Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/11791
DOI URL: http://dx.doi.org/10.21474/IJAR01/11791

RESEARCH ARTICLE

AUDIT OF "CODE BLUE" EVENTS IN A SINGLE SECONDARY CARE CENTER: A RETROSPECTIVE PILOT STUDY

Shrikant Desai[1], Ravin Kumar Bishnoi[2] and Shivani Devi[3]

1. Senior Nursing Officer for Quality Assurance, All India Institute of Medical Sciences, Rishikesh.
2. PhD Scholar, All India Institute of Medical Sciences, Rishikesh.
3. Nursing Officer, All India Institute of Medical Sciences, Rishikesh.

Manuscript Info

Manuscript History
Received: 25 July 2020
Final Accepted: 28 August 2020
Published: September 2020

Key words:-
Code Blue, Cardiac Arrest, Basic Life Support

Abstract

Background: "Code blue" is an alert code for cardiac emergency in hospital. Cardiac emergency can occur to anybody as expected or unexpected cause of event. The purpose was to analyse factors associated with this emergency and survival rate.

Methods: It was aretrospective audit of Code Blue data from a single secondary care Center. This audit was done for a period of four months, which were recorded by using Cardiopulmonary resuscitation (CPR) form.

Results: Total 63 code blue events are activated out of them maximum code blue event activated in critical care units (87.3%, n=55) and General ward have only 12.6 % (n=08). Most of the patients were male 45 (71.4%). The maximum code blue call activated in heart disease (15 (23.8%) patients, hypoxia found the major cause of events (n=37, 58.73%), 61 patients received CPR and eight (13.11%) patients developed shockable rhythm. The average response time of code blue team is 150±64.14 seconds in wards. Twelve (19.67%) patients survived and 40 (65.57%) patients died within 24 hours and nine (14.75%) died after 24 hours. Survival rate was found significantly associated with area of event occurrence ($p<0.05$) by Fisher's exact test. More deaths were found in ICU patients.

Conclusion: The code blue events occurred more in male patients. The maximum events were in heart disease and sepsis patient. The survival rate was low as reported in other published studies. There was a significant association of area of events with survival rate.

Introduction:-

A considerable number of hospitals are having emergency codes for emergency crisis to prepare their staff for dealing with the crisis circumstances.[1]These codes are utilized across the hospital through telephonically or intercom or open declaration framework. The most widely recognized crisis codes utilized in India are Code red for fire, Code blue in cardiac emergency, Code pink for child abduction, Code black for bomb danger and so on.[2, 3] Cardiac arrest is a cause of significant number of morbidity and mortality in-hospital and outside of hospital globally.[4] Every year in the US, 400,000–460,000 people die with sudden cardiac deaths which are unexpected before reaching to hospitals and however, emergency medical services both for in hospital and out of hospital can assist by sending

Corresponding Author:- Shrikant Desai
Address:- Senior Nursing Officer for Quality Assurance, All India Institute of Medical Sciences, Rishikesh.

appropriate team to survive these patients, survival rates for cardiac arrests that occur in hospitals is around 17% and outside hospital is 6%.[5] Early commencement of the Basic life support is very important for survival. It is proved that delay in every minute of treatment will decrease the survival rate by 10%.[6] India is also having considerable number of deaths due to this emergency condition. It is assessed that by 2020, cardiovascular diseases will be the biggest reason for morbidity and demise in India and presently 118 million are having hypertension, which is expected to increase 213 million by 2025.[7]

Cardio pulmonary arrest may happen anywhere in any area of the hospital premises including wards and critical care units. This is an sudden event in which emergency care is required within 5 minutes, because human brain is sensitive to hypoxia, if brain goes hypoxic for 20 seconds after circulatory arrest it causes depletion of neuronal oxygen store which leads unconsciousness. If circulatory arrest persist for 4-5 minutes then the series of changes occurs in brain cells which finally leads to hypoxic and anoxic brain injury.[8] Hospitals are required to establish medical emergency teams (METs) or rapid response teams (RRTs) which could be more beneficial to identify physiologic unstable patient, it will prevent progression to cardiac arrest and death. Calling criteria are often based on modified early warning score by the Royal College of Physicians.[9]

Materials & Methodology:-

The audit was retrospective and conducted in secondary care private hospital in Maharashtra. Audit was done for code blue records of four months by using Cardiopulmonary resuscitation (CPR) form. During these four months total 63 code blue events happened in the hospital. In this form various parameters are included such as demographic, primary diagnosis, cause of event for cardiac arrest, area of event, code blue announcement time, response time of code blue team, drugs used in CPR, initial rhythm, defibrillators used in CPR and survival data.The ethical permission to use hospital data was approved by the Local Institution Ethical Committee. Anonymity and confidentiality of data and setting was maintained.

