



# The effect of role assignment in high fidelity patient simulation on nursing students: An experimental research study<sup>☆</sup>

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## ABSTRACT

**Background:** Previous studies have evaluated the effectiveness of high fidelity patient simulators (HFPS) on nursing training; however, a gap exists on the effects of role assignment on critical thinking, self-efficacy, and situation awareness skills in team-based simulation scenarios.

**Objectives:** This study aims to determine if role assignment and the involvement level related to the roles yields significant effects and differences in critical thinking, situation awareness and self-efficacy scores in team-based high-fidelity simulation scenarios.

**Design:** A single factorial design with five levels and random assignment was utilized.

**Setting:** A public university-sponsored simulation center in the United States of America.

**Participants:** A convenience sample of 69 junior-level baccalaureate nursing students was recruited for participation.

**Methods:** Participants were randomly assigned one of five possible roles and completed pre-simulation critical thinking and self-efficacy assessments prior to the simulation beginning. Playing within their assigned roles, participants experienced post-partum hemorrhaging scenario using an HFPS. After completing the simulation, participants completed a situation awareness assessment and a post-simulation critical thinking and self-efficacy assessment.

**Results:** Role assignment was found to have a statistically significant effect on critical thinking skills and a statistically significant difference in various areas of self-efficacy was also noted. However, no statistical significance in situation awareness abilities was found.

**Conclusions:** Results support the notion that certain roles required the participant to be more involved with the simulation scenario, which may have yielded higher critical thinking and self-efficacy scores than roles that required a lesser level of involvement.

## 1. Introduction

Simulation and computer-based immersions have consistently grown and have become more popular forms of training in domains such as aviation, driving, military, and more recently, healthcare. There have been multiple studies outlining the effectiveness of training with high-fidelity patient simulators (HFPS) in the medical field. HFPS are defined as realistic full body mannequins that provide real physical inputs and real environmental interaction (Gates et al., 2012; Jeffries, 2005). However, there is a gap in research surrounding the effects of roles played in team-based simulation scenarios and the development of “intangible” nursing qualities (critical thinking, situation awareness,

and self-efficacy). HFPS are the most realistic mannequins used in training scenarios and best bridge the gap between simulated environments and; therefore, research on HFPS effects can provide a better understanding of how nurses perform in team-based care procedures and how the level of involvement in these care procedures can affect “intangible” nursing qualities.

Research related to simulation-based training is common in domains such as aviation, driving, and military, but research on simulation-based training of baccalaureate-level nurses remains limited. With a steady increase in the number of prospective nurses (baccalaureate-level students) and shrinking availability of clinical training positions, simulated patients and clinical environments have become more visible

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in nursing education than ever before (Jeffries, 2005; Nehring, 2008; Weaver, 2011). Nursing programs may require students to participate in clinical environments to perfect various care skills, but with a decrease in clinical availability, patient simulators are used to supplement, or even substitute, the clinical experiences (McCallum, 2007; Nehring, 2008; Weaver, 2011). There are many positives to using simulation in nursing, such as the ability of student nurses to practice a skill and not endanger a real patient. This allows nurses to make mistakes and not experience the dire consequences (Ironsides et al., 2009; Jeffries, 2005).

Simulation has been demonstrated as an effective tool to develop critical thinking, self-efficacy and situation awareness within the participants. In the context of this study, critical thinking is the ability to evaluate a situation and make a decision that provides the best care to the patient. Self-Efficacy is the perception of how prepared an individual is to successfully accomplish a task (Bambini et al., 2009; Bandura, 1977, 1986). Situation awareness (SA) is the ability to accomplish a task using three phases: perception, comprehension, and projection (Endsley, 1995a). Little research has been conducted evaluating the effects of role assignment in team-based simulation scenarios and the effects on critical thinking, self-efficacy, and situation awareness. Therefore, we designed a study to investigate the effects of role assignment on simulation scenario outcomes.

Based on reviewing previous studies, we hypothesized the following:

- (1) Participants are expected to display a statistically significant increase in critical thinking and self-efficacy after completing the simulation scenario.
- (2) Roles assignment for the simulation will have a statistically significant increase on critical thinking and a significant difference in self-efficacy and situation awareness. More specifically, roles requiring more patient involvement will yield the greatest increase in critical thinking and difference in self-efficacy for pre- vs. post-simulation comparisons. Additionally, roles requiring more patient involvement will yield a significant difference in situation awareness.

