Assessment of the Survival Rates Amongst the Code Blue Cases

By

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The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish him all success in all his future endeavors.

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Pooja

Signature

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ABBREVIATIONS

ACE – Apollo Clinical Excellence

AHA- American Heart Association

BLS - Basic Life Support

CB – Code Blue

CCC - Clinical Care Coordinator

CPR – Cardio Pulmonary Resuscitation

ER - Emergency

HDU – High Definition Unit

ICU – Intensive Care Unit

JCI – Joint Commission International

NICU - Neonatal Intensive Care Unit

PALS -Pediatric Advanced Life Support

PICU – Pediatric Intensive Care Unit

RRT – Rapid Response Team

UCL – Upper Control Limit

To Assess the Survival Rates amongst the Code blue Cases Occurring in Indraprastha Apollo Hospital

INTRODUCTION

Disaster: A disaster is any event causing widespread destruction and distress.

A disaster occurs when a hazard impacts on vulnerable people.
The combination of hazards, vulnerability and inability to reduce the potential negative consequences of risk results in disaster. (1)

Certain codes have been identified as a part of disaster management in the hospitals.

As per JCI standards, Indraprastha Apollo Hospital uses following codes for disaster management in the hospital-

BLUE **INDIVIDUAL DISASTER**

GREY **INTERNAL DISASTER**

RED **EXTERNAL DISASTER**

PINK **INFANT ABDUCTION / BABY MISSING**

PURPLE **LIKELIHOOD OF PHYSICAL ALTERCATION**

ORANGE **INDICATION OF SUDDEN DETERIORATION IN PATIENT'S CONDITION**

BLACK **BOMB THREAT**

Hospital Emergency Codes are used in hospitals around the world to alert the hospital staff to various emergencies. The codes are used to convey essential information quickly and with maximum understanding to staff, while preventing stress and panic among visitors to the hospital. (2)

Code blue: An emergency situation announced in a hospital or institution in which a patient is in cardiopulmonary arrest, requiring a team of providers (sometimes called a 'code team') to rush to the specific location and begin immediate resuscitative efforts. Code blue is an emergency response system for alerting the code blue team of intensivist, nurses.

A Code Blue Team of Apollo Hospitals constitutes of following members-

- Team Leader
  - Medicine Registrar on call for all areas except ICUs
  - ICU Doctor on duty for their respective ICUs other than NICU and PICU
  - Pediatric Registrar in PICU / Neonatal Registrar in NICU
- Anesthesia Registrar on call
- Others:
  - For routine working hours
    - Respective area CCC
    - 1st Floor CCC only for Tower 3
    - Male Nurse from emergency
    - Emergency Physician (Only for Government sponsored ward, Physician Offices, Ground Floor, -1&-2 basement)
  - After 5 PM and holidays
    - On call CCC
    - Respective Floor / Area Resident
    - Male Nurse from Emergency
  - For PICU / NICU
    - Respective area CCC (On call after 5PM)
    - Pediatric Registrar (same after 5PM)
- Senior Nurse
  - Respective Nursing Supervisor
- Code Nurse
  - Charge Nurse / Team Leader
- Housekeeping Supervisor and Staff of that area

Guidelines for Code Blue

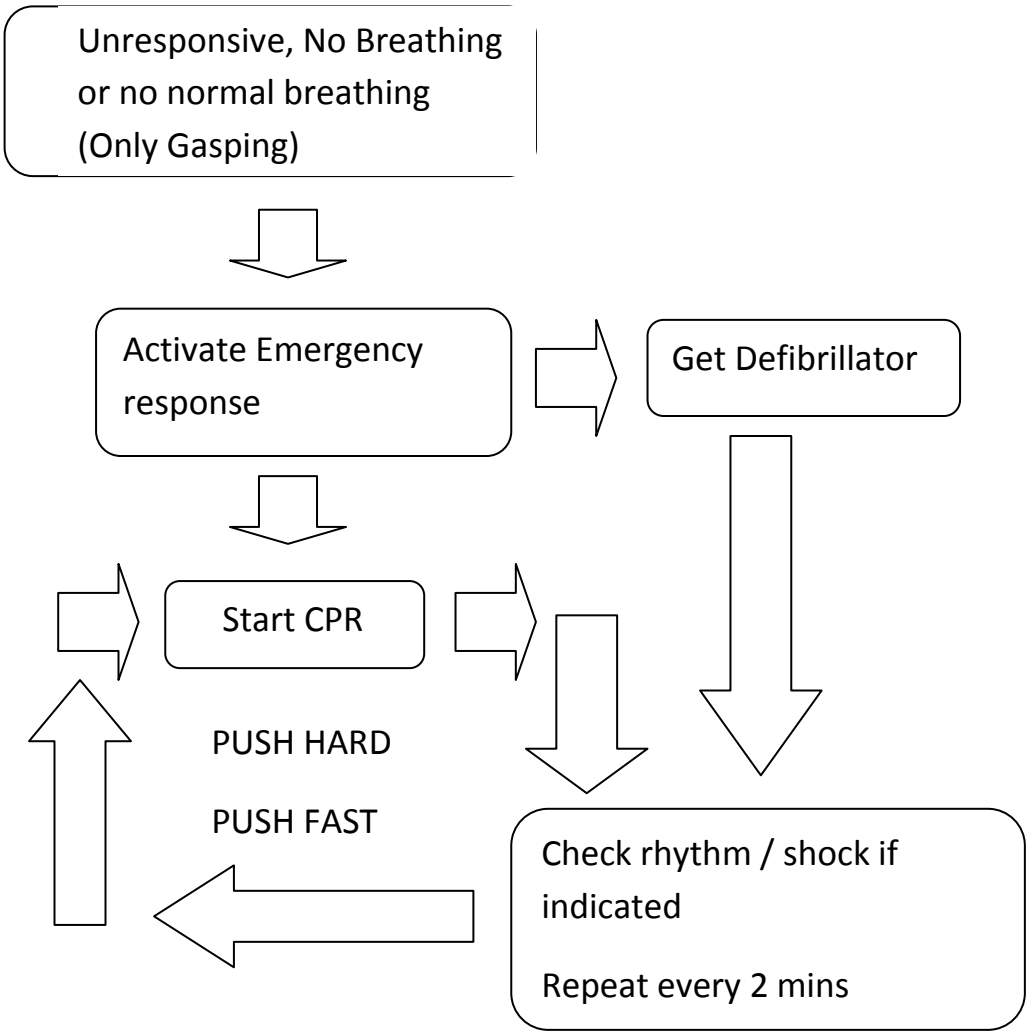
- In event of sudden patient collapse, BSL shall be initiated by staff members trained to do so and simultaneously instructions be given for a code blue announcement by dialing 66 / 9.
- The announcement for code blue shall be repeated three times on the overhead communication system. Simultaneously, all concerned personnel shall be informed over the dedicated code blue mobiles. Staff is expected to respond as quickly as possible and reach the place of incidence.
- The crash cart with all emergency care equipment and drugs shall be moved instantaneously to the patient bedside.
- The emergency duty doctor / staff nurse shall bring with him the “jump kit” and the defibrillator if desired by the team leader.
- The code blue running sheet shall be filled with the patient’s record.
- The code blue quality review form shall be sent to MS Office.

