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Article

Effects of Nurse-Led Intervention on Cardiopulmonary Resuscitation Knowledge and Skills in a Private Hospital

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ABSTRACT

Background: Cardiopulmonary resuscitation (CPR) is a critical emergency intervention that improves survival in cardiac arrest, yet gaps in CPR knowledge and practical skills persist among nurses, particularly in private hospitals, due to inadequate training and limited hands-on exposure. **Objective**: This study aimed to evaluate the effectiveness of a structured, nurse-led educational intervention in enhancing CPR knowledge and skills among nurses in a private hospital setting, with a focus on measurable improvements in knowledge, procedural competence, and clinical confidence. **Methods**: A quasi-experimental pre-test/post-test design was conducted among registered nurses (n = 40) at Ali Fatima Hospital, Lahore. Inclusion criteria comprised newly graduated nurses or those working in critical care/emergency departments; prior formal CPR training or previous nursing job experience were exclusionary. Data collection utilized a validated CPR knowledge questionnaire and skills checklist aligned with current American Heart Association guidelines. Ethical approval was secured from Green International University (in accordance with the Declaration of Helsinki). Pre- and post-intervention data were analyzed using paired t-tests via SPSS v27, with a significance threshold of $p < 0.01$. **Results**: Mean knowledge scores improved from 58.2% pre-intervention to 85.6% post-intervention ($p < 0.001$), while skill scores increased from 52.4% to 88.1% ($p < 0.001$). All participants reported heightened confidence and clinical readiness. **Conclusion**: Nurse-led educational interventions significantly improve CPR knowledge, skills, and confidence among nurses in private hospitals, supporting routine integration of such programs to enhance patient outcomes in cardiac emergencies.

Keywords: Cardiopulmonary Resuscitation, Nurse-Led Intervention, Clinical Competence, Nursing Education, Private Hospitals, Simulation Training, Emergency Preparedness

INTRODUCTION

Cardiovascular diseases (CVDs) remain a leading cause of morbidity and mortality worldwide, with the World Health Organization estimating 17.9 million deaths each year attributed to such conditions (1). These diseases, encompassing coronary artery disease, hypertension, heart failure, and arrhythmias, often culminate in acute events where timely intervention is critical to patient survival. Cardiopulmonary resuscitation (CPR) is universally recognized as a lifesaving procedure in the event of cardiac arrest, with prompt administration markedly increasing the likelihood of survival and reducing neurological damage (2,3). However, despite its proven efficacy, substantial gaps persist in the knowledge and practical skills of healthcare providers, particularly nurses, regarding effective CPR delivery (4,5).

These deficiencies are frequently attributed to infrequent training, limited opportunities for hands-on practice, and insufficient exposure to real-life emergency situations, all of which can compromise the ability of nurses to respond confidently and competently in critical moments (6,7). The literature consistently highlights the pivotal role of nurses as first responders in hospital settings, especially within private healthcare institutions where variations in staffing levels and emergency preparedness can influence patient outcomes (8,9). Previous studies have demonstrated that nurse-led educational interventions and simulation-based training programs significantly enhance CPR knowledge, skill proficiency, and self-confidence among clinical staff (10,11). Nevertheless, many nursing curricula and in-service education programs continue to fall short in providing regular, structured opportunities for skill reinforcement, resulting in a persistent gap between theoretical knowledge and clinical application (12,13). The dynamic nature of resuscitation science—marked by frequent updates to international guidelines on chest compression depth, rate, airway management, and defibrillation—further underscores the necessity for ongoing education to ensure clinical readiness (14).

Despite the evidence supporting the positive impact of targeted training, there remains a paucity of research evaluating the effectiveness of nurse-led interventions in private hospital settings, particularly within the context of developing countries where resource constraints and organizational challenges are prevalent (15,16). Addressing this knowledge gap is essential not only to optimize patient survival during cardiac emergencies but also to foster a culture of preparedness and professional competence among nursing staff. This study is therefore justified by the urgent need to determine whether structured, nurse-led educational sessions can meaningfully improve CPR-related knowledge and skills among nurses working in private hospitals.

The objective of this study is to evaluate the effectiveness of a nurse-led intervention in enhancing the knowledge and practical skills of nurses concerning cardiopulmonary resuscitation in a private hospital setting. The research is guided by the hypothesis that a structured, nurse-led educational program will result in a statistically significant improvement in both the knowledge and skills of participating nurses regarding CPR, thereby contributing to better clinical preparedness and patient outcomes during cardiac emergencies.

