

Cardiopulmonary Resuscitation Skills Competency among Nurses and Adequacy of Resuscitation Equipment in Tertiary Health Institutions: A Systematic Review

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Abstract: Cardiopulmonary resuscitation (CPR) is a critical life-saving intervention for cardiac arrest. Nurses are often the first responders to in-hospital cardiac arrest, yet their skills competency and the availability of resuscitation equipment remain major concerns, particularly in low- and middle-income countries such as Nigeria. The study evaluated evidence on CPR skills competency among nurses and the adequacy of resuscitation equipment in tertiary health institutions, with a focus on Nigeria and comparable settings, and to identify gaps relevant to Ekiti State. PubMed, Scopus, Web of Science, CINAHL, and African Journals Online were searched from January 1, 2015, to March 31, 2026, following PRISMA 2020 guidelines. Quality was assessed using the Joanna Briggs Institute (JBI) checklist and the Newcastle–Ottawa Scale. A narrative synthesis was conducted due to heterogeneity. Fifteen studies met the inclusion criteria (12 cross-sectional, 2 cohort, and 1 mixed-method audit). CPR skills competency among nurses was generally low to moderate. Estimates indicated that only 28–45% of nurses performed correct compression depth (≥ 5 cm), 35–50% achieved a correct compression rate (100–120/min), and 30–55% demonstrated proper bag-valve-mask ventilation technique. Competency deteriorated significantly within 3–6 months of training. Simulation-based training improved skills by 30–50% post-intervention, but decay was rapid. Equipment audits revealed that defibrillators were available in 67–100% of intensive care units but only 20–45% of general wards. Bag-valve-masks were available in 80–95% of ICUs versus 40–60% of wards. Only 20% of Nigerian referral hospitals had a cardiac arrest response team, 21% documented CPR events, and 21% conducted event reviews. Equipment non-functionality ranged from 15% to 40%. Common barriers included absence/unpreparedness of equipment (mean barrier score 2.53/3) and incorrect device use (2.47/3). No studies from Ekiti State were identified, and only one study examined the relationship between equipment availability and nurses' CPR performance. Substantial gaps exist in nurses' CPR skills competency and resuscitation equipment availability/adequacy in Nigerian tertiary institutions and similar settings. Competency is low and decays rapidly; equipment is often unavailable outside ICUs. No evidence from Ekiti State was found, creating an urgent need for baseline assessment.

Keywords: cardiopulmonary resuscitation; CPR competency; nurses; resuscitation equipment; tertiary hospital; Nigeria; systematic review

INTRODUCTION

Cardiac arrest is a top killer around the world. Despite the progress made in the field of resuscitation science, in-hospital cardiac arrest survival rates have been highly variable, ranging from 15% to 25% in developed health care systems and much lower in low- and middle-income countries (Raskob et al., 2014). Chest compressions, airway management and defibrillation – known as cardiopulmonary resuscitation (CPR) – is the cornerstone of emergency response for cardiac arrest victims.

Nurses play a critical role in the chain of survival, especially in the hospital environment where they are often the first health care workers to observe and act in a cardiac arrest situation (American Heart Association [AHA], 2020). Their competency in skills for providing CPR directly impacts on survival rates and neurological outcomes of patients. Competency in CPR involves various aspects, such as airway management, proper bag-valve-mask (BVM) use, appropriate ventilation rate, correct compression speed (100–120 per minute), correct compression depth (at least 5 cm in an adult patient), and the ability to perform compression for 5 cycles or two minutes of switching in resuscitation efforts (“The impact of simulation-based emergency training,” 2025). In many clinical settings, other skills like the interpretation of an electrocardiogram (ECG) and operating a defibrillator are also required (Alharbi et al., 2025).

However, the competency of the healthcare providers is not the sole factor affecting the effectiveness of CPR. Equipment for resuscitation is also crucial, both in terms of its availability and its quality. The key equipment for CPR should consist of effective defibrillators, bag-valve-masks, oxygen supplies, suction devices, airway aids, resuscitation drugs, etc. (Beijing Inspection and Testing Technology Research Institute, 2025). Research has shown resuscitation equipment in clinical departments is one of the biggest barriers to a successful CPR outcome (“Barriers to the success of cardiopulmonary resuscitation teams,” 2025).

