

Awareness of Cardiopulmonary Resuscitation amongst Interns and Resident Doctors: A Cross Sectional Analysis in a Tertiary Care Hospital in Northern India

Dheeraj Kapoor¹, Harsh Arora², Sunanda Kanojia³, Manjeet Kaur⁴, Manpreet Singh⁵, Jasveer Singh⁶, Parul Sood⁷, Akanksha Bhanwara⁸

¹MD (Anaesthesia), FCCP, FACEE, DESA, FSASS, Professor, Government Medical College and Hospital, Sector 32B, Chandigarh, India, **ORCID ID:** <https://orcid.org/000-0002-5110-3355>

²MBBS, Post-Graduate Trainee, Government Medical College and Hospital, Sector 32B, Chandigarh, India, **ORCID ID:** <https://orcid.org/0000-0001-5188-8474>

³MBBS, Post-Graduate Trainee, Government Medical College and Hospital, Sector 32B, Chandigarh, India, **ORCID ID:** <https://orcid.org/0000-0002-8505-9938>

⁴MD (Obstetrics and Gynaecology), Assistant Professor, Government Medical College and Hospital, Sector 32B, Chandigarh, India, **ORCID ID:** <https://orcid.org/0000-0002-1555-444X>

⁵MD (Anaesthesia), FCCP, FACEE, FIMSA, FSASS, Professor, Government Medical College and Hospital, Sector 32B, Chandigarh, India, **ORCID ID:** <https://orcid.org/0000-0003-2830-8317>

⁶MD (Anaesthesia), Professor, Government Medical College and Hospital, Sector 32B, Chandigarh, India, **ORCID ID:** <https://orcid.org/0000-0000-17257-8213>

⁷MPT (Physiotherapy), Specialist, Government Medical College and Hospital, Sector 32B, Chandigarh, India, **ORCID ID:** <https://orcid.org/0000-0003-2053-2963>

⁸MBBS, Post-Graduate Trainee, Government Medical College and Hospital, Sector 32B, Chandigarh, India, **ORCID ID:** <https://orcid.org/0000-0002-3052-8637>

DOI: [10.36347/sasjm.2022.v08i07.002](https://doi.org/10.36347/sasjm.2022.v08i07.002)

| Received: 26.06.2022 | Accepted: 04.07.2022 | Published: 07.07.2022

*Corresponding author: Dr. Dheeraj Kapoor

MD (Anaesthesia), FCCP, FACEE, DESA, FSASS, Professor, Government Medical College and Hospital, Sector 32B, Chandigarh, India

Abstract

Original Research Article

Background: Knowledge of basic and advanced cardiac life support is of paramount significance amongst health care professionals to attain higher survival rate of patients suffering from sudden cardiac death. **Objectives:** To determine the awareness and knowledge for performing high quality CPR amongst junior resident doctors in a tertiary care hospital. **Methods:** In a prospective cross-sectional study, 220 preformed questionnaires were distributed amongst the interns, postgraduate and non-postgraduate junior resident and senior resident doctors, with a response rate of 69% (n-152). Data on the responders awareness of cardiopulmonary resuscitation (CPR), core knowledge of basic life support (BLS) and advanced cardiac life support (ACLS) were collected. Data was subjected to descriptive and inferential statistical analyses using SPSS version 23.0 and was expressed as mean \pm standard deviation or in percentage. A p-value \leq 0.05 was considered as significant level. **Results:** Amongst the 152 responders, 31(20%) were interns, 74(49%) were postgraduate course junior residents (PG JR), 7(5%) were non- post-graduate course (Non-PG JR) and 40 (26%) were senior resident (SR) doctors. Only 24% (n-36) of doctors have done previous certified CPR training course. The awareness of resuscitation amongst all doctors was 71% and observed highest amongst the PG JRs 73%. The core knowledge of BLS and ACLS was only 47% and 44% respectively, amongst all doctors. **Conclusion:** Majority of resident doctors have limited knowledge of basic concept of BLS and ACLS guidelines. A well structured and evidence based format of CPR training should be incorporated in training modules for better outcome.

Keywords: Cardiopulmonary Resuscitation; Basic Life Support; Advanced Cardiac Life Support; Cardiac Arrest; Questionnaires; Awareness; Knowledge.

Key message: Core knowledge of CPR in sudden cardiac arrest should be an essential prerequisite for attending doctors the current time in Indian hospital setups. This may be achieved by incorporation of structured CPR educational programme in the under-graduate and post-graduate curriculum.

Copyright © 2022 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Rate of survival in sudden cardiac arrest depends on effective and high quality cardiopulmonary resuscitation (CPR) [1, 2]. Most of the resuscitation team in the hospital constitutes of resident doctors and interns [3, 4]. Knowledge of basic and advanced cardiac life support is of essential prerequisite amongst medical professionals [5]. However, protocolised training is still not followed or incorporated in the academic curriculum of most of the tertiary institutes in India. At present, data related to the awareness and genuine knowledge of interns and resident doctors for performing high quality CPR is very sparse, which prompted us to conduct this study.

