

GUIDELINES FOR RESUSCITATION TRAINING

IN MINISTRY OF HEALTH MALAYSIA HOSPITALS & HEALTHCARE FACILITIES



This guideline was developed by:
The National Committee on Resuscitation Training (NCORT)
Ministry of Health Malaysia.

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Glossary of Abbreviations

AED	Automated External Defibrillator
AHA	American Heart Association
ALS	Advanced Life Support
APLS	Advanced Paediatric Life Support
BLS	Basic Life Support
CPR	Cardiopulmonary Resuscitation
ERC	European Resuscitation Council
FBAO	Foreign Body Airway Obstruction
HCW	Healthcare Workers
ILCOR	International Liaison Committee on Resuscitation
KPI	Key Performance Indicator
MOH	Ministry of Health
NRP	Neonatal Resuscitation Program
PALS	Paediatric Advanced Life Support
RCA	Resuscitation Council of Asia
ROSC	Return of Spontaneous Circulation



Foreword & Introduction





Foreword

by

Dato' Sri Dr Hasan bin Abdul Rahman
Director General of Health Malaysia

It gives me great pleasure to pen a few words on the production of this guideline on resuscitation and resuscitation training for Ministry of Health (MOH) hospitals and healthcare facilities.

To the public and our patients, saving lives is very likely the number one expectation from us. Saving lives is exactly what cardiopulmonary resuscitation (CPR) is about. The art of resuscitation was first organized and documented in the 18th century. In 1960, it became a skill that was widely accepted. In our MOH, CPR training was formalized in 1986 with the introduction of the American Heart Association (AHA) CPR guidelines. Medical and nursing schools began introducing CPR training in the 1990s.

In 1992, an international committee was formed to come up with guidelines for CPR training. It is called the International Liaison Committee on Resuscitation (ILCOR). The committee comprised of representative resuscitation organizations from America, Canada, Europe, Australia, New Zealand and South Africa. This committee began an evidence based accumulation and review of the science of resuscitation in the year 2000. This was reviewed again in 2005 and 2010.

The third international consensus on the science of resuscitation and treatment recommendation was released late in 2010. Its intention is for communities and countries to utilise the science and adapt to the local resources and cultural needs.

MOH formed the National Committee on Resuscitation Training (NCORT) in 2006. This year the committee has worked on adapting the 2010 ILCOR guidelines for use in our MOH. With this guideline, I hope we shall set the path to a credible, systematic and well organised CPR training of all HCWs in the MOH. The job does not end here. Creation of training material, instructor updates, monitoring of programs and achieving KPIs shall have to be done. This guideline shall be used till 2016 when an update in the science of resuscitation shall be completed by ILCOR.

I want to thank the committee for their efforts in producing this guideline.



Introduction

by

Dr Kauthaman Mahendran

Chairman, National Committee on Resuscitation Training

The National Committee on Resuscitation Training (NCORT) for MOH Hospitals was formed in 2006. The primary aim was to streamline and provide direction for resuscitation training in MOH Hospitals. A policy booklet was published in February 2007 and circulated to all hospitals.

The International Liaison Committee on Resuscitation (ILCOR) was founded on November 22, 1992, and currently includes representatives from the American Heart Association (AHA), the European Resuscitation Council (ERC), the Heart and Stroke Foundation of Canada (HSFC), the Australian and New Zealand Committee on Resuscitation (ANZCOR), Resuscitation Council of Southern Africa (RCSA), the Inter American Heart Foundation (IAHF) and the Resuscitation Council of Asia (RCA). Its mission is to identify and review international science and knowledge relevant to cardiopulmonary resuscitation (CPR) and emergency cardiovascular care (ECC) and when there is consensus, to offer treatment recommendations. Efforts are underway for Malaysia to gain membership into the RCA and subsequently ILCOR.

In 2010 ILCOR produced a document (J.P. Nolan et al./Journal Resuscitation 81S (2010) pages e1-277, journal homepage: www.elsevier.com/locate/resuscitation with international consensus statements that summarise the science of resuscitation and, wherever possible, treatment recommendations. This consensus was produced after a review of thousands of peer-reviewed publications by 313 experts from 30 countries. The process took a total of 3 years between 2007 and 2010. A total of 277 specific recommendations were produced.

NCORT reviewed the ILCOR consensus document and has adapted the recommendations to suit our local cultural, economic, system differences in practice and resources and ease of training. We have ensured that our guidelines are consistent with the science in the ILCOR document.

NCORT created 5 sub-committees with representation from resuscitation trainers from the departments of Anaesthesia and Intensive Care, Emergency and Traumatology, Cardiology, Paediatrics and General Medicine. The sub-committees reviewed separate chapter to come up with our local recommendation. (See appendix vii for list of subcommittee members)

continue to the next page >>

The guidelines were then sent electronically to heads of services and known doctors directly involved in resuscitation training in their respective hospitals. They were given 2 weeks to submit their opinions. The opinions were reviewed electronically by NCORT members and accepted or rejected based on consensus. Where significant differences in opinion were found, NCORT included comments explaining why a specific recommendation was chosen over others.

This document is available on the MOH website.

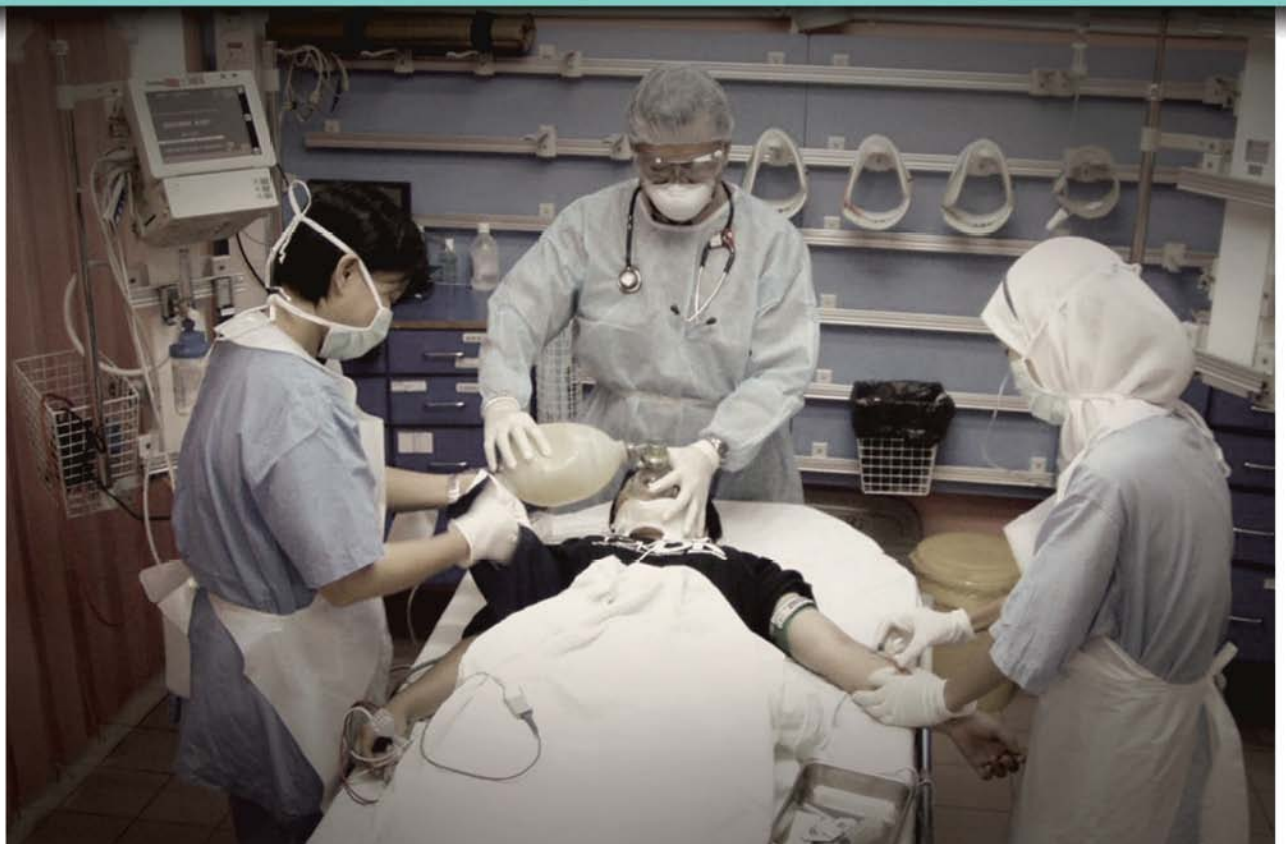
NCORT shall produce teaching aids based on this document for use in all MOH Hospitals. This document and accompanying teaching aids shall be used until 2016. A review shall then be undertaken by NCORT based on the expected ILCOR consensus statement in 2015.

A flow chart on the process of producing this guideline is given in appendix i.

It is hoped that these guidelines shall provide direction and consistency in CPR training with the end result of improved patient survival rates from cardiac arrest.



Chapter 1-8



Chapter

Adult Basic Life Support (BLS)

Based on ILCOR Part 5 and 7

Highlights

The following is a summary of the most important issues to highlight during Adult BLS training.

1. Cardiac arrest shall be recognized by unresponsiveness and absence of normal breathing.
2. Gasping and agonal breaths shall be highlighted as abnormal breathing and indicators of cardiac arrest.
3. Carotid pulse check shall not be performed prior to beginning chest compressions.
4. Chest compressions shall begin immediately after the absence of normal breathing.
5. High quality and uninterrupted chest compressions shall be emphasized.
6. Chest compressions shall resume immediately after delivery of the first shock from a defibrillator.

Issues addressed:

Assessing Danger and Safety to Rescuer Prior to Resuscitation

This issue is not addressed in the ILCOR statement.

A consensus within our committee was arrived based on our experiences.

Recommendation

Healthcare workers (HCW) shall be taught to protect themselves from danger during CPR. This shall include:

- 1.1 Wearing Personal Protective Equipment; mask, apron, and gloves.
- 1.2 Avoiding spills of body fluids, sharps and electrical wires at bedside.
- 1.3 Determining unstable beds and trolleys.

Responsiveness

This issue is not addressed in the ILCOR statement.

A consensus within our committee was arrived based on our experiences

Recommendation

- 2.1 Responsiveness shall be assessed by tapping both shoulders twice and calling 'Hello, hello are you OK'.

3 Shouting (Calling) for Help

This issue is not addressed in the ILCOR statement.

A consensus within our committee was arrived based on our experiences

Recommendation

- 3.1 HCW shall be taught to shout the following words after suspecting a cardiac arrest. 'Emergency! Emergency! Bring the resuscitation trolley and defibrillator!'

4 Positioning of Victim

ILCOR statement page e56 states 'It is reasonable to roll a face down, unresponsive victim into the supine position to assess breathing and assess circulation. Concern for protecting the neck should not hinder the evaluation process or delay life-saving procedures'.

It further states in page e51 'CPR should be performed on a hard surface when possible. Air filled mattresses should be routinely deflated during CPR. There is insufficient evidence for or against the use of backboards'.

Recommendation

- 4.1 Victims found on the floor should be initially managed on the floor.
- 4.2 Face down victims shall be rolled over to the supine position.
- 4.3 Air filled mattresses should be deflated during CPR.
- 4.4 Backboard use is not recommended because of delays in initiation or interruptions of compressions and the potential of dislodging tubes and catheters during backboard placement.

5 Airway

The ILCOR recommendation in page e53 states 'For unresponsive adults and children, it is reasonable to open the airway using the head tilt-chin lift maneuver when assessing breathing or giving ventilations'.

The AHA feels this step shall delay time to first compression. We feel the delay in performing this step is minimal and advocate it be done together with assessing breathing within 10 seconds.

This step also allows the continued use of the simple ABCD algorithm where A stands for airway.

Recommendation

- 5.1 The airway shall be opened after shouting for help using the 'head tilt-chin lift' maneuver.

6 Breathing

ILCOR statement (page e49) advocates breathing assessment to look for absence of breaths or presence of abnormal breathing as a sign of cardiac arrest. After determining the absence of normal breathing, rescuers shall proceed to chest compressions. It is silent on the method to assess for breathing.

The traditional way taught to assess for breathing was 'look, listen and feel for not more than 10 seconds'. The committee felt the 'look' component is more commonly used than the 'listen' and 'feel' components and may be more useful.

This step also allows the continued use of simple ABCD algorithm where B shall stand for the assessment of breathing. It shall not refer to giving 2 ventilations.

The time taken to open the airway and check for breathing should be not more than 10 seconds. This potential 10 seconds delay to first compression is thought to be minimal.

Recommendation

- 6.1 Breathing shall be assessed by looking at the chest, neck and face for not more than 10 seconds.
- 6.2 The absence of breathing or presence of abnormal breathing shall identify cardiac arrest.
- 6.3 HCW shall be taught to recognize agonal gasps as a sign of cardiac arrest.
- 6.4 Chest compression shall begin with absence of normal breathing.

7 Checking Pulse in The Initial Assessment of an Unresponsive Victim

ILCOR statement page e49 states 'Palpation of the pulse as an indicator of presence or absence of cardiac arrest is unreliable'.

Recommendation

- 7.1 Pulse check is not recommended prior to initiation of first chest compression.

