Original Research Article

Review of code blue system and audit

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ABSTRACT

Background: Code Blue systems are communication systems that ensure the most rapid and effective resuscitation of a patient in respiratory or cardiac arrest. Code blue was established in Bharati Hospital and Research Centre in Sept 2011 in order to reduce morbidity and mortality in wards. The aim of the study was to evaluate the current code blue system and suggest possible interventions to strengthen the system.
Methods: It was retrospective observational descriptive study. The study population included all consecutive patients above the age of 18 years for whom code blue had been activated. Data was collected using code blue audit forms. The data was analysed using SPSS (Statistical Package for social sciences) software.
Results: A total of 260 calls were made using the blue code system between September 2011 to December 2012. The most common place for blue code activation was casualty. The wards were next, followed by dialysis unit and OPD. The indications for code blue team activation were cardio-respiratory arrest (CRA) (88 patients, 33.84%), change in mental status (52 patients, 20%), road traffic accidents RTA (21, 8.07%), convulsions (29 patients 11.15%), chest pain (19 patients, 8.46%), breathlessness (18 patients,6.92%) and worry of staff about the patient (17 patients, 6.53%), presyncope (10 patients, 3.84%), and others (6 patients, 2.30%). The average response time was 1.58±0.96 minutes in our study. Survival rate was more in medical emergency group 46.15% than in CRA group 31.61%. Initial success rate was 35.2% and a final success rate was 34.6%.
Conclusions: Establishment of code blue team in the hospital enabled us to provide timely resuscitation for patients who had "out of ICU" CRA. Further study is needed to establish the overall effectiveness and the optimal implementation of code blue teams. The increasing use of an existing service to review patients meeting blue code criteria requires repeated education and a periodic assessment of site-specific obstacles to utilization.

Keywords: Code blue systems, Cardio-respiratory arrest, Survival rate

INTRODUCTION

Hospital Emergency Codes are used in hospitals worldwide to alert staff to various emergencies. The use of codes is intended to convey essential information quickly and with minimal misunderstanding to staff, while preventing stress and panic among visitors to the hospital. "Code Blue" is generally used to indicate a patient requiring resuscitation or in need of immediate medical attention, most often as the result of a respiratory arrest or cardiac arrest.[1] Chances of survival of CRA patient is higher in presence of early and prompt interventions like quality and duration of cardio-pulmonary resuscitation and advanced care.[2] Patient's pre-arrest co-morbid condition and nature of events affect the final outcome.[3]

The code blue is a warning system technology used for resuscitation, but personnel training and code procedures are important for those in charge of the code blue systems in the hospital. For blue code systems to function effectively and to "save lives", when a blue code situation occurs in a hospital (due to a respiratory or cardiac arrest incident), personnel must identify the situation and call experts to the scene. The hospital must shorten the duration of time before treatment, detection, and follow-up. The information about each blue code situation's time, event location, and routing should be recorded. Additionally, to monitor the efficiency of the detection of blue code situations, all the post-event outcomes must be recorded. To improve the quality of the application and utilization of code blue systems and bring about shorter response times, the notification forms that detail the treatment of the blue code status must be available and a variety of performance reporting data must be examined.[4]

