Ministry of Health
and Family Welfare
Government of India

सत्यमेव जयते

Provider Course Manual for Paramedics

NATIONAL EMERGENCY LIFE SUPPORT

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स्वास्थ्य एवं परिवार कल्याण
व रसायन एवं उर्वरक मंत्री
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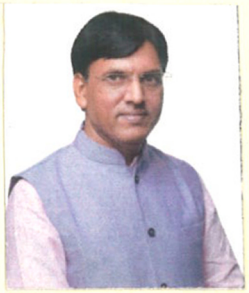

MESSAGE

It is a known fact that a patient, who receives timely emergency medical care from trained professionals in the shortest possible time, has the best chance of survival. Scientific evidence supports the need for uniform, appropriate and scientifically-backed emergency medical services in the country.

In the Government sector, the pre-hospital emergency services, institutional emergency and trauma care delivery, are being continuously strengthened under the National Health Mission and in future initiatives for Universal Health Coverage will comprehensively cover emergency medical services and it will also be an integral part of a package of services envisaged under Ayushman Bharat.

To keep pace with such advancements, parallel efforts are needed for human resource development with doctors, nurses, and paramedics acquiring the skills to save life. Health professionals in our country had to rely on short-term foreign certification courses for emergency life support, which not only copyrighted but are expensive, and hence limited in availability.

I am pleased to announce that in line with the Hon'ble Prime Minister's policy of 'Make in India', Ministry of Health and Family Welfare under its Central Sector Scheme "Human Resource Development for Emergency Medical Services" is releasing India's first indigenously developed National Emergency Life Support Course for doctors, nurses and paramedics. This toolkit intends to provide standardized skill-based training in emergency life support for common emergencies. The scheme also provides for the setting up of Skill Centers across India to provide the necessary infrastructural support to impart training to healthcare personnel at all levels of medical care.

In days to come, our Government aspires to ensure that quality emergency medical care is available, accessible and affordable to all. I call upon States and UTs to join us and whole-heartedly contribute to this noble endeavor of serving humanity, especially when it's needed the most.

(Dr. Mansukh Mandaviya)

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सत्यमेव जयते
आज़ादी का अमृत महोत्सव

स्वास्थ्य एवं परिवार कल्याण राज्य मंत्री
भारत सरकार
MINISTER OF STATE FOR
HEALTH & FAMILY WELFARE
GOVERNMENT OF INDIA

MESSAGE

Emergency Medical Services are an important component of health care delivery. Trained human resource in vital to man the emergency departments of health facilities including medical colleges, district and sub-district hospitals.

Presently, training to provide emergency life support is being imparted by various organizations and institutions in a piecemeal approach. There is a need to provide standardized training to doctors, nurses and paramedics deployed in emergency departments of medical colleges, district hospitals, CHCs, and PHCs in order to empower them to provide emergency life support during all kinds of medical emergencies especially in resource-constrained settings.

I am pleased to know that the 'National Emergency Life Support Course' training toolkit will be the first standardized indigenously developed training resource for doctors, nurses and paramedics to impart training in a structured manner for clinical management of cases presenting as emergencies. Further, this course is being institutionalized through 120 Skill Centers being set up across the country.

I appreciated the efforts of the officials and experts who have supported Ministry of Health and Family Welfare (MoHFW) in development of such course. This effort of skilling doctors, nurses, and paramedics in emergency life support will contribute to the overall "Skill India" initative of Government of India under the visionary leadership of Hon'ble Prime Minister Shri Narendra Modiji..

I wish all the success for this endeavour

(Dr. Bharati Pravin Pawar)

"दो गज की दूरी, मास्क है जरूरी"

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स्वास्थ्य एवं परिवार कल्याण मंत्रालय
Government of India
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Ministry of Health and Family Welfare

FOREWORD

Emergency Medical Services are a vital component of health care system. Acknowledging the fact that the Emergency Medical Services need to be further augmented, the National Health Policy 2017 calls for adequately skilled and equipped healthcare system that can respond effectively during emergencies. The Policy envisages creation of a unified emergency response system, linked to a dedicated universal access number, with network of emergency care that has an assured provision of life support ambulances and emergency and trauma management centers.

2. Capacity building of health human resources especially those deployed in pre-hospital services and emergency departments at all levels of the health system is crucial to ensure quality emergency medical care. Realizing wide variations in knowledge and skill of healthcare personnel delivering emergency medical services, the Central Sector Scheme, 'Human Resource Development for Emergency Medical Services, aims to strengthen human resource capacities by providing a standardized, uniform, need-base and skill based training programme.

3. This indigenous training toolkit aptly named "National Emergency Life Support" (NELS) course has been developed to impart lifesaving skills in a structured manner for a wide variety of medical emergencies. I would like to acknowledge the efforts put in by the subject experts in preparation of this course. Coupled with the efforts to develop 'Skill Centers', this will be immensely useful for doctors, nurses and paramedics involved in providing emergency medical care at all levels.

4. I expect that all States and UTs will make maximum use of this training course for doctors, nurses and paramedics to provide standardized emergency life support for all kinds of emergencies.

Place : New Delhi
Date : 16th February 2022

(Rajesh Bhushan)

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Emergency care is an essential element of healthcare system, responding to acute illnesses & injuries ranging from new born to elderly including pregnant women. An emergency care system (ECS) delivers time-sensitive health care services for acute illness and injury across the life-course. It extends from care at the scene, through transport and emergency unit care, and ensures access to early operative and critical care, when needed. The Disease Control Priorities report estimates that nearly half of deaths and a third of disabilities in low and middle-income countries result from conditions that could be addressed by emergency care.

Pre-hospital care is an essential part of the continuum of emergency care services where emergency medical service providers are the first to recognize the nature of an emergency and can immediately evaluate the situation and determine the need for appropriate medical resources. Pre- hospital care is the first avenue for the community to access the trained and skilled Emergency Medical Service Providers. However, the lack of skilled and trained EMS providers in the country is seriously affecting the development of a robust pre -hospital care system.

To achieve this goal, there is a need for development of well-structured curriculum and training to equip the Emergency Medical Services (EMS) providers with the requisite skills and knowledge to manage emergencies of all kinds in resource constrained settings.

Ministry of Health and Family Welfare in collaboration with JPNATC – AIIMS, New Delhi has undertaken the step towards bridging the gaps of Pre-hospital care system, by developing a skill-based training course manual "Pre-Hospital Emergency Life Support Course for paramedics and Emergency Medical Technicians" under the Central Sector Scheme - Human Resources Development for Emergency Medical Service which will be conducted at all levels of health facilities.

This Pre-Hospital Emergency Life Support course aims to impart hands-on skill-based training to paramedical personnel and emergency medical technicians deployed in ambulances and emergency departments of hospitals in the country, to enable them to function effectively to resuscitate any kind of emergency patients and stabilize the patient during pre-hospital phase of transfer to hospital/health facility. This will focus on pre-hospital emergency care of the common emergencies encountered such as cardio-pulmonary resuscitation, basic trauma and emergency management which includes splinting, helmet removal, extrication from ambulance or any vehicle, transporting a trauma victim as well as injury prevention including "Good Samaritan Law".

Going forward we envisage further development of this module by creating structured curriculum for Emergency Medical Service provider training and thus the capacity development of health work force to standardised lifesaving emergency measures for all kinds of emergencies at health facilities across the country in India.

I strongly believe that this manual will be useful in providing quality education and training thus, will ensure quality and accountability of Emergency Medical Services Providers.

I congratulate the Department of Emergency Medicine, JPNATC-AIIMS for developing this comprehensive training course manual.

(Prof. Rajesh Malhotra)

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Development of National Emergency Life Support (NELS) course for doctors was necessitatedto fill a critical gap of an indigenous training curriculum in emergency life support which was hitherto being imparted using foreign-owned copyright courses putting a huge cost to the exchequer.

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This manual is a consolidated effort, accomplish by advice, assistance and cooperation of many individuals and institutions across the country. We would like to thank present DGHS, former DGHS and all other senior official in Directorate General of Health Services, MoHFW, in particular, the constant guidance of Dr. Jagdish Prasad (former DGHS, Principal Consultant, Dte. GHS), is appreciated under whose chairmanship this expert committee was constituted to extensively review, develop and fine tune the course curriculum. Support provided by Dr. B.D. Athani (former special DGHS, Principal Consultant, Dte. GHS), Dr. A.K. Gadpayle (former Medical Superintendent Dr.RML Hospital) is greatly acknowledged. We are grateful to Dr. Prof. Rajesh Malhotra, Chairman & Chief, JPNATC, AIIMS, New Delhi in preparation and finalization of NELS Course for paramedics. The expertise and insights provided by Dr. Prof. Sanjeev Bhoi, Professor, Dept. of Emergency Medicine, JPNATC- AIIMS, New Delhi and Dr. Tej Prakash Sinha, Associate Professor, Dept. of Emergency Medicine, JPNATC- AIIMS, New Delhi was crucial for development of NELS course for paramedics. A special thanks is also due to Dr. Rathi Balachandran, ADG (Nursing), Dte. GHS for her leadership in preparation and finalization of NELS course for Nurses. Also the support given by Dr. Harindarjeet Goyal, Ex- Vice Principal, RAK College of Nursing, New Delhi; Dr. Manju Vatsa, Ex-Principal, College of Nursing, AIIMS, New Delhi and Dr. Daisy Thomas, Acting Vice-Principal, RAK College of Nursing, New Delhi.

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Introduction

Emergency care system (ECS) extends from care at the scene, through transport and emergency unit care; and it ensures delivery of time-sensitive health care services for acute illness and injury across the life-course. Pre-hospital care forms the earliest link in the chain of care and is the first avenue for the community to access trained healthcare providers. Efficient pre-hospital systems can play a pivotal role in effective utilisation of platinum minutes and golden hour in trauma and emergencies. The major benefits of the same are realized, when the timely provision of care can limit or halt the cascade of events that otherwise quickly leads to death or lifelong disability of patients. Besides, it forms an important component of the armoury in tackling mass casualty and disaster incidents.

A study conducted by Indian Council of Medical Research in 2017 to estimate the healthy lives lost in India revealed that, of the annual 9.7 million deaths and 486 million DALY (Disability Adjusted Life Years), the top killer diseases were ischaemic heart disease, perinatal conditions, chronic respiratory diseases, diarrhoea, respiratory infections, cancer, stroke and road traffic injuries. A study on the spectrum of paediatric and adult emergency case load across India revealed 9-24% cases of road traffic injuries with the rest 70-80% predominantly comprising of presentations such as chest pain, stroke, respiratory distress, fever, diarrhoeal diseases including pregnancy complications. This emphasizes the crucial role of emergency care system, not only on trauma care, but also across specialities of non-communicable diseases, maternal and child health. Most of these conditions involve time sensitive emergencies i.e., myocardial infarction, stroke, sepsis, haemorrhage or road traffic injuries, where timely access to emergency care becomes critical step in determining the final outcome of the patient, thereby emphasizing the significance of pre-hospital care as a crucial link in the chain of emergency care. The Disease Control Priorities (DCP-3) data suggests that a global burden of about 54% of annual deaths in low- and middle-income countries, can potentially be addressed by efficient pre-hospital and facility-based emergency care. On reviewing the available pre-hospital services in this part of the subcontinent, the unmet needs still remain high with Emergency Medical Services being fragmented, non-accessible throughout the country and where available, underutilised, with only 43% emergencies reaching hospitals via this mechanism. A basic structure exists in most Indian states, in the form of public-private partnership model “the 108-ambulance service”, however a paradigm shift is required to change this system from a simple transportation system to a healthcare interface where actual emergency medical care is provided by trained personnel. There is a need for standardizing, unifying the existing fragmented pre-hospital systems, benchmarking quality, moulding it as per the regional requirement and creating systems where it is unavailable. Introduction of structured quality training programs to create a skilled, empowered human resource is an indispensable part of building robust pre-hospital systems. The objective of this National Emergency Life Support (NELS) course is to take the first steps towards bridging this gap.

The course aims to impart hands-on skill-based training to paramedical personnel and emergency medical technicians deployed in emergency departments of hospitals and ambulances in the country, to enable them to function effectively in resuscitating any kind of emergency patients, stabilize the patient during pre-hospital phase of transfer to hospital/ health facility. This will focus on pre-hospital emergency care of the common emergencies encountered such as cardio-pulmonary resuscitation, basic trauma and emergency management which includes haemorrhage control, splinting, helmet removal,

extrication from ambulance or any vehicle, transporting a trauma victim, injury prevention including “Good Samaritan law”. The module will also feature recognition and initial care of common medical emergencies such as chest pain, stroke, drowning, electrocution, hypothermia, heat strokes, burns, bites and stings, seizure, shortness of breath. Going forward we envisage further advancement of this module by creating structured curriculum for Emergency Medicine Technician training in India.

