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Emergency Nurses' Understanding of Triage and Resuscitation in Ghana's Central Region: A Cross-Sectional Study

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Abstract

Each year, road traffic crashes result in about 1.19 million fatalities worldwide, with low- and middle-income nations bearing 92% of these losses. This research adopted a quantitative, cross-sectional approach. All 65 nurses working in the emergency units of three selected public hospitals in Ghana's Central Region were targeted using a census sampling method. Approval from the relevant ethics body was secured, and the final participants were those who provided consent. Data analysis involved descriptive statistics and binary logistic regression.

Female nurses displayed markedly greater likelihood of possessing adequate knowledge in resuscitation compared to their male counterparts (AOR = 23.631, $p < 0.05$). Nonetheless, this exceptionally large adjusted odds ratio warrants careful interpretation due to possible unaccounted confounders. In contrast, nurses with longer tenure in the emergency department showed significantly reduced probabilities of having competent skills in assessment and resuscitation relative to those with under one year of experience (2–3 years: AOR = 0.137; 4–5 years: AOR = 0.045; >5 years: AOR = 0.022; all $p < 0.05$). This unexpected pattern could indicate that recent graduates retain fresher knowledge of contemporary protocols from their training, while seasoned staff might have limited access to ongoing professional development or tend to adhere to outdated routines not aligned with current evidence-based practices. The investigation highlighted a notable link between gender and resuscitation expertise among participants, with female nursing personnel exhibiting a substantially greater chance of demonstrating appropriate proficiency in this area.

Keywords: Emergency nurses, Triage, Resuscitation, Ghana

Introduction

Road traffic crashes rank as the 10th leading cause of death globally, projected to cause 40% more fatalities by 2030 [1]. From 2007 to 2015, annual road traffic deaths remained steady around 1.25 million, later rising to 1.35 million per year [1], meaning a life is lost to road incidents every 24 seconds across the world [2]. In Africa, road-related deaths and injuries have risen steadily over the last three decades [2]. A comparison by the Global Road Safety Facility (2021) [3] among countries including Ghana, Mauritius, Nigeria, Switzerland, Norway, Singapore, and Sweden showed Ghana recording an estimated 7,018 road deaths in 2016, ranking second highest behind Nigeria's 39,802. Ghana also had the highest rate of road fatalities per 100,000 inhabitants (24.9%), surpassing Nigeria (21.4%), despite having fewer registered vehicles (7,328) than Nigeria, Mauritius, or Norway [3]. Furthermore, between January and October 2020, Ghana saw around 12,100 road incidents involving 20,400 vehicles, leading to 2,080 deaths and 12,380 injuries [4]. Road crash deaths in Ghana stabilized in 2017 with a slight 0.38% drop, but surged by 12.76% in 2018 [2].

Nurses in emergency departments serve as primary responders in handling victims of road traffic accidents (RTAs), with their expertise and abilities shaped by

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elements such as initial schooling, on-the-job training, years in practice, and availability of current clinical materials [5, 6]. Due to the urgent and high-stakes demands of trauma management, these nurses need strong preparation for quick and efficient actions. The promptness and precision of their interventions can profoundly affect survival rates, frequently determining patient outcomes [7]. Specifically, mastery in prioritizing care, early evaluation, and revival techniques is crucial for superior emergency services [8]. Continuous training and hands-on practice in trauma management are thus vital to enhance the contributions of emergency nurses in RTA cases. Their preparedness relies on foundational education and regular refresher programs organized by their institutions or related bodies [9]. Their rapid interventions can critically influence survival chances. Hence, nurses' understanding of prioritization, preliminary evaluation, and revival methods is essential for optimal emergency response.

In Ethiopia, research on 101 emergency nurses at Hawassa University Comprehensive Specialized Hospital revealed that 51.5% scored low on triage knowledge, though 76.2% rated their own triage abilities as strong. Elements like tenure and qualification positively correlated with triage awareness and execution [10]. In Eritrea, an intervention study evaluating triage education for emergency nurses noted that before the program, 55% could not explain triage; afterward, knowledge scores rose from 6.23 to 10.55 out of 15 [11]. A Botswana investigation, however, reported low baseline CPR knowledge among nurses (average 48.2%), with gaps especially in compression-ventilation ratios and defibrillator application, underscoring the importance of frequent, organized CPR sessions [12]. In Ghana, a pediatric-focused study showed that a single-day WHO Emergency Triage and Assessment Treatment (ETAT) course markedly boosted nurses' expertise and assurance in handling child emergencies [13]. Another Ghanaian study at Ho Teaching Hospital examined triage knowledge, attitudes, and practices among emergency personnel, finding 64% had moderate or higher familiarity with the South African Triage Scale (SATS), linked significantly to experience and triage frequency [14].

Prior research in Ghana, including the Ho Teaching Hospital work [14], often centers on particular facilities or areas like Volta or Greater Accra. Information is scarce for regions such as Central, which differ in population, infrastructure, and health services. Many investigations target triage or resuscitation alone, rarely combining these with comprehensive initial evaluation, restricting insights into overall emergency preparedness [11]. Currently, limited evidence exists on emergency nurses' proficiency in managing accidents, including prioritization, patient evaluation, and revival in Ghana's Central Region. Such results could spur governmental action to better equip health systems for road traffic challenges [15].

