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Effects of Simulation-Based Education for Cardiac Arrest on Nursing Students' Confidence and Clinical Performance Ability

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----------ABSTRACT----------

ABSTRACT: *The ultimate goal of nursing education is to prepare nursing students to make critical decisions and deliver safe, high-quality care based on sound scientific knowledge. However, due to concerns regarding patient safety, patient rights, and stringent infection control protocols, clinical practicums have increasingly become observation-oriented, limiting direct nursing care opportunities, particularly for high-acuity events such as in-hospital cardiac arrest. To overcome these constraints, this study developed an emergency care simulation scenario for in-hospital cardiac arrest tailored to the clinical environment and evaluated its educational effectiveness on nursing students' confidence and clinical performance ability. A methodological and quasi-experimental study using a one-group pretest-posttest design was conducted with 40 fourth-year nursing students. The program consisted of pre-briefing (10 min), simulation execution (15 min), and debriefing using the Gather-Analyze-Summarize (GAS) model (15 min). Data were collected using structured self-report instruments before the intervention and one week following completion, and analyzed using paired t-tests in IBM SPSS Statistics 25.0. Following the simulation-based education, confidence ($t = 16.42$, $p < .001$) and clinical performance ability ($t = 11.58$, $p < .001$) significantly improved compared to baseline. In sub-domain analysis of clinical performance ability, the 'Nursing Evaluation' domain showed a comparatively smaller, though still statistically significant, increase ($t = 2.21$, $p = .032$). These findings demonstrate that realistic, scenario-based cardiac arrest simulation coupled with structured debriefing effectively fosters self-confidence and clinical performance ability among prospective nurses.*

KEYWORDS: *Simulation Training, Cardiac Arrest, Confidence, Clinical Performance Ability, Nursing Education*

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I. INTRODUCTION

The ultimate goal of nursing education is to help students develop the practice competencies needed to think critically and provide safe, high-quality care in clinical settings, grounded in solid scientific knowledge. However, amid rapid changes in the healthcare environment, along with heightened standards for patient safety, patient rights protection, and infection control, clinical practicum for nursing students has increasingly shifted from hands-on care delivery toward observation-based learning [1]. As a result, opportunities for prospective nurses to directly experience and train in complex, rapidly evolving clinical situations have become progressively more limited.

To overcome these structural limitations of clinical practicum and meet the advanced demands of clinical practice, simulation-based education has become established as an essential alternative in nursing education. Technological advances such as high-fidelity simulators (HFS) and virtual reality (VR) enable the creation of highly immersive clinical environments that closely resemble actual hospital settings [2]. The core value of simulation-based education lies in its capacity to allow learners to make autonomous decisions and expand their learning through errors, within a psychologically and physically safe environment that does not jeopardize patient safety [3]. Beyond simply repeating mechanical skills, students assess dynamic changes in patient status in real time, derive optimal interventions, and experience clinical growth through immediate debriefing feedback [4].

Prior studies have shown that simulation-based education significantly improves nursing students' self-confidence and clinical performance ability [5, 6], and further reduces anxiety related to clinical performance while enhancing self-efficacy, thereby serving as a key educational strategy that facilitates successful clinical adaptation and transition to practice [7, 8].

However, the qualitative outcomes of simulation-based education depend critically on the realism and contextual relevance of the scenarios employed [9-12]. Many simulation scenarios currently used in Korean nursing programs have been adapted or translated from foreign protocols, and thus fail to fully capture the healthcare delivery system, interprofessional collaboration structures, and the cultural particularities of wards

and intensive care units specific to Korea. The absence of standardized domestic development criteria contributes to variability in educational outcomes, underscoring the urgent need for tailored scenario development that reflects the realities of Korean clinical practice.

In particular, in-hospital cardiac arrest is a representative time-critical emergency event that can occur unexpectedly in any clinical unit and progress rapidly to irreversible neurological damage or death within minutes without immediate, coordinated intervention [13, 14]. Managing this situation requires more than adherence to a resuscitation algorithm; it demands integrated competencies, including the confidence to act decisively under pressure and the clinical performance ability to rapidly and accurately deliver high-quality chest compressions, airway management, and defibrillation as part of a coordinated code team response. However, for patient safety reasons, students have virtually no opportunity to directly perform these high-acuity resuscitation interventions on actual patients experiencing cardiac arrest [15, 16].