The foundations of an effective pre-hospital system may be laid by recruiting carefully selected volunteers, professionals and giving them specialised training as well as the basic supplies and equipment they need to provide effective pre-hospital care. The purpose of initiating NELS is to initiate the process of bridging the missing link in our vision of building an integrated trauma and Emergency care system, to strengthen pre-hospital care, build capacity to respond effectively to day-to-day emergencies and be better prepared to prevent and mitigate the impact of disasters in the community.

Chapter 1: Basic Life Support

Learning Outcomes

At the end of this chapter, reader will be able to -

- Understand chain of survival
- Understand basic life support (BLS) in adult victims, paediatrics and pregnant victims
- Know how to perform cardio-pulmonary resuscitation (CPR)
- Know high-quality CPR and its role in survival
- Know when and how to use an automated external defibrillator (AED)
- Learn the importance of teamwork in multi-rescuer resuscitation

Introduction

Basic Life Support (BLS) is the foundation for saving lives after cardiac arrest. In this course you will learn the skills of high-quality cardiopulmonary resuscitation (CPR) for victims of all ages including pregnant individual and will be made to practice the skills both as single rescuer and as member of multi rescuer team. Also, you will learn how to recognize the cardiac arrest, activate the emergency response system early, and respond fast with confidence and coordinate with nearby hospital. The skill you will learn in this course will be to identify the cardiac arrest, activate the emergency response.

Main focus of BLS learning is that rescuers must perform high quality CPR in a wide variety of situations. In this training you will also learn how to respond to certain special emergency situations.

Main components of Cardiopulmonary Resuscitation (CPR)

- Circulation (Chest Compression)
- Airway
- Breathing

Chain of survival for all the ages

Survival of the victims depends upon on the certain links that need to be followed quickly and in a proper sequence. The essential chains are interlinked and are called “Core Chain of Survival”.

1. Early recognition of cardiac arrest and activation of the emergency response services (Call for help)
2. Early high-quality cardiopulmonary resuscitation with adequate chest compression
3. Early and rapid defibrillation
4. Early and quick transfer

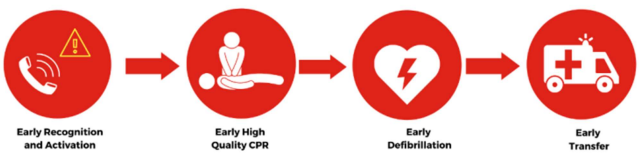


Fig 1: *Chain of Survival*

BLS of Adult victim

The chain of survival of adult victim is same as mentioned above. The algorithm for adult BLS is below:

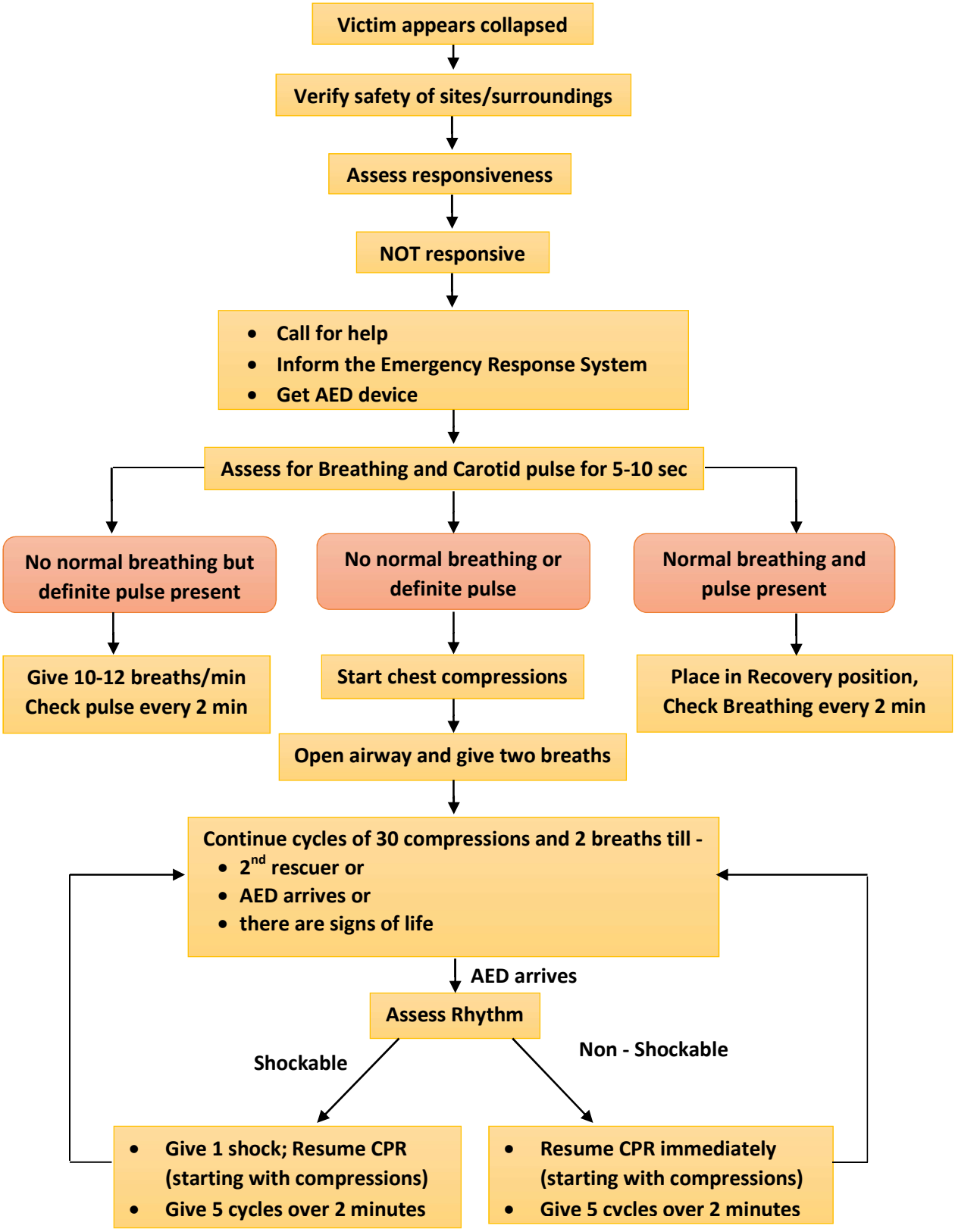


Fig 2: *Adult BLS algorithm for trained health providers*

Approach to the victim

The first link consists of -

1. Verify safety of site/surrounding
2. Assess the responsiveness
3. Call for help
4. Check for pulse and breathing

1. Verify safety of site/ surrounding

The time is essence for survival, but safety of the rescuer is of utmost importance. But if the proper safety measures are not followed or the place is not safe during resuscitation of the victim, mishaps can cause injury to the rescuer.

Fig 3: *Verify safety of site/ surrounding*

- The site should be safe for both the rescuer(you) and the victim.
- Rescuer should look around the site for any immediate threat.
- If the site is safe, resuscitation should be started immediately by the rescuer.
- And, if there is immediate threat (such as risk of fire, falling of wall, drowning, electrocution, crowd conflict). The rescuer must activate/inform the concerned authority and seek help from the local people available to shift the victim to a safe place.
- The help can be taken from the police personnel, fire brigade staff or life- guard or local authority by calling them and providing the necessary details of site.
- Only when the site becomes safe while managing this activity, the resuscitation should be started immediately.

2. Assess the responsiveness of victim

- Assess the response of the victim to proceed with further actions.
- How to approach the victim -
  - Rescuers should approach the victim from the front facing the victims face.
  - Tap on the shoulders and speaks loudly (Hello…are you alright?) in a language victim could understand to get the response from the victim.

Fig 4: *Technique to approach the victim*

What not to be done:

- Victim should be not shaken
- No neck movement
- No tapping on face

Note: As these all may cause further harm, if any cervical spine injury is present there.

- If no response noted from victim- Shout for nearby help

Note: Why so? The victims may have from suffered cardiac arrest.

- Then, activate (**Alert**) the emergency response services (ERS) of your setting, asked them to provide early help along with the emergency medical devices. (Such as AED)

Fig 5: *Activate ERS*

- If the victim responds either by verbal response and/ or by purposeful movement, then cardiac arrest is unlikely.
  - Such victims require constant monitoring
  - be shifted early and fast to the nearby medical facility for further evaluation and management.

3. Call for help

Make a call (alert), inform emergency response services (**ERS**) and get emergency medical devices.

Fig 6: *Call for help*

Scenario 1. If no help available (one trained rescuer/ lone rescuer) -

- Alert the emergency response services, seek their expertise, asked them to get emergency medical device (AED) and make arrangement for transfer to the medical facility.
  Note- Should be done before assessing the pulse and breathing
- The rescuer (you) should call from his/her mobile phone, with the speaker mode on while performing the important basics steps of BLS.
  - **Why So…?** With technology advancement, easy availability of personal mobile.

Scenario 2. If someone approaches to help or (more than one personnel present)
Other personnel can be any bystander or trained rescuer

2 a. If bystander:

- One trained should perform the cardiopulmonary resuscitation
- Another one bystander can call for help with all the details of victim and ask them to bring the AED
- Now while the **ERS** is being activated, please assess the breathing and pulse

2 b. If trained rescuer:

- One should perform the cardiopulmonary resuscitation
- Another trained rescuer can call for help with all the details of victim and bring the AED.
- Now while the **ERS** is being activated-
  - the first rescuer will please assess the breathing and pulse.
  - second rescuer can talk with doctors or medicine personnel and seek their expert opinion.

What to mention while calling ERS?
Ask the ERS to come quickly and bring the AED while giving all the details of the victim and the place where the event happened and don't put down the phone till they ask you to do so.
Note: At any point of time, if any local help is available, it should be taken, and that person should be asked to ALERT the medical emergency.

What is Emergency Response Service (ERS)?
ERS number is unique emergency no. of the country. The local emergency number or the pan India no. is 112/108/100.

4. **Check for pulse and breathing simultaneously**

Next you (rescuer) must assess for the presence of pulse and breathing simultaneously while you are informing/alerting/activating the emergency medical services.

- **Check (Feel/Examine) pulse**
  - In adult, for pulse check carotid should be examined.
  - During the pulse check, the rescuer should simultaneously look for chest breathing also.

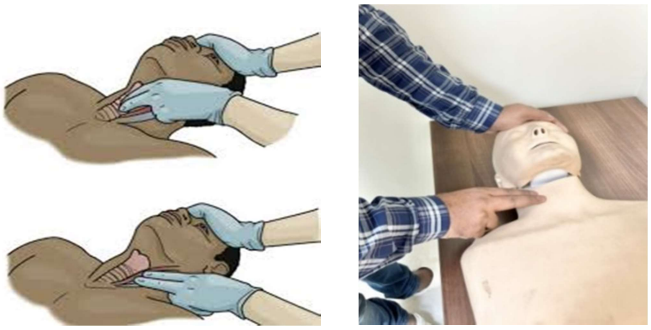


Fig 7: *Locating the Carotid Pulse*

Caution: The carotid should be examined for the definite presence for not more than 5-10 sec.

- **Assess Breathing**
  - To assess for breathing, observe the victim's chest rise and fall for not more than 10 seconds.

Fig 8: *Breathing assessment technique*

- Breathing is present- Continue monitoring the victim until the extra help arrives
- Breathing is absent or only gasping- This is not normal condition and it indicates cardiac arrest situation.

Note - Absent breathing or abnormal breathing such as gasping or agonal breaths and definitive absence of carotid pulse are suggestive of cardiopulmonary arrest.

Caution- During assessment, if the presence of pulse and breath cannot be determined, it should be assumed that victim is in cardiopulmonary arrest conditions.

Caution- Checking of pulse and assessment of breath should not take more than 10 s.

How to Assess the Time?

Assessment of time should be done by chanting loudly 1001, 1002, 1003,1010 for 10 s to avoid any delay in initiating "Early High-Quality CPR".

Three clinical situations may be encountered during the checking of pulse and breathing-

- **Victim Breathing normally with definitive carotid pulse**
  - Monitoring of victim should be done
  - Assessment of the victim in every 2 mins or earlier to determine any change in condition, until the help arrives
  - Place the victim in recovery position
  - Transfer victim early

  Note: During this time the victim should be assessed and managed as per the steps defined in the algorithm, then victim should be shifted

- **Victim breathing abnormally with definite pulse present**.
  - Give rescue breath

    Note: This is condition of a respiratory arrest.

    Then What to do?
  - Confirm that the **Emergency Response Services (ERS)** have been activated/informed
  - Continue to give rescue breaths and check for pulse about every 2 minutes or earlier
  - Observe any change in the victim condition, till the help arrives

  How much to Ventilate and Rate ……??
  - If there is visible/obvious chest rise, this is end point of adequate ventilation
  - Victim should be given normal tidal volume breath every 5 s (12 breath per minute) either mouth to mouth (with/without barrier device), mouth to mask or bag mask ventilation device.
  - Each breath should be delivered over 1 second.

