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IMPLEMENTATION OF CODE BLUE IN HOSPITALS

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KEYWORDS
Hospitals; code blue; cardiac

ABSTRACT

Cardiac Arrest is a form of emergency due to malfunction of electrical waves in the heart that cause arrhythmias, so that the heart cannot pump blood to the brain, lungs, and other organs that can occur to anyone and at any time so that it needs proper and immediate treatment to be able to save the patient's life. In the case of hospitals, an activation code system to respond to cardiac arrest, called Code blue, was established to provide an appropriate, fast, and systematic Basic Life Support. The Code blue system was formed by the local hospital by establishing a code blue system, including code blue teams, BLS equipment and equipment, code blue activation through communication systems in hospitals, and regular education and training to ensure quality control. Cardiac Arrest treatment is the ability to be able to detect and react quickly and correctly to restore the heart rate to a normal condition as soon as possible to prevent brain death and permanent death, The patient's chances of survival are reduced by 7 to 10 percent every minute that runs without cardiopulmonary resuscitation and defibrillation

INTRODUCTION

Based on data by the American Heart Association (AHA), in America there are morethan 200,000 cases of in-hospital cardiac arrest (IHCA) per year, with survival rates varying from hospital to 0 to 36.2%. The prevalence of cardiac arrest according to the Indonesian Association of Cardiovascular Specialists (PERKI) ranges from 10 out of 100,000 normal people under the age of 35 years and annually reaches around 300,000 - 350,000 events. Cardiac arrest is a form of emergency that must receive appropriate and immediate treatment from a trained medical or general public (Dame, Kumaat, & Laihad, 2018). Cardiac arrest can be restored if treated promptly with cardiopulmonary resuscitation or Cardiopulmonary Resuscitation (CPR/RJP) and defibrillation to restore normal heart rate. The patient's chances of survival are reduced by about 10 percent at every minute that runs without RJP and defibrillation (Aminuddin, 2013).

Code blue is a code activation system in patients who experience cardiac arrest, respiratory arrest, or emergency situations that require resuscitation. Several major hospitals inIndonesia have implemented a code blue activation system by using a telephone network to a certain number agreed upon by each hospital. When a patient is found who is experiencing a condition of respiratory arrest and cardiac arrest, the health worker who finds the patient will activate the blue sign / code. The central operator will disseminate information to the captain of the code blue team in the form of the location of the incident. After the captain of the code blue team receives the notification, the captain of the code blue team goes directly to the scene with the duration of time required between receiving the message "code blue" (code blue activation) and the arrival of the code blue team at the scene is 5 to 10 minutes (Monangi, Setlur, Ramanathan, Bhasin, & Dhar, 2018).

The establishment of the code blue system aims to reduce mortality and increase the rate of spontaneous return of circulation. Delayed cardiac arrest treatment is

associated with a reduced life expectancy of cardiac arrest patients. To achieve the goal of implementing the code blue system requires an early introduction of cardiac arrest cases, in this case knowledge of the code blue system and basic life support. Based on this, the activation of the ideal code blue system should be able to facilitate resuscitation in patients with medical emergencies and cardiac arrest conditions with an adequate response (Kilgannon et al., 2017).

Bibliography Review

Definition

Code Blue is the stabilization of a medical emergency that occurs within the hospital area. This medical emergency condition requires immediate attention. A code blue should start immediately whenever a person is found in a cardiac or respiratory arrest condition (unresponsive, not palpable pulse, or breathing) e.g. a patient in need of resuscitation.

A code blue team is a team of doctors and paramedics designated as a "code-team", who quickly go to patients to perform rescue measures. The team used crash carts, wheelchairs/stretchers, essential tools such as defibrillators, intubation equipment, suction, oxygen, ambubags, resuscitation drugs (adrenaline, atropine, lignocaine) and IV sets to stabilize patients with Basic Life Support (Vindigni, Lessing, & Carlbom, 2017).

Basic Life Support (BLS) is the beginning of an emergency response. BLS can be performed by medical personnel, paramedics or laypeople who see the victim for the first time. Skills must be mastered by paramedics and medical personnel, and ordinary people should also master them, because often victims are found first not by medics. The basic life support principle is to provide external assistance to circulation and ventilation in cardiac arrest or respiratory arrest patients through RJP/ CPR. BLS is a way of providing life support das ar which includes airway free (airway/A), adequate breathing (B), adequate circulation (circulation/C).