Cardiopulmonary resuscitation is an emergency procedure that combines chest compression often with artificial ventilation to manually preserve intact brain function until further measures are taken by the medical staff to restore spontaneous blood circulation and breathing in a person who is in cardiac arrest.

Its main purpose is to restore partial flow of oxygenated blood to the brain and heart. The objective is to delay tissue death and to extend the brief window of opportunity for a successful resuscitation without permanent brain damage.

As per Indraprastha Apollo Hospital, following are the BLS Algorithm and CPR guidelines.

SIMPLIFIED ADULT BLS ALGORITHM



CPR GUIDELINES

- **C – COMPRESSIONS**

  Push at least two inches on adult breastbone, 10times per minute, to move oxygenated blood to vital organs.

- **A – AIRWAY**

  Open the airway and check for breathing or blockage, watch for rise of chest and listen for air movement.

- **B – BREATHING**

  Tilt chin back for the unobstructed passing of air, give two breaths and resume chest compressions.

REVIEW OF LITERATURE

Blue code" is generally used to indicate a patient requiring resuscitation or otherwise in need of immediate medical attention, most often as the result of a respiratory or cardiac arrest. Each hospital, as a part of a disaster plan, sets a policy to determine which units provide personnel for code coverage. In theory, any medical professional may respond to a code, but in practice the team makeup is limited to those who had advanced cardiac life support or other equivalent resuscitation training. Frequently, physicians from anesthesia, emergency medicine and internal medicine are charged in the team. A rapid response team leader or a physician is responsible for directing the resuscitation effort and is said to "run the code" (3)

Cardiac arrest in hospital areas is common, and delayed treatment is associated with a lower survival rate. (4)

In-hospital cardiac arrests are common and delayed treatment is associated with a lower survival rate and poor neurological outcomes. However, early recognition of "at-risk" situation is important for the safety of the patients. (5, 6)

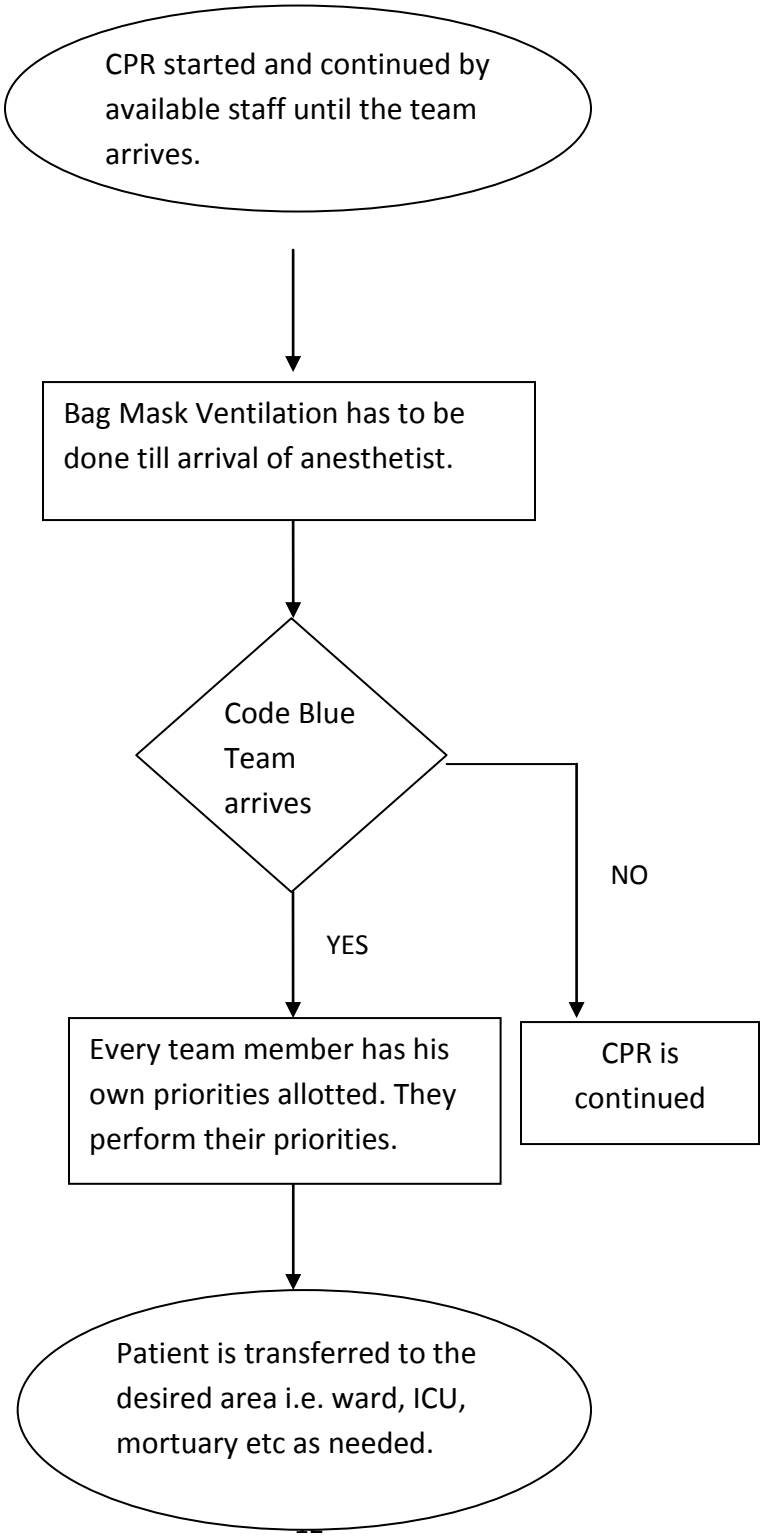
According to the Utstein definition, cardiac arrest is a sudden cessation of cardiac mechanical function which is evidenced by absence of detectable pulse, absent or gasping breath, and loss of consciousness. Cardiopulmonary resuscitation (CPR) is the standard treatment and has been widely used for the management of cardiac arrest. Initial survival after CPR is up to 50 %, but there is low survival to hospital discharge, ranging from 11 to 37 % (7).