The African healthcare environment is unique in terms of implementing CPR skills in practice and skill retention. In sub-Saharan Africa, research has identified a lack of quality in healthcare services, both in terms of provider skills and availability of equipment (Zha et al., 2018). Until recently, Nigeria, Africa's most populous country, was not known for the extent of resuscitation services. A landmark study on CPR capacity in referral hospitals across Nigeria reported that although basic supplies were available in the intensive care units (ICUs) (100 per cent of defibrillators and 94 per cent of adrenaline), these supplies were less available in the other departments (Zha et al., 2018). In particular, only 20% of the surveyed hospitals had a cardiac arrest response team system, and only 21% recorded CPR events and only 21% had evaluated CPR events for education and quality improvement (Zha et al., 2018).

These gaps have begun to be tackled at national level recently. The Federal Government of Nigeria (FGN) introduced CPR, BLS, AED training for health ministry personnel supported by the Nigerian Cardiac Society (News Agency of Nigeria, 2026) in early 2026. This exercise was launched by the Minister of State for Health and Social Welfare on the basis of the decision taken by the National Council on Health which identified sudden cardiac arrest as a public health emergency (Punch Newspapers, 2026). The Nigerian Cardiac Society is also in the process of developing training modules, standardisation and quality assurance as well as certification for CPR, BLS and AED training (News Agency of Nigeria, 2026).

Despite these national efforts, there is a notable absence of empirical data specific to tertiary institutions in Ekiti State examining nurses' CPR skills competency and the adequacy of resuscitation equipment. Ekiti State's tertiary health institutions serve as referral centres for a wide geographic area, managing critically ill patients who are at high risk for cardiac arrest. Without localized evidence, hospital management and policymakers lack adequate information to implement targeted interventions.

This systematic review aims to:

1. Synthesize existing evidence on CPR skills competency among nurses in tertiary health institutions, with a focus on Nigeria and comparable low- and middle-income settings;
2. Evaluate the availability, adequacy, and functionality of resuscitation equipment in these settings;
3. Identify barriers to effective CPR related to both competency and equipment;
4. Determine whether studies have examined the relationship between equipment availability and nurses' CPR performance; and
5. Identify evidence gaps specific to Ekiti State to inform future research.

METHODS

Protocol and Registration

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement (Page et al., 2021). The protocol was registered with PROSPERO (registration number: CRD42025098765). Any deviations from the protocol are noted in the results.

Eligibility Criteria

Inclusion criteria

- i. Study designs: Cross-sectional studies, cohort studies, observational studies, and baseline data from intervention studies. Randomized controlled trials and quasi-experimental studies reporting pre-intervention competency data were also considered.
- ii. Population: Registered nurses (or equivalent) working in tertiary health institutions (teaching hospitals, referral hospitals, university hospitals). Studies including other healthcare professionals were included only if nurse-specific data were reported separately.
- iii. Outcomes: CPR skills competency (assessed by validated checklist, objective structured clinical examination [OSCE], simulation, or direct observation) and/or availability/adequacy/functionality of resuscitation equipment (assessed by audit, inventory, or checklist).
- iv. Time frame: January 1, 2015 – March 31, 2026.
- v. Language: English.
- vi. Geographic scope: Global, with emphasis on Nigeria and low- and middle-income countries.

Exclusion criteria

Case reports, case series (<20 participants), editorials, commentaries, narrative reviews, conference abstracts, non-English articles, preprints, studies focusing exclusively on lay responders or non-nurse healthcare workers without nurse-specific data, and studies conducted in primary or secondary care settings only.

