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Featured Article

Does Nursing Student Self-efficacy Correlate with Knowledge When Using Human Patient Simulation?

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KEYWORDS

self-efficacy;
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clinical simulation;
scores;
knowledge

Abstract

Background: Self-efficacy (SE) is commonly believed to be associated with nursing knowledge and is thought to be improved with manikin-based human patient simulation (HPS) training. Yet there is little evidence of a relationship between SE and knowledge.

Methods: Using a 2-group (HPS and control) experimental design, we examined the relationship of knowledge and SE and the predictors of knowledge scores in 161 students (age 25.7 ± 6.6 ; 89% female) from 4 prelicensure cohorts at three nursing schools. Knowledge and SE assessments were given at two testing points: Baseline and after HPS. Statistical analyses consisted of Pearson's correlations, analysis of variance, and multivariate logistic regression with the covariates of group (HPS or control), gender, ethnicity, SE and knowledge at baseline, school, and number of prior HPS exposure(s).

Results: Significant score increases in SE and knowledge were seen between the testing points for the experimental group (had HPS), but not the control group (no HPS) and differences were found between the groups for both variables ($p < .01$ for each). However, there was no correlation between SE and knowledge. Additionally, a logistic regression for "high" SE scores revealed baseline SE ($p \leq .01$) and HPS participation ($p = .002$) as the only predictors of higher SE scores. Furthermore, SE was not a predictor of "good" knowledge scores.

Conclusion: This study demonstrated SE and knowledge gains in subjects who participated in HPS; however, there was no correlation between SE and knowledge nor was SE a predictor of "good" knowledge scores. Although educators strive to develop SE in their students, the limitations of SE's impact on outcome measures such as knowledge needs to be established.

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Self-efficacy (SE) is the belief that one is capable of performing a task or a desired action (Bandura, 1977). Arthur Bandura's SE theory (Bandura, 1977) is a

component of his more general theory, social cognitive theory. SE theory maintains that the processes of change occur through a person's sense of SE or personal mastery of a task. This includes a person's beliefs in their capability to mobilize a course of action necessary to complete

a task despite changing circumstances (Kisiel, 2006). SE is commonly believed to be associated with nursing knowledge and is thought to be improved with manikin-based human patient simulation (HPS) training. However, there is little evidence of a relationship between SE and knowledge. Although there are many publications reporting improvements in SE after HPS, this study

Key Points

- Self-efficacy is the belief a person can accomplish an action.
- Self-efficacy is commonly used to measure the success of HPS.
- No evidence of a relationship between self-efficacy and knowledge.

seeks to quantify its value in relation to HPS knowledge gains.

Literature Review

SE

A meta-analysis done by Bandura and Locke (2003) of SE research has shown that efficacy beliefs contribute significantly to the level of motivation and performance of a person in areas other than nursing. These studies have shown that belief of one's SE can predict one's functioning at different levels of efficacy over time and even variation within the same individual depending on the tasks performed. When predicting behavior, measures of SE have been found to be superior to evaluation of past performance, however these have not been tested in nursing (Scott and MacInnes, 2006), nor have they been correlated with knowledge.

SE and HPS

HPS is popular in nursing education as a method of training safe, competent practitioners. However, educators in the literature have used SE as a barometer of success after HPS (Bambini, Washburn, & Perkins, 2009; Brown, 2008; Cardoza & Hood, 2012; Kameg, Howard, Clochesy, Mitchell, & Suresky, 2010; Lauder et al., 2008; Leigh, 2008b; Ravert, 2004; Tuttle, 2009). This is owing to the belief that students need confidence to be successful in healthcare and that SE correlates strongly with knowledge (Lauder et al., 2008; Lundberg, 2008; Pike & O'Donnell, 2010). Nonetheless, there is no evidence that SE is associated with knowledge in healthcare.

HPS and Knowledge

Although some investigators have reported knowledge gains using HPS (Alinier, Hunt, Gordon, & Colin, 2006; Brannan, White, & Bezanson, 2008; Jeffries & Rizzolo, 2006; Kardong-Edgren, Lundstrom, & Bendel, 2009; Linden, 2008; Ravert, 2004; Shinnick, Woo, Horwich, & Steadman, 2011; Shinnick & Woo, 2012), there continues to be a preponderance of published studies touting the benefits of HPS based solely on gains in student confidence or SE (Bearnsen & Wiker, 2005; Bremner, Aduddell, Bennett, & VanGeest, 2006; Brown & Chronister, 2009; Feingold, Calaluce, & Kallen, 2004; Gordon & Buckley, 2009; Jarzemyk & McGrath, 2008; Kameg et al., 2010; Leigh, 2008a; Nishisaki, Keren, & Nadharni, 2007; Pike & O'Donnell, 2010; Reznick et al., 2003; Sherman, 2002; Smith, 2008; Taekman, Hobbs, & Wright, 2007; Tuttle, 2009). However, the relationships between SE and knowledge and HPS are unclear.

