

Assessment of the Knowledge Level and Practice Challenges of Cardiopulmonary Resuscitation (CPR) among Nurses in Tertiary Health Institutions in Ekiti State, Nigeria

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Abstract: Cardiopulmonary resuscitation (CPR) is a life-saving emergency procedure, and nurses are the most frequent first responders to in-hospital cardiac arrest. Yet their CPR competence, and the challenges they face in low-resource settings, remain understudied. This study assessed CPR knowledge, practice challenges, and the influence of clinical experience and equipment adequacy among nurses in tertiary health institutions in Ekiti State, Nigeria. A descriptive cross-sectional survey was conducted among 291 registered nurses randomly selected from three tertiary hospitals: Afe Babalola Multisystem Hospital (AMSH), Ekiti State University Teaching Hospital (EKSUTH), and Federal Teaching Hospital Ido-Ekiti (FETHI). Data were collected using a validated structured questionnaire (Cronbach's $\alpha = 0.82$) and a 20-item American Heart Association (AHA)-based skills checklist. Descriptive statistics, chi-square tests, and binary logistic regression were used for analysis (SPSS v27). The majority (67.4%, 196/291) had good CPR knowledge ($>75\%$ correct). Knowledge gaps were noted for compression rate (67.7% correct), compression-to-ventilation ratio (70.8%), and maximum pause for endotracheal tube placement (77.0%). Major practice challenges included lack of retraining (86.3%), lack of proper training (84.9%), lack of continuous practice (84.5%), high workload (80.1%), and lack of equipment (79.0%). Clinical experience was significantly associated with knowledge ($\chi^2 = 6.442$, $p = 0.040$); nurses with ≥ 21 years had the highest good knowledge (81.0%). After adjustment, ≥ 21 years of experience gave 3.21 times higher odds of good knowledge (AOR = 3.21, 95% CI: 1.21–8.52, $p = 0.019$). Equipment adequacy was strongly associated with skills performance ($\chi^2 = 12.847$, $p < 0.001$; AOR = 2.58, 95% CI: 1.45–4.59, $p = 0.001$). While most nurses have acceptable theoretical knowledge, systemic challenges, lack of retraining, equipment shortages, and heavy workloads severely undermine skills performance. Mandatory biannual refresher training, equipment procurement and maintenance protocols, and supportive institutional policies are urgently needed.

Keywords: cardiopulmonary resuscitation; CPR knowledge; practice challenges; nurses; equipment adequacy; Ekiti State; Nigeria

INTRODUCTION

Cardiopulmonary resuscitation (CPR) is an important emergency procedure, and the most important factor in survival after cardiac arrest. This involves systematic chest compressions and rescue breathing, aimed at ensuring the cerebral and myocardial perfusion, until spontaneous circulation returns (Goyal et al., 2025; Kosmopoulos et al., 2020). Sudden cardiac arrest (SCA) is a major contributor to cardiovascular disease deaths, which are about 17.9 million per year globally (World Health Organization, 2021). Immediate, high-quality CPR can double or triple the odds of survival, but the potential is not being realised in many healthcare settings because of knowledge gaps and system challenges, according to the American Heart Association (2024).

As the largest group of health professionals, and the first to respond to in-hospital cardiac arrest, nurses are in a unique position. They can affect patient outcomes based on their skills in promptly identifying arrest, correctly starting CPR, and navigating challenges that may arise during practice (American Heart Association, 2020). But strong evidence from various countries including Nigeria, shows that the knowledge of CPR by many nurses is low and that there are many barriers to effective use of CPR (Aina et al., 2021; Ihunanya et al., 2020; Tomas & Kachekele, 2023). Resuscitation science is constantly evolving and the guidelines are updated regularly, so continuous education and skills can't be maintained without reinforcement; however, studies have shown that knowledge of CPR decreases with time and without reinforcement within six months (Saidu et al., 2023; Umuhoza et al., 2021). CPR knowledge and practice are faced with multi-dimensional challenges. At the individual level, these factors encompass knowledge gaps, skill atrophy, fear and lack of confidence (Van den Bos-Boon et al., 2022). Interpersonal issues include a lack of team chemistry, hierarchy-based obstacles and role confusion (Hebert, 2019). The institutional factors are lack of training, workload, non-existent policies, and equipment (Junli et al., 2023). Equipment unavailability and poor equipment maintenance are resource factors (Perman et al., 2024; Tsima et al., 2019). It is important to understand how these factors interact in order to create effective interventions.