8 Chest Compressions

ILCOR statements in page e50 and 51 emphasise high quality chest compressions.

Recommendation

High quality chest compression shall be emphasized in BLS training.

The components include:

- 8.1 Location:
The lower half of the sternum shall be the site for hand placement. This is taught as 'Place the heel of your hand in the centre of the chest with the other hand on top'. This instruction shall be accompanied by the demonstration of placing the hands on the lower half of the sternum. The inter nipple line as a landmark for hand placement shall not be taught.
- 8.2 Rate:
At least 100 compressions per minute.
- 8.3 Depth:
At least 5 cm.
- 8.4 Recoil:
Complete recoil of the chest must be allowed after each compression.
- 8.5 Interruption of chest compression:
Shall be minimized during the entire resuscitation attempt.

9 Ratio of Chest Compression to Ventilation

ILCOR statement page e55 states 'A compression-ventilation ratio of 30:2 is reasonable for an adult victim of cardiac arrest whose airway is not secured'.

Recommendation

9.1 The compression-ventilation ratio shall be 30:2

10 Ventilation

ILCOR statement page e54 states 'For mouth to mouth ventilation for adult victims using exhaled air or bag-mask ventilation with room air or oxygen, it is reasonable to give each breath over a 1 second inspiratory time and with an approximate volume of 600ml to achieve chest rise'.

It is not possible to teach providers how to approximate 600ml.

In MOH hospitals and healthcare facilities, bag mask devices are usually available. Performing mouth to mouth ventilations is hardly done as there is fear of disease transmission and it may be culturally sensitive. It however may need to be done in areas without a bag-mask device.

Protective devices like pocket mask and face shields are available to reduce the uneasiness of mouth to mouth ventilation.

Recommendation

- 10.1 Use of bag-mask device shall be taught to all HCW.
- 10.2 Each breath shall be given within a 1 second inspiratory time until a chest rise is observed.
- 10.3 Mouth to mouth ventilation shall be taught for use in areas without bag mask devices.
- 10.4 Use of protective devices shall be taught during BLS courses.

11 Defibrillation

Early defibrillation is an essential step in the chain of survival for victims of cardiac arrest. It is advocated for use by lay rescuers.

Recommendation

- 11.1 Defibrillation (AED and/or Manual) training shall be part of BLS course content.
- 11.2 Rescuers shall be taught to attach the defibrillator as soon as it is available, with minimal interruptions to chest compression.
- 11.3 Chest compression should immediately resume after 1 shock.

12 Reassessment During CPR

Recommendation

- 12.1 After every 5 cycles or 2 minutes of CPR, rescuers shall check for normal breathing.

13 Teaching of Pulse Check

ILCOR statement page e50 states 'For healthcare professionals it is reasonable to check a pulse if an organized rhythm is visible on the monitor at the next rhythm check'.

Recommendation

- 13.1 If a cardiac monitor is available, the pulse (carotid or femoral) shall be checked when an organized rhythm is seen.
- 13.2 HCW who are expected to be familiar with ECG monitors shall be taught pulse (carotid and femoral) check.

14 Stopping CPR

Recommendation

- 14.1 CPR can be stopped in following circumstances:
 - 14.1.1 Victim recovers with normal breathing.
 - 14.1.2 Rescuer is exhausted.
 - 14.1.3 Assistance arrives to take over CPR.
- 14.2 Rescuers shall be taught to switch the role of chest compressions every 5 cycles or 2 minutes to avoid fatigue.

15 Recovery Position

The ILCOR 2010 statement says there is no change to the 2005 statement on recovery position.

The pulse check is unreliable as an indicator of cardiac arrest. Hence the return of spontaneous circulation can be assumed to have occurred with the return of normal breathing.

Recommendation

- 15.1 Recovery position is applied when victims resume normal breathing but remain unresponsive.
- 15.2 HCW shall be taught the recovery position during the BLS course. The technique taught must ensure the following:
 - 15.2.1 Victim is in the true lateral position.
 - 15.2.2 Head in the dependant position.
 - 15.2.3 Position is stable.
 - 15.2.4 Position is safe and comfortable to the victim.

16 BLS Algorithm for HCW

Recommendation

The D-R-S-A-B-C-D shall be used to simplify the learning process. This can also be utilised for public BLS training. Refer to appendix ii.

17 Conscious Adult Foreign Body Airway Obstruction (FBAO)

ILCOR statement page e53 states 'Chest thrusts, back blows or abdominal thrusts are effective in relieving FBAO in conscious adults. The techniques should be applied in rapid sequence until the obstruction is relieved. More than 1 technique may be needed. There is insufficient evidence for a treatment recommendation specific for an obese or pregnant patient with FBAO'.

Recommendation

- 17.1 Back blows and/or abdominal thrusts shall be applied in rapid and continuous sequence for a conscious adult with FBAO and poor oxygenation (universal distress sign, ineffective cough, turning blue).
- 17.2 Back blows and/or chest thrusts shall be applied in rapid and continuous sequence for a conscious adult who is pregnant or obese with FBAO and poor oxygenation (universal distress sign, ineffective cough, turning blue)
Cardiac arrest can be associated with other diseases or circumstances. This may need special consideration when instituting CPR. (See following guidelines 18 - 21)

18 Unconscious Adult FBAO

ILCOR statement page e53 states 'The finger sweep may be used in the unconscious victim with FBAO if solid material is visible in the airway'.

Recommendation

- 18.1 The unconscious adult with FBAO shall be managed the same way as an unresponsive victim in the BLS algorithm.
- 18.2 The finger sweep shall only be performed if solid material is seen in the airway.

19 Cardiac Arrest Caused by Asthma, Drowning and Drug Overdose

ILCOR statement page e107 states 'There is no change in treatment algorithm in cardiac arrest caused by these condition'.

Recommendation

- 19.1 No special considerations are needed when instituting basic life support in cardiac arrest due to asthma, drug overdose and drowning.

20 Cardiac Arrest in Pregnancy

ILCOR statement page e107 states 'There is insufficient evidence to support or refute the use of specialized obstetric resuscitation techniques in maternal cardiac arrest. Treatment may be guided by understanding the physiology of pregnancy, the importance of releasing aorto-caval compression, the increased risk for hypovolemia and the compression advantage through positioning'.

AHA guidelines state 'It is reasonable to perform manual left uterine displacement in the supine position first. If this is unsuccessful, and an appropriate wedge is readily available, then providers may consider placing the patient in a left-lateral tilt of 27° to 30° (page S834, Rees GA et al, Resuscitation in late pregnancy. Anaesthesia.1988; 43:347–349)'.

Recommendation

- 20.1 Manual left uterine displacement shall be performed in pregnancy associated with cardiac arrest.

21 Cardiac Arrest Associated with Trauma

BLS for the trauma patient is fundamentally the same as that for the patient with primary cardiac arrest. However, when multi-system trauma is present or trauma involves the head and neck, the cervical spine must be stabilised.

Concern for protecting the neck should not hinder the evaluation process or delay life-saving procedures (ILCOR page e58). Jaw thrust should be used instead of a head tilt-chin lift to establish a patent airway (Vanden Hoek T.L et al, AHA 2010 Guideline Part 12: Cardiac Arrest in Special Situation page S844).

Recommendation

21.1 Jaw thrust can be used instead of a head tilt-chin lift to establish a patent airway if multi-system trauma is present or in head and neck trauma; however this should not delay assessment and commencement of CPR.

22 CPR Techniques and Devices

The following circulatory adjuncts and techniques were reviewed by ILCOR

- Interposed abdominal compression (IAC)-CPR
- Active compression-decompression (ACD)-CPR
- Open-chest CPR
- Load distributing band (LDB)-CPR
- Mechanical (piston)-CPR
- Impedance threshold device (ITD)
- Lund University Cardiac Arrest System (LUCAS)

There was insufficient evidence to support or refute the use of any of the above techniques and devices (ILCOR page e86 - 88)

Cough CPR

ILCOR statements page e52 state 'Use of cough CPR may be considered only for patients maintaining consciousness during the initial seconds to minutes of VF or pulseless VT cardiac arrest in a witnessed, monitored, hospital setting (such as a cardiac catheterization laboratory)'.

Precordial Thump

ILCOR statement page e52 states 'Precordial thump is relatively ineffective for VF, and it should not be used for unwitnessed out of hospital cardiac arrest. Precordial thump may be considered for patients with monitored, unstable VT if a defibrillator is not immediately available'.

All the above techniques and devices have the potential to delay chest compression and defibrillation.

Recommendation

22.1 The use of the above CPR techniques and devices shall not be taught during Adult BLS training.

Chapter 2

Adult Life Support

Based on ILCOR Part 8

Highlights

The following is a summary of the most important issues to highlight during ALS training.

1. Advanced Life Support (ALS) is Basic Life Support (BLS) with the addition of invasive techniques e.g. manual defibrillation, advanced airway management, intravenous access and drug therapy.
2. D-R-S-A-B-C (**D**anger, **R**esponsiveness, **S**hout for help, **A**irway, **B**reathing and **C**hest compression) taught in BLS is to be followed.
3. Defibrillation techniques and its danger shall be taught. Continuation of chest compressions while a defibrillator is charged needs to be stressed.
4. Advanced airway management including insertion of supraglottic airway devices shall be taught. The teaching of endotracheal intubation is optional. However the emphasis shall be that such procedures shall only be carried out by healthcare personnel who are trained and have regular opportunities to refresh their skills.
5. High quality and uninterrupted chest compressions need to be re-emphasized. Chest compressions are paused briefly only to enable specific interventions.
6. Peripheral intravenous and intraosseous route of drug delivery shall be taught.
7. With regards to drug therapy, adrenaline and amiodarone shall be the two drugs used in adult cardiac arrest. Atropine is no longer recommended for PEA/asystole.
8. Unstable Periarrest arrhythmia shall also be taught in ALS.

Issues addressed

1 Defibrillation

Defibrillation is indicated for treating ventricular fibrillation and pulseless ventricular tachycardia. Defibrillation as soon as possible provides the best chance of survival in victims with VF/pulseless VT.

Refer to Chapter 3 for Defibrillation

2 Advanced Airway Management

2.1. Nasopharyngeal and Oropharyngeal Airway

ILCOR statement page e94 states 'Oropharyngeal and nasopharyngeal airways have long been used in cardiac arrest, despite never being studied in this clinical context. It is reasonable to continue to use oropharyngeal and nasopharyngeal airways when performing bag-mask ventilation in cardiac arrest, but in the presence of a known or suspected basal skull fracture an oral airway is preferred'.

Recommendation

We shall teach use oropharyngeal and nasopharyngeal airways when performing bag-mask ventilation in cardiac arrest.

2.2. Cricoid Pressure

ILCOR statement page e94 states 'The routine use of cricoid pressure to prevent aspiration in cardiac arrest is not recommended. If cricoid pressure is used during cardiac arrest, the pressure should be adjusted, relaxed, or released if it impedes ventilation or placement of an advanced airway'.

Recommendation

Cricoid pressure shall not be taught in ALS.

2.3. Advanced Airway Placement

ILCOR statement page e95 states 'There is inadequate evidence to define the optimal timing of advanced airway placement during cardiac arrest. Without adequate training and experience, the incidence of complication of placement of advanced airway is high. In addition, repeated attempts in intubation shall lead to interruption of chest compressions'.

Recommendation

To avoid substantial interruptions in chest compressions, providers may defer attempts to insert airway devices/ adjuncts until ROSC.

In the presence of trained personnel, placement of advanced airway shall be attempted after 10 cycles (4 minutes) of chest compression.

2.4. Supraglottic Airway Devices

ILCOR statement page e95 states 'A supraglottic airway device may be considered by healthcare professionals trained in its use as an alternative to bag-mask ventilation during cardiopulmonary resuscitation'.

It further states 'Healthcare professionals trained to use supraglottic airway devices may consider their use for airway management during cardiac arrest and as a backup or rescue airway in a difficult or failed tracheal intubation'.

There are also no data supporting the routine use of any specific approach to airway management during cardiac arrest.

Recommendation

The supraglottic devices/adjuncts can be used during cardiac arrest and must be chosen according to local training and availability.

Supraglottic airway devices/adjuncts shall be taught in ALS.

2.5. Endotracheal Intubation

This issue is not addressed in the ILCOR statement.

There is considerable evidence that without adequate training or ongoing skills maintenance, the incidence of failed intubations and complications such as unrecognised oesophageal intubation or unrecognised dislodgement is unacceptably high. A consensus within our committee was arrived based on our experiences. Teaching of endotracheal intubation shall be optional and if it is taught, emphasis shall be placed on complications and minimal interruptions to chest compressions. We shall further emphasize that endotracheal intubation should be attempted only if the rescuer is very confident and not more than 1 attempt is made.

Recommendation

The teaching of endotracheal intubation shall be optional in ALS.

2.6. Confirming Advanced Airway Placement

ILCOR statement page e96 states 'Waveform capnography (if available) is recommended to confirm and continuously monitor the position of a tracheal tube in victims of cardiac arrest, and it should be used in addition to clinical assessment (auscultation and direct visualization are suggested)'.

If waveform capnography is not available, a nonwaveform carbon dioxide detector or oesophageal detector device in addition to clinical assessment (auscultation and direct visualization are suggested) is an alternative.