METHODS

The study was cross-sectional in design and was conducted in Government Medical College and Hospital, Chandigarh, India after approval of institutional ethical committee (IEC:Ethics/2016/023), under the guidance of the Department of Anaesthesia and Intensive Care over the period of 3 months. A preformed questionnaire was distributed after taking written informed consent from the interns, junior and senior resident doctors working in various non-clinical, para-clinical and clinical departments, willing to participate in the study. We excluded all resident doctors who were undergoing short term attachment for observership or training from other institutes. The questionnaires were formulated from the literature published by the American Heart Association (AHA) for CPR in accordance with 2015 guidelines.^[1] Most of the questions were close-ended with single response and were categorised into three parts; ‘Awareness Towards Resuscitation’, ‘Core Knowledge of Basic

Life Support (BLS)’ and ‘Core Knowledge of Advanced Cardiac Life Support (ACLS)’ (Appendix 1). In total there were 25 questions and the maximum time allowed to answer all the questions was 15 minutes. Data was collected from the participants who filled the questionnaire in front of the principle investigator to avoid any misdeed while answering the questionnaire. The medium of the questionnaire was in American English. Each participant was given a brief on the objective of the study before filling up the questionnaire. Each participant was selected on the basis of non-probability convenience sampling technique. Incomplete response sheets were excluded from the data for statistical analysis.

The data was subjected to both descriptive and inferential statistical analysis. The data was expressed as mean \pm standard deviation or in percentage. A p-value equal to or less than 0.05 was considered as significant level. The data analysis, descriptive statistics was analyzed using SPSS version 23.0 of windows.

RESULTS

Total of 220 questionnaires distributed amongst the interns and resident doctors, 68 were excluded, as they were unfilled, incomplete or missing. The response rate was 69% and the final sample size comes out to be 152. Out of 152 responders, 31(20%) were interns, 74(49%) were junior residents pursuing post-graduate course (PG JR), 7(5%) were junior resident not pursuing post-graduate course (Non-PG JR) and 40 (26%) were senior resident (SR) doctors. It was observed that 116 (76%) doctors have no previous CPR training with only 36 (24%) have done certified ACLS course, at the time of conduct of survey (Figure 1).

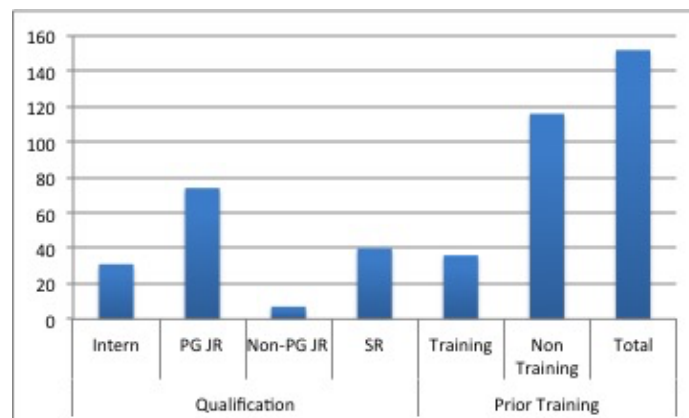


Figure 1: Qualification of responders with or without previous CPR training

Resident doctors responses regarding awareness of CPR were recorded (Table 1). The awareness of resuscitation amongst all doctors was only 47% and observed highest amongst the PG JRs 73%. Nearly all doctors in the study groups were able to expand the term CPR and BLS correctly. Most of the PG JR (97.3%) and SR (92.5%) of various departments were aware of the term ACLS. Only 80.6% of interns

and 71.4% of Non-PG JR were able to expand the term ACLS correctly. The intergroup comparison amongst various doctors was statistically significant ($p=0.009$). Doctors were compared pre and post training and were observed statistically insignificant ($p=0.462$). Nearly 90% of the doctors agree that BLS can be performed in out-of-hospital cardiac arrest (OHCA) situations and nearly 80% of them were aware of specific guidelines

of CPR. More than 90% of doctors agree that CPR can be performed by any doctor either working in clinical or non-clinical departments. Approximately 21% of the doctors were able to expand the full form of bag mask

ventilation (BMV). Amongst them, PG JR (32.4%) and interns (22.6%) were most aware of the information and Non-PG JR (14.3%) were the least aware.

Table 1: Percentage of responders to question 1 to 5: Awareness of CPR (Appendix 1)

