A Study on the Knowledge of Basic Life Support among Perfusionists- a Questionnaire and Clinical-Based Prospective Analysis

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Abstract

Aim*: To assess the theoretical knowledge and practical skills in BLS among perfusionists using a structured questionnaire and clinical skill-based evaluation.*

Materials and Methods*: This prospective observational study included full-time practicing perfusionists from the Narayana Institute of Cardiac Sciences. Participants completed a 20-item questionnaire and were evaluated through simulated emergency scenarios to assess clinical performance. Responses and skill assessments were analyzed using descriptive statistical methods to determine the proportion of participants demonstrating adequate knowledge and competence.*

Results*: Analysis of the questionnaire data revealed that 23% of perfusionists had good knowledge, 57% had adequate knowledge, and 20% had inadequate knowledge of BLS. Among participants, 58% identified the correct next step when no pulse and breathing were present, and 52% activated the Emergency Medical System (EMS). High-quality chest compressions were effectively performed by 31%, correct airway maneuvers and rescue breaths by 35%, and appropriate AED use by 45% of participants.*

Conclusion*: The Perfusionist exhibited a foundational understanding of BLS, with scope for improvement in chest compressions, airway management, and AED use. Regular, structured BLS training, simulation-based practice, and mandatory skill refreshers are essential to strengthen competency, ensuring improved patient safety and outcomes in critical care environments.*

Keywords: Basic Life Support, Cardiac Arrest, Perfusionist, Knowledge, Standard Questionnaire

Introduction

Cardiac arrest is a critical medical emergency in which the heart stops suddenly, leading to a cessation of breathing and consciousness[1]. The heart stops pumping blood to vital organs, and if left untreated, it results in death. Survival after cardiopulmonary arrest is generally low and depends heavily on early recognition, high-quality cardiopulmonary resuscitation, and rapid defibrillation[2]. It may often be fatal if appropriate management isn't taken immediately.

Cardiac arrest may result from a variety of cardiac and non-cardiac causes. The common cardiac etiologies include arrhythmias (such as ventricular fibrillation or ventricular tachycardia), structural heart disease, including coronary artery disease, cardiomyopathies, or prior myocardial infarction[3]. Non-cardiac causes include,

Table 1: Represents the Reversible non-cardiac causes of cardiac arrest arranged by H's and T's (AHA 2020 Guidelines)

H's (Hypo\Hyper conditions)	T's (Tension\Trauma\Toxins)
Hypoxia	Tension pneumothorax
Hypovolemia	Cardiac Tamponade
Hypo-/Hyperkalemia and other lectrolyte disturbances	Toxins/Drug overdose/poisoning
Hypothermia	Thrombosis
Hypoglycemia	Trauma

Other possible causes of cardiac arrest include,

Severe Metabolic Acidosis-

Severe metabolic acidosis, characterized by a low blood pH, impairs myocardial contractility and reduces responsiveness to resuscitation interventions, increasing the risk of cardiac arrest[4,5].

Anaphylaxis-

Anaphylaxis shock may lead to cardiac arrest through sudden vasodilation, severe hypotension, potentially causing cardiac arrest[6].

Pulmonary Embolism-

Massive pulmonary embolism can obstruct blood flow through the pulmonary vasculature, resulting in acute right heart failure and subsequent cardiac arrest[7].

Electrical abnormalities-

These include bradyarrhythmias, pulseless electrical activity, Wolff-Parkinson-White syndrome, and Long QT syndrome[8]. [9].

The Main Signs of cardiac arrest are **Sudden loss of responsiveness, no normal breathing, no carotid pulse**, and with or without Chest Pain. Pulseless cardiac arrest can be produced by these four rhythms: ventricular fibrillation (VF), rapid ventricular tachycardia (VT), pulseless electrical activity (PEA), and asystole. Survival from these arrest rhythms requires both basic life support (BLS) and advanced cardiovascular life support(ACLS). [10,11].