  Note: Time assessment should be done by chanting loudly 1001, 1002…which almost take 1 sec

- **Abnormal or No breathing without a definite pulse**

  Note: The victim is in cardiopulmonary arrest

  Next what to do?
  - Immediately start high-quality CPR along with giving breaths at the earliest.
  - Dresses covering the victim chest should be move or removed.
  - This also help in placement of the AED pads when it arrives in the chest area.

Early high-quality CPR with adequate chest compression

This is the second link of chain of survival and it consist of three interlinked steps.

1. Providing adequate chest compression
2. Opening the airway
3. Giving Breath

1. Providing adequate chest compression

When - As soon as the **Cardiac Arrest** become obvious/evident, the rescuer (you) should give the high-quality CPR immediately.

Chest compressions:

- Start with 30 compressions in one set and the compression should be effective.
- If single rescuer –
  - Use the compression to ventilation ratio of 30 compressions to 2 breaths when giving CPR to victims of any age

- If rescuer more than one –
  - One rescuer performs chest compression and other will administer breath.
  - Both the rescuer should interchange every 5 cycles of CPR (means 5 cycles of 30 chest compression and 2 breaths) to avoid exhaustion and maintain effective chest compression.

Note - After the 5 cycles of CPR, the victim should be reassessed again for the carotid pulse. **Caution:**

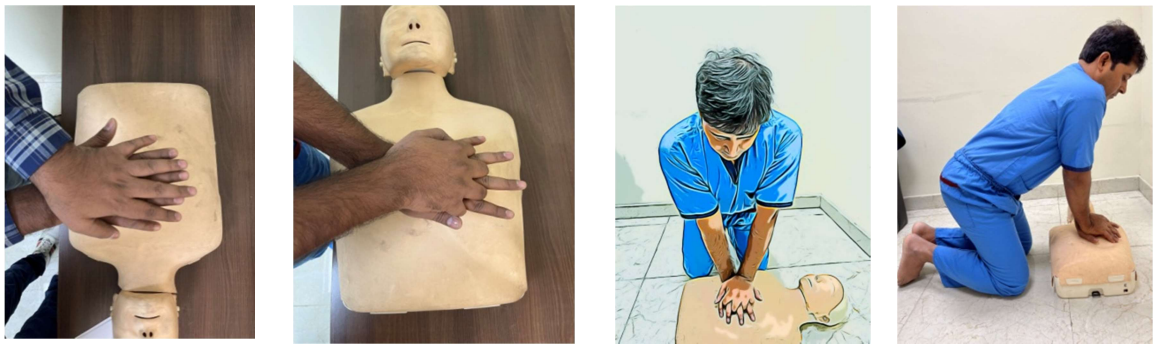
- No movement of victim while doing CPR, unless the victim is in dangerous atmosphere.
- Or rescuer(you) cannot perform CPR effectively in the victim's present situation.
- If help arrives, continue the CPR or transfer the victim to the nearby a hospital.
- No leaning on the victim's chest during chest compression.

Key Facts: **Try to place the victim on firm surface before starting CPR. Why so?** Due to compression against the firm surface, the blood is pump in the heart to the rest of the body, but on soft surface the body will be pushed into this. So, compression will be effective when the victim is placed on a firm surface such as the floor or wooden board. During the compression, rescuer should count **loudly** to maintain the speed.

Technique of Chest Compression

- Place yourself by the side of victims
- Make sure the victim is lying faceup on a affirm
- Place your hands and body to perform the Chest compression
- Give chest compression at a rate of 100-120/min
- Push down hard for at least for 5 cm with each compression
- Press down straight on the victim's lower half of the sternum
- Allow complete chest recoil at the end of each compression
- Interruption in Chest compression should be avoided

Note: Learn how to combine compressions with ventilation



(a) **(b)** **(c)** **(d)**

Fig 9: *(a) Hand position (b) Place the heel of your hand on the breast bone, in the centre of the chest (c) and (d) CPR technique*

Components of high- quality chest compression

- **Push Fast** means the compression should be at the rate of 100 to 120 /min
- **Push Hard** depth of compression should be at least 5 cm (not more than 6 cm)
- Allow the chest to recoil (re-expand) completely, after each compression

- Interruptions in between the chest compression should be minimized
- Hyperventilation should be avoided

Opening the airway

- After the first 30 chest compression, the rescuer should open the airway.
- Two techniques used for opening the airway is -
  - Head tilt & chin-lift
  - Jaw thrust
- Mostly head tilt & chin-lift manoeuvre is performed. Only jaw thrust or chin lift are performed in victims of suspected cervical spine trauma.

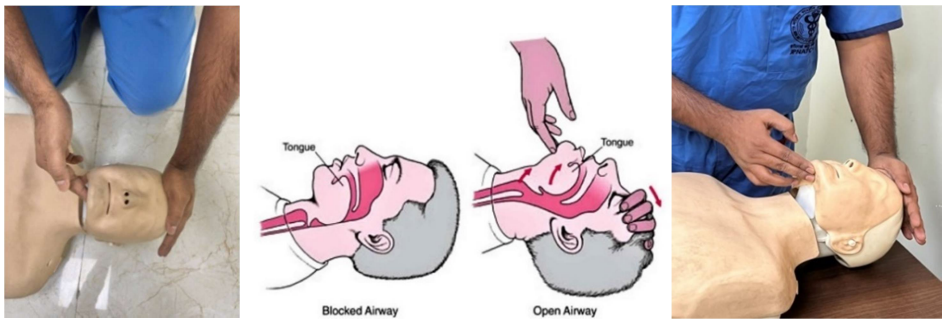


Fig 10: *Technique of head tilt and chin lift*

Steps of performing jaw thrust:

1. Place the palm and three fingers (of the head towards the victim's head) on the victim's forehead, keeping the index finger and thumb free.
2. Now placed fingers of the other hand under the bony part of the jaw near the chin.
3. Do not press deeply into soft tissues and do not use thumb to lift the chin.
4. Tilt the head back and lift the chin to bring the chin forward.

Fig 11: *Technique of jaw thrust*

Giving / Administering Breaths:

- As soon as chest compression is started, 2 rescue breaths should be given using -
  - mouth to mouth (with/without barriers device) or
  - mouth to mask or
  - bag mask device

Fig 12: *Breath administration technique*

- breath should be delivered over 1 sec and it should be tidal volume breath with a visible chest rise as the end point.
- allow 1s for exhalation and over 1 sec another breath should be provided.
- chest compression should be restarted immediately without waiting for exhalation.

How to provide Breath?

- Universal precautions should be followed, and the rescuer should use barrier device like pocket mask to give breath.
- Pockets masks are available in kit packing, that includes a collapsed mask, a one-way valve, a pair of gloves and alcohol swab.
- The pocket mask is in triangular shape with an apex, a base and a connector.
- The connector has one-way valve, that will act as barrier.

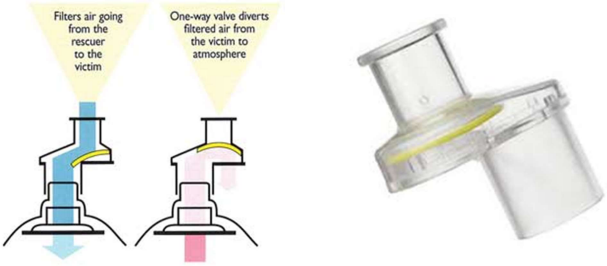


Fig 13: *Valve - Pocket mask*

Key Facts: To revise

When you will check for the pulse-

- If pulse present- Then check for the presence of breath. If no pulse, provide a breath every 5 sec and reassess every 2 min. If Breath present- Reassess every 2 min till the victim is shifted to the nearest medical facility or the emergency help arrives.
- If pulse absent: Continue with another 5 cycles of CPR (5 cycles of 30 chest compression: 2 breaths) and reassess the carotid pulse, thereafter. Further CPR steps is continuing same as mentioned in the above line, depending on whether pulse is present or absent.

Attention - It is to be noted that as soon as AED or defibrillator is available, rather than pulse check, rhythm analysis needs to be done after 5 cycles of CPR till return of spontaneous circulation.

The Single Rescuer should continue CPR till -

1. AED arrives
2. Another rescuer arrives
3. EMS team arrives
4. Victim is revived
5. Rescuer is exhausted
6. Till the victim is transfer or handed over to ERS Team

Rapid and Early Defibrillation:

This is the third **Core link** of BLS:

- Rapid and early defibrillation should be done, as soon as any sudden cardiac arrest is witness.
- Automated External Defibrillator (AED) should be used to deliver the shock or manual defibrillator can also be used, if a trained rescuer is present.
- Rescuer himself or should ask nearby layman to get the AED but it should be used by the trained personnel.
- Defibrillation should be done as soon as the emergency medical team arrives with the device. But till that time high quality CPR should be continued.

When to administered Shock-

- First shock must be given at the **earliest possible time**, irrespective of the stage of the CPR cycle.
- After giving shock- Rhythm should be assessed using the defibrillator monitor and further defibrillation should be given, if required.

When to give Next Shock:

- It should be done after every five sets of CPR (five cycles of 30 chest compressions and 2 breaths).

AED (Automated External Defibrillator)

- It is a battery-operated device which when applied to the victim properly, detects and analyses the rhythm automatically and prompts the user regarding further actions as required.
- It is public access device.
- Health authorities should be aware of the mapping of the AED availability in the area. So that **ERS** team gets the AED from nearest possible area and use it.

- AED available in various types but all AED machine have the following things in common -
  - On/Off switch
  - Plug with self-sticking pads
  - Shock delivery button
  - Speaker with voice prompts
  - Battery

(a)

(b)

(c)

(d)

Fig 14: *Components of AED (a. on/off switch, b. Plug with self-sticking pads, c. shock delivery button, d. speaker with voice prompts)*

Key Facts: What does AED do?

An AED device analyses the rhythm of heart to deliver the shock therapy. If the shockable rhythm is identified, the device prompts for the delivery of shock. Ventricular fibrillations (VF) and pulseless ventricular tachycardia (pVT) are two shockable rhythms. The electric shock temporarily stuns the heart muscle and resets the electrical system of its. If a regular rhythm returns and high-quality CPR continues, the heart muscle begins to contract and again able to pump blood. The pulse become palpable if there is return of circulation called Return of Spontaneous circulation (ROSC).

Where to apply AED pads?

- Anterior-Lateral
- Anterior -Posterior

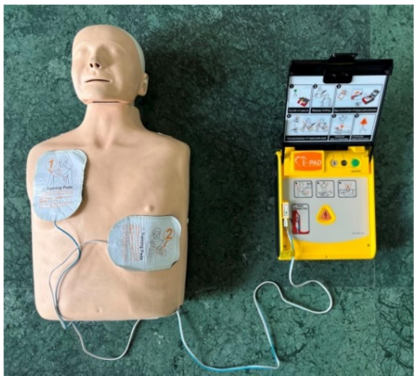


Fig 15: *Location of AED pads*

Steps for using Automated External Defibrillator (AED)

Step 1

- Power on the AED device
- AED prompts with voice message

Step 2

- Attach the adhesive pads to the chest of victim's without interrupting the chest compressions.
- Attach the AED connecting tables to the AED device. (In some AED, there may be preconnected cables)

Step 3

- Stand clear of the victim. Make sure nobody ids touching the victim
- Let AED analyze the rhythm, which will take few seconds.

Step 4

- If AED prompts for the shock, administer it. (Some AED prompt you to press the button). But before going for shock.
- Make sure nobody is touching the victim, even the rescuer who is giving breath.
- Say Loudly, "All Clear"
- Look to make sure again.
- Push the shock button.
- Delivery of shock will cause sudden contraction of the victim's muscles.

Step 5

- If AED prompts no shock needed, and after any shock delivery, immediately resume CPR, starting with chest compression.
- After about the 5 cycles or 2 minutes of CPR, AED will prompt again for shock or no shock, so follow again the same steps.
- Continue until the advanced life support providers help arrives or the victim start breathing, moving or reacting.

(a) Step 1

(b) Step 2

(c) Step 3

(d) Step 4

(e) Step 5

Fig 16: *AED usage*

Note: Certain AED may also have smaller PADS that can be used in children under 8 years of age.

Caution: Don't use paediatric PADS for an adult. It may be too small for an adult. The shock delivered might not be appropriate. In such situations it is better to continue with high quality CPR than to deliver the shock in adult with paediatric PADS.

AED uses in special conditions

- **Hairs on Chest**
  - If there is hairy chest of the victim, then AED pads may not stick to skin rather it sticks to hairs.
  - AED will not analyze the victim's heart rhythm
  - AED may display check electrodes pads message

What to do?