Qualification	Questions Response		P value
	Question 1 (A)		
	Correct	Incorrect	
Intern	100% (31)	0% (0)	NA
PG JR	100% (74)	0% (0)	
Non-PG JR	100% (7)	0% (0)	
SR	100% (40)	0% (0)	
Training			NA
Prior Training	100 % (36)	0% (0)	
No Prior Training	100% (116)	0% (0)	
Total	100% (152)	0% (0)	
	Question 2 (B)		
	Correct	Incorrect	
Intern	96.8% (30)	3.2% (1)	0.497
PG JR	100% (74)	0% (0)	
Non-PG JR	100% (07)	0% (0)	
SR	97.5% (39)	2.5% (1)	
Training			0.428
Prior Training	100% (36)	0% (0)	
No Prior Training	98.3% (114)	1.7% (2)	
Total	98.7% (150)	1.3% (2)	
	Question 1 (C)		
	Correct	Incorrect	
Intern	80.6% (25)	19.4% (6)	0.009
PG JR	97.3% (72)	2.7% (2)	
Non-PG JR	71.4% (5)	28.6% (2)	
SR	92.5% (37)	7.5% (3)	
Training			0.462
Prior Training	94.4% (34)	5.6% (2)	
No Prior Training	90.5% (105)	9.5% (11)	
Total	91.4% (139)	8.6% (13)	
	Question 2		
	Correct	Incorrect	
Intern	96.8% (30)	3.2 % (1)	0.292
PG JR	97.3% (72)	2.7% (2)	
Non-PG JR	100% (7)	0 % (0)	
SR	90% (36)	10% (4)	
Training			0.756
Prior Training	94.4% (34)	5.6% (2)	
No Prior Training	95.7% (111)	4.3% (5)	
Total	95.45 (145)	4.6 % (7)	
	Question 3		
	Correct	Incorrect	
Intern	83.9% (26)	61.1% (5)	0.454
PG JR	79.7% (59)	20.3% (15)	
Non-PG JR	100% (7)	0% (0)	
SR	87.5% (35)	12.5% (5)	
Training			0.133
Prior Training	91.7% (33)	8.3% (3)	
No Prior Training	81% (94)	19% (22)	
Total	83.6% (127)	16.4% (25)	

	Question 4		
Intern	0% (0)	100% (31)	0.352
PG JR	5.4% (4)	94.6% (70)	
Non-PG JR	14.3% (1)	85.7% (6)	
SR	7.5% (3)	92.5% (37)	
Training			0.928
Prior Training	5.6% (2)	94.4% (34)	
No Prior Training	5.3% (6)	94.8% (110)	
Total	5.3% (8)	94.7% (144)	
	Question 5		
Intern	22.6% (7)	77.4 % (24)	0.283
PG JR	32.4% (24)	67.6 % (0)	
Non-PG JR	14.3% (1)	85.7 % (6)	
SR	17.5% (7)	82.5 % (33)	
Training			0.441
Prior Training	30.6% (11)	69.4 % (25)	
No Prior Training	24.1% (28)	75.9 % (88)	
Total	25.7% (39)	74.3 % (113)	

Results of core knowledge of BLS amongst various doctors were observed (Table 2). The core knowledge BLS 47% amongst all doctors. More than 78% of the doctors correctly agree that immediate recognition and activation of emergency medical services (EMS) should be done in unresponsive victims. Non-PG JR (85.7%) and PG JR (81.1%) exceed in terms of knowledge of the aforesaid question. Nearly 47% of the doctors knew about universal chest compression to ventilation ratio, out of which PG JR and SR of various departments were 54.1% and 45% respectively. While comparing trained and non-trained doctors in terms of the resuscitation training course, the result were statistically significant (P-0.018).

Regarding the chest compression rate, 61.1% of the total doctors have the knowledge of the recommended rate in accordance with the 2015 ACLS guidelines. Only 46.7% of the doctors responded correct depth of chest compression, out of which 61.1% were trained, and was statistically significant (p-0.047). In addition, 76.3% of the doctors knew the correct landmarks of the chest compression. Only 28.9% of the doctors knew the hands-off time for chest compression (<10 seconds), out of which 85.7% of Non PG JRs were correct responders which was statistically very significant in intergroup comparison (p-0.004).

Only 28.3% of the doctors were aware of the term automated external defibrillator (AED) for delivery of shock usage during resuscitation, out of which 16.1% of the interns and 14.3% of the Non PG JR were correct responders. Only 47% were aware of correct sequence of direct current (DC) cardiac shock delivery, rhythm analysis and subsequent immediate high quality CPR. Amongst them, PG JRs (23%) were least aware and were statistically significant in intergroup analysis (p-0.013). Only 2% of doctors were able to expand the term extracorporeal cardiopulmonary resuscitation (ECPR). Further, 72% of doctors agree that "Heimlich Maneuver" is done only in responsive adults and 76% of doctors correctly mention the exact landmark of chest compression. Around 47% of doctors were aware of universal chest compression ratio and exact depth of chest compression. Only 29% of doctors were aware of hands-off time for chest compression (<10 seconds) and 28% of doctors are aware of specific indications of AED for delivery of shock. In addition, 61% of doctors know about exact compression rate and 31% of doctors knew the exact sequence and order of shock delivery and chest compression. Only 2% of doctors were able to expand the term extracorporeal cardiopulmonary resuscitation (ECPR).