Cardiac arrest is the most common cause of death worldwide, and early intervention with high-quality BLS improves a victim's chances of survival. A patient in cardiac arrest is treated by early CPR and early defibrillation, and administration of Emergency Drugs. [12,13,14].

Basic life support comprises essential interventions, including recognizing cardiac arrest, activating emergency response systems, performing effective CPR, and using AEDs when available. These actions significantly increase the likelihood of survival after out-of-hospital cardiac Arrest[15] . Steps of CPR: Locate the carotid pulse behind the trachea on the side of the neck. An attempt to feel the pulse should only be performed for about 5-10 seconds, if a pulse cannot be distinctly detected, assume that there is no pulse[14,15,16]. The anatomical landmark for chest compressions during CPR is the Xiphoid process. Begin CPR by alternating 30 compressions and 2 breaths, open the airway by head tilt, chin lift method, place the heel of one hand (dominant hand)on the center of the chest, with the other hand on top, interlocking the fingers [17].The arms and shoulders are straight and begin the chest compressions hard and fast. According to the 2021 CPR Guidelines, the line of Survival sequence will be Compression – Airway -Breathing[12,18].

The chest compression depth for adults will be at least 2 to 2.4 inches deep for adults, The chest compression depth for Infants and children up to puberty is 1/3 the depth of the chest, which is about 1.5 inches (4 cm) in infants and 2 inches (5 cm) in children up to puberty and Infants under one year of age (excluding newborns): two fingers in the center of the chest, just below the nipple line[18,19]. The chest needs to fully expand between each compression to allow blood to flow into the victim's heart, leaning on the chest at any time during CPR is contraindicated. After 30 hard and fast chest compressions, tilt the head and chin to make sure the victim's airway is still open[12,19]. If the victim appears to have a neck injury, perform a jaw thrust to open the airway by gently moving the jaw forward, perform a round of 30 chest compressions followed by 2 breaths (each breath per second).A defibrillator is used to assess the cardiac rhythm in victims to deliver a controlled electrical shock during abnormal cardiac rhythms. [20]. If a defibrillator cannot be accessed, use an Automated External Defibrillator(AED) to assess the cardiac rhythm.AEDs automatically analyze the heart rhythm and provide voice-guided prompts for pad placement and shock delivery if indicated. [21,22].

Therefore, every healthcare professional should be knowledgeable about cardiac arrest and Basic Life Support to save the precious life of a patient.

Objectives

1.To assess the current level of BLS knowledge and clinical skills among practicing perfusionists of Narayana Hrudayalaya Institute of Cardiac Sciences.

2.To identify areas of BLS where additional education or training is required for practicing perfusionists.

Methodology

Study type

Observational questionnaire-based research study

Study Design

The target population selected was practising perfusionists of Narayana Hrudayalaya Institute of Cardiac Sciences, Bengaluru, Karnataka.

Data Collection

1.The study was conducted in the Simulation Lab,located on the 7th floor of Narayana Hrudayalaya Institute of Cardiac Sciences,Bengaluru, from 24th May 2025 to 09th August 2025.

2.Permission was obtained from the Narayana Hrudayalaya Academic Ethics Committee, Bengaluru, Karnataka (Approval No. NHH/AEC-CL-2025-1399).

3.We designed and implemented an online data collection tool using Google Forms via(docs.google.com/forms/forms). The questionnaire assesses knowledge and management of Cardiac Arrest, and a Clinical assessment of CPR skills was performed in accordance with the evaluation guidelines of the American Heart Association.

4.Google Forms include socio-demographic details such as name, age, gender, year of study and course of the study, Institution name, and Place. Informed Consent in one part, and the next section contains 20 Questions to check the knowledge of the students on cardiac arrest and its management.

5.Participants were asked to select the appropriate option, for each correct response, 2 marks will be given. During clinical assessment,Participants were presented with standardized scenarios reflecting real-life emergencies, and their CPR skills were evaluated according to AHA guidelines.

6.Complete data were collected, entered in an Excel sheet, and the results were analyzed with the proper statistical method.