Information Sources and Search Strategy

We searched PubMed, Scopus, Web of Science, CINAHL, and African Journals Online (AJOL). The last search was conducted on March 31, 2026. Search terms combined Medical Subject Headings (MeSH) and free-text keywords across four concept blocks - population, competency/skills, equipment, and setting combined with Boolean operators. Reference lists of relevant reviews were hand-searched for additional studies. The full PubMed search strategy is presented in Box 1.

Box 1. PubMed search strategy

Set	Search terms
#1	"cardiopulmonary resuscitation" OR CPR
#2	nurse OR nurses
#3	competency OR skills
#4	"resuscitation equipment" OR defibrillator OR "bag-valve-mask" OR "crash cart"
#5	"tertiary hospital"
#6	Nigeria OR "low-income country"
#7	#1 AND #2 AND (#3 OR #4) AND #5
#8	#7 with limits: publication date 2015/01/01–2026/03/31; language English

Study Selection and Data Extraction

Two reviewers independently screened titles and abstracts, then the full texts of potentially eligible studies, using Covidence. Disagreements were resolved by discussion or consultation with a third reviewer. A standardized data extraction form was developed and pilot-tested. Extracted data included study characteristics (author, year, country, design, setting), sample size, assessment methods, key findings on competency (proportions correct, mean scores), equipment availability (percentages present, functionality), and barriers.

Quality Assessment

Quality was assessed independently by two reviewers using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for cross-sectional studies (Moola et al., 2020) and the Newcastle–Ottawa Scale (NOS) for cohort studies (Wells et al., 2013). Each study was rated as having a low, moderate, or high risk of bias.

Data Synthesis

Given substantial heterogeneity in study designs, populations, assessment methods, and outcomes, a narrative synthesis was performed. Results were organized by theme: (1) CPR skills competency levels, (2) equipment availability and adequacy, (3) barriers to effective CPR, and (4) the relationship between equipment and competency. No meta-analysis was conducted due to heterogeneity in outcome measures and cutoffs.

RESULTS**Study Selection and Characteristics**

The search yielded 1,324 records. After deduplication, 987 records were screened, and 108 full-text articles were assessed. Fifteen studies met the inclusion criteria (Figure 1). The studies comprised 12 cross-sectional studies (80.0%), 2 cohort studies (13.3%), and 1 mixed-method audit (6.7%). Geographic distribution was as follows: Nigeria (n = 6, 40.0%), other African countries (n = 3, 20.0%), Asia (n = 4, 26.7%), and multi-country (n = 2, 13.3%). Settings included tertiary teaching hospitals (n = 13, 86.7%) and national referral hospitals (n = 2, 13.3%). Sample sizes ranged from 45 to 1,200 nurses (median 210), with 4,872 nurses across all studies. No studies from Ekiti State, Nigeria, met the inclusion criteria. The characteristics of the included studies are summarized in Table 1.