Despite ongoing research and progress in resuscitation science, IHCA continues to be one of the most common causes of death globally, with low survival rates (Andersen et al., 2019; Cheng et al., 2020). A poor level of skills in CPR by healthcare professionals, including nurses, is a major contributing factor (Chung et al., 2024; Sachdeva, 2020). CPR is not often used as a lifesaving intervention in Nigeria, and many nurses lack knowledge and skills in CPR (Orukwowa et al., 2022; Olofin-Samuel et al., 2024; Oluwasanmi et al., 2025). However, Nigerian studies have shown that CPR knowledge is low with a report that less than 3% of nurses were able to correctly identify key components of CPR (Akinbodewa et al., 2022). There are no standardised clinical guidelines, limited CPR equipment, and a lack of certificated CPR training bodies exacerbate the problem (Kalu et al., 2023).

Despite recognition of these challenges in the broader literature, specific data on CPR knowledge and practice challenges among nurses in Ekiti State's tertiary health institutions are lacking. The tertiary institutions serve as major referral centres, yet the readiness of their nursing workforce to respond to cardiac arrest remains unknown. The absence of this evidence hampers efforts to develop targeted interventions, allocate resources effectively, and implement supportive policies. This study therefore sought to fill this critical gap.

The study assessed the knowledge level and practice challenges of cardiopulmonary resuscitation among nurses in tertiary health institutions in Ekiti State, Nigeria. The study sought to: (1) determine the level of CPR knowledge among nurses; (2) identify the challenges affecting effective CPR practice; (3) examine the relationship between years of clinical experience and CPR knowledge level; and (4) determine whether the availability and adequacy of CPR equipment influence nurses' CPR skills performance. Two hypotheses were formulated as below:

Ho1: There is no significant relationship between years of clinical experience and CPR knowledge level.

Ho2: There is no significant relationship between the availability and adequacy of CPR equipment and nurses' CPR skills performance.

METHODOLOGY

Research Design and Setting

A descriptive cross-sectional survey design was adopted, appropriate for assessing prevailing CPR knowledge and practice challenges among nurses at a single point in time and for examining relationships between variables. The study was conducted in three tertiary health institutions in Ekiti State, south-western Nigeria: Afe Babalola Multisystem Hospital (AMSH) and Ekiti State University Teaching Hospital (EKSUTH), both in Ado-Ekiti, and Federal Teaching Hospital Ido-Ekiti (FETHI) in Ido-Ekiti. These facilities serve as major referral centres with substantial nursing populations.

Population, Sample Size, and Sampling

The target population comprised all registered nurses working in the three institutions, EKSUTH (334), AMSH (134), and FETHI (338), totalling 806 nurses. The sample size was calculated using the Yamane (1967) formula, $n = N / [1 + N(e)^2]$, giving $n = 806 / [1 + 806(0.05)^2] = 806 / 3.015 = 267$. Adjusting for a 10% non-response rate produced a target of 297 nurses.

A multistage sampling technique was employed. In stage one, the three tertiary hospitals were purposively selected on the basis of their referral status and substantial nurse populations. In stage two, nurses were stratified by hospital with proportionate allocation: EKSUTH (123), FETHI (125), and AMSH (49). In stage three, participants were randomly selected from eligible nurses within each stratum. Eligible participants were NMCN-licensed registered nurses working in one of the three hospitals with at least six months of clinical experience who were willing to participate. Nurses on leave, those ill at the time of data collection, and those who declined consent were excluded.

Instrument, Validity, and Reliability

The instrument was a structured questionnaire adapted from previous validated ones (Aina et al., 2021; Akber et al., 2020; Ihunanya et al., 2020) with five sections: Section A - socio-demographics (6 items); Section B - CPR knowledge (15 yes/no items in recognition, ratio, depth, rate, airway, sequence, abdominal thrust, recoil, pause, and survival); Section C - practice challenges (15 items in institutional, workload, psychological, role-clarity, teamwork, and continuous-practice domains); Section D - availability and adequacy of equipment (8 items on storage, labelling, maintenance personnel, check frequency, functionality, and replacement plans); and Section E - training history (6 items). The 20-

item CPR skills checklist from the American Heart Association (2020) was used for objective 4 to observe and assess participants in a mannequin-based CPR drill.