Multiple studies have indicated that patient simulators, and the scenarios used, have improved self-efficacy, situation awareness, and critical thinking. The exact causation behind the increase is not clear, but the additional experience and realism associated with simulation should cause the participant to feel more confident in their abilities and learn to think more critically and deduce proper care strategies based on the scenario, leading to the deduction of hypothesis (1). The effects of various roles in nursing student simulation have not been widely explored (if at all). Hypothesis (2) was generated based on a thorough understanding of the role requirements for the scenario used in this study. It was understood that three roles would have “high” levels of involvement, whereas two would have “low” levels of involvement.

## 2. Methods

This study was a single factor design with five levels. The factor was the role performed in the simulation with the five levels being the possible roles participants were assigned. Participants were randomly assigned one of the five following roles prior to the simulation scenario: lead nurse, secondary nurse, documenter, medication nurse, or caller. The role functions and involvement level can be found in Table 1, and are later discussed in the scenario description subsection. The response considered was the pre- and post-simulation critical thinking and self-efficacy assessment and the situation awareness assessment.

### 2.1. Participants

Participants for this Institutional Review Board (IRB)-approved

study were 69 third-year baccalaureate level nursing students. The participants completed the same core coursework, but may have taken different electives. Each participant likely has had different clinical experiences by earning their clinical time at different locations. The scenario used is required for course completion in the course the participants were enrolled in, but participation was voluntary and choosing not to participate had no effect on the course grade. Additionally, participants had the same preparation assignments to complete before participating in the simulation (as per course requirements), but the participants were unaware of the simulation scenario topic they would experience.

### 2.2. Facilities, Equipment, Materials

The study took place at a public university nursing simulation center used only by students in the school of nursing. All participants used the same medical equipment and HFPS to complete the assigned task(s) during the simulation scenario. Data collection materials included: a researcher-developed critical thinking and self-efficacy assessment and a researcher-modified Situation Awareness Global Assessment Technique (SAGAT). Each document was developed or modified to correspond directly with the postpartum emergency scenario being performed and not exceed five minutes to complete staying within logistic time constraints. These modifications were done with coordination between the authors, which included a nurse and two human factors professionals.

#### 2.2.1. Critical Thinking Assessment

Critical thinking assessments used in nursing exist, but there are serious logistical concerns with them. Items such as The California Critical Thinking Disposition Inventory (CCTDI), Watson-Glacier Critical Thinking Appraisal (WGCTA), and the Critical Thinking Process Test (CTPT) are simple multiple choice assessments, but they all take anywhere from 20 to 60 min to complete (Carter et al., 2015). Due to the large number of students needing to utilize the simulation center, there was only approximately 10 min allotted for pre- and post-simulation assessment for critical thinking. Therefore, the researchers developed a critical thinking assessment requiring participants to gather information from a scenario and develop conclusions that could be completed in five minutes for each pre- and post-simulation assessment. Participants were provided with a patient scenario and the participant was required to determine the potential postpartum emergency, identify immediate care procedures, and justify their responses through evidence found in the scenario and patient information provided. Responses were in the form of an open-ended essay. The scenario description and response requirements were the same for the pre- and post-simulation assessment.

#### 2.2.2. Self-efficacy Assessment

There exist multiple self-efficacy assessments that were considered for use in this study. In particular, the Nursing Anxiety and Self-Confidence with Clinical Decision Making Scale (NASC-CDM) which is a self-report, six-point Likert-type scale with 27 inquires with subscales in anxiety and self-confidence (White, 2013) was considered. However, for purposes of this study, there was more interest in self-efficacy levels of participants as it pertains to a post-partum hemorrhaging emergency. Therefore, this researcher-developed scale contains statements focused on the proper nurse-patient interaction and actions to be performed through the scenario. This assessment was a 14-item assessment with a 7-point Likert-type response scale with “1” indicating “not confident”, “7” indicating “very confident”, and “4” serving as a neutral point. The same assessment was used for pre- and post-simulation.

#### 2.2.3. Situation Awareness Global Assessment Technique (SAGAT)

Currently, a nursing relevant and specific situation awareness tool is lacking and there is a need for more research dedicated to developing

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