Recommendation

We shall use waveform capnography, if available, to confirm and continuously monitor the position of a tracheal tube in victims of cardiac arrest, in addition to clinical assessment.

If waveform capnography is not available, a non-waveform carbon dioxide detector can be used.

2.7. Supplemental Oxygen During Cardiac Arrest: 100% Versus Titration

ILCOR statement page e96 states 'There is insufficient evidence to support or refute the use of a titrated oxygen concentration or constant 21% oxygen (room air) when compared with 100% oxygen during adult cardiac arrest. In the absence of any other data there is no reason to change the current treatment algorithm, which includes use of 100% oxygen during adult cardiac arrest'.

Recommendation

The use of 100% oxygen in the current treatment algorithm during adult cardiac arrest shall be continued.

2.8. Passive Oxygen Versus Positive Pressure Oxygen During CPR

ILCOR statement page e97 states 'There is insufficient evidence to support or refute the use of passive oxygen delivery during CPR to improved outcomes (ROSC, hospital discharge rate, and improve neurological survival) when compared with oxygen delivery by positive pressure ventilation'.

Recommendation

The use of passive oxygen delivery can be considered if oxygen delivery by positive pressure ventilation is not possible.

2.9. Monitoring Physiological Parameters During CPR

ILCOR statement page e97 states 'Continuous capnography or capnometry monitoring, if available, may be beneficial by providing feedback on the effectiveness of chest compressions'.

ILCOR statement page e120 further states 'Quantitative measurement of end tidal CO₂ may be a safe and effective noninvasive indicator of cardiac output during CPR and may be an early indicator of ROSC in intubated patients. Although low values of end tidal CO₂ are associated with a low probability of survival, there are insufficient data to support or refute a specific cutoff of end tidal CO₂ at different time intervals as a prognostic indicator of outcome during adult cardiac arrest. The committee feels the awareness of this technique is good but the details of its use are unnecessary in a ALS course. This is because of its limited availability in the Ministry of Health'.

Recommendation

Continuous capnography monitoring, if available, can be utilised to provide feedback on the effectiveness of chest compressions. Details of this monitoring, however, shall not be taught during ALS training.

3 Intravenous Access

3.1. Peripheral Versus Central Venous Drug Delivery

This issue is not addressed in the ILCOR statement.

A consensus within our committee was arrived based on our experiences. Peripheral venous cannulation is quicker, easier to perform and safer. Central venous cannulation requires interruption of chest compressions.

Recommendation

Intravenous access should be obtained as soon as possible with minimal interruptions to chest compressions. Peripheral venous cannulation shall be carried out. Central venous cannulation shall not be taught during ALS training.

3.2. Intraosseous Route

This issue is not addressed in the ILCOR statement.

Intraosseous injection of drugs achieves adequate plasma concentrations in a time comparable with injection through a central venous catheter.

Recommendation

Intraosseous route shall be used when intravenous access is difficult or impossible. It shall be taught during ALS.

3.3. Tracheal Route

This issue is not addressed in the ILCOR statement.

Tracheal route of drug administration results in unpredictable plasma concentrations. In addition, the optimal tracheal dose of most drugs is unknown.

Recommendation

Tracheal route shall be considered only if intravenous/intraosseous route is not possible. It shall be introduced during ALS training.

4 Drugs During Adult Cardiac Arrest

4.1 Vasopressor

ILCOR statement page e99 states 'Although there is evidence that vasopressors (adrenaline or vasopressin) may improve ROSC and short-term survival, there is insufficient evidence to suggest that vasopressors improve survival to discharge and neurological outcome. There is insufficient evidence to suggest the optimal dosage of any vasopressor in the treatment of adult cardiac arrest. Given the observed benefit in short-term outcomes, the use of adrenaline or vasopressin may be considered in adult cardiac arrest'.

Recommendation

Adrenaline or vasopressin shall be used in adult cardiac arrest.

4.2. Amiodarone/Lignocaine

ILCOR statement page e99 states 'Amiodarone may be considered for those who have refractory VT/VF, defined as VT/VF not terminated by defibrillation, or VT/VF recurrence in out-of-hospital cardiac arrest or in-hospital cardiac arrest. There is inadequate evidence to support or refute the use of lidocaine in the same settings'.

Recommendation

Amiodarone Shall Be Used in Refractory VF/VT.

If VF/VT persists after three shocks, give 300 mg amiodarone by bolus injection. A further bolus of 150 mg may be given for recurrent or refractory VF/VT, followed by an infusion of 900 mg over 24hours.

Lignocaine 1 mg/kg may be considered in refractory VT/VF only if amiodarone is not available.

4.3. Atropine

ILCOR statement page e99 states 'There is insufficient evidence to support or refute the use of atropine in cardiac arrest to improve survival to hospital discharge'.

Recommendation

Atropine shall not be used in adult cardiac arrest (PEA/asystole).

4.4. Calcium, Steroid and Hormonal Therapy, Sodium Bicarbonate and Fibrinolytic Therapy

ILCOR statement page e100 states 'Routine administration of calcium for treatment of in-hospital and out-of-hospital cardiac arrest is not recommended. There is insufficient evidence to support or refute the use of corticosteroids alone or in combination with other drugs during cardiac arrest'.

Routine administration of sodium bicarbonate for treatment of in-hospital and out-of-hospital cardiac arrest is not recommended.

Routine administration of fibrinolytics for the treatment of in-hospital and out-of-hospital cardiac arrest is not recommended.

Recommendation

These drugs shall not be used routinely in adult cardiac arrest.

5 Anti-arrhythmics In The Peri-arrest Period

5.1. Narrow Complex Tachycardia

ILCOR statement page e101 states 'Vagal maneuver, IV adenosine, verapamil, and diltiazem are recommended as first-line treatment strategies in the termination of narrow-complex tachycardias. Nadolol, sotalol, propafenone, and amiodarone may be considered'.

Verapamil, diltiazem, nadolol, sotalol and propafenone are not easily available in our country.

Recommendation

As these maneuver and drugs are used in stable narrow complex tachycardia.

5.2. Atrial Fibrillation

ILCOR statement page e102 states 'Patients who are haemodynamically unstable with atrial fibrillation should receive prompt electrical cardioversion'.

Rate control in atrial fibrillation: Beta-blockers and diltiazem are the drugs of choice for acute rate control in most individuals with atrial fibrillation and rapid ventricular response. Digoxin and amiodarone may be used in patients with congestive heart failure, and amiodarone may also result in cardioversion to normal sinus rhythm. Magnesium and clonidine have rate controlling effects, though there are fewer data supporting their use.

Rhythm control of atrial fibrillation: Chemical cardioversion can be achieved with ibutilide, dofetilide, and flecainide. Amiodarone can also be used for chemical cardioversion, but it is less effective. Quinidine or procainamide may be useful for cardioversion, but their use is less well established. Propafenone is more effective than placebo but not as effective as amiodarone, procainamide, or flecainide. There is no role for digoxin in chemical cardioversion.

Recommendation

Prompt electrical cardioversion is recommended in haemodynamically unstable patient. Hence electrical cardioversion shall be taught in ALS.

In haemodynamically stable patient, expert help should be sought. The anti-arrhythmics mentioned in the ILCOR statement shall not be taught with the exception of amiodarone as amiodarone is also the drug used in adult cardiac arrest.

5.3. Wide Complex Tachycardia

ILCOR statement page e102 states 'Procainamide is recommended for patients with haemodynamically stable monomorphic ventricular tachycardia (mVT) who do not have severe congestive heart failure or acute myocardial infarction. Amiodarone is recommended for patients with haemodynamically stable mVT with or without either severe congestive heart failure or acute myocardial infarction. Nifekalant (not approved for use in all countries) may be useful in improving outcomes in shock refractory VF/VT even though it did not seem to be effective in immediately terminating the arrhythmia. Sotalol may be considered for patients with haemodynamically stable sustained mVT, including patients with acute myocardial infarction'.

Recommendation

Prompt electrical cardioversion is recommended in haemodynamically unstable patient. Hence electrical cardioversion shall be taught in ALS.

In haemodynamically stable patient, expert help should be sought. The anti-arrhythmics mentioned in the ILCOR statement shall not be taught with the exception of amiodarone as amiodarone is also the drug used in adult cardiac arrest.

5.4. Undifferentiated Regular Stable Wide-complex Tachycardia

ILCOR statement page e104 states 'In undifferentiated regular stable wide-complex tachycardia, IV adenosine may be considered relatively safe, may convert the rhythm to sinus, and may help diagnose the underlying rhythm'.

Recommendation

IV adenosine shall be used in undifferentiated regular wide-complex tachycardia. However, the committee feels that IV adenosine should not be taught in ALS as its use requires the recognition of this tachycardia in the ECG. As the patient is haemodynamically stable, expert help should be sought.

5.5. Polymorphic Wide-complex Tachycardia

ILCOR statement page e105 states 'Polymorphic wide-complex tachycardia associated with familial long QT may be treated with IV magnesium, pacing and/or B-blockers; however, isoprenaline should be avoided. Polymorphic wide-complex tachycardia associated with acquired long QT may be treated with IV magnesium. Addition of pacing or IV isoprenaline may be considered when polymorphic wide-complex tachycardia is accompanied by bradycardia or appears to be precipitated by pauses in rhythm. Polymorphic wide-complex tachycardia without long QT may be responsive to IV B-blockers (ischaemic VT; catecholaminergic VT) or isoprenaline (Brugada)'.

Recommendation

Polymorphic wide complex tachycardia shall be treated with IV magnesium. Give magnesium 2 g over 10 minutes and expert help should be sought.

5.6. Bradycardia

ILCOR statement page e106 states 'First-line drug treatment for symptomatic bradycardia is atropine 0.5 - 1 mg IV repeated every 3 - 5 minutes as needed up to 1.5 - 3 mg total.

If not effective, then consider adrenaline (2 - 10 µg/minute) or dopamine (2 - 10 µg/kg/minute). Transcutaneous pacing may be considered when full-dose atropine fails, although it may not be any more effective than second-line drug therapy.

After inferior myocardial infarction, cardiac transplant, or spinal cord injury, theophylline 100 - 200mg slow injection IV (maximum 250 mg) may be given. Atropine should be used with caution in patients with bradycardia after heart transplant as it may cause paradoxical AV block'.

Recommendation

Atropine shall be used for symptomatic bradycardia. Give atropine 0.5 - 1mg IV repeated every 3 - 5 minutes as needed up to 1.5 - 3 mg total.

Adrenaline, and dopamine infusion shall be taught.

Trans-cutaneous pacing shall be introduced during ALS training.

Chapter 3

Defibrillation

Based on ILCOR Part 6

Highlights

The following is a summary of the most important issues to highlight during defibrillation training.

1. Defibrillation is indicated for treating ventricular fibrillation and pulseless ventricular tachycardia.
2. Defibrillation as soon as possible provides the best chance of survival in victims with VF/pulseless VT.
3. Defibrillation should be carried out with minimal interruption in chest compressions.

Issues addressed

1 Timing of Defibrillation

ILCOR statement page e71 states 'There is inconsistent evidence to support or refute delay in defibrillation to provide a period of CPR for patients in non-witnessed VF/pulseless VT cardiac arrest'.

Recommendation

In non-witnessed VF/pulseless VT cardiac arrest, good quality CPR shall be carried out while a defibrillator is retrieved, applied and charged.

In witnessed VF/pulseless VT cardiac arrest, the victim shall be defibrillated as soon as possible.

2 Self-adhesive Defibrillation Pads Compared with Paddles

ILCOR statement page e72 states 'For both defibrillation and AF cardioversion, when using biphasic defibrillators, self-adhesive defibrillation pads are safe and effective and are an acceptable alternative to standard defibrillation paddles'.

In AF cardioversion, using monophasic defibrillators, hand-held paddles are preferable.

Self-adhesive defibrillation pads enable the operator to defibrillate the patient from a safe distance rather than leaning over the patient as occurs with paddles. In addition, gels can spread between the two paddles, creating the potential for a spark.

Recommendation

We shall use self adhesive defibrillation pads when performing defibrillation. In the absence of these pads, hand-held paddles may be used.

3 Placement of Electrodes

ILCOR statement page e72 states 'It is reasonable to place paddles/pads on the exposed chest in an anterior-lateral position. Acceptable alternative positions are anterior-posterior (for paddles/pads) and apex-posterior (for pads). In large-breasted individuals it is reasonable to place the left electrode paddle/pad lateral to or underneath the left breast, avoiding breast tissue. Consideration should be given to the rapid removal of excessive chest hair before the application of paddles/pads but emphasis must be on minimizing delay in shock delivery'.

Recommendation

Paddles/pads shall be placed on the exposed chest in an anterior-lateral position. In large-breasted individuals, the left electrode paddle/pad shall be placed lateral to or underneath the left breast. In individuals with hairy chest, the excessive chest hair should be removed rapidly before the application of paddles/pads.

4 Size of Paddles/Pads

ILCOR statement page e72 states 'There is insufficient evidence to recommend a specific electrode size for optimal external defibrillation in adults. However, it is reasonable to use a paddle/pad size >8 cm'.

Recommendation

The size of paddle/pad size shall be more than 8 cm.