Current practice of code blue in our institute

As of now the Code blue services are provided by Department of Critical Care Medicine and the team comprises of ICU Physician as Team leader, ICU/HDU resident, HDU nurse supported by resident of primary unit. CODE BLUE was established in Bharati Hospital and Research Centre in Sept 2011 in order to reduce morbidity and mortality in wards. Specific criteria for calling the "CODE BLUE" team were laid down. "CODE BLUE" implementation protocols were distributed all over the hospital. Flow of code blue is shown in Figure 1.
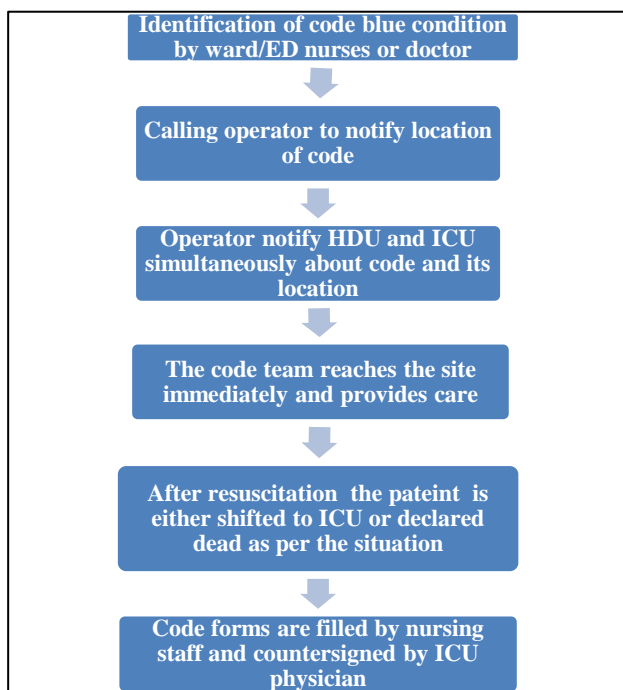

Figure 1: Flow of code blue.

This system is in place for few years now and there is a need to analyze the system and to improve upon the limitation and to provide effective quality emergency care. The aim of the audit was to evaluate the current code blue system and suggest possible interventions to strengthen the system. The objectives of present study were to determine the Indications of code blue and various emergencies, response time of the code team i.e. the time between announcement of code and arrival of code team, to identify the possible causes of delay and to correlate the various indication of code blue with immediate outcome ICU outcome and hospital outcome.

METHODS

The study was retrospective observational descriptive study and conducted at Emergency Department and wards of a tertiary care hospital.

Study population (selection of subjects)

- Sample size estimation: not applicable
- Sampling technique: all consecutive patients for whom code blue had been activated

Inclusion criteria

- All adult patients above the age of 18 years for whom code blue was called.
- New onset altered sensorium/ unresponsiveness.
- Pulse Rate >140/min and <50/min
- Respiratory Rate >32/min and <10/min
- SpO_2 <90%
- Systolic BP <90 mm of Hg.
- Convulsions /worsening of GCS by 2 or more /new onset neuro-deficit.
- Any event deemed to be life threatening by senior nurse.
- Any other emergency like polytrauma, hemorrhage, GI bleed.

Tools of data collection

Code blue audit forms

Variables used in the study

Demographics of the patients, site of code blue person calling code blue, response time, indication for code blue, rhythm at presentation, patient current illness and co morbidities, potential cause of arrest and patient outcome.

Ethical committee approval was obtained.

Statistical analysis

The collected data was coded and entered in Microsoft Excel sheet. The data was analysed using SPSS (Statistical Package for social sciences) version 20.0 software. The results were presented in tabular and graphical format.

