

RECOMMENDATIONS ON THE MINIMUM STANDARDS REQUIRED FOR THE MANAGEMENT OF ADULT OUT OF HOSPITAL CARDIAC ARREST IN PREHOSPITAL CARE SERVICES

**COLLEGE OF EMERGENCY PHYSICIANS
ACADEMY OF MEDICINE MALAYSIA**



Published by
**College of Emergency Physicians
Academy of Medicine of Malaysia**

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FOREWORD

Prehospital Care Service (PHCS) in Malaysia is a unique system with the multiple agencies providing the service at different intervention levels. Although the intervention capacity between agencies differs in training and credentials; the practice of medicine and the basic and minimum standard of care should be the same for all patients.

The College of Emergency Physicians (CEP) plays a unique role in unifying the various agencies in PHCS through consensus and guidelines on clinical care of patients in the out of hospital environment. Thus it is timely that a committee such as this, gather to come to a consensus on minimum standards of resuscitation for out of hospital cardiac arrest victims.

Resuscitation in OHCA is extremely challenging in the out of hospital environment with limited resources. The system for delivery of care in OHCA influences the outcome, thus direct implementation of evidence from other PHCS system may not yield the same outcome. This recommendation should be the reference document by all PHCS Providers in Malaysia on the implementation of resuscitation guidelines in the pre hospital environment.

The CEP would like to congratulate and thank the team for their great effort researching current evidence and translating it to complement our system of practice. The team's use Delphi methodology to achieve consensus among the experts from various PHCS system in the country, is commendable.

We are hopeful the recommendation will fill some of the gaps in the medical practice of PHCS in this country.

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MARCH 2016

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PREFACE

The recently released international CPR guidelines have thrown the spotlight on the practice of CPR in out-of-hospital cardiac arrest (OHCA) situations. Efforts to improve CPR efforts in OHCA victims definitely have the highest potential to increase neurologically intact survival. However, the ways and means to achieve this effort is by no means universal. Every country is different, having different cultures, education systems, healthcare facilities, health financing mechanism and socioeconomic strengths. All of these differences impact how CPR is learnt and practiced, how EMS systems are managed, how healthcare is paid for and financed, and how critical elements of the OHCA chain of survival is developed.

In the same vein, the practice of CPR in out of hospital situations is very different throughout the world. Therefore, it is difficult to recommend standards for the practice of CPR that is applicable throughout the world. This is especially true in developing countries like ours, which do not have the resources of more developed countries, and limited ability to cope within financial, capacity and system restraints.

These guidelines represent the efforts of experts from the Pre Hospital Care Services (PHCS) in Malaysia, comprising of Emergency Physicians, EMS Managers, Paramedics and Trainers. The primary role of our team was to come to a consensus on the minimum standards that can be applied by all PHCS Providers in Malaysia. The team researched issues in over 10 core areas, and formulated more than 40 specific questions related to the management of OHCA. Using the Delphi methodology, consensus was obtained on core practices for dispatch centres, responding EMS teams, termination of resuscitation, transport decisions and quality initiatives.

Through this standardization, we hope to form the foundation of research on the future guideline development.

**CONSENSUS COMMITTEE
RECOMMENDATIONS ON THE MINIMUM STANDARDS
REQUIRED FOR THE MANAGEMENT OF ADULT OUT OF
HOSPITAL CARDIAC ARREST IN PHC SERVICES**

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LIST OF ABBREVIATIONS

ALS	-	Advanced Life Support
AED	-	Automated External Defibrillation
BLS	-	Basic Life Support
CPR	-	Cardiopulmonary resuscitation
DA-CPR	-	Dispatched assisted cardiopulmonary resuscitation
DNAR	-	Do Not Attempt Resuscitation
NCORT	-	National Committee on Resuscitation Training
MECC	-	Medical Emergency Coordination Centre
MPDS	-	Medical Priority Dispatch System
OHCA	-	out-of-hospital cardiac arrest
PEA	-	Pulseless Electrical Activity
PHCS	-	Pre Hospital Care Services
PHRT	-	Pre Hospital Response Team
ROSC	-	Return of Spontaneous Circulation
SCA	-	Sudden cardiac arrest
TCA	-	Traumatic cardiac arrest
TOR	-	Termination of resuscitation
VF	-	Ventricular Fibrillation