Supervisor and subject matter experts ensured the content validity. Pilot testing was conducted among ten nurses at Oba Adejugbe General Hospital, Ado-Ekiti to determine the reliability of the instrument, and the result gave a Cronbach's alpha of 0.82 for knowledge section, showing acceptable internal consistency of the instrument.

Data Collection Procedure

The researcher and a trained assistant visited each hospital unit. After obtaining informed consent, questionnaires were self-administered (15–20 minutes). For the skills assessment, each nurse performed CPR on a mannequin in a private area and was observed using the 20-item checklist (2–3 minutes per nurse). Data collection took place Monday to Friday over two weeks per facility.

Data Analysis

Data were coded and entered into SPSS version 27. Descriptive statistics (frequencies, percentages, means, and standard deviations) were computed. Knowledge was categorised as good (>75% correct) or poor (<50% correct) relative to the mean score. Chi-square tests examined bivariate associations, and binary logistic regression adjusted for potential confounders (age, gender, qualification, and prior training). A p-value < 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Afe Babalola University Health Research Ethics Committee (ABU/HREC/2024/056) and from each participating hospital. Written informed consent was obtained from all participants, anonymity and confidentiality were maintained, and participants could withdraw at any time without consequence.

RESULTS

Socio-demographic Characteristics

A total of 291 nurses participated (response rate 98.0%). The majority were female (80.1%), aged 20–29 years (47.8%), held a BNSc degree (58.4%), and had fewer than 10 years of clinical experience (60.1%). Clinical areas included medical wards (22.7%), theatre (19.2%), surgical wards (18.9%), accident and emergency (15.5%), maternity (9.3%), intensive care (8.9%), and outpatient (5.5%).

Table 1 presents the full profile.

Table 1: Socio-demographic characteristics of nurses (N = 291)

Variable	Category	n (%)
Gender	Male	58 (19.9)
	Female	233 (80.1)
Age (years)	20–29	139 (47.8)
	30–39	59 (20.3)
	40–49	73 (25.1)
	≥50	20 (6.9)
Qualification	Diploma (RN/Post-Basic)	88 (30.2)
	BNSc	170 (58.4)
	Postgraduate (MSc, PhD)	33 (11.3)
Professional rank	Nursing Officer II	65 (22.3)
	Nursing Officer I	36 (12.4)
	Senior Nursing Officer	92 (31.6)
	Principal Nursing Officer	15 (5.2)
	Assistant Chief Nursing Officer	38 (13.1)
	Chief Nursing Officer / ADNS	32 (11.0)
	DDNS / DNS	13 (4.5)
Work experience (years)	<10	175 (60.1)
	11–20	74 (25.4)
	≥21	42 (14.4)
Current clinical area	Medical ward	66 (22.7)
	Surgical ward	55 (18.9)
	Theatre	56 (19.2)
	Accident & Emergency	45 (15.5)
	Maternity	27 (9.3)
	Intensive care unit	26 (8.9)
	Outpatient	16 (5.5)

Level of CPR Knowledge (Objective 1)

The mean knowledge score was 11.4 (SD = 2.1). Overall, 196 nurses (67.4%) had good knowledge, while 95 (32.6%) had poor knowledge. The highest-scoring items were head tilt–chin lift (96.2%), abdominal thrust for conscious choking (95.2%), and correct CPR improving survival chance (93.1%). The lowest-scoring items were compression rate (67.7%), compression-to-ventilation ratio (70.8%), and maximum pause for endotracheal tube placement (77.0%). Knowledge also varied by hospital (FETHI 74.4%, EKSUTH 63.4%, AMSH 51.0%; $\chi^2 = 8.47$, $p = 0.014$) and by clinical area (ICU

92.3%, A&E 82.2%, outpatient 43.8%; $\chi^2 = 19.34$, $p = 0.004$). Item-wise responses are shown in Table 2.