5 Biphasic Compared with Monophasic Defibrillation Waveform

ILCOR statement page e73 states 'Biphasic waveforms are more effective in terminating VF when compared with monophasic waveforms. There is insufficient evidence to recommend any specific biphasic waveform. In the absence of biphasic defibrillators, monophasic defibrillators are acceptable'.

Recommendation

Biphasic defibrillators shall be the preferred machine.

6 Energy Levels

ILCOR statement page e73 states 'It is reasonable to start at a selected energy level of 150J - 200J for a BTE waveform for defibrillation of pulseless VT/VF cardiac arrest. There is insufficient evidence to determine the initial energy levels for any other biphasic waveform. Although evidence is limited, because of the lower total shock success for monophasic defibrillation, initial and subsequent shocks using this waveform should be at 360J'.

Recommendation

The energy level should be based on the manufacturer's recommendation. If this is unknown, use 200J for biphasic waveforms for defibrillation of pulseless VT/VF cardiac arrest. If the first shock is not successful and the defibrillator is capable of delivering shocks of higher energy, the energy can be increased for subsequent shocks.

For monophasic defibrillation, initial and subsequent shocks shall be at 360J.

7 One-shock Compared with Three-stacked Shock Protocols

ILCOR statement page e73 states 'When defibrillation is required, a single shock should be provided with immediate resumption of chest compressions after the shock. Chest compressions should not be delayed for rhythm reanalysis or pulse check immediately after a shock. CPR should not be interrupted until rhythm reanalysis is undertaken'.

Recommendation

A single shock shall be used when defibrillation is required. Chest compression must be resumed immediately after the shock until after 5 cycles or 2 minutes when rhythm reanalysis is undertaken.

8 Implantable Cardioverter Defibrillator (ICD) or Pacemaker

ILCOR statement page e76 states 'In patients with an ICD or a permanent pacemaker, the placement of paddles/pads should not delay defibrillation. When treating an adult with a permanent pacemaker or an ICD, the defibrillator paddle/pad should be placed on the chest wall ideally at least 8 cm from the generator position'.

The anterior-posterior and anterior-lateral paddle/pad placements on the chest are acceptable in patients with a permanent pacemaker or ICD.

Recommendation

When treating an adult with a permanent pacemaker or an ICD, the defibrillator paddle/pad shall be placed on the chest wall at least 8 cm from the generator position.

9 Medication Patch

This issue is not addressed in the ILCOR statement.

A consensus within our committee was arrived based on our experiences. The patch may block delivery of energy from the electrode pad to the heart and may cause small burns to the skin.

Recommendation

Do not place defibrillator paddle/pad directly on top of the medication patch.

10 Shock Using Manual Versus Semiautomatic Mode

ILCOR statement page e76 states 'No significant survival differences have been demonstrated between defibrillation in semiautomatic and manual modes during out-of-hospital or in-hospital resuscitation; however, the semiautomatic mode is preferred because it is easier to use and may deliver fewer inappropriate shocks'.

Trained personnel may deliver defibrillation in manual mode. Use of the manual mode enables chest compressions to be continued during charging, thereby minimizing the preshock pause. When using the defibrillator in manual mode, frequent team training and ECG recognition skills are essential.

The defibrillation mode that results in the best outcome shall be influenced by the system of care and by provider skills, training, and ECG recognition.

Recommendation

We shall have automated external defibrillators (AED) in areas where defibrillators are used infrequently eg: psychiatric wards, radiology suites, clinics, physiotherapy suites etc.

Chapter 4

Immediate Post-Cardiac Arrest Care

After the return of spontaneous circulation (ROSC), the optimization of the cardiorespiratory and organ perfusion should be instituted as soon as possible to increase the likelihood of patient survival with good neurological outcome. Reversible conditions should be identified and managed appropriately.

The following issues shall be discussed during the ALS training

Issues addressed:

1 Airway

ILCOR is silent on the need to change the supraglottic airway adjunct used for airway management during CPR in the immediate post-resuscitation period.

AHA suggested the need to replace the supraglottic airway with an endotracheal tube but the timing of replacement is not determined (Peberdy MA et al, AHA 2010 Guidelines, Part 9 page S769).

Recommendation

With the ROSC, if the airway has not been secured and the patient remains unconscious, the placement of endotracheal tube should commence as soon as possible by staff trained in this procedure.

If supraglottic airway was used in the initial airway management during CPR, it should be replaced with an endotracheal tube as soon as possible.

2 Oxygenation

ILCOR states that there is insufficient evidence to support or refute the use of inspired oxygen concentration titrated to arterial blood oxygenation. (page e116).

AHA recommends to titrate the inspired oxygen to the lowest level required to achieve an arterial saturation of >94% so as to avoid potential oxygen toxicity (Peberdy MA et al, AHA 2010 Guidelines, Part 9 page S769).

Recommendation

Inspired oxygen should be titrated to maintain an oxygen saturation of >94% in the immediate post-cardiac period.

3 Ventilation

After Return of Spontaneous Circulation, routine hyperventilation leading to hypocapnia should be avoided to prevent additional cerebral ischaemia (ILCOR page e116). However ILCOR is silent on the optimal PaCO₂ level.

AHA recommends to maintain PaCO₂ of 40 - 45 mmHg or PETCO₂ (end tidal CO₂) of 35 - 40 mmHg and ventilation rate of 10 - 12/minute (Peberdy MA et al, AHA 2010 Guidelines, Part 9 page S769).

Recommendation

Ventilate the patient at a rate of 10 - 12/minute with tidal volume 6 - 8 ml/kg

Avoid hypocapnia or hypercapnia

Maintain ventilatory parameter of PaCO₂ 40 - 45 mmHg or PETCO₂ 35 - 40 mmHg

4 Support of Circulation

4.1 Fluid therapy

ILCOR states that there is insufficient evidence to support or refute the use of IV fluids following sustained ROSC (page e117). However, it also states that it is reasonable to use IV fluids as part of a package of post-cardiac arrest care.

In AHA 2010 guidelines (Peberdy MA et al, AHA 2010 Guidelines, Part 9 page S769) fluid boluses can be considered in the hypotensive (systolic blood pressure <90 mmHg) patients.

4.2 Vasopressor

ILCOR states that there is insufficient evidence to support or refute the routine use of vasopressors and/or inotropes for improving survival after ROSC (page e117). AHA 2010 guidelines states that vasoactive drugs such as dopamine, noradrenaline or adrenaline may be initiated if necessary and titrated to achieve a minimum systolic blood pressure of >90 mmHg or mean arterial blood pressure of >65 mmHg (Peberdy MA et al, AHA 2010 Guidelines, Part 9 page S769).

4.3 Antiarrhythmic Drugs and Mechanical Assist Device

There is no evidence to support or refute continued administration of amiodarone or lignocaine (ILCOR page e117) and the use of mechanical circulatory support (ILCOR page e118) in post-cardiac arrest patient after ROSC.

4.4 Replacement of IV Lines To Replace The Intraosseous Device Used During CPR

ILCOR is silent on this matter. AHA guidelines suggest the prompt replacement of the intraosseous device with an IV line placement (Peberdy MA et al, AHA 2010 Guidelines, Part 9 page S769).

4.5 12-lead ECG

Since cardiovascular disease and coronary ischaemia is the most common cause of cardiac arrest (AHA guidelines 2010 Spaulding et al; NEJM 1997;336:1629 - 1633 and Anyfantakis et al Am Heart J 2009;157:12 - 318), 12-lead ECG should be obtained as soon as possible.

Recommendation

- I. If intraosseous device is used during CPR, it should be promptly replaced with an IV line in the immediate post-cardiac period.
- II. Fluid boluses 1 - 2 L of normal saline or lactated ringers can be given if patient is hypotensive.
- III. Dopamine, adrenaline or noradrenaline infusion can be used to achieve a minimum systolic blood pressure of >90 mmHg or mean arterial blood pressure of >65 mmHg.
- IV. Dopamine infusion: 5 - 10 µg/kg/minute.
- V. Adrenaline infusion: 0.1 - 0.5 µg/kg/minute.
- VI. Noradrenaline infusion: 0.1 - 0.5 µg/kg/minute.
- VII. Continuous ECG monitoring should continue and 12-lead ECG obtained as soon as possible.
- VIII. Identify and treat cause of cardiac arrest.

Chapter 5

Neonatal Resuscitation

Neonatal Resuscitation Program

Ministry of Health hospitals in Malaysia adopt the Neonatal Resuscitation Program (NRP) developed by the American Heart Association (AHA) and the American Academy of Pediatrics (AAP). The NRP guidelines updated by the AHA in 2010 are an interpretation of the evidence presented in the 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations.

The following are the issues addressed in the NRP guidelines and shall be taught during NRP training in Ministry of Health hospitals in Malaysia using the latest edition of the Textbook of Neonatal Resuscitation (American Academy of Pediatrics).

1 Anticipation of Resuscitation Need

Anticipation, adequate preparation, accurate evaluation and prompt initiation of support are critical for successful neonatal resuscitation and shall be emphasized.

2 Initial Steps

The initial steps are providing warmth by placing the baby under a radiant heat source, positioning the head in a “sniffing position” to open the airway, clearing the airway if necessary, drying the baby, and stimulating breathing. Endotracheal suctioning is performed in non-vigorous babies with meconium stained liquor.

3 Reevaluation

The infant is reevaluated after completing the initial steps. The decision to progress beyond the initial steps is determined by the simultaneous assessment of respirations and heart rate.

4 Administration of Supplementary Oxygen

It is recommended to monitor the state of oxygenation using a pulse oximeter. It is recommended that the goal of babies being resuscitated at birth, whether born at term or preterm, should be an oxygen saturation value in the interquartile range of preductal saturations measured in healthy term babies following vaginal birth (values available in the Newborn Resuscitation Algorithm).

5 Positive Pressure Ventilation (PPV)

PPV is started if the infant remains apneic or gasping, or if the heart rate remains <100 per minute after administering the initial steps.

The use of self-inflating bags \pm T-piece resuscitator shall be taught.

6 Continuous Positive Airway Pressure (CPAP)

Spontaneously breathing preterm infants who have respiratory distress may be supported with CPAP or with intubation and mechanical ventilation. The most appropriate choice may be guided by local expertise and preferences.

7 Endotracheal Tube Placement

Endotracheal tube placement and confirmation of correct tube placement shall be taught.

8 Chest Compressions

Both the 2 thumb-encircling hands technique and the 2-finger technique shall be taught. The compressions to ventilation ratio is 3:1

9 Medications

The use of epinephrine and volume expanders shall be taught.

10 Postresuscitation Care

Postresuscitation care shall be discussed at the course.

11 Other Issues

Other issues to be discussed include induced therapeutic hypothermia and guidelines for withholding and discontinuing resuscitation.

Chapter 6

Paediatric Basic Life Support

Based on ILCOR Part 5 & 10

Rescuers who have been taught adult BLS and have no specific knowledge of paediatric resuscitation may use the adult sequence as outcome is worse if they do nothing.

The following sequence is to be followed in a Paediatric emergency situation.

1 Ensure The Safety of Rescuer and Child

There is no ILCOR recommendation on this.

A consensus within our committee was arrived based on our experiences.

Recommendation

The rescuer should ensure the external environment is safe and the child is not in danger.

2 Check for the Child's Responsiveness

This is no ILCOR recommendation on this.

A consensus within our committee was arrived based on our experiences.

Recommendation

Gently stimulate the child and ask loudly "Are you alright?"

- 2.1 If he responds by answering or moving, leave him in the position in which you find him (provided he is safe), check his condition and seek help. Reassess him regularly.
- 2.2 If he does not respond:

3 Shout for Help

There is no ILCOR recommendation on this.

A consensus within our committee was arrived based on our experiences.

Recommendation

Shout for help by saying out loudly 'Emergency! Emergency! Bring the resuscitation trolley and defibrillator!'

4 Positioning of Victim

ILCOR statement on page e56 states 'It is reasonable to roll a face down, unresponsive victim into the supine position to assess breathing and assess circulation. Concern for protecting the neck should not hinder the evaluation process or delay life-saving procedures'.

It further states on page e51 'CPR should be performed on a hard surface when possible. Air filled mattresses should be routinely deflated during CPR. There is insufficient evidence for or against the use of backboards'.

Recommendation

- 4.1 Victims found on the floor should be initially managed on the floor.
- 4.2 Face down victims shall be rolled over to the supine position.
- 4.3 Air filled mattresses should be deflated during CPR.
- 4.4 Backboard use is not recommended because of delays in initiation or interruptions of compressions and the potential of dislodging tubes and catheters during backboard placement.

5 Open The Airway

ILCOR statements on pages e51 and e216 state that 'Opening and maintaining a patent airway and providing ventilation are fundamental elements of paediatric CPR especially because cardiac arrest often results from or is complicated by asphyxia'.

It further states on page e53 that 'For unresponsive adults and children, it is reasonable to open the airway using the head tilt-chin lift maneuver when assessing breathing or giving ventilations'.

Recommendation

Open the airway by the head tilt chin lift maneuver.

6 Breathing

ILCOR statements on pages e51 and e216 state that 'Opening and maintaining a patent airway and providing ventilation are fundamental elements of paediatric CPR especially because cardiac arrest often results from or is complicated by asphyxia'.

Recommendation

Keeping the airway open, look, listen and feel for normal breathing. Look for chest movements. Listen for breath sounds at the child's nose and mouth. Feel for air movements on your cheek. These should not take more than 10 seconds.