  - Before applying for the pads, check for the chest hair
  - If hair present –then shave the area where pad is to be applied by using the razor from the AED case
  - If two pads are available, then use the first set of pads to remove the hair
  - Then apply the second one to deliver the shock

- **Water present**
  - Do not use AED in water conditions
  - If victim is placed in water, pull out the victim of the water
  - If chest is covered or soaked with water, wipe the chest quickly before applying the AED.
  - If victim is lying on snow, quickly wipe the chest and you can use the AED

- **Implanted Devices**

If you find swelling or lump under the skin of the upper chest or abdomen, that shows there may be implanted medical devices.

  - Avoid placing AED pad directly over the implanted device
  - Rest same steps should be followed for applying the AED

- **Transdermal Medication patches**

  Medication used are nitro glycerine, nicotine, pain medications such as fentanyl patch and hormone replacement therapy
  - Do not place AED pads directly on the top of medication patch
  - Medication patch may block the transfer of appropriate energy to the heart for the shock.

Alert: Rescuer must use gloves to remove the medications, otherwise medication may get delivered to them while removing.

Recovery Position

If the victim is showing signs return of spontaneous circulation and normal breathing, they should be positioned in recovery position till the medical help arrives or the victim is shifted to medical facility.

- The recovery position can be either left or right lateral. (Fig)
- Position the Victim
- Monitor the victim and reassessed every 2 min or earlier if required

Concepts: The recovery position allows maintenance of the airway and drainage of any oral secretions.

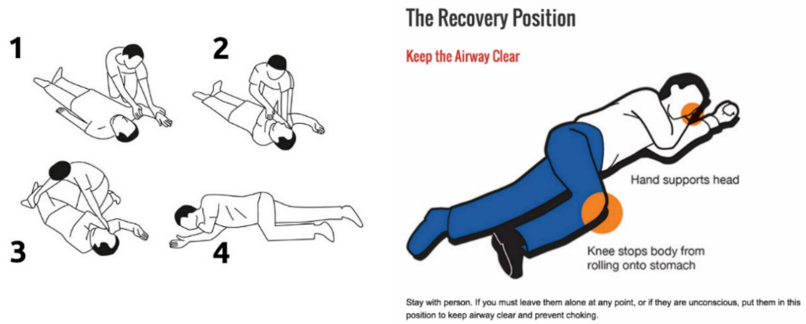


Fig 17: *Recovery position*

Steps of recovery position

1. Kneel beside the victim on the side he is to be turned
2. Extend victims arm towards you to make it perpendicular to his body.
3. Bend this arm at the elbow to make the forearm parallel to the head with palm facing up (as if "waving good bye").
4. Place the victim's other arm across his chest to hold the shoulder on your side (as if holding a painful shoulder")
5. With your hand towards the victim's feet, grasp the back of his side thigh a few inches above the knee and pull the thigh up towards his body.
6. With your other hand, hold the victims far side shoulder.
7. Pulling with both your hands simultaneously, pull the victim towards you.

8. Now shift the victim's hand that was holding his shoulder underneath his lower cheek and tilt his head back to keep his airway open. Keep the lower leg straight while keeping the upper leg bent.
9. Keep checking for breathing often (every 2 minutes)
10. If the breathing stops, at any time, roll the victim back to supine position and start CPR.

Early transfer

- The victim should be shifted to the nearest healthcare facility for the definitive management of the underlying cause of the cardiopulmonary arrest.
- Nearest healthcare facility can be according to the local/ national protocol.
- Till the time victim is arranged for the shifting to the definitive medical care facility, the BLCS (Basic Life Care Support) should be continued as mentioned earlier.

BLS in Pediatric victims

If the rescuer is alone:

- Verify the safety of scene, check for responsiveness and call for help
- Assess for breathing and pulse
- Start high quality CPR, starting with chest compression
- Perform defibrillation
- Resume high quality CPR
- Transfer

Checking Pulse in child

It is difficult for the rescuers to assess the pulse in any victim particularly in an infant and child. So, if the pulse is not felt definitely within 10 seconds, start CPR beginning with chest compressions.

In infant- Palpate brachial pulse for pulse checking
In child- Palpate carotid or femoral pulse

Fig 18: *Checking pulse in child*

Breathing

- For pediatric patients scan the victim's chest for rise and fall for no more than 10 seconds**.**
- If the victim is breathing, monitor the victim until additional help arrives
- If the victim is not breathing or is only gasping, the victim has respiratory (no pulse is felt or cardiac arrest.
- Gasping is not considered normal breathing and is sign of cardiac arrest.

Chest compressions

- Rate of compressions in all cardiac arrest victim is 100 to 120 min.
- Compression to ventilation ratio
- For single rescuer- same as adult, 30: 2
- For 2 rescuers – 15: 2

Compression depth

- In adult: At least 5 cm
- Children: At least one third diameter the AP diameter of chest or about 5 cm
- Infants- At least one third diameter the AP diameter of chest or about 5 cm

Chest Compression Technique

For the child -

- In most of the children the compression technique is same as for adult
- Either 1 or 2 hands technique should be used to compress the chest
- 2 Hands: Heel of one hand with heel of other hand on top of the first hand
- If child is small 1 – handed compressions may be adequate to achieve the desired compression depth
- Compress the chest at least one third the antero-posterior (AP) diameter of the chest (about 5 cm) with each compression

For Infants (1 year) -

- If single rescuers: Use 2 finger technique
- If multiple rescuers: 2 Thumb–encircling hands technique preferred

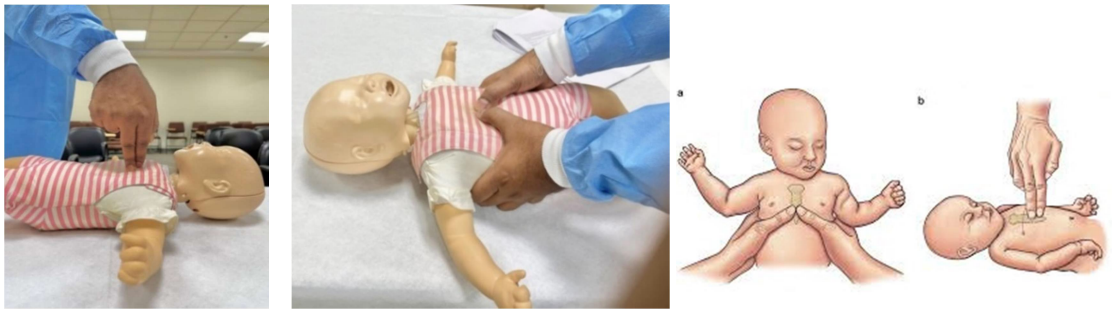


Fig 19: *Two finger chest compression technique for an infant*

Bag mask ventilation technique:

- A BAG- MASK is a device that is used to provide positive pressure ventilation to a victim who is not breathing or abnormal breathing is present.
- Trained rescuers should be able to use a bag mask device.
- During CPR attempt, 2 rescuers are recommended for effective ventilation.
- One rescuer opens the airway and seals the mask to deliver ventilations and other rescuers squeeze the airway.
- Use the E-C technique to hold the mask on face while you lift the jaw to hold the airway open.

Fig 20: *Bag mask ventilation technique*

Basic life Support in Pregnant victims

BLS algorithm is same with few changes that are mentioned below at the respective links of survival.

1. Assess the responsiveness: While assessing the responsiveness, also see uterus size at or above the umbilicus.
2. Call for help: Activating the ERS, tell required 3 or more additional rescuers or staff
3. Providing chest compression in pregnant victim
    a. Position of hands: At the center of chest
    b. Perform continuous manual left uterine displacement (LUD)

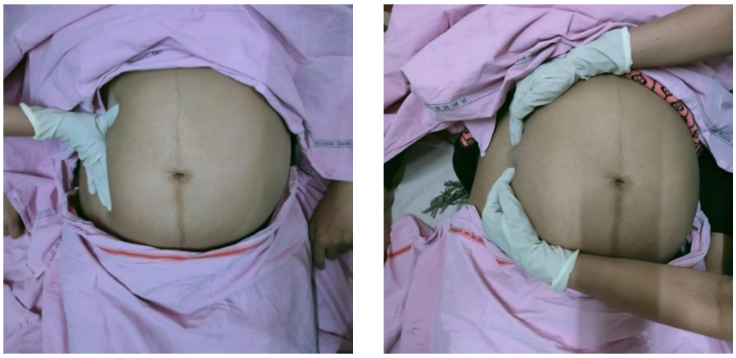


Fig 21: *Left uterine displacement*

4. Document time: When you started CPR
5. Inform the nearest facilities to prepare for the perimortem cesarean section

Key Facts: Why hand position at the Centre of Chest?

The diaphragm is pushed upward by the gravid uterus and the abdominal contents in pregnant patients. So, the hand position for chest compression should be moved upward at the centre of chest.

Key Facts: **Why manual left uterine displacement?**

In pregnant patients, supine position will result in compression of aortocaval compression (Aorta & Inferior vena Cava). So, the beneficial effect of chest compression i.e., pumping out of blood and venous return to the heart will be affected

Team Dynamics and Multi-Rescuer Resuscitation

Learning outcomes: -

- Learn the importance of a teamwork
- Know the role and responsibilities in a team
- Perform as an effective team member
- Learn to communicate effectively with another member

- Good team dynamics are play very crucial role in saving life when multi-rescuers are resuscitation the victim.
- It improves the chance of survival of life as the teamwork in a well-coordinated way.
- Bad communication among the team members can affect the performance of CPR.
- Effective and good communication increases the probability of successful resuscitation
- Resuscitation hours are tense and painful moments, often there are emotional outburst, so it's important for the team members to be calm and composed.
- In multi-rescuers team, either you will be Team leader, or you will be part of team member with definitive role assigned.
- And, it is very important to know what to do and what not to do during resuscitation process; how to communicate and perform effectively as a part of the multi-rescuer team.
- During this time get as much as help possible and communicate with team members

Components of Team dynamics can be divided into three categories:

- Definitive Roles
- What need to communicate
- How to communicate

Definitive roles during resuscitation

- **Clear assigned roles and responsibilities**
  During the resuscitation effort, the roles and responsibilities should be defined as early as possible. The team leader role is to clearly assign and give tasks according to the skill of team member. If the team members are aware of the job and their responsibilities, then team performs smoothly.

- **Aware of your limitations**
  The team member should be aware of his or her limitations and the team leader should have knowledge of them.
  Each team member should ask for the help and advice as early, if possible, but not when the situation started to worsen.

- **Constructive interference/ involvement**
  Certain time team members and team leader may need to rectify their actions that may be incorrect or inappropriate.
  Be tactful while you are correcting other team member who is about to make mistake that may de drug, dose, technique or intervention.

Any team member should prevent any other member from making mistake, regardless of that person's role in the team be it team leader itself.

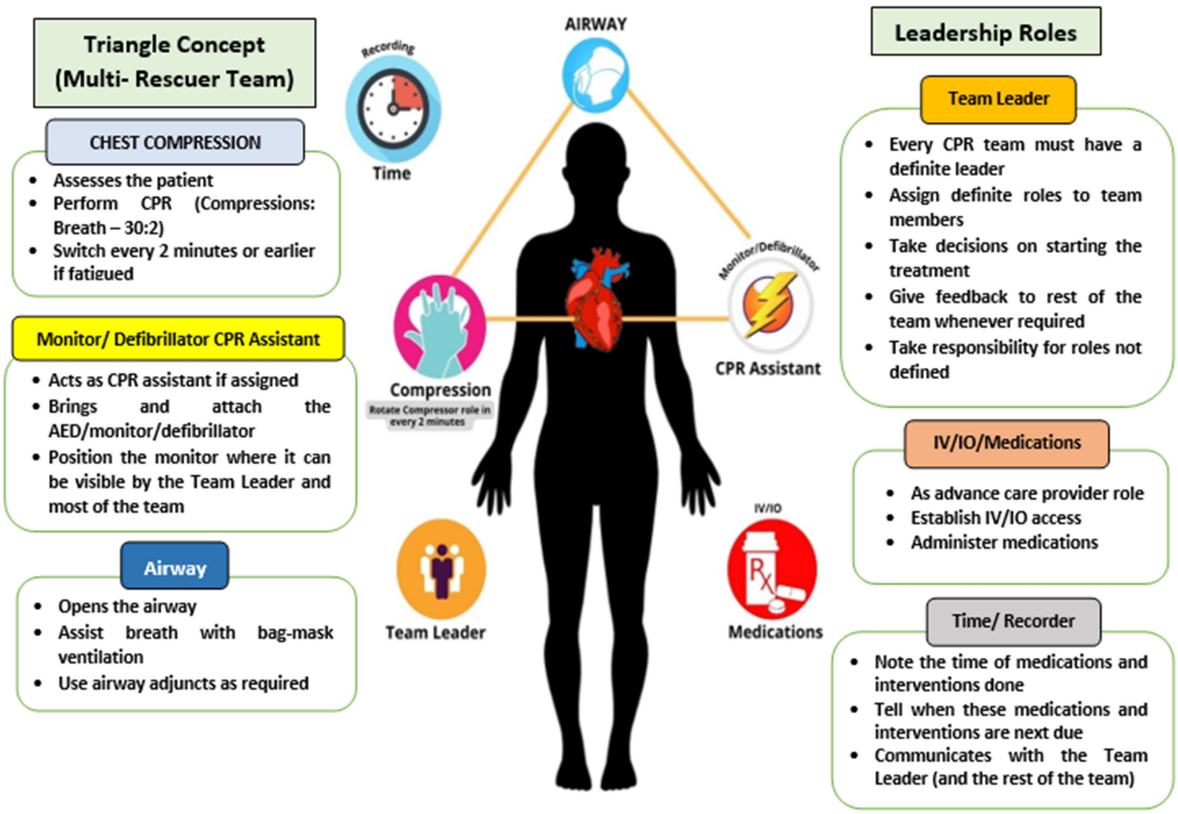


Fig 22: *High performance CPR team*

What need to communicate?