RESULTS

A total of 260 calls were made using the code blue system. Age wise distribution of patients is shown in Figure 2 and month-wise distribution was shown in Figure 3. Maximum number of patients were in the age group of 21-30 years followed by 51-60 and 61-70 years. Department wise distribution is depicted in Figure 4.
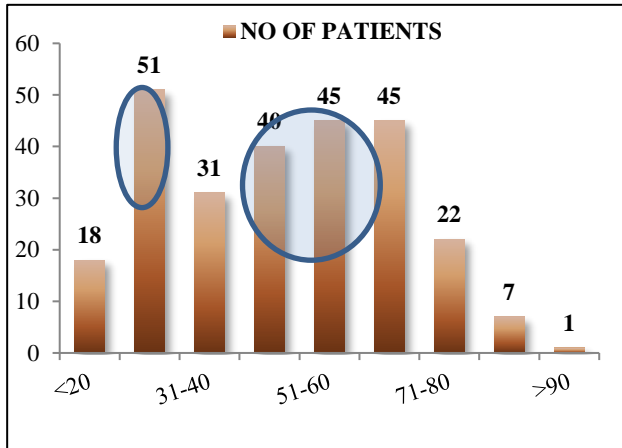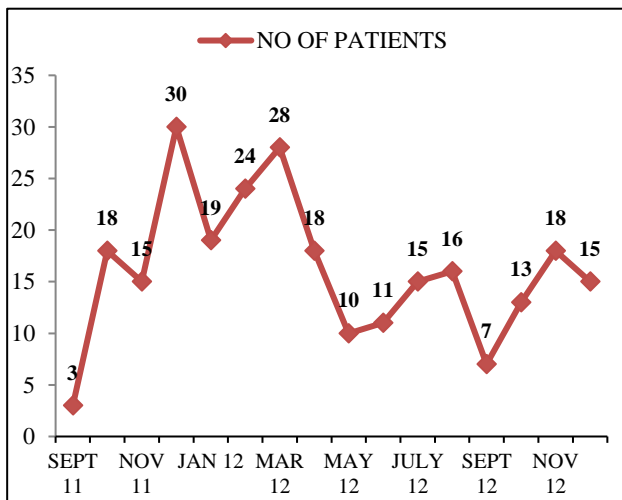

Figure 2: Age wise distribution of patients.
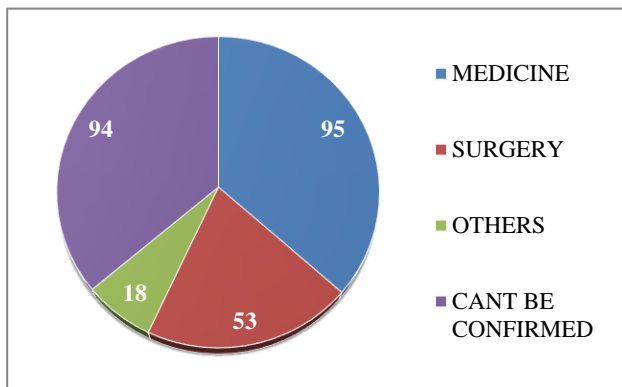

Figure 3: Month wise distribution of patients.

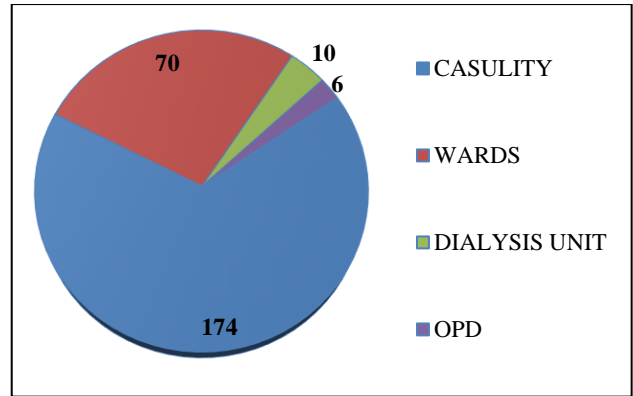**Figure 4: Department wise distribution of patients.**

Figure 5: Site wise distribution of code blue.

The most common place for code blue activation was casualty. The wards were next, followed by dialysis unit and OPD as shown in Figure 5.
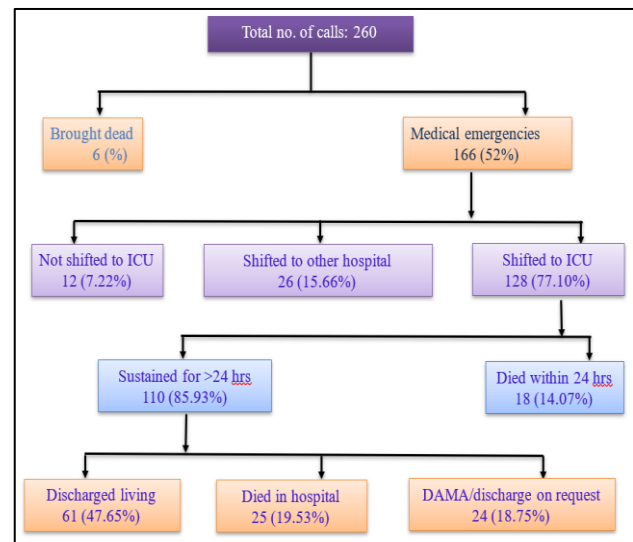

