

**To Assess whether human variables have an impact on
CPR procedures at Jaypee Hospital, Noida, using Simulation**

Dissertation Submitted to



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Hospital and Health Management
by

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Under the Supervision and Guidance of

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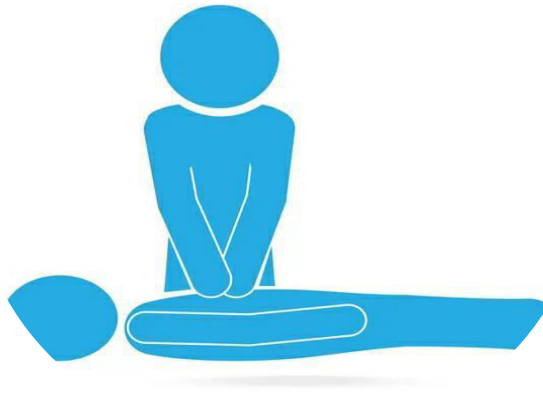
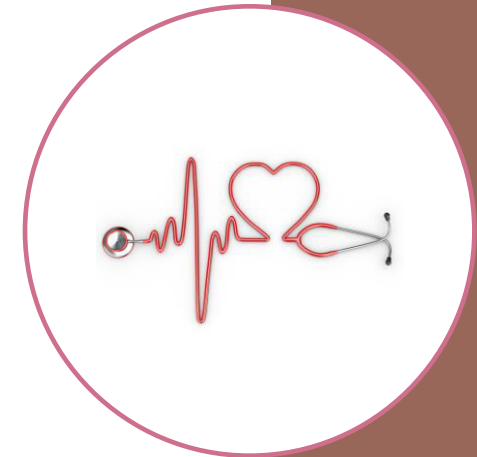


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INTRODUCTION:

- The term Code Blue is a code that is used to describe a patient who requires resuscitation or emergency medical assistance, usually because of a respiratory or cardiac arrest. The Code is called so that the ERT members reach the location on time and also to avoid panic in the premises.
- Every hospital establishes a policy to identify which units provide personnel for code coverage as part of its catastrophe plans. In theory, any emergency medical practitioner can respond to a code, but only those with advanced cardiac life support or other equivalent resuscitation training are allowed to join the team.
- Anesthesia, emergency medicine, and internal medicine physicians are part of the team along with critical care nurse. A rapid response team leader or a physician is in-charge of directing the resuscitation effort and is referred to as “running the code”. Cardiopulmonary resuscitation is a critical component of cardiac arrest treatment. It is suggested that it be started as soon as feasible with as little interruption as possible. The chest compressions are the part of CPR that makes the largest effect in most circumstances along with required medications in required doses. After 20 minutes of high-quality CPR that has not resulted in ROSC and the person’s cardiac rhythm is in asystole, it is reasonable to stop CPR and pronounce the person dead.



JAYPEE HOSPITAL'S CPR COMMITTEE:

- The Cardio-Pulmonary Resuscitation (Code Blue) Committee at Jaypee Hospital is a multi-disciplinary body that supports high quality patient care standards by monitoring and reviewing the quality and appropriateness of all major cardio-pulmonary resuscitation functions.
- **Objective of the CPR Committee:** To formulate policies on the administration of artificial heart and lung action in the event of cardiac and/or respiratory arrest and closed-chest cardiac massage.
- **Policy for CODE BLUE in Jaypee Hospital:**
 1. The individual who notices the cardiac arrest should call the call centre using the CODE BLUE.
 2. If a patient has a cardiac arrest in the ward, the Code Blue button on the bed panel can be pressed to alert the nurses at the nursing station.
 3. The Call Centre then alerts the ERT, who has a three-minute response time.
 4. If the phone system fails, the Call Centre will notify the ERT team via the Public Announcing System.
 5. If the PA system fails, the Call Centre will notify the security in-charge about the code blue and the location, and the security in-charge will notify all security guards via wireless walkie-talkie. Emergency, OT, and ICU security guards will immediately notify the nurse in charge and duty doctor of their respective departments.



7. As soon as the Critical care doctor arrives, he or she will assume command and assign tasks to team members, as well as direct their actions. Determines the most appropriate therapy according to ACLS criteria and issues orders to team members. Once the patient has been stabilized, decides on the best course of action. One of the team members is responsible for briefing the patient's attendant during resuscitation. The Internal Medicine Doctor is in-charge of keeping track of occurrences in the code blue flow sheet and dealing with the medicine.

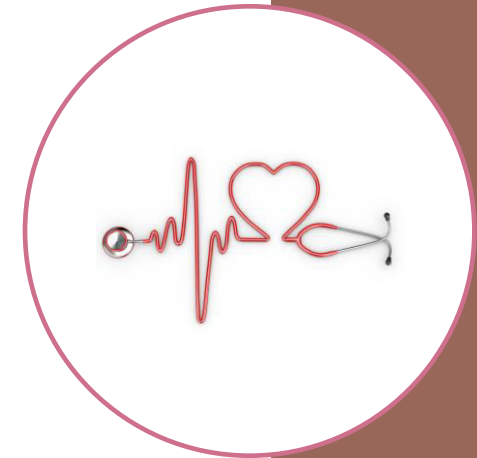
8. NICUU/PICU/Paeds CTVS (on call) Doctor assigns duties to team members and guides their actions according to NALS/PALS rules in the case of neonates and pediatric patients.

9. The anesthetist collaborates with the ICU doctor to determine the patient's rescue plan.

10. Nursing Supervisor and Emergency In-charge Nurse follows the doctor's orders. She is in-charge of turning on the AED/Defibrillator. She must monitor rhythms using AED pads/ECG leads/paddles, as well as analyze rhythms and deliver shocks as directed by the doctor.