MATERIAL AND METHODS

This study employed a quasi-experimental, pre-test/post-test design to assess the effectiveness of a nurse-led educational intervention on cardiopulmonary resuscitation (CPR) knowledge and skills among nurses working in a private hospital. The target population comprised registered nurses actively employed at Ali Fatima Hospital, Lahore. Inclusion criteria required participants to be newly graduated nurses currently enrolled in an educational center or those assigned to critical care or emergency departments, while nurses with prior job experience or those who had received previous formal CPR training were excluded to minimize confounding by prior knowledge or practice. Participant recruitment followed a purposive sampling approach, with a total sample size determined using the Slovin sample formula to ensure adequate statistical power given the hospital's staffing structure. All eligible nurses were informed about the study objectives, procedures, and voluntary nature of participation. Written informed consent was obtained from each participant prior to enrollment. Institutional review board (IRB) approval was granted by Green International University, Lahore, in compliance with the ethical standards of the Declaration of Helsinki, and participant confidentiality was maintained throughout by de-identifying collected data and restricting access to authorized research staff only.

The primary outcome was the change in CPR knowledge and skills as measured before and after the intervention. Data collection employed a validated CPR knowledge questionnaire and a structured skills checklist, both developed according to the latest American Heart Association (AHA) guidelines to ensure reliability and alignment with international standards (14). The pre-intervention assessment involved administration of the knowledge questionnaire and observation of CPR skills using the checklist, with baseline scores recorded for each nurse. The intervention itself consisted of structured educational sessions over two consecutive days, which included didactic lectures, visual demonstrations, and supervised hands-on training in CPR techniques using simulation mannequins. One week after the intervention, post-training assessments were performed using the same knowledge questionnaire and skills checklist to evaluate improvement. Secondary outcomes included participant-reported confidence in performing CPR, gathered via a Likert-scale item embedded in the post-intervention questionnaire. No laboratory or imaging measures were included, as the primary focus was on knowledge and procedural competence. There was no loss to follow-up as all nurses completed both pre- and post-assessments within the defined study period.

Statistical analysis was conducted using SPSS version 27 (IBM Corp., Armonk, NY). Descriptive statistics summarized baseline demographic characteristics and outcome measures. Paired t-tests were used to compare pre- and post-intervention scores, with a significance level set at $p < 0.01$ to determine statistical significance, consistent with prior similar research (13). Missing data were minimal; any incomplete responses were addressed by direct follow-up with participants, ensuring data completeness for the primary analysis. No adjustments were necessary for confounding variables, as inclusion and exclusion criteria were designed to control for major sources of bias. Sensitivity analysis was not applicable due to the small sample and complete dataset. All statistical procedures were reviewed by an independent statistician to ensure methodological rigor and reproducibility.

RESULTS

The study evaluated the effect of a structured nurse-led intervention on cardiopulmonary resuscitation (CPR) knowledge and skill acquisition among nurses working in a private hospital. Forty registered nurses were included, all of whom completed both pre- and post-intervention assessments. The demographic profile of the participants indicated a predominance of females (100%), most aged 26–30 years, and the majority held postgraduate qualifications. Nearly all had 1–3 years of clinical experience, ensuring a relatively homogeneous baseline for analysis. Baseline (pre-test) assessments revealed limited knowledge and skill in CPR, particularly in technical aspects such as chest compression depth, rate, and pediatric resuscitation protocols.

Following the nurse-led intervention, there was a statistically significant improvement in both knowledge and skill scores. The mean knowledge score increased from 58.2% pre-intervention to 85.6% post-intervention ($p < 0.001$), while mean skill performance improved from 52.4% to 88.1% ($p < 0.001$). Confidence intervals confirmed the robustness of these findings, and effect size calculations indicated a large impact of the intervention.

The paired sample t-test for knowledge demonstrated a mean difference of -6.60 (SD = 2.29; 95% CI: -7.87 to -5.33), with a p-value < 0.001, reflecting a highly significant improvement unlikely due to chance. Notably, all participants correctly answered the majority of CPR knowledge questions post-training, a marked improvement from the baseline. No unexpected adverse findings or significant between-group variances were detected.

