Ability to Care in Acute Situations—The Influence of Simulation-Based Education on New Graduate Nurses

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Contribution to Emergency Nursing Practice

- Acute care situations are known to be challenging for a novice nurse. Studies have reported simulation-based education to support new graduate nurses' clinical judgment, confidence, and clinical practice.
- This study adds knowledge about the influence of a simulation on perceived ability to provide care in acute situations. Using a scale specifically developed for new graduate nurses, a significant increase in perceived abilities to care in acute situations was found.
- Simulation-based education can influence newly graduated nurses' perceived ability to provide care in acute situations. Experiences from working in acute situations seem more important than length of work experience to facilitate perceived ability.

Abstract

Introduction: Simulation-based education is frequently used in transition programs for new graduate nurses. Simulation-based education is implemented as a measure to practice nursing skills, gain experience, and prepare nurses for caring in challenging situations, such as acute situations. However, concerns about the data supporting the use of simulation are obtained from small studies that do not use validated measurement scales.

Objective: This study aimed to explore the influence of simulation-based education on new graduate nurses' perceived ability to provide care in acute situations.

Methods: A total of 102 new graduate nurses participated in simulation-based education as a mandatory part of an introductory program. They completed a premeasurement and a postmeasurement using the Perception to Care in Acute Situations scale. The Wilcoxon signed-rank test and the paired samples *t* test were used to test the statistical significance of outcomes for the simulation-based education, with the alpha set at 0.05. Cohen's *d* formula was used to calculate the effect size.

Results: The Wilcoxon signed-rank test on the total scale score showed that simulation-based education resulted in a statistically significant change in the nurses' perceptions of their ability to care in acute situations ($N = 99$; $Z = 7877$; $P < .001$). The paired samples *t* test showed that the mean posteducation score was significantly higher ($P < .001$) in the total score. Cohen's *d* formula (−1.24) indicated a large effect size on the total score.

Discussion: Simulation-based education can provide an effective means of improving new graduate nurses' perceived ability to provide care in acute situations.

Key words: Simulation; Nursing; Transition; New graduate nurse

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Introduction

Nurses play a crucial role in recognizing and responding to acute situations.[1] This issue is further complicated by the fact that patient acuity is expected to increase in hospital wards as patients get older and have more complex care needs.[2] In a

review, Hawkins et al[3] found that the experiences of new graduate nurses (NGNs) transitioning to acute care settings are dominated by fear. This was illustrated as fear of the acuity of patients, making mistakes, harming patients, the unknown after orientation, and not meeting expectations. Critically ill patients and limited resources have been reported to influence NGNs' feelings of being overwhelmed.[4] The reason for this overwhelming feeling can be related to their limited clinical experience, with limited ability to recognize and sort out what to focus on in acute situations.[5] Specific areas that NGNs find challenging and important aspects of caring in acute situations are confidence in the provision of care, communication, and including the patient perspective.[6]

To facilitate the challenging transition process from being a nursing student to being a registered but novice nurse, different interventions and transition programs have been developed.[7,8] As one of several learning activities, simulation-based education is often incorporated into these programs to support NGNs in developing their readiness for action.[9] Simulation in health care settings creates a situation or environment that allows participants to experience a representation of a real event for practice, learning, evaluation, testing, or gaining an understanding of systems or human actions.[10] Advantages of simulation-based education are the ability to include repetition, specific diseases and scenarios and, most critically, allow participants to make mistakes in a safe atmosphere without fear of causing harm to patients.[11] A review from the specific context of transition program studies indicated that the use of simulation-based education improved NGNs' perceptions of their skills, confidence, competence, and readiness for practice.[12] Elsewhere, simulations have been reported to enhance NGNs' ongoing development of clinical judgment and their ability to notice patient issues and reflect on care experiences.[13]

Despite literature indicating that simulation-based education is beneficial, there is no consensus regarding the types and timing of simulations.[14,15] There are also concerns that data for simulation-based education in NGN transition programs are often obtained from small sample sizes with low statistical significance that fail to use valid, reliable, and psychometric-tested scales.[12] Hence, we need to better understand whether and how simulation-based education can improve NGNs' perceived ability to provide care in acute situations using a scale specifically developed for measuring NGNs' ability in acute situations.