Accordingly, this study aims to develop an "in-hospital cardiac arrest patient care simulation scenario" that maximizes realism and immersion by reflecting the practice contexts nurses actually encounter in Korean clinical settings, and to apply this scenario to nursing students in order to examine its effects on confidence and clinical performance ability—thereby establishing a standardized foundation for practice-linked emergency nursing education.

Purpose of the Study

The purpose of this study is to systematically develop a cardiac arrest patient care simulation program to strengthen nursing students' emergency nursing practice competencies, and to examine its educational effects. The specific objectives are as follows:

1. To develop a cardiac arrest patient care simulation scenario that reflects the Korean clinical practice environment.
2. To verify the effects of the developed simulation education on nursing students' confidence and clinical performance ability.

Research Hypotheses

1. Hypothesis 1: Nursing students who receive cardiac arrest simulation education will show significantly higher clinical performance ability scores after the education compared to before.

2. Hypothesis 2: Nursing students who receive cardiac arrest simulation education will show significantly higher confidence scores after the education compared to before.

II. METHODOLOGY

1. Research Design

This study is a methodological study and quasi-experimental study conducted in two stages—a scenario development phase and an evaluation phase—to develop a cardiac arrest patient care simulation program and evaluate its effects. A one-group pre-posttest design was applied to verify the educational effects.

This study applied Jeffries' simulation framework [17] (National League for Nursing Jeffries Simulation Theory) as its theoretical framework, organically linking the scenario development process with the evaluation of educational outcomes.

Scenario development phase: A cardiac arrest nursing scenario reflecting the complexity and dynamics of actual clinical practice was constructed by incorporating the core elements of simulation design—context, facilitator (instructor), learner characteristics, and educational design—and its content validity was verified by experts.

Evaluation phase: After applying the developed simulation education intervention to nursing students, pre- and post-intervention changes in the key learning outcomes—clinical performance ability and confidence—were compared and analyzed.

2. Study Participants

This study used convenience sampling to recruit fourth-year nursing students at C University, located in City G. The specific inclusion criteria were as follows:

- Students who had completed a simulation-related practicum course or a theoretical course in adult nursing (emergency nursing and basic life support content)
- Students who received a full explanation of the purpose and procedures of this study and voluntarily provided written informed consent

The sample size was calculated using G*Power 3.1. Based on a paired t-test for a one-group pre-post design, and referencing a prior simulation study involving nursing students [18], a medium effect size (dz) of .50, a significance level (α) of .05, and a power (1−β) of .80 were applied, yielding a minimum required sample size of 34. Considering an anticipated attrition rate due to incomplete responses or practicum absence, a total of

40 students were recruited; there was no attrition, and data from all 40 participants were included in the final analysis.

3. Research Instruments

1) Clinical Performance Ability

In this study, participants' clinical performance ability was measured using a self-report questionnaire adapted from the clinical competence measurement tool originally developed by Lee Won-Hee et al. [19] for nursing students. The original instrument consists of 45 items across five domains—nursing process, nursing skills, education/collaborative relationships, interpersonal relationships/communication, and professional development—rated on a 5-point Likert scale. For this study, the instrument was modified and reduced to fit the context of simulation-based emergency nursing care for cardiac arrest, retaining a total of 20 items across four subdomains: "nursing assessment," "nursing intervention," "nursing evaluation," and "professional attitude and communication."

To reflect the practice-specific characteristics of cardiac arrest nursing, content validity (Content Validity Index, CVI) was assessed in this study by five experts—charge nurses with at least 5 years of emergency department or intensive care unit experience and professors specializing in emergency nursing—and only items with an item-level content validity index (I-CVI) of .80 or higher were retained for use. Each item is rated on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"), with total scores ranging from 20 to 100. Higher scores indicate better clinical performance ability in cardiac arrest situations. The reliability (Cronbach's α) of the instrument was .90 in this study.

2) Confidence

To measure participants' confidence, this study used a self-report instrument originally developed by the researcher (Chae) in her doctoral dissertation to assess nursing students' confidence in performing emergency nursing care for cardiac arrest patients [20], and subsequently reported in a published simulation study [21]. The instrument consists of 10 items covering the core tasks of cardiac arrest response—including recognition of cardiac arrest, activation of the code team, chest compressions, airway management, defibrillation, and administration of resuscitation medications.