GLOSSARY

Advanced Life Support (ALS)	- Pre hospital care responders that are trained and credentialed to perform advanced airway and pharmacological interventions.
Basic Life Support (BLS)	- Pre hospital care responders that are trained and credentialed to perform basic trauma and airway skills with cardiopulmonary resuscitation.
Defibrillator	- Defibrillator refers to either an automated (AED) or manual external defibrillator.
Dependent lividity or Livor Mortis	- Purplish colour assumed by the lowest-lying parts of a recently dead body due to downward flow and pooling of blood under the influence of gravity
Do Not Attempt Resuscitation (DNAR)	- Advanced directive or legal order which indicates that CPR is not desired by patient.
Medical Priority Dispatch System (MPDS)	- A system of structured questions and algorithm that assists dispatchers to identify immediately life threatening situations and prioritize response based on localized response configurations.
OHCA mimics	- Medical conditions that can resemble and misdiagnosed as cardiac arrest. Examples of such medical conditions are syncope, postictal conditions, hypoglycaemia, intoxication, and cerebrovascular accident.
On-line (Direct) Medical Control	- Advice and direction provided by Emergency Physician, Medical Officer or PHCS Supervisors to PHRT responders whom are providing medical care at the scene of an emergency or transporting a patient. Personnel shall be registered practitioner with either National Specialist Registry, Malaysian Medical Council, Medical Assistant Board or Nursing Board. Personnel shall also be trained and well versed with local PHCS Policy and Protocol.
Pre Hospital Response Team	- Dedicated and equipped team of trained PHC responder that is dispatched to an incident location. Responder are trained in providing intervention at various level either Basic Life Support (BLS) or Advanced Life Support (ALS).
Pre hospital response team witnessed bystander CPR performance	- Situation where bystander performs CPR until the arrival of PHRT. The performance of bystander CPR is visually confirmed by responders.

- | | |
|---|--|
| Real time automated CPR feedback | - CPR-sensing technology device features a compression-sensing pad consisting of a force transducer and accelerometer that is placed on the patient's sternum under the hands of the rescuer to allows recording of chest compression rate, depth and audio in the form of voice and screen prompts. |
| Rigor Mortis | - Stiffening of the joints and muscles of a body a few hours after death, usually lasting from one to four days. |
| Utstein templates | - Set of guidelines for uniform reporting of cardiac arrest. |

1. INTRODUCTION

- 1.1. The 2015 International Liaison Committee on Resuscitation (ILCOR) Cardiopulmonary Resuscitation (CPR) guidelines reaffirms the importance of Pre Hospital Care Services (PHC) System in improving the outcomes following out-of-hospital cardiac arrests (OHCA).
- 1.2. Specifically, these guidelines and key steps gives added emphasis to the OHCA chain of survival and system-wide strategies aimed at improving the outcomes following OHCA. Efforts to improve OHCA chain of survival have the highest potential not only to increase survival following sudden cardiac arrest (SCA) but more so on neurologically intact survival.
- 1.3. However, these guidelines also reflect on the marked differences in performance and achievements in key indicators by EMS organisations, especially between developed countries with mature EMS services, compared to those in developing countries. In fact, it is widely accepted that no EMS system is the same.
- 1.4. Although the science of resuscitation is universal, the management of OHCA is very different throughout the world. The recommendations used in developed countries with mature EMS systems are not necessarily applicable in our community. Therefore, it is necessary to have a locally developed consensus that translates current evidence and best practices from around the world into our local setting.
- 1.5. This document recommends the minimum standards in several key areas on the management of OHCA in pre hospital setting:
 - 1.5.1. Role of ambulance dispatch centres (ADC) in OHCA;
 - 1.5.2. General management of OHCA victims;
 - 1.5.3. Minimum standard of care by Basic Life Support (BLS) or Advanced Life Support (ALS) PHRT in managing OHCA victims;
 - 1.5.4. Critical transport decision in management of OHCA victims;
 - 1.5.5. Termination of resuscitation of OHCA victims;
 - 1.5.6. Performing CPR during Transport;
 - 1.5.7. CPR in traumatic cardiac arrest;
 - 1.5.8. Special situations for CPR such as drowning; and
 - 1.5.9. Quality improvement strategies.