Objective of the study

The primary goal of this research is to evaluate the level of knowledge among emergency nurses in Ghana concerning triage procedures, preliminary patient evaluation, and resuscitation techniques.

Through examining their comprehension and practical application of these essential skills, the investigation aims to pinpoint deficiencies in knowledge and offer suggestions for enhancing training programs and clinical practices in emergency care throughout the nation.

Materials and Methods

Research design

A quantitative, descriptive, cross-sectional approach was employed to examine the expertise of nurses in Accident and Emergency (A&E) departments regarding triage, early patient evaluation, and resuscitation methods. This approach facilitates data gathering at a single point in time, offering a snapshot of the existing knowledge levels within the selected group.

Population

The study focused on registered nurses employed in Accident and Emergency (A&E) units across health facilities in Ghana's Central Region. These professionals were chosen because of their pivotal position in delivering urgent, potentially lifesaving interventions, such as cardiopulmonary resuscitation (CPR), during crises. By targeting this cohort, the research could gauge resuscitation competence among key frontline workers who often serve as the initial responders for severely ill or traumatized patients. Their skills and readiness are crucial for optimizing survival rates in emergency environments.

Study area

The research took place in three facilities providing emergency services in Ghana's Central Region. These

institutions were selected through convenience and purposive methods, as they represent the primary hospitals in the region managing a high volume of trauma, particularly road traffic accidents (RTAs). The Central Region is one of Ghana's 16 administrative divisions, recognized for its rich history, tourist sites, and academic centers. Its capital, Cape Coast, hosts a leading university and multiple health training programs. The region's healthcare infrastructure includes both public and private providers, from teaching hospitals to local clinics. Similar to other parts of Ghana, it grapples with issues in resource distribution, emergency facilities, and staff development. By concentrating on three emergency units in this area, the study offers targeted yet relevant perspectives on nursing knowledge in emergency settings.

Sampling procedure

Three hospitals—Cape Coast Teaching Hospital (CCTH), Trauma and Specialist Hospital (TSH), and Kingsway Provincial Clinic (KPC)—were chosen via convenience and purposive selection due to their status as the main centers handling substantial trauma loads, especially RTAs, in the Central Region. Every available eligible nurse during the data collection period was approached for inclusion (census of the accessible group). Participation was voluntary and limited to consenting nurses in the A&E units of these facilities. The final sample depended on availability and agreement to join. The overall target encompassed all nurses in these three institutions. Using a significance level (α) of 0.05, 95% confidence interval, moderate effect size, and power (β) of 0.80, the calculated minimum sample was 65 nurses, aligning with parameters from comparable prior studies [16].

Census sampling was selected to incorporate all qualified emergency nurses in the chosen sites, enabling a thorough evaluation of their understanding (covering topics like triage definition, SATS protocol, triage scales, early warning scores, 2020 American Heart Association guidelines, chest compression site, basic resuscitation algorithm, adult pulse check location, CPR compression-to-breath ratio, AED defibrillator sequence, and fluids for suspected head injury). Nevertheless, this approach risks selection bias if certain nurses (e.g., those absent or on particular shifts) were missed. Non-response bias is also possible if non-participants differed systematically in knowledge from respondents. Convenience sampling was applied, which could restrict the broader applicability of results. Additionally, potential bias from non-respondents should be noted, as volunteers might vary significantly from those who declined.

Data collection instrument

Data were gathered using a structured questionnaire focused on nurses' expertise in triage, preliminary patient evaluation, and resuscitation. The knowledge component was derived from an existing published work [17]. Validity was supported by grounding the tool in contemporary evidence from peer-reviewed sources and related literature [17]. Face validity was confirmed by independent reviewers, including seasoned emergency nurses and research experts, to verify clarity, appropriateness, and suitability. Content validity was verified through assessments by senior nursing staff, emergency specialists, and approvals from the Ghana Health Service Ethics Review Committee and Cape Coast Teaching Hospital Ethical Review Committee, ensuring compliance with standards.

The questionnaire had two parts. Section A collected demographic details (9 questions): age, gender, total practice years, emergency department tenure, marital status, professional rank, area of specialization, highest qualification, and workplace. Section B addressed knowledge of triage, initial evaluation, and resuscitation (including CPR), comprising 16 items (5 Likert-scale, 1 true/false, and 11 multiple-choice). The highest possible score was 16, with 1 point for correct answers and 0 for incorrect. Triage knowledge used Likert responses, dichotomized as maximum (4–5) versus minimum to moderate (1–3). CPR knowledge via multiple-choice was classified as inadequate (0–3), moderately adequate (4–7), or adequate (8–11) [18]. To create the dichotomous outcome for analysis, responses were binarized: correct/incorrect (1/0) or adequate/inadequate. For instance, Likert triage items were split into “maximum” (coded 1, adequate) and “minimum to moderate” (coded 0, inadequate), justified by (1) clinical relevance—separating high from lower proficiency, (2) consistency with training priorities for identifying gaps, and (3) utility for planning interventions. Multiple-choice CPR items were scored 1 for correct and 0 for incorrect. These binary variables served as outcomes in logistic regression. Though customized, the tool was contextually appropriate, testable, and familiar to participants. Unlike research relying on WHO

emergency preparedness standards, this instrument was adapted to Ghana-specific conditions.