Table 2: Percentage of responders to question 6 to 15: Core knowledge of BLS (Appendix 1)

Qualification	Questions Response		P value
	Question 6		
	Correct	Incorrect	
Intern	71.0% (22)	29.0% (9)	0.669
PG JR	81.1% (60)	18.9% (14)	
Non-PG JR	85.7% (6)	14.3% (1)	
SR	77.5% (31)	22.5% (9)	
Training			0.312
Prior Training	72.2% (26)	27.8% (10)	
No Prior Training	80.2% (93)	19.8% (23)	
Total	78.3% (119)	21.7% (33)	

Question 7			
	Correct	Incorrect	
Intern	38.7% (12)	61.3% (19)	0.144
PG JR	54.1% (40)	45.9% (34)	
Non-PG JR	14.3% (01)	85.7% (06)	
SR	45.0% (18)	55.0% (22)	
Training			0.018
Prior Training	63.9% (23)	36.1% (13)	
No Prior Training	41.4% (48)	58.6% (68)	
Total	46.7% (71)	53.3% (81)	
Question 8			
	Correct	Incorrect	
Intern	64.5% (20)	35.5% (11)	0.855
PG JR	58.1% (43)	41.9% (31)	
Non-PG JR	71.4% (05)	28.6% (02)	
SR	62.5% (25)	37.5% (15)	
Training			0.115
Prior Training	50.0% (18)	50.0% (18)	
No Prior Training	64.7% (75)	35.3% (41)	
Total	61.2% (93)	38.8% (59)	
Question 9			
	Correct	Incorrect	
Intern	54.8% (17)	45.2% (14)	0.108
PG JR	41.9% (31)	58.1% (43)	
Non-PG JR	85.75 (06)	14.3% (01)	
SR	42.55 (17)	57.5% (23)	
Training			0.047
Prior Training	61.1% (22)	38.9% (14)	
No Prior Training	42.2% (49)	57.85% (67)	
Total	46.7% (71)	53.3% (81)	
Question 10			
	Correct	Incorrect	
Intern	71.0% (22)	29% (09)	0.368
PG JR	78.4% (58)	21.6% (16)	
Non-PG JR	100% (07)	0% (0)	
SR	72.5% (29)	27.5% (11)	
Training			0.493
Prior Training	80.6% (29)	19.4% (07)	
No Prior Training	75.0% (87)	25.0% (29)	
Total	76.3% (116)	23.7% (36)	
Question 11			
	Correct	Incorrect	
Intern	35.5% (11)	64.5% (20)	0.004
PG JR	25.7% (19)	74.3% (55)	
Non-PG JR	85.7% (06)	14.3% (01)	
SR	20.05 (08)	80.0% (32)	
Training			0.054
Prior Training	41.7% (15)	58.3% (21)	
No Prior Training	25.05 (29)	75.0% (87)	
Total	28.9% (44)	71.1% (108)	
Question 12			
	Correct	Incorrect	
Intern	16.1% (5)	83.9% (26)	0.271
PG JR	32.4% (24)	67.6% (50)	
Non-PG JR	14.3% (01)	85.7% (06)	
SR	32.5% (13)	67.5% (27)	
Training			0.233
Prior Training	36.1% (13)	63.9% (23)	
No Prior Training	25.9% (30)	74.1% (86)	
Total	28.35% (43)	71.7% (109)	

Question 13			
Intern	45.2% (14)	54.8% (17)	0.013
PG JR	23.0% (17)	77.0% (57)	
Non-PG JR	71.4% (05)	28.6% (02)	
SR	27.55% (11)	72.55 (29)	
Training			0.441
Prior Training	36.1% (13)	63.9% (23)	
No Prior Training	29.3% (34)	70.7% (82)	
Total	30.9% (47)	69.1% (105)	
Question 14			
Intern	0% (0)	100% (31)	0.358
PG JR	4.1% (3)	95.9% (71)	
Non-PG JR	0% (0)	100% (07)	
SR	0% (0)	100% (40)	
Training			0.077
Prior Training	5.6% (2)	94.4% (34)	
No Prior Training	0.9% (1)	99.1% (115)	
Total	2.0% (3)	98% (149)	
Question 15			
Intern	74.2% (23)	25.8% (08)	0.350
PG JR	70.3% (52)	29.7% (22)	
Non-PG JR	100% (07)	0% (0)	
SR	67.5% (27)	32.5% (13)	
Training			0.233
Prior Training	63.9% (23)	36.1% (13)	
No Prior Training	74.1% (86)	25.9% (30)	
Total	71.7% (109)	28.3% (43)	

Results in terms of core knowledge of ACLS amongst study doctors were observed (Table 3). The core knowledge ACLS was only 44% amongst all doctors. Only 38% of doctors were aware about “shockable” and “non-shockable” rhythm. Knowledge regarding this question amongst the trained and non-trained doctors was statistically significant ($p=0.03$). Nearly 60% of the doctors were aware of the role of atropine administration in sudden cardiac arrest in adults. Regarding the knowledge of correct rate of ventilation during CPR with advance airway was significant between non-trained and trained doctors ($p=0.018$). Intraosseous access recommendation during CPR and recommended initial unsynchronised shock dose with biphasic defibrillator in joules, the understanding between trained and non-trained doctors was found to be statistically significant ($p=0.015$ and $p=0.005$ respectively). Knowledge regarding the correct

values of quantitative waveform capnography and intraarterial diastolic blood pressure to attain high quality CPR was 11.8% amongst all the doctors. Awareness regarding airway adjuncts such as laryngeal mask airway (LMA) and its subsequent use in CPR was 35% amongst the PG-JR and was statistically significant on intergroup comparison ($p=0.044$). Around 52% of the doctors were aware of the initial management of acute myocardial infarction (AMI) including STEMI and Non-STEMI. Correct knowledge regarding management of SVT was more than 50% in interns and PG-JR and was statistically significant ($p=0.049$). Nearly 80% of doctors were aware of initial pharmacological management of paroxysmal supraventricular tachycardia (PSVT). Amongst them 97% of the interns responded correctly which was statistically significant on intergroup comparison ($p=0.01$).