Heart failure (HF) is the most common hospital discharge diagnosis in persons >65 years old (Miller & Missov, 2001; Sturm, van Gilst, Swedberg, Hobbs, & Haaijer-Ruskamp, 2005). Therefore, improving both knowledge and SE in HF are important in the training of healthcare providers. However, there is little information on the relationship of HPS with HF knowledge and SE in the training of healthcare providers.

There is a paucity of evidence in the literature correlating SE with knowledge or identifying the value of SE as a predictor of knowledge in HF in healthcare trainees, particularly in relationship to HPS. Therefore, the specific aims of this study were to (1) determine whether SE in areas of HF management (as measured by the SE for nursing skills evaluation tool) is correlated to knowledge scores (as measured by the HF clinical knowledge questionnaire) in prelicensure nursing students with and without an HPS experience, (2) identify if SE is a predictor of "good" HF knowledge scores ($\geq 75\%$ on the HF clinical knowledge questionnaire), and (3) determine the predictors of "high" HF SE (scores ≥ 3 ["moderately confident"]) as measured on by the SE for nursing skills evaluation tool.

Methods

Study Design and Sample

The study used a 2-group, randomized, pretest–posttest, clinical trial design. The groups consisted of the experimental subjects (who were randomized to 1 of 3 parallel HF scenarios in HPS) and controls (who did not participate in HPS). Both groups were measured at baseline (pretest) and posttest (for the experimental group, after HPS; for the controls, at the same amount of time as the post-HPS testing period for the experimental subjects; Figure 1).

Figure 1 Study protocol depicting randomization, experimental and control groups, testing completed.

A convenience sample of 4 cohorts of prelicensure nursing students ($n = 161$) were recruited from three baccalaureate schools of nursing at the same point in their prelicensure nursing curriculum. All schools used the same simulation equipment (Sim Man® Laerdal Medical Corp., Wappinger Fall's, NY) and institutional review board approval was obtained from all three schools before data collection and recruitment for the study. Power analyses indicated that a sample size of 82 subjects would allow detection of moderate (0.3) effect sizes on an a priori Pearson's correlation with a power of 0.80 (Faul, Erdfelder, Lang, & Buchner, 2007).

Inclusion criteria were undergraduate nursing students in the same course at each school who had successfully completed instruction in the care of the decompensated HF patient. Although course objectives were reviewed by the researcher, the HF lectures at each school were not controlled and no lecture faculty were involved in this study. The length and content were left to the discretion of the usual course faculty. This point in the prelicensure curriculum is the standard equivalent of a medical surgical course, level III, taken in many schools the final year

of a baccalaureate nursing program. Exclusion criteria were students who either had HF or had family members with HF.

HPS Scenario Intervention

Three parallel simulation scenarios of clinical cases of acute decompensated HF were used in this study and followed by debriefing (Shinnick et al., 2011). The scenarios (hands-on component) were identical to each other in design with the exception of the patient history and gender and were designed to last 12 minutes. Parallel simulations were necessary to decrease cross-talk between participants and prevent scenario predictability among students. The design of the scenarios was to elicit basic nursing responses such as elevating the head of the bed for a dyspneic patient, applying a pulse oximeter and appropriate oxygen, identifying pulmonary edema on physical examination, choosing the priority medication from multiple physician orders (intravenous furosemide), and monitoring appropriate electrolytes in a patient receiving a diuretic. Research faculty running the

simulations were master's-prepared nursing educators with an average of 10 years teaching experience. The debriefer was a PhD faculty with >20 years of teaching experience. All involved faculty had formal training in simulation and debriefing with ≥ 3 years simulation experience.

After a pre-brief at the bedside in which subjects were oriented and ensured of a safe environment, both groups rotated together through the assessments (and HPS if they were in the experimental group) in cadres of five. The hands-on HPS component was done with students individually and there were no confederates. Students were not allowed to ask questions during the simulation. Non-scripted, reflective style debriefing as a group followed upon completion of the last member of the cadre (fifth HPS event of the group) and lasted approximately 20 minutes. There was no individual feedback given, although errors and critical elements were discussed. One trained and blinded debriefer (faculty) facilitated debriefings at all of the sites.