AIM

This study aims to explore the influence of simulation-based education on NGNs' perceived ability to provide care in acute situations.

Methods

The reporting of this study was guided by the Cheng et al[16] guidelines for health care simulation research: extensions to the Consolidated Standards of Reporting Trials and Strengthening the Reporting of Observational Studies in Epidemiology statements.[16]

STUDY DESIGN

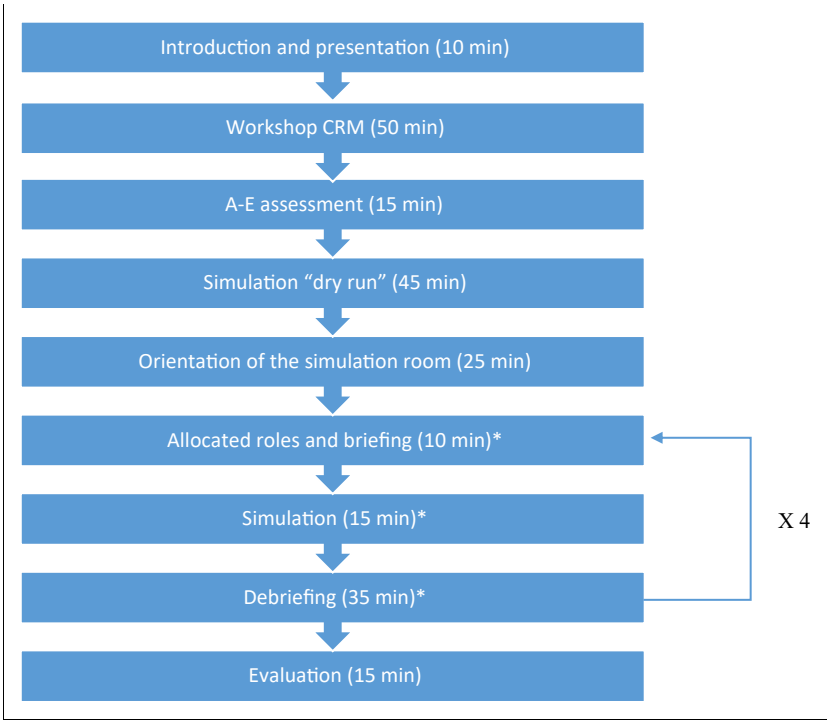
The study used a quantitative method with a pretest and post-test design.

SETTING

The study was conducted at a regional simulation center in the southwest region of Sweden. The simulation center is located at a university hospital, where the participants also work; thus, the medical equipment, devices, and procedures are well known to most of the participants. The center provides high-fidelity simulation that creates a high degree of realism through the careful selection of equipment (such as advanced patient simulators) and scenarios. All simulation facilitators and operators/technicians have completed a course to be medical simulation instructors or operators. Facilitators also have vast clinical experience working as nurses/physicians in various wards. The 1-day simulation-based education studied has been part of the regional transition program for several years. The overall design and components of the program (eg, introducing workshop, practical work, observation, and debriefing) have been similar over the years, although scenarios and facilitators/operators have varied and refinements in equipment have been made.

SIMULATION-BASED EDUCATION

The simulation-based education was developed by representatives from the introduction program and the simulation and education center at the university hospital. The first activity was a workshop building Lego. The activity focused on attempting to provide clear instructions, cooperation, and communication given that participants may have been new to one another. This activity led to the introduction of a set of principles in crisis resource management.[17] Thereafter, a movie covering the Airway, Breathing, Circulation, Disability, Exposure assessment[18] was shown. The next step was a simulation without a patient simulator. Participants received a patient case and cards with a range of actions described. A facilitator then led the simulation exercise orally, with 2 participants in each group. The next part was



FIGURE

The process of the simulation-based education. CRM, crisis resource management. *Small groups.

an orientation of the simulation room, including the equipment, available medicines, patient simulator, and environment.

