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Original Research Article

FACTORS INFLUENCING QUALITY OF CPR AND ITS OUTCOME AMONG PATIENT'S ADMITTED IN INTENSIVE CARE UNITS

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Abstract

Background: Cardiopulmonary resuscitation (CPR) is an integral part of initial treatment for cardiac arrest victims. The annual occurrence of sudden cardiac death in India is 0.55 per 1000 inhabitants. This study will focus on a range of factors that influence quality of compression, depth, rate at which chest compressions were given in order to improve CPR performance with the goal of improving patient survival and functional outcomes which will help in decreasing the mortality rate in Intensive Critical care units. The aim of the study was to find out factors influencing quality of CPR and its outcome among Intensive Care Units patients. **Materials and Methods:** Quantitative research approach with purposive sampling technique was followed to include 70 participants. Demographic information and self-structured checklist were used to gather data to check the quality and its factors affecting outcome during CPR. **Result:** The findings related to outcome was (30%) of patients achieved return of spontaneous circulation. **Conclusion:** The most common mechanism leading to CPR among patients was asystole. The main factor affecting CPR quality in this study was, readiness of defibrillator on time.

INTRODUCTION

Cardiopulmonary resuscitation (CPR) is a lifesaving method which provides compressions for appropriate airflow in a person, who has had a rapid loss of consciousness. To maintain person's cognition activate it is therefore, to facilitate spontaneous flow of blood and respiration by pushing sternum hard and fast until medical assistance approaches. It is indicated for people who are unable to respond due to lack of respiration or irregular breathing.

CPR for adults include, chest compressions at a rate of (100 to 120 per minute) and 5 cm depth (2 inches), with 30:2 chest compression to breathing ratio and total chest recoil. Natural oxygenation can begin with a life saver blowing air into the suspect's mouth or nose, or with the use of ventilator that pumps oxygen through victim's lungs.1

The most widely accepted guidelines to perform CPR are made by the American Heart Association (AHA) every five years, International Liaison Committee on Resuscitation (ILCOR).2

Frequency of cardiopulmonary arrest globally is 20-140 per 100,000 persons, with an alarming low survival rate of around 2-11 percent.3

As the major cause of death nationwide, nearly 17 million people die every year in the world as a result of cardiovascular disease, and about 30 percent of the world's total mortality. It causes twice as many deaths in developing nations as AIDS, malaria, and tuberculosis. Around 40% and nearly half of all cardiovascular deaths are estimated to be cardiac fatalities and ventricular tachyarrhythmias are accountable for almost eighty percent of the overall cases.

Consequently, due to arrhythmias, every year approximately six million people die of abrupt heart failure and survival rate is less than 1% of the world's population and in the United States, it's close to 5%.4

In 2010, Cardiopulmonary Resuscitation (CPR) standards have now been modified by American Heart Association (AHA). In order to enhance patient success rate, significant changes have been incorporated for further new recommendation. Changing the Basic Life Support

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(BLS) order from ABC to CAB and CPR without rescue breaths focusing on standard CPR and after care treatment are now just a few major changes and proposals that were made.5

As per AHA, the main goal of CPR seeks to enhance on fixing cardiopulmonary arrest mortality and increasing by stander responsiveness outside of health facilities. So far Out-of-Hospital (OOH) accounts for 15.8% while In-Hospital (IH) accounts for 38% in the survival rate. They have achieved it 76% OOH and 65% In Hospital. Every year AHA has a goal of training 20 million people and still in advancement (112%) (22/3 million people trained by financial year of 2016-17). AHA also doing best to achieve another goal of by stander response has more than doubled to 62 percent, and the work is still ongoing (74 percent achieved) with 46.1% response rate in 2016-2017.6

Global occurrence of adult heart failure in the hospital is still not been specifically described, and much of information attain from the Get with the Guidelines-Resuscitation (GWTG-R) registry of the American Heart Institute and the Resuscitation Council's United Kingdom Intensive Care and Research Centre. The estimated frequency of arrest i.e., 6 to 7 per 1000 admissions inside hospital was 211 000 annually according to GWTG-R data in US, and the other report showed a rise in incidence i.e., 9 to 10 cardiac arrests per 1,000 admissions from 2003 to 2007.8

On the other hand, from 2011-2013, the frequency of in-hospital cardiac arrests per 1000 admissions was 1.6.8

MATERIALS AND METHODS

An Observational research study with purposive sampling technique was followed to include 70 cardiac events with a resuscitation attempt between 5th April, 2021 to 5th June, 2021 in Intensive Care unit at Himalayan Institute of Medical Science, (HIMS) Dehradun, Uttarakhand. Data were collected by the help of practice check list for quality of CPR and structured checklist for identification of influencing Factors affecting outcome during CPR.
INCLUSION CRITERIA
Patient
Patient between 18 to 70 years of age.
Both male and female.
Healthcare worker
Physician/doctors and Nurses.
Performing CPR during even to cardiac Arrest.
Who has completed at least1cycle of CPR.