Table 3: Percentage of responders to questions 16 to 25: Core knowledge of ACLS (Appendix 1)

Qualification	Questions Response		P value
	Correct	Incorrect	
Question 16			
Intern	41.9% (13)	58.1% (18)	0.030
PG JR	36.5% (27)	63.5% (47)	
Non-PG JR	85.7% (06)	14.35 (01)	
SR	27.5% (11)	72.5% (29)	
Training			0.030
Prior Training	52.8% (19)	47.2% (17)	
No Prior Training	32.8% (38)	67.2% (78)	

Total	37.5% (57)	62.5% (95)	
Question 17			
	Correct	Incorrect	
Intern	35.5% (11)	64.5% (20)	0.017
PG JR	64.9% (48)	35.1% (26)	
Non-PG JR	85.7% (06)	14.3% (01)	
SR	60.0% (24)	40% (16)	
Training			
Prior Training	69.4% (25)	30.6% (11)	0.129
No Prior Training	55.2% (64)	44.8% (52)	
Total	58.6% (89)	41.45 (63)	
Question 18			
	Correct	Incorrect	
Intern	29.0% (9)	71.0% (22)	0.042
PG JR	35.1% (26)	64.9% (48)	
Non-PG JR	85.7% (06)	14.3% (01)	
SR	35.0% (14)	65.0% (26)	
Training			
Prior Training	52.8% (19)	47.2% (17)	0.018
No Prior Training	30.0% (36)	69.0% (80)	
Total	36.2% (55)	63.8% (97)	
Question 19			
	Correct	Incorrect	
Intern	58.1% (18)	41.9% (13)	0.352
PG JR	51.4% (38)	48.6% (36)	
Non-PG JR	85.7% (06)	14.3% (01)	
SR	52.5% (21)	47.5% (19)	
Training			
Prior Training	72.2% (26)	27.8% (10)	0.015
No Prior Training	49.1% (57)	50.9% (59)	
Total	54.6% (83)	45.4% (69)	
Question 20			
	Correct	Incorrect	
Intern	51.6% (16)	48.4% (15)	0.376
PG JR	37.8% (28)	62.2% (46)	
Non-PG JR	57.1% (04)	42.9% (03)	
SR	35.0% (14)	65.0% (26)	
Training			
Prior Training	61.1% (22)	38.9% (14)	0.005
No Prior Training	34.5% (40)	65.5% (76)	
Total	40.8% (62)	59.2% (90)	
Question 21			
Intern	06.5% (2)	93.5% (29)	0.773
PG JR	13.5% (10)	86.5% (64)	
Non-PG JR	14.3% (01)	85.7% (06)	
SR	12.5% (05)	87.5% (35)	
Training			
Prior Training	19.4% (07)	80.6% (29)	0.106
No Prior Training	09.5% (11)	90.5% (105)	
Total	11.8% (18)	88.2% (134)	
Question 22			
Intern	12.9% (04)	87.1% (27)	0.044
PG JR	35.1% (26)	64.9% (48)	
Non-PG JR	14.3% (01)	85.7% (06)	
SR	17.5% (07)	82.5% (33)	
Training			
Prior Training	33.3% (12)	66.7% (24)	0.186
No Prior Training	22.4% (26)	77.6% (90)	

Total	25.0% (38)	75.0% (114)	
Question 23			
Intern	61.3% (19)	38.7% (12)	0.12
PG JR	55.4% (41)	44.6% (33)	
Non-PG JR	71.4% (05)	28.6% (02)	
SR	37.5% (15)	62.5% (25)	
Training			
Prior Training	61.1% (22)	38.9% (14)	0.243
No Prior Training	50.0% (58)	50% (58)	
Total	52.6% (80)	47.4% (72)	
Question 24			
Intern	54.8% (17)	45.2% (14)	0.049
PG JR	52.7% (39)	47.3% (35)	
Non-PG JR	42.9% (03)	57.1% (04)	
SR	27.5% (11)	72.5% (29)	
Training			
Prior Training	47.2% (17)	52.8% (19)	0.872
No Prior Training	45.7% (53)	54.3% (63)	
Total	46.1% (70)	53.9% (82)	
Question 25			
Intern	96.8% (30)	3.2% (01)	0.010
PG JR	81.1% (60)	18.9% (14)	
Non-PG JR	85.7% (06)	14.3% (01)	
SR	65.0% (26)	35.0% (14)	
Training			
Prior Training	80.6% (29)	19.4% (07)	0.960
No Prior Training	80.2% (93)	19.8% (23)	
Total	80.3% (122)	19.7% (30)	

DISCUSSION

Cardiopulmonary resuscitation (CPR) is a series of critical lifesaving steps, performed following cardiac arrest to improve the chances of life survival [4, 6]. These critical steps are designated as important links in the chain of survival as described elaborately in many established guidelines [7]. However, it is observed that implementations of these links are weak due to insufficient knowledge and awareness of first responder's in the hospital [8]. Because CPR is such a critical skill, all HCPs, regardless of their degree of training or work setting, should be able to initiate and conduct CPR, and hospitals should provide training to their employees [9, 10]. In India, majority of these first responders are junior attending doctors which includes interns, junior and senior resident doctors. However, execution of these guidelines is still not followed in majority of Indian medical institutions, which encouraged us to conduct this study in our hospital.