The group was then divided into smaller groups with a maximum of 8 participants. Four patient scenarios were simulated, one at a time and with debriefing sessions in between. The simulated scenarios were a patient with chest pain, a patient with an altered level of consciousness, a patient with sepsis, and a patient with chronic obstructive pulmonary disease who was intoxicated with opioids. The sex of the patient simulator varied depending on the sex of the simulation operator/technician (ie, if the operator was a female, the patient was a female). The scenarios started with one primary nurse entering the room. The others in the allocated group either waited in the adjacent corridor ready to participate in the scenario when they were called upon or were allocated the role of an observer. The observers observed the scenarios in a room that was fully equipped with audio and video from the simulation room. The observers were given a specific task in each scenario, such as monitoring the use of the crisis resource management criteria, re-evaluation, closed loops, or speak up. These observations were later discussed in the debriefing session, accompanied by feedback from the facilitator after each scenario. Between each of the 4 scenarios, nurses were assigned a new role to allow the participants to alternate between active participation in a scenario and the role of an observer. This means that all participants were actively engaged in both scenario work and observation during the education day. Once all scenarios were performed and debriefed, the whole group gathered and evaluated the day verbally and in writing. Figure illustrates the process of the simulation-based education.

MEASUREMENT OF OUTCOMES

The outcome of the simulation-based education was measured using the Perception to Care in Acute Situations (PCAS) scale. The PCAS scale was developed and validated as a measure of novice nurses' ability to care in acute situations.[6] The scale consists of 17 items grouped into 3 factors: confidence in the provision of care (10 items), communication (4 items), and patient perspective (3 items). The items used a 4-point scale ranging from 1 to 4. High scores indicate an inclination toward the perception of the ability to

care in acute situations. The PCAS scale has been suggested for both reflection and evaluation of novice nurses' training interventions, such as simulation. A brief statement in the introduction of the scale describes these acute situations as sudden changes in care situations (eg, in patient status) or the perception that there is insufficient time in relation to actions that must be performed. A common illustration of an acute situation is when a patient experiences a sudden illness.[6]

PARTICIPANTS AND DATA COLLECTION

The foci of this study were NGNs who participated in a simulation-based education activity in a mandatory part of a regional NGN transition program. NGNs were defined as having fewer than 2 years of work experience after graduation.

Representatives of the introduction program distributed an information letter to all NGNs in the transition program during the autumn of 2021. The letter contained initial information about the study and included contact information for the research group. When attending the simulation-based education, the participants received both written and oral information about the study and the opportunity to ask questions. A written informed consent was obtained when the participants completed the PCAS scale before the start of the first activity as a baseline measurement (pre-education data). Subsequently, after completing the education day, the participants completed the PCAS scale for a second time (posteducation data). Data were collected from 17 simulation education days. The number of participants varied from 3 to 12 per education day.

TABLE 1
Participant demographics

Variable	Value
Participants	102
Sex, N (%)	
Female	91 (89)
Male	9 (9)
Other/unknown	2 (2)
Median age (range)	27 (22-50)
Median months working experience (range)	12 (6-22)
No. of universities nurses graduated from	13
Work experience in health care before nursing education, n (%)	64 (63)
Education in another health care related profession before nursing education, n (%)	24 (24)
Work experience in health care during nursing education, n (%)	89 (88)
Experience of acute situations during nursing education, n (%)	59 (58)
Experience of acute situations posteducation, n (%)	
Few	72 (71)
Many	30 (29)
Acute care/in patient wards represented, N	22
Nurses in each specialization, n	
Medicine	44
Surgery	38
Emergency department	9
Psychiatric	3
Combinations/missing	8

ANALYSIS

Data were analyzed using SPSS 27 for Windows (IBM Corp, Armonk, NY).[19] Descriptive statistics and frequency statistics were used to analyze missing data, errors, and demographics. Owing to the ordinal nature of the scale, the nonparametric Wilcoxon signed-rank test was applied to observe differences in repeated measurements. The Wilcoxon signed-rank test was designed for analyzing paired ordinal data.[20,21] Calculations were made on both items, factor and total score on pre-education and posteducation data. For comparative purposes, paired samples *t* tests[20,21] were also calculated. Differences in demographic variables (experience) and score between participants on both pretest and post-test were analyzed using independent sample *t* tests (2-tailed).[20,21] Before this analysis, the normality of the score distribution was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests.[22] A significance level (alpha) was defined as $P < .05$ (2-tailed). The effect size for the tests was calculated using Cohen's d formula: small ($d \geq 0.20$), medium ($d \geq 0.50$), and large ($d \geq 0.80$).[23] Internal consistency as a degree of reliability of the scale was assessed both in pre-/post-education using Cronbach's alpha.[24]