Each item is rated on an 11-point numeric rating scale ranging from 0 ("not at all confident") to 10 ("completely confident"), with total scores ranging from 0 to 100. Higher scores indicate greater confidence in performing cardiac arrest emergency care. The reliability (Cronbach's α) of the instrument was .93 in the researcher's dissertation study [20], and .91 in this study.

4. Research Procedure

1) Instructor Preparation

To ensure the quality and operational validity of simulation-based practicum education, the researcher completed multiple accredited faculty development programs, including Nursing Simulation Operating Training, strategies for activating simulator use, S-PBL education, the Simulation Specialist Training Course, e-PBL-based course operation and strategies, an advanced simulation educator course, and an Advanced Cardiovascular Life Support (ACLS) Provider course. At the time of the study, the researcher was solely responsible for teaching fundamentals of nursing and simulation-based practicum courses at the university.

2) Simulation Environment and Preparation

The simulation laboratory was designed to closely resemble an actual general ward unit of a university hospital. Clinical equipment and supplies—including a high-fidelity patient simulator, patient monitor/defibrillator, code cart (crash cart) stocked with airway adjuncts, a bag-valve-mask device, and emergency resuscitation medications—were standardized and arranged accordingly. A one-way mirror and audio communication system were installed between the practicum room and the control room, allowing the instructor to control the flow of the scenario and vital sign parameters from outside the room, and to observe and video-record the students' entire performance in real time.

Prior to the simulation, participants were assigned to small-group teams of 4 members each. During orientation, teams engaged in a pre-simulation discussion (approximately 60 minutes) in which they identified core nursing problems and developed a resuscitation response plan based on an overview of the patient case. Team members were instructed to autonomously assign roles among themselves, consisting of 1 team leader, 1 chest-compression provider, 1 airway/ventilation provider, and 1 medication/recorder nurse.

3) Simulation Implementation and Scenario Content

The scenario was developed and its content validity verified between April 15 and May 20, 2025, through four in-depth panel meetings involving an expert panel composed of one adult health nursing professor, one fundamentals of nursing professor, and one head nurse from a university hospital emergency department.

The simulation run time was set at 15 minutes per team <Table 1>. Participants were organized into a total of 10 teams (4 members per team, 40 participants in total), with each team member autonomously assigning roles during the pre-briefing session—1 team leader, 1 chest-compression provider, 1 airway/ventilation provider, and 1 medication/recorder nurse—to carry out the resuscitation interventions specified in the scenario.

Process	Monitor Setting (Instructor)	Patient/Manikin (Action)	Student Intervention	Cue/Prompt
Recognition of Cardiac Arrest (3 min)	RR: 0/min (apneic) HR: 0/min BP: unobtainable SpO2: unobtainable EKG: ventricular fibrillation	*Manikin is unresponsive to verbal and painful stimuli.* *No spontaneous breathing is observed (apneic/agonal gasps).* *No carotid pulse is palpable.*	• Assess responsiveness by tapping and shouting • Check for breathing and carotid pulse within 10 seconds • Activate the code team / call for a defibrillator and code cart • Begin high-quality chest compressions immediately (rate 100–120/min, depth 5–6 cm)	**Role member providing cue — Charge nurse:** "The patient isn't responding and I can't feel a pulse—call a code now!"
CPR / Basic Life Support (4 min)	(Rhythm remains VF if compressions/ventilation are delayed or inadequate) EtCO2: low if compressions are shallow or interrupted	Chest rises with each delivered breath if airway is patent. Pulse remains absent throughout this phase.	• Perform continuous 30:2 compression-to-ventilation cycles with minimal interruption • Open the airway and insert an oropharyngeal airway • Deliver ventilation using a bag-valve-mask with 100% oxygen • Attach the cardiac monitor/defibrillator pads and identify the rhythm • Rotate compressors every 2 minutes to prevent fatigue and maintain compression quality	**Role member providing cue — Instructor (monitor voice):** "Rhythm check—shockable rhythm identified. Continue compressions while the defibrillator charges."
ACLS Intervention (5 min)	EKG: VF → defibrillation delivered Post-shock: coarse VF/ROSC rhythm HR → 62/min (post-ROSC) BP → 88/56 mmHg SpO2 → 93%	*Manikin shows a brief shock artifact, then a return of an organized rhythm.* *A faint carotid pulse becomes palpable after defibrillation and epinephrine administration.*	• Clear the team ("all clear") and deliver a single defibrillation shock • Resume chest compressions immediately after the shock without pulse check • Establish IV/IO	*(If the student delays defibrillation)* ***Role member providing cue — Instructor (physician on phone):*** *"Is the rhythm shockable? We need to defibrillate now and push epinephrine*