- **Sharing knowledge**
  - Sharing of the knowledge is important for a effective team performance.
  - A team leader should always ask for observations and feedback. Any good ideas for improvement in management and observations should always be welcomed.

- **Summarizing and Reassessing**
  - Summarizing the information is helpful during a resuscitation process.
  - The reasons being:
    - ❖ Reviewing the records of ongoing treatment.
    - ❖ It helps in revaluating the victim's status, the interventions done till now, and the team's progress within the algorithm of care.
    - ❖ It helps other team members to know the victim's changing conditions.

How to communicate

- Communication should be closed loop
- Messages should be clear
- Respecting each other

- **Communication should be closed-loop**
  Closed loop communications are important during resuscitation attempts among all the team members and the team leader. The closed loop communication should be practiced. For this team leaders and the team members do the following:

Team leader:

- Must know each team member by name and call each by their name
- Make eye to eye contact when giving the directions
- Additional task shouldn't be assigned until you are sure that the team member understands the directions.

Team members:

- Members must confirm that they understand the task assigned to them
- The task assigned must be verbally acknowledge by them
- Informed the team leader when you finished the task.

- **Messages should be Clear**
  - Clear message should be pass by the team leaders and the team members
  - Use of concise and clear language helps prevents misunderstandings.
  - Speaking should be loud and clear but it should be calm and confident type, helping other team members to stay focused and motivated.

- **Respecting Each Other**
  - All team members should respect each other and should keep professional attitude towards other team members, regardless of their skill or training.
  - Team members should always speak in calm, friendly, controlled voice during a resuscitation attempt, as the emotions may be very high at that time.
  - Team members should avoid shouting or aggression.

Fig 23: *Team work during CPR*

Guidelines of CPR to rescuers while handling COVID-19 victim

- **Limiting the trained rescuer risk**

Health care rescuers can reduce their risk of infection by receiving the vaccine against the SARS-CoV2 virus and follow other guidelines as issued by the competent authority.

- **Limiting the rescuer exposure and providing timely care**
  1. While Activating the ERS, inform regarding the COVID-19 status also
  2. Early and rapid chest compressions without any delay or interruption
  3. Rescuers should apply their own masks but do not delay chest compression

4. Do not delay chest compression
    - For PPE availability or
    - To place a face covering/mask on the patient
5. Relieve initial rescuer with providers wearing appropriate PPE as soon as help arrives
6. Defibrillate as soon as possible when indicated
7. Does not delay defibrillation for application of masks or PPE
8. Don appropriate PPE if airway management is planned (for putting LMA)
9. Limit unprotected rescuers from exposures
10. Consider using mechanical CPR devices

Specific additional resuscitation strategies:

1. For adult - Prioritize chest compression
2. For pediatrics - Prioritize oxygenation
3. For agonal breath- Consider passive oxygenation until HEPA filtered ventilation can be provided
4. Attach HEPA filter to any ventilation device
5. Ventilate with a bag-mask-HEPA filter with tight seal
6. Transfer as early as possible with COVID-19 protocol

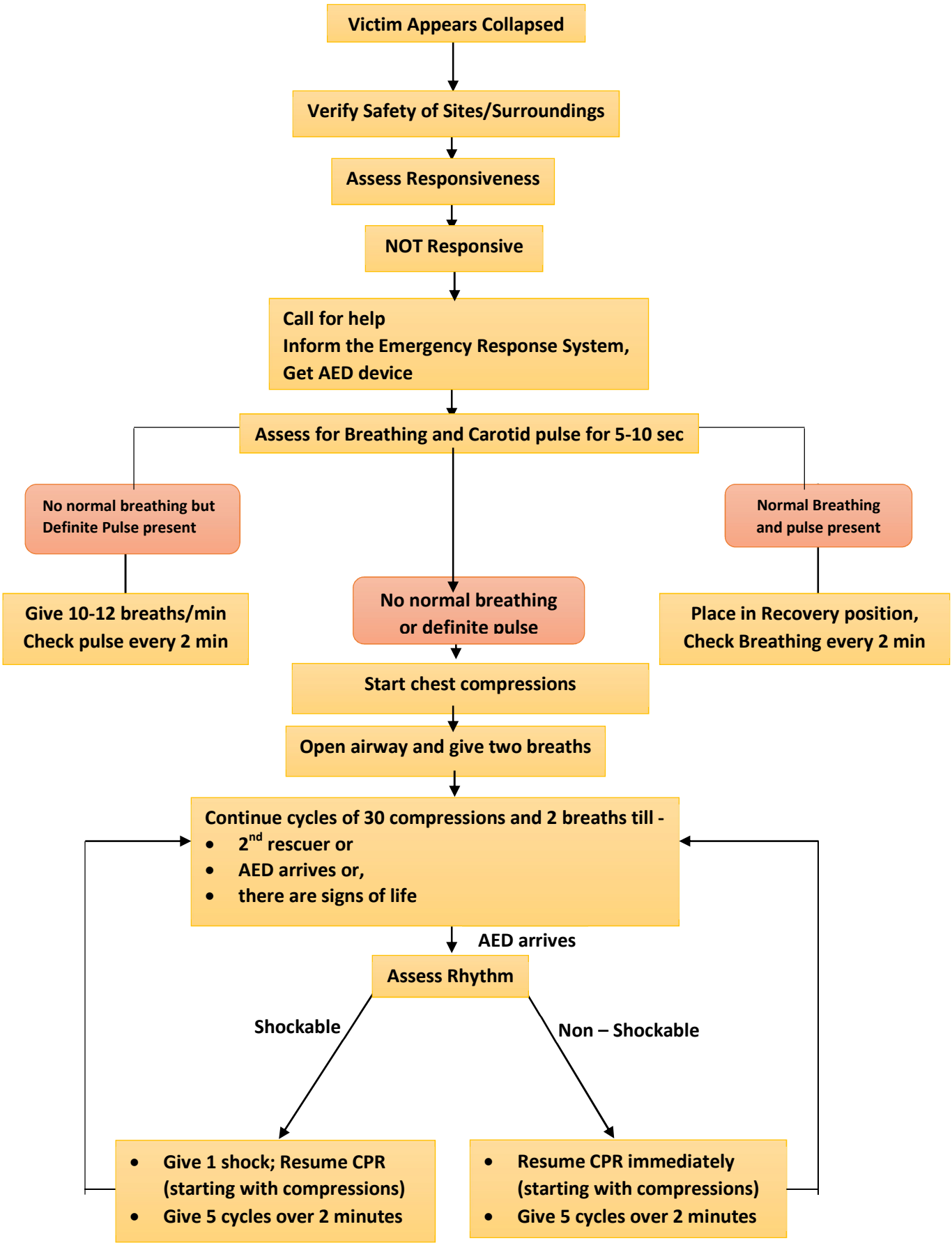


Fig 24: *Adult BLS algorithm for trained health providers for suspected COVID-19*

	Features	Adults (Puberty & Above)	Children (1 year to Puberty*)	Infants (< 1 year)
1	Verify Safety of Sites/Surroundings	Make sure the site/surroundings is safe for both victim and rescuer		
2	Assess Responsiveness	Tap on the shoulders and shout		Tap on the feet and shout
3	ERS Activation (**1** rescuer)	As soon as victim is found to be unresponsive	After 2 minutes of CPR**	
4	Pulse check	Carotid	Brachial	
5	When to start compressions	No Pulse	No Pulse: or PR<60 bpm+ Signs of poor perfusion even after proposer oxygenation & Ventilation	
6	Chest Compression Site	Centre of chest, over lower half of sternum		Just below nipple line
7	Technique of hand position for adequate compression force	2 hands; Heel of one hand other hand on top	2 hands as in adults OR Heel of one hand only	1 rescuer:2 fingers 2 rescuers :2 thumbs encircling hands
8	Compression depth	At least 5 cm (2 inches) But not > 6cm (2.4 inches)	At least 1/3 the AP diameter of the chest; Approximately 5cm (2 inches)	At least 1/3 the AP diameter of the chest Approximately 4cm
9	Breaths administer	2 Breaths; Each breath is given over 1 second	2 effective breaths***; Each breath given over 1 second	
10	Compression to ventilation ratio	30:2 (1 or 2 rescuers)	1 rescuer - 30:2 2 rescuers - 15:2	
11	Compression rate	100-120/min		
12	Breathing with no compressions required	10-12 breaths/min (1 breath every 5 to 6 seconds)	12-20 breaths/min (1 breath every 3 to 5 seconds)	
13	AED	>8 years Use only adult pads Do not use child pads/child system	0-8 years Use child pads/system, or use dose attenuator. If not available, use adult AED and pads; Do not overlap pads	

* Puberty defined as appearance of secondary sexual characters (In female development of breasts and in male appearance of axillary hair)

** In child/infant, ERS activation is done after 2 minutes of CPR

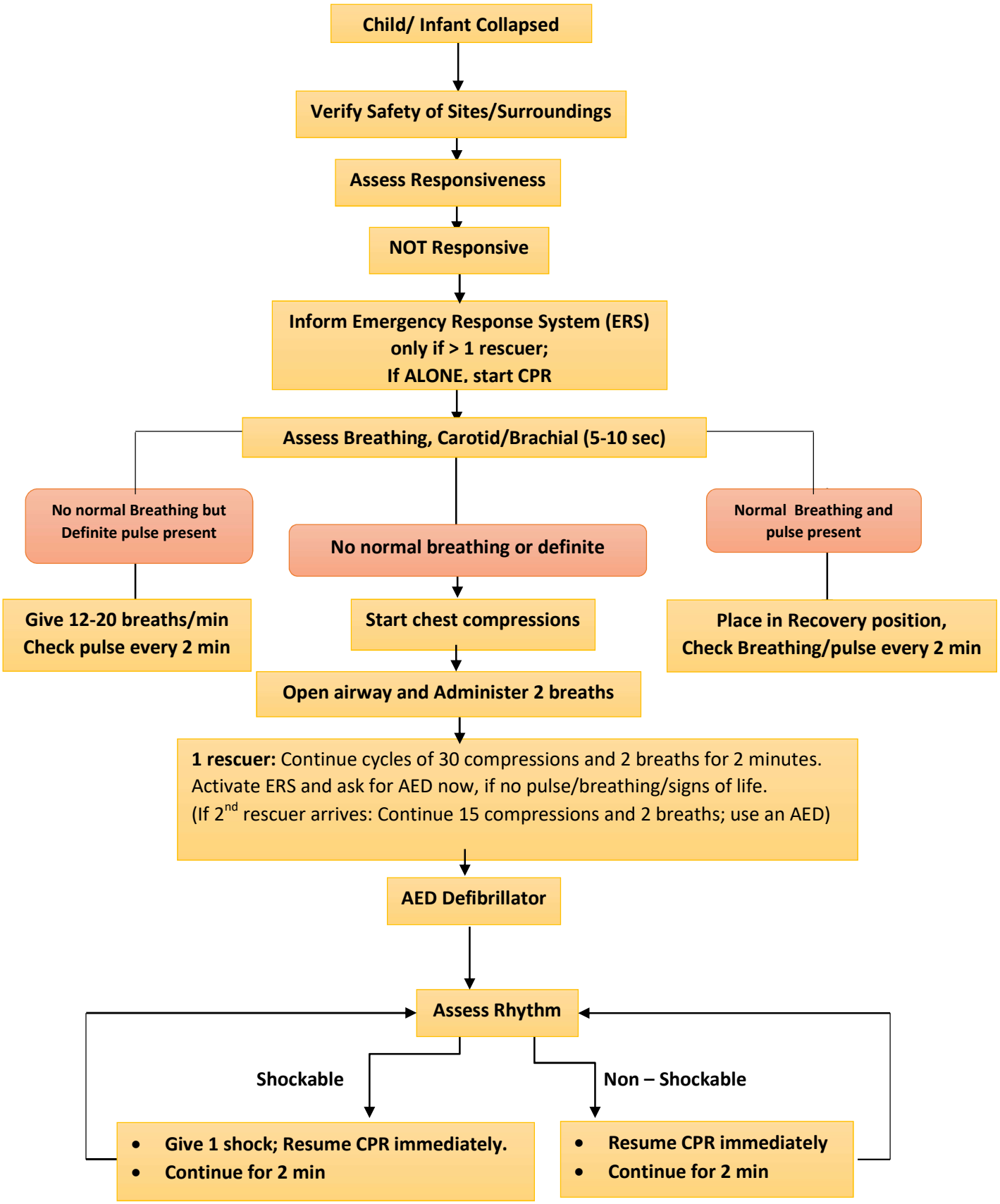


Fig 25: *Child and infant BLS algorithm for trained health providers*

Summary

Basic life support (BLS) care is the foundation for saving lives whenever victim suffers from cardiac arrest. This is the type of care that can be provided by first-responders, healthcare providers and lay man. It requires knowledge and skills of performing cardiopulmonary resuscitation in all age groups, use of automated external defibrillators (AED), certain special situations in BLS and early transfer to the nearest hospital. As a trained rescuer you must perform all these skills alone or as part of multi rescuer team.