- 6.1 If the child is breathing normally, turn him on his side into the recovery position, send or go for help.
- 6.2 Check for continued breathing.
- 6.3 If breathing is not normal or absent, give 5 rescue breaths.

7 Checking Pulse In The Initial Assessment Of An Unresponsive Victim

ILCOR statement in page e215 states that 'Palpation of a pulse (or its absence) is not reliable as the sole determinant of cardiac arrest and need for chest compressions. If the victim is unresponsive, not breathing normally, and there are no signs of life, lay rescuers should begin CPR. In infants and children with no signs of life, healthcare providers should begin CPR unless they can definitely palpate a pulse within 10 seconds'.

AHA guidelines states that 'If the infant or child is unresponsive and not breathing, healthcare providers may take up to 10 seconds to attempt to feel for a pulse. If, within 10 seconds, you don't feel a pulse or are not sure if you feel a pulse, begin chest compressions (Class IIa, LOE C)'.

Recommendation

The committee recommends checking the pulse for infant and child. Take no more than 10 seconds to check the pulse. For an infant feel the brachial pulse. For a child feel the carotid pulse. The femoral pulse may be felt in both infant and child.

- 7.1 If there is a palpable pulse ≥ 60 /minute but there is inadequate breathing, continue rescue breaths at 12 - 20 breaths per minute till the child starts breathing effectively on his own.
- 7.2 If pulse is < 60 /minute and there are signs of poor perfusion or no signs of life, start chest compressions.

8 Chest Compressions

There is also insufficient data on an optimal compression ventilation ratio for CPR in infants and children. ILCOR statements in page e200 recommends that 'For ease of teaching and retention, a compression-ventilation ratio of 30:2 is recommended for the lone rescuer performing CPR in infants and children, as is used for adults. For healthcare providers one or two-rescuer CPR in infants and children, performing a compression-ventilation ratio of 15:2 is recommended. When a tracheal tube is in place, compressions should not be interrupted for ventilations'.

Recommendation

We recommend "Push hard" and "Push fast", allowing full chest recoil after each compression, minimize interruptions of chest compressions and avoid excessive ventilation.

Technique:

For one rescuer CPR in an infant, the rescuer compresses with the tips of 2 fingers.

For two rescuers CPR in an infant, the two thumb chest compression technique is used.

For a child > 1 year old, use the heel of one hand over the lower sternum. For a larger child, use 2 hands with fingers interlocked.

Site of Compression:

For Infant - lower half of the sternum

For Child - lower half of the sternum

Depth of Compression:

For Infant - at least $1/3$ the depth of the chest or 4 cm

For Child - at least $1/3$ the depth of the chest or 5 cm

Rate of Compression:

Push at the rate of AT LEAST 100-120/mm

Ratio of Compressions to Breaths:

One Rescuer CPR - 15:2

Two Rescuers CPR - 15:2

9 Ventilation

ILCOR statement in page e217 states that 'Bag-mask ventilation remains the preferred technique for emergency ventilation during the initial steps of paediatric resuscitation'.

In the MOH hospital scenario, bag mask devices are usually available. Performing mouth to mouth ventilations is hardly done as there is fear of disease transmission from hospitalized patients. It however may need to be done in areas without a bag-mask device. Protective devices like pocket mask and face shields are available to reduce the uneasiness of mouth to mouth ventilation.

Recommendation

- 9.1 Use of bag-mask device shall be taught to all HCW.
- 9.2 Mouth to mouth ventilation shall be taught for use outside of the - hospital and in hospital areas without bag mask devices.
- 9.3 Use of protective devices shall be taught during BLS courses.

10 Defibrillation

ILCOR recommendations on page e221 reaffirm an initial dose of 2 - 4J/kg and a single initial shock rather than stacked shocks as the latter are associated with worse outcomes. No changes are recommended in pad/paddle size or position. The safety of AED in infants <1year old is unknown. Case reports have documented successful defibrillations using AED in infants. A manual defibrillator or an AED with paediatric attenuation is preferred for use in infants and small children.

Recommendation

- 10.1 Defibrillation (AED and/or Manual) training will be part of Paediatric BLS course content.
- 10.2 Rescuers will be taught to attach the defibrillator as soon as it is available, with minimal interruptions to chest compression.
- 10.3 Chest compression should immediately resume after 1 shock.

11 Stopping CPR

Recommendation

- 11.1 CPR can be stopped in following circumstances:
 - 11.1.1 Victim recovers with normal breathing.
 - 11.1.2 Rescuer is exhausted.
 - 11.1.3 Advanced life support assistance arrives.
- 11.2 Rescuers shall be taught to switch the role of chest compressions every 5 cycles or 2 minutes to avoid fatigue.

12 Recovery Position

The ILCOR 2010 statement says there is no change to the 2005 statement on recovery position.

Recommendation

- 12.1 Recovery position is applied when victims resume normal breathing but remain unresponsive.
- 12.2 HCW will be taught the recovery position during the BLS course. The technique taught must ensure the following:

- 12.2.1 Victim is in the true lateral position.
- 12.2.2 Head in the dependant position.
- 12.2.3 Position is stable.
- 12.2.4 Position is safe and comfortable to the victim.

13 Relief of Foreign Body Airway Obstruction (FBAO)

ILCOR statement on page e53 states 'Chest thrusts, back blows or abdominal thrusts are effective in relieving FBAO in conscious adults and children >1 year of age. The techniques should be applied in rapid sequence until the obstruction is relieved. More than 1 technique may be needed'.

AHA recommends repeated cycles of 5 back blows (slaps) followed by 5 chest thrusts in infants.

Recommendation

- 13.1 If the FBAO is mild, do not interfere. Allow the victim to clear the airway by coughing while you observe for signs of severe FBAO.
- 13.2 If the FBAO is severe (ie, the victim is unable to make a sound), you must act to relieve the obstruction.
 - 13.2.1 For a child, perform back blows or abdominal thrusts until the object is expelled or the child becomes unresponsive.
 - 13.2.2 For an infant, deliver repeated cycles of 5 back blows (slaps) followed by 5 chest thrusts until the object is expelled or the victim becomes unconscious.
 - 13.2.3 Abdominal thrusts are not recommended in infants as it may cause liver injury.
- 13.3 If the victim becomes unresponsive:
 - 13.3.1 Start CPR compressions.
 - 13.3.2 After 30 compressions, open the airway. If you see a foreign body, remove it but do not perform blind finger sweeps.
 - 13.3.3 Attempt to give 2 rescue breaths.
 - 13.3.4 Continue with cycles of chest compressions and ventilations until the object is expelled.
 - 13.3.5 After 1 minutes, if no one has done so, activate the EMS.

Chapter

Paediatric Advanced Life Support

In contrast to adults cardiac arrest in infants and children does not usually result from a primary cardiac cause. It is more often the terminal result of progressive respiratory failure or shock.

The following is the list of changes that required reemphasis in pediatric advanced life support.

System

The use of medical emergency teams or rapid response teams (RRT) has been shown to be effective in preventing respiratory and cardiac arrests in selected pediatric inpatient settings. Multiple responders are rapidly mobilized and are capable of simultaneous coordinated actions.

Recommendation

Teamwork shall continued to be emphasised.

Family Presence During Resuscitation

Family presence during resuscitations has been shown to be beneficial for the grieving process and in general was not found to be disruptive. Thus, family presence is supported if it does not interfere with the resuscitative effort. One person in the team should be assigned to remain with the family to comfort, answer question and provide support.

However if the presence of family members creates undue staff stress or is detrimental to the resuscitative process they should be respectfully asked to leave.

Refer ILCOR statement page e14, e214

Recommendation

Family presence during resuscitation shall be encouraged where possible.

Pulse Check Versus Check for Signs of Life

Palpation of a pulse (or its absence) is not reliable as the sole determinant of cardiac arrest and need for chest compressions. If the victim is unresponsive, not breathing normally, and there are no signs of life, lay rescuers should begin CPR. In infants and children with no signs of life, healthcare providers should begin CPR unless they can definitely palpate a pulse within 10 seconds.

Recommendation

CPR shall be commenced when the victim is unresponsive, not breathing normally with no sign of life.

4 Echocardiography

ILCOR recommendation page e215 states there is insufficient evidence to recommend for or against the routine use of echocardiography during paediatric cardiac arrest.

Recommendation

Echocardiography shall not be routinely used during cardiac arrest.

5 End-tidal CO₂ (PETCO₂) and Quality of CPR

ILCOR page e215 states that continuous capnography or capnometry monitoring, if available, may be beneficial by providing feedback on the effectiveness of chest compressions. Whereas a specific target number cannot be identified, if the PETCO₂ is consistently ≤ 15 mmHg, it is reasonable to focus efforts on improving the quality of chest compressions and avoiding excessive ventilation.

Recommendation

Where available ETCO₂ shall be used to improve on the quality of chest compressions.

6 Airway and Ventilation

Opening and maintaining the patency of the airway are fundamental to pediatric CPR often due to asphyxia arrest. There are no new data to change ILCOR 2005 for airway maneuvers with or without using oropharyngeal airways and bag mask ventilation.

When airway control is not effective supraglottic airways may be helpful if inserted by trained personnel.

Recommendation

Routine confirmation of tracheal placement with capnography or capnometry shall be encouraged where available with the caveat that PETCO₂ may be below detectable levels during cardiac arrests.

7 Supplementary Oxygen

There is insufficient evidence to recommend any specific inspired oxygen concentration for ventilation during resuscitation from cardiac arrest in infants and children. Once circulation is restored, it is reasonable to titrate inspired oxygen to limit hyperoxaemia. In five LOE 5 animal studies ventilation with 100% oxygen during and following resuscitation contributed to free radical-mediated reperfusion injury to the brain.

Recommendation

We shall use 100% inspired Oxygen during resuscitation but once ROSC occurs we shall titrate inspired oxygen to limit hyperoxemia with the use of pulse oximetry.

8 Cuffed Versus Uncuffed Tracheal Tube

ILCOR on page e217 recommends that both cuffed and uncuffed tubes are acceptable and when cuffed tubes are used there is a need to avoid excessive pressure.

If a cuffed tracheal tube is used in infants ≥ 3.5 kg and < 1 year of age, it is reasonable to use a tube with an ID of 3.0mm. If a cuffed tracheal tube is used in children between 1 and 2 years of age, it is reasonable to use a tube with an ID of 3.5mm. After the age of 2, it is reasonable to estimate the cuffed tracheal tube size with the formula $ID (mm) = (age \text{ in years}/4) + 3.5$. If the tracheal tube meets resistance during insertion, a tube with an ID 0.5mm smaller should be used. If there is no leak around the tube with the cuff deflated, reintubation with a tube ID 0.5mm smaller may be beneficial when the patient is stable.

Recommendation

We recommend that both cuffed and uncuffed tube can be used and the above formulas to be applied in infants and children.

9 Bag-Mask Ventilation Versus Intubation

Studies showed a significantly greater rate of failed intubation and complications in children compared with adults in out of hospitals and emergency department settings.

BMV is recommended over tracheal intubation in infants and children. BMV remains the preferred technique for emergency ventilation during the initial steps of paediatric resuscitation. In infants and children for whom BMV is unsuccessful, use of the LMA by appropriately trained providers may be considered for either airway rescue or support of ventilation who require ventilatory support in the out-of-hospital setting when transport time is short.

Recommendation

We recommend bag mask ventilation as the preferred technique during emergency situations.

10 Minute Ventilation

Following placement of a secure airway, avoid hyperventilation of infants and children during resuscitation from cardiac arrest, whether asphyxial or due to VF. A reduction in minute ventilation to less than baseline for age is reasonable to provide sufficient ventilation to maintain adequate ventilation-to-perfusion ratio during CPR while avoiding the harmful effects of hyperventilation.

11 Devices to Verify Advanced Airway Placement

Confirmation of tracheal tube position using exhaled CO_2 detection (colorimetric detector or capnography) should be used for intubated infants and children with a perfusing cardiac rhythm in all settings (e.g. out of hospital, emergency department, ICU, inpatient, operating room).

Recommendation

Where available we shall use capnography or capnometry to confirm tracheal placement in addition to auscultation.

12 Cricoid Pressure

There are no data to show that cricoid pressure prevents aspiration during rapid sequence or emergency tracheal intubation in infants or children. If cricoid pressure is used during emergency intubations in infants and children it should be discontinued if it impedes ventilation or interferes with the speed or ease of intubation.

Recommendation

We shall not apply cricoid pressure during emergency intubation or rapid sequence intubation.

13 Chest Compression and Compression Ventilation-Ratio

The concept of chest compression-only CPR is appealing because it is easier to teach than conventional CPR, and immediate chest compressions may be beneficial for resuscitation from sudden cardiac arrest caused by VF or pulseless VT. In a large study of out-of-hospital paediatric cardiac arrest, few children with asphyxial arrest received compression-only CPR and their survival was no better than in children who received no CPR.

Rescuers should provide conventional CPR (rescue breathing and chest compressions) for in-hospital and out-of-hospital paediatric cardiac arrests. Lay rescuers who cannot provide rescue breathing should at least perform chest compressions for infants and children in cardiac arrest.