Most often, cardiac arrest in children is the result of a respiratory cause. Breathing conditions such as anaphylaxis, apnea, aspiration, asthma, epiglottitis, pneumonia, respiratory syncytial virus, smoke inhalation, and suffocation can quickly deteriorate into respiratory failure. Variable periods of systemic hypoxemia, hypercapnea, and acidosis occur, with progression to bradycardia and hypotension, terminating in cardiac arrest. (8)

A pediatric cardiac arrest is one of the most stressful situations a clinician can experience. Unfortunately, despite a medical team's best effort, some pediatric patients will require resuscitation from a cardiac arrest. Utilization of rapid response teams or medical emergency

teams in the hospital can help to decrease mortality and morbidity from pediatric cardiac arrests. (9)

CODE BLUE PROCESS AT APOLLO HOAPITAL



Duties performed by various team members- (10)

Senior Nurse

- Start recording events in the code blue running sheet
- Ensure availability of Glucometer and BP apparatus through other nurses
- Creates labels for blood samples
- Handover the required medications to the staff nurse
- Dispatch blood samples to labs as required by the team leader
- Process the patient for transfer to ICU / Mortuary at the end of the code blue

Code Nurse

- Obtain and open crash cart
- Handover laryngoscope and ET tube to anesthetist
- Administer medications as per Team Leader
- Obtain blood sugar level by Glucometer
- Transfer the patient at the end of the code blue

Team Leader

- Attach defibrillator leads and obtain baseline recording
- Interpret ECG finding and advice medications accordingly.
- Ask nurse to do Glucometer check
- Obtain ECG recordings after every 5 minute interval
- Order DC shocks, medications, tests as required
- Confer with primary consultant at the end of the code blue
- Discussion with patient's family at the end of the code blue
- Write detailed CPR notes and paste ECG recordings in the progress notes at the end of the code blue

Anesthetist

- Establish airway and breathing
- Establish venous access if not done so far

Residents / CCC

- Start cardiac massage and rotate every 3-5 minutes
- Start venous access
- Give DC shock as advised by the team leader
- Check vitals as desired by the team leader

IMPORTANT DEFINITIONS USED

- **Immediate Survival Rate** - the percentage of people in a study or treatment group who are alive for a given period of time after diagnosis.

  For Apollo Hospitals, it is taken as 20 minutes after the code blue.

- **Twenty four hours survival rate** - the percentage of people in a study or treatment group who are alive after twenty four hours after the code blue.

- **Survival Rate to Discharge** – the percentage of people in a study or treatment group who are alive and discharged to home or another facility after the code blue.

- **Code Blue** – It is a mode of alerting all medical, nursing paramedical and allied healthcare service personnel for cardiopulmonary resuscitation following emergencies such as myocardial infarctions, neurosurgical emergencies, multiple trauma cases etc. causing sudden collapse of patient / person in all areas of the hospital premises.

- **Post –op Cases** – These are the cases in which code blue occurs after the patient has undergone any surgery.

RESEARCH QUESTION

- What is the current survival rate of the patients suffering with the code blue in the hospital premises?

AIM

- To assess the Code Blue process followed in the hospital.

OBJECTIVES

- To analyze the code blue process.
- To find out the survival rate of the patients suffering from Code Blue.
- To analyze and recommend changes if any loopholes are present.

RESEARCH METHODOLOGY

- **Study type** – The study is non-experimental evidence based that is a Retrospective and analytical study.
- **Area of study**- Study is conducted in the Indraprastha Apollo Hospital, New Delhi.
- **Data Collection method**

  Data is collected from the Code Blue Sheets that are filled and sent to the department by staff of the respective areas of the hospital and also by the monthly Code Blue Announcements given by the telephone exchange and training cell.

- **Inclusion/Exclusion criteria** – All the patients suffering from any emergency that leads to a Code Blue are included in the study.
- **Sample Size** – 365 cases of code blue that occurred in the hospital
- **Study Period** – 4months, December 2015 to March 2016

- **Sampling Technique**- Purposive sampling

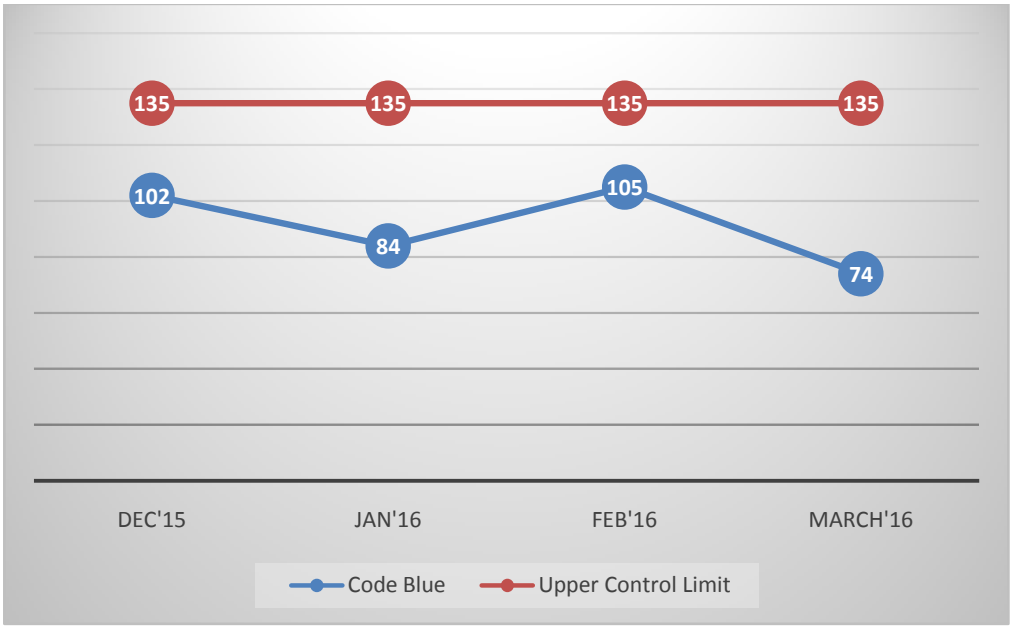
DATA COLLECTION PROCESS

- Data is collected on a daily basis from a Code Blue Running Sheet that is used in the hospital for any code blue emergency.
- This code blue running sheet is sent to the department from the respective areas where and whenever any code blue is announced.
- Data in the form of Code Blue announcements is also received through telephone exchange.
- Another data in the form of Code Blue Mock Drills is received through training cell.
- All the data is collected, compared and segregated in to actual and mock code blue announcements using Microsoft Excel.