Table 2: Proportion of correct responses to CPR knowledge items (N = 291)

Knowledge item (correct answer)	Correct n (%)
Must wait for a doctor before starting CPR? (No)	266 (91.4)
First check responsiveness	263 (90.4)
CPR most effective when started immediately	262 (90.0)
Compression-to-ventilation ratio 30:2	206 (70.8)
Compression rate 100 per minute	197 (67.7)
Head tilt–chin lift for airway	280 (96.2)
Compression landmark: centre of chest	245 (84.2)
CPR sequence C-A-B (compressions, airway, breathing)	248 (85.2)
Abdominal thrust for conscious choking	277 (95.2)
Full chest recoil required between compressions	270 (92.8)
Compression depth 4–5 cm	257 (88.3)
Maximum pause for ET-tube placement 10 seconds	224 (77.0)
Compressions should be deep and fast	234 (80.4)
Correct CPR improves survival chance to 75%	271 (93.1)

Practice Challenges (Objective 2)

The five most frequently reported challenges were lack of retraining (86.3%), lack of proper training (84.9%), lack of continuous practice or drills (84.5%), workload and understaffing (80.1%), and lack of equipment (79.0%). Lack of a hospital CPR policy was reported by 63.6% of respondents. Psychological barriers, fear of causing harm (56.7%) and fear of being culpable if the patient died (41.9%) were less common but still present. Table 3 and Figure 1 summarise these findings.

Table 3: Practice challenges reported by nurses (N = 291)

Challenge	Yes n (%)	No n (%)
Lack of retraining / refresher courses	251 (86.3)	40 (13.7)
Lack of proper training	247 (84.9)	44 (15.1)
Lack of continuous CPR practice / drills	246 (84.5)	45 (15.5)
Workload / understaffing	233 (80.1)	58 (19.9)
Lack of equipment (e.g., AED, BVM, pocket mask)	230 (79.0)	61 (21.0)
No prior training in CPR	216 (74.2)	75 (25.8)
Inadequate knowledge of CPR	216 (74.2)	75 (25.8)
Team hierarchy does not matter in CPR (reverse-coded)	216 (74.2)	75 (25.8)

Challenge	Yes n (%)	No n (%)
Lack of teamwork during resuscitation	209 (71.8)	82 (28.2)
Lack of a hospital policy for CPR	185 (63.6)	106 (36.4)
Difficulty diagnosing cardiac arrest	180 (61.9)	111 (38.1)
Perception that CPR is the physician's role	168 (57.7)	123 (42.3)
Lack of clarity on when to commence CPR	167 (57.4)	124 (42.6)
Fear of causing harm / doubt in own skills	165 (56.7)	126 (43.3)
Fear of being culpable if the patient dies	122 (41.9)	169 (58.1)