Pilot testing occurred at the University of Cape Coast Hospital Emergency Unit to evaluate comprehensibility, reliability, and fit. Internal consistency was strong, with a Cronbach's alpha of 0.85, confirming reliable measurement of the targeted concepts.

Data collection procedure

The process of gathering data involved distributing self-administered questionnaires to nurses in the emergency departments after securing administrative approval from the selected facilities. Data collection occurred from December 4, 2022, to February 22, 2023. Nurses who were on shift during visits received a verbal explanation of the research, along with clear assurances of voluntary involvement and confidentiality. Questionnaires were handed out during periods when nurses were not actively engaged in patient care to prevent interference with their responsibilities. All participation remained optional, and individuals filled out the forms on their own. Written informed consent was secured after fully explaining the study's objectives, participants' rights, and guarantees of privacy and anonymity. Only on-duty emergency nurses who expressed willingness were included through convenience approaches. A total of 65 questionnaires were distributed over the course of one month. In situations where direct distribution was not feasible—due to logistical challenges such as travel distances between the three hospitals and associated costs—questionnaires were left with the unit in-charge, accompanied by detailed guidance on proper administration. The in-charge received instructions emphasizing the need for independent completion and voluntary engagement. The lead researcher oversaw the entire data collection process, and participants were advised to complete the forms during breaks or downtime.

Several strategies were implemented to reduce incomplete responses and improve data quality. These included designing the questionnaire with straightforward language, suitable answer choices, and an appropriate length to avoid respondent exhaustion following pilot testing. The research team received training on effective data collection methods and the value of thorough responses. Procedures involved immediate on-site checks of returned forms for omissions, fostering a supportive and secluded setting to promote candid answers, timing collections to suit participants' schedules, and recording any trends in non-completion for subsequent interpretation.

Measures to mitigate bias were incorporated throughout. Selection bias was limited through census-based inclusion of all available emergency nurses. Measurement bias was reduced by employing a standardized, pilot-validated instrument for uniform evaluation. To counter response bias, the team was trained to remain impartial, and questions were phrased neutrally without suggestive wording. Social desirability bias was addressed by reinforcing anonymity—no identifying details on forms—and conducting collections privately. All criteria for inclusion and exclusion were clearly documented and reported to enable evaluation of potential selection influences.

Data processing and analysis

Returned questionnaires underwent thorough inspection for errors, discrepancies, or absent information, with required corrections applied to maintain data reliability and completeness. Responses were then coded and inputted into SPSS version 26 for statistical processing. Both descriptive and inferential methods were applied. Frequencies and percentages summarized the patterns in knowledge responses. Binary logistic regression was performed to explore how sociodemographic variables affected nurses' expertise in initial patient evaluation and resuscitation within accident and emergency settings. This modeling approach allowed identification and measurement of predictors linked to the primary outcome.

Results and Discussion

Sociodemographic characteristics

Table 1 presents the sociodemographic profile of the 65 participating nurses. The majority were female (74%, n = 48), aged 31–40 years (58%, n = 38), had 4–6 years of overall professional experience (38.5%, n = 25), and had spent 2–3 years in the emergency department (38.5%, n = 25). Regarding marital status, 63.1% (n = 41) were single, and in terms of professional rank, 95.4% (n = 62) held the position of Staff Nurse (SN).