Table 2: Survey Questionnaire

SI.No	QUESTIONS	OPTIONS GIVEN FOR SCORING
1.	What is meant by Cardiac Arrest?	a)Myocardial Infarction (MI) b) Sudden unexpected loss of heart function

		c) Angina Pectoris d) Don't know
2	Which is the most common etiology (cause) of Cardiac Arrest?	a) Myocardial Infarction (MI) b) Valvular heart disease c) Arrhythmia d) Infective endocarditis e) Don't know
3	Can Cardiac Arrest cause Brain Damage?	a) Yes b) No c) Don't know
4	Which is the most common risk factor of Cardiac Arrest?	a) Coronary artery disease b) Rheumatic heart disease c) Valvular heart disease d) Congenital heart disease e) Don't know
5	How do you diagnose a patient under Cardiac Arrest?	a) Sudden loss of responsiveness, No breathing and No pulse in carotid artery b) Sudden loss of responsiveness, High pulse rate and No breathing c) Sudden loss of responsiveness, Increased body core temperature and High blood pressure d) Don't know
6	Where should you feel for a pulse in an unresponsive adult victim under cardiac arrest?	a) Radial artery b) Brachial artery c) Carotid artery d) Femoral artery e) Don't know
7	Where should you feel for a pulse in an unresponsive infant victim under cardiac arrest?	a) Radial artery b) Brachial artery c) Carotid artery d) Femoral artery e) Don't know
8	What is the first line emergency treatment for cardiac arrest?	a) Advanced Airway b) Use of Defibrillator c) Cardio Pulmonary Resuscitation

		d) Don't know
9	Is cardiac arrest and heart Attack the same?	a) Yes b) No c) Don't know
10	Before beginning CPR, check for the pulse,	a) No longer than 10 seconds b) At least 20 seconds c) At least 30-40 seconds d) At least 1 minute e) Don't know
11	What is the chest compression depth for adults and adolescents in High quality CPR?	a) 1to 1.5 inches b) 2 to 2.4 inches c) 2.5 to 3.2 inches d) 3 to 3.5 inches e) Don't know
12	What is the chest compression depth for infants in High quality CPR?	a) 1.5 inches b) 2.5 inches c) 3.5 inches d) 4 inches e) Don't know
13	What is the CPR ratio of chest compression and rescue breathing in Cardiac Arrest?	a) 2: 30 b) 4: 15 c) 15: 4 d) 30: 2 e) Don't know
14	The rate of chest compression for an adult in High quality CPR is	a) 60-80 compressions per minute b) 40-70 compressions per minute c) Between 100-120 compressions per minute d) Between 130-170 compressions per minute e) Don't know
15	According to 2021 CPR Guidelines, line of survival sequence will be	a) Airway -> Breathing ->Compression b) Compression -> Airway -> Breathing c) Compression -> Breathing -> Airway

		d) Breathing -> Airway -> Compression e) Don't know
16	According to American Heart Association (AHA), How many joules of shock should be delivered by a monophasic defibrillator to an adult victim?	a) 70 Joules b) 120 Joules c) 270 Joules d) 360 Joules e) Don't know
17	The most common abnormal shockable rhythms observed in Cardiac Arrest are	a) Ventricular Flutter and Atrial fibrillation b) Ventricular Fibrillation and Ventricular Tachycardia c) Asystole and Pulseless electrical activity d) Don't know
18	Which drug is considered as first line of treatment for Asystole and PEA (Pulseless electrical activity)?	a) Amiodarone b) Lidocaine c) Epinephrine d) Atropine e) Don't know
19	When you are doing an CPR on a patient with pulseless ventricular tachycardia. You should check for a pulse, a) After each cycle of CPR b) After 2 minutes of CPR c) After 5 minutes of CPR d) After 10 minutes of CPR e) Don't know	a) After each cycle of CPR b) After 2 minutes of CPR c) After 5 minutes of CPR d) After 10 minutes of CPR e) Don't know
20	Are you trained in Basic Life Support (BLS)?	a) Yes, I am trained and able to perform BLS skills under medical emergency b) Yes, I am trained but not practically trained to perform BLS skills under medical emergency c) Not trained in BLS