Data Collection Instruments

SE

SE in the management of HF was evaluated by a modified version of a tool developed by Ravert (2004), in which only pertinent questions were edited and used for this study. The resultant SE for nursing skills evaluation tool was a paper-pencil assessment of 3-items on a Likert-scale (from 1 [not at all confident] to 5 [extremely confident]), which measured responses to confidence in performing specific skills associated with those needed in acute HF: SE in the “management of HF,” “prioritizing physician orders,” and “managing a patient’s fluid levels” (Table 1). Reliability results from this study reveal a Cronbach’s alpha of .952, .953, and .953, respectively. In the analyses, posttest SE was used both as a continuous and categorical variable. Posttest SE in the “management of HF” as a

bivariate was categorized as “high” or “low,” with “high” scores being those ≥ 3 (“moderately confident”).

Knowledge

Three parallel HF clinical knowledge questionnaires were developed by the investigator based on national guidelines for HF management (Jessup et al., 2009). Each version of the HF clinical knowledge questionnaire was different but considered parallel (questions with the same intent) to the others. Each questionnaire consisted of 12 items with a maximum possible score of 12 points. The questions did not mention HF by name, so the participant was blinded to the topic of the simulation. However, questions were included that focused on desired nursing interventions for common issues associated with HF, such as elevating the head of the bed and administering oxygen. Both pretests and posttests were monitored by a trained research assistant. Scoring of the HF clinical knowledge tests was via Scantron, an automated grading device. In the analyses, posttest knowledge was used both as a bivariate and continuous variable. Posttest knowledge of HF was categorized as “good” or “poor,” with “good” scores being those ≥ 9 points correct (75%) per faculty consensus.

Validation of Instruments

Validation of SE and HF knowledge questionnaires were done by three experts in HF management (1 cardiologist from a world-renowned HF clinic and 2 doctorally prepared nurses with HF expertise; none were co-investigators on this study). These experts in HF reviewed and provided content validity for both the knowledge and SE assessments with 100% agreement among the three experts.

Demographic Questionnaire

A demographic questionnaire was given to each subject and included the participant’s age, gender, ethnicity, school

Table 1 Self-efficacy for Nursing Skills Evaluation

INSTRUCTIONS: Individuals do many different things to help themselves perform well in different situations. We are interested in how **confident (how comfortable you feel)** you are in performing each of the following skills. For example, for the skill, “*assessing pulses*,” a person might rank their confidence as “*very confident*” (scale D = 4), if they had been taking pulses as a volunteer in a health clinic for 6 months.

We are interested in your **first reaction**: Do not spend a lot of time thinking about how well you do the skill—just how confident you are that you can do it. *Answers are to be placed on the Scantron.*

Skill	A = 1 Not At All Confident	B = 2 Slightly Confident	C = 3 Moderately Confident	D = 4 Very Confident	E = 5 Extremely Confident
1. Managing a patient with the disease/ condition of heart failure					
2. Prioritize physician orders					
3. Monitoring fluid status of a patient					

Adapted with permission from Ravert, P. (2004). Unpublished dissertation.

Table 2 Self-efficacy (SE) and Knowledge Changes within and between Each Group

Measure	Experimental Group Mean $\pm$ SD			Control Group Mean $\pm$ SD			Difference between Groups (Posttest)
	Pretest	Posttest	<i>p</i> Value	Pretest	Posttest	<i>p</i> Value	
SE prioritizing physician orders	2.51 $\pm$ 0.87	3.10 $\pm$ 0.94	<.001 [†]	2.68 $\pm$ 0.88	2.76 $\pm$ 0.84	.063	0.013*
SE in the management of a patient's fluid level	2.62 $\pm$ 1.00	2.75 $\pm$ 0.98	.031*	2.63 $\pm$ 0.93	2.68 $\pm$ 0.82	.077	0.614
SE in the management of the HF patient	2.01 $\pm$ 0.89	2.47 $\pm$ 0.86	<.001 [†]	1.93 $\pm$ 0.88	2.08 $\pm$ 0.97	<.001 [†]	< 0.001 [†]
Knowledge	64.75 $\pm$ 11.94	61.39 $\pm$ 12.71	<.001 [†]	64.03 $\pm$ 13.13	55.47 $\pm$ 14.77	<.001 [†]	< 0.001 [†]

Note. control group = no intervention; HF = heart failure; pretest = baseline; posttest = experimental group after HPS; SD = standard deviation.

* $p < .05$ on *t*-tests and repeated measures analysis of variance.