Code Blue Objectives

a) To provide rapid resuscitation and stabilization for victims who experience emergency cardio respiratory arrest conditions within the hospital area.
b) To form a well-trained team with emergency medical paralatans that can be used quickly.
c) To begin BLS skills training and the use of automated external defibrillators (AEDs), for all hospital teams both clinical and non-clinical based.
d) Placement of BLS equipment in various strategic locations within the hospital area to facilitate rapid response to medical emergencies.
e) There is a common mindset / perception of the emergency management system in the hospital in an integrated manner.
f) Similarity of action patterns is obtained in the handling of emergency cases within the hospital.
g) Speed up the response of the emergency team at the hospital to avoid deaths and disabilities that should not have occurred (FAUZIAH, 2019).

Code Blue Team Organization

The Code blue team is a team that is always ready at any time / at all times. The primary response code blue team consists of a crew that has mastered Basic Life Support (BLS). The Code blue team consists of 3 to 4 members, namely (Bhoi, Sharma, Singh, Sardana, & Chauhan, 2015):

- 1 team coordinator

- 1 medic
- 1 assistant medic and 1 or 2 nurses (implementing nurse and resuscitation team)
- 1 support group (if necessary)

Job description:

1. Team coordinator
   - Held by a NICU/ICU doctor
   - In charge of coordinating all team members. Working with training makes emergency training needed by the team.
2. Medical person in charge
   - Doctor on duty / room doctor
   - Identifying the initial / triage of the patient
   - Lead patient response in the event of an emergency
   - Lead the team during RJP implementation
   - Determining the next attitude
3. Implementing nurse
   - Together with the medical doctor to triage the patient
   - Helping doctors in medical charge handle emergency and emergency patients
4. Resuscitation team
   - Trained nurses and room doctors/doctors on duty
   - Providing basic life support to emergency or emergency patients
   - Performing cardiopulmonary resuscitation to emergency or emergency patients
   - Team Code blue's roster is the responsibility of the Coordinator each month in the MECC.

Each team member will have designated responsibilities such as team leader, airway manager, chest compressions, IV line, drug preparation and defibrillation. Each designated team member must bring a mobile phone.

Code Blue System Management

1. Code Blue Phase
   a. Alert System

There should be a good, coordinated system in place that is used to activate the alert of a medical emergency within the scope of the hospital to the members of the code blue team. The existing phone system will be used.

In the event of a medical emergency, hospital personnel anywhere within the scope of the hospital can activate a response from code blue by phone for assistance and activation:

I. Local Alert
   - Announcement via PA system
   - Display the names of primary blue code teams in strategic locations in their zones
   - After code blue activation occurs, the Primary Team must leave their work and take the code blue bag and rush to the location and start CPR/BLS

II. Hospital Alert
   - Priority 1: To enable secondary team code blue from ETD
   - Priority 2: To check (as a second safety net) the activation of the team code blue primer.

Members of the primary code blue response team that have been determined around the place where the medical emergency occurred will respond to the code blue situation as soon as possible. The team members will mobilize their resuscitation devices and rush to the medical emergency site. The code blue ETD team will also respond to code blue situations.

2. Central Responsibility / Hospital Operator Towards Blue Line Code in Hospitals
   - Assume every call in the code blue line is the actual case code blue (until it can be proven).
   - Code blue calls must be answered as soon as possible (< 3x ringing)
   - Vital information is:
     1) Name and name of person/paramedic team/doctor team code blue
     2) Exact location
     3) Trauma or medical cases
     4) Adult or child
3. Immediate Intervention at the Scene

   The team at the scene of a medical emergency found the patient unconscious or in cardiac and Respiratory Arrest responsible for requesting further assistance, initiating resuscitation using Basic Life Support (BLS) guidelines and ALS skills as well as sufficient equipment, trained and complete HR (Garg et al., 2017).
4. Guidelines for implementing the Code Blue Team in the field

   Initial management before the arrival of the Code Blue team
   - The hospital's blue code team mobile number is placed throughout the rooms in the hospital including offices, elevator lobbies, corridors, canteens, parks, parking lots, and other locations within the hospital
   - Hospital personnel who find victims must be able to activate local notifications to the primary blue code team or someone to each team's cellphone or to the telephone number and forward the information spread to the center / hospital operator
   - Instructing the team to move towards the scene, they should also ask for further assistance from the nearest team if available
   - At the same time, the activation of the hospital notification must be done by calling the designated hospital code blue number
   - The party in charge of a particular area (from another space) should also be notified to come to the location immediately
   - While waiting for the arrival of the main code blue team (Primary), if a team trained for BLS is available, it is informed the team must start the BLS (airway position, breathing assistance, chest compressions etc.)
   - If there is no BLS-trained team, the team on the scene must wait for experienced help and guard the location from crowds
   - If a cardiac monitor, manual defibrillator or automated external defibrillator (AED) is available, this equipment should be attached to the patient to determine defibrillation needs, this phase is performed by an experienced team or a team trained in Alert Cardiac Life Support (ACLS)
   - The team from each room will be responsible for the maintenance of their resuscitation kits that are already available
   - All code blue case data must be sent to the team coordinator, for further evaluation of the implementation of the code blue team in the field / scene, including the response time of receiving messages and the response time of the code blue team's arrival at the scene.