Table 1. Demographic data of respondents

Variables	Name of Facilities			Total (%)
	Facility A *n* (%)	Facility B *n* (%)	Facility C *n* (%)	
Age in years				
21–30	16 (34.0)	5 (62.5)	5 (50.0)	26 (40)
31–40	31 (66.0)	2 (25.0)	5 (50.0)	38 (58.5)
41–50	0 (0.0)	1 (12.5)	0 (0.0)	1 (1.5)
Sex				
Male	12 (25.5)	2 (25.0)	3 (30.0)	17 (26.2)
Female	35 (74.5)	6 (75.0)	7 (70.0)	48 (73.8)
Number of years of practice				
1–3 year	18 (38.3)	1 (12.5)	6 (60.0)	25 (38.5)
4–6 years	21 (44.7)	4 (50.1)	0 (0.0)	25 (38.5)
7–9 years	5 (10.6)	2 (25.0)	1 (10.0)	8 (12.3)
Ten years and above	3 (6.3)	1 (12.5)	3 (30.0)	7 (10.7)
Length of stay at the emergency department				
0–1 years	14 (29.8)	4 (50)	4 (40.0)	22 (33.8)
2–3 years	18 (38.3)	3 (37.5)	4 (40.0)	25 (38.5)
4–5 years	7 (14.9)	0 (0.0)	1 (10.0)	8 (12.3)
Above 5 years	8 (17.0)	1 (12.5)	1 (10.0)	10 (15.4)
Marital status				
Single	32 (68.1)	3 (37.5)	6 (60.0)	41 (63.1)
Married	14 (29.8)	5 (62.5)	4 (40.0)	23 (35.4)
Widow/widower	1 (2.1)	0 (0.0)	0 (0.0)	1 (1.5)
Designation				
SN	16 (34)	1 (12.5)	4 (40.0)	21 (32.3)
SSN	12 (25.5)	2 (25.0)	0 (0.0)	14 (21.5)
NO	7 (14.9)	1 (12.5)	0 (0.0)	8 (12.3)
SNO	6 (12.8)	0 (0.0)	1 (10.0)	7 (10.8)
PNO	2 (4.3)	0 (0.0)	0 (0.0)	2 (3.1)
EN	0 (0)	3 (37.5)	3 (30.0)	6 (9.2)
SEN	2 (4.3)	0 (0.0)	1 (10.0)	3 (4.6)
PEN	2 (4.3)	1 (12.5)	1 (10.0)	4 (6.2)
Specialist				
Yes	3 (6.4)	0 (0.0)	0 (0.0)	3 (4.6)
No	44 (93.6)	8 (100.0)	10 (100.0)	62 (95.4)
Highest level of education				
Certificate	3 (6.4)	4 (50.0)	2 (20.0)	9 (13.8)
Diploma	27 (57.4)	3 (37.5)	6 (60.0)	36 (55.4)
Degree	15 (31.9)	1 (12.5)	2 (20.0)	18 (27.7)
Masters	2 (4.3)	0 (0.0)	0 (0.0)	2 (3.1)

Knowledge on triage

Table 2 displays the results concerning nurses' expertise in triage, preliminary patient evaluation, and resuscitation, with a focus on cardiopulmonary resuscitation (CPR). Every one of the 65 participants (100%) correctly understood the standard definition of triage. A large proportion, 87.7% (n = 57), accurately listed the triage color codes as red, orange, yellow, green, and black. All respondents (100 percent, n = 65) knew that there are three distinct versions of the triage scale tailored for adults, children, and infants, while 96.9 percent (n = 63) properly named the two main elements of the triage scale: the triage early warning score and the discriminator list. For the triage early warning score (TEWS), 92.3 percent (n = 60) recognized that the overall score is calculated based on the patient's fundamental vital signs. Regarding core resuscitation steps aligned with the 2020 American Heart Association guidelines, 47.7 percent (n = 31) correctly noted that the process involves opening the airway, evaluating breathing, and checking the pulse. When faced with an unresponsive individual on the roadside, 73.8 percent (n = 48) prioritized confirming safety for themselves and the victim. On the appropriate site for chest compressions in adults, 49.2 percent (n = 32) selected the center of the chest. Furthermore, 64.6 percent (n = 42) identified the ideal compression frequency as 120 per minute. In relation to the basic resuscitation sequence for adults, 49.2 percent (n = 32) emphasized securing the scene, summoning emergency services, assessing the pulse, and starting CPR. For pulse checking in adults, 72.3 percent (n = 47) correctly chose the carotid artery. On the compression-to-ventilation ratio for adult CPR, 81.5 percent (n = 53) endorsed 30 compressions to 2 rescue breaths, and 87.7 percent (n = 57) understood the requirement to re-evaluate the victim's status after every 5 cycles (30 compressions and 2 breaths) during basic life support. With respect to Automated External Defibrillator (AED) operation, 72.3 percent (n = 47) agreed on the proper sequence: powering on the device, attaching pads, allowing rhythm analysis, clearing contact with the patient, and administering the shock. Additionally, 76.9 percent (n = 50) confirmed the importance of limiting fluids during early resuscitation of trauma cases with possible head injury. Likewise, 75.4 percent (n = 49) supported avoiding Dextrose Normal Saline in patients with suspected head trauma.

Table 2. Knowledge on triaging, initial assessment of patients, and resuscitation including cardiopulmonary resuscitation

Variables	Facility C n (%)	Facility B n (%)	Facility A n (%)	Total n (%)
Knowledge on triage				
Triage refers to prioritizing or sorting patients based on the severity of their condition or injury to optimize the use of medical and nursing resources; it involves evaluating the degree of injury and the level of urgency required.				
Agree	10 (100.0)	8 (100.0)	47 (100.0)	65 (100.0)
Under the SATS protocol, the triage colour codes are red, orange, yellow, green, and black.				
Agree	9 (90.0)	5 (62.5)	43 (91.5)	57 (87.7)
Disagree	1 (10.0)	2 (25.0)	4 (8.5)	7 (10.8)
I do not know	0 (0.0)	1 (12.5)	0 (0.0)	1 (1.5)
The triage scale has three separate versions: one for adults, one for children, and one for infants.				
Agree	10 (100.0)	8 (100.0)	47 (100.0)	65 (100.0)
Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
I do not know	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
The triage scale consists of two main components: the Triage Early Warning Score (TEWS) and the discriminator list.				
Agree	9 (90.0)	8 (100.0)	46 (97.9)	63 (96.9)
Disagree	0 (0.0)	0 (0.0)	1 (2.1)	1 (1.5)
I do not know	1 (10.0)	0 (0.0)	0 (0.0)	1 (1.5)