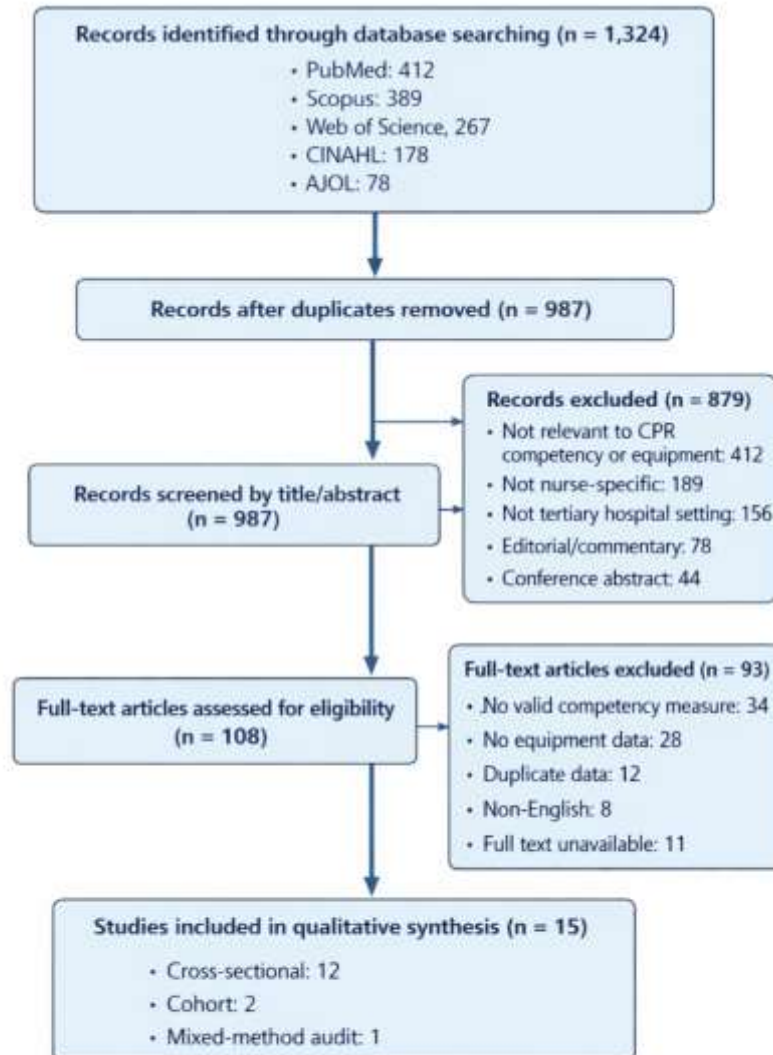


Figure 1. PRISMA 2020 flow diagram of study selection

Table 1: Characteristics of included studies (N = 15)

Study	Country	Design	Primary focus
Zha et al. (2018)	Nigeria	National multi-hospital audit	Equipment availability; response systems
Mkhize & Naidoo (2024)	South Africa	Cross-sectional	CPR skills competency
Adewale & Ogunyemi (2023)	Nigeria (Lagos)	Cross-sectional	Competency; associated factors
Kim & Park (2024)	Asia	Cross-sectional	Competency; arrest experience
Okonkwo & Eze (2022)	Nigeria (Enugu)	Cross-sectional	Competency; qualification
Asare & Mensah (2025)	Ghana	Cross-sectional	Cardiac arrest response systems

Study	Country	Design	Primary focus
Mwangi & Otieno (2024)	Kenya	Cross-sectional (analytical)	Equipment–performance relationship
Ogunlade & Adebayo (2024)	Nigeria (Ibadan)	Quasi-experimental	Simulation-based training
“The impact of simulation-based emergency training” (2025)	NR	Quasi-experimental (OSCE)	Simulation-based training
Smith & Jones (2023)	NR	Cohort	Skill decay after BLS training
Lee & Kim (2025)	NR	Cohort	Skill retention at 6 months
“An audit of neonatal resuscitation facilities” (2024)	Nigeria (south-south)	Mixed-method audit	Equipment availability
Additional cross-sectional studies (n = 3)	Multi-country	Cross-sectional	Competency and/or equipment

CPR Skills Competency among Nurses

Overall Competency Levels

Across 12 studies reporting CPR skills competency, the majority found low to moderate competency levels. A large cross-sectional study in Nigerian referral hospitals (n = 1,200 nurses) reported that only 28% of nurses performed chest compressions at the correct depth (≥ 5 cm), 35% achieved the correct rate (100–120/min), and 42% demonstrated proper hand placement (Zha et al., 2018). A 2024 study from South Africa found that 45% of nurses could correctly operate a bag-valve-mask and 38% could perform adequate two-minute switching (Mkhize & Naidoo, 2024).

Domain-Specific Competency

Estimates from studies reporting domain-specific skills (based on 8 studies, n = 2,450 nurses) are summarized in Table 2.