Code blue activation Process of the hospital:

As per hospital policy Code blue can be activated from anywhere inside the hospital premises including ICU, OT and Emergency because of it's a small secondary care hospital having only 200 bed capacity with four floors and expert team is not available all the time in all the departments, these team are developed from different departments such as anaesthesia team from OT, nursing Staff from ICU and emergency. If cardiac arrest happens in ICU then expert nursing staff and medical staff initiate the CPR and simultaneously one staff will activate code blue, this communication first received by Electronic Private Automatic Branch Exchange (EPABX) system from there it is directly exchanged to assigned anaesthetist for code blue of the day, then he will reach immediately to ICU. If Cardiac arrest happens out of the ICU, anywhere in the hospital, then nearest staff nurse or any other BLS trained staff will initiate the CPR after activating the code through intercom to EPABX, from here call directly goes to ICU and as well as anaesthetist for code blue, after receiving the call, assigned ICU staff with code blue kit and anaesthetist will reach to the concerned area and continue the expert care as per updated AHA guidelines, there after patient is being shifted to ICU for further care and whole process of code blue is documented by concerned nursing staff under the guidance of nursing supervisor.

Data Collection and analysis:

Total 63 CPR analysis forms are received as sample, in this 61 forms are included and two are excluded because of non-cardiac arrest (false calls). The data was entered and recorded in a Microsoft excel and analysed by using SPSS. Descriptive statistics and Fisher's exact test were used for analysis.

Results:-

Retrospective data was collected for 63 patients. Most of the patients were male 45 (71.4%). The maximum code blue events occurred in heart disease 15 (23.8%) patients, followed by sepsis in seven (11.1 %), Malignancy in six (9.5%), CKD, Pneumonia, Trauma each in five (7.5%), CLD in four (6.3%), Poisoning, stroke each in three (4.8%) and in other diseases ten (15.9%) patients. (Table I)

Table I:- Distribution of disease of all the patients.

Disease	**n (%)**
Heart Diseases	15 (23.8%)
Sepsis	07 (11.1%)

Malignancy	06 (9.5%)
CKD	05 (7.5%)
Pneumonia	05 (7.5%)
Trauma	05 (7.5%)
CLD	04 (6.3%)
Poisoning	03 (4.8%)
Stroke	03 (4.8%)
Other Diseases	10 (15.9%)
Total	**63 (100%)**

As per cause of events (five 'H' & five 'T') of CPR, researcher found hypoxia was the major cause of event (n=37, 58.73%) followed by hypovolemia in 30.15% (n=19), Coronary thrombosis in 07.93% (five), pulmonary thrombosis and hypokalaemia each in one (01.58%) case. (Table II)

Table II:- Cause of events for initiation of code blue as per 5 H 5 T of CPR.

Five 'H' & Five 'T' of CPR	**n (%)**
Five 'H'	
Hypovolemia	19 (30.15%)
Hypoxia	37 (58.73%)
Hydrogen ion (acidosis)	00 (00.00%)
Hypokalaemia	01 (01.58%)
Hypothermia	00 (00.00%)
Five 'T'	
Toxins	00 (00.00%)
Tamponade (cardiac)	00 (00.00%)
Tension Pneumothorax	00 (00.00%)
Thrombosis (Coronary)	05 (07.93%)
Thrombosis (Pulmonary)	01 (01.58%)
Total	**63 (100%)**

Total 63 code blue events are activated out of them maximum code blue event activated in critical care units (87.3%, n=55) and General ward have only 12.6 % (n=08). The average response time after the completion of call in hospital wards were 150±64.14 seconds.

Total 61 (96.83%) of patients received CPR, as maximum number of patients were from intensive care unit and few from general wards, out of which 12 (19.67%) patients survived, 40 (65.57%) patients died within 24 hours and nine (14.75%) died after 24 hours. (Figure I) Survival rate was more in wards than the ICU and this difference was statistically significant (p=0.023), but there was no significant difference in death within 24 hours and after 24 hours between ICU and wards. (Table III)

Table III:- Association between area of code blue call and survival & death rate.

