**Original Article**

# Cardiopulmonary Resuscitation among Nursing Staff at a Tertiary Health Facility in Nigeria: A Cross-Sectional Study

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## ABSTRACT

***Background:*** Cardiopulmonary Resuscitation (CPR) is an emergency life-saving care to restore blood circulation following cardiac arrest. Nurses are often the closest when cardiac arrest occurs, thus their competence and initiation of CPR could be life-saving**.**

***Aim:*** To evaluate nurse practitioners' knowledge, attitude, and willingness to initiate CPR.

***Methods:*** A cross-sectional study was conducted; participants were nursing staff at the University of Ilorin Teaching Hospital, Ilorin, Nigeria. Nursing students and other healthcare workers were excluded from the study. Multistage sampling method was used and all participants completed a self-administered questionnaire after informed consent. Data analysis was with SPSS version 21.0 and p<0.05 was significant.

***Results:*** Among the 220 participants, 35(15.9%) were 5years post-qualification, 100(45.5%) had sub-specialty training, awareness about CPR was 100%, 66(30%) showed good knowledge on the practice of CPR, 154(70%) had formal training on CPR, 112 (50.9%) of the training were during schooling while 182(82.7%) showed good attitude towards initiating CPR when indicated. Hindrances to initiation of CPR included lack of training (56.2%), heavy workload (47.3%), inadequate knowledge (42.8%), lack of equipment (41.8 %,) and difficulty establishing a diagnosis of cardiac arrest (13.9%). Competence grading for CPR was 48.4% for participants with surgical, 40.0% for medical subspecialty training, and 44.2% for non-subspecialists. There was a statistically significant relationship between competence in CPR and knowledge about it (p=0.026).

***Conclusion:*** Knowledge and practice of CPR among nurses were low; health institutions and the mandatory nursing professional development programs should prioritize post-qualification training of nurses in the life-saving skills of CPR.

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## INTRODUCTION

Cardiac arrest is a medical emergency that may complicate severe cardiac and pulmonary diseases; it is a major cause of premature death claiming one life every 90 seconds.[1] An estimated 180,000–300,000 sudden cardiac deaths (SCD) occur in the US annually;[1,2] globally, sudden and unexpected cardiac arrest is the commonest cause of death with about 17 million cases annually.[2] The low rates of survivors of cardiac arrest have been a concern to clinicians,[3] prompting the need for multiple resuscitative measures to improve the overall survival rates. This underscores the role of Cardiopulmonary Resuscitation (CPR) in the improvement of patient survival in cardiac arrest.

CPR is emergency care designed to save lives through early recognition and prompt initiation of basic life support (BLS) to reduce sudden death and its attendant complications.[1] Occurrence of sudden cardiac arrest is not impossible and if not treated immediately can result in serious complications. Therefore, healthcare providers are expected to be proficient at performing CPR especially nurses who are often viewed as the closest personnel to hospitalized patients. A previous study reported that timely initiation of CPR by a health care provider with adequate skills can significantly prevent sudden death.[3] However, other reports indicated that nurses generally have poor knowledge and skills of CPR [4, 6] possibly due to inadequate training and non-availability of resources and equipment among other factors.

In Nigeria, a report showed general poor knowledge of basic CPR among nurses at the primary health care level.[7] Another study observed that knowledge gained during CPR training deteriorated by three months afterwards when it is not utilized.[8] This study aimed to evaluate nurse practitioners' knowledge, attitude, and willingness to initiate CPR when it is indicated.

## METHODOLOGY

**Study setting:** The study was conducted at the University of Ilorin Teaching Hospital (UITH), a tertiary health facility in North Central Nigeria.

**Study Design:** A prospective cross-sectional study.

**Study Population:** The study participants were qualified Nurses and Midwives who were staff of the UITH at the time of the study.

**Study period:** The study period was from 1st February to 31st August, 2020.

### Inclusion/ exclusion criteria

Inclusion criteria were Nurses or Midwife staff of the hospital working at the clinical service points in the hospital i.e. general outpatient department (GOPD), Specialist clinics, inpatient wards, operating theatre and intensive care unit (ICU). Nurses and Midwife tutors at the Basic and Post-basic Nursing schools of the hospital, Nursing students and other health workers were excluded from the study.