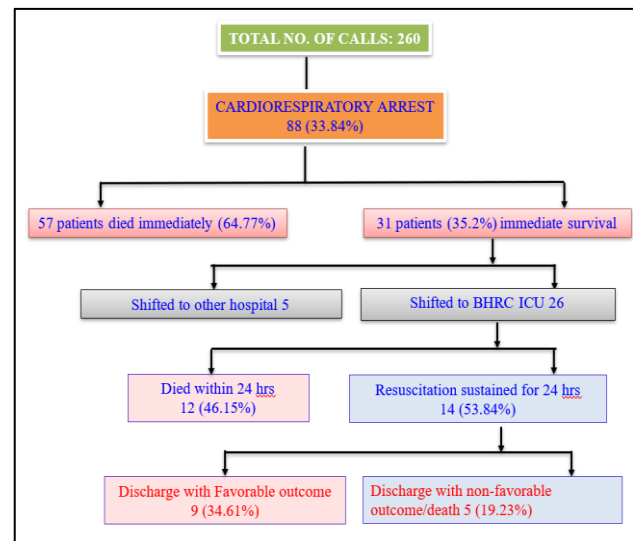**Figure 6: Outcome in medical emergency group.**

Figure 7: Outcome in CRA group.

The indications for code blue team activation were cardiopulmonary arrest (88 patients, 33.84%), change in mental status (52 patients, 20%), RTA (21, 8.07%), convulsions (29 patients 11.15%), chest pain (19 patients, 8.46%), breathlessness (18 patients,6.92%) and worry of staff about the patient (17 patients, 6.53%), presyncope (10 patients, 3.84%), and others (6 patients, 2.30%). The average response time (i.e. the time between announcement of code and arrival of code team) was 1.58±0.96 minutes in our study. Outcome in medical emergency group and CRA group in shown in Figure 6 and Figure 7 respectively.

Survival rate was more in medical emergency group 46.15% than in CRA group 31.61% which was found to be statistically significant (P <0.001). Initial success rate was 35.2% and a final success rate was 34.6%.

DISCUSSION

The average response time was 1.58 minutes in our study. The time was fixed at six minutes in Canural et al, study.[5] In Garcia et al, study, 90 patients were treated within one minute. Because our hospital is large, we reached the patients in an acceptable amount of time.[6]

Improving survival after in-hospital cardiac arrest requires an integrated set of coordinated actions that are described by the "Chain of Survival."[7] Therefore, multifaceted efforts that reinforce the Chain of Survival could potentially show a synergistic effect compared to that of a single method of intervention. Strengthening these procedures to maximize survival outcome also requires effective resuscitation education and the implementation of high quality treatment.[8]

Survival rate in this study was comparable to study conducted by Monangi S et al.[9] The emergency team, which is a well-known tool for cardiac arrest is the first link in the chain of survival. It has been shown to have a positive effect in previously published prospective, historically controlled studies. The presence of an emergency team can decrease the incidence of cardiac arrests in the general wards as well as the interruptions of ICU activities.[10] Success rate (34.6%) was comparable with study Saghafinia M et al.[11]

Establishment of code blue team in the hospital enabled us to provide timely resuscitation for patients who had "out of ICU" CRA. Further study is needed to establish the overall effectiveness and the optimal implementation of blue code teams. The increasing use of an existing service to review patients meeting code blue criteria requires repeated education and a periodic assessment of site-specific obstacles to utilization.

Ethical approval: The study was approved by the Institutional Ethics Committee

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