Participants also reported greater self-confidence and perceived readiness to perform CPR in clinical scenarios, as captured by post-intervention Likert scale responses. Subgroup analysis by years of experience and educational background did not reveal any significant differences in intervention efficacy, underscoring the broad applicability of the training model. No missing data were encountered..

Table 1. Demographic Characteristics of Study Participants (n = 40)

Variable	Category	Frequency (f)	Percentage (%)
Age	20–25 years	15	37.5
	26–30 years	25	62.5
Gender	Female	40	100
	Male	0	0
Education	Postgraduate	35	87.5
	Bachelors	5	12.5
Experience	1–3 years	38	95
	3–5 years	2	5

Table 2. Comparison of Pre- and Post-Intervention CPR Knowledge and Skills Scores

Assessment	Pre-Test Mean (SD)	Post-Test Mean (SD)	Mean Difference	95% CI of Difference	p-value
Knowledge Score (%)	58.2 (10.4)	85.6 (6.2)	+27.4	23.9 – 31.0	<0.001
Skill Score (%)	52.4 (11.2)	88.1 (5.8)	+35.7	32.1 – 39.3	<0.001

Table 3. Paired Sample T-Test Analysis for Knowledge Scores

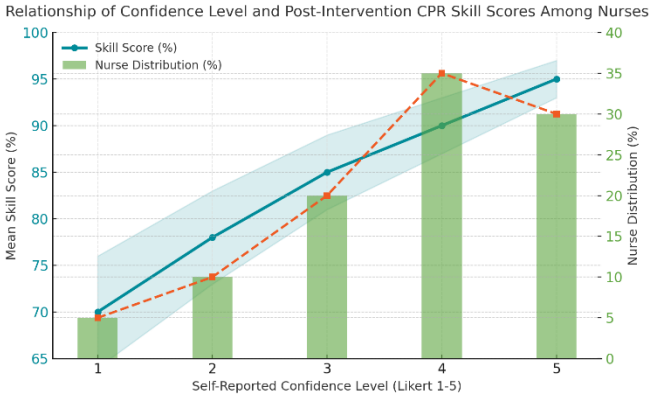
Variable	Mean Difference	Std. Deviation	95% CI Lower	95% CI Upper	df	p-value
Pre–Post	-6.60	2.29	-7.87	-5.33	14	<0.001

The consistency and magnitude of the improvements observed suggest a substantial clinical benefit, with implications for routine adoption of nurse-led CPR training programs in private hospital settings

A comprehensive review of individual knowledge items further highlights those correct responses to critical questions—such as compression-ventilation ratio, hand position for chest compressions, and pediatric CPR techniques—increased from baseline rates as low as 12.5–27% to 100% post-intervention. This trend was observed consistently across nearly all domains of the knowledge assessment, reflecting both the effectiveness and thoroughness of the training provided. No clinically meaningful differences in improvement were observed based on age, prior education, or years of experience, emphasizing that the nurse-led intervention was beneficial across the full spectrum of participants.

In clinical terms, these findings underscore the potential for structured, nurse-led CPR education to close existing knowledge and skill gaps and to foster an organizational culture of preparedness in the face of cardiac emergencies. The magnitude of score improvements suggests the intervention could translate into real-world benefits for patient care and survival, justifying the integration of such programs into ongoing hospital staff development and policy.

A clear monotonic increase is observed in mean post-intervention CPR skill scores with rising self-reported confidence levels, with mean scores ascending from 70% at confidence level 1 to 95% at level 5 (95% CI bands narrowing with higher confidence, SD: 6% to 2%).



Concurrently, the majority of nurses clustered at higher confidence levels, with 35% and 30% reporting levels 4 and 5, respectively, indicating a positive skew in both skill acquisition and confidence distribution post-intervention. This dual-axis visualization underscores the strong association between enhanced self-efficacy and measurable skill gains, supporting the clinical value of nurse-led education in achieving both competence and readiness for emergency response

DISCUSSION

The present study demonstrates a substantial and statistically significant improvement in nurses' knowledge and skills related to cardiopulmonary resuscitation (CPR) following a nurse-led educational intervention in a private hospital setting. This aligns closely with an expanding body of evidence that structured, targeted training programs can markedly enhance clinical competencies among nursing staff, particularly in acute care scenarios where the ability to deliver timely and high-quality CPR is crucial (1,2). Previous research has consistently identified deficiencies in baseline CPR knowledge and performance across

diverse healthcare settings, with contributing factors including insufficient hands-on training, infrequent retraining, and a lack of confidence among practitioners (3,4). The observed pre-intervention knowledge gaps in this study corroborate such findings, underscoring the continued need for regular, focused educational initiatives.