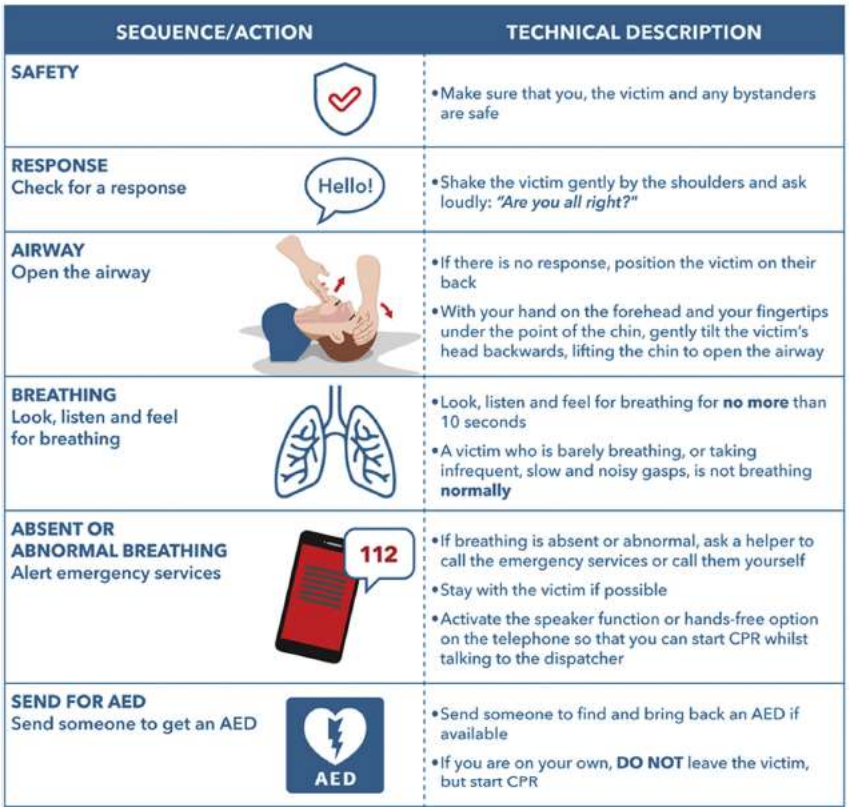

Figure 1 Initial management before the arrival of the Code Blue team

5. The Arrival of the Code Blue Team
   - After the code blue team members received code blue activation, they had to stop their current duties, take their basic resuscitation kits (equipment bags) and rush to the medical emergency site on foot.
   - The code blue team had to quickly respond moving towards the location using the shortest route available and arrived within < 5 minutes.
   - Response time (standard service) code blue call / activation of the arrival of the code blue team at the scene must be stored data (for MONEV).
   - The code blue team arrives at the ready location with the basic resuscitation kit equipment, what if the victim is still in cardiac or respiratory arrest, the team will take over the task of resuscitation (the team coordinator directs for further action).
   - What when needing a heart monitor, manual defibrillator or automatic external defibrillator (AED), this equipment should be attached to the patient to determine the need for defibrillation, this phase is performed by an experienced team or a team trained in Alert Cardiac Life Support (ACLS)
   - Patient management is then handed over to the code blue team coordinator
   - If resuscitation is unsuccessful (the victim died at the scene of the crime/ DOA patient, the victim is transferred to the forensic department, not to the emergency room (for further documentation or confirmation of death, as well as administration completed in the forensic section).