Table 3: BLS Evaluvator Checklist

STEP	CANDIDATE ACTION FOR VIRTUAL ADULT CPR AND AED USE	EVALUATOR MARKS
1 Check each box only if the skill is performed successfully.	☐ Verbalizes and demonstrates checking responsiveness ☐ Shouts for help/activates emergency response system ☐ Verbalizes and demonstrates checking for breathing ☐ Verbalizes and demonstrates checking pulse	
2 Once the student shouts for help,evaluator says, "Here's the barrier device I am going to get the AED."		
3	**Cycle 1:** Adult compressions Performs high quality CPR,including ☐ Demonstrates hand placement on lower half of sternum ☐ Demonstrates 30 compressions in no less than 15 seconds and no more than 18 seconds ☐ Compresses at leasr 2 inches, with complete chest recoil after each compression	
4	☐ Gives 2 breaths with a barrier device ☐ Demonstrates giving each breath over 1 second with visible chest rise with each breath ☐ Resumes compressions in less than 10 seconds	

Evaluator Notes • Place a check in the box next to each step the candidate completes successfully.	
Test Results Circle PASS or NR to indicate pass or needs remediation.	**PASS** **NR**
Evaluator Name: Date: Signature:	

5	**Cycle 2:** Repeats these steps of cycle 1: ☐ Performs high quality compressions ☐ Gives 2 breaths,1 second each,with visible chest rise ☐ Resumes compressions in less than 10 seconds	
6	Follows AED Prompt: ☐ Powers on AED ☐ Demonstrates correctly attaching goals ☐ Verbalizes “clear” for analysis ☐ Demonstrates clearing the patient to safely deliver shock ☐ Demonstrates safely delivering shock	
7	Resumes compressions: ☐ Verbalizes “Resume compressions” and directs the evaluator to resume compressions ☐ Ensures that compressions resume immediately after shock delivery	

STOP TEST

Results:

A survey on knowledge of Basic life support among perfusionists was conducted on full-time practicing perfusionists of Narayana Hrudayalaya Institute of Cardiac Sciences. Out of 51 participants, 38 participants were postgraduates, 13 participants were undergraduates. The correct responses for question one to twenty were 66.7%, 31.4%, 94.1%, 100%, 96.1%, 90.2%, 45.1%, 98%, 80.4%, 82.4%, 68.6%, 68.6%, 90.2%, 51%, 56.9%, 15.7%, 62.7%, 51%, 37.3%, 100%.

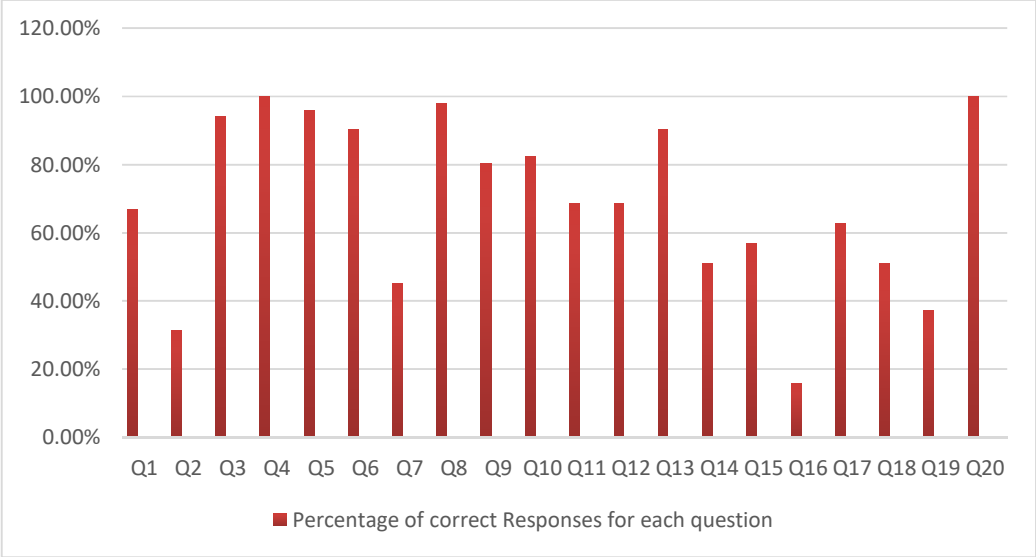

Figure 1: Responses showing the percentage of correct responses for Question 1 to Question 20