11. Security officers guarantee that the code blue site is not over-crowded.

12. The MOD works with the code blue team to coordinate.



Code BLUE team members:

- i. Anesthetist (on call)
- ii. ICU Doctor (on call)
- iii. EMO on duty
- iv. Emergency In-charge Nurse (on call)
- v. PICU Doctor (on call) NICU Doctor (on call)
- vi. Paeds CTVS Doctor (on call)
- vii. Nursing Supervisor (on call)
- viii. Manager-On-Duty (on call)
- ix. Security Supervisor (on call)
- x. Internal Medicine- Doctor (on call)

ROLES AND RESPONSIBILITY OF CODE BLUE TEAM MEMBERS:

(a) First Responder The closest healthcare personnel, who discovers the need for resuscitation
Starts CPR as per protocol (within 1 minute)

1. Scene Safety
2. Shakes and shouts-Are you okay? To check responsiveness
3. Scans the chest for breathing.
4. Calls for help/Activates – Code Blue himself if no help available
5. Checks pulse and delivers chest compression
6. Open airway and give two Rescue Breaths
7. Until the Code Blue crew arrives, keep performing CPR
8. Upon arrival, brief the Code Blue crew



(b) **Second Responder** The one who has heard the call for help or one designated by the first responder

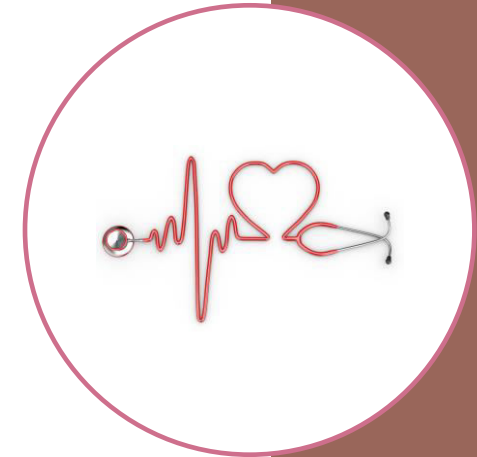
1. Dial your code activation number and state —Code Blue, location, and age of patient
2. Brings the crash cart & Defibrillator to the room.
3. Opens Crash Cart & connects AED pads to patient's bare chest
4. Switches to oral airway, ambu-bag, and oxygen if available
5. Assists in CPR

(c) **Call Centre:** Top priority to code blue calls and send messages immediately to the designated numbers, through phones, if phones are not working then PA system and if PA system is also not working then through Wireless walkie talkie.

1. Arrival of “Code Blue Team” (Within 3 minutes)
2. Intensivist, Anesthetist, EMO, ER Nurse, Nurse, Manager on duty, Security Staff
3. 2 Floor nurses & nursing team leader will help the code blue team
4. Also informed by call centre: Duty Manager, Security Personnel

(d) **Code Blue Team Leader (Intensivist):**

1. Assigns team members roles and controls their behavior.
2. Makes a treatment decision in accordance with ACLS recommendations and issues directives to team members.



3. Once the patient has stabilized, decides on the best course of action.
4. Assign one of the team members to inform the patient's companion while performing CPR.
5. Ensures that the Nursing Manager is assigned the responsibility of keeping a running log of events for the code blue.
6. Ensures that the floor doctor helps nursing manager fill out the record sheet.

(e) Airway & Breathing (Anesthetist + ER Nurse):

1. Bag Mask Ventilation
2. Prepares for advanced airway with the help of a nurse if required.

(f) Circulation (RMO + Nurse):

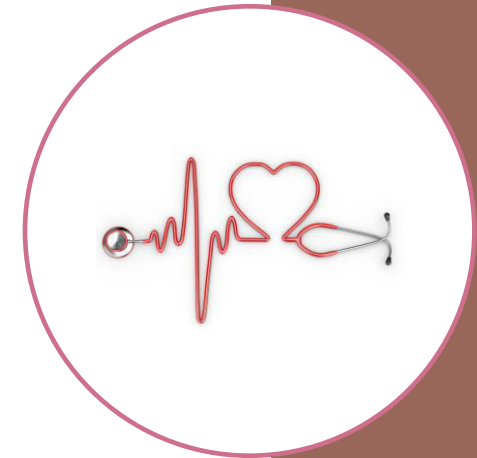
1. Cardiac Compressions
2. IV/IO access & administers drugs as directed by the team leader.

(g) Defibrillation (Nurse):

1. Turn on the AED/Defibrillator.
2. Monitor rhythms using AED pads/ECG leads/Paddles.
3. Conduct rhythm analysis and shock administration as directed by the Code Blue Team Leader.

(h) Security Personnel:

1. Directs team members towards code location.
2. Certifies that the code blue site is not overcrowded.



Methodology:

Study Design: Descriptive Retrospective study, was used for this study.

- Another approach is the observational/participatory study from Apr-June 2022 to assess if the human variables have an impact on CPR procedures at Jaypee Hospital, Noida, U.P.

Setting: This study was conducted at Jaypee Hospital, Noida, U.P.

Study Population: Patients admitted in the ICUs and In-patient wards, all visitors, and staff of Jaypee Hospital.

Inclusion Criteria: If a patient, visitor, or member of staff experiences a cardiac or respiratory arrest and displays any of the following signs, a Code Blue will be commenced:

- Unresponsiveness
- Lack of breathing
- There is no neck pulse (this must be witnessed by a healthcare provider).

Duration of the Study: 6 months, from Jan 2022-March 2022 (the quantitative data) and April-June 2022 for observational study.

Data Analysis: Analysis of the collected data was done through MS Excel.