DATA ANALYSIS

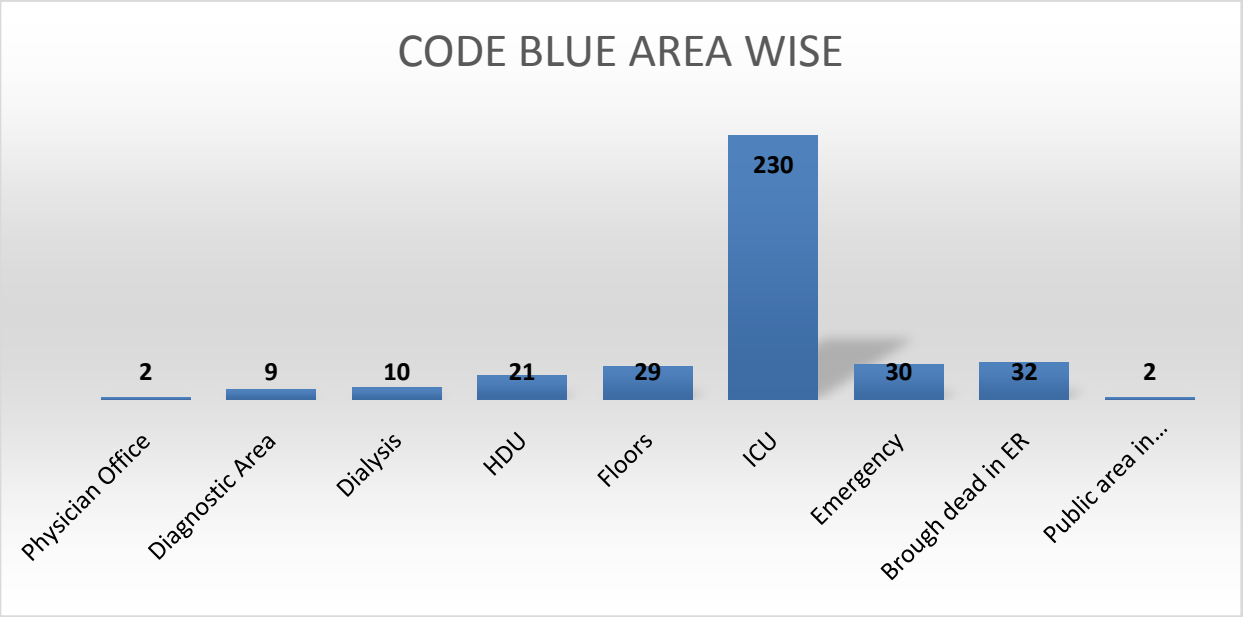
- **Total No. of Code Blue Cases for the quadrimester, Dec'15-Mar'16 is 365**

CODE BLUE STATUS Dec'15 Mar'16	Code Blue
Dec'15	102
Jan'16	84
Feb'16	105
March'16	74
TOTAL	**365**



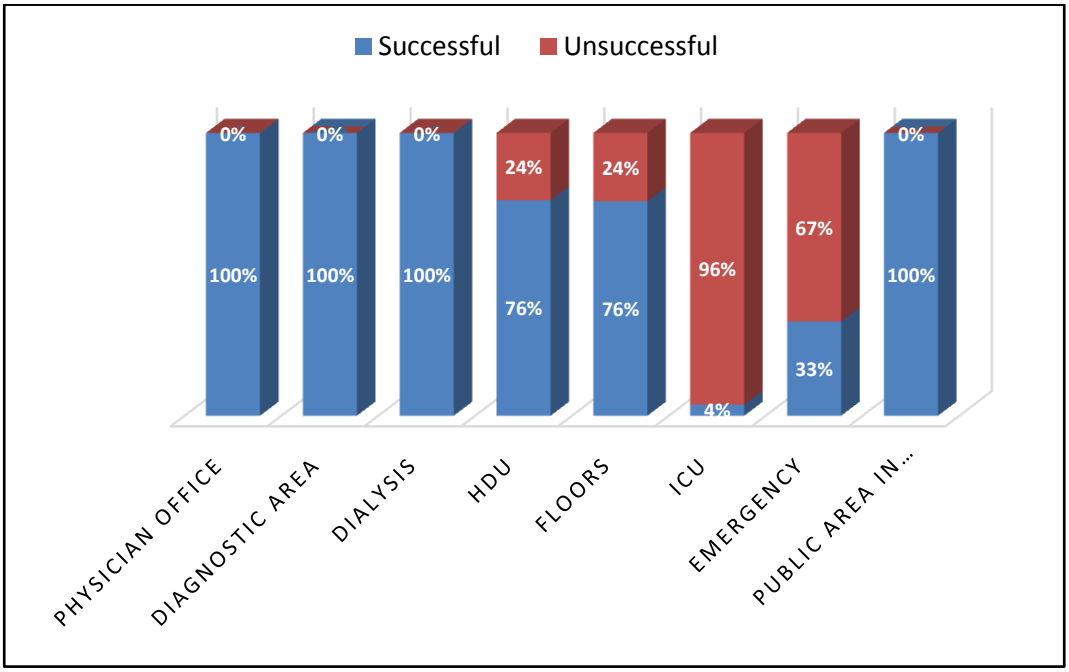
➢ No. of Code Blue in different areas of the hospital

Department	
Physician Office	2
Diagnostic Area	9
Dialysis	10
HDU	21
Floors	29
ICU	230
Emergency	30
Brought dead in ER	32
Public area in Hosp Premises	2