According to the statistical analysis of the data received from the Questionnaire survey, 23% of the perfusionists has good knowledge, 57% of the perfusionists has adequate knowledge and 20% of the perfusionists has inadequate knowledge about Basic Life Support.

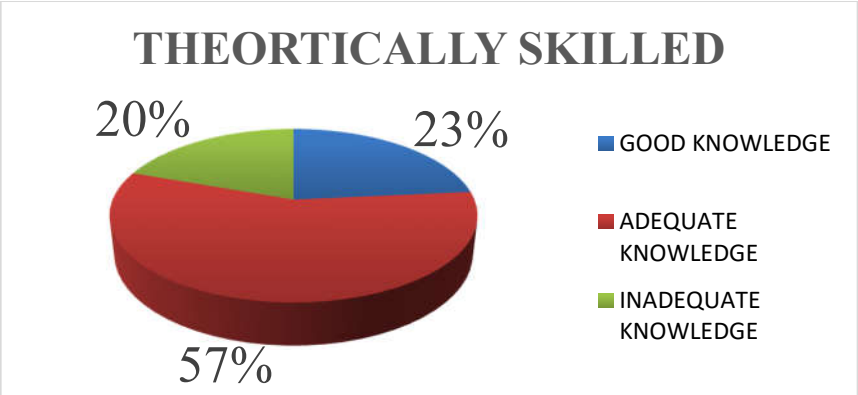

Figure 2: Represents the Questionnaire survey on Knowledge of Basic Life Support among perfusionists

According to the statistical analysis of data received from Basic Life Support skills assessment, 69% of perfusionists are non-qualified and 31% of perfusionists are qualified. A total of 58% of participants demonstrated the knowledge of the next appropriate step to be taken when no pulse and breathing were present.52% Of participants has the potential to shout for help and activate the Emergency Medical System(EMS). Only, 31% of participants were able to perform High-quality chest compressions. Correct airway opening maneuvers and provision of rescue breaths were performed by 35% of the participants. Furthermore, 45% of the participants demonstrated adequate knowledge and skill in the use of Automated External Defibrillator (AED).