Results:

- **4.1: For the months of Jan 2022-March 2022, the numbers of CPR forms received by the Quality department:**

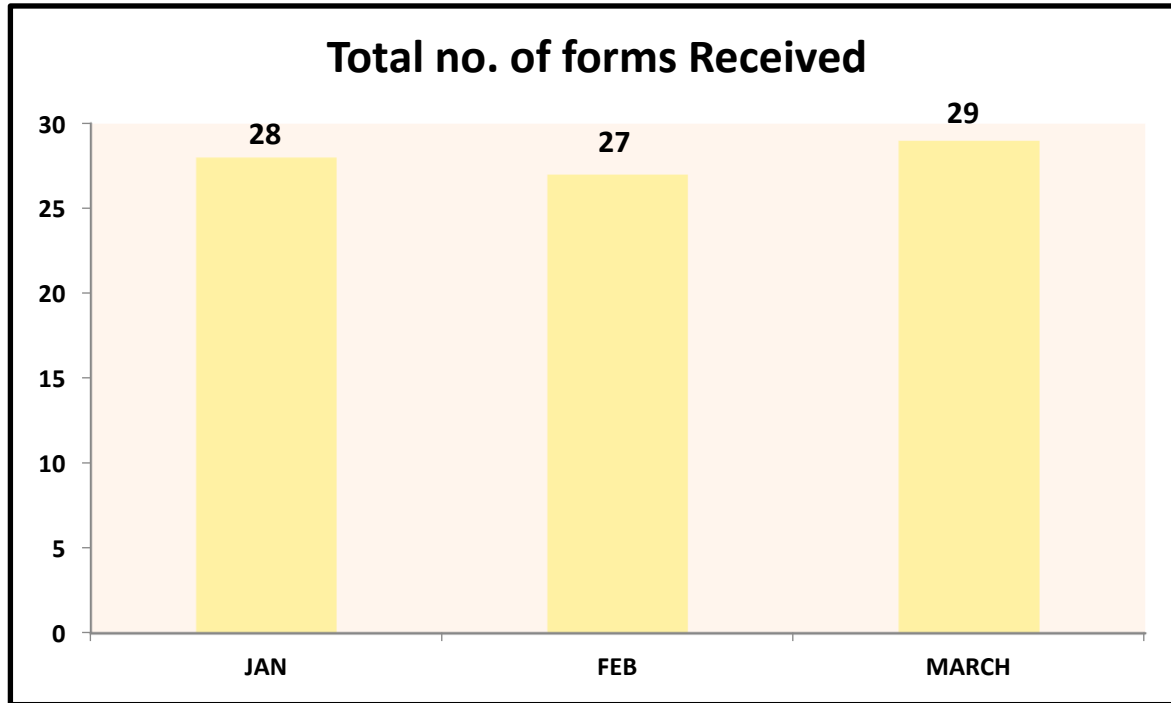
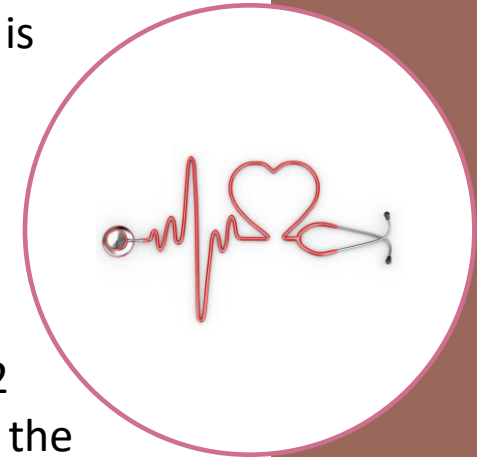


Fig. 1: Total number of CPR forms received
(Jan 2022-March 2022)

From Fig. 1, we can see that the total number of CPR forms received by the quality department is inclining toward the total number of times the hospital has experienced a code blue. The overall number of code blues for the month of January 2022 was 28, with 27 and 29 for the months of February and March 2022, respectively.



- From Jan 2022 to March 2022, total number of Code Blue & Non-Code Blue CPRs performed:

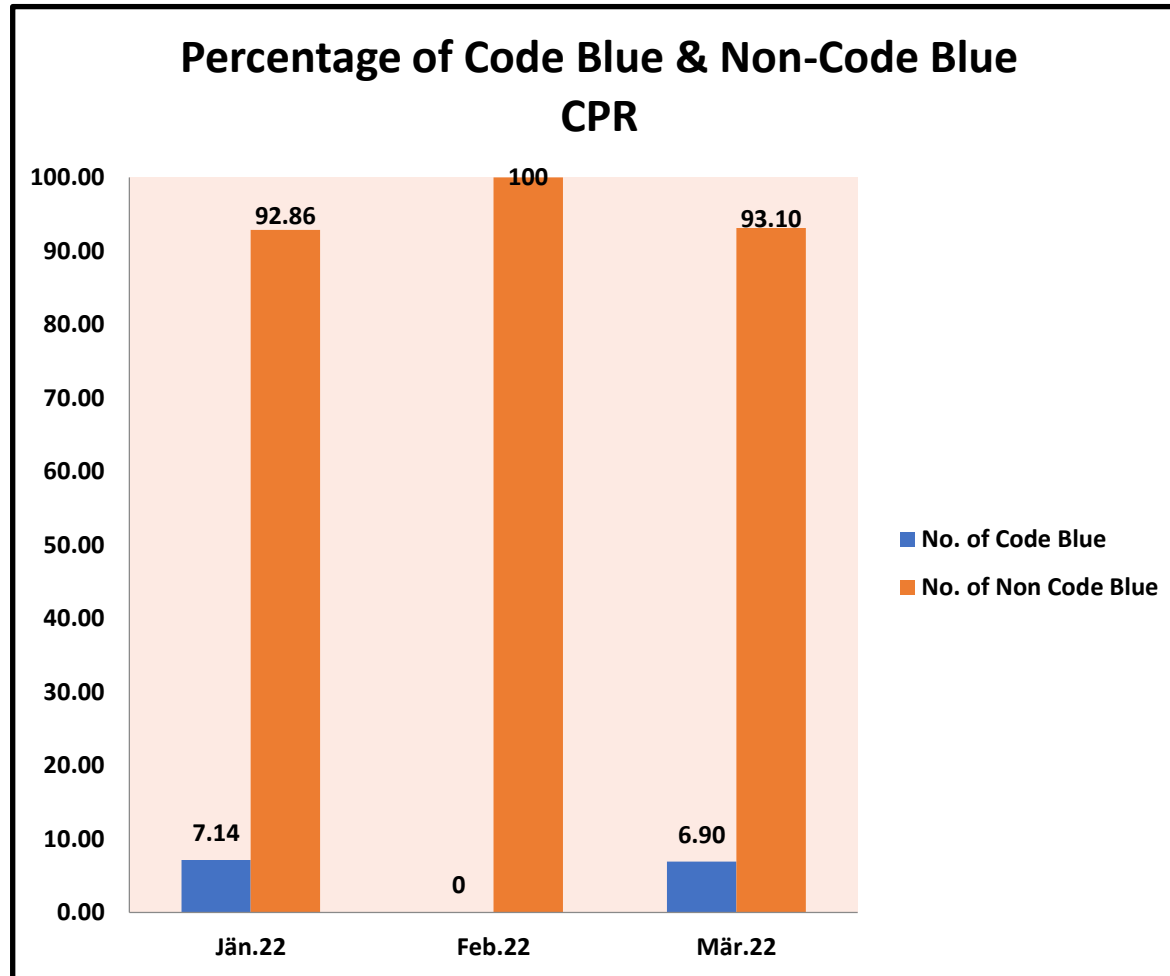


Fig. 2: Total number of Code Blue & Non-Code Blue CPRs

If the need for resuscitation happens in a critical care area, the code is announced as non-code blue; if the need for resuscitation occurs in an in-patient, outpatient, emergency department, or any other place other than critical care areas, the code is announced as code blue. From Fig.2, we can see that non-code blues were reported to be 92.86% in January 2022, while code blues were around 7.14%. Non-code blues were 100% for the month of February 2022, while no code blues were reported. Similarly, non-code blues were 93.10% in March 2022, while code blues were around 6.90%.



- **Patient Status (After CPR) from Jan 2022-March 2022:**

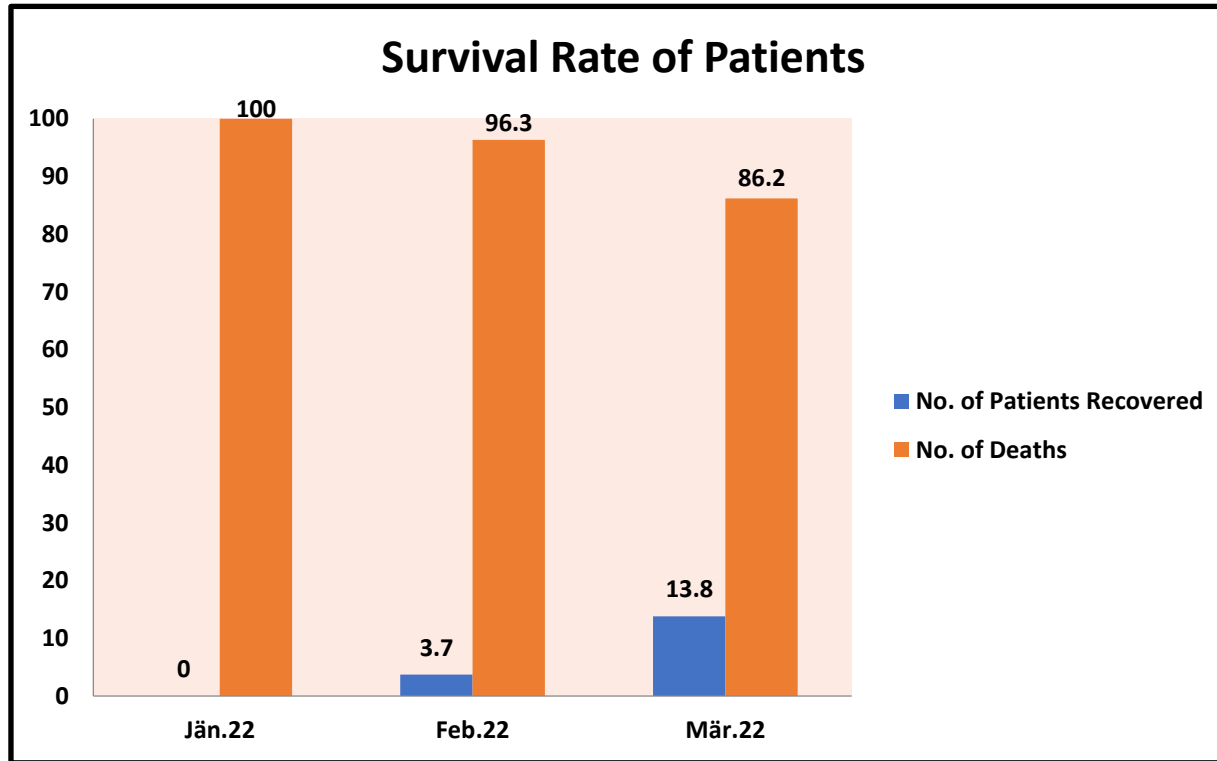


Fig. 3: Patient Status (After CPR)

In the month of January, survival rates after cardiopulmonary resuscitation were found to be zero. The survival rates for the months of February and March were 3.7% and 13.8%, respectively.