In the present study the response rate of doctors in completion of survey was only 69%. This low response rate was attributed to certain factors, which include inadequate knowledge of the subject surveyed or inadequate time to answer the time bound questionnaires, owing to large patient load in emergencies and in-patient wards or mere apprehension of getting exposed of insufficient knowledge among their peer group and seniors. Similar observations were also seen in previous surveys conducted on attending

and junior doctors, with almost similar findings [11-13]. In the present study, most of the doctors were able to expand the common abbreviations such as CPR, BLS and ACLS. However, most of them were interns and non-PG JR, and this could be because respondents were preparing for the upcoming postgraduation exams and were aware of the theoretical knowledge.

In our study, we observed that most of the doctors knew that specific guidelines exist for performing resuscitation. However, 76% of the doctors have not done any protocolised CPR training and mere 10.5% of the doctors have done certified course. This is in contrast to the observation seen by Okanta et al, who observed that nearly 69% of house officers in a tertiary hospital in Nigeria, had prior training with nearly 52% within the last 2 years [3]. However, Kaihula et al concluded that less than 50 % of HCPs in a tertiary referral hospital in Tanzania self-reported to have prior formal adult BLS /CPR training, with less than 40 % reporting to have the training within the last year [14]. We observed most of the doctors in our institution strongly agree that CPR can be performed by any doctor either in clinical or non-clinical stream, both in and out-of hospital scenario. The lack of awareness regarding CPR amongst the doctors in our institution maybe attributed to inadequate dissipation of information regarding such courses and lack of initiation and awareness by their respective department. These observations reflect that proper dissipation of

information regarding CPR courses and incorporation of protocolised hands-on training should be incorporated in various clinical, para-clinical and non-clinical departmental training policies for junior doctors.

In the present study, we analyzed the core knowledge of BLS amongst various cadres of attending doctors. Most of the attending doctors (78%) were able to define the initial steps in resuscitation such as immediate recognition of unresponsiveness of victims and activation of EMS. Most of the PG JR and SR as compared to interns and Non-PG JR from various departments were acquainted with the universal chest compression to ventilation ratio because of regular involvement in active resuscitation in clinical practice. Parujulee *et al* also observed similar results and emphasised the role of regular updation and clinical involvement of resident doctors for improving CPR knowledge and performance [15].

We observed that most of the doctors having previous CPR training knew the correct depth of chest compression. Our observations were in concordance with similar previous studies, suggesting early hands-on training for all junior doctors during their residency period [9, 16]. Further, more than 70% of doctors are aware of special skill called “Heimlich Maneuver” along with its indications. Most of them also knew about the correct landmark of performing CPR (76%). However, only 47% of them knew the exact depth of compression and further only 29% were aware of hands-off time during chest compression, out of which surprisingly 86% were Non PG-JRs. This may be attributed to the fact that Non-PG JRs in our institution require mandatory CPR training after MBBS degree course for getting registration into the state medical council for clinical practice license. Moreover, they have done CPR training immediately after their degree course and were well aware of the finer intricacies of effective chest compression. Semeraro *et al.*, also suggested that there may be a decay of CPR skills in anaesthetists which initiate as early as six month after the CPR course and hence requires regular updation [17].

We observed that only 47% of the doctors correctly responded the depth of compression and more than half of them (61%) were previously trained. Further, only 29% of the doctors were aware of correct hands-off time, out of which 86% of them were Non-PG JRs. Only 2% of attending doctors were able to expand term ECPR. Barely 28% of the doctors were aware of AED and 47% regarding the correct sequence of direct current (DC) cardiac shock delivery, rhythm analysis and subsequent immediate high quality CPR. Surprisingly, PG JRs were least aware of the correct sequence. Guidelines published by AHA in 2015 had updated the depth of compression (5-6 cm) on the basis of robust scientific evidence and also incorporated

ECPR as an alternative strategy for adult resuscitation. Indications of AED and hands-off time during chest compression was same as published in previous 2010 AHA guidelines. The present observation reveal that most of attending doctors were relying on old knowledge acquired during their graduation or post-graduation and are not aware of updated and evidence based medicine. On the contrary, Non-PG JRs had recently acquired knowledge and hence most of them were correct responders. Chandrasekaran *et al* also observed similar results in medical, dental, nursing students and doctors and found that most of them were not updated and have poor knowledge in respect to core knowledge of BLS. [18] Similar results were also observed in few other studies and it was categorically suggested that regular CPR courses with updated information should be incorporated in junior doctors training curriculum [11, 19].