			access and administer epinephrine 1 mg per ACLS protocol • Prepare for advanced airway placement and confirm placement with EtCO2 • Reassess rhythm and pulse every 2 minutes	*every 3 to 5 minutes."*
ROSC & Evaluation (3 min)	RR → 14/min (spontaneous) HR → 96/min BP → 104/68 mmHg SpO2 → 97% Temp → 36.4℃	*Manikin regains spontaneous breathing and a palpable, regular pulse.* *Level of consciousness gradually improves to responsive to voice.*	• Confirm return of spontaneous circulation (ROSC) and reassess ABCs • Obtain a 12-lead EKG and post-ROSC vital signs • Initiate post-resuscitation care (oxygenation, blood pressure support, targeted temperature management as indicated) • Accurately document the resuscitation timeline, interventions, and medications given • Communicate the patient's status to the receiving ICU team using SBAR	**Role member providing cue — Instructor (ICU nurse on phone):** "We're ready to receive the patient—can you give me a full SBAR handoff of the arrest and the resuscitation so far?"

Table 1. Cardiac Arrest Simulation Scenario Flowchart

Scenario case overview: Mr. Lee (male, 68 years old), postoperative day 2 after an elective abdominal surgery with a known history of ischemic heart disease, was found unresponsive in bed by the ward nurse during a routine rounding check. The patient was not breathing normally and had no palpable pulse—an in-hospital cardiac arrest situation requiring immediate activation of the code team and initiation of cardiopulmonary resuscitation (CPR).

Core performance tasks: Students were required to promptly recognize cardiac arrest (unresponsiveness, absent/abnormal breathing, no pulse), activate the code team without delay, and collaboratively perform priority-based resuscitation interventions, including high-quality chest compressions, bag-valve-mask ventilation, rhythm analysis and defibrillation, and administration of resuscitation medications per the Advanced Cardiovascular Life Support (ACLS) algorithm.

Debriefing: Immediately after the scenario, students moved to a separate debriefing room, completed a self-reflection journal, and participated in a debriefing session applying the GAS (Gather-Analyze-Summarize) model of Phrampus and O'Donnell [22].

Gather: Emotions were ventilated immediately after the practicum, and students shared factual observations of what they had first noticed in the patient's unresponsive, pulseless state.

Analyze: Teams reflected on the appropriateness of their recognition and activation timing, the quality and continuity of chest compressions, the prioritization of interventions, and the causes of errors or delays, engaging in in-depth analysis of their decision-making process under pressure.

Summarize: Students consolidated the core principles of the resuscitation algorithm for cardiac arrest and reviewed strategies for practical application.

5. Data Collection and Ethical Considerations

Data were collected from July 1 to July 15, 2025. Prior to data collection, protective measures for vulnerable subjects were implemented in consideration of the fact that participants were currently enrolled students. Both orally and in writing, it was explicitly disclosed that participation or withdrawal from the study would result in no disadvantage whatsoever to academic performance or course evaluation. An online questionnaire (Google Forms) URL link was distributed via mobile messenger to those who voluntarily agreed to participate. The first page of the survey provided information on the study's purpose, procedures, guarantee of anonymity, confidentiality, and the right to withdraw; the system was designed so that participants could proceed to the main survey (approximately 15–20 minutes) only after completing online electronic informed consent. All collected data were converted into anonymous identification codes and stored as encrypted files; participants were informed that the data would not be used for any purpose other than statistical analysis and would be permanently destroyed after the legally required retention period (3 years).

The pretest was conducted immediately before the start of the simulation intervention, and the posttest was conducted one week after the completion of the education, using the same instruments, in order to confirm the maintenance of educational effects and reflective effects.