Death rates were 100% in January, 96.3% in February, and 86.2% in March.



• **Age-wise Distribution of Patients:**

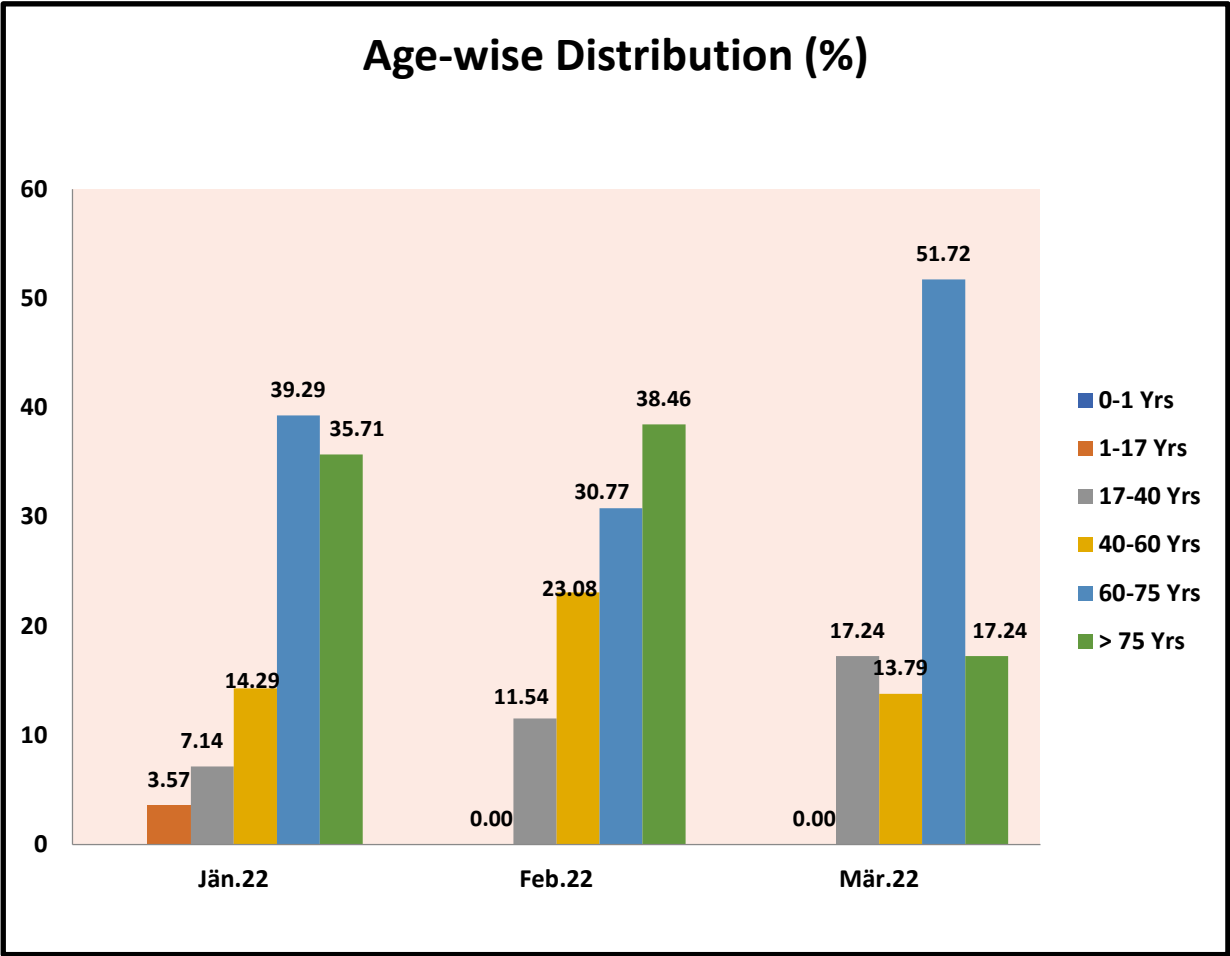
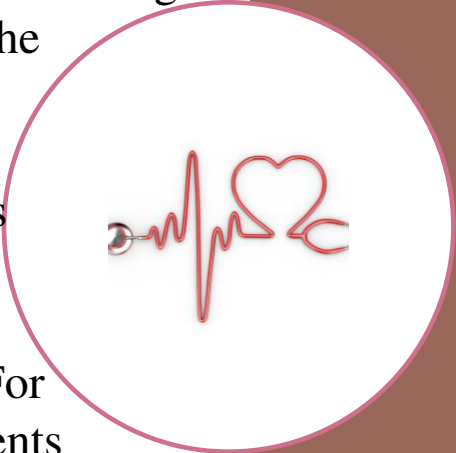


Fig. 4: Patient’s age-wise distribution

For the month of January, the age group 60-75 years had the highest number of patients receiving CPR, accounting for 39.29%, followed by geriatric patients (>75 years) accounting for 35.71%. Patients aged >75 years required CPR the most, accounting for 38.46%, and patients aged between 60-75 years also required it subsequently, accounting for 30.77% in February. For the month of March, patients aged between 60-75 years required CPR the most, accounting for 51.72%, and the patients aged between 17-40 years and >75 years also required it subsequently, accounting for 17.24%.