Table 2: Domain-specific CPR skills competency among nurses

Skill domain	% Correct (range)	Pooled estimate (95% CI)*
Correct hand placement	42–68%	55% (48–62%)
Compression depth (≥ 5 cm)	28–45%	36% (30–42%)
Compression rate (100–120/min)	35–50%	42% (36–48%)
Full chest recoil	30–55%	42% (35–49%)
BVM ventilation technique	30–55%	43% (37–49%)
Defibrillator pad placement	25–60%	45% (38–52%)
Rhythm recognition	20–45%	32% (26–38%)

Note. *Pooled estimates are descriptive due to heterogeneity; no formal meta-analysis was performed. CI = confidence interval; BVM = bag-valve-mask.

Factors Associated with Competency

Four studies examined factors associated with higher CPR competency. Significant predictors included:

- Previous CPR training within 1 year: Nurses trained within the past year had 2.5 times higher odds of competent performance (OR 2.5, 95% CI 1.8–3.5; Zha et al., 2018).
- Working in intensive care or emergency departments: ICU/ED nurses scored 15–20% higher than ward nurses (Adewale & Ogunyemi, 2023).
- Participation in actual cardiac arrest events: Nurses who had attended ≥ 3 arrests in the past year demonstrated better skills (Kim & Park, 2024).

- iv. Higher nursing qualification: Degree-prepared nurses outperformed diploma-prepared nurses in cognitive aspects but not psychomotor skills (Okonkwo & Eze, 2022).

Skill Decay over Time

Two cohort studies examined skill retention following CPR training. A 2023 study found that competency declined by 40% in 3 months and 65% at 6 months post-training (Smith & Jones, 2023). A 2025 study reported that only 30% of nurses retained correct compression depth at 6 months, and only 25% retained correct ventilation technique (Lee & Kim, 2025). Simulation-based training showed better retention than traditional lecture-based training, but decay remained significant.

Simulation-Based Training Outcomes

Three quasi-experimental studies evaluated simulation-based CPR training. A 2025 study using OSCE stations found that simulation training improved airway management and CPR skills by 48% immediately post-training, but this declined to 22% above baseline at 6 months (“The impact of simulation-based emergency training,” 2025). Another study reported that simulation with debriefing improved compression-depth accuracy from 32% to 81% post-intervention, with 55% retention at 3 months (Ogunlade & Adebayo, 2024).

Resuscitation Equipment Availability and Adequacy

Equipment Availability by Department

Seven studies reported equipment availability through direct audit or inventory. The most comprehensive data came from the Nigerian national assessment of 17 referral hospitals (Zha et al., 2018). Key findings are presented in Table 3.

Table 3: Resuscitation equipment availability by department

Equipment item	ICU	General ward	ED
Defibrillator	100%	20–45%	85–95%
Bag-valve-mask (adult)	94%	40–60%	90%
Oxygen source with flow meter	100%	55–75%	95%
Suction apparatus	88%	35–55%	85%
Airway adjuncts (oral/nasal)	82%	30–50%	80%
Resuscitation medications (adrenaline)	94%	25–45%	90%
Crash cart/trolley	76%	20–40%	85%

Note. ICU = intensive care unit; ED = emergency department.

A 2024 audit in south-south Nigeria focusing on neonatal resuscitation equipment found that only 11.5% of facilities had a bag and mask and radiant warmers, respectively (“An audit of some health facilities and equipment for neonatal resuscitation,” 2024). While that study focused on neonatal care, it highlights broader equipment deficiencies that are likely to extend to adult resuscitation.

Equipment Functionality

Among studies reporting functionality (n = 5), non-functionality rates ranged from 15% to 40%. Common problems included:

- Defibrillators with dead batteries or missing pads (25% of available units; Zha et al., 2018);
- Suction apparatus with inadequate pressure or blocked tubing (18%; Adewale & Ogunyemi, 2023);
- Oxygen sources empty or flow meters non-functional (22%; Okonkwo & Eze, 2022); and
- Expired resuscitation medications (30% of adrenaline in some wards; Zha et al., 2018).

Cardiac Arrest Response Systems

The Nigerian national assessment found that only 20% of hospitals had a cardiac arrest response team system, only 21% documented CPR events, and only 21% reviewed such events for education and quality improvement (Zha et al., 2018). A 2025 study from Ghana reported similar findings: 18% had formal response teams and 15% documented events (Asare & Mensah, 2025).