The overall Triage Early Warning Score (TEWS) is calculated from measurements of the patient's basic vital signs.				
Agree	10 (100.0)	8 (100.0)	42 (89.4)	60 (92.3)
Disagree	0 (0.0)	0 (0.0)	2 (4.2)	2 (3.1)
I do not know	0 (0.0)	0 (0.0)	3 (6.4)	3 (4.6)
Knowledge on initial assessment of patients and cardiopulmonary resuscitation				
According to the 2020 American Heart Association (AHA) guidelines, the recommended sequence for basic resuscitation steps is:				
Compress the chest, clear the airway, check breathing	7 (70.0)	1 (12.5)	3 (6.4)	11 (16.9)
Clear the airway, check breathing, check pulse	3 (30.0)	2 (25.0)	26 (55.3)	31 (47.7)
Check breathing, clear the airway, check pulse	0 (0.0)	5 (62.5)	18 (38.3)	23 (35.4)
You encounter an unresponsive person lying in the road with inadequate breathing. Your first action should be:				
Clear the airway	3 (30.0)	1 (12.5)	5 (10.6)	9 (13.8)
Ensure safety for both yourself and the victim	7 (70.0)	5 (62.5)	36 (76.6)	48 (73.8)
Start chest compressions immediately	0 (0.0)	2 (25.0)	6 (12.8)	8 (12.3)
The proper location for chest compressions in an adult is:				
Left side of the chest	1 (10.0)	4 (50.0)	10 (21.3)	15 (23.1)
Right side of the chest	1 (10.0)	0 (0.0)	0 (0.0)	1 (1.5)
Centre of the chest	3 (30.0)	4 (50.0)	25 (53.2)	32 (49.2)
Xiphoid process	5 (50.0)	0 (0.0)	12 (25.5)	17 (26.2)
The recommended rate of chest compressions during CPR for adults and children is:				
At least 100 per minute	5 (50.0)	4 (50.0)	2 (4.3)	11 (16.9)
More than 100 per minute	2 (20.0)	1 (12.5)	5 (10.6)	8 (12.3)
80 per minute	1 (10.0)	1 (12.5)	2 (4.3)	4 (6.2)
120 per minute	2 (20.0)	2 (25.0)	38 (80.9)	42 (64.6)
The correct sequence for basic resuscitation in an adult is:				
Ensure safety, give two rescue breaths, defibrillate, start CPR	1 (10.0)	1 (12.5)	2 (4.3)	4 (6.2)
Ensure safety, call ambulance, check pulse, start CPR	9 (90.0)	4 (50.0)	19 (40.4)	32 (49.2)
Check pulse, give two rescue breaths, ensure safety, defibrillate	0 (0.0)	0 (0.0)	2 (4.3)	2 (3.1)
Ensure safety, start CPR, give two rescue breaths, defibrillate	0 (0.0)	3 (37.5)	24 (51.1)	27 (41.5)
The appropriate site to check the pulse in an adult is the:				
Carotid artery	8 (80.0)	7 (87.5)	32 (68.1)	47 (72.3)
Brachial artery	2 (20.0)	0 (0.0)	6 (12.8)	8 (12.3)
Femoral artery	0 (0.0)	0 (0.0)	7 (14.9)	7 (10.7)
Temporal artery	0 (0.0)	1 (12.5)	2 (4.3)	3 (4.6)
The compression-to-ventilation ratio during CPR for adults is:				
15:2	0 (0.0)	2 (25.0)	4 (8.5)	6 (9.2)
15:1	1 (10.0)	1 (12.5)	0 (0.0)	2 (3.1)
30:1	1 (10.0)	1 (12.5)	2 (4.3)	4 (6.2)
30:2	8 (80.0)	4 (50.0)	41 (87.2)	53 (81.5)
During basic resuscitation, the victim's condition should be reassessed:				
Every minute	0 (0.0)	2 (25.0)	4 (8.5)	6 (9.2)
Every 5 cycles (30 compressions and 2 rescue breaths)	10 (100.0)	5 (62.5)	42 (89.4)	57 (87.7)
When the victim begins breathing abnormally	0 (0.0)	1 (12.5)	0 (0.0)	1 (1.5)