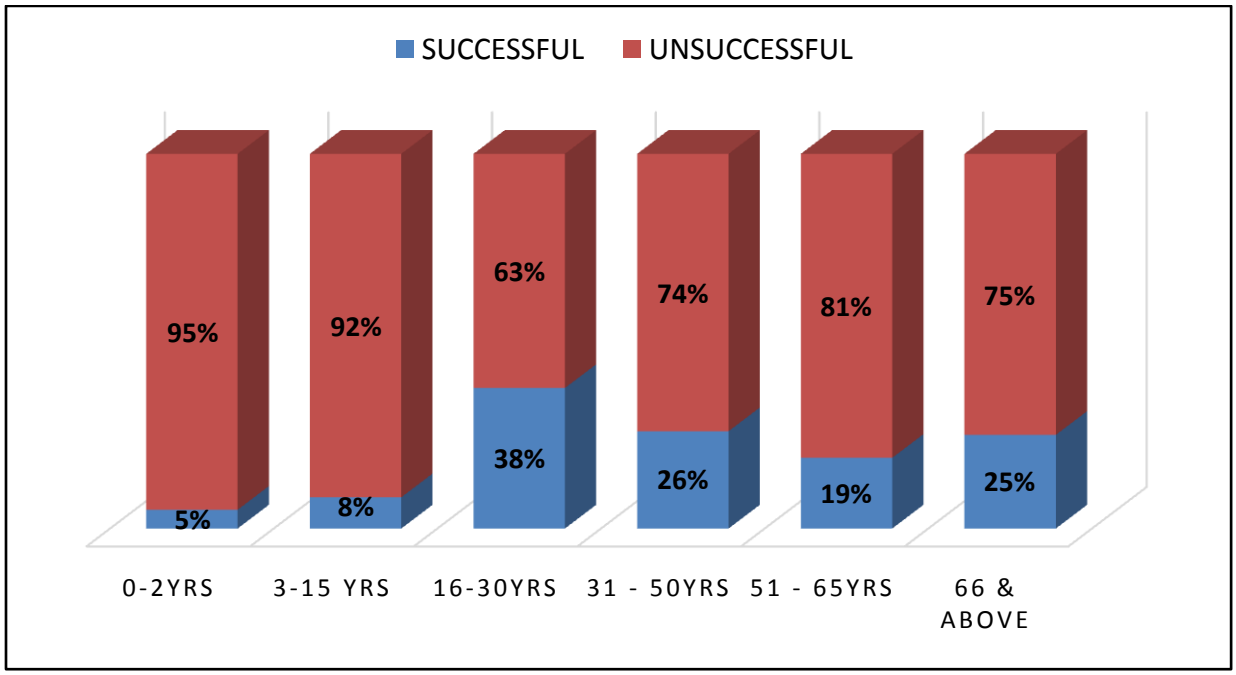
➢ Outcome of Code Blue in different areas of the hospital

Department	Successful	Unsuccessful
Physician Office	**100%**	**0%**
Diagnostic Area	**100%**	**0%**
Dialysis	**100%**	**0%**
HDU	**76%**	**24%**
Floors	**76%**	**24%**
ICU	**4%**	**96%**
Emergency	**33%**	**67%**
Public area in Hosp Premises	**100%**	**0%**



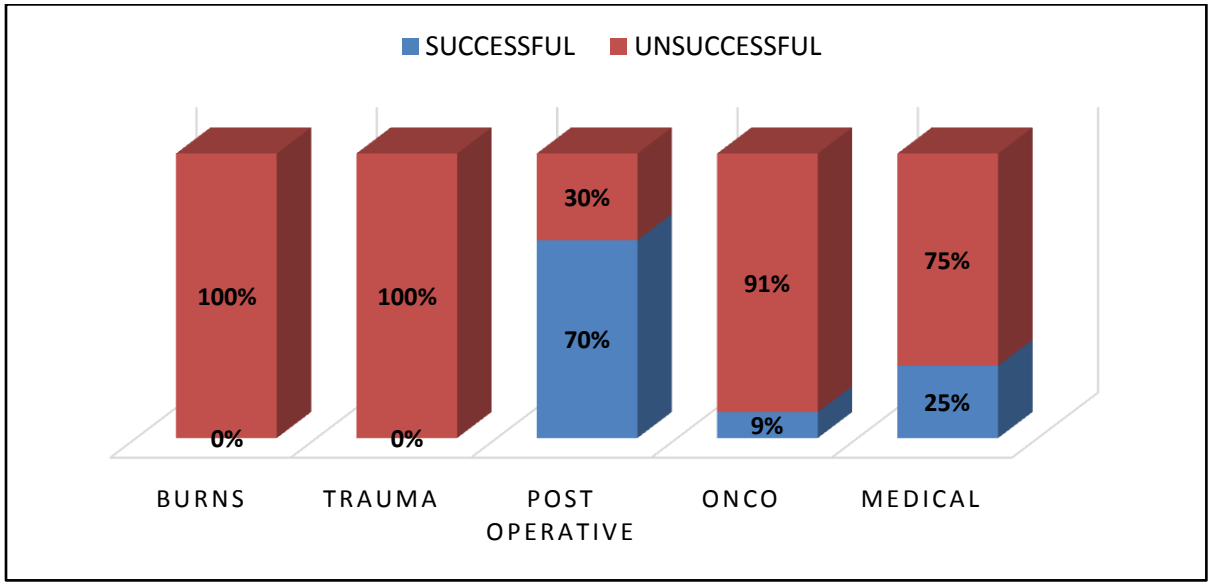
➢ Outcome of Code Blue Age Group wise

Age group	Code Blue	SUCCESSFUL	UNSUCCESSFUL
0-2yrs	**20**	5%	95%
3-15yrs	**12**	8%	92%
16-30yrs	**24**	38%	63%
31 - 50yrs	**77**	26%	74%
51 - 65yrs	**106**	19%	81%
66 & above	**84**	25%	75%



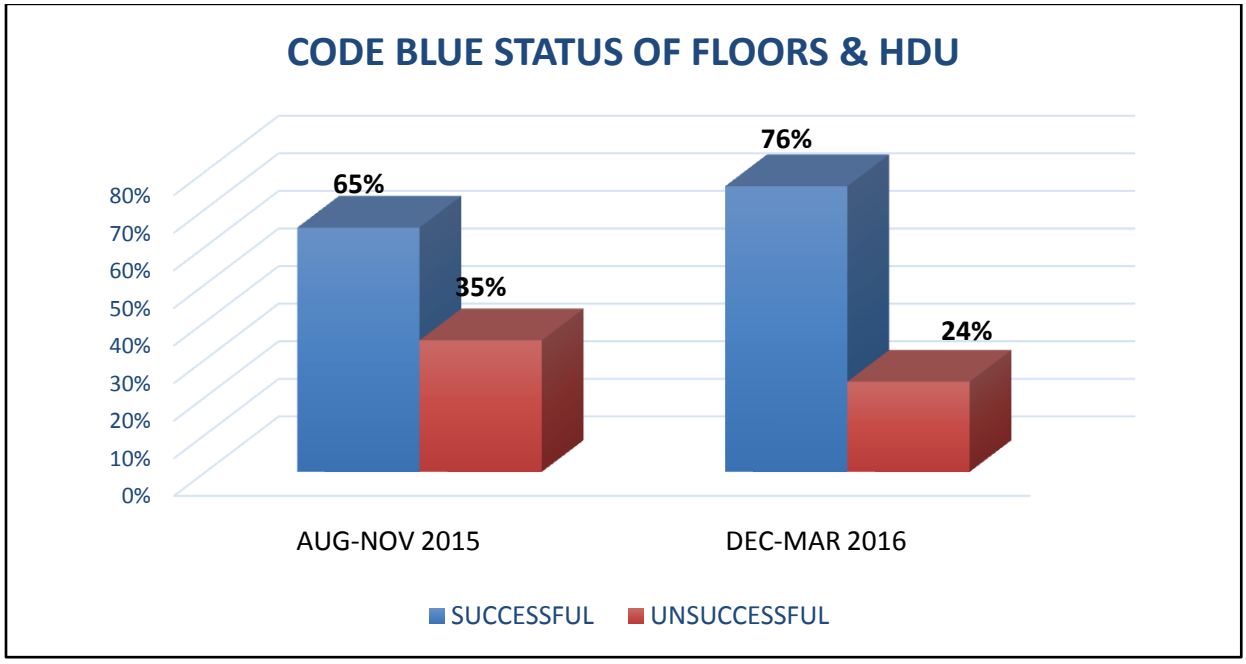
➢ Outcome of Code Blue as per Diagnosis

DIAGNOSIS	CODE BLUE	SUCCESSFUL	UNSUCCESSFUL
Burns	3	0%	100%
Trauma	8	0%	100%
Post Operative	23	70%	30%
Onco	33	9%	91%
Medical	256	25%	75%