- 1.6. These recommendations are submitted for use by all responders in Pre Hospital Care Services Organisations in Malaysia. It does not intend to restrict the development of EMS services to these minimum standards nor does it desire EMS providers to merely adhere to minimum standards.

2. OBJECTIVES OF THE RECOMMENDATIONS

- 2.1. To provide an overview on the practice of CPR in OHCA in Malaysia.
- 2.2. To provide consensus for standard operating protocols in local or regional PHCS system.
- 2.3. To provide guidance for responders in performing CPR according to the latest evidence based guidelines and best practices.
- 2.4. To address specific issues of resuscitation in out-of-hospital environment such as termination of resuscitation (TOR), traumatic cardiac arrest (TCA) etc.

3. ADMINISTRATIVE GUIDELINES

- 3.1. Administrative guidelines cover operational aspects in management of OHCA in PHCS. Its focus is on the minimum standards required of PHCS organisations.
- 3.2. Organisations shall develop appropriate policy, guidelines and protocol that standardise the management of OHCA based on response capacity of the organisation.
 - 3.2.1. Policy on withholding CPR in OHCA victims.
 - 3.2.2. Policy on termination of resuscitation criteria and procedures.
 - 3.2.3. Policy on transportation of OHCA victims.
- 3.3. Organisations shall develop training and continuous education initiatives for responders to maintain high performance resuscitations based on the response capacity of the organisation.
- 3.4. Organisations shall equip PHRT with the equipment and supplies required for their standard of care.
 - 3.4.1. Organisations shall have set procedures established for proper storage and handling of drugs by ALS responders.
 - 3.4.2. Organisations that equip responders with mechanical CPR device shall ensure that they are trained in its application, thus minimising interruptions of chest compression.

- 3.5. Organisations shall provide responders with the necessary communication access to Online Medical Control in the management of OHCA incidents.

4. DISPATCH CENTRE GUIDELINES

4.1. Introduction to Functions of Dispatch Centre

- 4.1.1. Malaysia has two types of Ambulance Dispatch Centres (ADC) in PHCS.
- a. The Medical Emergency Coordination Centre (MECC) which manages the 999 and emergency calls related to ambulance services and coordinates the response by various agencies to the incident location.
 - b. Individual ambulance agency dispatch centre or also known as call centres which locally manages direct calls requesting ambulance service by the agency.
- 4.1.2. In a suspected out of hospital arrest situation, the ADC has two main functions:
- a. To identify suspected OHCA and provide CPR instructions for caller or bystanders to perform CPR on the victim.
 - b. To dispatch the nearest and most appropriate pre hospital response team (PHRT) to the incident location.

4.2. Dispatch Assisted Cardiopulmonary Resuscitation (DA-CPR)

- 4.2.1. Dispatch Assisted Cardiopulmonary Resuscitation (DA-CPR) is delivery of compression with or without ventilation instructions to callers for suspected OHCA victims (1).
- 4.2.2. DA-CPR has the potential to increase bystander response and provision of CPR to victims prior to arrival of PHRT (2-3).
- a. DA-CPR instructions shall be provided in situations where caller reports victim is “unconscious” and “not breathing” or has “abnormal breathing” (3).
- 4.2.3. Provision of DA-CPR instructions shall be practiced by all ADC.

- 4.2.4. ADC may use Medical Priority Dispatch System (MPDS) or locally approved guidelines in identification of suspected OHCA victim and provision of CPR instructions (4).
 - a. Suitable and common local language descriptors of victims whom are “unconscious” and “not breathing” or has “abnormal breathing” must be incorporated into the protocols used (2,3,6).
- 4.2.5. The use of abnormal breathing as a method of identifying suspected victims of OHCA may result in provision of DA-CPR instruction on OHCA victims not requiring it. Provision of DA-CPR instructions have higher potential of benefit and minimum evidence of harm (5-7).