6. Data Analysis

The collected data were analyzed using IBM SPSS Statistics 25.0. The specific analytic methods were as follows:

1. Descriptive statistics (frequencies and percentages, means and standard deviations) were calculated for participants' general characteristics.
2. Pre- and post-intervention scores for clinical performance ability and confidence were presented as means and standard deviations.
3. Normality of the key dependent variables was tested using the Shapiro-Wilk test, confirming that all variables satisfied the assumption of normal distribution ($p > .05$).
4. Paired t-tests were conducted to examine differences in clinical performance ability and confidence before and after the cardiac arrest simulation education.
5. The reliability of the measurement instruments was evaluated by calculating Cronbach's α, a coefficient of internal consistency.
6. The statistical significance level (α) was set at .05 for all analyses.

III. RESULTS

1. General Characteristics of Participants

Participants were a total of 40 fourth-year nursing students, comprising 12 male students (30.0%) and 28 female students (70.0%). The mean age of participants was 23.15±1.42 years. Regarding major satisfaction, "very satisfied" was the most common response (24 students, 60.0%), followed by "satisfied" (10 students, 25.0%), "neutral" (4 students, 10.0%), and "dissatisfied" and "very dissatisfied" (1 student each, 2.5%).

In addition, satisfaction with prior simulation coursework showed "very satisfied" as the highest proportion (26 students, 65.0%), followed by "satisfied" (9 students, 22.5%), "neutral" (3 students, 7.5%), and "dissatisfied" and "very dissatisfied" (1 student each, 2.5%) <Table 2>.

Characteristics	Category	n (%) or M ± SD
Gender	Male	12 (30.0)
	Female	28 (70.0)
Age (years)		23.15 ± 1.42
Major satisfaction	Very satisfied	24 (60.0)
	Satisfied	10 (25.0)
	Average	4 (10.0)
	Dissatisfied	1 (2.5)
	Very dissatisfied	1 (2.5)
Simulation class	Very satisfied	26 (65.0)

satisfaction	Satisfied	9 (22.5)
	Average	3 (7.5)
	Dissatisfied	1 (2.5)
	Very dissatisfied	1 (2.5)

Table 2. General Characteristics of the Participants

2. Hypothesis Testing

The results of hypothesis testing analyzing changes in participants' clinical performance ability and confidence before and after the cardiac arrest simulation education are as follows <Table 3>.

Testing of Hypothesis 1: To verify that "nursing students who receive cardiac arrest simulation education will show significantly higher clinical performance ability scores after the education compared to before," results showed that participants' clinical performance ability improved significantly from 2.84±0.37 before the education to 3.76±0.39 after the education ($t = 11.58$, $p < .001$). Therefore, Hypothesis 1 was supported.

Testing of Hypothesis 2: To verify that "nursing students who receive cardiac arrest simulation education will show significantly higher confidence scores after the education compared to before," results showed that participants' confidence improved significantly from 4.28±1.32 before the education to 7.85±1.09 after the education ($t = 16.42$, $p < .001$). Therefore, Hypothesis 2 was supported. Among the clinical performance ability subdomains, "Nursing Assessment," "Nursing Intervention," and "Professional Attitude and Communication" showed statistically significant increases, while "Nursing Evaluation" showed a comparatively smaller, though still statistically significant, increase in score ($t = 2.21$, $p = .032$).

Variables	**Pre-test**	**Post-test**	***t***	***p***
	M* ± *SD	***M* ± *SD***		
Confidence	4.28 ± 1.32	7.85 ± 1.09	16.42	<.001
Clinical Performance Ability	2.84 ± 0.37	3.76 ± 0.39	11.58	<.001
Nursing Assessment	2.79 ± 0.44	3.68 ± 0.46	8.35	<.001
Nursing Intervention	2.76 ± 0.41	3.81 ± 0.43	10.12	<.001
Nursing Evaluation	2.91 ± 0.48	3.62 ± 0.50	2.21	.032
Professional Attitude & Communication	2.93 ± 0.46	3.77 ± 0.45	7.89	<.001

Table 3. Comparison of Confidence and Clinical Performance Ability between Pre- and Post-test

IV. DISCUSSION

This study attempted to develop a cardiac arrest patient care simulation program that reflects the domestic clinical practice environment, apply it to nursing students, and examine its educational effects on confidence and clinical performance ability in emergency nursing situations.