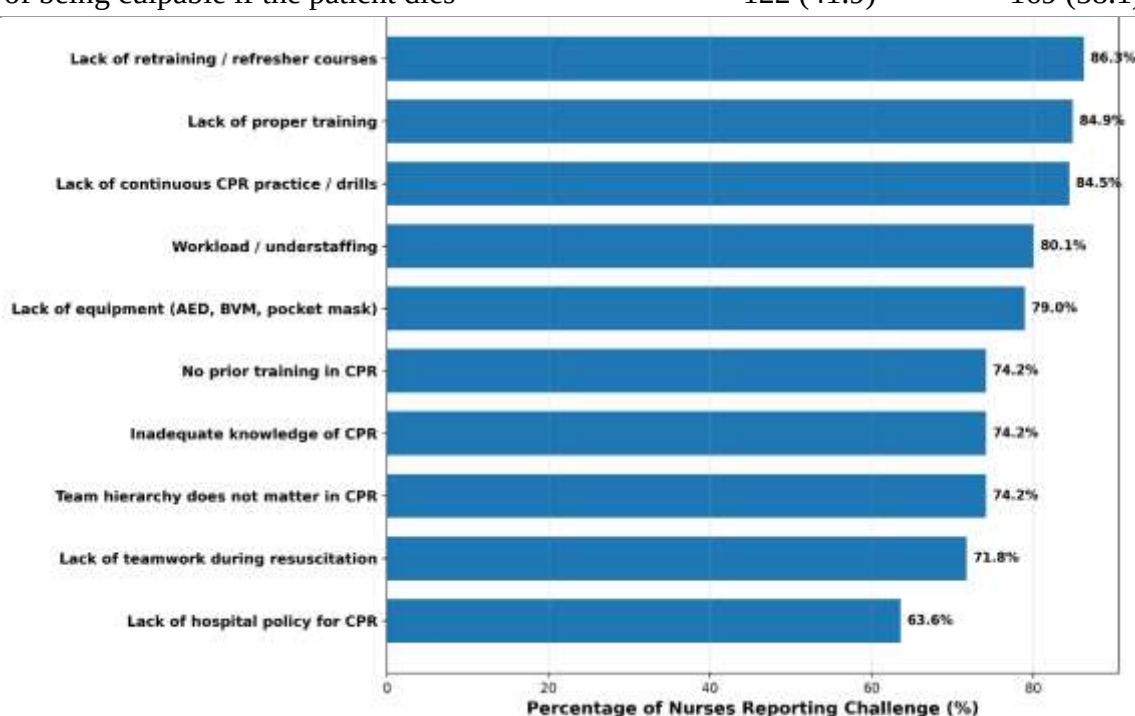


Figure 1: Top 10 practice challenges reported by nurses (N = 291)

Clinical Experience and CPR Knowledge (Objective 3)

Bivariate analysis showed a significant association between clinical experience and CPR knowledge ($\chi^2 = 6.442$, $p = 0.040$): 68.0% of nurses with fewer than 10 years had good knowledge, compared with 58.1% of those with 11–20 years and 81.0% of those with ≥ 21 years (Table 4). After adjustment, nurses with ≥ 21 years of experience had 3.21 times higher odds of good knowledge (AOR = 3.21, 95% CI: 1.21–8.52, $p = 0.019$), and prior training within the last two years was also significant (AOR = 2.45, 95% CI: 1.32–4.55, $p = 0.005$) (Table 5). H_{01} was therefore rejected.

Table 4: Bivariate association between clinical experience and CPR knowledge

Years of experience	Poor n (%)	Good n (%)	Total	χ^2	p
<10 years	56 (32.0)	119 (68.0)	175	6.442	0.040
11–20 years	31 (41.9)	43 (58.1)	74		
≥21 years	8 (19.0)	34 (81.0)	42		
Total	95 (32.6)	196 (67.4)	291		

Table 5: Binary logistic regression for good CPR knowledge

Predictor	Adjusted OR	95% CI	p
Years of experience: ≥21 (ref: <10)	3.21	1.21–8.52	0.019
Prior CPR training within last 2 years (yes vs no)	2.45	1.32–4.55	0.005

Note. Model adjusted for age, gender, qualification, and prior training. Only statistically significant predictors are reported.

Equipment Availability, Adequacy, and Skills Performance (Objective 4)

Suction devices (94.5%) and oxygen supply (92.4%) were widely available, but bag-valve masks (50.5%), AEDs (30.9%), CPR backboards (30.9%), and pocket masks (27.5%) were not. Only 32.3% of nurses reported on a designated maintenance person, 51.5% lacked an equipment replacement plan, 20.3% reported that checks were never performed, and only 35.4% reported that all staff were trained on equipment use (Table 6). Skills performance was assessed across 334 observations from 277 nurses. Among nurses with adequate equipment, 41.3% achieved good or excellent skills, compared with 21.5% of those with inadequate equipment ($\chi^2 = 12.847$, $p < 0.001$; Table 7). Logistic regression confirmed equipment adequacy as an independent predictor of skills performance (AOR = 2.58, 95% CI: 1.45–4.59, $p = 0.001$; Table 8 and Figure 2). H_{02} was therefore rejected.