Before attaching AED electrodes	0 (0.0)	0 (0.0)	1 (2.1)	1 (1.5)
The proper sequence for using an Automated External Defibrillator (AED) is:				
Turn on AED, apply electrodes, discharge, analyse rhythm	1 (10.0)	1 (12.5)	4 (8.5)	6 (9.2)
Turn on AED, apply electrodes, analyse rhythm, clear the victim, discharge	6 (60.0)	2 (25.0)	39 (83.0)	47 (72.3)
Apply electrodes, check pulse, discharge, analyse rhythm	2 (20.0)	1 (12.5)	1 (2.1)	4 (6.2)
Check pulse, apply electrodes, analyse rhythm, discharge	1 (10.0)	4 (50.0)	3 (6.4)	8 (12.3)
During early resuscitation of a trauma patient with suspected head injury, fluid administration should be limited as much as possible.				
True	9 (90.0)	7 (87.5)	34 (72.3)	50 (76.9)
False	1 (10.0)	1 (12.5)	13 (27.7)	15 (23.1)
Which fluid should be avoided in a patient with suspected head injury?				
Dextrose Normal Saline	6 (60.0)	5 (62.5)	38 (80.9)	49 (75.4)
Normal Saline	1 (10.0)	2 (25.0)	7 (14.9)	10 (15.4)
Ringer's Lactate	0 (0.0)	1 (12.5)	1 (2.1)	2 (3.1)
Blood	3 (30.0)	0 (0.0)	1 (2.1)	4 (6.2)

Socio-demographic factors as predictors of knowledge in initial patient assessment and resuscitation

Table 3 presents the results from the binary logistic regression examining associations between socio-demographic characteristics and nurses' proficiency in preliminary patient evaluation and resuscitation. To detect multicollinearity, Variance Inflation Factor (VIF) and tolerance values were calculated for all independent variables. VIF scores ranged from 1.12 to 2.84 (all substantially below the standard cutoff of 10), while tolerance values fell between 0.35 and 0.89 (all exceeding 0.1), indicating no concerns with multicollinearity. Additionally, a review of the correlation matrix showed no pairwise correlations above 0.60, further supporting the absence of multicollinearity issues.

Model fit was evaluated using the Hosmer-Lemeshow goodness-of-fit test, which produced a non-significant outcome ($p = 0.839$, $\chi^2 = 2.753$), confirming adequate fit to the data. The Nagelkerke R^2 value of 0.539 indicated that the predictors accounted for 53.9% of the variation in knowledge levels. Overall, these diagnostics demonstrate that the model is well-specified and that the selected variables meaningfully explain differences in participants' understanding of initial assessment and resuscitation procedures.

The socio-demographic variables examined were gender, duration of employment in the emergency department, and highest educational qualification. Gender influences nursing workforce composition and may affect approaches to patient management and skill acquisition, justifying its inclusion [19]. Extended time in a specific facility is typically associated with greater procedural familiarity, potentially strengthening expertise in triage and revival techniques [20]. Advanced education is often related to improved grasp and implementation of emergency protocols and prioritization strategies [21].

Regarding specific predictors, female nurses showed substantially greater likelihood of demonstrating sufficient knowledge in resuscitation compared to males (AOR = 23.631, $p < 0.001$; 95% CI: 2.88–193.68). For years of service in the emergency department, those with 2–3 years (AOR = 0.137, $p = 0.034$; 95% CI: 0.022–0.859), 4–5 years (AOR = 0.045, $p = 0.013$; 95% CI: 0.004–0.526), and more than 5 years (AOR = 0.022, $p = 0.005$; 95% CI: 0.002–0.317) had significantly reduced odds of adequate proficiency in initial patient assessment and resuscitation relative to nurses with less than 1 year of experience. Educational attainment, however, did not emerge as a statistically significant factor influencing knowledge in these areas within the model.

Table 3. Socio-demographic information as predictors of knowledge of initial patient assessment and resuscitation

Variable	Categories	B	Wald	AOR	95% CI	
					Lower	Upper

Sex	Male	Ref	Ref	Ref	Ref	Ref
	Female	3.16	8.681	23.631***	2.88	193.68
Length of stay at the facility	0–1 year	Ref	Ref	Ref	Ref	Ref
	2–3 years	−1.99	4.516	0.137*	0.022	0.859
	4–5 years	−3.10	6.123	0.045*	0.004	0.526
	> 5 years	−3.80	7.809	0.022**	0.002	0.317
Education	Certificate	Ref	Ref	Ref	Ref	Ref
	Diploma	−0.53	0.286	0.587	0.083	
	Degree	−1.99	2.269	0.137	0.010	
	Masters	−19.56	0.000	0.01	0.000	0.010
Hosmer and Lemeshow						
Nagelkerke R Square						

***p value < 0.001; **p value < 0.01; *p value < 0.05
AOR adjusted odds ratio, *CI* confident intervals

Summary of key findings

The research revealed that emergency nurses in Ghana's Central Region demonstrated robust understanding of triage procedures, yet notable deficiencies remained in resuscitation competencies, especially CPR methods. Female participants exhibited superior performance compared to males, while nurses with greater experience displayed reduced knowledge scores, potentially indicating erosion of current evidence-based practices over time. Educational qualification did not significantly influence outcomes, emphasizing the importance of ongoing refresher programs irrespective of seniority.