[†] $p < .001$.

attending, history of personal or family experience with HF, and number of prior HPS exposures in their nursing program.

Data Collection Procedures

Two sequential full days were scheduled for data collection at each site within 3 weeks of their HF lecture. Groups were randomized to either experimental or control by coin flip. Experimental subjects were further randomized via a random numbers table to one of the three parallel HF simulations. The study sequence for the experimental group was to take the SE in HF tool and the HF clinical knowledge questionnaire before HPS (pretest) and a SE in HF tool and a parallel version of the HF clinical knowledge questionnaire after HPS (posttest; Figure 1).

The study sequence for the control group was to take the SE in HF tool and the HF clinical knowledge questionnaire at baseline. Without participating in HPS or debriefing, they took a parallel version of the HF clinical knowledge questionnaire and the SE tool at a time point congruent to the hands-on component of HPS (posttest; 50 minutes after pretest). A trained research assistant administered all of the assessments, but the researcher was responsible for all scoring and data entry. A 2-GB flash drive was given as a thank you gift to all subjects (Figure 1).

Statistical Analyses

Statistical analyses were done using SPSS version 20 software (IBM, Chicago, IL) (SPSS Statistics 20, 2011). Pearson's correlation was used to determine the relationship between the three SE variables and HF knowledge. T-tests were performed to determine changes between the pretest and posttest scores and to compare groups over time. Logistic regression was used to determine the predictors of SE in the "management of HF" and HF knowledge. Covariates for logistic regression analysis were selected from demographic and educational variables which were found to be significantly related to SE or knowledge on a bivariate analysis at $p < .05$.

Results

The variables were examined for accuracy by reviewing data entry responses, fit between their distributions and assumptions examining histograms, normal probability plots of residuals and scatter diagrams of residuals versus predicted residuals. Data distribution was normal and no violations of normality, linearity, or homoscedasticity of residuals were detected. In addition, box plots revealed no evidence of outliers. There were 161 ethnically diverse students in three cohorts of generic baccalaureate and 1 cohort of master's entry nursing students who completed all components of the study. Subjects were predominately female (88.2%) with a mean age of 25.7 years. Despite coin flip randomization, the experimental and control groups were unequal in size (89 and 72, respectively); however, there were no differences between the groups at baseline (pretest) for HF knowledge, SE, or other key characteristics.

SE and Knowledge Changes within Each Group

Changes between testing points in each group for SE and knowledge were examined using *t*-tests. Significant score increases were seen between the pretest and posttest SE and knowledge scores for the experimental group (HPS) but in the control group (no HPS), significant differences were seen in knowledge (score decrease) and one SE variable, "management of the HF patient" (score increase; Table 2).

SE and Knowledge Differences between Groups

Using repeated measures analysis of variance, differences between groups were examined between the pretest and posttest. The experimental and control groups were equivalent at baseline (pretest) for both SE and knowledge, although significantly greater increases were seen in the experimental group at posttest in the areas of Knowledge ($p < 0.01$), SE "prioritizing physician orders" ($p = 0.01$), and SE "management of the HF patient" ($p < 0.01$) (Table 2).

Table 3 Pearson's Correlations between Knowledge and Self-efficacy (SE)

Measure	Pretest All			Post-test Experimental Group			Posttest Control Group		
	Mean $\pm$ SD	<i>r</i>	<i>p</i> Value	Mean $\pm$ SD	<i>r</i>	<i>p</i> Value	Mean $\pm$ SD	<i>r</i>	<i>p</i> Value
Knowledge	64.43 $\pm$ 12.45	—	—	61.38 $\pm$ 12.71	—	—	55.46 $\pm$ 14.77	—	—
SE prioritizing physician orders	2.58 $\pm$ 0.87	−0.16	.05*	3.13 $\pm$ 0.92	−.031	0.77	2.77 $\pm$ 0.81	−.06	.62
SE in the management of a patient's fluid level	2.62 $\pm$ 0.97	.18	.02*	2.75 $\pm$ 0.98	−.031	0.77	2.68 $\pm$ 0.82	.04	.73
SE in the management of the HF patient	1.98 $\pm$ 0.88	.10	.18	2.47 $\pm$ 0.85	−.076	0.48	2.08 $\pm$ 0.97	.009	.94

Note. control group = no intervention; HF = heart failure; pretest = baseline; Post-test = experimental group after HPS; SD = standard deviation.

* $p < .05$.