Area of code blue	**Survived**	**Died**	**Fisher's exact test**
ICU	08	46	p=0.023
Wards	04	03	(two sided)
	Died within 24 hrs	**Died after 24 hrs**	
ICU	38	08	p=0.46
Wards	02	01	(two sided)

Out of 61 patients, only 08 (13.11%) patients developed shockable rhythm (arrhythmic events), out of these four had ventricular fibrillation, two had ventricular tachycardia and 0two had both ventricular tachycardia & ventricular fibrillation and all of these patients received defibrillation without delay. (Table IV)

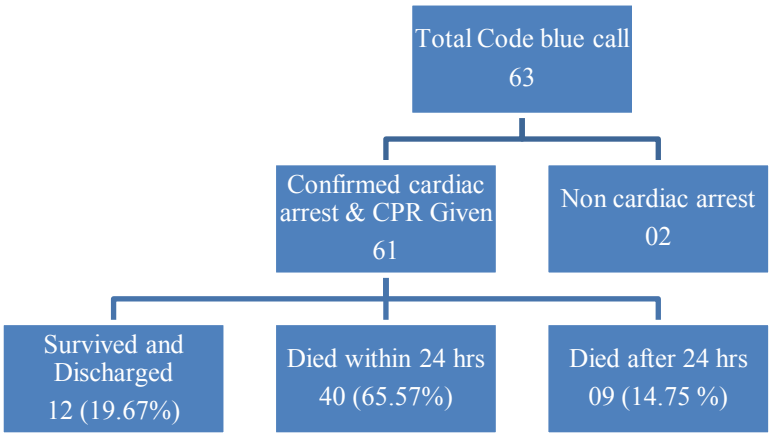

Figure I:- Analysis of Code Blue Events.

Table IV:- Arrhythmic events.

Cause of event	Rhythm	Defibrillation
Coronary Thrombosis	VF- 02 patients VT- 01 patient VT & VF- 01 patient	Given
Hypoxia	VF-02 patients VT- 01 patient	Given
Hypokalaemia	VT & VF – 01 patient	Given
Total	**08 patients**	

VT- Ventricular tachycardia; VF- Ventricular fibrillation.

Discussion:-

This retrospective audit of Code Blue events from a single healthcare centre reported specific findings according to gender, area of code blue, CPR, response time in wards, survival rate and arrhythmic events. Code blue events happened more in male patients than females, which is consistent with the published studies (Porter JE et al., 2019; Özütürk B et al., 2014; Panda NB et al., 2014), [10-12] whereas another study found higher number of women affected with cardiac arrest and received CPR (Limpawattana P et al., 2018).[13] The majority number of code blue events happened in heart disease (15 (23.8%) patients), followed by sepsis in seven (11.1 %) and Malignancy in six (9.5%) patients. Another study has found that more number of events (68.4%) occurred in medical patients (Suraseranivongse S et al., 2006).[14] The average time for receiving basic life support is one to two minutes and advanced life support (ALS) is four minutes (Suraseranivongse S et al., 2006), [14] which is comparable to findings of this study.

The survival rate after cardiopulmonary resuscitation is varied from 06-30 % (Möhnle P et al., 2012; Suraseranivongse S et al., 2006 Limpawattana P et al., 2018; Chakravarthy M et al., 2012), [13-16] this study also reported survival rate of 19.67 %. Other than these 19.67% survived patient, 14.75% have died after 24 hours, which is much less than the 51.3% reported by Möhnle P et al., 2012.[13] Current study found that maximum number of Code Blue events (87.3%) happened in ICU, whereas Limpawattana P et al., 2018 found more number of events (46.04%) occurred in general wards.[15] This study found statistically significant association of area of code blue events with survival rate. VT/VF reported in this study is 13.11 %, which is far more than reported by Qureshi SA et al (2012) that is 6%.[17] Few studies have reported similar percentage 12.4% (Suraseranivongse S et al., 2006)[12] even more (21.79%) of Ventricular fibrillation (Panda NB et al., 2014).[14]

Limitations:

The data collected for this study were reliant on staff entering all the required data under each heading of CPR form which resulted in at times missing data. Data collection was a lengthy process which required multiple team members. This resulted in duplication of data and required double check to remove duplication. Data collection was

also done for a short period of time as it was a pilot project.