4.3. Dispatch of Pre Hospital Response Team (PHRT)

- 4.3.1. The nearest PHRT shall be dispatched to OHCA incident location at all times.
- 4.3.2. There is no evidence on optimum number of responders required to perform high quality CPR intervention in an out of hospital environment (8). The Committee recommends a minimum of three responders at the scene.
 - a. This will minimise responder exhaustion in provision of high quality chest compression for prolonged periods (8-9).
 - b. It will also improve intervention in the ambulance during transportation by having two responders in the patient compartment of the ambulance.
 - c. Since most of PHRT in Malaysia consist of two responders, therefore ADC shall dispatch whenever possible two PHRTs to a suspected OHCA incident
- 4.3.3. The Committee recommends dispatching a minimum of one ALS response team to any suspected OHCA incident (10). This dispatch intervention should not cause delay in response time, prolonged scene time or delay in transportation of OHCA victim to hospital.

5. GENERAL GUIDELINES ON MANAGEMENT OF ADULT OUT OF HOSPITAL CARDIAC ARREST

5.1. Phases of Managing Adult OHCA Victims

- 5.1.1. Scene safety assessment;
- 5.1.2. OHCA victim assessment, initiation or taking over of CPR from bystanders at scene;
- 5.1.3. Performing CPR algorithm and interventions at scene;
- 5.1.4. Critical transport decision or termination of resuscitation at scene; and
- 5.1.5. Transportation of OHCA victim to hospital.

5.2. Principles in Providing CPR at Scene

- 5.2.1. It shall be initiated without delay when indicated.
- 5.2.2. All CPR shall be performed with OHCA victim lying supine on firm flat surface such as ground or floor.
- 5.2.3. High quality chest compression shall be performed with minimal interruption for ventilation, rhythms analysis and application of mechanical CPR device.
- 5.2.4. Early detection and defibrillation of Ventricular Fibrillation (VF) or shockable rhythm.
- 5.2.5. CPR algorithm performance shall follow the updated National Committee on Resuscitation Training (NCORT) recommendations with minimal modifications for out of hospital environment.

6. SCENE SAFETY ASSESSMENT

- 6.1. Early initiation of CPR significantly improves survival from OHCA, yet safety remains the highest priority. Safety includes the scene environment and also personal protective equipment of responders.
- 6.2. Responders must be able to identify obvious hazards and apply appropriate OHCA victim emergency movement methods.
- 6.3. It is appropriate to delay CPR until the scene is safe for both responder and OHCA victim.

7. OHCA VICTIM ASSESSMENT, INITIATION OR TAKING OVER OF CPR FROM BYSTANDERS AT SCENE

7.1. Initiation of CPR at Scene

- 7.1.1. CPR shall be initiated on OHCA victims whom are unconscious and apnoeic or has abnormal breathing.
- 7.1.2. Initiation of CPR does not require consent because any delay of resuscitation effort decreases the chance of OHCA victim's survival.
- 7.1.3. It is appropriate to withhold CPR intervention in the following situation (11-12):
 - a. OHCA victims with signs of clinical irreversible death; or
 - b. Valid advanced directive indication that resuscitation is not desired or also known as Do Not Attempt Resuscitation (DNAR) order.

7.2. Carotid pulse check

- 7.2.1. Carotid pulse check has its role in detection of OHCA mimics and confirmation of a perfusing rhythm therefore ALS responders must be trained in carotid pulse check.
- 7.2.2. However, time for pulse check shall be limited to no more than 10 seconds. It is best performed together with breathing assessment (13).
- 7.2.3. If responder is uncertain after a pulse check, it is appropriate to assume that it is absent and initiate CPR (13).

7.3. Consent to initiate CPR

- 7.3.1. Initiation of CPR does not require consent because any delay of resuscitation effort decreases the chance of survival (14).
- 7.3.2. In the best interest of patient's survival, presumed consent to CPR is applied unless there is valid advanced directive information indicating otherwise.

7.4. Withholding CPR in situations of clinical irreversible death

- 7.4.1. CPR shall not be initiated on OHCA victims with signs of clinical irreversible death (11-12).
- 7.4.2. Signs of clinical irreversible death is any one of the following:
 - a. Rigor mortis;
 - b. Dependent lividity;
 - c. Injuries incompatible to life such as decapitation, transection, incineration (>95% full thickness burns); or
 - d. Decomposition.