### Sample size determination

The minimum sample size for the study was calculated using the formula for estimating minimum sample size in descriptive health study[9]

$$n = z^2 pq/d^2$$

Where

n= the minimum sample size when the target population is greater than 10,000

z=Standard deviate usually set at 1.96 which corresponds to 95% confidence interval

p=Proportion in the target population estimated to have a particular characteristic- the proportion of Nurses in the workforce at the study site was 20% (from hospital records), i.e. p= 0.2

q=1- p= 1-0.2=0.8

d= degree of accuracy desired was set at 0.05

Therefore: n = 1.96 x 1.96 x 0.2 x 0.8 ÷ 0.0025 = 246

However, total number of Nurses in the hospital was 700, therefore, corrected sample size is:

$$n = n_o \div 1 + n_o - 1$$

Where:

n= sample size for population <10,000

$n_o$= sample size for population >10,000= 246

N= Total number of nurses in the hospital = 700

$$n = 246 \div 1+ (246\text{-}1/700) = 182$$
participants

Using 20% attrition rate, the minimum sample size for the study was 182+38= 220 participants.

## Sampling

Multistage stratified random sampling method was adopted. First, a list of all Nurses and Midwives in the hospital was obtained; second, they were categorized into four groups i.e. Medical, Surgical, Obstetrics / Gynaecology and Outpatient clinics. Third, a list of staff in each group was compiled while individual participants were selected from the list in proportion relative to the number of nurses in each group using simple random sampling. A total of 250 staff were identified and approached for participation while 220 consented to participate in the study.

## Data Collection Techniques and Study tools

Data collection was through a structured, self-administered questionnaire consisting of multiple-choice close-ended questions fashioned in Likertformat which included biosocial characteristics, professional qualification, practice, knowledge, proficiency and willingness to initiate CPR.

## Validity and Reliability of the study research instrument

The study questionnaire was compared to those of similar previous studies and the questions framed along similar lines to allow for comprehension and comparison. Constructive criticisms, verifications, proofreading, adjustments, and corrections were done by independent Researchers in health sciences and the ethical review committee of the institution (UITH) to prove its validity, reliability, and relevance.

## Research, Questions

1) What is the level of knowledge of CPR among Nurses at the study site?
2) What are the problems faced by Nurses in initiating CPR at the study site?
3) What are the factors influencing Nurses' skills, confidence, and competency in initiating CPR?

## Research Hypotheses

For the study, the Null hypotheses were:
a). Lack of knowledge/competence does not significantly affect the initiation of CPR by Nurses.
b). Work experiences do not significantly affect the practice of CPR by Nurses.

## Data analysis

The research tool was a structured, self-administered questionnaire divided into socio-demographic characteristics, evaluation of the knowledge and skill of participants about CPR, their practice and competence. Each questionnaire was entered into the computer followed by analysis using the Statistical Package for Social Sciences (SPSS) version 21.0. Comparison of data was with chi-square and Fisher's exact tests while $p<0.05$ was statistically significant.

## Ethics

Institutional ethical approval for the study was obtained from the ethical review committee of the University of Ilorin Teaching Hospital while a written informed consent was obtained from all participants in the study.

## RESULTS

A total of 220 nurses participated in the study. From table 1, participants were aged 18 to 60 years (mean 55±46.8), 210 (95.5%) were females while 96(43.6%) had a Bachelor's degree in nursing. Majority of study participants had 1 to 5 years working experience (50, 22.8%) and 26-30 years (39, 17.7%) while the commonest job titles were SeniorNursing Officer (61, 27.7%) and Chief Nursing Officer (61, 27.7 %,). Majority of the staff

were yet to undertake their sub-specialization training (120, 54.5%); however, the commonest area of sub-specialization was medical (45, 20.5%).