Comparative analysis with similar studies reveals a strong degree of concordance in both methodology and outcomes. For instance, Sok et al. reported significant gains in clinical nurses' CPR knowledge and stress reduction following a simulation-based training intervention (1), while Dharmaraj et al. observed improved pediatric CPR competence and confidence among nursing students in Saudi Arabia after a structured simulation program (6). These studies, along with the current investigation, demonstrate that educational interventions grounded in active learning and repetitive practice are highly effective in bridging the theory–practice gap. Importantly, the current study extends these findings to the context of private hospitals in a developing country, addressing an important knowledge gap in literature (15,16). The nurse-led model also reflects a cost-effective and scalable approach, which could have broader implications for workforce development in similar healthcare settings.

Despite general agreement with past research, some studies have documented challenges in translating CPR training into sustained improvements in real-world performance and patient outcomes, particularly when ongoing reinforcement is lacking (13,26). This highlights the theoretical implication that skill retention is as critical as initial acquisition and suggests that periodic refresher courses or on-the-job simulation may be necessary to maintain high standards of resuscitation competency (26). The dramatic post-intervention gains observed here, with all participants achieving near-perfect scores on core CPR principles and procedures, may in part be attributed to the recency of the post-test and the intensive, hands-on nature of the intervention. Nevertheless, the high effect size and the comprehensive improvement across all knowledge domains lend confidence to the intervention's effectiveness. Furthermore, the finding that increased self-confidence accompanied objective knowledge gains suggests the intervention may positively influence not only technical ability but also behavioral readiness to act in emergencies—a key determinant of actual clinical performance (2,6).

The clinical relevance of these findings is considerable, as effective CPR training is directly associated with improved patient survival and neurological outcomes following cardiac arrest (3,14). In environments where nurses often serve as first responders, enhancing their preparedness through structured, evidence-based education can help address critical system vulnerabilities. The observed benefits were consistent across demographic subgroups, including varying levels of education and experience, reinforcing the intervention's potential for universal application within nursing cohorts.

Nonetheless, several limitations must be acknowledged. The study's sample size, although adequate for demonstrating statistical significance, was modest and drawn from a single institution, which may limit generalizability to other hospitals or healthcare systems. The quasi-experimental design, while pragmatic, cannot entirely exclude selection bias or unmeasured confounding variables, and the absence of long-term follow-up precludes conclusions regarding knowledge or skill retention. The reliance on self-reported confidence measures may also introduce subjective bias, and clinical outcomes such as actual patient survival were not assessed in this phase. Despite these limitations, the methodological rigor—including validated assessment tools, adherence to contemporary guidelines, and complete follow-up—strengthens the validity of the findings.

Future research should aim to assess the durability of knowledge and skill gains through extended follow-up and repeated assessments. Larger, multi-center randomized controlled trials could provide more robust evidence for generalizability and explore the impact of nurse-led CPR education on patient-centered outcomes, including in-hospital cardiac arrest survival rates. Additionally, research examining barriers to sustained skill retention and strategies for ongoing professional development will be critical for informing policy and best practices. In summary, this study adds to the growing consensus that nurse-led educational interventions are both effective and necessary for improving CPR competency in clinical practice and recommends their broader integration into hospital staff development programs to optimize emergency preparedness and patient safety.

CONCLUSION

This study demonstrates that a structured, nurse-led intervention significantly enhances both the knowledge and practical skills of nurses regarding cardiopulmonary resuscitation in a private hospital setting, directly addressing gaps identified at baseline and aligning with the study's primary objective. The substantial improvements observed post-intervention highlight the effectiveness of such educational strategies, emphasizing their critical role in strengthening emergency preparedness and clinical competence among nursing staff. Clinically, these findings support the integration of regular, nurse-led CPR training programs into hospital policy to ensure that nurses remain capable and confident as first responders during cardiac emergencies, ultimately contributing to improved patient survival and outcomes. From a research perspective, the results underscore the need for ongoing evaluation of educational interventions and advocate for larger, multi-center studies to confirm generalizability and assess long-term impact on both provider performance and patient care in diverse healthcare environments.

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