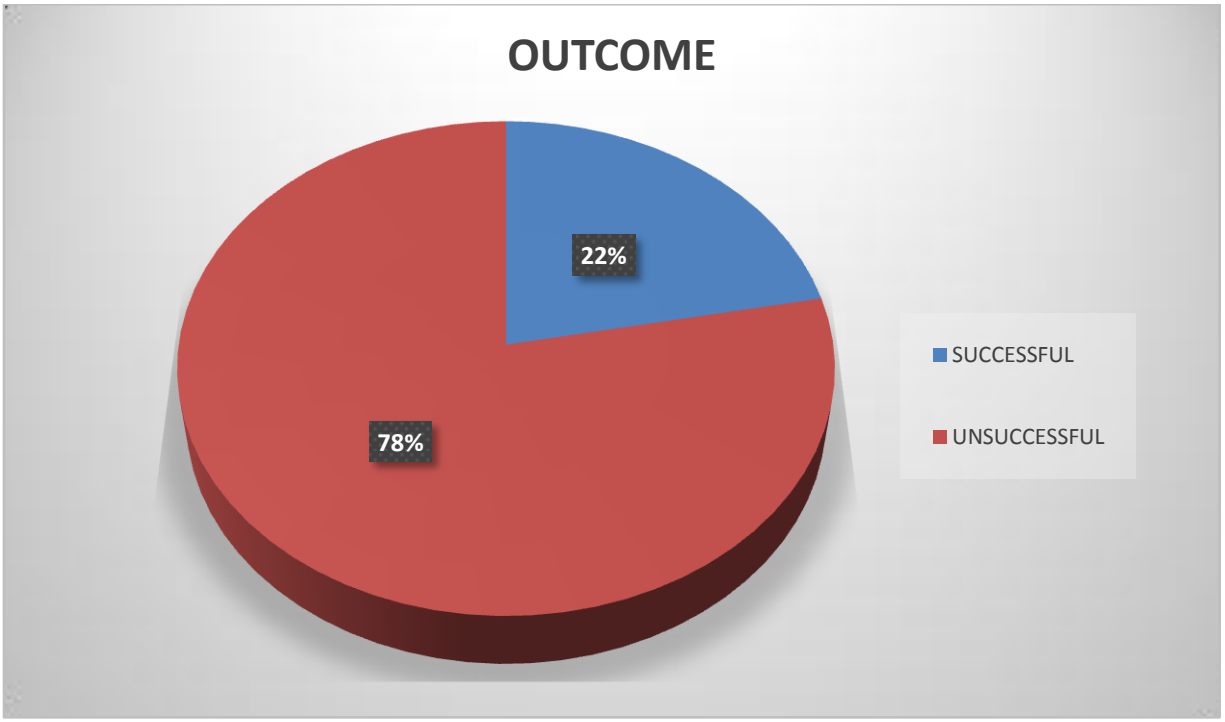
➢ COMPARISON OF CODE BLUE STATUS OF FLOORS AND HDU OF THIS QUADRIMESTER FROM PREVIOUS QUADRIMESTER

CODE BLUE STATUS ON FLOORS & HDU	AUG-NOV 2015	DEC-MAR 2016
SUCCESSFUL	65%	76%
UNSUCCESSFUL	35%	24%



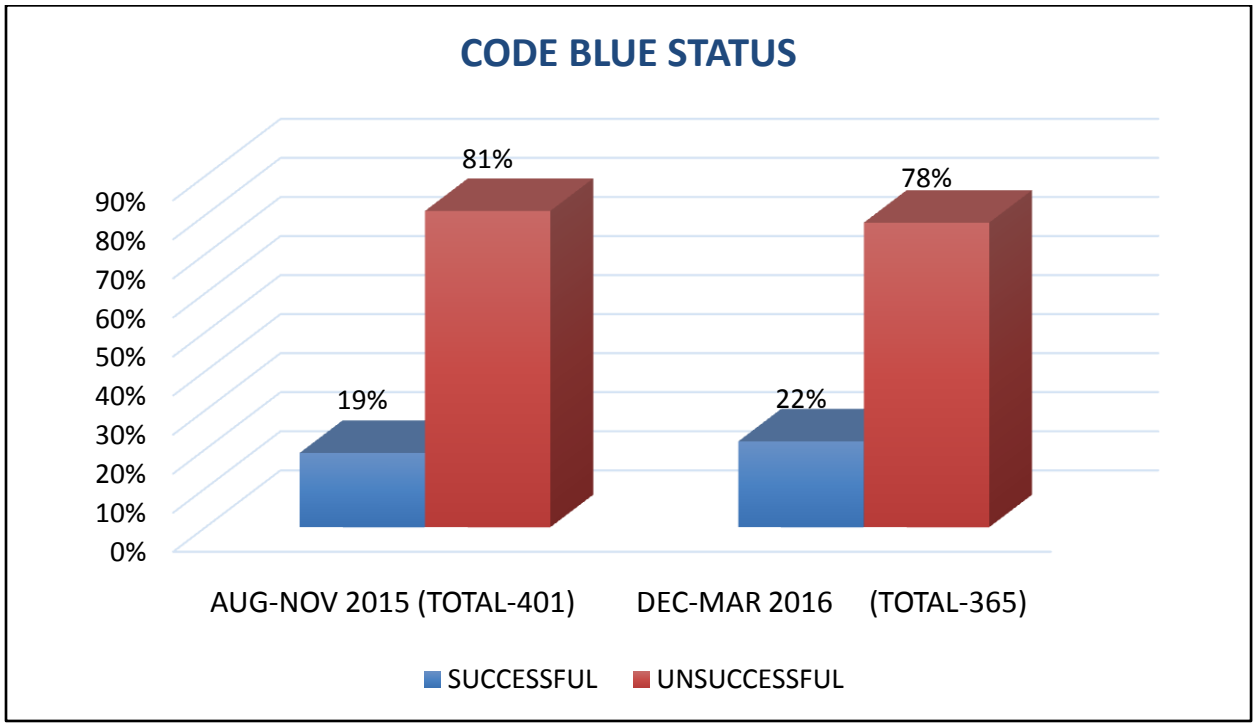
➢ Outcome of Code Blue (Total)