In the present study, we also analyzed the core knowledge of ACLS amongst the attending doctors. Surprisingly, only 38% of all attending doctors were aware of the difference between the shockable and non-shockable rhythm, out of which significant numbers of previously trained doctors were the correct responders. In addition, the aforesaid subset of doctors were also well aware of the correct rate of ventilation with advance airway in-situ. We also observed that more than half of the attending doctors (60%) knew that atropine has no role as an initial pharmacological drug in cardiac arrest victims due to recent evidence suggesting against its use in asystole and PEA. Further, majority of doctors were also aware of “intraosseous” route for resuscitative drug administration as well as the concept of initial unsynchronised shock dose in cardiac arrest victims with significant number of previously trained doctors. However, the interpretation of capnography and cut-off values of intra-arterial diastolic pressure was significantly lacking amongst all attending doctors. In addition, significant proportions of PG JRs were well aware of the LMA as an adjunct during CPR. Role of PCI as an initial therapy of choice in ST elevation myocardial infarction (STEMI) was correctly answered by 55% of the all the doctors. We observed that intern (61%) and non PG-JR (71%) doctors gave most of the correct answers and were aware of PCI as an initial choice in STEMI. We infer that most of the PG JR and SR of different departments showed paucity of knowledge pertaining to CPR due to the academic burden of their primary subject and lack of time and concentration with the passage of time. Similar results were also observed in previous studies conducted by various researchers [11, 20, 21].

We observed that more than 80% of the doctors, with majority of interns, were aware of the initial drugs commonly used in tachyarrhythmias. This maybe because for many years, initial pharmacological therapy remains the same and set as gold standard in stable arrhythmias and thus least related to skill based

CPR training. Interestingly, only 2% of the doctors were aware of the objective criteria to define high quality CPR that includes arterial diastolic pressures and end tidal capnography values. This again clearly shows that most of the doctors are not having an updated and certified training in CPR. We infer that the awareness of CPR and core knowledge of BLS and ACLS amongst first responding doctors in our institution was limited. This may be ascribed to the paucity of updated and certified formal training in CPR in most of the clinical and para-clinical departments.

The present study have some limitations. The sample size of participating doctors were limited in the present study and doctors of only one hospital were surveyed. Most of the previous studies were multicentric and included various departments and its subspecialties. Additionally, the division of doctors into the groups were not proportional. Since our institute is primarily a teaching institute hence we were not able to find significant proportion of Non-PG JRs which might make the observation more clearer.

Appendix 1: Questionnaire

Awareness towards resuscitation	
Question Number	Question
1A	Expand the term CPR
1B	Expand the term BLS
1C	Expand the term ACLS
2	Can BLS be performed in out of hospital cardiac arrest (OHCA) situations? (Yes/No)
3	Name any specific guidelines at present to approach adult and pediatric BLS and ACLS?
4	Certified BLS and ACLS courses are meant for doctors working in clinical fields? (Yes/No)
5	Expand the term BMV
Core Knowledge of BLS	
6	In responsive victims healthcare providers should immediately recognize and activate emergency response system. (Yes/No)
7	What is the universal chest compression to ventilation ratio in adults?
8	Specify the recommended chest compression rate?
9	What is the recommended chest compression depth?
10	What is the Landmark for correct chest compression?
11	What is the upper limit for any interruption in chest compression in seconds?
12	Automated external defibrillator (AED) is an electrical device to analyze all type of cardiac arrhythmias in cardiac arrest and delivers shock if required. (Yes/No)
13	DC cardiac shock should be followed by immediate rhythm analysis followed than by high quality CPR. (Yes/No)
14	Expand the term ECPR
15	Heimlich maneuver is performed in unresponsive choking adult victims. (Yes/No)
Core Knowledge of ACLS	
16	Which is the other non-shockable rhythm apart from asystole?
17	Atropine (0.5 mg every 3-5min) is the initial drug of choice in adult victims with sudden cardiac arrest. (Yes/No)
18	What is the rate of ventilation during CPR with advance airway?
19	During CPR, intraosseus (IO) access is not recommended and considered an ineffective means for drugs and fluids administration. (Yes/No)
20	What is the recommended initial unsynchronized shock dose with Biphasic Defibrillator in joules?
21	Quantitative waveform capnography (> 10 mm Hg) and intra-arterial diastolic blood pressure (>20 mm Hg) suggest high quality CPR. (Yes/No)
22	Expand LMA, which is used as adjunct in CPR.
23	PCI is an initial reperfusion strategy in patients identified as Non-STEMI on pre-hospital ECG. (Yes/No)
24	Synchronized cardioversion is an initial choice for stable supraventricular tachycardia. (Yes/No)
25	Initial drug of choice for PSVT?

PCI: Percutaneous Coronary Intervention, STEMI: ST-Elevation Myocardial Infarction

CONCLUSION

The core knowledge of BLS and ACLS amongst first responding doctors in our institution was limited. A well structured and evidence based structured CPR educational programme should be incorporated in training modules of all junior attending doctors who are mainly the first responders in managing patients having cardiac arrest. In addition, health-care setups should ensure that trained CPR instructors are readily available

for proper institution of CPR training for the attending doctors.

Source of support: Nil

Presentation at a meeting: Nil

Organization: Government Medical College and Hospital, Sector 32B, Chandigarh, India

Place: Chandigarh, India

Date: 24-06-2022

Conflicting Interest: Nil

Acknowledgement: We sincerely appreciate Mr. Harsimran Singh, OT Assistant for helping in acquisition of the data.