• **Area-wise Distribution of the occurrences of Code Blue:**

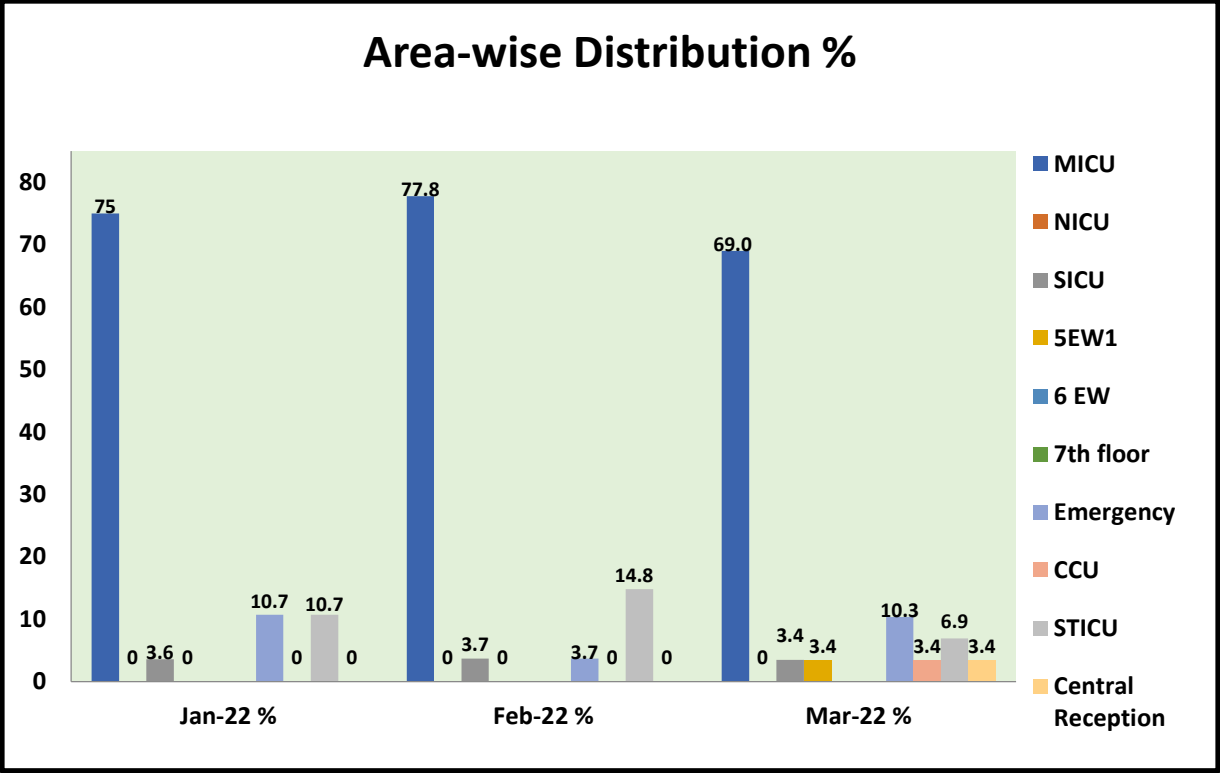
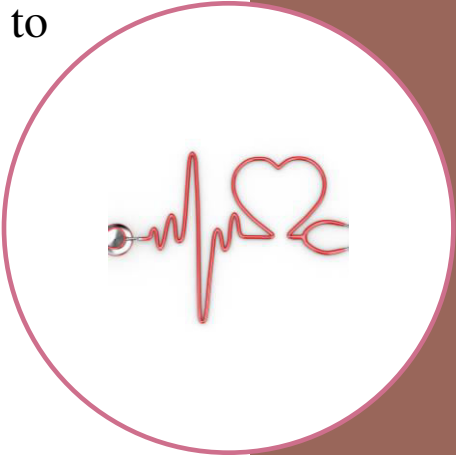


Fig. 5: Code Blue Processes' Area-wise distribution

According to Fig. 5, most code blues were initiated in ICUs, particularly the MICU, accounting for 75% in January, 77.8% in February, and 69% in March. The obvious reason is that most of the patients that are admitted to the MICU are terminally ill.



- **Gaps Identified in the Code Blue Processes (April-June 2022):**
- Gap Analysis method is used for determining the discrepancy amid present understanding, skills, and/or practices and the aspired optimum practice (or the Desired State).
- Gaps in both quantitative and qualitative data were discovered while doing the analysis.
- **Gaps Identified from the Quantitative data:**

Gap 1:

Current State	Desired State	Identified Gap	Gap due to knowledge, skill and/or practice	Mechanism used to identify Professional Practice Gap
CPR is divided into code blue and non-code blue CPR on the CPR Record sheet.	<u>All code blues</u> whether in intensive care or any other area of the hospital are known as code blue.	The staff is currently marking non-code blue & code blue in the CPR form, as it the hospital policy.	<u>Practice:</u> Hospital Policy, which is to be followed by the staff.	By observing the CPR review sheets of the patients.

Table 1: Differentiation of Code Blue



• Gaps Identified from Direct Observation:

Gap 2:

Current State	Desired State	Identified Gap	Gap due to knowledge, skill and/or practice	Mechanism used to identify Professional Practice Gap
Debriefing meetings for identifying deficiencies in the CPR process and implementing changes does not take place.	Debriefing meetings for identifying deficiencies in the CPR process and implementing changes are <u>taking place regularly.</u>	No debriefing meetings are taking place after a code blue.	<u>Practice:</u> There is no protocol for holding a debriefing meeting following a code blue.	Direct observation after conducting a Code Blue mock drill.

Table 2: No Protocol of Debriefing Meetings post CPR



Gap 3:

Current State	Desired State	Identified Gap	Gap due to knowledge, skill and/or practice	Mechanism used to identify Professional Practice Gap
Lack of task distribution and leadership skills among the ERT team.	<u>The clinician who comes first at the site</u> should accept task distribution and leadership skills.	During a code blue, clinicians are hesitant to take the lead.	<u>Practice:</u> There is no team-building aptness shown in the ERT team.	Direct observation during a simulated Code Blue mock drill.