The "chain of survival" is the most important steps of BLS consisting of four essentials links, which includes early recognition and activation of Emergency response system, early initiation of CPR by the trained rescuers, early use of defibrillator and early transfer. Survival of the victims depends upon on these four interlinked steps if perform quickly and in a proper sequence.

Cardiopulmonary resuscitations (CPR) consist of three main components that include chest compression, airway and breathing. Each part of CPR has very vital role. Chest compression should be started as early as possible and it should be of high quality. Moreover, the chest compression should be continued till the AED arrives or 2nd rescuer arrives (help). High quality CPR is the most important aspects of BLS that increases chance of victim survival. Airway management forms another important aspect in CPR after the initial chest compression. Head tilt –chin lift and Jaw thrust are two important techniques to open the airway according to the suspected victim's injury. 2 rescue breaths are administered after each 30 chest compressions. Breaths can be delivered through the bag –mask device or mouth to mask (Using one way valve pocket mask). Bag- mask ventilation can be done by E-C clamp technique. Standard precautions such as using barrier devices like pocket mass during administering breaths should be practice.

During the CPR process, automated external defibrillator (AED) device should be used as early as possible or as the help arrives. AED is portable device that can identify the abnormal heart rhythm and deliver that require the shocks when it is required. AED is easy to use and it usually prompts with command when it is switched on.

Regarding BLS in child and infant it is almost similar except few differences which should be noted. For any child or infant victim lying collapsed, if there is one rescuer, he should perform the one cycle of chest compression first and then activate the emergency response system. And if the help arrives (2nd rescuer), then ratio of chest compression to breath should be 15:2. The chest compression depth in child (at least one third AO diameter of chest or about 5 cm) and infant (at least one third AO diameter of chest or about 5 cm) are different. About the hand placement for chest compression, either 2 hands or 1 hand placed on the lower half of sternum for a child and either 2 finger or 2 thumb-encircling hands in the centre of chest just below the nipple line for infant.

For BLS, in pregnant victim, few salient points to be noted. These are position of hand for performing chest compression should be at the centre of chest, performing continuous manual left uterine displacement (LUD) during CPR, documenting the time for CPR and inform the nearest facility to prepare for the perimortem caesarean section.

After CPR, victim may show signs of recovery or not. If victim shows signs of spontaneous circulation, then patients should be placed in the recovery position and plan

for early transfer to nearest facility should be done. If there is no signs of life or no help arrives, the decision to continue CPR depends upon the rescuer.

In recent times due to the covid-19 pandemic, this is pertinent to follow all the biosafety protocol while performing the CPR. This becomes important as in the pre-hospital settings the rescuer may be exposed or at the risk of getting infected. The trained rescuer should wear the mask or full PPE while attending the victim depending upon its availability or follow the guidelines for the same.

Chapter 2: Medical Emergencies

Learning Outcomes

At the end of this chapter, reader will be able to -

- Understand the approach towards various medical emergencies
- Understand pathophysiology of medical emergencies
- Assess victims with medical emergencies
- Provide pre-hospital resuscitative measures to medical emergency victims
- Make decisions to carry patient to specific medical facility based on the condition
- Take time sensitive measures to prevent further loss or injury to the victim

Introduction

As a pre-hospital care provider most of your victims will be having one of the following medical emergencies:

- Heart conditions e.g., heart attacks, heart pump failure, heart rhythm failure
- Brain conditions e.g., paralysis or stroke, seizure disorders, fever related altered sensorium
- Lung conditions e.g., asthma in young or old (smokers), pneumonia, tuberculosis (tb), lung cancer
- Stomach e.g., diarrhoea, vomiting, blood in vomitus, jaundice, ascites (alcoholic liver failure)
- Poisoning e.g., Suicidal poison intake, unintentional poison intake
- Environmental injuries e.g., drowning, hypothermia, heat stroke, snake or insect bite, electric shock
- Miscellaneous: fever, altered behavior, unconscious victim, kidney disease

Approach to a victim of Medical Emergency

Take Good History

Make a habit of writing notes on a diary for each patient

If the victim can talk ask 'What do you think you are suffering from?' Give the victim a chance to explain her problem. If victim is not responding, ask the family members 'What do you think s/he is suffering from?' listen patiently to what they know about the victim's condition.

- Ask and note the **time of onset** of her medical condition.
- Ask about the **severity** of medical condition on a scale of 1 (mildest) to 10 (most severe).
- Ask if s/he is having some disease for which s/he has been **already diagnosed**?
- Ask if s/he is taking some **medication for any disease**?

- Ask the family of the victim to **carry with them all the medical records and medications** to the hospital. On the way, make a list of the medicine patient is taking and note the diagnosis.

Initial assessment and management

Medical emergencies often require urgent interventions even before a specific diagnosis is made and a presentation-based approach is essential for managing patients in pre-hospital setup. Hence, knowledge about a general approach that can be used for every medical emergency which would rapidly assess and manage immediate life threats which would allow for a safer transfer of these patients.

First step is to **check the responsiveness** of the patient

Unconscious patientor altered mental status:
Patient's consciousness level may vary from being very combative and aggressive on the one hand (Hyperactive Delirium) to being totally unarousable (Comatose).

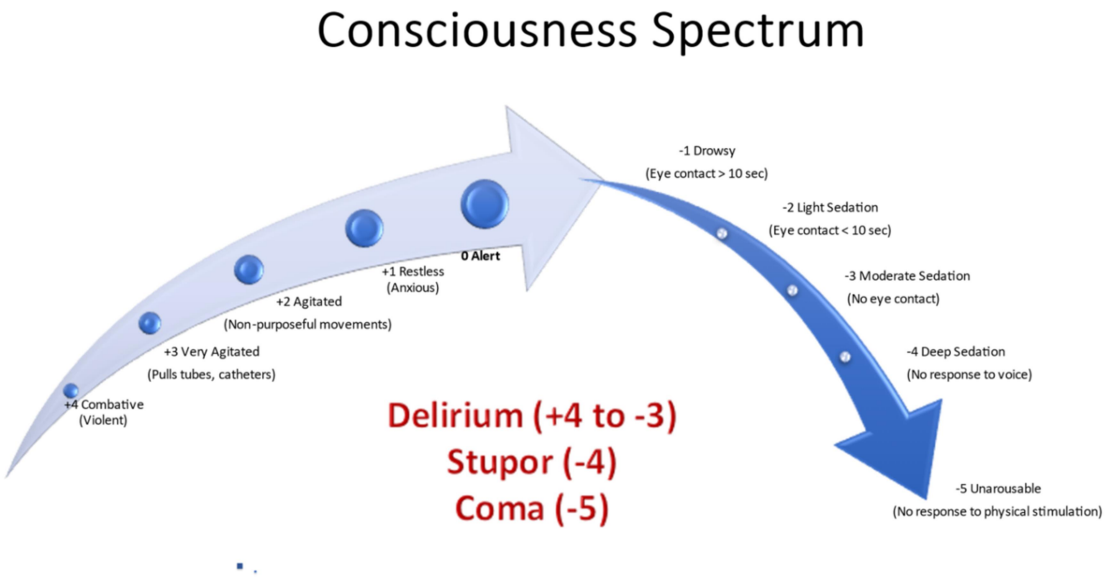


Fig 26: *Consciouness spectrum*

AVPU scale is a quick and simple, tool which can be used for assessment on the field.
A - Alert (Patient is awake and talks to you)
V - Responds to verbal stimulus (Patients attempts to responds when you talk to him)
P - Responds to painful stimulus

1. Central stimuli:
    - Trapezius pinch - pinch between the neck and shoulder
    - Supraorbital pressure - press up on the upper ridge of the eye socket
    - Armpit pinch - pinch the margin of the armpit
2. Peripheral stimuli: Pressure on nailbed, pinching the thumb-index finger web

U - Unresponsive

Non-purposeful movements

- Flexion posturing or decorticate posturing. This is due to upper brain stem compression

Patient's head arches back and flexes arms inwards.

- Extension posturing or decerebrate posturing. Usually due to lower brain stem compression

  Patient head arches back and extends arms and legs straight and parallel to the body

  ✓ Open and protect the airway

  ✓ Administer oxygen to unresponsive or altered mental status patients

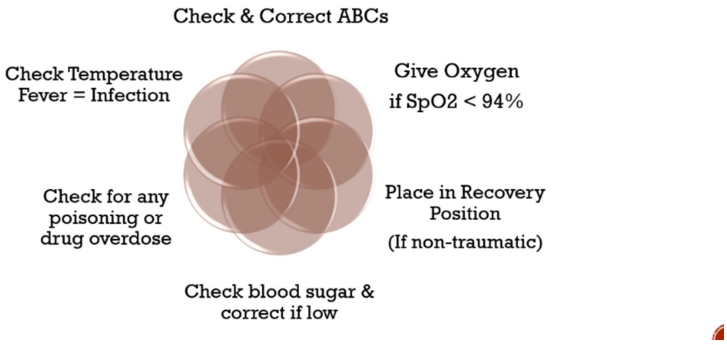


Fig 27: *Prehospital Care of the Unconscious*

Next step is to assess ABCD

A: AIRWAY

Assessment

- Can the patient talk normally? If YES, the airway is open
- If the patient cannot talk normally: Assess if the chest wall is moving and listen to see if there is air movement from the mouth or nose
- Listen for abnormal sounds (such as stridor, grunting, or snoring) or a hoarseness of voice that indicates a partial airway obstruction. If there is stridor with swelling and/or urticarial rashes, it suggests a severe allergic reaction (anaphylaxis)
- Look and listen for fluid (such as blood, vomit-gurgling sound) in the airway
- Look for foreign body or abnormal swelling around the airway and altered mental status
- Check if the patient is able to swallow saliva or is drooling

Management

- If the airway is not patent (patient is unconscious and not normally breathing)
- Open the airway using the head-tilt and chin-lift manoeuvre. Place an oropharyngeal or nasopharyngeal airway to maintain the airway
- If a foreign body is suspected:
  - If the object is visible, remove it
  - Be careful not to push the object any deeper
  - If the patient is able to make noises, keep the patient calm and encourage coughing
  - If the patient is unable to cough, not making sounds (choking) use age-appropriate chest thrusts/ abdominal thrusts/back blows
  - If the patient becomes unconscious while choking, start BLS
- If secretions or vomit are present, suction when available, or wipe clean. Consider placing patient in the recovery position if the rest of the ABCDE is normal
- If the patient has swelling, rashes or stridor, consider severe allergic reaction (anaphylaxis), and give intramuscular adrenaline (0.3-0.5mg, 1:1000)

- If there is need for advanced airway management then allow the patient to stay in a position of comfort and rapidly transfer

B: BREATHING

Assessment

- Look, listen, and feel to see if the patient is breathing.
- Does the pulse oximeter read above 95%?
- Assess if breathing is very fast, very slow, or very shallow
- Asses for signs of increased work of breathing (such as accessory muscle use, chest indrawing/ retractions, nasal flaring) or abnormal chest wall movement
- Listen for abnormal breath sounds such as wheezing or crackles
- Listen to see if breath sounds are equal on both sides
- Check for the absence of breath sounds and dull sounds with percussion on one side (large pleural effusion)
- If there are no breath sounds on one side, and hypotension, check for distended neck veins or a shifted trachea (tension pneumothorax)
- Check oxygen saturation with a pulse oximeter when available