Correlation between HF Knowledge and SE

Pearson's correlation was done to determine if a relationship existed between SE and HF knowledge in either group (experimental and control). Although there were significant correlations at pretest (negative correlation for SE “prioritizing physician orders” [$r = -0.16$; $p = .05$]; and a positive correlation for SE in the “management of a patient's fluid levels” [$r = 0.18$; $p = .02$]), there were no correlations between SE and HF knowledge at posttest (Table 3). Effect sizes for each testing point for Pearson's correlation ranged from 0.14 to 0.32 (small to medium effect sizes).

Predictors of Knowledge and SE

To determine whether SE “in the management of HF” was a predictor for posttest knowledge, logistic regression was performed with HF knowledge as the dependent variable. The categorized version of the variable knowledge (“good” or “bad”) was used. The covariates included in the model were demographic and study variables with a $p < .05$ on bivariate analyses for HF test scores as well as pretest SE (Table 4). The resulting 6 covariates entered into the forward, stepwise logistic regression analysis for predictors of posttest HF knowledge were group (HPS/experimental or no HPS/control), gender, ethnicity, SE “in the management of HF” at baseline, school, and knowledge at baseline (pretest). Results revealed group (experimental/participants

in HPS) and knowledge at baseline as the only independent predictors for “good” knowledge (Table 5).

A second forward, stepwise logistic regression was done in the interest of determining the predictors of higher posttest SE “in the management of HF” scores. The categorized version of the variable posttest SE “in the management of HF” (“high” scores being those ≥ 3) was used. After bivariate analysis, the 6 covariates entered into the analyses were group (experimental or control), gender, number of prior HPS exposures, ethnicity, SE “in the management of HF” at baseline, and school. The only significant, independent predictors of “high” posttest SE “in the management of HF” were group (experimental) and SE at baseline (Table 6).

Discussion

Results of this study are congruent with the findings of others such that prelicensure nursing students gain confidence (SE) and knowledge with an HPS experience (Alinier et al., 2006; Brannan et al., 2008; Jeffries & Rizzolo, 2006; Kardong-Edgren et al., 2009; Linden, 2008; Ravert, 2004; Shinnick et al., 2011; Shinnick & Woo, 2012). However, a significant correlation between SE and knowledge was not found. Unfortunately, SE has been viewed as an important barometer of HPS success, because it is believed to be related to knowledge. Although educators should strive to develop SE in their students, the limitations of its

Table 4 Bivariate Analysis of Key Variables for Knowledge and Self-efficacy (SE; $n = 161$)

Variable	Mean $\pm$ SD	Knowledge <i>p</i> Value	SE <i>p</i> Value
Age	25.72 $\pm$ 6.6	.131	.619
Group (control = 1; experimental = 2)	1.55 $\pm$ 0.50	<.001 [†]	<.001 [†]
School	2.62 $\pm$ 1.08	<.001 [†]	<.001 [†]
Prior HPS events (<i>n</i>)	0.59 $\pm$ 1.1	.760	<.001 [†]
Gender (female = 1; male = 2)	1.12 $\pm$ 0.32	<.001 [†]	<.001 [†]
Ethnicity (1 = white; 2 = all others)	1.86 $\pm$ 0.34	<.001 [†]	<.001 [†]
Pretest SE in the “management of HF”	1.98 $\pm$ 0.88	<.001 [†]	<.001 [†]
Pretest knowledge	64.43 $\pm$ 12.45	.020*	.208

Note. HF = heart failure; HPS = human patient simulation.

* $p < .05$.

† $p < .001$.

Table 5 Logistic Regression: Predictors of “Good” Knowledge (n = 161)

Variable	Mean ± SD	Bivariate <i>p</i>	Multivariate <i>p</i>	Exp (B)	B
Group (control = 1; experimental = 2)	1.55 ± 0.50	< 0.001 [†]	< 0.001 [†]	0.073	−2.62
Gender (female = 1; male = 2)	1.12 ± 0.32	< 0.001 [†]	—	—	—
Ethnicity (1 = white; 2 = all others)	1.9 ± 0.34	< 0.001 [†]	—	—	—
Pretest SE “management of HF”	1.98 ± 0.88	< 0.001 [†]	—	—	—
School	2.62 ± 1.08	< 0.001 [†]	—	—	—
Pretest knowledge	64.43 ± 12.45	0.020*	0.013*	1.041	0.04

Note. HF = heart failure; SD = standard deviation; SE = self-efficacy.

* *p* < .05.

† *p* < .001.

relationship to knowledge (there does not seem to be any needs to be acknowledged).