RESULTS

Table 1: Frequency and percentage distribution of Socio-demographic and clinical characteristics of critically ill patients. N= 70
Illustrates the distribution of socio demographic and clinical characteristics of critically ill patients. As per

age, 36(51.4%) were in the age group of 57-70 years. According to gender majority were male i.e., 42 (60%).

As per diagnosis, mostly patients i.e. 14 (20%) were diagnosed with CVA followed by13 (18.5%) were diagnosed with CLD followed by 12(17%) were diagnosed with Ca. followed by 10(14.2%) were diagnosed with CKD followed by equivalent number of patients i.e. 05(7.14%) were diagnosed with RTA (head injury), Old PTB and same number of patients i.e. 03(4.2%) were diagnosed with COPD, Poisoning followed by equal number of patients i.e. 01(1.4%) were diagnosed with Acute pancreatitis, Hypoxic brain injury and Parkinson while 2(2.85%) were diagnosed with Diabetic foot.

As per co morbidity, 32(45.71%) patients had comorbidity while 38(54.28%) patients did not had comorbidity.

As per types of comorbidities, 14(20%) of patients were HTN, 13(18.57%) patients were DM followed by equal number of patients i.e.,3 (4.28%) were Hypothyroidism and COPD.

According to the number of patients on ventilator i.e. 51(72.85%) of patients were on ventilator. Out of that, majority of patients i.e. 50(98.03%) were on AC-VCV support and only 01(1.96%) was on PSV support.

As per procedure, 16 (22.85%) of patients were on dialysis.

As per pharmacological therapy, 51 (72.85%) were on vasopressors support and most of patients i.e. 33(64.70%) were on vasopressor support, while 18(32.29%) patients were on inotropic support.

According to the number of days in ICU, majority of patients i.e. 62(88.57%) were stayed in the range of 1-20 days and only 04(5.71%) patients were stayed in the range of 21-30days.

As per recognition of ECG rhythm before giving CPR, most of the patients i.e. 31(44.28%) were recognized PEA, followed by 22(31.41%) patients were recognized VT, followed by 11(15.71%) patients were recognized asystole and 06(8.57%) patients were recognized VF.
Table 2: Frequency and percentage distribution of socio demographic characteristics of HCW's. N=70
Illustrates the distribution of socio demographic characteristics of HCW's. As per age, 44(62.85%) of HCW'S (registered nurse) were in the age group of 21-30 with a majority of 40(57.14%) were female.

As per designation, majority i.e., 64(91.42%) were registered nurse (RN), 4(5.71%) were nurse practitioner (NP) and only 2(2.85%) were medical residents (Doctors).

As per work experience of ICU, most of HCW's i.e., 44(62.85%) had ICU experience <5years and only 4(5.71%) of HCW's had experience between 11-15 years.

As per educational qualification, most of HCW's (RN) i.e., 33(47.14%) had a qualification of GNM (N), 29(41.42%) were B.Sc (N), 4(5.71%)

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were NPCC, 2 (2.85%) were M.Sc (N) and 2(2.85%) of them were medical residents (Doctors).

As per BLS certified, majority of HCW's i.e.,67 (95.71%) was BLS certified and only 3(4.28%) were not certified.

As per ACLS certified, most of HCW's i.e., 51(72.85%) were ACLS certified and 19(27.14%) were not certified.

As per involvement of HCW's in CPR, majority of HCW's i.e., 58(82.85%) were between the range of 1-4 during CPR of patient and 12(17.14%) HCW's were between the range of 1-3. Table 3: Description of factors affecting quality of CPR Frequency and percentage distribution of Factors affecting quality of CPR in CPR Events. Illustrates that, majority of HCW's i.e., 64 (91.42%) were adequately present at the scenario (AHA guidelines) during CPR event. Majority of HCW's i.e., 70(100%) did not showed any disharmony while performing CPR.

Mostly seen that, there was an availability of emergency equipment's on bedside (laryngoscope, E.T tube, AMBU-BAG, bougie and drugs) i.e., 55(78.57%). Minimum time showed that, there was a lack of materials (gloves, syringe, and gauze) i.e., 8(11.42%). None of HCW's i.e., 70 (100%) showed dis familiarity with the emergency trolley.