**Table 1: Socio-demographic characteristics of the study participants**

| Variables | Frequency (n) | Percentage (%) |
|---|---|---|
| **Age (years)** | | |
| 18-25 | 15 | 6.8 |
| 26-35 | 20 | 9.1 |
| 36-45 | 71 | 32.3 |
| 46- 60 | 114 | 51.8 |
| **Gender** | | |
| Male | 10 | 4.5 |
| Female | 210 | 95.5 |
| **Qualification** | | |
| Diploma | 23 | 10 |
| Midwifery | 7 | 3.2 |
| RN, RM | 78 | 35.5 |
| BSc. | 96 | 43.6 |
| MSc./ Phd | 16 | 7.3 |
| **Working experience (years(** | | |
| 1-5 | 35 | 15.9 |
| 6-10 | 26 | 11.8 |
| 11-15 | 50 | 22.8 |
| 16-20 | 26 | 11.8 |
| 21-25 | 31 | 14.1 |
| 26-30 | 39 | 17.7 |
| 31-36 | 13 | 6 |
| **Rank (Job Title)** | | |
| Senior Nursing Officer | 61 | 27.7 |
| Chief Nursing Officer | 61 | 27.7 |
| Intern | 2 | 0.9 |
| Nursing Officer | 53 | 24.1 |
| Principal Nursing Officer | 26 | 11.9 |
| Assistant Chief Nursing Officer | 17 | 7.7 |
| **Sub-specialization training** | | |
| Medical | 45 | 20.5 |
| Surgical | 31 | 14.1 |
| Obstetrics &Gynaecology | 12 | 5.5 |
| Clinic | 12 | 5.5 |
| Non-Specialty | 120 | 54.5 |

**Table 2: Awareness and training in CPR among participants**

| A general assessment of the participants about CPR | Freq (%) |
|---|---|
| **Awareness about CPR** | |
| Yes | 220 (100.0) |
| **Source of information** | |
| Media | 6(2.7) |
| School | 154(70.0) |
| Conference | 25(11.4) |
| Training workshops | 35(15.9) |
| **Have you had formal training on CPR** | |
| Yes | 154(70.0) |
| No | 66(30.0) |
| **Where did you receive the formal training on CPR** | 55(25.0) |
| Workshop | 112(50.9) |
| School | 53(24.1) |
| Not stated | |

Table 2 shows that awareness about CPR was 100%, the sources of information include during training in school (154, 70%), conference (25, 11.4%), and training workshops (35, 15.9%). Also, 154 (70%) had received formal training in CPR; of these 50.9% were from school and (25.0%) were from the workshop while (24.1%) of the respondents did not indicate the source of training.

**Table 3: Structured multiple-choice questions used to evaluate the knowledge of the participants about CPR**

| | Questions used in the evaluation of the knowledge of the participants about CPR | Score | Yes N (%) | No N (%) | Don't know N(%) |
|---|---|---|---|---|---|
| 1 | Have you heard about CPR | 1 | 220(100.0) | | |
| 2 | Have you had formal training on CPR | 1 | 154(70.0) | 66(30.0) | |
| 3 | Is CPR a critical emergency | 1 | 7(3.2) | 213(96.8) | |
| 4 | CPR can be performed by anyone | 1 | 157(71.4) | 63(28.6) | |
| 5 | Shock/drug toxicity is not an indication for CPR | 1 | 38(17.3) | 182(82.7) | |
| 6 | CAB is the sequence of CPR according to AHA guideline | 1 | 119(54.1) | 100(45.5) | 1(0.5) |
| 7 | Picked the correct choice for hand placement for CPR among the listed options | 1 | 57(25.9) | 163(74.1) | |
| 8 | The recommended compression per minute is 100-120 | 1 | 79(35.9) | 140(63.6) | 1(0.5) |
| 9 | The compression to breathing ratio is 30:2 in the AHA guideline | 1 | 132(60) | 87(39.5) | 1(0.5) |
| 10 | The recommended sternal compression depth is 5-6cm | 1 | 98(44.5) | 117(53.2) | 5(2.3) |
| 11 | Picked the correct choice for the recommended duration of rescue breath to a child out of the listed options | 1 | 152(69.1) | 65(29.5) | 3(1.4) |
| 12 | Picked the correct choice for how to perform CPR in children | 1 | 16(7.3) | 202(91.8) | 2(0.9) |
| 13 | Picked the correct choice for how to perform CPR in infants | 1 | 122(55.5) | 97(44.1) | 1(0.5) |
| 14 | Is CP R to be continued until the physician arrives | 1 | 204(92.7) | 11(5) | 5(2.3) |
| 15 | Does the survival of cardiac arrest depend on its early recognition in a patient | 1 | 210(95.5) | 7(3.2) | 3(1.4) |
| 16 | CPR should be performed with a defibrillator handy | 1 | 70(31.8) | 147(66.8) | 3(1.4) |
| | **Total possible knowledge score** | 16 | | | |

Table 3 shows the test statements fused to assess the knowledge of participants about CPR using the

Absolute Category Rating Scale (ACR)[10] with each statement attracting a score of 1 mark and the possible overall score of 16 points which is then converted to a percentageto determine the rating of the scores.In all, 95.5% indicated that survival of cardiac arrest depend on its early recognition, 92.7% opined that CPR should be continued until the physician arrives, 71.4% opined that CPR can be performed by anyone, 55.5% picked correct choice of performing CPR in an infant while 82.7% indicated that shock or drug toxicity is an indication for CPR.