Statement: The manuscript has been read and approved by all the authors, that the requirements for authorship as stated earlier in this document have been met, and that each author believes that the manuscript represents honest work

REFERENCES

- Kleinman, M. E., Brennan, E. E., Goldberger, Z. D., Swor, R. A., Terry, M., Bobrow, B. J., ... & Rea, T. (2015). Part 5: adult basic life support and cardiopulmonary resuscitation quality: 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*, *132*(18_suppl_2), S414-S435.
- Morgan, R., & Westmoreland, C. (2002). Survey of junior hospital doctors' attitudes to cardiopulmonary resuscitation. *Postgraduate medical journal*, *78*(921), 413-415.
- Okonta, K. E., & Okoh, B. A. N. (2014). Basic cardiopulmonary resuscitation knowledge of house-officers in a tertiary institution: factors determining accuracy. *The Pan African Medical Journal*, *18*, 209.
- Sasson, C., Rogers, M. A., Dahl, J., & Kellermann, A. L. (2010). Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. *Circulation: Cardiovascular Quality and Outcomes*, *3*(1), 63-81.
- Sharma, R., & Attar, N. R. (2012). Adult basic life support (BLS) awareness and knowledge among medical and dental interns completing internship from deemed university. *Journal of Health and Allied Sciences NU*, *2*(3), 6-13.
- Writing Group Members, Lloyd-Jones, D., Adams, R. J., Brown, T. M., Carnethon, M., Dai, S., ... & Wylie-Rosett, J. (2010). Heart disease and stroke statistics—2010 update: a report from the American Heart Association. *Circulation*, *121*(7), e46-e215.
- Travers, A. H., Rea, T. D., Bobrow, B. J., Edelson, D. P., Berg, R. A., Sayre, M. R., ... & Swor, R. A. (2010). Part 4: CPR overview: 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*, *122*(18_suppl_3), S676-S684.
- Nichol, G., Thomas, E., Callaway, C. W., Hedges, J., Powell, J. L., Aufderheide, T. P., ... & Stiell, I. (2008). Regional variation in out-of-hospital cardiac arrest incidence and outcome. *Jama*, *300*(12), 1423-1431.
- Roshana, S., Batajoo, K. H., Piryani, R. M., & Sharma, M. W. (2012). Basic life support: knowledge and attitude of medical/paramedical professionals. *World journal of emergency medicine*, *3*(2), 141-145.
- Govender, K., Rangiah, C., Ross, A., & Campbell, L. (2010). Retention of knowledge of and skills in cardiopulmonary resuscitation among healthcare providers after training. *South African Family Practice*, *52*(5), 459-462.
- Zamir, Q., Nadeem, A., & Rizvi, A. H. (2012). Awareness of cardiopulmonary resuscitation in medical-students and doctors in Rawalpindi-Islamabad, Pakistan. *JPMA. The Journal of the Pakistan Medical Association*, *62*(12), 1361-1364.
- Skinner, D. V., Camm, A. J., & Miles, S. (1985). Cardiopulmonary resuscitation skills of preregistration house officers. *British medical journal (Clinical research ed.)*, *290*(6481), 1549-1550.
- Casey, W. F. (1984). Cardiopulmonary resuscitation: a survey of standards among junior hospital doctors. *Journal of the Royal Society of Medicine*, *77*(11), 921-924.
- Kaihula, W. T., Sawe, H. R., Runyon, M. S., & Murray, B. L. (2018). Assessment of cardiopulmonary resuscitation knowledge and skills among healthcare providers at an urban tertiary referral hospital in Tanzania. *BMC health services research*, *18*(1), 1-8.
- Parajulee, S., & Selvaraj, V. (2011). Knowledge of nurses towards cardiopulmonary resuscitation in a tertiary care teaching hospital in Nepal. *Journal of Clinical and Diagnostic Research*, *5*(8), 1585-1588.
- Majid, A., Jamali, M., Ashrafi, M. M., Haq, Z. U., Irfan, R., Rehan, A., ... & Menezes, R. G. (2019). Knowledge and attitude towards cardiopulmonary resuscitation among doctors of a tertiary care hospital in karachi. *Cureus*, *11*(3).
- Semeraro, F., Signore, L., & Cerchiari, E. L. (2006). Retention of CPR performance in anaesthetists. *Resuscitation*, *68*(1), 101-108.
- Chandrasekaran, S., Kumar, S., Bhat, S. A., Shabbir, P. M., & Chandrasekaran, V. P. (2010). Awareness of basic life support among medical, dental, nursing students and doctors. *Indian journal of Anaesthesia*, *54*(2), 121-126.
- Goldstein, D. H., & Beckwith, R. K. (1991). A survey of resuscitation training in Canadian undergraduate medical programs. *CMAJ: Canadian Medical Association Journal*, *145*(1), 23-27.
- Kano, M., Siegel, J. M., & Bourque, L. B. (2005). First-aid training and capabilities of the lay public: a potential alternative source of emergency medical assistance following a natural disaster. *Disasters*, *29*(1), 58-74.
- Anderson, G. S., Gaetz, M., & Masse, J. (2011). First aid skill retention of first responders within the workplace. *Scandinavian journal of trauma, resuscitation and emergency medicine*, *19*(1), 1-6.