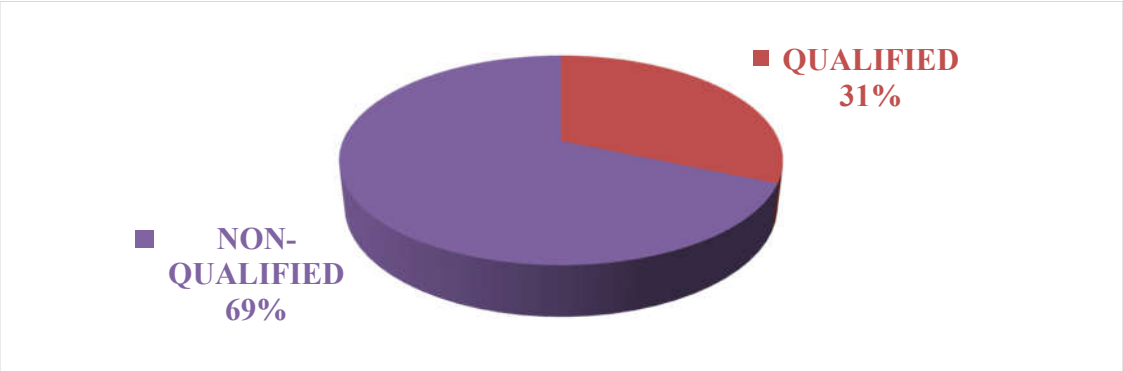

Figure 3: Represents the Assessment Outcome of BLS Skills among the participants

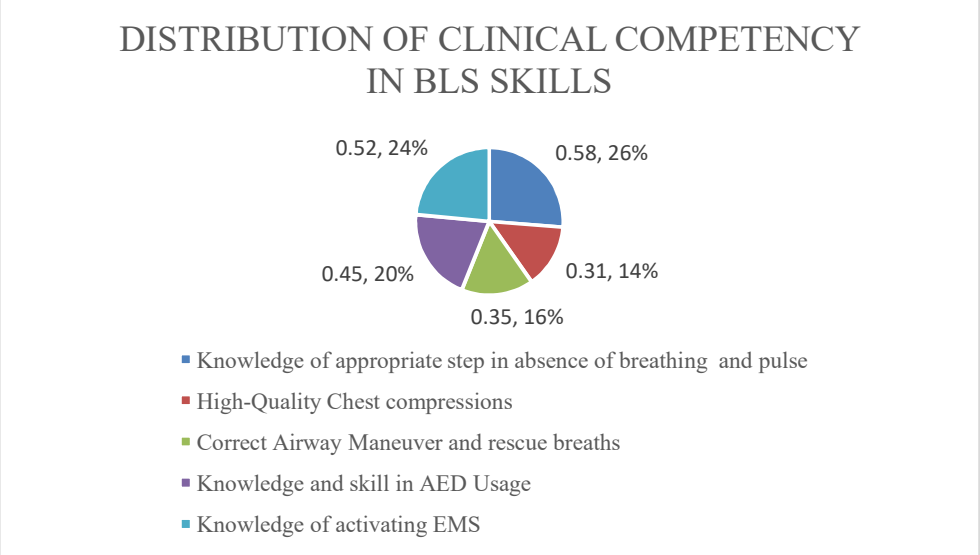

Figure 4: Represents the Clinical competency in BLS Skills among the participants

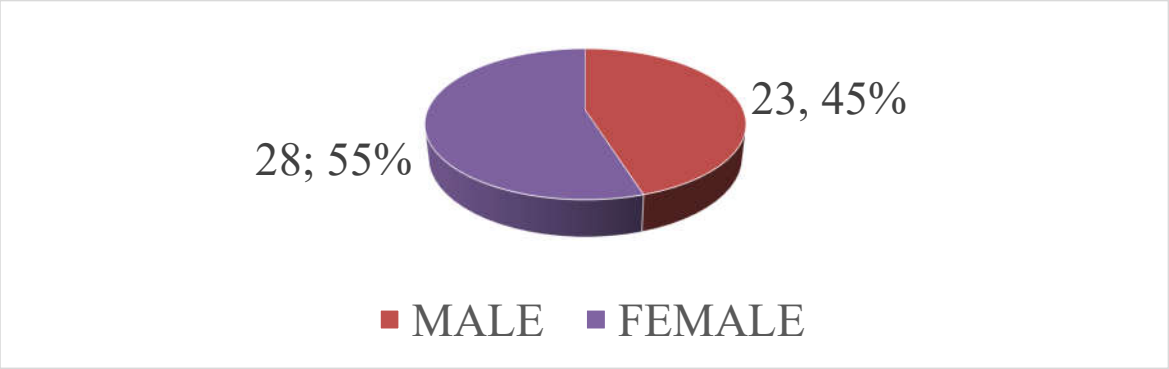

Figure 5: Represents the gender of the participants who participated in the study