Additionally, SE was not found to be a predictor of “good” HF knowledge on a logistic regression analysis. Participating in HPS (experimental group) and HF knowledge at baseline are the only predictors of this desired knowledge outcome. Although this is good news for HPS as a teaching methodology, it is not encouraging news for use of SE as an indicator of nursing student knowledge. SE does not seem to be an acceptable surrogate measure for knowledge and thus should not be used as the sole or major outcome variable to assess understanding of concepts in nursing students. Additionally, as the predictors of “high” SE were only group membership (experimental group) and SE at baseline, the value of SE assessment in HPS is further diminished. Clearly, “high” SE after HPS seems more related to one’s pre-HPS level of SE rather than as a result of knowledge gains.

One explanation for these outcomes may be related to the instrument used to measure SE. The SE for nursing skills evaluation tool may not have been sensitive or detailed enough to best reveal a subject’s SE in the area of managing a HF patient, as care for this type of situation requires multiple interventions. Although SE is a complex phenomenon, it is subjective and thus more items on the SE instrument would not necessarily change the subject’s response. Although others have used multiple item SE assessments in HPS (Jarzemsky & McGrath, 2008; Jeffries & Rizzolo, 2006; Lauder et al., 2008; McCausland, Curran,

& Cataldi, 2004; Ravert, 2004), they typically are inquiring about a subject’s SE in multiple topic areas.

Another reason for this outcome is the idealistic view of skill ability in these prelicensure nursing students. Interestingly, on the SE instrument’s 5-point Likert scale (1 [not at all confident] to 5 [extremely confident]), subjects with a SE score of 3 or 4 scored highest on posttest HF knowledge, whereas those with SE scores of 1, 2, or 5 had lower HF knowledge scores. Although skill level was not measured in this study, there is a possibility that BOTH students who were very hesitant about their HF skills and those who were overconfident regarding their HF abilities could enter the clinical setting lacking the knowledge needed to care for this type of patient. Therefore, although the optimal target for SE may be a 3 or 4 (moderate SE level), it is hoped HPS (through simulated clinical performance and debriefing) provides prelicensure nursing students with a more realistic appraisal of what caring for a HF patient is actually like, as well as their own ability.

Educators have placed significant importance on student SE after HPS without identifying its value as related to critical characteristics such as knowledge and skills (Bambini et al., 2009; Brown, 2008; Cardoza & Hood, 2012; Kameg et al., 2010; Lauder et al., 2008; Leigh, 2008a; Ravert, 2004; Tuttle, 2009). This study, using a 2-group, randomized, clinical trial design, has shown SE to have no relationship to HF knowledge; nor is it a predictor for “good” HF knowledge scores. Although some level of

Table 6 Logistic Regression: Predictors of “High” Self-efficacy (SE) “in the Management of Heart Failure” (HF; n = 161)

Variable	Mean ± SD	Bivariate <i>p</i>	Multivariate <i>p</i>	Exp (B)	B
Group (control = 1; experimental = 2)	1.55 ± 0.50	< 0.001 [†]	.002*	0.269	−1.31
Gender (female = 1; male = 2)	1.12 ± 0.32	< 0.001 [†]	—	—	—
Prior HPS exposures (n)	0.59 ± 1.1	< 0.001 [†]	—	—	—
Ethnicity (1 = white; 2 = all others)	1.9 ± 0.34	< 0.001 [†]	—	—	—
SE “in the management of HF” at baseline (pretest)	1.98 ± 0.88	< 0.001 [†]	<.001 [†]	5.88	1.77
School	2.62 ± 1.08	< 0.001 [†]	—	—	—

Note. HPS = human patient simulator; SD = standard deviation.

* *p* < .05.

† *p* < .001.

confidence in nursing students is desired, the value of high SE is questionable. Therefore, educators should be cautious in applying such great importance to a student's SE (Lundberg, 2008) and spend more effort on measuring outcomes that affect patient safety, such as knowledge and skill level. Further research is needed to determine whether a relationship exists between SE and skill level such that clinical implications can be drawn and the clinical value of SE determined.

Study Limitations

Although efforts were made to minimize study limitations, some were unavoidable. At each study site, different resident faculty gave their usual cardiac lecture, which included HF. Although a limitation, the lecturers did not know the content of the HPS. In addition, the emphasis on HF may have varied from school to school, because it was part of a larger, cardiac topic lecture. Subjects at one of the sites had experienced HPS before, but not on the topic of HF. However, the randomization of subjects and their equivalency at baseline/pretest for this study support the contention that variations in school, teaching, or content regarding HF was not a significant factor for HF knowledge in this project.