Recommendation

We shall provide conventional CPR (rescue breathing and chest compression) for in-hospital and out of hospital paediatric cardiac arrest.

14 Chest Compression

Either a one- or two-hand technique can be used for performing chest compressions in children. There are insufficient data for or against the need for a circumferential squeeze of the chest when performing the two-thumb technique of external chest compression for infants. In infants, rescuers should be taught to compress the chest by at least one-third the anterior-posterior dimension or approximately 4cm. In children, rescuers should be taught to compress the chest by at least one-third the anterior-posterior dimension or approximately 5cm.

Recommendation

For ease of teaching and retention, a compression-ventilation ratio of 30:2 is recommended for the lone rescuer performing CPR in infants and children, as is used for adults. For healthcare providers performing two-rescuer CPR in infants and children, a compression-ventilation ratio of 15:2 is recommended. When a tracheal tube is in place, compressions should not be interrupted for ventilations.

For newborn resuscitation we shall follow guidelines as taught in the NRP.

15 Vascular Access and Drug Delivery

There are no studies comparing IO with IV access in children with cardiac arrest. ILCOR recommendations page e221 states that IO cannulation is an acceptable route of vascular access in infants and children with cardiac arrest. It should be considered early in the care of critically ill children whenever venous access is not readily attainable. The preferred routes of drug delivery for infants and children in cardiac arrest are IV and IO.

If adrenaline is administered via a tracheal tube to infants and children (not including the newly born) in cardiac arrest, the recommended dose is 0.1 mg/kg (100 µg/kg).

Recommendation

We shall recommend early use of intraosseous access in paediatric cardiac arrest and de emphasise the tracheal route.

16 Defibrillation

The Paediatric Task Force evaluated several issues related to defibrillation, including safe and effective energy dosing, stacked versus single shocks, use of automated external defibrillators (AEDs) in infants ≤ 1 year of age and paddle/pad type, size, and position. The new recommendation of an initial dose of 2 - 4 J/kg-1 is based on cohort studies showing low success in termination of VF in children with 2J/kg.

17 Paddle Size and Orientation

One paediatric LOE 4 study 264 observed no difference in the rate of ROSC between antero-lateral and anterior-posterior electrode positions for shock delivery. For ease of placement anterolateral is recommended. When no paediatric paddle available an anterior-posterior placement is recommended.

18 Number of Shock

A single-shock strategy followed by immediate CPR (beginning with chest compressions) is recommended for children with out-of-hospital or in-hospital VF/pulseless VT.

19 Arrhythmia Therapy

For treatment of out-of-hospital VF/pulseless VT in infants, the recommended method of shock delivery by device is listed in order of preference below. If there is any delay in availability of the preferred device, the available device should be used. The AED algorithm should have demonstrated high specificity and sensitivity for detecting shockable rhythms in infants. The order of preference is as follows:

1. Manual defibrillator.
2. AED with dose attenuator.
3. AED without dose attenuator.

In three LOE 5 animal studies a paediatric attenuator used with an adult-dose biphasic AED shock was as effective and less harmful than monophasic weight-based.

It is reasonable to use synchronised electric cardioversion as the preferred first therapy for paediatric VT with hypotension or evidence of poor perfusion. If drug therapy is used to treat unstable VT, amiodarone may be a reasonable choice, with careful haemodynamic monitoring performed during its slow delivery.

For infants and children with SVT with a palpable pulse, adenosine should be considered the preferred medication. Verapamil may be considered as alternative therapy in older children but should not be routinely used in infants. Procainamide or amiodarone given by a slow IV infusion with careful haemodynamic monitoring may be considered for refractory SVT. Synchronized cardio version in SVT is recommended to start at 1J/kg then 2J/kg for subsequent dose.

Recommendation

We recommend defibrillation for pulseless VT and VF at 4 J/kg as single shock followed by immediate chest compression for 2 minutes before rhythm check and subsequent shocks at 4 J/kg.

For synchronised cardioversion in SVT we recommend initial 1 J/kg and 2 J/kg for subsequent doses.

20 Shock

Isotonic crystalloids are recommended as the initial resuscitation fluid for infants and children with any type of shock. There is insufficient evidence to identify the superiority of any specific isotonic crystalloid over others. One large adult trial suggested that normal saline (isotonic crystalloid) is equivalent to albumin, although subgroup analysis suggested harm associated with the use of colloid in patients with traumatic brain injury. There were insufficient data to change the 2005 recommendations.

21 Vasoactive Agent in Distributive Shock

There is insufficient evidence to recommend a specific inotrope or vasopressor to improve mortality in paediatric distributive shock. Selection of an inotrope or vasopressor to improve haemodynamics should be tailored to each patient's physiology and adjusted as clinical status changes.

22 Vasoactive Agent in Cardiogenic Shock

The catecholamine dose for inotropic support in cardiogenic shock must be individually titrated because there is a wide variability in clinical response. It is reasonable to use adrenaline, levosimendan, dopamine, or dobutamine for inotropic support in infants and children with cardiogenic shock. Milrinone may be beneficial for the prevention and treatment of low cardiac output following cardiac surgery.

23 Corticosteroid in Shock

There is insufficient evidence to support or refute the routine use of stress-dose or low-dose hydrocortisone and/or other corticosteroids in infants and children with septic shock. Stress-dose corticosteroids may be considered in children with septic shock unresponsive to fluids and requiring vasoactive support.

A protocol-driven therapy, which includes titration to a superior vena caval oxygen saturation $\geq 70\%$, may be beneficial for infants and children (without cyanotic congenital heart disease) with fluid-refractory septic shock. No treatment recommendations can be made to target ScvO₂ saturation in the management of fluid-refractory septic shock in paediatric patients with cyanotic congenital heart disease or for other forms of paediatric shock.

24 Medications During Cardiac Arrest

Recommendation

In infants and children with out of hospital or in-hospital cardiac arrest, the appropriate dose of iv adrenaline is 10µg/kg per dose for the first and subsequent dose. The maximum single dose is 1mg.

Routine administration of sodium bicarbonate is not recommended in the management of paediatric cardiac arrest.

There is insufficient evidence for or against the administration of vasopressin or its long-acting analogue, terlipressin, in paediatric cardiac arrest.

Routine use of calcium for infants and children with cardiopulmonary arrest is not recommended in the absence of hypocalcaemia, calcium channel blocker overdose, hypermagnesaemia, or hyperkalaemia.

Adrenaline may be used for infants and children with bradycardia and poor perfusion that is unresponsive to ventilation and oxygenation. It is reasonable to administer atropine for bradycardia caused by increased vagal tone or cholinergic drug toxicity. There is insufficient evidence to support or refute the routine use of atropine for paediatric cardiac arrest.

25 Extracorporeal Cardiac Life Support

ECLS may be beneficial for infants and children with cardiac arrest if they have heart disease amenable to recovery or transplantation and the arrest occurs in a highly supervised environment such as an ICU with existing clinical protocols and available expertise.

Recommendation

This expertise is presently not available in MOH.

26 Post Resuscitation Care

Hypothermia

There are no randomized paediatric studies on the use of hypothermia following cardiac arrest.

Studies in newborn showed that therapeutic hypothermia (32 - 34°C) up to 72 hours after resuscitation is safe and associated with a better neurological outcome.

Therapeutic hypothermia (to 32 - 34°C) may be beneficial for adolescents who remain comatose following resuscitation from sudden witnessed out-of-hospital VF cardiac arrest. Therapeutic hypothermia (to 32 - 34°C) may be considered for infants and children who remain comatose following resuscitation from cardiac arrest.

27 Vasoactive Drugs

There are no studies evaluating the role of vasoactive medications after ROSC in children. Studies however show evidence of myocardial dysfunction and vascular instability following resuscitation from cardiac arrest.

Recommendation

It is reasonable to administer vasoactive medications to infants and children with documented or suspected cardiovascular dysfunction after arrest. These drugs shall be titrated to improve function and reduce adverse effects.

28 Blood Glucose

It is appropriate to monitor blood glucose levels and avoid hypoglycaemia as well as sustained hyperglycaemia following cardiac arrest. There is insufficient evidence to recommend specific strategies to manage hyperglycaemia in infants and children with ROSC following cardiac arrest. If hyperglycaemia is treated following ROSC in children, blood glucose concentrations should be carefully monitored to reduce episodes of hypoglycaemia.

Recommendation

Blood glucose shall monitored during and after cardiac arrest and treated accordingly.

There is insufficient evidence to make a recommendation for modification of standard resuscitation for infants and children suffering cardiac arrest due to major trauma, although consideration should be given to selectively performing a resuscitative thoracotomy in children with penetrating injuries who arrive at the hospital with a perfusing rhythm.

29 Prognosis and Decision to Terminate CPR

There is insufficient evidence to allow a reliable prediction of success or failure to achieve ROSC or survival from cardiac arrest in infants and children.

Chapter 8

Education, Implementation, Safety and Ethics

Highlights of ILCOR Consensus 2010;

1. Efforts to implement new resuscitation guidelines are likely to be more successful if a carefully planned, multifaceted implementation strategy is being used. Education, while essential, is only one element of a comprehensive implementation strategy.
2. All courses should be evaluated to ensure that they reliably achieve the program objectives. Training should aim to ensure that learners acquire and retain the skills and knowledge that will enable them to act correctly in actual cardiac arrests.
3. Life support knowledge and skills, both basic and advanced, can deteriorate in as little as 3 - 6 months. Frequent assessments and, when needed, refresher training are recommended to maintain knowledge and skills.
4. Short video/computer self-instruction courses with minimal or no instructor coaching, combined with hands-on practice (practice-while-you-watch), can be considered as an effective alternative to instructor-led basic life support (cardiopulmonary resuscitation [CPR] and automated external defibrillator [AED]) courses.
5. AED use should not be restricted to trained personnel. Allowing use of AEDs by individuals without prior formal training can be beneficial and may be lifesaving. Since even brief training improves performance (e.g. speed of use, correct pad placement), it is recommended that training in the use of AEDs be provided.
6. CPR prompt or feedback devices improve CPR skill acquisition and retention and may be considered during CPR training for laypeople and healthcare professionals. These devices may be considered for clinical use as part of an overall strategy to improve the quality of CPR.

1 Targeted Populations

Recommendation

- 1.1 All Healthcare Workers (HCWs) in MOH Hospitals and healthcare facilities shall be trained in Basic Life Support (BLS).
- 1.2 All house-officers shall be trained in Advanced life support (ALS) during their 2 years training period.
- 1.3 All doctors working in critical areas (e.g. Acute admission wards, ED, ICU, HDW, CCU) shall be trained in ALS.

2 Pre Course Preparation

Recommendation

- 2.1 NCORT subcommittees shall review/adapt/produce training material that may include written self-instruction materials, video-based learning, textbook reading, pre-tests, skills scenarios and testing and written assessments as part of the respective resuscitation courses.

- 2.2 NCORT subcommittees will consider implementing a validation process to ensure the learning objectives will be achieved.

Reference:

ILCOR Consensus Guidelines 2010. J. Soar et al./Resuscitation 81S (2010) e289

3 Instructional Methods Using Video/Computer

Short video/computer self-instruction in basic life support may be used and considered as alternative to instructor-led courses. Any alternative instructor method in basic life support must go through a validation process to ensure the learning objectives can be achieved.

Recommendation

NCORT subcommittees shall review all short video and computer self-instruction modules for use in MOH Hospitals.

Reference:

ILCOR Consensus Guidelines 2010. J. Soar et al./Resuscitation 81S (2010) e290

4 Use of CPR Prompt/Feedback Devices

Recommendation

- 4.1 CPR prompt/feedback devices may be used during CPR training for MOH HCWs.
- 4.2 CPR prompt/feedback devices may be used for clinical use as part of an overall strategy to improve the quality of CPR.
- 4.3 Instructors and rescuers should be made aware that a compressible support surface may cause a feedback device to overestimate depth of compression.

Reference:

ILCOR Consensus Guidelines 2010. J. Soar et al./Resuscitation 81S (2010) e291

5 Course Duration

There are knowledge gaps on optimal timing and form of assessment to optimise learning, retention and application of resuscitation skills. The recommendation made is based on the current scenario in Ministry of Health hospitals. The economy and logistic of shorter intervals for update and training need to be look into based on local system and settings.

Recommendation

- 5.1 A minimum of 4 hours duration of instructor-led BLS course.
- 5.2 Brief reassessment at 6 months may be considered by MOH Hospitals to improve skills and retention of providers.
- 5.3 New course formats introduced should be assessed by NCORT committee to ensure that they achieve their objectives.

Reference:

ILCOR Consensus Guidelines 2010. J. Soar et al./Resuscitation 81S (2010) e292 - 293

6 Ratio Between Instructor and Provider for BLS Training

Recommendation

We recommend an instructor to participant ratio of 1:6 for BLS Provider courses, with at least one manikin and one AED for each group of 6, however there is insufficient evidence to suggest standard ratio between instructor and providers.

Reference:

European Resuscitation Council Guidelines for Resuscitation 2010 Section 9. Principles of education in resuscitation. J. Soar et al./Resuscitation 81 (2010) 1434-1444

7 Retraining Intervals

ILCOR states 'For CPR courses, skills assessment and, if required, a skills refresher should be undertaken more often than the current commonly recommended training interval of 12 - 24 months'.