Table 6: Availability and adequacy of CPR equipment (N = 291 nurses reporting)

Variable / category	n (%)
Available equipment (multiple responses)	
Suction device	275 (94.5)
Oxygen supply system	269 (92.4)
Bag-valve-mask resuscitator	147 (50.5)
Automated external defibrillator (AED)	90 (30.9)
CPR backboard	90 (30.9)
Pocket mask with one-way valve	80 (27.5)
Equipment storage	
Easily accessible	206 (70.8)
Locked / restricted access	20 (6.9)
Not sure / variable	65 (22.3)

Variable / category	n (%)
Designated maintenance personnel	
Yes	94 (32.3)
No	197 (67.7)
Frequency of equipment checks	
Daily	42 (14.4)
Weekly	131 (45.0)
Monthly	59 (20.3)
Never	59 (20.3)
Replacement plan for expired / used equipment	
Yes	141 (48.5)
No	150 (51.5)
Staff training on equipment use	
All trained	103 (35.4)
Some trained	131 (45.0)
No training	57 (19.6)

Table 7: Bivariate association between equipment adequacy and CPR skills performance

Equipment adequacy	Poor skills n (%)	Good/Excellent n (%)	Total	χ^2	p
Adequate	121 (58.7)	85 (41.3)	206	12.847	<0.001
Inadequate	97 (78.5)	31 (21.5)	128		
Total	218 (65.3)	116 (34.7)	334		

Note. 334 observations from 277 unique nurses; some nurses provided separate ratings for more than one equipment category (e.g., AED and BVM).

Table 8: Binary logistic regression for good/excellent CPR skills performance

Variable	Adjusted OR	95% CI	p
Equipment adequacy (adequate vs inadequate)	2.58	1.45–4.59	0.001
Prior CPR training within last 2 years (yes vs no)	1.98	1.12–3.50	0.019
Experience 11–20 years (ref: <10)	1.21	0.68–2.15	0.517
Experience ≥ 21 years (ref: <10)	1.78	0.85–3.72	0.126
Age (continuous)	0.98	0.95–1.01	0.213

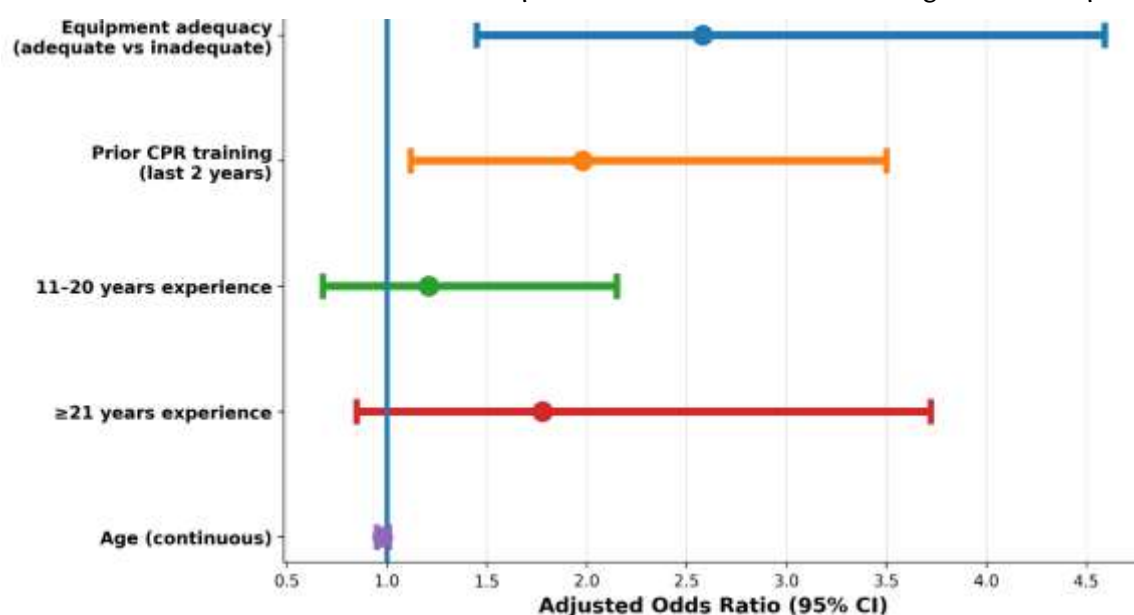


Figure 2: Forest plot of adjusted odds ratios for good/excellent CPR skills performance

DISCUSSION

The result of 67.4% good theoretical CPR knowledge amongst the nurses is encouraging and is similar to that of Ihunanya et al. (2020: 74.9%), but higher than that of other Nigerian studies (Akinbodewa et al., 2022: 2.8% and Olowokere et al., 2020: 38%) and that of other countries (Batoool et al., 2022: 15.2%). These differences are due to the differences in training requirement and recency. However, the results that almost a third of the nurses had poor knowledge is worrisome.