ETHICAL CONSIDERATIONES

This study followed the principles stated in the Declaration of Helsinki.[25] To accomplish this, information was given both verbally and in writing. A written informed consent

TABLE 2
PCAS-scale item and factors

Factor 1 "Confidence in provision of care"
1. I worry about providing care in acute situations
2. I trust my ability to provide care in acute situations
3. I have sufficient knowledge to provide care in acute situations
4. I estimate my general ability to provide care in acute situations
5. I estimate my ability to manage the demands that I place upon myself in acute situations
6. I estimate my ability to manage demands from my colleagues in acute situations
7. I estimate my ability to independently determine necessary actions in acute situations
8. I estimate my ability to independently prioritise between actions in acute situations
9. I estimate my ability to independently lead bedside care in acute situations
10. I estimate my ability to understand the individual patient's medical needs in acute situations
Factor 2 "Communication"
11. I estimate my ability to take instructions over the telephone in acute situations
12. I estimate my ability to carry out instructions that I have received over the phone in acute situations
13. I estimate my ability to receive instructions from an attending doctor in acute situations
14. I estimate my ability to report a patient's condition to a nurse in an acute situation
Factor 3 "Patient perspective"
15. I estimate my ability to make patients participate in acute situations
16. I estimate my ability to understand the individual patient's care needs in acute situations
17. I estimate my ability to provide information adapted to the needs of the individual in acute situations
Pre-education Cronbach alpha: Total scale 0.877
Posteducation Cronbach alpha: Total scale 0.886

PCAS, Perception to Care in Acute Situations.

was obtained, ensuring that participation in this study was voluntary and that responses were treated anonymously. Participants were informed of their right to withdraw at any time without giving a reason. Ethical approval was waived by the Swedish Ethical Review Authority (DNR: 2019-06329) because this type of study is exempt from ethical approval according to the Swedish Ethical Review Act.[26]

Results

A total of 109 NGNs were asked to participate in the study at the start of simulation-based education. One nurse declined to participate. Six participants were excluded from the study owing to missing data > 20% on one scale. Of the remaining 102 NGNs, 3 participants each had one missing value on the PCAS scale: 2 nurses in the pretest and 1 in the post-test. Owing to the ordinal nature of the scale and the sample size in this study, we chose not to impute any data. Accordingly, the analysis was performed based on data from between 99 and 102 NGNs.

The demographics of the 102 participants are presented in detail in Table 1. For the total sample, the median age was 27 years. Most participants were female (89%). Their median working experience as nurses was 12 months. Of the participants, 58% had experience with acute situations during their nursing education (eg, from clinical training); they were educated at 13 universities and represented 22 different wards or departments.

The PCAS scale items and factors are presented in Table 2. Internal consistency as a measure of reliability on the PCAS scale was assessed using Cronbach's alpha. The PCAS scale pre-education test demonstrated an alpha coefficient of .877 and a posteducation coefficient of .886, indicating that the PCAS scale was sufficient for research.[27]

The Wilcoxon signed-rank test (Table 3) indicates that participation in simulation-based education had a statistically significant increase in the NGNs' perception of their ability to care in acute situations (N = 99;

TABLE 3
Wilcoxon signed-rank test before and after education

Items pre-post	Total	Negative	Positive	Ties	Z	Significant(2-tailed), *P* value
1	102	6	37	59	4425	< .001
2	102	8	51	43	5574	< .001
3	102	7	48	47	5504	< .001
4	100	5	36	59	4824	< .001
5	102	4	36	62	5009	< .001
6	102	4	30	68	4459	< .001
7	102	13	30	59	2595	< .010
8	102	6	31	65	4111	< .001
9	102	3	49	50	6299	< .001
10	102	4	43	55	5689	< .001
11	101	8	26	67	3124	< .002
12	102	3	34	65	5096	< .001
13	102	6	28	68	3781	< .001
14	102	5	31	66	4317	< .001
15	102	4	45	53	5456	< .001
16	102	4	27	71	3768	< .001
17	102	4	35	63	4584	< .001
F1	100	8	86	6	7617	< .001
F2	101	9	49	43	5220	< .001
F3	102	4	56	42	5670	< .001
TS	99	9	86	4	7877	< .001

F, factor; TS, total scale.