CPR training activities currently vary among MOH Hospitals. Some are well established with frequent training programs and will be able to conduct frequent retraining. Some hospitals are just expanding their programs and have difficulty conducting even one course for all healthcare workers.

Recommendation

All HCW in MOH Hospitals will be reassessed or refreshed in BLS skills based on the resources available in individual training centres.

Reference:

ILCOR Consensus Guidelines 2010. J. Soar et al./Resuscitation 81S (2010) e292

8 Assessments

Recommendation

All resuscitation courses in MOH Hospitals shall emphasise a practical skills assessment component.

Reference:

ILCOR Consensus Guidelines 2010. J. Soar et al./Resuscitation 81S (2010) e292-3

9 Use of Check Lists During Actual CPR

Cognitive aids (e.g. checklists) can be used during resuscitation, provided that they do not delay the start of resuscitative efforts.

Recommendation

Cognitive aids (e.g. checklists) shall be created for use during actual resuscitation in MOH Hospitals.

Reference:

ILCOR Consensus Guidelines 2010 J. Soar et al./Resuscitation 81S (2010) e297

10 Team Briefing and Debriefing

Briefing and debriefing can be used as part of learning activities during the course and actual resuscitation activities in MOH Hospitals.

Recommendation

Briefing and debriefing shall be used as part of learning activities during CPR courses.

Debriefing shall be encouraged as a learning tool after actual resuscitation activities in MOH Hospitals.

Reference:

ILCOR Consensus Guidelines 2010. J. Soar et al./Resuscitation 81S (2010) e297

11 Implementation Strategies

Recommendation

In efforts towards implementation of these guidelines in MOH Hospitals, we shall use a comprehensive, multifaceted approach including clinical champions, a consensus-building process, multidisciplinary involvement, written protocols, detailed process description, practical logistic support, multimodality/multilevel education, and rapid cycle improvement methods.

Reference:

ILCOR Consensus Guidelines 2010. J. Soar et al./Resuscitation 81S (2010) e296

Safety

1 Physical Effects on Rescuers

Recommendation

- 1.1 It shall be emphasised to participants at CPR courses that training and actual performance is safe in most circumstances.
- 1.2 Individuals undertaking CPR training shall be advised before the course of the nature and extent of the physical activity required during the training program.
- 1.3 Learners who develop significant symptoms (e.g. chest pain, severe shortness of breath) during CPR shall be advised to stop.
- 1.4 When performing chest compressions, if feasible, encourage changing rescuers after about 2 minutes to prevent rescuer fatigue.

Reference:

ILCOR Consensus Guidelines 2010. J. Soar et al./Resuscitation 81S (2010) e293 - 4

2 Disease Transmission

'There are only a very few cases reported where performing CPR has been implicated in disease transmission. Salmonella, staphylococcus aureus, severe acute respiratory syndrome (SARS) meningococcal meningitis, helicobacter pylori, herpes simplex virus, cutaneous tuberculosis, stomatitis, tracheitis, shigella and streptococcus pyogenes have been implicated. One report described herpes simplex virus infection as a result of training in CPR. One systematic review found that in the absence of high-risk activities, such as intravenous cannulation, there were no reports of transmission of hepatitis B, hepatitis C, human immunodeficiency virus (HIV), or cytomegalovirus during either training or actual CPR'.

Recommendation

- 2.1 It shall be emphasised during CPR classes that the risks of disease transmission during training and actual CPR performance is very low.
- 2.2 The following safety precautions shall be instituted at all CPR classes
 - 2.2.1 The use of barrier devices (e.g. face shields) for mouth to mouth breathing.
 - 2.2.2 Use of gloves during chest compressions.
 - 2.2.3 Hand hygiene (anti-septic rubs) before and after manikin use as an alternative to gloves.
- 2.3 The use of the following person protective equipment shall be encouraged during actual CPR performance
 - 2.3.1 Gloves
 - 2.3.2 Masks
 - 2.3.3 Plastic aprons
- 2.4 Instructors/equipment managers shall be responsible for effective cleaning, disinfection and changing of disposable parts (e.g. lungs) of manikins.
- 2.5 Hospital resuscitation training committees shall be responsible to institute and monitor proper management of all training equipment.

References:

Cross infection risks and manikin disinfection. Australian and New Zealand Resuscitation Council Guidelines 2010
ILCOR Consensus Guidelines 2010. J. Soar et al. Resuscitation 81S (2010) e295

Ethics

1 Decision

It is a duty of every doctor to attempt resuscitation on any patients with cardiac arrest.

The ILCOR recommend standardized orders for limitations on life-sustaining treatments should be considered to decrease the incidence of futile resuscitation attempts and to ensure that adult patient wishes are honored. These orders should be specific, detailed, and transferable across healthcare settings, and easily understood. Processes, protocols, and systems should be developed that fit within local cultural norms and legal limitations to allow providers to honor patient wishes about resuscitation efforts.

Law governing the use of Do-Not-Attempt-Resuscitation (DNAR) forms and advance directives still not available in Malaysia, therefore if CPR is judged to be medically futile, this means that doctors are under no obligation to provide it. Nevertheless, the patient and/or their family or next of kin should still have a role in the decision about active CPR order. This involvement stems from respect for all people to take part in important life decisions, commonly referred to as respect for autonomy or respect for person.

There is still a knowledge gaps in the best approach for doctors to use to measure quality of life for patient after resuscitations.

Recommendation

Where death is deemed to be imminent and where curative or life-prolonging treatment appears to be futile, ensure that death occurs with dignity and comfort. Such futile therapy could be withheld, withdrawn or one may allow irreversible pathology to continue without active resuscitation. One should always take into consideration any advance directives and the wishes of the family in this regard.

References:

ILCOR Consensus Guidelines 2010 J. Soar et al./Resuscitation 81S (2010) e296.

The Code of Medical Ethics, Section II-Ethical obligation of doctors to patients-The Dying patient pg 12. Malaysian Medical Association 2001.

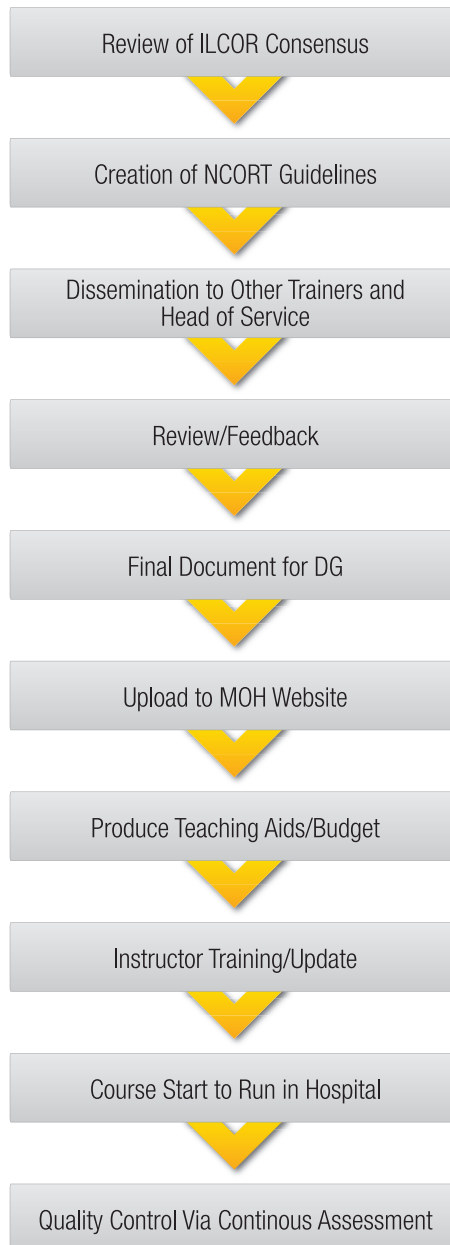
Legal and ethical issues related to resuscitation, Guideline 10.5 . Australian and New Zealand Resuscitation Council 2006.



Appendix i - vii



Flow Chart on Production of NCORT Guidelines



Adult BLS Algorithm for Healthcare Providers in MOH Hospitals & Healthcare Facilities



Danger

Wear PPE (gloves, apron, mask) if available. Look out for blood spills, sharps, electric wires, unsteady beds, trolley



Responsiveness

Tap shoulders twice. Say 'Hello, hello are you OK?'



Shout for help

'Emergency! Emergency! Bring the resus trolley and defibrillator!'



Airway

Head tilt-chin lift



Breathing

Look for normal breathing in not more than 10 seconds. Start chest compressions if not breathing or abnormal breathing (gasps) is seen.



Circulation

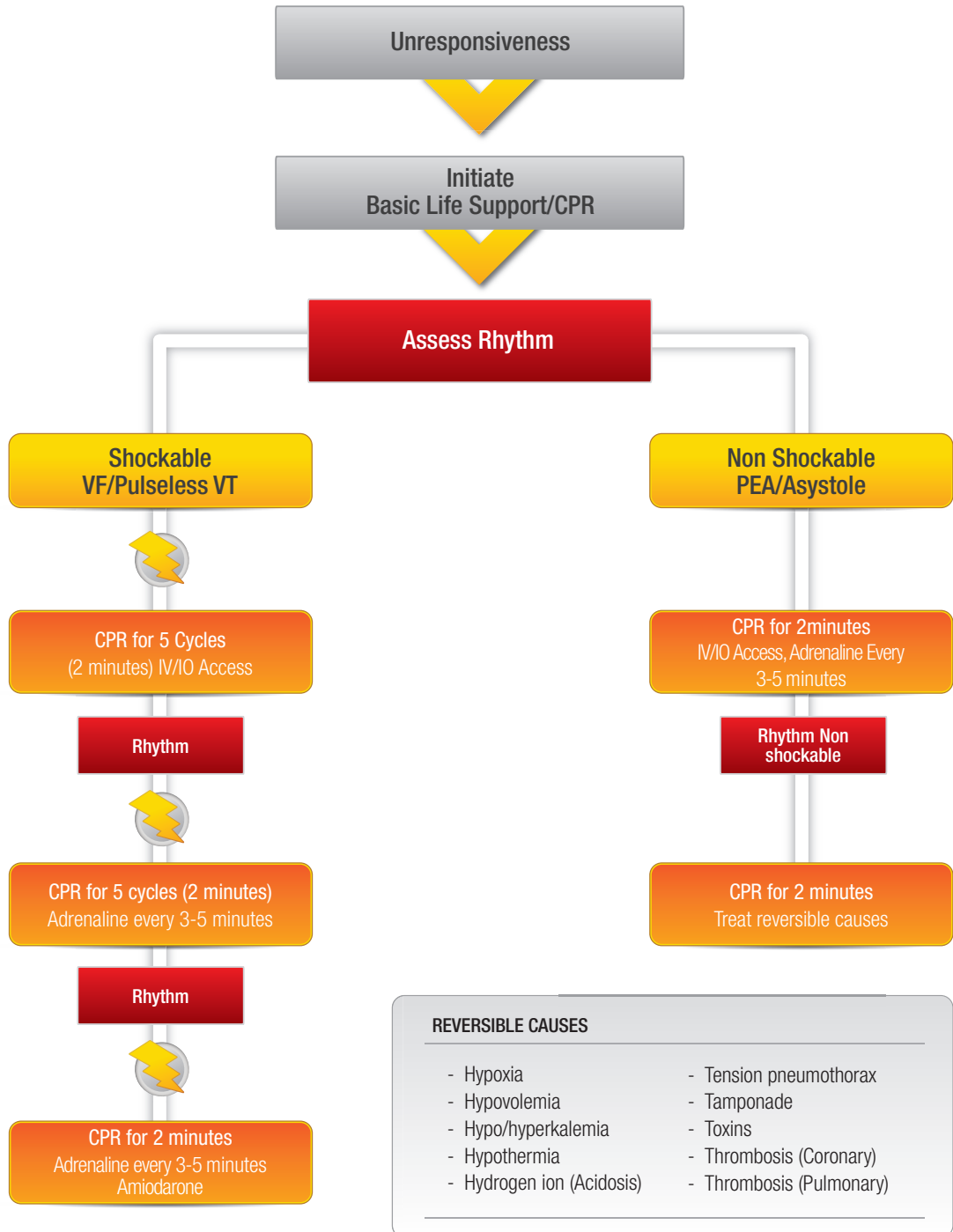
- Emphasis on high quality chest compressions
- Middle of the chest, depth not less than 5cm
- Rate not less than 100/minute
- Full recoil after each compression
- Minimum interruption of compressions
- After 30 compressions, proceed with 2 ventilations
- Each ventilation over 1 second, just enough to see chest rise
- Ratio compression to ventilation 30:2