Demographic profile of participants

The majority of respondents fell within the 31–40 age bracket, mirroring observations by Phukubye, Mbombi, and Mothiba [22], but differing from investigations where most participants were younger than 30 [23–26]. This profile points to a nursing workforce at its professional peak, which could bolster endurance and adaptability in demanding settings. Females dominated the sample (74%), in line with international patterns [16, 24], although certain studies featured predominantly male cohorts [23, 26]. Average professional experience hovered around five years, consistent with reports from Al-Janabi and Al-Ani [23] and others [25, 26], yet contrasting research showing longer-serving staff [16, 24]. The comparatively younger tenure may stem from staff turnover or emigration, potentially limiting experiential depth. This could impact overall expertise, particularly when junior nurses handle complex responsibilities, prompting questions about readiness for critical emergency roles.

Knowledge of triage, preliminary patient evaluation, and resuscitation (CPR)

Triage knowledge

Participants showed excellent grasp of triage concepts, with all (100%) accurately defining it and 87.7% correctly identifying SATS color codes, diverging from earlier evidence of substantial shortcomings [27–29]. In contrast to findings by AlShatarat *et al*. [29] and Mikita *et al*. [27] highlighting training inadequacies, the current results reflect higher proficiency, possibly attributable to local initiatives or recent educational efforts. Relative to the study at Ho Teaching Hospital reporting 64% moderate SATS familiarity [14], these outcomes suggest improvement. Although 96.9% properly named the SATS elements, only 92.3% fully appreciated the role of vital signs in scoring, indicating specific domains needing further emphasis. These patterns resonate with work by Mothiba [16] and Uzamuhoza [18], but differ from Mikita *et al*. [29]. Initial training appears to have supported strong performance, as noted by Al-Janabi and Al-Ani [23], especially in urgent scenarios.

Deficiencies in certain areas echoed Rajeswaran [24] and reports of knowledge decline within six months after instruction [30–32]. Accuracy in adult pulse site selection (47 nurses) paralleled Rajeswaran [33], whereas identification of the 30:2 compression-to-ventilation ratio (53 nurses) exceeded previous observations [24]. A majority (57 nurses) correctly stressed re-evaluation after every five cycles [24, 33]. Proficiency in AED steps (47 nurses) matched Rajeswaran [24], though restricted equipment availability might impede practical application. For suspected head trauma, 50 nurses endorsed fluid limitation, and 49 avoided dextrose

solutions owing to risks of elevated intracranial pressure, aligning with Alzanitan [33] and McEvoy *et al*. [34]. Aggregate scores (typically 6–7) signified reasonable proficiency, comparable to Rajeswaran [24] yet superior to accounts of weaker trauma management awareness [16, 18, 35, 36]. The outcomes lend support to the Knowledge-Attitude-Practice (KAP) framework [37] and Benner's stages of skill acquisition [37], implying progression from beginner to capable practitioner. This accords with evidence of significant links between triage awareness and execution ($r = 0.68$, $p < 0.01$) [38, 39]. Nevertheless, the disparity between theoretical understanding and applied skills reinforces that intellectual mastery does not guarantee procedural effectiveness [37, 40].

In line with KAP and Benner models, bridging knowledge to competent practice demands sustained reinforcement, practical exposure, and institutional backing. To deepen this interpretation, greater attention to systemic influences is warranted. Factors including frequency of training sessions, mentorship, volume of cases, staffing pressures, and resource provision critically affect retention and skill transfer [41, 42]. Without regular practice or updates, even proficient nurses risk knowledge attrition or procedural lapses. Subsequent research should examine these environmental aspects to more fully explain and maintain long-term clinical expertise.

Initial evaluation of patients and CPR proficiency

CPR performance showed varied results: nurses demonstrated strong understanding in compression-to-ventilation ratios (81.5%), pulse assessment (72.3%), and frequency of reassessment (87.7%), yet performed less effectively in compression rate (64.6%) and comprehensive algorithm mastery (49.25%). These shortcomings align with earlier research [24, 26], probably stemming from restricted availability of expensive BLS/ACLS courses [33, 34]. Errors specific to the facilities, including improper AED usage and suboptimal fluid administration, underscore the practical consequences of these knowledge gaps. The negative correlation between years of experience and knowledge levels is consistent with observations by Kirkbright *et al*. [43] and Greif *et al*. [44], indicating that skills and knowledge may deteriorate over time in the absence of regular refresher training. Additionally, senior nurses' increasing involvement in administrative duties might divert attention from staying current with clinical advancements [43–45].

Factors influencing knowledge

Gender and years of professional experience were identified as key predictors. Female nurses exhibited greater odds of having sufficient knowledge [19], possibly owing to increased training opportunities or stronger motivation. Nevertheless, the broad confidence interval (AOR = 23.63; 95% CI: 2.88–193.68) reflects considerable statistical imprecision, warranting cautious interpretation—the actual effect size could deviate substantially from the reported estimate. Greater professional experience correlated with reduced knowledge scores [20], potentially due to erosion of contemporary knowledge or adherence to obsolete methods. The link between extended experience and diminished knowledge may arise from multiple causes. Professional complacency could lead veteran practitioners to depend on established routines and prior successes rather than pursuing updates [46]. Age-related cognitive changes, such as slower processing speed and reduced learning efficiency, might impair absorption of new material despite preserved practical expertise [47]. Furthermore, deficiencies in ongoing education—often due to absent mandatory, accessible programs for seasoned staff—can result in divergence from current evidence-based standards [48]. These results emphasize that tenure alone does not guarantee sustained competence, underscoring the importance of comprehensive lifelong learning initiatives.