Students may have had different and unequal clinical experiences in HF before the study. Attempts were made to control this by randomization to group assignment and scheduling the study within 2 weeks of the HF lecture at each site. Additionally, groups were equivalent at baseline. Contamination of the study content may have occurred with students discussing the simulation experience among themselves (cross-talk) despite confidentiality agreements. This was apparent only at the end of the last study day at 1 site with 2 subjects. There was no difference in results when the 2 subjects were removed from the sample in a preliminary analysis and, because contamination was not confirmed, they were included in the final analysis.

Previous simulation experiences differed slightly between the groups as 1 of the 4 study cohorts had experienced simulation in other courses. This cohort seemed more comfortable in the simulation and did not need as much cuing as the others, although they did not score the highest on the knowledge scores. All students were oriented to the HPS manikin and the environment before the simulation to decrease the effect of this limitation.

In conclusion, although both SE and knowledge increased after HPS, there was no relationship between SE and HF knowledge. Furthermore, although HPS participation was a predictor of both higher SE and knowledge, SE did not predict knowledge. Further studies in other nursing groups and with other diagnoses are needed to substantiate these results.

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References

- Alinier, G., Hunt, B., Gordon, R., & Colin, H. (2006). Effectiveness of intermediate-fidelity simulation training technology in undergraduate nursing education. *Journal of Advanced Nursing*, 54(3), 359-369.
- Bambini, D., Washburn, J., & Perkins, R. (2009). Outcomes of clinical simulation for novice nursing students: Communication, confidence, clinical judgment. *Nursing Education Perspectives*, 30(2), 79-82.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215.
- Bandura, A., & Locke, E. A. (2003). Negative self-efficacy and the goal effects revisited. *Journal of Applied Psychology*, 88, 87-99.
- Bearnson, C. S., & Wiker, K. M. (2005). Human patient simulators: A new face in baccalaureate nursing education at Brigham Young University. *Journal of Nursing Education*, 44(9), 421-425.
- Brannan, J., White, A., & Bezanson, J. (2008). Simulator effects on cognitive skills and confidence levels. *Journal of Nursing Education*, 47(11), 495-500.
- Bremner, M. N., Aduddell, K., Bennett, D. N., & VanGeest, J. B. (2006). The use of human patient simulators: Best practices with novice nursing students. *Nurse Educator*, 31(4), 170-174.
- Brown, S. C. (2008). *The impact of high fidelity simulation and role modeling in the acquisition of critical thinking skills and self-efficacy: an experimental study*. (Ph.D.). University of Northern Colorado. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2010550100&site=ehost-live> Available from EBSCO-host rzh database.
- Brown, D., & Chronister, C. (2009). The effect of simulation learning on critical thinking and self-confidence when incorporated into an electrogram nursing course. *Clinical Simulation in Nursing*, 5(1), e45-e52.
- Cardoza, M. P., & Hood, P. A. (2012). Comparative study of baccalaureate nursing student self-efficacy before and after simulation. *Computers, Informatics, Nursing*, 30(3), 142-147.
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175-191.
- Feingold, C., Calaluze, M., & Kallen, M. (2004). Computerized patient model and simulated clinical experiences: Evaluation with baccalaureate nursing students. *Journal of Nursing Education*, 43(4), 156-163.
- Gordon, C. J., & Buckley, T. (2009). The effect of high-fidelity simulation training on medical-surgical graduate nurses' perceived ability to respond to patient clinical emergencies. *Journal of Continuing Education in Nursing*, 40(11), 491-498.
- Jarzemsky, P. A., & McGrath, J. (2008). Look before you leap: Lessons learned when introducing clinical simulation. *Nurse Educator*, 33(2), 90-95.
- Jeffries, P., & Rizzolo, M. (2006). *Designing and implementing models for the models for the innovative use of simulation to teach nursing care of ill adults and children: A national, multi-site, multi-method study. Summary report*. New York: National League for Nursing.