Management

- If unconscious with abnormal breathing, start bag-valve-mask ventilation and check for pulse
- If not breathing adequately (too slow for age or too shallow), begin bag-valve-mask ventilation with oxygen. If oxygen not immediately available, DO NOT DELAY ventilation. Start ventilation while oxygen is being prepared
- If breathing fast or hypoxic, give oxygen
- If concern for severe allergic reaction (anaphylaxis), give intramuscular adrenaline (0.3-0.5mg, 1:1000)
- If concern for tension pneumothorax, perform needle decompression immediately and give IV fluids and oxygen
- If concern for large pleural effusion or haemothorax, give oxygen and rapidly transport

C: CIRCULATION

Assessment

- Look and feel for signs of poor perfusion or shock (cool, moist extremities, delayed capillary refill greater than 3 seconds, low blood pressure, tachypnoea, tachycardia, absent pulses)
- Check and record heart rate and blood pressure
- Look for both external & internal bleeding
- Look for hypotension, distended neck veins and muffled heart sounds that might indicate pericardial tamponade (fluid around the heart)

Management

- If signs of poor perfusion, give IV fluids and oxygen
- For external bleeding, apply direct pressure or use other technique to control
- If internal bleeding or pericardial tamponade are suspected transfer rapidly a nearby centre with surgical capabilities

- If cause unknown, remember the possibility of occult bleeding like gastrointestinal bleed or ectopic ***in female patients***

D: DISABILITY

Assessment

- Assess level of consciousness with the AVPU scale (Alert, Voice, Pain, Unresponsive
- Asses pupillary size and reaction
- Check blood glucose level
- Check movement and sensation in all four limbs
- Look for abnormal repetitive movements or shaking on one or both sides of the body (seizure/convulsion)

Management

- If altered mental status, place the patient in recovery position and take care of the airway while transportation.
- If blood glucose is low (<50mg/dl) or glucose test not available and patient has altered mental status, give intravenous 25% dextrose 100ml.
- For active seizures, place the patient in recovery position, prevent trauma and after tele-consult give a benzodiazepine.
- If pregnant and having seizures, after tele-consult give magnesium sulphate.
- If pupils are not equal, consider increased pressure on the brain and raise head of bed 30 degrees and rapid transfer to nearest centre with facility for neurosurgical care.

E: EXPOSURE

Assessment

- Examine the entire body for hidden injuries, rashes, bites or other lesions. Rashes, such as hives, can indicate allergic reaction, and other rashes can indicate serious infection.

Management

- If snake bite is suspected, immobilise the limb. Take a picture of the snake if possible from a distance and send with patient. Do not risk additional bites to catch/kill snake
- Remove constricting clothing and all jewellery
- Prevent hypothermia by covering the patient as soon as possible. Acutely ill patients have difficulty regulating body temperature
- Remove any wet clothes and dry patient thoroughly

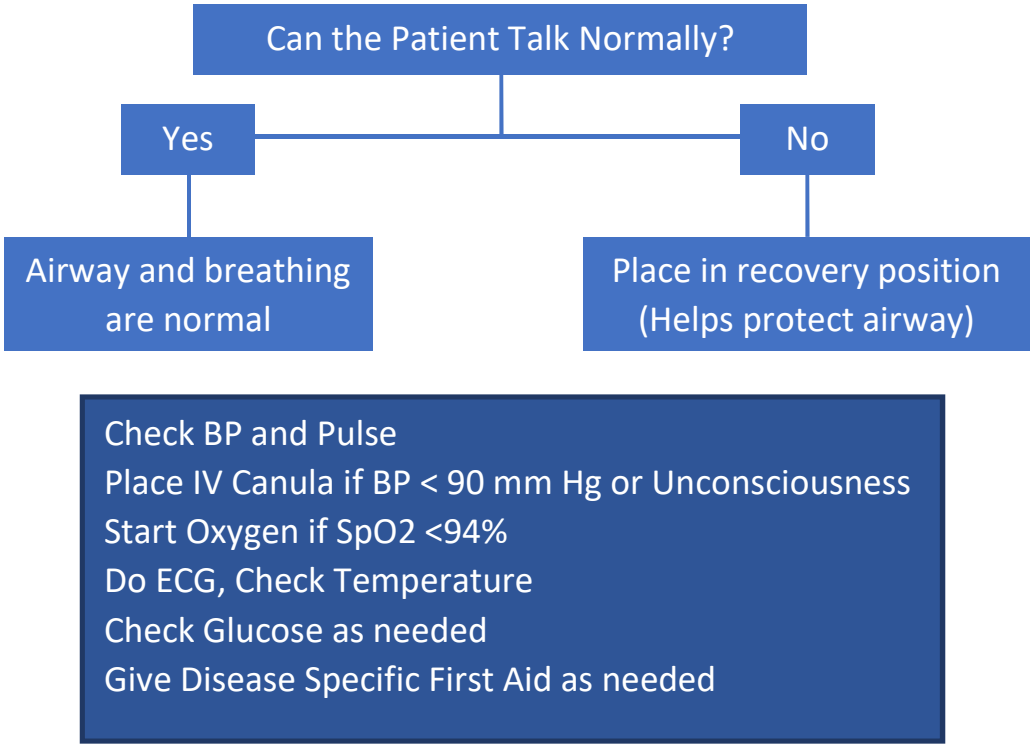


Fig 28: *Assessment and management of patient*

Disease Specific Actions

Breathless patient

- Common possible disease conditions include: Kidney failure, heart failure, lung disease, pulmonary embolism (block in blood vessel)
- Check respiratory rate and spo2 – start oxygen only if SpO2 < 94%
- Put in an IV cannula if BP < 90 mm Hg, Pulse > 150 or < 50 beats/min
- Get an ECG done and seek Tele-ECG opinion

Febrile patient

- Put IV line if the patient is unconscious
- Check Blood Pressure
- If mean arterial pressure (2xDiastolic pressure + Systolic Pressure)/3 < 65 start IV Normal Saline.
- Give Oxygen if SpO2 < 94%

Stroke/Paralysis

Note the time of onset of symptoms. Place in recovery position if patient is unconscious.

Stroke symptoms – New fast

N - Nausea, Vomiting
E - Eyes - Double vision, field cut, neglect, nystagmus
W - Walking – difficulty in walking
F - Facial droop - one side of the face is droopy
A - Arm weakness - especially one side being weak
S - Speech - slurred, confused, absent speech
T - Terrible headache, dizziness

Fig 29: *Pre-hospital Stroke actions*

If onset of paralysis was within 4.5 hours transfer the patient to the nearest Stroke center or a hospital where CT scan is available so that the patient can be taken up for thrombolysis after doing a quick CT.

Seizures

- Place the patient in recovery position to prevent aspiration
- Check SpO_2, if < 94% then give oxygen and take the patient to the nearest medical facility

Poisoning

- Identify the poison (Empty poison bottle, tablet strips at the scene)

- Put in an IV cannula and start IV fluids if BP < 90 mm Hg
- Give oxygen if SpO_2< 94%
- Put the patient in recovery position if unconscious
- Take the patient to the nearest hospital

Chest pain/heart attack

- Get an ECG and seek telemedicine opinion
- Take the patient to the nearest heart care center
- While transporting keep AED (Automated External Defibrillator) ready
- Give tablet Aspirin 325mg chewable and Atorvastatin 80mg orally (After tele-consultation, if patient is alert)
- First medical contact to ST-elevation MI (STEMI) diagnosis time should be <10 minutes
- Transport patient of STEMI to percutaneous coronary intervention center if within 120-minute distance, otherwise transport to the nearest thrombolysis capable hospital.

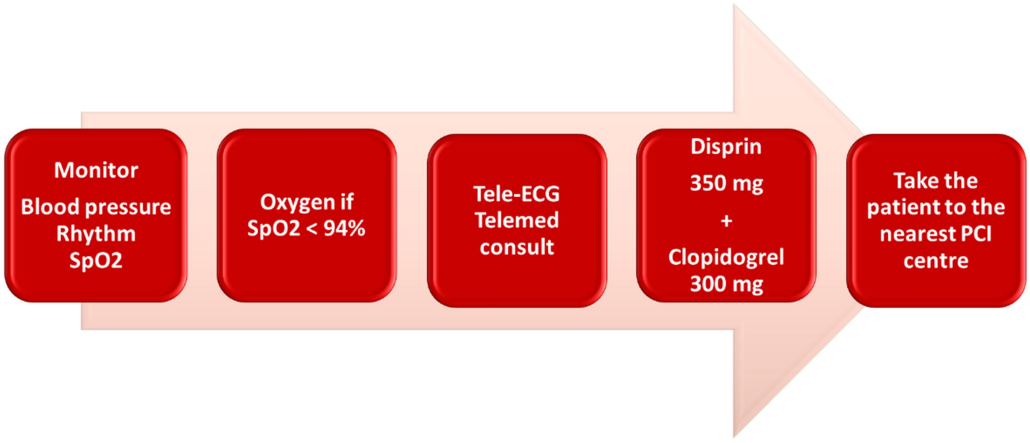


Fig 30: *Management of Heart Attack*

Snake bite

- Reassure and calm the patient. Avoid handling the snake to prevent recurrent bite.
- Immobilize the limb of bite site using a splint. Put in an IV cannula
- Remove constricting clothing and all jewellery (if easily removable; do not squeeze)
- Look for signs of paralysis (drooping of eyelids, difficulty in breathing, paralysis etc.)
- Look for signs of bleeding (gum bleed, urinary bleed or bleeding from site of snake bite.
- Take the patient to the nearest health care center where ASV (anti snake venom) is available

Bee sting

- Watch the patient for development of low Blood pressure or difficulty in breathing
- Monitor BP and SpO2 regularly
- Give intramuscular 0.3-0.5mg Adrenaline 1:1000 if any of these develop
- Put in an IV cannula and start IV fluids if BP < 90 mm Hg

- Remove the stinger with a thin card (ATM/ID card) if visible. Do not attempt to squeeze out the stinger

Drowning Management

- Ensure scene safety. Don't jump for help; Ask for professional help if available
- Check for responsiveness & breathing
- If conscious - give side line position (recovery position)

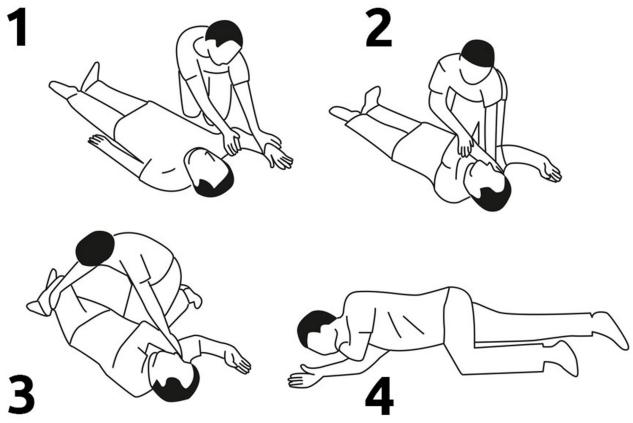


Fig 31: *Placement of a patient in recovery position*

- If unconscious – start CPR immediately
- Ventilation is considered the most important initial treatment for victims of submersion injury
- Rescue breathing should begin as soon as the rescuer reaches shallow water or a stable surface
- Note that the priorities of CPR in the drowning victim differ from those in the typical adult cardiac arrest patient, which emphasize immediate uninterrupted chest compressions
- If the patient does not respond to the delivery of two rescue breaths that make the chest rise, the rescuer should immediately begin performing high-quality chest compressions.
- CPR, including the application of an automated external defibrillator, is then performed according to standard guidelines. Dry the chest prior to applying AED pads
- Prevent hypothermia by removing wet clothes and covering with warm blankets.
- Attempts at rewarming hypothermic patients with a core temperature <33°C should be initiated, either by passive or active means as available.
- Cervical spine injury is possible yet not very common. As per AHA/ACLS guidelines, unless there is a concerning mechanism of injury (e.g., dive into shallow pool) and visible or suspected head injury, routine cervical spine immobilization in all drowning patients is not recommended.
- The Heimlich manoeuvre or other postural drainage techniques to remove water from the lungs are of no proven value
- Transport the patient to nearest hospital.

Summary

Medical Emergencies form the major proportion of the day-to-day emergency conditions. They often require urgent interventions even before a specific diagnosis is made and a presentation-based approach is essential for managing patients in pre-hospital setup. The spectrum also involves time sensitive emergencies such as stroke and heart attack where early pre-hospital identification and timely management is crucial for better patient outcome.

Better understanding few specific diseases of heart conditions such as heart attack, heart failure, brain conditions paralysis or stroke, seizure disorders, altered consciousness, lung conditions such as asthma, pneumonia, abdominal conditions such as diarrhoea, vomiting, blood in vomitus, jaundice, various poisoning, snake bite, insect stings, drowning, electrocution, fever and its complications is essential to be able to manage basic medical emergencies efficiently.