Table 3: Lack of team-building & leadership skills



Gap 4:

Current State	Desired State	Identified Gap	Gap due to knowledge, skill and/or practice	Mechanism used to identify Professional Practice Gap
Most of the registered nurses do not have BLS certification or training. And the majority of the ERT team's clinicians aren't ACLS-certified. NALS & PALS training is also required amongst the clinicians and support staff.	All <u>registered nurses must have BLS certification. ACLS, NALS & PALS training and certification are essential for medical personnel who work in emergency or critical care units,</u> and it is also essential for registered nurses working in the intensive care unit or with adults.	Some clinicians and nurses lack certain knowledge about the recent guidelines and steps that are followed during a code blue, as they lack BLS, ACLS, NALS & PALS certification/training.	<u>Knowledge:</u> Some nurses are unfamiliar with the fundamentals of CPR. As some practitioners are unaware of the new AHA guidelines since they are not ACLS certified. <u>Skill:</u> Lack of skill, as some registered nurses are unsure how to use their knowledge in a real-life situation.	Direct observation and questioning with nurses revealed that some of the nurses are hesitant to use their knowledge during a code blue.

Table 4: Need for BLS, ACLS, NALS & PALS training



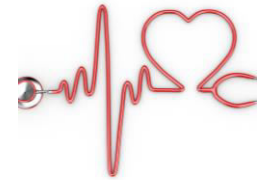
Bridging the identified Gaps:

- On April 26, 2022, the CPR Review Committee met and decided that the analysis of CPR occurrences in the hospital should be represented in percentages rather than numbers. The protocol for holding a debriefing meeting following CPR, as well as the requirement for BLS and ACLS training, were all discussed.

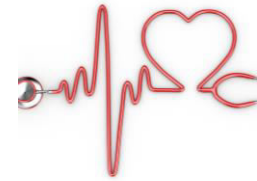
- To close **Gap 1** (as discussed in Table 1), the CPR review committee is still debating whether to refer to all instances of CPR (whether they occur in critical care areas or any other areas of the hospital) as CODE BLUE and not differentiate them as Code Blue and Non-Code Blue, as is the hospital's policy.

Following the meeting, all the data in figures 2 through 5 were corrected and presented in %.

- For rectifying **Gap 2** (as discussed in Table 4.6.2), debriefing meetings were added to the hospital's protocol after each Code Blue incident.



- In relation to **Gap 3**, it was discovered during a mock Code Blue exercise that was held on April 04, 2022, that the ERT team members lacked leadership qualities. This might be because no one wanted to assume the role of a leader or because there was no sense of camaraderie among the ERT members.
- To resolve it, members of the CPR review committee sat down with the physicians and emphasized the value of teamwork and leadership abilities. Following this, another mock Code Blue exercise was held on June 16, 2022, in OBGYN triage area, to test the leadership skills of the ERT members & the supporting staff.
- This time, all the ERT members were familiar with one another and demonstrated excellent leadership and team-building abilities. The code was led by the anesthetist, and the procedure went smoothly.



- To close **Gap 4**, BLS+PALS training was scheduled for doctors and support staff on May 18th and 19th, 2022. NALS training for the NICU and PICU clinicians and support staff was also scheduled on May 18th, 2022.

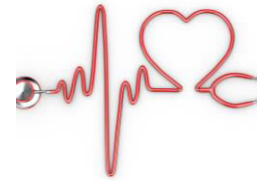
JAYPEE UNIVERSITY				TRAINING ATTENDANCE & EVALUATION RECORD				Date: 18/05/2022 Page No: 10 Date: 18/05/2022			
NALS Function 18/05/2022 Dr. Dinesh				Evaluation Method (if applicable)							
Dr. Dinesh				(To be filled by the trainer)							
				Theory				Practical			
				Marked	Score	Marked	Score	Marked	Score	Marked	Score
1.	Fauzia	Dr. Dinesh	LDR	8	10	9	10				
2.	APRAGITA	Dr. Dinesh	LDR	5	10	8	10				
3.	Adarsh	Dr. Dinesh	LDR	4	10	8	10				
4.	Rukman	Dr. Dinesh	LDR	4	10	8	10				
5.	Gomti	Dr. Dinesh	LDR	5	10	8	10				
6.	Pooja	Dr. Dinesh	LDR	6	10	9	10				
7.	Anamika	Dr. Dinesh	LDR	5	10	8	10				
8.	Greet	Dr. Dinesh	LDR	3	10	8	10				
9.	Meera	Dr. Dinesh	LDR	4	10	8	10				
10.	Kamla	Dr. Dinesh	LDR	5	10	8	10				
11.	Ashwini	Dr. Dinesh	LDR	4	10	8	10				
12.	Rupinder	Dr. Dinesh	LDR	6	10	9	10				
13.	Mangal Saini	Dr. Dinesh	LDR	8	10	9	10				
14.	Anurag	Dr. Dinesh	NICU	7	10	9	10				
15.	Shagun	Dr. Dinesh	NICU	7	10	9	10				
16.	Sangam	Dr. Dinesh	NICU	8	10	9	10				
17.	Sanjay	Dr. Dinesh	NICU	9	10	10	10				
18.	Samir	Dr. Dinesh	NICU	8	10	10	10				
19.	Kamini	Dr. Dinesh	NICU	4	10	8	10				
20.	Siddhant	Dr. Dinesh	NICU	4	10	8	10				
21.	Anjali	Dr. Dinesh	NICU	4	10	8	10				
22.	Siddhant	Dr. Dinesh	NICU	4	10	8	10				
23.	Arushi	Dr. Dinesh	NICU	5	10	9	10				
24.	Arushi	Dr. Dinesh	NICU	6	10	9	10				
25.	Arushi	Dr. Dinesh	NICU	9	10	10	10				