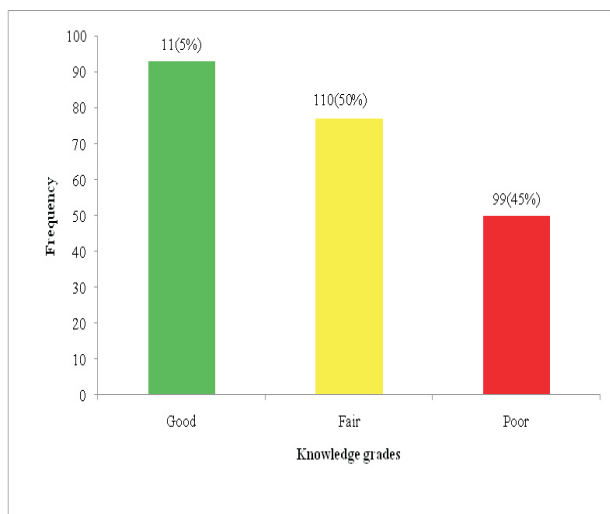**Figure 1: Grade of the knowledge score of CPR among participants**



**Figure 1** shows the grading score of the assessment of the knowledge about CPR from table 3. In all, 11 (5%) had good (score 12-16), 110 (50%) had fair (score 9-11) while 99 (45%) had poor (score 8) knowledge of CPR respectively
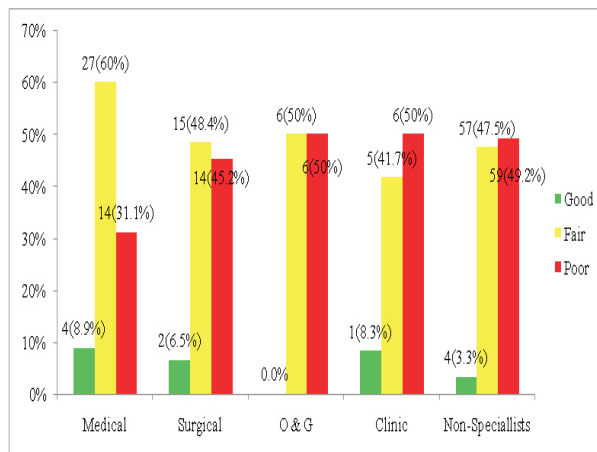


**Figure 2: Knowledge of CPR according to sub-specialties of participants**

Figure 2 shows that the highest number of participants with good knowledge about CPR was 4 each for Nurses with medical sub-specialties and non-specialist nurses. Non-specialist nurses were highest for fair knowledge (57 participants) and poor knowledge (59 participants) respectively.

**Table 4: Evaluation of the attitude and practice of CPR among the participants**

| Questions used in the evaluation of the attitude of the participants to CPR | Score | Agree N (%) | Disagree N (%) | Not sure N (%) |
|---|---|---|---|---|
| CPR is difficult to perform | 1 | 10(4.5) | 210(95.5) | |
| CPR is for doctors only | 1 | 6(2.7) | 214(97.3) | |
| CPR is harmful | 1 | 15(6.8) | 205(93.2) | |
| Will you be willing to perform CPR? | 1 | 207(94.1) | 11(5) | 2.9) |
| | 4 | | | |
| **Area of sub-specialization** | Good attitude score | | Poor attitude score | |
| | Frequency | % | Frequency | % |
| Medical | 36 | 80.0 | 9 | 20.0 |
| Surgical, | 24 | 77.4 | 7 | 22.6 |
| Obstetrics & Gynaecology | 11 | 91.7 | 1 | 8.3 |
| Clinics | 9 | 75.0 | 3 | 25.0 |
| Non-specialists | 102 | 85.0 | 18 | 15.0 |

The attitude of participants was assessed using one positive and three negative questionsstructured in Likert pattern (Agree, Disagree, and Not sure)

while. Each question is one mark, a score of 4 marks israted good and score 3 as poor using Absolute Category Rating Scale (ACR)[10]. So, 4.5% affirmed that CPR is difficult to perform, 2.7% stated that CPR is for doctors only, 93.2% that CPR is not painful and while 94.1% were willing to perform CPR. The highest grading for good attitude score was for nurses in Obstetrics and Gynaecology (91.7%).