CODE BLUE	OUTCOME
SUCCESSFUL	22%
UNSUCCESSFUL	78%



➢ **Comparison of Code Blue Outcome of this quadrimester with previous quadrimester**

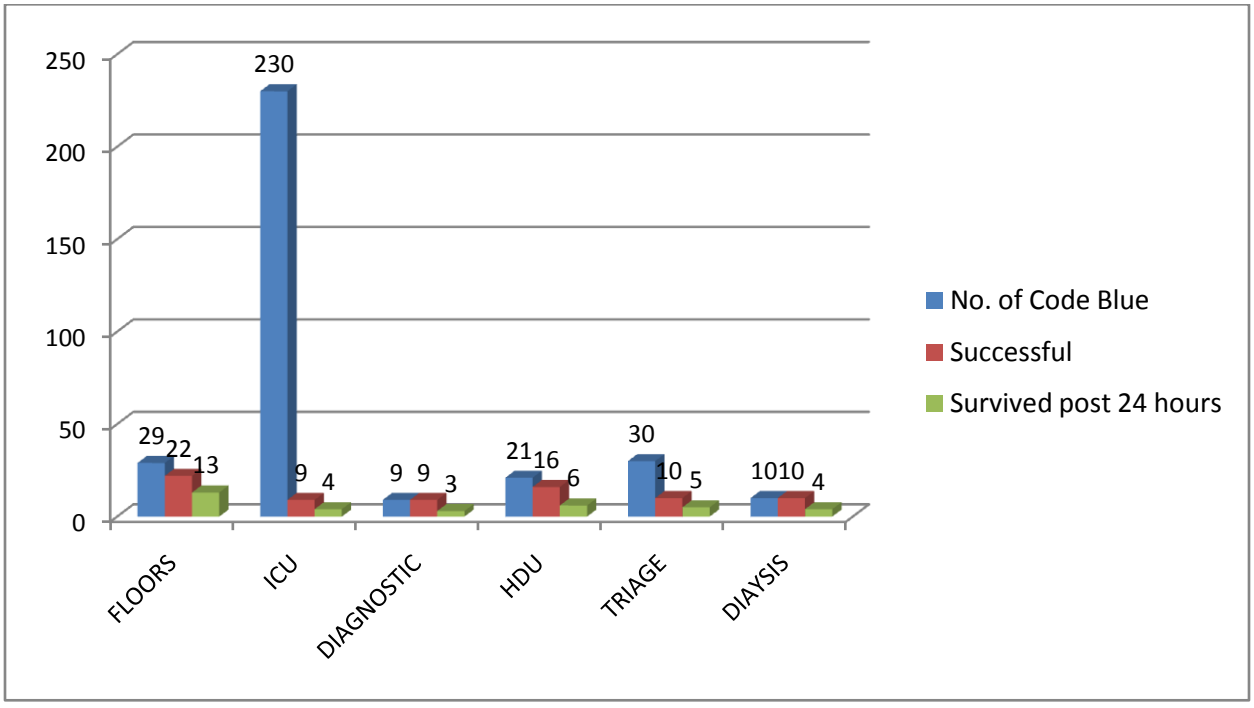
CODE BLUE STATUS	AUG-NOV 2015 (TOTAL-401)	DEC-MAR 2016 (TOTAL-365)
SUCCESSFUL	19%	22%
UNSUCCESSFUL	81%	78%



- **Twenty four hours survival post Code Blue**

SURVIVAL AFTER 24 HOURS (DEC-MAR'16)	No. of Code Blue	Successful	Survived post 24 hours
FLOORS	29	22	13
ICU	230	9	4
DIAGNOSTIC	9	9	3
HDU	21	16	6
TRIAGE	30	10	5
DIAYSIS	10	10	4

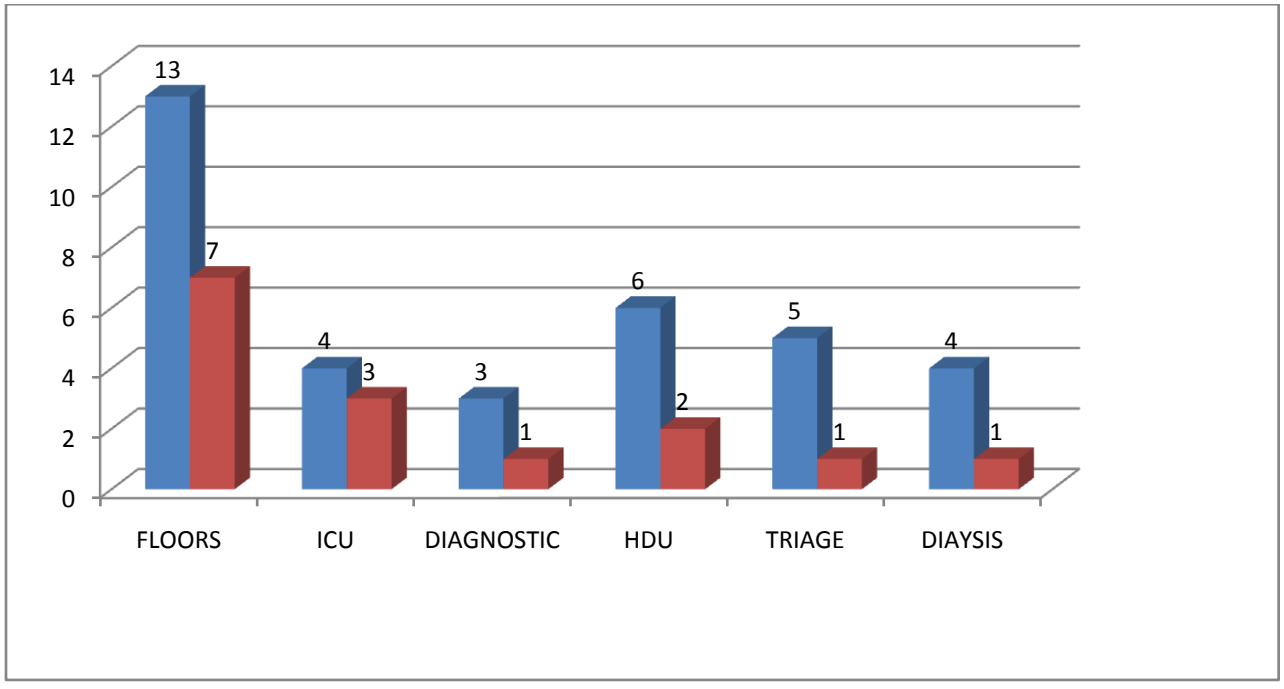
Twenty four hours survival rate = $\frac{13+4+3+6+5+4}{365} = \frac{35}{365} = 10\%$



➢ Discharges post Code Blue

Area	Survived after 24 hrs	Discharged
FLOORS	13	7
ICU	4	3
DIAGNOSTIC	3	1
HDU	6	2
TRIAGE	5	1
DIAYSIS	4	1

Survival Rate to Discharge = $\frac{7+3+1+2+1+1}{365} = \frac{15}{365} = 4.11\%$



CONCLUSION

The following study shows the Code Blue Cases occurring in the hospital from December 2015 to March 2016.