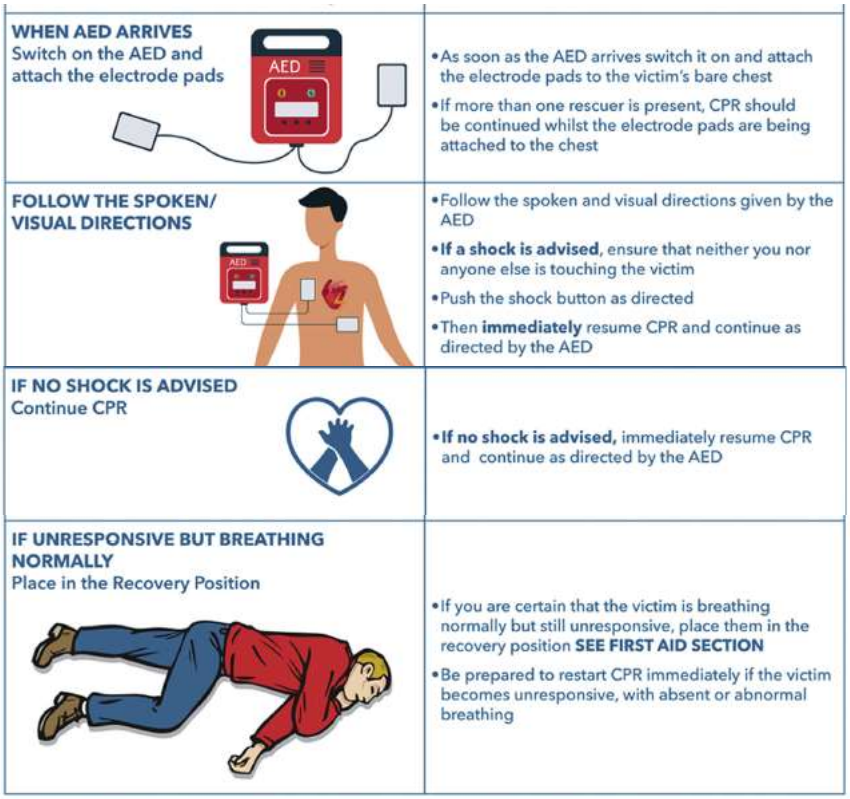

Figure 2 Help when the code blue team comes (Olasveengen et al., 2021)

6. Equipment Needed by the Code Blue Team

All levels of the hospital team must be moderately trained at least in BLS and AED use. AED and resuscitation kit bases should be placed in different areas within the hospital grounds and easily accessible for medical personnel and Code blue teams to use

Semi-Automated Defibrillators (SAED) must be present near the Emergency Trolley. A package of SAED x 2 electrodes and a disposable razor must be stored in the SAED package box. The electrode package should not be opened until before discharging (Quan et al., 2015).

Resuscitation equipment is placed in an area that often needs resuscitation assistance so that when code blue appears the team designated as code blue The team will immediately be able to access the equipment. If code blue is called in an area without crash-cart, the team designated code blue will carry a crash-cart or resuscitation kit.

Bagian atas Troli	
Resuscitator x 1 (Tersegel) Sungkup muka ukuran 3/4 & 5 Resuscitator termasuk bag & reservoir Pipa Oropharyngeal Ukuran 3 & 4 (sekali pakai)	Pocket Face Mask dengan klep 1 arah
	Obat-obatan emergensi dalam segel plastik
Laci 1 – Peralatan Intubasi – Paket (sekali pakai) + Gagang Laringoskop Handle	

Gagang Laryngoskop x 1	Bilah Laringoskop: No 3 & 4
Introducer x 1	Forsep Magill's x 1
Pipa Endotracheal: Ukuran 7.5, 8, 8.5 x 2	Saset Gel Pelumas x 2
Yankauer disposable sucker x 1	Kateter Suction: 12g & 14g x 2 each
Catheter mount x 1	Angle Konektor x 1
10ml syringe x 1	Forsep Arteri x 1
Micropore 25mm x 1 Tracheostomy tape ~ 1m	Gunting x 1
Pipa Nasofaring Ukuran Size 7	

Laci 2 – Peralatan IV
Paket IV (Sekali Pakai)

Basic Dressing Packs x 2	Torniket x 2	Swab Alkohol x 12	Silet x 1
IV Cannula 16g x 4 18g x 4 20g x 4	Syringes 3ml, 5ml x 3 10ml x 4, 20ml x 1	Jarum 19g x 6 21g x 6 25g x 2	Tabung Darah: FBC x 2 U&E x 2 (Li Heparin) Cross match x 1
Occlusive Dressing x 2	IV Giving Sets x 2		Normal Saline 10ml ampul x 4
Additive labels x 2	Long Airways x 1	ABG syringes x 2	

Laci 3 atau Rak Bawah	Laci 4 atau Rak Bawah
Larutan IV: Plasma Volume Expander (Haemaccel) 500ml Dekstrose 5% dalam 1 liter H_2O Normal Saline 0.9% 1 liter	Perlengkapan pelindung: masker gogel Apron plastik aprons Sarung tangan sekali pakai
Attachments: Silinder O_2 ukuran C dengan regulator, flow meter, O_2 tubing & medium flow masker O_2 Pipa Suction	Form Rekam Emergensi, Papan kertas, Pulpen Sharps Container