**Table 5: Self-reported factors hindering initiation of CPR by the participants and competence scores**

| Mitigating factor | Frequency | % |
|---|---|---|
| Unfavorable hospital policy | 69 | 34.3 |
| Lackof equipment | 84 | 41.8 |
| Lack of proper training | 113 | 56.2 |
| Anxiety | 34 | 16.9 |
| Workload | 95 | 47.3 |
| No prior training | 47 | 23.4 |
| Lack of retraining | 73 | 36.3 |
| The legal implications of CPR | 39 | 19.4 |
| Inadequate knowledge | 86 | 42.8 |
| Fear of causing more harm | 51 | 25.4 |
| Lack of idea on when to commence CPR | 28 | 13.9 |
| Lack of teamwork | 68 | 33.8 |
| Difficulty in establishing adiagnosis of cardiac arrest | 28 | 13.9 |

| Participants area of sub-specialization | Competence grading | | |
|---|---|---|---|
| | Good | Fair | Poor |
| Medical | 18(40.0) | 20(44.4) | 7(15.6) |
| Surgical | 15(48.4) | 8(25.8) | 8(25.8) |
| Obstetrics & Gynaecology | 4(33.3) | 6(50.0) | 2(16.7) |
| Clinic | 3(25.0) | 5(41.7) | 4(33.3) |
| Non-specialists | 53(44.2) | 38(31.7) | 29(24.2) |

From table 5, 113(56.2%) nurses reported a lack of proper training as a major factor affecting their practice of CPR. Other limitations identified included workload (47.3%), inadequate knowledge of CPR (42.8%), lack of equipment (41.8%), and fear of causing more harm (25.4%). The competence grading showed that 48.4% of surgical, 44.2% of non-specialists, and 40.0 of medical sub-specialized nurses had a good competence score on CPR

**Table 6: Competence of participants compared to their characteristics about CPR**

| | Competence | | | | |
|---|---|---|---|---|---|
| | Good | Fair | Poor | Fisher exact | P-value |
| **Knowledge of CPR** | | | | | |
| Good | 6(2.7) | 3(1.4) | 2(0.9) | 11.003 | 0.026 |
| Fair | 45(20.5) | 48(21.8) | 17(7.7) | | |
| Poor | 42(19.1) | 26(11.8) | 31(14.1) | | |
| **Years of experience** | | | | | |
| 1-5 | 15(6.8) | 14(6.4) | 7(3.2) | 2.997 | 0.996 |
| 6-10 | 10(4.6) | 10(4.6) | 6(2.7) | | |
| 11-15 | 22(10.0) | 15(6.8) | 13(5.9) | | |
| 16-20 | 11(11.8) | 10(13.2) | 5(10.0) | | |
| 21-25 | 13(5.9) | 12(5.5) | 6(2.7) | | |
| 26-30 | 18(8.2) | 12(5.5) | 9(4.1) | | |
| 31-35 | 5(2.3) | 3(1.4) | 4(1.8) | | |
| **Formal training on CPR** | | | | | |
| Yes | 67(30.5) | 55(25.0) | 32(14.5) | 1.117 | 0.572 |
| No | 26(11.8) | 22(10.0) | 18(8.2) | | |

From table 6, 6(2.7%) of the participants had good knowledge and competence grades respectively, 3(1.4%) had good knowledge grades and fair competence grades and there was a significant association between the knowledge and competence among the participants (p=0.026).

Also, 15(6.8%) of the participants in the 1-5years experience group have good competence grades, 14 (6.4%) had fair competence grades while 7(3.2%) had poor competence grades. However, there was no significant association between the duration of experience and competence grades among the study participants (p=0.996). Sixty-seven (30.5%) of the participants who had formal CPR training had good competence grades, 55(25%) had fair competence grades. There was no significant association between the history of formal training in CPR and competence grades among the study participants (p=0.572).