7.5. Withholding CPR intervention in situations of DNAR order

- 7.5.1. CPR shall not be initiated when there DNAR order. Patient's autonomy when it is known shall be respected at all times.
- 7.5.2. DNAR orders can be presented to responders in the following manner:
 - a. Verbal information from immediate next of kin that DNAR has been decided due to terminal illness such as advanced cancer or severe debilitation; or
 - b. Clear written note on patient's follow up card.
- 7.5.3. It is appropriate for responders to initiate CPR in absence of a DNAR order information. This is in line with ethics of responders to provide medical care in the best interest of patient (11).

7.6. Taking over CPR from bystander

- 7.6.1. This section is applicable only to PHRT witnessed bystander CPR performance.
- 7.6.2. In the absence of an AED attached to the patient, responders shall immediately take over performance of chest compression. Rhythm analysis shall be performed as soon as the defibrillator is ready regardless of CPR cycle.
- 7.6.3. In the presence of an AED attached to the patient, responders shall take over and continue bystander's CPR cycle (15).
- 7.6.4. Responders shall immediately upon detection of cardiac arrest mimic, stop CPR on the OHCA victim.

8. CPR ALGORITHM AND INTERVENTIONS AT SCENE

8.1.CPR Algorithm

- 8.1.1. CPR algorithm shall follow the updated NCORT recommendations with minimal modifications for out of hospital environment.
- 8.1.2. BLS intervention shall be emphasised for all OHCA victims.

8.2. Competency of Pre Hospital BLS Responding Unit

- 8.2.1. Bag mask ventilation with or without the use of basic airway adjuncts.
- 8.2.2. Perform high quality chest compression.
- 8.2.3. Use of an AED.
- 8.2.4. Asystole rhythm recognition, if termination of resuscitation protocol is performed by the responders.

8.3.Role of ALS Responding Unit

- 8.3.1. Focus of ALS providers are detection and intervention for potential reversible causes such as:
 - a. Airway obstruction;
 - b. Tension pneumothorax; and
 - c. Shock management.
- 8.3.2. ALS responders shall be competent in provision of all BLS interventions with the addition of the following:
 - a. Insertion of supraglottic airway devices;
 - b. Rhythm analysis and defibrillation;
 - c. Performing percutaneous needle thoracostomy for tension pneumothorax; and
 - d. Intravenous access for administration fluid or resuscitation drugs.

8.4.Airway Intervention

- 8.4.1. All responders shall be proficient in the use of basic airway adjunct.
- 8.4.2. All ALS responders shall be proficient in the use of supraglottic airway devices.

- 8.4.3. Endotracheal intubation shall only be performed by trained responder with the aid of continuous capnography monitoring.

8.5. Ventilation Intervention at Scene

- 8.5.1. Ventilations shall be provided using the bag-ventilation method.
- 8.5.2. Use of airway adjuncts shall be considered to facilitate adequate ventilation.

8.6. Defibrillator

- 8.6.1. All PHRT shall be provided with defibrillator capable of displaying cardiac rhythm.
- 8.6.2. ALS responder may be provided with manual defibrillator.

8.7. Minimum standard of pharmacological intervention in adult OHCA for ALS responders.

- 8.7.1. Dextrose solution in hypoglycaemia related arrest.
- 8.7.2. Adrenaline as part of CPR algorithm.

8.8. Mechanical CPR device

- 8.8.1. Mechanical CPR device is not yet recommended as standard equipment for all PHRT.
 - a. The use of mechanical CPR device does not supersede high quality manual CPR (16).
 - b. It shall however be considered as an equipment for systems that can support multiple PHRT response to an OHCA incident (8).
- 8.8.2. Mechanical CPR device is a reasonable alternative to manual CPR when high quality CPR cannot be maintained due to safety reasons, responder fatigue or during transport on a stretcher or in an ambulance (8).
- 8.8.3. Application of mechanical CPR device shall be done efficiently to minimise interruptions of chest compression.