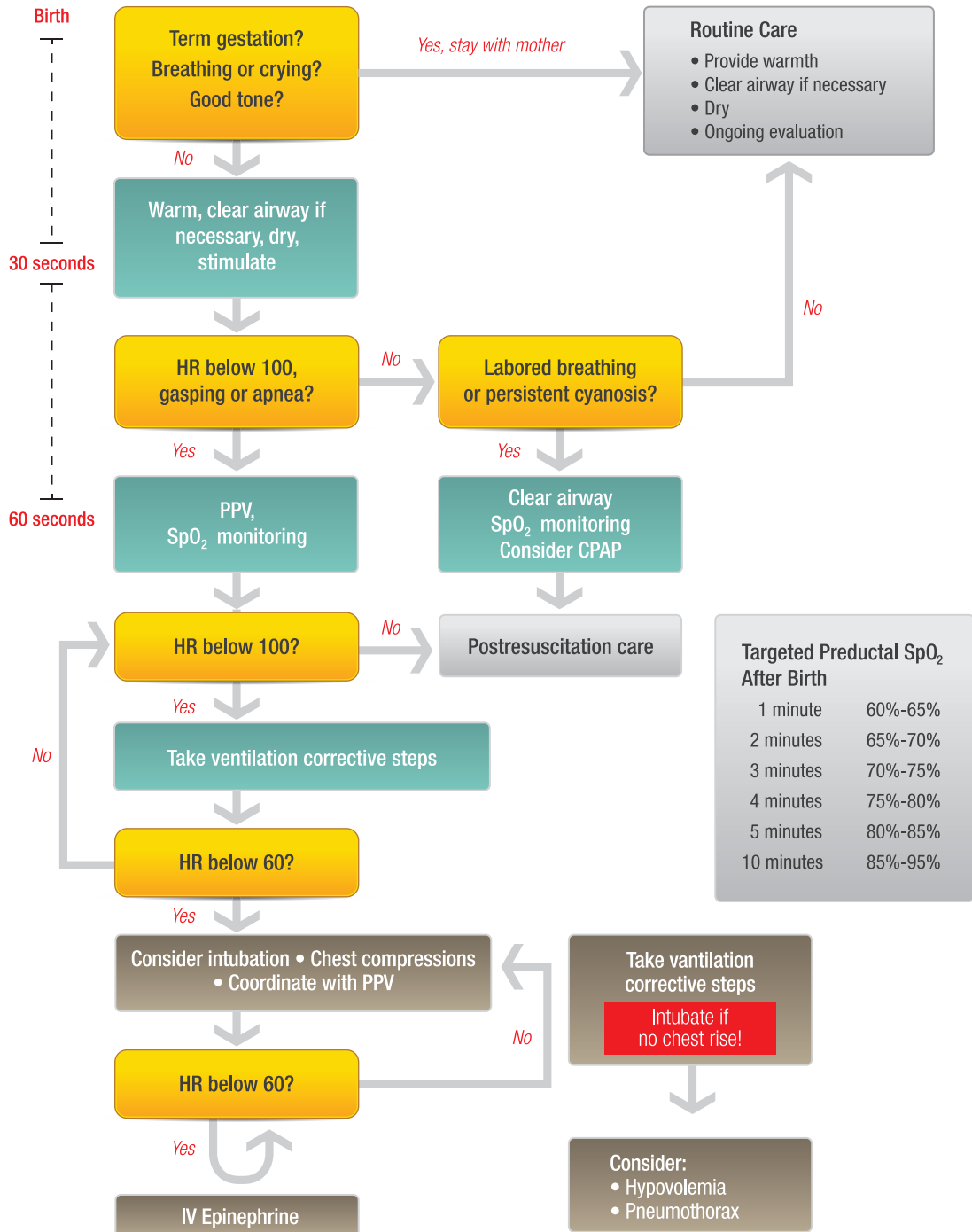
Defibrillation

- Attach AED/manual defibrillator as soon as available without interrupting compression
- Follow AED prompt
- For manual defibrillator shock if VF/VT recognized

Algorithm Adult Pulseless Arrest



Neonatal Resuscitation Algorithm



Reference:

Part 15: Neonatal Resuscitation: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. John Katwink, Jeffrey M. Perlman, Khalid Aziz, Christopher Colby, Karen Fairchild, John Gallagher, Mary Fran Hazinski, Louis P. Halamek, Praveen Kumar, George Little, Jane E. McGowan, Barbara Nightengale, Mildred M. Ramirez, Steven Ringer, Wendy M. Simon, Gary M. Weiner, Myra Wyckoff and Jeanette Zaichkin. *Circulation* 2010;122;S909-S919

Paediatric BLS Algorithm for Healthcare Providers in MOH Hospitals Healthcare Facilities



Danger

Wear PPE (gloves, apron, mask) if available • Look out for blood spills, sharps, electric wires, unsteady beds, trolley



Responsiveness

Tap shoulders twice. Say 'Hello Hello are you OK?'



Shout for help

'Emergency! Emergency!, Bring the resus trolley and defibrillator!'



Airway

Open the airway



Breathing

Look, listen and feel for normal breathing in not more than 10 seconds • If breathing is not normal or absent, give 5 rescue breaths



Circulation

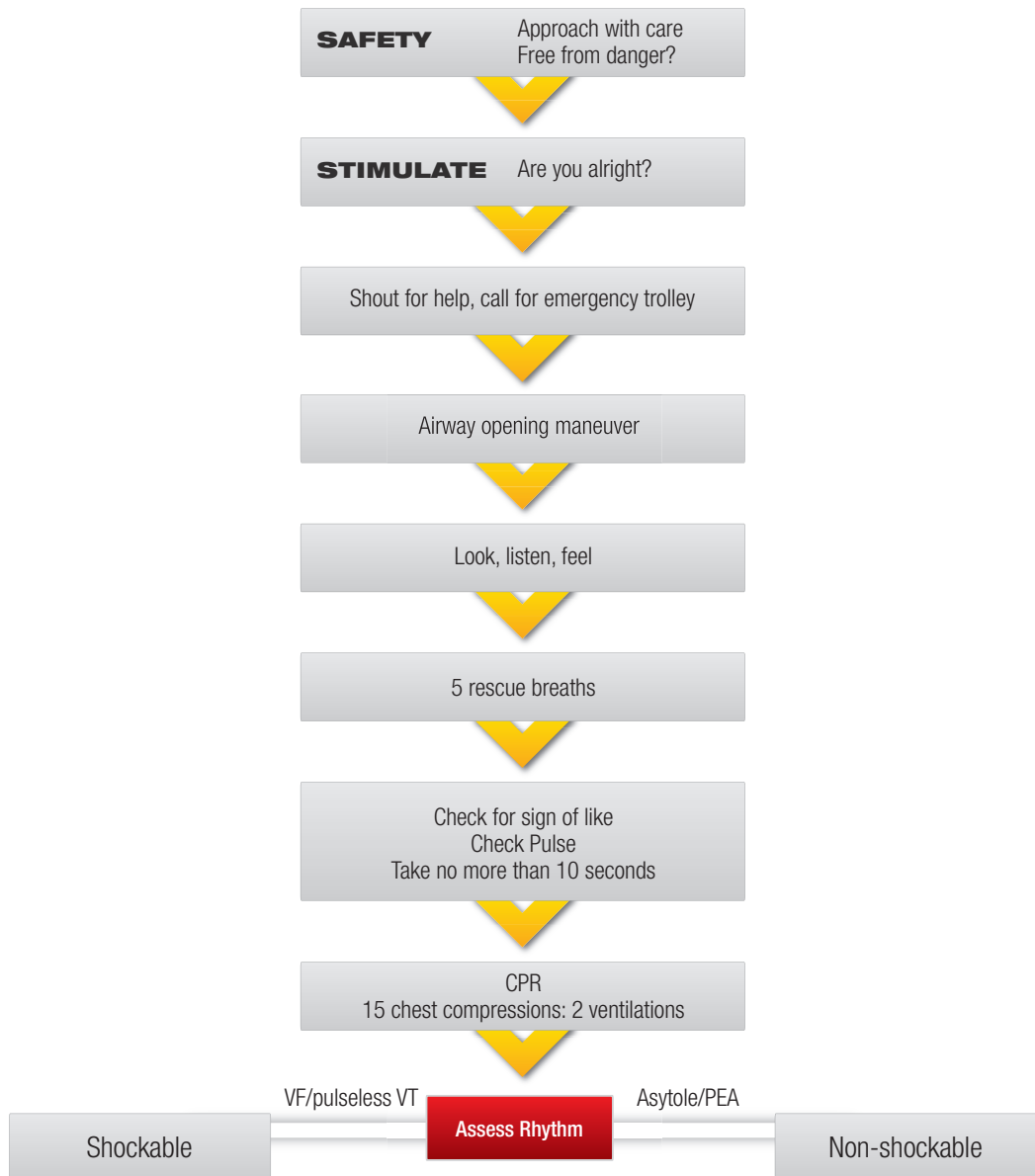
Check pulse. Take no more than 10 seconds • Start chest compressions if pulse <60/minute with poor perfusion • One rescuer Begin cycles of 30 compressions and 2 breaths • Two rescuers begin cycles of 15 compressions and 2 breaths



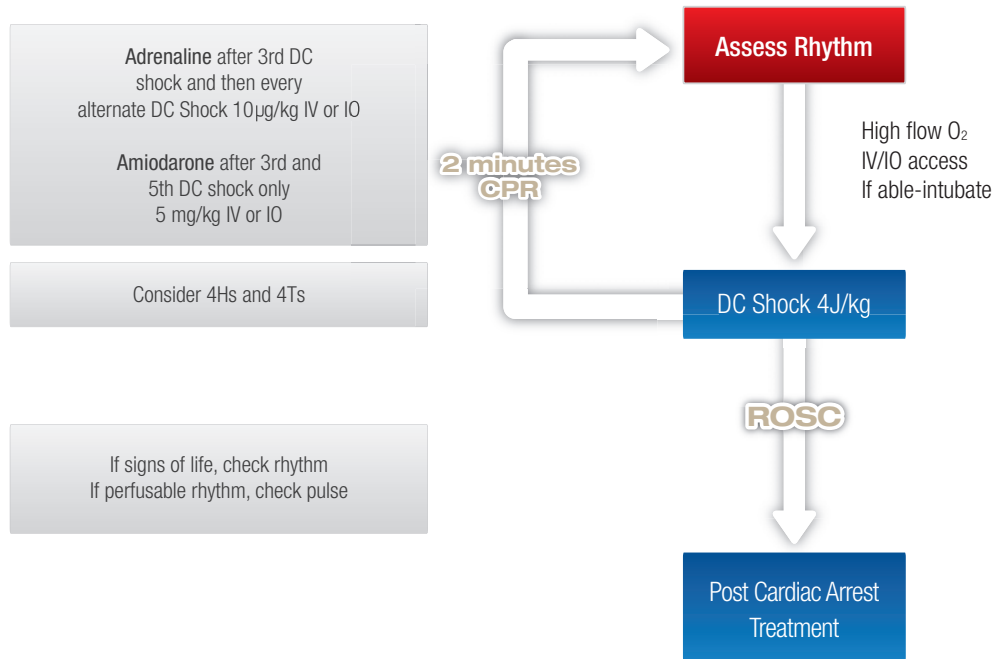
Defibrillation

Attach AED/manual defibrillator as soon as available without interrupting compression • Follow AED prompt • For manual defibrillator shock if VF/VT recognized, resume CPR after shock • Check rhythm every 2 minutes

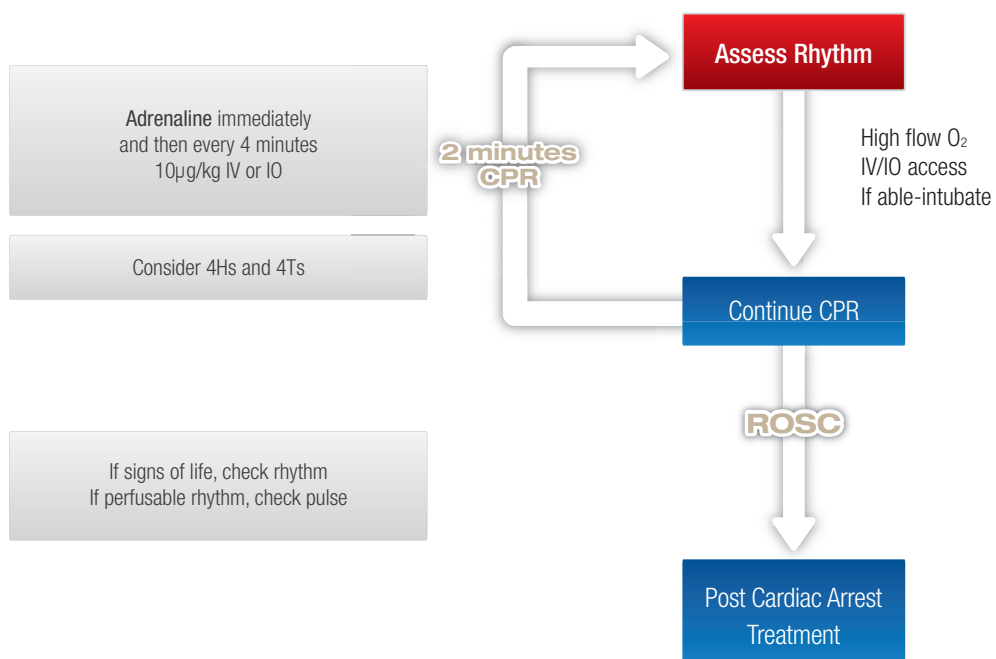
Algorithm Paediatric Cardiac Arrest



Algorithm Paediatric Ventricular Fibrillation and Pulseless Ventricular Tachycardia



Algorithm Paediatric Asystole/PEA



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This guideline will be use in all government hospitals as their Standard Operating Procedure (SOP) on how to handle resuscitation case.



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