Level of education did not significantly predict knowledge in this investigation, implying that initial academic credentials do not necessarily ensure current clinical proficiency. This could relate to influences beyond formal education, including shifts in responsibilities, barriers to continuous training, or differences in engagement with professional development [23–26]. Within clinical environments, nurses holding identical qualifications often follow varied career paths that affect their exposure to modern guidelines. This observation reinforces the primacy of continuous learning over baseline education and advocates for frequent, tailored continuing education to sustain competence.

Discrepancies observed in the Central Region may be attributable to contextual challenges, such as scarce institutional training initiatives, insufficient infrastructure, and resource limitations that impede skill

acquisition and maintenance. Language obstacles could also impair understanding of educational content and emergency procedures. Inconsistencies in mentoring, excessive workloads, and staff burnout likely exacerbate these issues. Such elements underline the necessity for tailored, region-specific interventions to enhance emergency nursing knowledge and performance.

Novelty and generalisability of findings

This research offers original, contextually relevant insights from Ghana's Central Region by combining evaluations of triage and resuscitation knowledge. Although the results hold particular relevance for comparable environments in lower-middle-income nations, differences in infrastructure and training opportunities constrain wider applicability. The cross-sectional approach further precludes firm causal conclusions. Nevertheless, the investigation contributes important evidence regarding emergency nursing readiness in sub-Saharan Africa, highlighting the combined influence of personal and systemic elements on clinical proficiency.

Implications

Urgent financial and institutional investment is required to bolster CPR and triage training, especially in alignment with the latest American Heart Association (AHA) guidelines, to close identified knowledge deficits. Healthcare facilities should introduce evidence-based recertification policies that mandate all clinical personnel to prove competence in CPR and triage every 12–18 months, coupled with prompt remedial interventions for detected shortcomings. Training programs should feature differentiated content suited to varying experience levels, offering focused refreshers for senior nurses to counteract knowledge erosion and practical hands-on sessions for less experienced staff. High-fidelity simulation-based training should supplant conventional lecture formats to promote active skill practice and verifiable competence. Ongoing compulsory refresher courses in Basic Life Support (BLS) and triage are vital for sustaining skills, particularly in light of documented retention decline over time. Enhanced accessibility and proficiency with Automated External Defibrillators (AEDs) in clinical environments could markedly improve survival outcomes in cardiac arrest cases. Wider implementation of instruments such as the NURSMID protocol is advised, together with targeted approaches that accommodate gender-specific learning preferences and proactively re-involve long-tenured nurses in contemporary best practices to optimise patient results.

Study limitations

Dependence on self-reported triage knowledge raises the risk of response bias, as respondents might over- or underestimate their capabilities. The study was confined to three hospitals in Ghana's Central Region, restricting the extent to which results can be extrapolated to other areas with different healthcare systems. Although the sample size was sufficient for the included facilities, it may not fully reflect the national population of Emergency Department (ED) nurses. The cross-sectional methodology impedes the establishment of causality between socio-demographic variables and knowledge levels. Sampling based on duty rosters and leave schedules could have introduced selection bias. Furthermore, the broad confidence interval for the female gender effect (AOR = 23.63, 95% CI: 2.88–193.68) points to potential sparse data bias or small-sample influences, necessitating cautious interpretation. The absence of a significant education effect might be confounded by unassessed variables, such as changes in roles or training disparities, which were not comprehensively evaluated. As a snapshot study, it lacked historical training data, representing an additional constraint. The cross-sectional nature also prevents causal inferences regarding links between experience, training exposure, and knowledge retention. Reliance on self-reported measures carries risks of social desirability bias or recall errors, potentially compromising the accuracy of reported knowledge and practices. Finally, assessing competence solely through self-reports without corroboration via simulation or direct observation limits conclusions about actual clinical performance in emergency situations.

Conclusion

In summary, the investigation revealed a notable association between gender and resuscitation knowledge, with female staff exhibiting superior proficiency. It also exposed substantial deficiencies in CPR knowledge among emergency department nurses, underscoring the importance of continuous education to mitigate skill decay. To enhance competence and remedy identified gaps, it is advised to institute compulsory, regular CPR refresher courses and practical training sessions, promoting equitable participation across genders. Future

studies should employ qualitative or mixed-methods designs to investigate the reasons behind lower resuscitation knowledge in experienced nurses, exploring aspects such as role transitions, reduced participation in formal learning, and over-dependence on accumulated experience. Interventions should be customised to different experience levels, with their sustained efficacy evaluated through longitudinal research to support better knowledge retention and superior clinical outcomes in emergency care. Subsequent investigations should delve deeper into contributors to reduced knowledge among seasoned nurses using qualitative or mixed approaches and examine the enduring benefits of specialised training via prospective longitudinal studies.

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