Figure 3 BLS10 Equipment

7. Code Blue Activation Criteria

Patients who have the following criteria can be activated code blue, namely:

- Adult Medical emergency criteria
- Pediatric Medical emergency criteria

Figure 4 Adult and pediatric medical emergency criteria (Marsum, Windari, Subinarto, & Candra, 2018)

8. Adult and children's cardiac arrest algorithm

About 1.2% of adult individuals admitted to United States Hospitals, suffer cardiac arrest in hospitals, and more than 20,000 infants and children experience cardiac arrest each year. This condition is one of the factors that makes changes to the guidelines related to cardiac arrest management in adults and children. Here are recommendations for basic life support and advanced cardiovascular life support in the 2020 AHA guidelines.

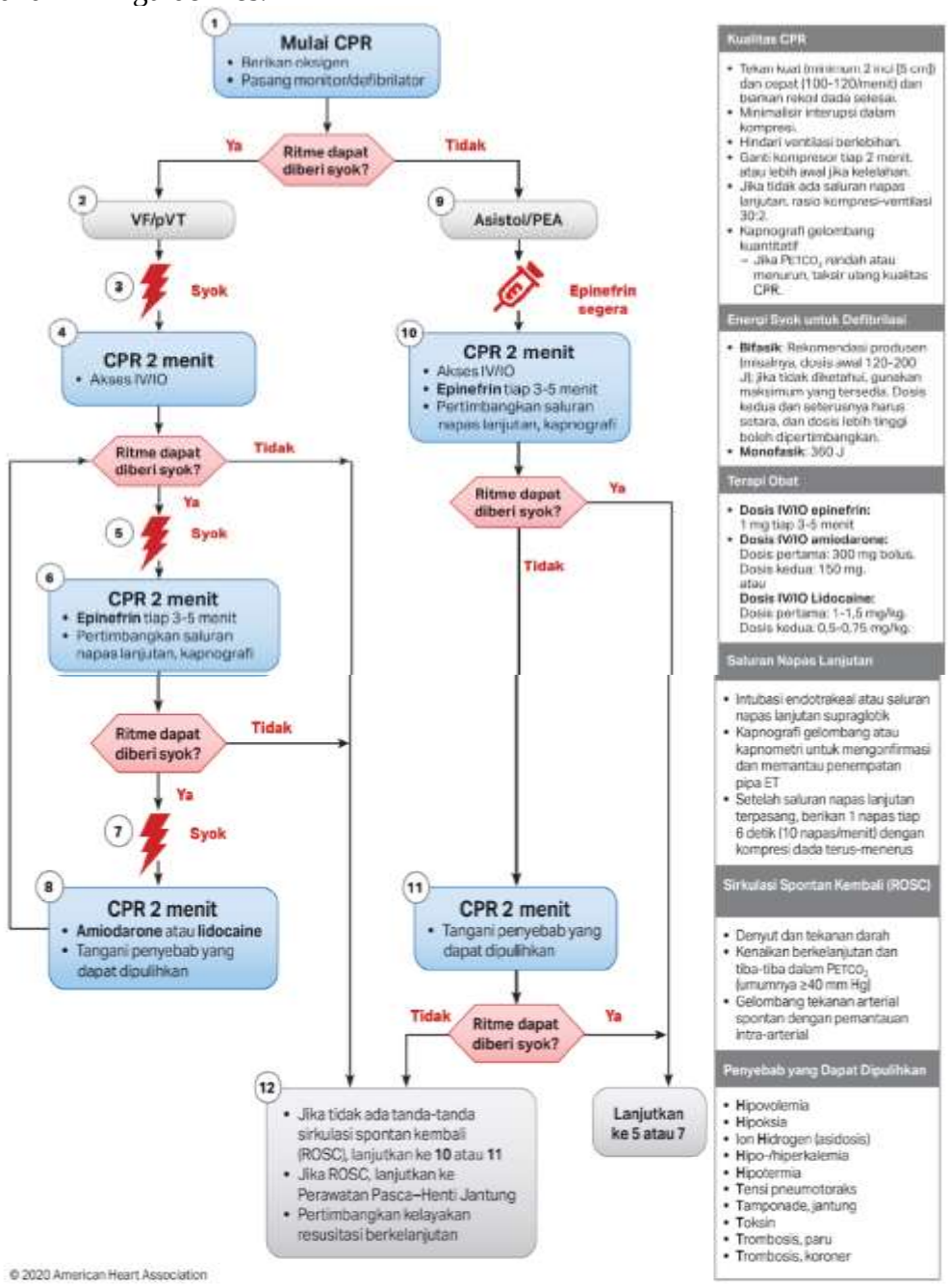

Figure 5 Adult Cardiac Arrest Algorithm (Cheng et al., 2020)