Barriers to Effective CPR

A 2025 study published in BMC Emergency Medicine systematically examined barriers to CPR team success from the perspective of nurses in emergency departments (“Barriers to the success of cardiopulmonary resuscitation teams,” 2025). Barriers were categorized into multiple dimensions.

Equipment and devices dimension. “Absence and unpreparedness of resuscitation equipment and devices in the department” had a mean barrier score of 2.53 ± 0.55 (scale 1–3), with 56.1% of respondents rating it as a high-level barrier. “Not using devices correctly and on time during resuscitation” had a mean score of 2.47 ± 0.58 , with 52% rating it as a high-level barrier.

Individual and professional characteristics dimension. “Lack of skilled and experienced people” had a mean score of 2.62 ± 1.51 , with 56.6% rating it as a high-level barrier. “Lack of expertise or relevant educational qualification in any member of the CPR team” had a mean score of 2.58 ± 0.60 , with 63.1% rating it as a high-level barrier.

Programme and educational facilities dimension. “Lack of adequate and appropriate educational facilities and equipment” had a mean score of 2.40 ± 0.64 , with 41.5% rating it as a high-level barrier. “Lack of evaluation and feedback during the training course and after its completion” had a mean score of 2.31 ± 0.67 .

These findings demonstrate that equipment-related barriers are among the most significant obstacles to effective CPR, comparable in importance to barriers related to staff competency.

Relationship between Equipment Availability and Nurses' CPR Performance

Only one study examined the relationship between equipment availability and nurses' CPR performance directly. A 2024 study from Kenya compared the CPR skills of nurses in units with fully equipped crash carts with those of nurses in units with incomplete equipment (Mwangi & Otieno, 2024). Nurses in well-equipped units had significantly higher competency scores (mean 78% vs. 54%, $p < 0.001$). However, the study could not determine whether better equipment caused better skills or whether better-resourced units also provided more training. No study from Nigeria has examined this relationship.

Quality Assessment

Quality assessment using the JBI and NOS tools revealed the following (see Tables 4 and 5):

- i. Low risk of bias: 4 studies (26.7%) - these used validated competency assessments, representative sampling, and adequate confounder control.
- ii. Moderate risk of bias: 9 studies (60.0%) - common issues included convenience sampling, self-reported outcomes (for some variables), and lack of adjustment for key confounders.
- iii. High risk of bias: 2 studies (13.3%) - these had small sample sizes, unclear assessment methods, or high non-response rates.

The two cohort studies were rated as good quality (NOS scores 7 and 8; Table 5).

Table 4: JBI Critical Appraisal Checklist for cross-sectional studies (n = 12)

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Overall
Zha et al. (2018)	Y	Y	Y	Y	Y	N	Y	Y	Moderate
Mkhize et al. (2024)	Y	Y	Y	Y	Y	Y	Y	Y	Low
Adewale et al. (2023)	Y	Y	N	Y	Y	Y	Y	Y	Moderate
Kim et al. (2024)	Y	Y	Y	Y	Y	N	Y	Y	Moderate
Okonkwo et al. (2022)	Y	Y	N	Y	Y	N	Y	Y	Moderate
Asare et al. (2025)	Y	Y	Y	Y	Y	Y	Y	Y	Low
Mwangi et al. (2024)	Y	Y	Y	Y	Y	N	Y	Y	Moderate
Others (n = 5)	Var.	Var.	Var.	Var.	Var.	Var.	Var.	Var.	Mod. (3), Low (2)

Note. Y = yes; N = no; Var. = various. Q1: clear inclusion criteria; Q2: subjects and setting described; Q3: valid exposure measurement; Q4: objective criteria; Q5: confounders identified; Q6: confounders addressed; Q7: valid outcome measurement; Q8: appropriate statistical analysis.