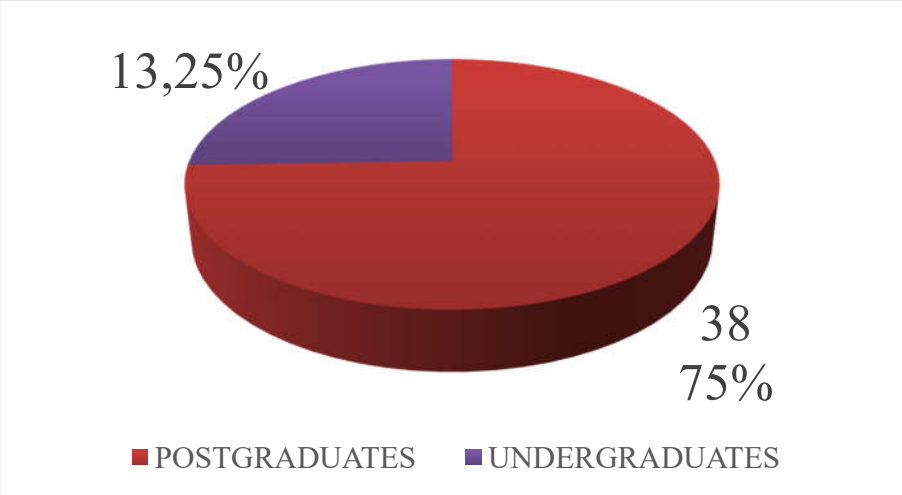

Figure 6 : Represents the Designation of the participants who participated in our study.

Discussion:

The present study evaluated the knowledge and clinical competency of perfusionists in Basic Life Support (BLS). The findings revealed that only 31% of participants were able to perform high-quality chest compressions, while 58% demonstrated awareness of the next appropriate step when both pulse and breathing were absent. Additionally, 35% of participants correctly performed airway opening maneuvers and provided effective rescue breaths, and 45% exhibited adequate knowledge and skill in the use of an Automated External Defibrillator (AED). These results indicate that although a proportion of perfusionists possessed fundamental

BLS knowledge, there remains a considerable gap between theoretical understanding and effective clinical application.

When interpreted in the context of available evidence, These findings align with previous studies reporting that healthcare professionals—including physicians, nurses, and allied health staff—often demonstrate suboptimal cardiopulmonary resuscitation (CPR) performance. The primary contributing factors identified in previous literature include inadequate training frequency, insufficient hands-on exposure, and limited opportunities for skill reinforcement in real-life emergency situations.

The outcomes of this study highlight the need for structured and periodic BLS training programs specifically designed for perfusionists. Regular certification updates, combined with simulation-based learning modules, can significantly enhance both cognitive and psychomotor aspects of resuscitation. Simulation-based education, as endorsed by the American Heart Association (AHA), provides a realistic, low-risk environment that promotes active learning, improves confidence, and enhances skill retention.

Furthermore, implementing mandatory refresher courses and competency evaluations at defined intervals may help maintain proficiency and ensure readiness during cardiac emergencies. Continuous education and practice are essential to bridge the gap between knowledge and performance, ultimately improving patient safety and outcomes in critical care and cardiac surgical settings.

Future research should focus on conducting multi-center studies with larger participant groups to validate these findings and to establish standardized benchmarks for BLS competency among perfusionists. Long-term follow-up studies assessing skill retention and the impact of different training methodologies would further contribute to optimizing educational strategies and improving clinical preparedness in resuscitation practices.

Conclusion:

The present study highlights that perfusionists possess a foundational understanding and skill set in Basic Life Support, with opportunities for improvement in areas such as chest compressions, airway management, and AED use. While many participants were able to identify the correct steps during cardiac arrest scenarios, enhancing overall performance to meet recommended standards remains essential. These findings underscore the value of structured and periodic BLS training, simulation-based practice, and regular skill refreshers to further strengthen preparedness for real-life resuscitation events. Continued development of BLS competency among perfusionists will play a vital role in enhancing patient safety and outcomes in critical care settings.

Declarations

Ethics Approval:

The study was approved by Narayana Hrudayalaya Academic Ethics Committee, Bengaluru, karnataka.

Approval number(NHH/AEC-CL-2025-1399)

It certifies that the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards

Consent To Participate:

Informed consent was obtained from all participants during the study

Competing Interests

The authors declare that they have no competing of interest.

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None

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