JAYPEE UNIVERSITY				TRAINING ATTENDANCE & EVALUATION RECORD				Date: 18/05/2022 Page No: 11 Date: 18/05/2022			
PALS Dr. Dinesh				Evaluation Method (if applicable)							
Dr. Dinesh				(To be filled by the trainer)							
				Theory				Practical			
				Marked	Score	Marked	Score	Marked	Score	Marked	Score
1.	SHIVANI	Dr. Dinesh	PICU								
2.	SHIVANI	Dr. Dinesh	PICU								
3.	Vansha	Dr. Dinesh	GEN								
4.	Arushi	Dr. Dinesh	PICU								
5.	Vaishali Saini	Dr. Dinesh	ACTVS								
6.	Parul Singh	Dr. Dinesh	ACTVS								
7.	Anita Mathur	Dr. Dinesh	ACTVS								
8.	Rishi	Dr. Dinesh	ACTVS								
9.	TINO THOMAS	Dr. Dinesh	ACTVS								
10.	Dr. Abhinav M.	Dr. Dinesh	Paeds								
11.	Dr. Varun H	Dr. Dinesh	Paeds								
12.	Dr. Priyanka	Dr. Dinesh	Paeds								
13.	Dr. Arushi	Dr. Dinesh	Paeds								



Discussion & Suggestions:

- Worldwide, hospital emergency codes are used to notify workers of a range of emergencies. The purpose of using codes is to immediately communicate critical information to hospital workers with the least amount of misunderstanding possible while minimizing anxiety or dread amid hospital visitors. The term "blue code" is typically used to describe a patient who needs resuscitation or other urgent medical care, typically because of a respiratory or cardiac arrest. Cardiac arrest occurs often in hospital settings, and postponing treatment is linked to a worse survival rate.
- This study aimed to assess whether human variables have an impact on CPR procedures & to identify gaps (if any) in the Code Blue processes at Jaypee Hospital in Noida, as well as to propose and implement changes that would result in improved CPR outcomes.
- Before initiating the study, a mock code blue was performed. Information from the mock code was used to change and enhance the study design. We timed the first responder's arrival, the crash cart's arrival at the code site, the arrival of the first six ERT responders, the start of the first chest compression, and the start of the first electrical shock.
- We found mistakes that might have affected CPR responses using group debriefings, CPR review forms, and observations. The organization's CPR Review Committee was then informed of the mistakes for further action and correction. Further analysis of both quantitative and qualitative data, the gaps or errors were rectified.
- This study is akin to the previous studies done in terms of taking human variables into consideration and provides more information and suggestions that can help the clinicians, support staff and hospital administrators to further improve the CPR processes that takes place in a hospital.



- We found mistakes that might have affected CPR responses using group debriefings, CPR review forms, and observations. The organization's CPR Review Committee was then informed of the mistakes for further action and correction. Further analysis of both quantitative and qualitative data (collected through direct observation), the gaps or errors were rectified.
- This study is akin to the previous studies done in terms of taking human variables into consideration and provides more information and suggestions that can help the clinicians, support staff and hospital administrators to further improve the CPR processes that takes place in a hospital.

Limitations:

- Identification of specific effective aspects influencing the results was challenging to evaluate, factors such as time effect, dynamic team unit, and code site locations may have contributed to the study and affected the outcome.
- Several support staff members and clinicians stated after debriefing that the simulation was not "realistic," therefore the training was partially effective



Conclusion:

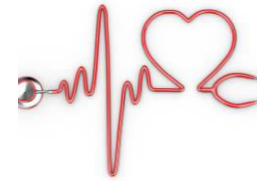
- The term "Code Blue" is typically used to describe a patient who needs resuscitation or other urgent medical care. Cardiac arrest occurs often in hospital settings, and postponing treatment is linked to a worse survival rate.
- The Jaypee Hospital's Cardio-Pulmonary Resuscitation (Code Blue) Committee is a multidisciplinary body that promotes high quality patient care standards. It monitors and evaluates the effectiveness and appropriateness of all major cardiopulmonary resuscitation functions.
- CPR survival rates after cardiopulmonary resuscitation were found to be zero in January 2022.

The survival rates for the months of February and March were 3.7% and 13.8% respectively.

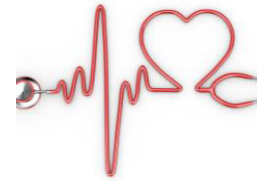
Non-code blues were 100% for the month of February 2022, while no code blues were reported. The age group 60-75 years had the highest number of patients receiving CPR, followed by geriatric patients. Patients aged between 17-40 years and >75 years also required it subsequently.

- From Fig.4, it is evident that the pediatric patients were in a better state and did not require the CPR.

Most code blues were initiated in ICUs, particularly the MICU, accounting for 75% in January, 77.8% in February, and 69% in March. The obvious reason is that most of the patients that are admitted to the MICU were found to be terminally ill.



- After executing several Code Blue mock exercises in the hospital, there were a few Gaps that were discovered by direct observation. These gaps are documented in Tables 1 through 4. Following that, specific actions were made to close these gaps like holding debriefing meetings post CPR, BLS, NALS & PALS training were conducted.
 - Exercises including mock code simulations offered a special and practical way to orient healthcare staff.
- This study offered a thorough gap analysis that was used to create and put into practice a tailored system-wide CPR protocol.



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