The significant improvement in participants' clinical performance ability following the cardiac arrest simulation education is consistent with prior studies reporting that simulation-based education helps learners integrate and demonstrate nursing knowledge, skills, and attitudes in high-risk, clinically realistic situations [23, 24]. Cardiac arrest, in particular, is an area requiring the simultaneous execution of complex interventions—high-quality chest compressions, airway management, defibrillation, and real-time rhythm/vital sign reassessment under severe time pressure. It is interpreted that the experience of directly performing these high-acuity resuscitation interventions—difficult to practice hands-on during clinical practicum for patient safety

reasons—within a safe environment substantially drove students' improvement in practical performance competency. Prior studies have similarly reported that repeated intervention practice using simulation significantly enhances nursing students' clinical performance ability and practice confidence [25], and it is considered that the realism and clinical tension provided by this study's scenario immersed students in their respective roles (team leader, compressor, airway provider, medication nurse), leading to integrated, team-based resuscitation performance.

In this study, participants' confidence score improved markedly after the education, which aligns with prior research indicating that simulation education strengthens nursing students' self-efficacy and self-confidence in performing emergency and resuscitation procedures, beyond mere fragmentary skill acquisition [14, 16, 21]. This is consistent with the researcher's own earlier work demonstrating that cardiac arrest simulation education significantly improves nursing students' confidence alongside knowledge and clinical performance ability [21]. It is judged that directly and repeatedly performing the core resuscitation sequence—recognition, activation, compressions, defibrillation, and medication administration—within a psychologically safe simulated environment provided students with a mastery experience that is well established as the strongest source of self-efficacy growth, thereby driving the marked increase in confidence observed in this study.

On the other hand, among the clinical performance ability subdomains, the comparatively smaller improvement observed in the "Nursing Evaluation" domain suggests a structural limitation of a single-session simulation education. Within the compressed 15-minute scenario, post-resuscitation reassessment and documentation tasks were necessarily performed under severe time pressure immediately following the high-intensity resuscitation phase, which may have constrained students' ability to fully attend to evaluation and documentation accuracy. This suggests that, in order to strengthen students' post-resuscitation evaluation and documentation competencies, simulation modules that allocate dedicated time for structured reassessment and handoff communication are needed, beyond a single, time-compressed educational session.

The methodological limitations and significance of this study are as follows. First, due to ethical considerations regarding equitable access to educational opportunities and practical sampling constraints, this study applied a one-group pretest-posttest design without a control group. Therefore, the possibility that testing effects or historical factors partially contributed to the observed educational effects cannot be ruled out. Second, although this study conducted the posttest one week after the completion of education—thereby partially excluding immediate post-education transient effects—it did not track the long-term retention level of the educational effects; this is a particularly important consideration given that resuscitation skills and confidence are well documented to decay over time without reinforcement. Third, because convenience sampling was used with nursing students from a single university, caution is needed in generalizing the findings to nursing students as a whole.

Nonetheless, this study holds significant value for nursing education in that it developed a cardiac arrest scenario faithfully reflecting the domestic clinical practice context based on Jeffries' [17] theoretical framework, and—through rigorous expert content validation linked with standardized GAS debriefing—empirically demonstrated improvement in fourth-year nursing students' confidence and clinical performance ability.

V. CONCLUSION

This study is a one-group pretest-posttest quasi-experimental study conducted to systematically develop a cardiac arrest patient care simulation program to strengthen nursing students' emergency nursing practice competencies and to examine its effects.

The findings confirmed that cardiac arrest simulation education is an effective educational intervention that significantly improves nursing students' confidence and clinical performance ability (particularly the nursing assessment, intervention, and professional attitude/communication domains). In particular, the realistic resuscitation experience using a high-fidelity simulator and the in-depth debriefing based on the GAS model made decisive contributions to enabling students to acquire clinical skills within a safe environment and to build confidence in their own resuscitation decision-making.

Based on these findings, the following recommendations are proposed:

1. Expansion of research design: As this study employed a single-group design, future research should apply a randomized controlled trial (RCT) or nonequivalent control group design to more rigorously verify the internal validity of the intervention's effects.

2. Repeated education and skill-retention evaluation: To strengthen post-resuscitation evaluation and documentation competencies and to assess the temporal retention of confidence and performance gains, longitudinal research is recommended that combines staged, multi-session simulation modules with follow-up assessments at set intervals (e.g., 1, 3, and 6 months), given the well-documented decay of resuscitation skills over time.

3. Diversification of the target population: It is recommended that the cardiac arrest simulation program developed in this study be expanded beyond soon-to-graduate nursing students to clinical transition education programs for newly graduated nurses and practicing nurses on general wards and in intensive care units.

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