- Jessup, M., Abraham, W. T., Casey, D. E., Feldman, A. M., Francis, G. S., Ganiats, T. G., & Yancy, C. W. (2009). 2009 focused update: ACCF/AHA guidelines for the diagnosis and management of heart failure in adults. *Circulation*, 119(14), 1977-2016.
- Kameg, K., Howard, V. M., Clochesy, J., Mitchell, A. M., & Suresky, J. M. (2010). The impact of high fidelity human simulation on self-efficacy of communication skills. *Issues in Mental Health Nursing*, 31(5), 315-323.
- Kardong-Edgren, S., Lundstrom, N., & Bendel, R. (2009). VitalSim versus SimMan: A comparison of BSN student test scores, knowledge retention, and satisfaction. *Clinical Simulation in Nursing*, 5(3). <http://dx.doi.org/10.1016/j.ecns.2009.01.007>.
- Kisiel, M. (2006). Nursing observations: knowledge to help prevent critical illness. *British Journal of Nursing*, 15(19), 1052-1056.
- Lauder, W., Holland, K., Roxburgh, M., Topping, K., Watson, R., Johnson, M., & Behr, A. (2008). Measuring competence, self-reported competence and self-efficacy in pre-registration students. *Nursing Standard*, 22(20), 35-43.
- Leigh, G. T. (2008a). *Examining the relationship between participation in simulation and the levels of self-efficacy reported by nursing students*. (D.N.P.), Case Western Reserve University (Health Sciences). Retrieved from. <http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2009988806&site=ehost-live> Available from EBSCOhost rzh database.
- Leigh, G. T. (2008b). High-fidelity patient simulation and nursing students' self-efficacy: a review of the literature. *International Journal of Nursing Education Scholarship*, 5(1), 17.
- Linden, L. (2008). *The effect of clinical simulation and traditional teaching versus traditional teaching alone on critical thinking of nursing students*. Omaha, NE: College of Saint Mary.
- Lundberg, K. M. (2008). Promoting self-confidence in clinical nursing students. *Nurse Educator*, 33(2), 86-89.
- McCausland, L. L., Curran, C. C., & Cataldi, P. (2004). Use of a human simulator for undergraduate nurse education. *International Journal of Nursing Education Scholarship*, 1, Article 23.
- Miller, L. W., & Missov, E. D. (2001). Epidemiology of heart failure. *Cardiology Clinics*, 19(4), 547-555.
- Nishisaki, A., Keren, R., & Nadharni, V. (2007). Does simulation improve patient safety? Self-efficacy, competence, operational performance and patient safety. *Anesthesiology Clinics*, 25, 225-236.
- Pike, T., & O'Donnell, V. (2010). The impact of clinical simulation on learner self-efficacy in pre-registration nursing education. *Nurse Education Today*, 30(5), 405-410.
- Ravert, P. (2004). *Use of a human patient simulator with undergraduate nursing students: A prototype evaluation of critical thinking and self-efficacy*. Unpublished doctoral dissertation. Salt Lake City: The University of Utah.
- Reznek, M., Smith-Coggins, R., Howard, S., Kiran, K., Harter, P., Sowb, Y., & Krummel, T. (2003). Emergency medicine crisis resource management (EMCRM): Pilot study of a simulation-based crisis management course for emergency medicine. *Academic Emergency Medicine*, 10(4), 386-389.
- Scott, C., & MacInnes, J. D. (2006). Cardiac patient assessment: Putting the patient first. *British Journal of Nursing*, 15(9), 502-508.
- Sherman, F. T. (2002). Vital signs are still... well, vital. How 'Dr. Rectal,' a stickler for proper technique, never misses a fever. *Geriatrics*, 57(3), 9, 12.
- Shinnick, M., Woo, M., Horwich, T., & Steadman, R. (2011). Debriefing: The most important component in simulation? *Clinical Simulation in Nursing*, 7(3), e105-e111.
- Shinnick, M., & Woo, M. A. (2012). Predictors of knowledge gains using simulation in the education of pre-licensure nursing students. *Journal of Professional Nursing*, 28, 41-47.
- Smith, S. J. (2008). *High-fidelity simulation in nursing education: Design characteristics and their effect on student satisfaction and self-efficacy*. (PhD dissertation). Greeley: University of Northern Colorado. Retrieved from. <http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2010155042&site=ehost-live> Available from EBSCOhost rzh database.
- SPSS Statistics 20. (2011). Chicago, IL: IBM SPSS, Inc. Retrieved from. www.spss.com.
- Sturm, H., van Gilst, W., Swedberg, K., Hobbs, F. D. R., & Haaijer-Ruskamp, F. (2005). Heart failure guidelines and prescribing in primary care across Europe. *BMC Health Services Research*, 5(1), 57.
- Taekman, J. M., Hobbs, E., & Wright, M. C. (2007). Intraoperative apnea: Medication error with disclosure (simulation case scenario). *Simulation in Healthcare*, 2(1), 39-42.
- Tuttle, R. E. (2009). *The impact of simulation in nursing education on the self-efficacy and learner satisfaction of nursing students*. PhD dissertation. Minneapolis: Capella University. Retrieved from. <http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2010634672&site=ehost-live> Available from EBSCOhost rzh database.