Conclusions:-

In conclusion, the code blue events occurred more in male patients. The maximum events were in heart disease and sepsis patient. The reported survival rate was low as reported in other published studies. There was significant association of area of events with survival rate. VT/VF have occurred in very few of the patients. Strict monitoring of the performance of the Code Blue team is needed for accurate reporting. Regular reinforcement is needed for improve the quality of BLS & ACLS care providers.

Acknowledgement:-

The authors express their gratitude to the staff members who helped in data entry.

Funding & support:
All the expenses of the study were paid by the researcher.

Conflict of Interest:
The authors declare that they have no conflict of interests.

References:-

1. Mapp A, Goldsack J, Carandang L, Buehler JW, Sonnad SS. Emergency codes: a study of hospital attitudes and practices. J Healthc Prot Manag Publ Int Assoc Hosp Secur. 2015;31(2):36–47.
2. Ashworth I, El Dali AM, ElDeib O, Altoub AA, Pasha F, Butt T. Variability of emergency color codes for critical events between hospitals in Riyadh. Ann Saudi Med. 2015;35(6):450–5.
3. Truesdell A, Morris DP. EMERGENCY. 2009;3322(213).
4. Kocamer Şimşek B, Akyılmaz AA. Analysis of "Code Blue" events in a single center: A cohort study with 419 incidents. J Surg Med. 2019;3(2):82–5.
5. Singh S, Sharma DK, Bhoi S, Sardana SR, Chauhan S. Code Blue Policy for a Tertiary Care Trauma Hospital in India. Int J Res Found Hosp Heal Adm. 2015;3(2):114–22.
6. Mitra M, Sinha D, Biswas N, Basu M. A Study on the Success and Other Correlates of Code Blue Cases in a Multi-specialty Teaching Hospital in Bihar. Int J Contemp Med Res [IJCMR]. 2020;7(1):1–5.
7. Ramana Rao G, Rajanarsing Rao H, Reddy G, Prasad M. Epidemiological study on cardiac emergencies in Indian states having GVK Emergency Management and Research Institute services. J Soc Heal Diabetes. 2016;04(02):121–6.
8. Temple A, Porter R. Predicting neurological outcome and survival after cardiac arrest. Contin Educ Anaesthesia, Crit Care Pain. 2012;12(6):283–7.
9. Santamaria J, Tobin A, Holmes J. Changing cardiac arrest and hospital mortality rates through a medical emergency team takes time and constant review. Crit Care Med. 2010;38(2):445–50.
10. Porter JE, Peck B, McNabb TJ, Missen K, JE P, B P, et al. A review of Code Blue activations in a single Regional Australian Healthcare Service: A retrospective descriptive study of RISKMAN data. J Clin Nurs. 2020 Jan;29(1–2):221–7.
11. Özütürk B, Muhammedoğlu N, Dal E, Çalışkan B. Mavi kod uygulama sonuçlarının değerlendirilmesi. Haseki Tip Bul. 2015;53(3):204–8.
12. Panda NB, Batra YK, Mishra A, Dhandapani SS. A giant intracranial hydatid cyst in a child: Intraoperative anaesthetic concerns. Indian J Anaesth. 2014;58(4):477–9.
13. Möhnle P, Huge V, Polasek J, Weig I, Atzinger R, Kreimeier U, et al. Survival after cardiac arrest and changing task profile of the cardiac arrest team in a tertiary care center. Sci World J. 2012;2012:1–8.
14. Suraseranivongse S, Chawaruechai T, Saengsung P, Komoltri C, S S, T C, et al. Outcome of cardiopulmonary resuscitation in a 2300-bed hospital in a developing country. Resuscitation. 2006 Nov;71(2):188–93.
15. Limpawattana P, Aungsakul W, Suraditnan C, Panitchote A, Patjanasoontorn B, Phunmanee A, et al. Long-term outcomes and predictors of survival after cardiopulmonary resuscitation for in-hospital cardiac arrest in a tertiary care hospital in Thailand. Ther Clin Risk Manag. 2018 Mar;14:583–9.
16. Chakravarthy M, Mitra S, Nonis L. Outcomes of in-hospital, out of intensive care and operation theatre cardiac arrests in a tertiary referral hospital. Indian Heart J. 2012 Jan;64(1):7–11.
17. Qureshi SA, Ahern T, O'Shea R, Hatch L, Henderson SO, SA Q, et al. A standardized code blue team eliminates variable survival from in-hospital cardiac arrest. J Emerg Med. 2012;42(1):74–8.