Z = 7877; $P < .001$). The total score results were 86 positive, 9 negative, and 4 ties (no change). The Wilcoxon signed-rank test of each factor also indicated a statistically significant increase in the NGNs' perception of factor 1 (confidence in provision of care [N = 100; Z = 7617; $P < .001$]), factor 2 (communication [N = 101; Z = 5220; $P < .001$]), and factor 3 (patient perspective [N = 102; Z = 5670; $P < .001$]).

The normality test of score distribution was calculated on the pretest total score using the Kolmogorov-Smirnov test ($P = .107$) and the Shapiro-Wilk test ($P = .756$). Given that data indicated normality, mean scores were calculated for each factor and the total score and were compared between pre-education and posteducation; details are presented in Table 4. The paired sample *t* test indicated the mean posteducation score was significantly higher ($P < .001$) for all 3 factors, as was the total score, indicating that participation in simulation-based education had a statistically significant change on nurses' perception of their ability to care in acute situations. The effect size of the mean scores between pre-education and posteducation data was calculated using Cohen's d effect size −1.24, indicating a large effect size on the total score.

Independent *t* tests (Table 5) on mean score before and after education were significant ($P < .05$) for experience in acute situations during nursing education and experiences of acute situations postnursing education. Work experience was not significant ($P > .05$) in mean score before and after education.

Discussion

The results of this pretest and post-test study found that simulation-based education can increase NGNs' perceptions of their ability to provide care in acute situations. An increased perception of ability was found to be statistically significant using the Wilcoxon signed-rank test for total score and the 3 PCAS scale factors: confidence in the

TABLE 4
Paired sample *t* test and Cohen's *d* effect size

	n	Mean	SD	SE mean	Paired *t* test			Cohen's *d*
					t value	df	Significant (2-tailed) *P* value	
Factor 1 "Confidence in provision of care"								
Pretest	100	25.59	4.02	.402	−11.346	99	< .001	−1.13
Post-test		28.98	3.60	.360				
Factor 2 "Communication"								
Pretest	101	11.95	1.59	.158	−5973	100	< .001	−059
Post-test		12.93	1.90	.189				
Factor 3 "Patient perspective"								
Pretest	102	8.49	1.49	.147	−6.478	101	< .001	−064
Post-test		9.47	1.27	.125				
Total score								
Pretest	99	46.04	5.68	.571	−12.357	98	< .001	−1.24
Post-test		51.47	5.56	.559				

F, factor; TS, total scale.

provision of care, communication, and patient perspective.[6] Based on paired sample *t* tests, the mean posteducation score was significantly higher for the total score and all 3 factors. Cohen's d effect size indicates a large effect size on the total score and "confidence in the provision of care" and medium effect sizes on the factors "communication" and "patient perspective." Subsequently, the increase in "confidence in the provision of care" was specifically evident, whereas more ties were reported regarding "communication" and "patient perspective." The differences between the factors can be explained by the NGN's skill levels. In this simulation, the NGNs were trained to use an algorithm (Airway, Breathing, Circulation, Disability, Exposure), a procedure that could provide nurses with the confidence to care safely and adequately in acute situations. Access to procedures is necessary for the novice/advanced beginner in managing clinical situations.[5] However, in nurse's practice and "know how," a great deal of knowledge is tacit, knowledge that cannot be fully developed unless it is made visible. Simulation-based education can also facilitate reflection and consequently the development toward a deeper practical understanding.[5] Thus, simulations may improve self-confidence in dealing with acute situations by increasing the NGN's practical and tacit understanding.

