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Featured Article

Simulation Research for Academics: Novice Level

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Ashley E. Franklin, PhD, RN, CCRN, CNE, CHSE[a,*], Kim Leighton, PhD, RN, ANEF[b], Mary Ann Cantrell, PhD, RN, CNE[c], Tonya Rutherford-Hemming, EdD, RN, ANP-BC, CHSE[d]

[a]*Assistant Professor, Harris College of Nursing and Health Sciences, Texas Christian University, Fort Worth, TX 76129, USA*
[b]*Assistant Dean, Research and Simulation Faculty Development, Institute for Research and Clinical Strategy, DeVry Medical International, Iselin, NJ 08830, USA*
[c]*Professor, College of Nursing, Villanova University, Villanova, PA 19085, USA*
[d]*Senior Nurse Researcher, Office of Nursing Research and Innovation, Cleveland Clinic, Cleveland, OH 44195, USA*

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Abstract: This article addresses common concerns surrounding simulation research and provides strategies for novice researchers to avoid potential errors. Unique situations related to research and simulation in academic settings are discussed. This article focuses on several elements of rigorous quantitative simulation research, including use of a theoretical framework, intervention fidelity, measurement, sample size, and protection of human subjects.

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There is agreement in the scientific and academic communities about the need for research of simulation as pedagogy for facilitating learning in health care education (Aebersold & Tschannen, 2013; Dieckmann, et al., 2011; Issenberg, Ringsted, Ostergaard, & Dieckmann, 2011; Sanford, 2010). However, many academic educators are unprepared to manage the rigors of design and implementation of a research study (Brannan, Dumsha, & Yens, 2013). Reasons for this may include not having a strong research foundation in one's educational background, working in environments that are not associated with research universities, lack of workload balance that includes research time, and lack of experience with research.

Simulation educators may choose to conduct research in areas of interest, despite lacking a strong foundational understanding of the process. Colleges and universities may mandate that research studies be conducted without providing the necessary support. This article is written to

* Corresponding author: a.b.edge@tcu.edu (A. E. Franklin).

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provide mentorship to those who are novice in the area of simulation research. Although standard research textbooks provide most of the methodological information needed (Brannan et al., 2013; LoBiondo-Wood & Haber, 2014), there are challenges unique to conducting rigorous simulation research. Having an awareness of these areas will help novice researchers to better design their studies to avoid common pitfalls and, therefore, strengthen the research base for this pedagogy.

Key Points

- Theoretical frameworks underpin quantitative research.
- Intervention fidelity is paramount to rigorous research.
- Measuring outcomes requires use of instruments with known reliability and validity.

Background

Simulation has been used as a teaching strategy in health care education for over a century (Nehring, 2010; Sanford, 2010), but 15 years ago, technology-enhanced simulation, such as that associated with patient simulators, became popular (Bradley, 2006; Gaba, 2004). More recently, the use of simulation has become expected by nurses in academic and practice settings to provide experiential learning outside traditional patient care environments (Benner, Sutphen, Leonard, & Day, 2010; IOM, 2011; NRC, 2011). The findings of the recent study completed by the National Council of State Boards of Nursing (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014) support the notion that up to 50% of traditional clinical time can be replaced by simulation and still result in acceptable outcomes, including enhanced readiness to practice.

Although the findings of the National Council of State Boards of Nursing study are important to the progression of simulation use in health care education, it is imperative that we move forward in our investigations and use evidence-based guidelines for simulation practice such as those outlined in the *Standards of Best Practice: Simulation* (INACSL, 2013). Many gaps exist in the understanding of simulation pedagogy, providing a multitude of options for simulation research development (McGaghie, Issenberg, Petrusa, & Scalese, 2010). This field has moved beyond studies of learner satisfaction to more complex questions. As complexity of research design increases, so does risk of completing studies that do not adequately address the research question.

Some common concerns surrounding simulation research include ineffective use of a theoretical framework, lack of intervention fidelity, insufficient reliability and validity of instruments, inadequate sample size, and lack of attention to protection of human subjects. This article will focus on elements to consider when designing a rigorous quantitative study. We aim to assist novice researchers in avoiding these common dilemmas.

Laying the Groundwork for Simulation Research

Studies involving simulation-based learning should be systematically developed using rigorous research methods. Sound methodology should guide the development of a research study so that it can be replicated. Remove for implementation or for further study. Table 1 describes important elements that reflect a rigorous, well-developed study design and provides strategies to avoid some of the common challenges in simulation research.

Simulation-based research should be guided by a significant and relevant problem statement, purpose, and question(s) that reflect the state of the science. The current state of the science in simulation-based research calls for intervention studies that build off of previously published descriptive studies. A white paper by Issenberg et al. (2011) identified the state of the art of educational simulation research, provided direction to establishing a research agenda in simulation-based learning, and identified future directions in simulation-based learning; the paper provides guidance for novice researchers conducting simulation studies.

In both intervention and descriptive studies, research question(s) should identify specific concepts of interest, and the concepts should be aligned with how they are stated in the theoretical framework. In quantitative approaches, the concepts should fit into a theoretical framework that underpins the research. The Figure provides an example of how a problem statement, concepts, theoretical framework, and research question(s) interface during the research process. Table 2 provides definitions for basic research terminology.

The conceptual basis of study should be guided by a theoretical framework; it provides a context for examining a problem. In other words, a theoretical framework provides the conceptual basis of a study by describing how the variables in a study are related. It also provides a rationale for predictions about the relationships among variables of a research study. How the theory is being used to guide the study design needs to be made clear in the early phase of the research process. Furthermore, the theoretical framework should guide the entire research process, including interpretation of the study's findings. Researchers should consider how the findings reflect the specific elements of the theoretical framework and how the implications of the findings support or refute the proposition in the theoretical framework. Include this information in manuscripts with your study findings. Specific questions that should be addressed pertaining to the theoretical framework include: (a) Were the study findings related to the framework? (b) Are the findings for each hypothesis, question, or objective consistent with those proposed by the framework? (c) If the findings are not consistent with the framework, was the methodology adequate to test the hypothesis, question, or objective? (d) Are the findings consistent with those of