The level of knowledge in compression rate (67.7%) and compression-to-ventilation ratio (70.8%) is similar to the previous studies (Aina et al., 2021; Saidu et al., 2023) and shows specific areas for targeted reinforcement. The main practice challenges identified were systemic as lack of retraining (86.3%), lack of proper training (84.9%), lack of continuous practice (84.5%), workload (80.1%) and lack of equipment (79.0%), along with a lack of understanding of the institutional community about the project and the need for new backup hardware and software (67.7%). There is a lack of a hospital CPR policy in 63.6% of responses, reflecting poor institutional frameworks, and the psychological barriers mentioned were similar to those found by Hebert (2019) and Van den Bos-Boon et al. (2022) (fear of doing harm, 56.7% and fear of personal liability, 41.9%).

Clinical experience had a significant relationship with knowledge, with ≥ 21 years having the highest knowledge (81.0%) which is in support of Benner's (1984) novice to expert model. The dip in the 11-20 years category (58.1%) may have a cohort effect, with younger nurses getting more recent training and guideline aligned information, and the mid-career nurses having outdated information. Logistic regression showed that long experience (≥ 21 years) was an independent predictor of good knowledge with AOR = 3.21.

Skills performance was very strongly correlated with equipment adequacy (AOR = 2.58), but there were significant gaps in equipment available (30.9% of them were not available), replacement plans

(only 48.5% had replacement plans), regular checks (20.3% did not perform regular checks), and staff training (only 35.4% were fully trained). This is in line with the findings of Brooks et al. (2022), Perman et al. (2024) and Tsimas et al. (2019) that equipment readiness has a direct impact on resuscitation quality.

Implications

The findings suggest that refresher training in nursing practice should be required every other year, practice with simulation drills should be conducted, and policies should be put in place to support these methods. In nursing education, they advocate for including skill-retention and simulation training in curricula and remind nurses that CPR is an integral part of their job. They require the procurement of AEDs, pocket masks, and backboards, the appointment of a staff of maintenance workers, regular testing, and complete staff training, for hospital administration. On health policy, they are in favor of CPR certification for license renewal, equipment standards, and legal protection for good faith CPR.

Limitations

This is a cross-sectional design which does not allow causal inferences to be drawn, and self-report is prone to bias. The simulated skills setting may not fully represent real emergencies, the depth criterion used (4–5cm) is not the same as the current AHA recommendation (5–6cm), and the single state sampling frame limits generalisability.

CONCLUSION AND RECOMMENDATIONS

Conclusion

While most nurses (67.4%) performed good theoretical CPR knowledge, nearly one third had poor knowledge with major systemic challenges that significantly affected skills performance being lack of retraining, lack of continuous practice, heavy workload, and lack of equipment. Modifiable factors identified as important were clinical experience (particularly ≥ 21 years) and equipment adequacy. Even trained and aware nurses may be unable to provide quality CPR in the absence of institutional policies and procedures that include regular retraining, equipment procurement and maintenance, and supportive legal frameworks.

Recommendations

1. CPR training should be refreshed every six months and repeated simulation drills should be made mandatory on a regular basis for all clinical nurses, as part of their condition of employment.
2. Hospital administrators should obtain, standardise and ensure good maintenance of essential resuscitation equipment such as AEDs, bag-valve masks, pocket masks and back boards in all clinical units with weekly testing and a documented plan for replacement, and with assigned maintenance personnel.
3. Every institution must have a clear CPR policy which allows the nurse to start resuscitation promptly and protects the nurse from professional or legal retribution, when acting in good faith.
4. CPR skill retention and simulation education should be included in pre-service education and CPR certification should be required for periodic renewal of licensure for nursing education and regulatory bodies.
5. Targeted retraining should be encouraged for mid-career nurses (11-20 years experience) whose knowledge of CPR had been found to be the most outdated and further longitudinal studies should

be correlated to actual patient survival outcomes in conjunction with competence in CPR and readiness of equipment.

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