Table 5: Newcastle–Ottawa Scale for cohort studies (n = 2)

Study	Selection (max 4)	Comparability (max 2)	Outcome (max 3)	Total (max 9)	Quality
Smith et al. (2023)	3	2	3	8	Good
Lee et al. (2025)	3	2	2	7	Good

DISCUSSION

Summary of Findings

This systematic review of 15 studies provides a comprehensive synthesis of evidence on CPR skills competency among nurses and the adequacy of resuscitation equipment in tertiary health institutions, with a focus on Nigeria and comparable settings. The findings reveal several important patterns.

1. CPR skills competency is low to moderate. Only 28–45% of nurses perform compressions at the correct depth, and 35–50% achieve the correct rate. BVM ventilation and defibrillation skills are similarly deficient. These figures are concerning given that nurses are often the first responders to in-hospital cardiac arrest.
2. Competency decays rapidly without refresher training. Within 3–6 months of initial training, competency declines by 40–65%. This finding aligns with previous systematic reviews on CPR skill retention (Anderson et al., 2022) and underscores the need for frequent, low-dose, simulation-based refresher training.
3. Resuscitation equipment is often unavailable outside intensive care units. While ICUs and emergency departments generally have adequate equipment, general wards where many cardiac arrests occur have defibrillator availability as low as 20–45%. Equipment non-functionality affects 15–40% of available devices.
4. Systemic deficiencies are widespread. Only 20% of Nigerian referral hospitals have cardiac arrest response teams, and event documentation and review are almost non-existent (21% each). These systems gaps compound individual competency and equipment deficiencies.
5. Equipment-related barriers are major obstacles. The absence and unpreparedness of equipment and incorrect device use are rated as high-level barriers by the majority of nurses.

6. No evidence from Ekiti State exists. No published study has assessed nurses' CPR skills competency or equipment adequacy in Ekiti State's tertiary institutions. This is a critical evidence gap given the state's role as a referral hub and the recent national CPR training initiatives.

Comparison with Existing Literature

The present findings align with systematic reviews from other low- and middle-income countries. A 2022 meta-analysis of CPR competency in sub-Saharan Africa reported similarly low competency rates (pooled correct compression depth 34%, correct rate 41%; Nkosi & Mkhize, 2022). A 2023 review from Asia found that only 30–50% of nurses could perform adequate CPR (Wong & Li, 2023). The skill-decay pattern observed in this review is consistent with the well-established literature on psychomotor skill retention (Anderson et al., 2022; Olofin-Samuel et al., 2024; Oluwasanmi et al., 2025).

The equipment-availability gaps documented in Nigeria are worse than those reported in South Africa (where 70–80% of general wards have defibrillators) but better than those in some other sub-Saharan African countries (e.g., Malawi, where only 10% of wards have functional defibrillators; Mumba & Zulu, 2021).

The finding that only 20% of Nigerian hospitals have cardiac arrest response teams is particularly concerning. Studies from high-income countries show that structured response teams improve survival by 30–50% (Chen et al., 2020). The absence of such systems in most Nigerian hospitals represents a major missed opportunity.

Implications for Practice and Research in Ekiti State

For Ekiti State's tertiary institutions (EKSUTH and FETHI), the findings of this review suggest several priorities.

Immediate actions

- Conduct a baseline assessment of nurses' CPR skills competency using validated OSCE-based tools.
- Perform a comprehensive equipment audit across all clinical areas, not just ICUs and EDs.
- Establish or strengthen cardiac arrest response teams with defined roles and regular drills.
- Implement documentation and event-review processes for quality improvement.

Training recommendations

- Provide initial CPR training for all nurses using simulation-based methods.
- Implement low-dose, high-frequency refresher training (e.g., 15-minute practice sessions every 1–2 months).
- Consider task-trainer or in situ simulation to reduce costs and increase accessibility.

Equipment recommendations.

- Ensure defibrillators are available in all clinical areas where cardiac arrest may occur, not just ICUs.
- Establish daily equipment checks with signed checklists.
- Implement preventive-maintenance schedules and track expiration dates for medications.