According to the data and its analysis, the maximum no. of code blue cases have occurred in the month of February.

The area with the maximum no. of Code Blue cases is ICU followed by emergency and then wards.

Although ICU has maximum no. of Code Blue, it has got least survival rate that is only 4%. On the other hand, dialysis, physician office, diagnostic areas etc have 100% immediate survival rate.

When we compared the cases on the basis of age of the patient, most successful age group that is with best survival rate has been found to be the young age group, 16-30 years.

The worst survival rate has been found for the children aged 15 years. The survival rate has been found to be just 6% i.e out of 30 code blues, only 2 have survived and out of those two, only 1 has successfully discharged. Most of the children amongst them have suffered from respiratory causes. As per a study, most often, cardiac arrest in children is the result of a primary respiratory cause. Breathing conditions such as anaphylaxis, apnea, aspiration, asthma, bronchiolitis, epiglottitis, drowning, pneumonia, respiratory syncytial virus, smoke inhalation, and suffocation can quickly deteriorate into respiratory failure. Variable periods of systemic hypoxemia, hypercapnea, and acidosis occur, with progression to bradycardia and hypotension, terminating in cardiac arrest. (8)

All the code blue cases have been categorized in to five diagnoses i.e.

- Medical
- Burns
- Trauma
- Oncology Cases
- Post operative cases

When we compared them on the basis of these diagnoses, the post operative cases have been found out to be most successful with 70% immediate survival rate.

The overall Immediate Survival Rate has been found out to be 22% and if we exclude ICU &Emergency from the Total Cases, the Immediate Survival Rate has drastically improved to 84%

We have also analysed the twenty four hour survival rate in these cases.

As far as twenty four hours survival rate is concerned, the overall rate has been found out to be 10% with maximum no. of cases in Wards.

The Overall Survival Rate to discharge has also been analysed and has come out to be 4.11% with maximum no. of cases in wards.

RECOMMENDATIONS

From the study, it is concluded that the Overall Code Blue Survival Rate has definitely improved as compared to the previous quadrimester. Previously, it was 19% but has improved to 22% for this period.

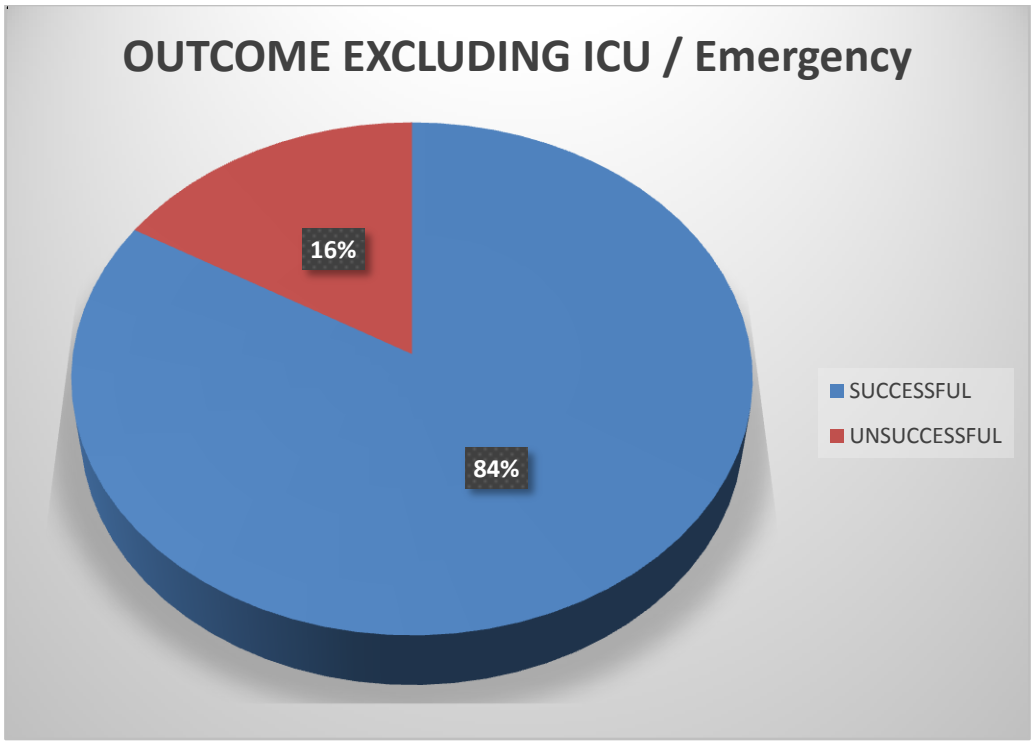
It has also been concluded from the above study that the hospital also includes the cases of ICU as Code Blue Cases in the study following the usual protocols. But, it actually should not be included in the study as they are not the code blue cases that are announced.

The survival rate including the cases of ICU and emergency comes out to be 22% but when we exclude the cases of ICU & Emergency, the survival rate gets improved to 84% and these are the actual code blue cases that are announced.

So, it has been recommended to the management to exclude these cases from their quarterly study of Code Blue and management has already implemented this change from this quarter only.

- **Outcome of Code Blue excluding ICU & Emergency**

OUTCOME excluding ICU / Emergency		
SUCCESSFUL	61	84%
UNSUCCESSFUL	12	16%



The Survival Rate to discharge is also very less i.e. 4.11%. For this, the management has decided to look in to the diagnostic details of such cases.

For the declining survival rate of pediatric patients:

- **Training and maintaining skills**.
  Enrollment in lifesaving courses such as pediatric basic life support (BLS) and PALS is recommended once every year.
  The frequency with which a professional is required to use resuscitation skills also have an impact on the frequency with which training is needed in order to prevent the degradation of knowledge and skills.
- **Follow 2010 AHA Guidelines for CPR**
  Chest compressions first, followed by airway, and then breathing/ventilations

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