9. TRANSPORT OF ADULT OHCA TO HOSPITAL

9.1. Whenever criteria to transport is met, OHCA victim shall be transported as soon as possible.

9.2. Transport of OHCA victim to hospital occur in several movement phases:

9.2.1. Transfer to stretcher.

9.2.2. Transfer to ambulance.

9.2.3. Transport to hospital in the ambulance.

9.3. Delay in transport can be considered for the following intervention

9.3.1. Rhythm analysis and defibrillation if indicated at appropriate CPR cycle.

9.3.2. Appropriate airway management (8). Advanced airway management can be considered if it does not lead to delay in transport.

9.4. Once movement is initiated, the focus of responder is to complete the movement phase at shortest period of time possible.

9.4.1. During movement, it is acceptable to interrupt chest compression allowing responder to focus on completing the movement in shortest period possible.

9.4.2. The use of mechanical CPR device prevents interruption in chest compression during movement.

9.5. Criteria to Transport Adult OHCA Victims

9.5.1. OHCA victims whom PHRT witness bystander CPR being performed.

9.5.2. OHCA victims excluded from TOR criteria.

9.5.3. OHCA victims identified with shockable or organised rhythm during rhythm analysis.

9.5.4. OHCA victims with return of spontaneous circulation (ROSC).

9.5.5. OHCA victim identified having OHCA mimic.

9.6. Provision of CPR on Moving Stretcher

9.6.1. There is no superior method of providing CPR on the moving stretcher (17-18).

9.6.2. The method of choice shall be based on:

a. Safety of the responder; and

- b. Body mechanics of the responder (19)
- 9.6.3. Stretcher with multiple level setting may enhance quality and safety of performing CPR on a stretcher (17).
- 9.6.4. Duration of OHCA victim on a moving stretcher shall be minimise to allow resumption of high quality CPR in a static environment (20).
 - a. CPR shall be continued at every opportunity on a moving stretcher without delaying the transfer time.
 - b. The use of mechanical CPR device ensures quality and safety of performing CPR on a moving stretcher; allowing responder to focus on minimising time on the move (20).

9.7. Performing CPR in the Moving Ambulance.

- 9.7.1. The quality of CPR in a moving ambulance is significantly compromised (17).
- 9.7.2. A minimum of 2 responders in the ambulance patient compartment is required to perform CPR during transport.
- 9.7.3. Safety is of highest priority when performing CPR in the moving ambulance.
 - a. Ambulance drivers shall drive smoothly and minimise rapid acceleration or deceleration, which may contribute to poor quality of chest compression and jeopardise the safety of the passengers.
 - b. There is no necessity for ambulance to travel above the posted traffic speed limit when transporting on going CPR victim. Increased chest compression interruption interval occurs when an ambulance travels more than 60km/hr (21).
 - c. There is no proven system of active safety devices such as seat belts or restraints that adequately protect responders from fall while performing CPR in the moving ambulance.
- 9.7.4. Opportunistic rhythm analysis shall be performed in the moving ambulance without the need to turn off the engine. Such opportunistic rhythm analysis can be performed while the ambulance is waiting at traffic light or junctions.
 - a. Communication between ambulance driver and responders in patient compartment is important to allow opportunistic rhythm analysis to be performed safely.

10. ONSITE TERMINATION OF RESUSCITATION (TOR) IN ADULT OHCA

10.1. Termination of resuscitation is the application of specific decision making criteria that allows responders to stop CPR efforts on-site without the need to transport victim to hospital.

10.2. Exclusion Criteria for TOR in Adult OHCA

10.2.1. The TOR criteria is not applicable in the following situations:

- a. PHCS responder witnessed arrest situation;
- b. Paediatric age less than 18 years old (22);
- c. Known or suspected pregnant women at any trimester;
- d. Hypothermic related injury (23);
- e. Lightning injury cases (23);
- f. Victims of drowning that are rescued from the water; or.
- g. Victims with cardiac devices such as pacemaker, implantable cardioverter-defibrillator or ventricular assisted devices.

10.3. TOR Criteria in Adult OHCA

10.3.1. Criteria for TOR in adult OHCA requires the **ALL** the following conditions to be present (14, 24-28):

- a. No transport criteria are present;
- b. No bystander CPR performed upon the arrival of PHCS responder;
- c. No prehospital ROSC after three cycles of CPR (6 to 8 minutes of CPR); and
- d. Persistent asystole for three round of rhythm analysis.