Majority of HCW's i.e., 59(84.28%) were able to recognised CPR on time. Majority of HCW's i.e.,64 (91.42%) initiated CPR on time. Majority of HCW's i.e.,65 (92.85%) was able to diagnose cardiac rhythm properly. More than half of the time i.e., 37(52.85%) defibrillator was ready on time.

Timely shock was given (n=6) i.e., 6(100%) by HCW's. Majority of HCW's i.e., 62(87.14%) were not exhausted while giving CPR. Majority shows that, there was no delay in administering drug i.e., 65(92.85%) while giving CPR. Majority i.e., 60(85.71%) shows that, drugs given in a proper dosage form by HCW's.

More than half i.e., 45(64.28%) shows that, patients were not hyperventilated during CPR by HCW's.

Table 1: Frequency and percentage distribution of Socio demographic and clinical characteristics of critically ill patients. N = 70

Sl. No.	Socio-demographic characteristics	Frequency(f)	Percentage (%)
1	Age (in years)		
	18-30	05	07%
	31-43	07	10%
	44-56	22	31.4%
	57-70	36	51.4%
2	Gender		
	Male	42	60%
	Female	28	40%
3	Diagnosis	14	20%
	Cerebrovascular Accident (CVA)	13	18.5%
	Chronic Liver Disease (CLD)	12	17%
	Cancer (Ca.)	10	14.2%
	Chronic Kidney Disease (CKD)	05	7.14%
	RTA (Head Injury)	05	7.14%
	Old PTB	03	4.2%
	Chronic Pulmonary Obstructive Disease (COPD)	03	4.2%
	Poisoning	01	1.4%
	Acute Pancreatitis	02	2.85%
	Diabetic foot	01	1.4%
	Hypoxic Brain Injury	01	1.4%
	Parkinson		
4	Co morbidity		
	Yes	32	45.71%
	No	38	54.28%
4.1	Types of comorbidities (n=32)		
	Diabetes mellitus	13	18.57%
	Hypertension	14	20%
	Hypothyroidism	03	4.28%
	COPD	02	2.85%
5	On Ventilator		
	Yes	51	72.85%
5.1	Mode of ventilator(n=51)		
	AC-	50	98.03%
	VCVPS V	01	1.96%
6	Procedure		
	Dialysis	16	22.85%
7	Pharmacological therapy		
	Yes	51	72.85%
	No	19	27.14%
8	Pharmacological therapy (n=51)		
	Vasopressors	33	64.70%
	Inotropes	18	35.29%
9	Total no. of ICU days		
	1-10	62	88.57%

	11-20	04	5.71%
	21-30	04	5.71%
10	Recognition of ECG rhythm before giving CPR		
	Pulseless electrical activity	31	44.28%
	Ventricular tachycardia	22	31.42%
	Asystole	11	15.71%
	Ventricular fibrillation	06	8.57%

Table 2: Frequency and percentage distribution of socio demographic characteristics of HCW's. N = 70

Sl. No.	Socio demographic characteristics	Frequency (f)	Percentage (%)
1	Age (in years)		
	21-30	44	62.85%
	31-40	24	34.28%
	41-50	02	2.85%
2	Gender		
	Male	30	42.85%
	Female	40	57.14%
3	Designation		
	Registered nurse	64	91.42%
	Medical resident	02	2.85%
	NPCC	04	5.71%
4	Years of work experience in ICU		
	1-5	44	62.85%
	6-10	22	31.42%
	11-15	04	5.71%
5	Educational qualification	33	47.14%
	GNM(N)	29	41.42%
	B. Sc(N) M.Sc(N)	02	2.85%
	NPCC	04	5.71%
	MS	01	1.42%
	MD	01	1.42%
6	BLS certified		
	Yes	67	95.71%
	No	03	4.28%
7	ACLS certified		
	Yes	51	72.85%
	No	19	27.14%
8	Health care workers involved in CPR		
	1-3	12	17.14%
	4-6	58	82.85%

Table 3: Description of factors affecting quality of CPR Frequency and percentage distribution of Factors affecting quality of CPR in CPR Events. N = 70