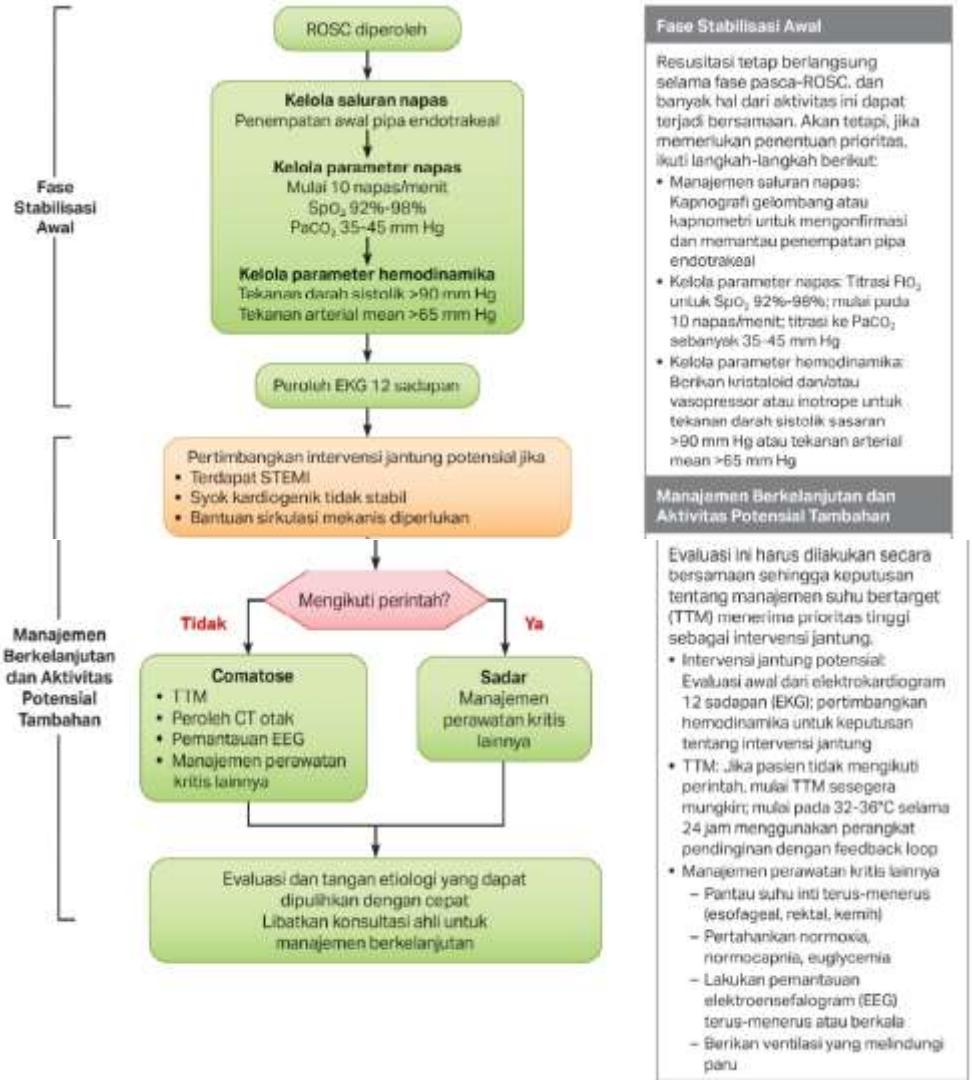

Figure 6 Adult Cardiac Post-Arrest Care Algorithm

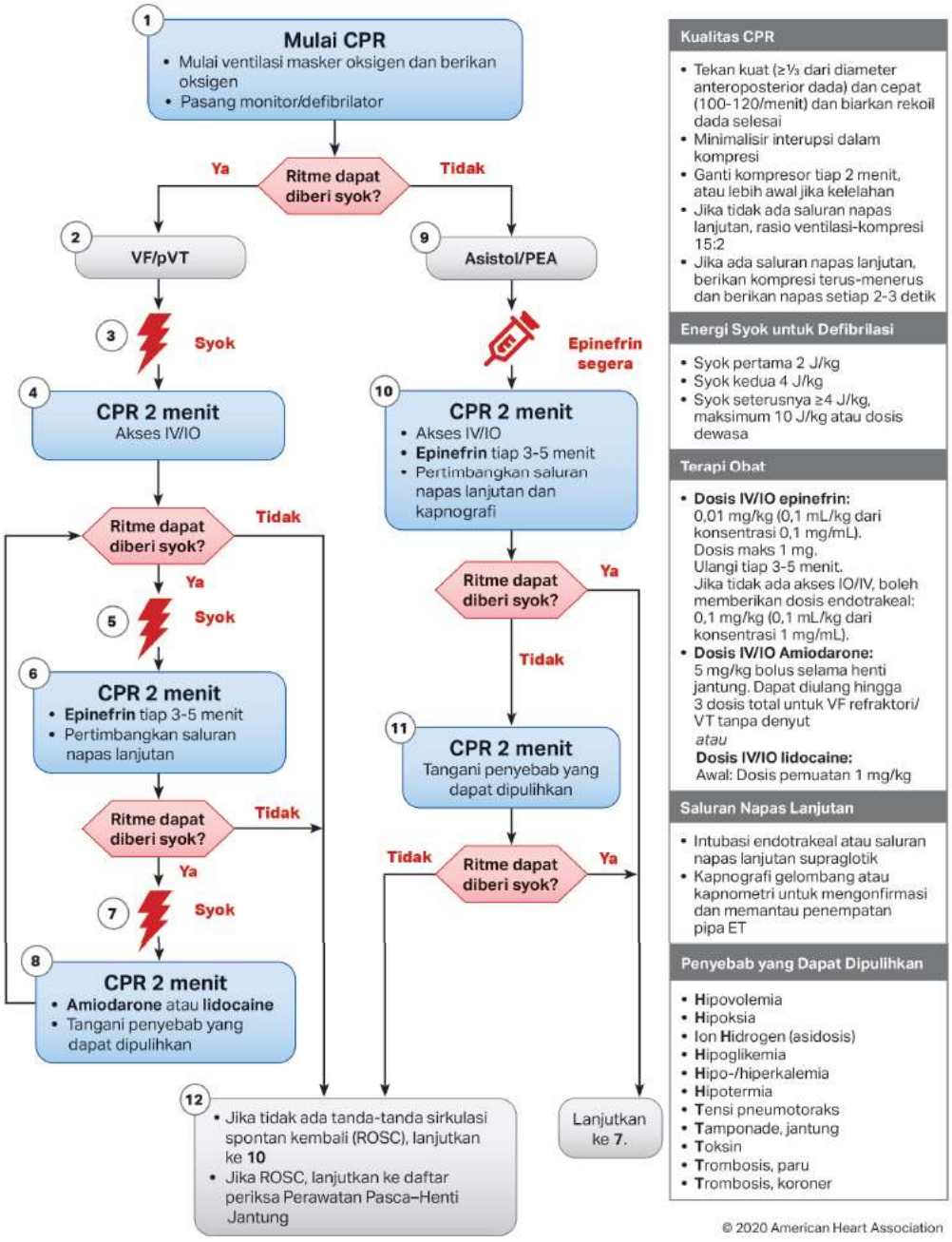

Figure 7 Cardiac Arrest Algorithm in Children

RESEARCH METHOD

The research method used is a review of publications with an extensive systematic literature search related to the implementation of *Code Blue* in hospitals. through electronic database searches, namely *Google Schoolar*, NCBI, and *Guideline*.

This journal search was conducted by researchers using keywords: *Code Blue* Team Management in Hospitals, CPR, Defibrillation in Cardiac Arrest which is limited from 2013 to 2022. It also includes a review of the National and International CPR Guidelines.

The journals and articles obtained are then filtered based on the title and abstrak chosen by the researcher based on the desired criteria, namely, the Implementation of *Code Blue* in Hospitals. Meanwhile, journals that are not relevant to the research topic are issued. After sorting according to these criteria, a systematic review is carried out. The inclusion criteria used in the systematic review are journals published from 2013 to 2022 on *the Code Blue* System in Hospitals, CPR, and Cardiac Arrest Management.

Of the 10,349 articles found in searches that match the keywords needed by researchers, restrictions were made based on publication time from 2013 to 2022, then 5,042 articles were obtained, then restrictions were made based on the ease of access to *fulltext* available 103 articles with conformity to the criteria, targets and goals of obtaining 9 articles for systematic review.