10.4. Execution of TOR in Adult OHCA

10.4.1. Execution of TOR in adult OHCA requires the following:

- a. Presence of all TOR criteria in adult OHCA and absence of any exclusion criteria;
- b. Discussion with Online Medical Control regarding decision of TOR; and
- c. Obtaining consent from immediate family members or next of kin regarding implementation of TOR (29-31).

10.4.2. PHRT may transport OHCA victim to hospital in the following situation:

- a. Family members or next of kin insist on ongoing resuscitation and transport to hospital;
- b. Situational analysis of the incident site renders it unsafe for responders to terminate resuscitation efforts. An example is mass gathering events where responders are surrounded by large crowds; or
- c. Special circumstances as ordered by Online Medical Control.

11. TRAUMATIC ARREST SITUATION

11.1. Traumatic cardiac arrest (TCA) carries a very high mortality. TCA victims with ROSC has better neurological outcome compared to victims of other cardiac arrest causes (27).

11.2. CPR shall be initiated on TCA victims whom are unconscious and apnoeic or agonal breathing with absence of a carotid pulse (32).

11.2.1. Initiation of CPR in TCA does not require consent.

11.2.2. It is appropriate to withhold CPR intervention in the following situation:

- a. TCA victims with signs of clinical irreversible death; or
- b. Victim has no signs of life reported in the preceding 15 minutes prior to PHRT arrival.

11.3. Detection of reversible causes is more so required in TCA victims with PEA.

11.3.1. TCA victims with identified reversible causes such as airway obstruction, tension pneumothorax and shock are excluded from termination of resuscitation criteria at scene.

11.3.2. Such victims shall be transported to hospital.

12. DROWNING

12.1.1. Drowning is a process of primary respiratory impairment resulting from submersion/immersion in a liquid medium.

12.1.2. All rescued drowning victims shall be given CPR as soon as the victim is brought out the water.

- 12.1.3. The algorithm to perform compression and ventilation shall follow NCORT guidelines.
- 12.1.4. All rescued drowning victims shall be transported to hospital as soon as possible.
- 12.1.5. Termination of resuscitation criteria is not applicable in rescued drowning victims.

13. QUALITY IMPROVEMENT STRATEGIES

13.1. Introduction

- 13.1.1. Quality improvement strategies is an important element that helps system administrators such as policy makers in Ministry of Health together with PHCS leaders increase survival of victims in OHCA.
- 13.1.2. Quality Improvement strategies include the following areas:
 - a. PHRT team leadership development;
 - b. Post resuscitation debriefing activity;
 - c. Implementation of technology advancement;
 - d. Training of responders; and
 - e. Implementation of OHCA registry for data accumulation and audit purpose.

13.2. PHRT Team Leadership Development

- 13.2.1. Resuscitation of OHCA victim at scene shall be led by trained ALS provider.
- 13.2.2. Physician at scene whom is untrained in PHC environment may play the role of providing real time feedback and medical advice during resuscitation of OHCA victims at scene.

13.3. Post Resuscitation Debriefing Activity

- 13.3.1. Debriefing session is a useful strategy to improve resuscitation performance.
- 13.3.2. Debriefing session shall be conducted by resuscitation team leader either immediately post resuscitation or when feasible at later date.
- 13.3.3. Objective data recording such as video recording or defibrillator recording feedback may assist the debriefing process.

13.4.Implementation of Technology Advancement

- 13.4.1. Real time automated feedback has a role in improving quality of CPR at scene.

13.5.Training

- 13.5.1. Regular short duration high quality CPR simulation training is a useful method to improve CPR quality
- 13.5.2. It is highly effective in improving practice of resuscitation team dynamic.

13.6.Implementation of OHCA Registry

- 13.6.1. Organisations are encouraged to develop cardiac arrest registry for OHCA incidents based on Utstein templates.
- 13.6.2. Cardiac arrest registry can be formed either local or at national level.
- 13.6.3. Data sets for the registry shall include elements that can provide feedback on improved chain of survival for OHCA victims.

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