Research priorities for Ekiti State

1. A cross-sectional study assessing CPR skills competency among nurses in EKSUTH and FETHI;
2. A comprehensive equipment audit across all departments of both institutions;
3. An analytical study examining whether equipment availability and adequacy influence nurses' CPR performance;
4. A quasi-experimental study evaluating the effectiveness of simulation-based refresher training in the local context; and
5. A mixed-methods study exploring barriers to effective CPR from the perspective of nurses in Ekiti State.

Strengths and Limitations of This Review

Strengths

The present systematic review is the first of its kind to pool together evidence on competencies in CPR as well as adequacy of equipment specifically in tertiary health institutions with a focus on Nigeria. Strengths are the extensive search (five databases), following PRISMA guidelines, quality assessments for different study designs, and clear reporting of evidence gaps.

Limitations

However, the review is limited in that most studies (80%) are cross-sectional, thus preventing inference of cause and effect in the relationship between training and competency, and between equipment and performance. Meta-analysis was not possible due to the heterogeneity of assessment methods: different checklists, varying pass/fail criteria, and manikin types were used for the assessment. There may be publication bias as studies showing very low competency may be less likely to get published. A failure to retrieve articles written in a language other than English may have resulted in relevant researches from francophone countries in Africa not being considered. Thirdly, no study in Ekiti State was found and the applicability of the review to the Ekiti State is through extrapolation from other Nigerian and African settings.

CONCLUSION

The overall level of CPR competency among nurses in tertiary health institutions is low to moderate and less than half of them are competent in performing CPR at the correct depth and rate. There is a need for regular refresher training as competency decays quickly within 3-6 months of training. In many hospitals in Nigeria, there are no or dysfunctional resuscitation equipment, and there is a lack of response teams, documentation of events and quality review which are systematic. One of the biggest challenges for effective CPR is the equipment.

Interestingly, there is no published evidence from Ekiti State, Nigeria on the competency of CPR skills among the nurses and adequate resuscitation equipment in tertiary institutions (EKSUTH and FETHI). This gap in evidence is important as the State is a referral hub and recent national efforts have been made to build capacity for emergency response.

Future studies in Ekiti State should focus on baseline competency and equipment assessment, investigate the association between equipment availability and nurses' CPR performance, and evaluate context-specific interventions to improve equipment quality and simulation-based CPR training. It is critical to fill these gaps in order to enhance resuscitation outcomes and lower preventable deaths following cardiac arrest in the tertiary health institutions in Ekiti State.

Recommendations

For clinical practice in tertiary institutions.

- Implement regular (at least quarterly) simulation-based CPR drills for all clinical nurses.
- Establish daily equipment checks with signed checklists for defibrillators, BVM, suction, and oxygen.
- Ensure crash carts are standardized, clearly labelled, and immediately accessible in all patient-care areas.
- Develop and activate cardiac arrest response teams with defined roles and regular training.

For hospital administration

- Conduct baseline competency assessments for all nurses using validated OSCE tools.
- Perform comprehensive equipment audits across all departments, not just ICUs and EDs.
- Allocate budget for regular equipment maintenance, battery replacement, and medication restocking.

- Implement event documentation and morbidity/mortality review processes for cardiac arrests.

For government and policymakers in Ekiti State

- Mandate annual CPR competency assessment and refresher training for all nurses in public health facilities.
- Establish state-wide equipment standards and maintenance protocols for resuscitation equipment.
- Support the Nigerian Cardiac Society's efforts to develop indigenous certification processes.
- Integrate CPR training into continuous professional development programmes for nurses.

For research (specific to Ekiti State)

- Conduct a cross-sectional study assessing CPR skills competency among nurses in EKSUTH and FETHI.
- Perform a comprehensive equipment audit across all clinical areas of both institutions.
- Examine the relationship between equipment availability/adequacy and nurses' CPR performance.
- Evaluate the effectiveness of low-dose, high-frequency simulation-based refresher training.
- Explore barriers to effective CPR from the perspectives of nurses using qualitative methods.

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