Sl. No.	Events	Yes (Frequency & %)	No (Frequency & %)
1.	Adequate number of healthcare workers present at the scenario. (AHA guidelines)	64 (91.42%)	06 (8.57%)
2.	Any disharmony among the healthcare workers.	0	70(100%)
3.	Availability of emergency equipment's on bedside. (Laryngoscope, E.T tube, AMBUBAG, Bougie, drugs)	55 (78.57%)	15 (21.42%)
4.	Lack of materials (gloves, syringe, gauze.	08 (11.42%)	62 (88.57%)
5.	Equipment failure.	16 (22.85%)	54(77.14%)
6.	Lack of familiarity with the emergency trolley.	0	70 (100%)
7.	Cardiac arrest recognition on time.	59(84.28%)	11(15.71%)
8.	CPR initiated on time.	64 (91.42%)	6 (8.57%)
9.	Proper diagnosis of cardiac rhythm.	65 (92.85%)	5 (7.14%)
10.	Defibrillator was ready on time.	37 (52.85%)	33 (47.14%)
11.	Timely shock given (n=6)	06 (100%)	0
12.	Rescuers exhausted while giving CPR.	08 (10%)	62 (87.14%)
13.	Delay in administering drugs.	05 (7.14%)	65 (92.85%)
14.	Drugs given in proper dosage.	60 (85.71%)	10 (14.28%)
15.	Patient is hyperventilated.	25 (35.71%)	45 (64.28%)
16.	Patient responded on time(<10min)	21 (30%)	49 (70%)

DISCUSSION

Description of quality of CPR.

The findings of the present study regarding quality of CPR showed that majority of HCW's 91.42% were clearly identified their role before starting CPR and 84.28% were able to maintain the scene orderly and quiet. The majority of HCW's 85.71% started CPR promptly. Airway was secured efficiently & position was maintained 100%. Most of HCW's 75.71% were able to give chest compressions at the rate of 100-120/minute, without leaning 74.28%. Majority of HCW's 88.57% were able to minimized pauses during CPR delivery and successfully (88.57%)

switched their role at an interval of 2 minutes. Majority of HCW's were able to deliver drugs at proper time (92.85%), Shock initiated timely (100%) by following CPR sequence (84.28%) as per AHA guidelines.

Similar study was done by Kaplow R, et al. (2020) 200 cases, 37% of compressions were in the recommended range for rate (100-120/min) and 63.9% were in range for depth.

Similar study was done by Benjamin S Abella, et al. (2012) 67 samples, analysis of the first 5 minutes of each resuscitation by 30-second and revealed that chest compression rates were less than 90/min in 28.1% in participants and Compression depth was too shallow for 37.4%.

Factors affecting quality of CPR

The findings of the present study regarding factors affecting quality of CPR showed that majority of HCW's 91.42% were adequately present at the scenario and none of showed any disharmony while performing CPR. There was an availability of emergency equipment's (78.57%) on bedside (laryngoscope, E.T tube, AMBU-BAG, bougie and drugs) and all were familiar with the emergency trolley. All recognised CPR on time (84.28%) and initiated CPR timely (91.42%) Recognised (92.85%) cardiac rhythm properly. In half of the events defibrillator was not ready on time. Shock was given timely. Medicines were given mostly (92.85%) on time in a proper dosage form (85.71%). Few patients (35.72%) were hyperventilated during CPR.

Similar study was done by Citolino Filho C, Santos E, Silva R, Nogueira L. (2015) most nurses reported that the high number of professionals in the scenario (75.5%), the lack of harmony (77.6%) or stress of any member of staff (67.3%), lack of material / equipment failure (57.1%), lack of familiarity with the emergency trolleys (98.0%) are the factors that adversely affect the quality of care provided during CPR.

Limitations

This study had several limitations.

1. Sick patients care was prioritised rather than observing CPR event.
2. In some chronically ill and the elderly patients do not resuscitate (DNR) was an instruction.
3. It was impossible to evaluate two CPRs at same time.

Recommendations: Taking into account, below are some personal experiences of the investigator that offered following recommendations.

1. The study can be replicated on a large sample: thereby, findings can be generalized for a larger population.
2. The Evidence based practice standards should be apply to guide about practice protocols that can lead to optimal patient care and outcome.
3. There is a need to improve quality of CPR by more focused on practice.
4. To identify and implement new strategies devices to improve in delivering care.

CONCLUSION

The study revealed that, maximum number of patients were diagnosed with CVA and more of them had Hypertension. Majority were on AC-VCV support. The most common mechanism leading to CPR among patients was asystole. The main factor affecting CPR quality in this study was, readiness of defibrillator on time and few patients were hyperventilated and 21% of patients have achieved return of spontaneous circulation. All HCW's working in critical care units must be trained in advance cardiac life support to decrease the mortality and maintain the quality care.

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