The incorporation of simulation-based education into transition programs is a widespread and effective strategy to improve nurses' skills, improve quality in health care, and reduce errors.[28] The effect size in the present study suggests the greatest improvement of the factor "confidence in the provision of care," which may be an indicator of an increase in NGNs' skills. A review by Connell et al[29] of the effectiveness of education on the recognition and management of deteriorating patients also found that simulation-based education improved overall techniques and skills. NGNs' improvement in confidence using simulation-based education, including in acute situations, has also been reported previously.[30,31]

The results on 1 specific item, number 7, "I estimate my ability to independently determine necessary actions in acute situations," were not in line with the rest of the items. The Wilcoxon signed-rank test showed that 13 participants perceived a decrease in their ability on this item. A possible explanation for this decrease could be that some participants became aware of their lack of knowledge and experience related to the medical problems presented during the simulation. Such an understanding may be the basis for not feeling able to independently determine what actions are needed.

Crowe et al[30] demonstrated the importance of confidence to independently determine necessary actions in acute situations. They found that low confidence contributes to delays and an inability to perform appropriate care in acute situations. Therefore, the overall strong effect on the factor

TABLE 5
Difference in PCAS scores between participant groups

	Pre-education (mean)	Significant (2-tailed) *P* value	Posteducation (mean)	Significant (2-tailed) *P* value
Experience of acute situations during nursing education				
No	44.22	.010	49.90	.019
Yes	47.22		52.51	.019
Work experience as a nurse				
< 12 mo	45.74	.636	52.30	.114
> 12 mo	46.28		50.54	
Experience of acute situations posteducation				
Few	44.97	.004	50.59	.020
Many	48.55		53.36	

PCAS, Perception to Care in Acute Situations.

"confidence in the provision of care" could be seen as crucial for facilitating appropriate care in acute situations.

The comparison of scores using independent sample *t* test revealed a significant difference both before and after the simulation-based education based upon participation in acute situations during nursing education and acute situation experiences after nursing education. The result of this finding corresponds to those of Sterner et al[32] who indicated that participation in acute situations during nursing education and posteducation had a significant effect on perceived ability to provide care in acute situations.

An interesting finding in this study was that working experience as a nurse was not significant in perceived ability to provide care. Working length as a nurse and higher self-assessed competence have been found in several other studies.[33] However, our results indicate that in providing care in acute situations there is an importance of a contextual experience of acute situations and not mere working experience. This also corresponds to Benner[5] who means that acquisition and development of skills are the use of concrete experience and not mere passage of time.

This study continues to build on evidence for simulation-based education as a measure to increase nursing competence in different forms. The findings of this study can be used as a basis for further investigation of whether and how modifications to simulated scenarios or educational components (eg, debriefing, progression in practical moments) can provide strong support for the development of communication and patient perspectives in acute situations. Future studies could also explore how NGNs translate their knowledge into clinical practice and the possible long-term effects of simulation-based interventions for NGNs.

Implications for Emergency Nurses

Simulation-based education can influence the perceived ability to provide care in acute situations. This study also confirms the importance of providing experiences of acute situations during nursing education and posteducation to develop this ability in early working life. This reinforces the importance clinical placements on wards and clinics with a high ratio of acute situations during nursing education, but also the value of including simulations focusing acute situations in transition programs for further developing this ability.

LIMITATIONS

The use of a pretest and post-test study methodology is not as rigorous as a study with randomization or a control group. The choice of a validated and psychometric-tested instrument for the measurement of the ability to care in acute situations should, however, be considered a methodological strength.[12] Furthermore, the data in this study were self-reported. However, the use of self-reported data is frequently used in simulation-based studies,[34] owing to a lack of objective measures. NGNs in this study were defined as having fewer than 2 years of work experience after graduation. The reason for the inclusion of participants with working experience up to 22 months was that they still were subject to the transition program.

Conclusion

The transition from NGN to competent, confident, and independent nurse is challenging, calling for meaningful and effective learning opportunities for NGNs to support

practice needs and expectations. Acute situations are described as specifically challenging for NGNs; thus, it is important to highlight initiatives in transition programs that influence the perceived ability to provide care in these situations. This study supports previous findings that simulation-based education for NGNs can provide an effective means of improving perceived ability to provide care. A contribution from this study is the significant findings and strong effect on perceived ability to provide care in the specific context of acute situations. More specifically, aspects of confidence, communication, and patient involvement were found to be positively influenced.

Author Disclosures

Conflicts of interest: none to report.

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