

# The use of human patient simulation to improve academic test scores in nursing students<sup>1,2</sup>

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## KEYWORDS:

Academic test scores;  
Simulation;  
Cognitive domain

**Abstract** Many technologies that were not yet invented when today's educators went to nursing school are now staples in nursing colleges and schools worldwide. Although there are numerous studies that examine the relationship between simulation and student success, most focus on the affective and psychomotor domains of learning. This article focuses on the cognitive domain of learning and discusses the correlation between the use of high-fidelity human patient simulation and improved academic test scores.

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## 1. Introduction

Many technologies that were not yet invented when today's educators went to nursing school are now staples in nursing colleges and schools worldwide. For example, human patient simulation (HPS) for most of the educators consisted of a Resusci-Annie, which is now replaced by high-fidelity HPS that is able to produce life-like physiologic responses to students' actions. The National Council of State Boards of Nursing found that over 1,060 schools nationwide are using simulation in the preparation of prelicensure nursing students (Hayden, 2010). Because more schools compete for limited clinical resources, it is expected that this number will increase. Although there are numerous studies that examine the relationship between simulation and student

success, most focus on the affective and psychomotor domains of learning. Using HPS in nursing education promotes clinical competency, patient safety, and student confidence (Bremner, Aduddell, & Adamson, 2008; Jenson & Forsyth, 2012; Richards, Simpson, Aaltonene, Krebs, & Davis, 2010).

A review of the literature related to the cognitive domain in nursing students using HPS reveals no studies specific to this topic. The purpose of this study was to examine the relationship between academic test scores and the use of HPS. National accrediting bodies expect to see measurable learning outcomes with the use of technology. These issues in nursing education prompted the writers to ask the following questions: Is there a correlation between the use of simulation and improved academic outcomes? If so, what is that correlation and how can it best be measured?

## 2. Background

Faculty of an advanced medical–surgical course identified student weaknesses in certain areas based on high-miss

<sup>1</sup> The authors wish to thank the National Organization of Associate Degree Nursing Foundation for their generous grant support of this research.

<sup>2</sup> The authors have no conflict of interest to disclose.

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test concepts. The areas included pneumothorax management, ventilator settings, chest pain management, complex electrolyte imbalances, and acute stroke management. With this information, the faculty developed four HPS learning activity modules to be incorporated into the course. The four modules were (a) respiratory, which included the pneumothorax and ventilator settings; (b) cardiac; (c) renal, to cover complex electrolyte issues; and (d) neuro. The modules focused on both theory content and areas of clinical concern or skills that were not easily obtained by a large number of students, such as chest tube and ventilator management.

Once content and skills were selected and the modules written, piloting of the modules began as an optional learning activity. The four modules were fully incorporated into the course as a mandatory activity the following semester. Using test analysis data on individual test items kept by the department, we analyzed results of three unit examinations covering the topics above. The analysis of the unit examinations from the semester before any simulation was initiated, and the semester where participation was optional was compared against the results of the semester when simulation became a mandatory activity (Table 1). The targeted high-miss items were the same on all three sets of unit examinations. For test security, other test items were equal in difficulty and content but not identical. Group 1 represents the students that took the unit examination without any simulation activities in the semester prior to writing the modules. Group 2 represents the piloting of simulation as an optional activity for students that wanted to participate, and Group 3 represents the students where the modules were mandatory. In two out of three unit examinations, the students with mandatory simulation (Group 3) had a mean score higher than Group 1 and Group 2.

One unexpected finding when doing the initial comparison was that Group 3 did not perform as high on the unit Examination 3 as the previous group. The team discovered that Group 3 struggled with medication dosage calculation in

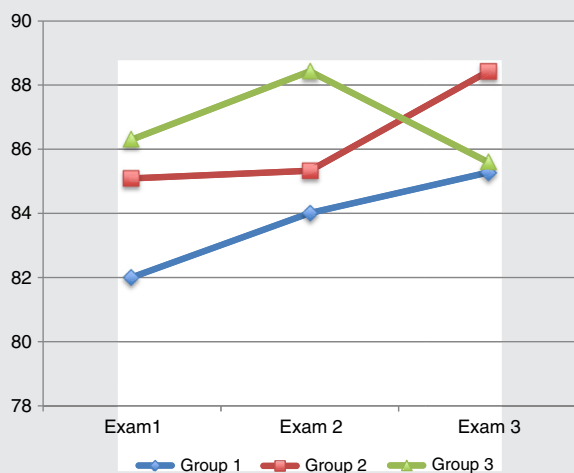
Module 3 that might have taken away from the learning as it was intended. A modification of Module 3 was completed and implemented in the next semester. Table 2 represents the test scores of the students enrolled at the time of the modified Module 3 (Group 4), showing that the new test scores were significantly higher than those reported in Table 1 after the modification.

Researcher bias was identified as a potential limitation. Knowing that the area of difficulty was the starting point for writing the modules, emphasis was placed on the review of those concepts and the additional time allotted for the mastery of the material. In addition, the unit examination covered material not specific to the module but rather an entire unit of study; therefore, the student grade was not a reliable indication of only the learning activity. After reviewing this early data, the need for an empirical research study was clear. Preliminary data were shared with administration, and institutional approval was received to conduct a well-designed study. The researchers then sought and received grant assistance from the National Organization for Associate Degree Nursing (N-OADN) to assist in funding the study.

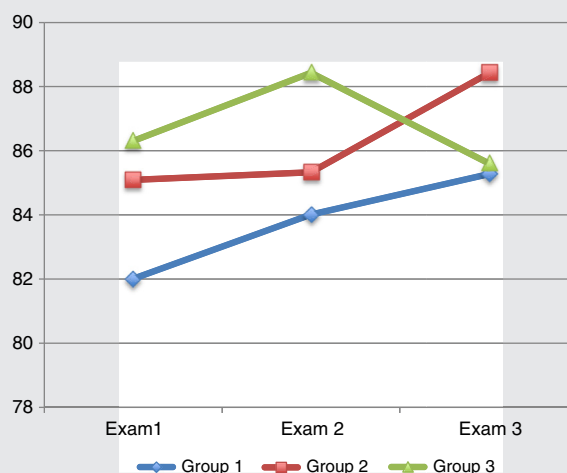
### 3. Study design

Initially, 50 students were invited to participate in the study; however, the study was expanded to a final count of  $n = 184$  and covered three total semesters. The students were considered a homogenous group because each student had taken the same general education courses and prerequisite courses and completed all their nursing education within the program. The students had completed the research lecture in the capstone course prior to being asked to participate. Students signed consent to participate, and each was advised of the right to withdraw at any time. None withdrew.

**Table 1** Student academic test scores (Groups 1–3)



**Table 2** Student academic test scores for unit Examination 3 only (Groups 1–4)



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