation involves the use of high-fidelity computerized manikins driven by pre-designed scenarios and controlled directly by the educators, e.g., Laerdal SimMan®, which provide students very realistic simulated learning experience (Bezyack, 2007). Another example of advanced simulation is the High Fidelity Patient Silicone Simulation (HFPSS) that enhances teaching and learning of students with the transformation of experienced educators into a simulated character by the use of clothing and silicone props including masks, hands and torsos (Reid-Searl, Happell, Vieth, & Eaton, 2012). There has been an important development since mid 2010 that The Council of Deans of Nursing and Midwifery (CDNM) Australia and New Zealand established an expert reference group which brings nurse educators with simulation teaching and learning expertise to reflect on the state of nursing simulation. This endeavor enhances the building of expertise and sharing of best practice knowledge on simulation more widely in the region (Brown et al., 2012).

Earlier studies showed that time and effort were required for the efficient and effective use of HPS technology in nursing education (Nehring & Lashley, 2004), and students' learning outcomes had increased in terms of their knowledge, ability, and confidence in medication administration (Bearnson & Wiker, 2005). Bremner, Aduddell, Bennett & VanGeest, 2006 analyzed 56 novice students' reactions to simulation with HPS and found that the experience enabled them to engage in active learning and confidence building in their clinical skills. Early studies showed promise in establishing a foundation for best practices in using HPS for baccalaureate nursing education, particularly for the novice students. Although there are inconsistent or short-term effects (Corbridge, Robinson, Tiffen, & Corbridge, 2010), non-experimental studies generally demonstrate the benefits of using advanced simulation with HPS in nursing education (Blum, Borglund, & Parcells, 2010; Buckley & Gordon, 2011; McCaughey & Traynor, 2010). Recent studies attempted to demonstrate if patient safety could better be assured through the learning from advanced stimulation (Henneman et al., 2010); and more recent qualitative studies continue to capture different outcomes and needs of students who learn from such technology (Reid-Searl et al., 2012; Rochester et al., 2012).

With increasing student numbers in undergraduate nursing programs due to the shortage of nurses worldwide (Walker, 2010), it is essential that educators strengthen the teaching and learning of clinical skills for students. Although there may be a pedagogical challenge of using advanced simulation to match real life clinical practice (Berragan, 2011), there is a potential to create more relevant clinical learning opportunities and to further develop critical thinking and clinical decision-making skills in students. This may be done through practical learning and debriefing using the advanced HPS technology. As a number of previous studies in nursing have demonstrated the advantages of using HPS for teaching and learning, further research is warranted to study the effectiveness of applying such realistic simulation with HPS to enhance nursing students' learning experience and outcomes (Moule, 2011). For instance, Steadman et al. (2006) compared critical thinking as the learning outcome of problem-based learning (PBL) and simulated learning. They found that simulation induced better student learning outcomes in the critical assessment and management skills of patients. On the other hand, Yeh and Chen (2003) found that there were some differences in critical thinking between students with different cultural backgrounds. The primary aim of this study was to evaluate the outcomes of advanced simulation for students regarding their critical thinking disposition and skills. The second aim of this study was to identify the issues and experience of nursing students in order to inform nurse educators to further improve their teaching with advanced simulation for experiential learning and curriculum development, as well as contributing to the growing body of scholarship in this area.

Methods

In order to achieve the aims, we utilized a mixed-method design of the core pre-post quantitative evaluation with a set of validated tools, and a supplementary qualitative investigation (Morse & Niehaus, 2009) informed by the orientation of naturalistic inquiry (Sandelowski, 2000). Qualitative data were collected through focus group interviews with students. With this mixed-method of study that used different sources and types of data, the results can be triangulated to produce a more comprehensive picture of the subject matter being studied (Sands & Roer-Strier, 2006). The central premise of mixed-method is that the combination provides a better understanding of research problems than either approach alone (Creswell & Plano Clark, 2007). The qualitative and quantitative aspects complement each other so that the investigation can be dovetailed, thus broadening the evidence base for nursing with more accurate reflection of the diverse nature of the required knowledge (Flemming, 2007).

Theoretical framework

Like the broadest currency among advanced simulation researchers and practitioners (Rourke, Schmidt, & Garga, 2010), Kolb's (1984) theory of experiential learning framed the theoretical underpinning of this study. The HPS is capable of simulating multiple physiological functions and creating realistic scenarios for students' experiential learning of health assessment, clinical skills, critical thinking, clinical decision-making, and life support. Experiential learning (with the advanced simulation in this case) is the change in students with new abstractions and applications that results from reflection on their direct learning experience (Kolb, 1984). In other words, with such