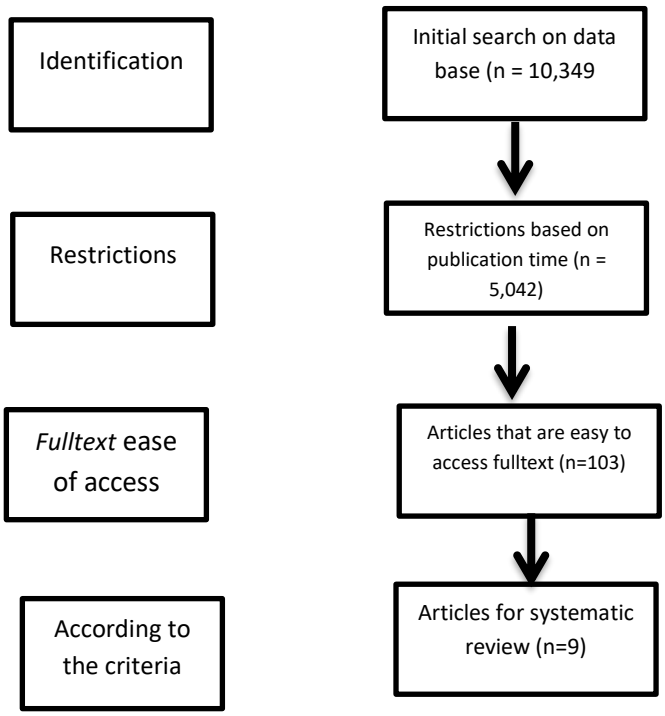

Figure 8 Article *Review* Selection Process Scheme

RESULT AND DISCUSSION

Code blue system is an emergency system consisting of a code blue team consisting of doctors and paramedics designated as a "code-team", who quickly go to patients to carry out rescue measures on all patients with emergencies during respiratory arrest and or cardiac arrest . The application of the code blue system aims to reduce

mortality and increase the return of spontaneous circulation (ROSC) or the return of spontaneous circuses.

Patients who experience cardiac arrest are given assistance in the form of Basic Life Support (BHD), where the p rinsi is to provide external assistance to circulation and ventilation in patients with cardiac arrest or respiratory arrest through RJP / CPR. 4 CPR of good quality, with early defibrillation, early correction of underlying etiology and effective post-resuscitation treatment are essential to improve neurological recovery after a heart attack.

In implementing Code Blue in hospitals, it is necessary to pay attention to important things, such as (Rahmawati, Emaliyawati, & Kosasih, 2019) :

1. In some studies, it is said that patients with Code Blue are not always patients with cases of cardiopulmonary arrest, so it is necessary to verify the patient's condition before activating Code Blue.
2. Many studies have shown that the existence of the Code Blue team is effective in preventing deaths. This can be seen from the indicators of spontaneous circulation returning to normal from the patient or commonly known as ROSC (Return of Spontaneous Circulation). One of the studies from Thomas & Shafi (2017) in the study "Survival After In Hospital Cardiac Arrest and Code blue Initiation" found that 130 patients could be saved or obtained patient circulation back to normal (ROSC) from 442 code blue calls (Desrochers, 2021).
3. The process of providing basic life support assistance in the Code Blue system refers in principle to the chain of survival in accordance with the 2015 AHA guidelines. These include: immediate detection of the victim's condition and asking for help (early access), immediate cardiopulmonary resuscitation (early cardiopulmonary resuscitation), early defibrillation, early advanced cardiovascular life support and post cardiac-arrest care.

The implementation of Code Blue assistance in accordance with the AHA (American Heart Association) protocol will provide better results, which can be seen in Code Blue help in the number of patients who have been helped well, with indicators of ROSC incidence.

CONCLUSION

Code blue is a code activation system in patients who experience cardiac arrest, respiratory arrest, or emergency situations that require resuscitation. Several major hospitals in Indonesia have implemented a Code Blue activation system by using a telephone network to a certain number agreed upon by each house.

The establishment of the code blue system aims to reduce mortality and increase the rate of spontaneous return of circulation. Cardiac arrest can be restored if treated immediately with cardiopulmonary resuscitation or cardiopulmonary resuscitation (CPR/RJP) and defibrillation.

With the Code Blue team, it is effective in preventing death cases. One of the indicators of seeing the success of the Code Blue Team Service is the occurrence of ROSC (Return of Spontaneous Circulation) in patients with heart-lung arrest.

The management of cardiac-pulmonary arrest through the services of the Code Blue Team carried out in accordance with the protocols of the international guidelines compiled by the AHA is carried out correctly and effectively will provide better results. So that it can improve the life rate of patients with previous cases of Cardiacpulmonary

Arrest by looking at the ROSC indicator as a success in cardiacpulmonary arrest management

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