**DISCUSSION**

CPR is an emergency measure to save lives, especially for cardiac arrest either within or outside the hospital setting. The treatment goal for sudden

cardiac arrest is to restore blood flow to the heart and brain to improve neurological outcome.[1,2] Nurses are likely to be the first professional responders in these emergencies; therefore, their knowledge and competence to initiate CPR effectively can be life-saving. The mean age of the participants was 55±46.8 years; this shows that the nursing workforce at the study site is an aging population who are nearing retirement. This study also reported a high level of education among the participants which suggests high expectations for competence, knowledge, skills, and abilities required to render professional nursing care to patients.

There was poor knowledge of CPR although 70% of participants had undergone formal training on CPR which compares to other reports. Olateju reported from Nigeria that 18.6% of nurses had theoretical knowledge of CPR while only 5.7% knew the correct approach to CPR;[7] other reports showed CPR knowledge of 48% from Botswana,[4] 53.8% from Uganda[6] and 7% from Bahrain[7] to corroborate the **insufficient** knowledge and skills among nurses.

The study also emphasized deterioration of knowledge and skill because despite 70% of participants having had previous formal training on CPR, the practice was lower as they rarely perform CPR. Adekola et al[11] reported that knowledge and skills of nurses and doctors on CPR declined with time despite training. Also, Rajeswaran & Ehlers[8] reported a decline in knowledge and skills for CPR post-training and therefore commended regular training as a means of retaining the skills learned. In addition, the area of sub-specialization and the frequency of occurrence of cardiac arrest affect skills in CPR such that the poor knowledge and practice among maternity nurses in this study probably may be due to relatively lesser occurrence f cardiac arrest in pregnancy compared to the other surgical and medical sub-specialties.[12] Therefore, prioritizing both basic and advanced life support training for regular in-service training has been suggested to assist nurses to retain their CPR knowledge and skills.[8]

From this study, the problem faced majorly by participants in initiating CPR was poor knowledge which was grossly inadequate to institute CPR. Similar studies have reported a lack of confidence and essential knowledge of CPR[13,14] as major

hindrances to nurses. Therefore, there is a need for nurses to improve their proficiency to perform CPR via training and periodical on-the-job re-training. The resuscitation guidelines by the American Heart Association emphasized the ability of the rescuer to recognize emergencies and thus provide prompt intervention.[13] Thus, trained health care professionals with credible knowledge of CPR and adequate resources are expected to be able to identify cardiac arrest and initiate prompt response to improve survival. However, despite the poor knowledge of nurses about CPR in this study, the majority showed a positive attitude and 94.1% were willing to perform CPR when the need arises. Munezero et al[6] reported significant improvement in the CPR knowledge (16.8% vs. 37.2%) and skills assessment (19.18% vs. 21.6%) for pre-and post-training assessment among nurses. Makinen et al[15] recommended training of nurses using the American Heart Association guidelines with an educational focus on defibrillation and recognition of rhythms to improve nurses' attitude and skills on CPR. The study further encouraged nurse educators to serve as positive role models to reinforce the crucial nurses' role at the scene of emergency being the first health care responders to witness or recognize changes in patients' condition.

Participants in this study identified lack of proper training, workload, lack of equipment and the fear of causing more harm during CPR as part of the inhibitory factors to effective initiation and performance of CPR by nurses. These corroborate a previous report among nurses by Adekola et al[11] which reported inhibitory factors to CPR among nurses to include poorly equipped health facilities, low competence levels among the staff, and inadequate staffing. Therefore, placing adequate emphasis on skill acquisition and sustenance through empowerment to practice the skills were recommended to retain knowledge and skills in CPR with the required confidence.[12-14]

## CONCLUSION

This study concludes that the skill to identify the need for CPR, the requisite knowledge as well as the confidence to initiate CPR are low among participating nurses in this study although participants had a positive attitude to learn and practice CPR when the need arises. The study

recommends interventions including education, regular in-service drills, and training on CPR to enhance requisite skill, competence, and confidence among nurses to initiate CPR when required. There should be periodic assessment and updated knowledge on CPR guidelines among nurse practitioners while basic life-saving skills should be included in the nursing training curriculum for nursing students.

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**Conflict of interest:** The authors declare no conflict of interest in the conduct of this study.

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