Identifying threatened airway, breathing, circulation, airway opening manoeuvres, initiating oxygen therapy, fluid resuscitation, recognising cardiac or respiratory arrest in an unresponsive patient, initiating basic life support, transitioning to advance life support, placing a patient in recovery position are the key skills to be mastered.

The cornerstone of initial management involves physiological assessment i.e., assessing airway, breathing, circulation, disability and time bound stabilization. A brief understanding of pathophysiology and specific management of medical conditions helps in early initiation of definitive management and also gives the pre-hospital personnel the discretion for transporting a patient to appropriate medical facility with required infrastructure for treatment.

Chapter 3: Obstetric Emergencies

Learning Outcomes

At the end of this chapter, reader will be able to -

- Know how to assess the pregnant patient in the pre-hospital phase
- Recognize and manage common antepartum emergencies
- Understand how to assist with an emergency pre-hospital delivery
- Recognize and manage common intrapartum emergencies
- Recognize and manage common postpartum emergencies

Introduction

Childbirth is a natural process. At times Paramedics or EMTs may have to assist with out-of-hospital delivery. A paramedic should be prepared to manage any complications of pregnancy labour and delivery. In a study conducted in India, it was found that about 20% of pregnant women used ambulance services for transport to respective facilities, and out of these, about 12% were obstetric emergencies. The National Rural Health Mission (NRHM) and under its umbrella, the Reproductive and Child Health Programme Phase II recommends that response time for the ambulance should be reaching the beneficiary within 30 minutes and the woman reaches the health facility within the next 30 minutes.

Clinical features

Obstetric emergencies can be divided into

- Antepartum (before delivery)
- Intrapartum (during delivery)
- Postpartum (after delivery)

Antepartum (Pre-delivery) Emergencies

1. **Hyperemesis Gravidarum:** Patients can have severe nausea, vomiting, excessive salivation, headaches, syncope and Jaundice

2. **Antepartum haemorrhage**: Bleeding occurring after 20 weeks of pregnancy caused by:
   - Placenta previa
   - Placental abruption
   - Uterine rupture

Placenta previa abnormal attachment of baby to mother in uterus

- c/f painless bleeding per-vaginum which is commonly bright red in colour and torrential.
- They also might have symptoms of shock
- management-2 large IV bore cannula with normal saline bolus and transport to hospital as soon as possible

Placental abruption sudden detachment of placenta

- c/f- severe abdominal pain, symptoms of shock, and will have a hard tender uterus on palpation.
- management-2 large IV bore cannula with normal saline bolus and transport to hospital as soon as possible

Uterine rupture seperation of the muscular wall of the uterus usually during labor and ocassionally during later weeks of pregnancy.

- c/f- abdominal pain,vaginal bleeding,undetectable fetal heart rate ,palpable fetal body parts,cessation of contrations,sudden appearance of fetal distress during labor
- management- shock management, administer broad spectrum antibiotics and quick tranfer to hospital as it requires emergency laporotomy

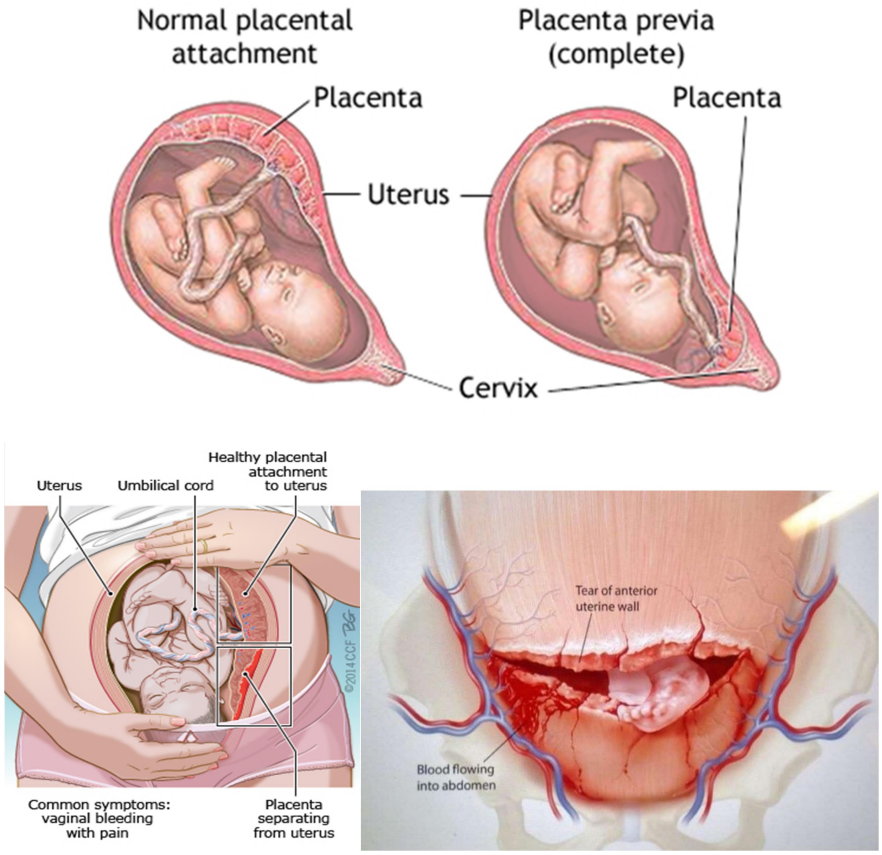


Fig 32: *Pre-delivery antepartum emergencies*

Severe preeclampsia and eclampsia

- Preeclampsia is a multi-system disorder which consists of elevated blood pressure (140/90 mmHg and proteinuria in patients 20 weeks' gestation until 4 to 6 weeks after delivery.
- Severe preeclampsia is defined as greatly elevated blood pressure (>160/110 mmHg), proteinuria and one or more of the following symptoms: severe headache, visual disturbance, abdominal pain, vomiting, or signs of clonus.
- Eclampsia is preeclampsia with seizure. Seizures are usually self-limiting but can become severe and recurrent.

- **Gestational Hypertension (gHTN)**
  - BP > 140/90
  - Onset > 20 wks gestation
- **Preeclampsia = gHTN + New Onset ≥ 1:**
  - Proteinuria (300 mg/24 hr)
  - Cr > 1.1 mg/dL or ↑ 2x
  - Thrombocytopenia
  - Elevated AST/ALT
  - Pulmonary edema
  - Cerebral/visual symptoms
- **Eclampsia**
  - Preeclampsia + Grand Mal Seizure

HELLP Syndrome
- Thrombocytopenia
- Elevated AST/ALT
- Hemolysis

Fig 33: *Preeclampsia and eclampsia symptoms*

Assessment of a pregnant patient

Stabilizing their ABC's (Airway Breathing Circulation) is the key to prevent maternal mortality and quality obstetric care. Two lives (mother and baby) both require assessment.

Obstetric assessment will focus on doing a detailed primary assessment and stabilization of vitals followed by a focused history and secondary assessment.

Secondary assessment and history will focus on assessing for the

- Level of consciousness
- Signs of external trauma
- Active bleeding
- Last menstrual period
- Gestational age
- Details of prenatal care and any medical disease complicating pregnancy
- Asses for any signs of labour
- Assessment of fetal heart tones, fetal movement and measurement of fundal height.

Management

Management of patients with antepartum haemorrhage involves rapid transfer to nearby obstetric facility. Attempts at starting an intravenous access should be made en route and fluid resuscitation with normal saline or ringer lactate solution should be initiated.

Patients with severe preeclampsia and eclampsia should be rapidly transported to a nearby obstetric facility. The patient should be placed in their left side or with their right hip elevated at least 15 degrees to the left if they are at greater than 20 weeks of gestation for transfer and oxygen applied if SpO2 <94%. Monitor the blood pressure en route. Self-limiting seizures should be managed initially with basic airway adjuncts (e.g. NPA) and intravenous access. Further seizures can be prevented by giving magnesium sulphate 4g intravenously over 15 minutes. If magnesium sulphate is not available and the patient has recurrent or prolonged seizures consider parental or rectal benzodiazepines.

Emergency pre-hospital delivery

Pre-hospital delivery poses risk of perinatal mortality and maternal complication. Hence pre-hospital care providers have to be prepared on performing delivery on field and during en-route to healthcare facility.

Delivery is divided into stages: 1st stage, 2nd stage and 3rd stage.

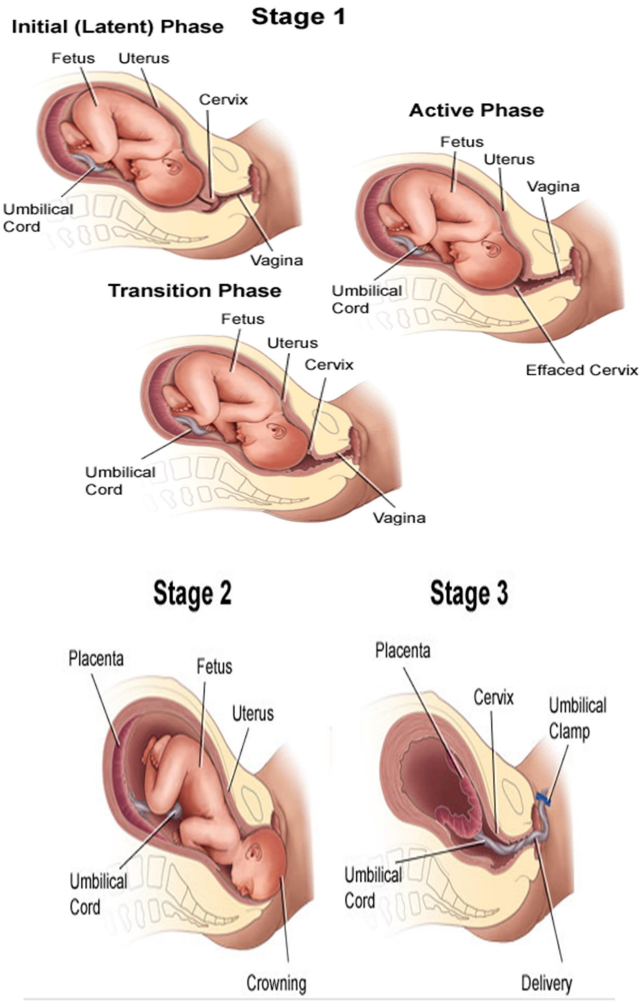


Fig 34: Stages of delivery

a. First stage (Dilatation)

This stage involves the dilatation and effacement of cervix. It established labour contractions of 3-4 times in every 10 minutes which usually last for at least 60 seconds. At this stage its best to transport the mother in labour quickly so that the delivery can occur at a hospital.

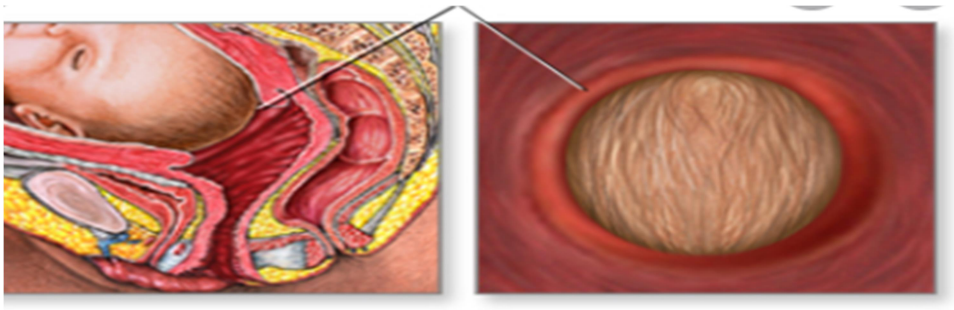


Fig 35: *First stage (Dilatation)*

b. Second stage

Begins with complete dilatation of cervix to delivery of the fetus. In this stage contractions are 2 minutes apart lasting for 60-90 seconds. The perineum bulges and head become visible at introitus. At this stage delivery is imminent and an emergency prehospital delivery preparation should be ready.

Take Standard Precautions

- Do not touch the vaginal area except during delivery
- Do not allow the patient to use the toilet
- Do not hold the mother's legs together
- Prepare a sterile delivery kit
- Position the patient in the lithotomy position
- Apply oxygen by nasal cannula at 2-4 liters/minute
- Anticipate vomiting
- Tear the amniotic sac, if not ruptured
- Apply gentle pressure to the perineum to allow head to deliver
- Assess for the possibility of nuchal cord.Suction the airway only if needed
- After Delivery of anterior shoulder, deliver the posterior shoulder and then the remaining body
- Support the baby's body with both hands as it is delivered
- All babies should be dried immediately post-delivery

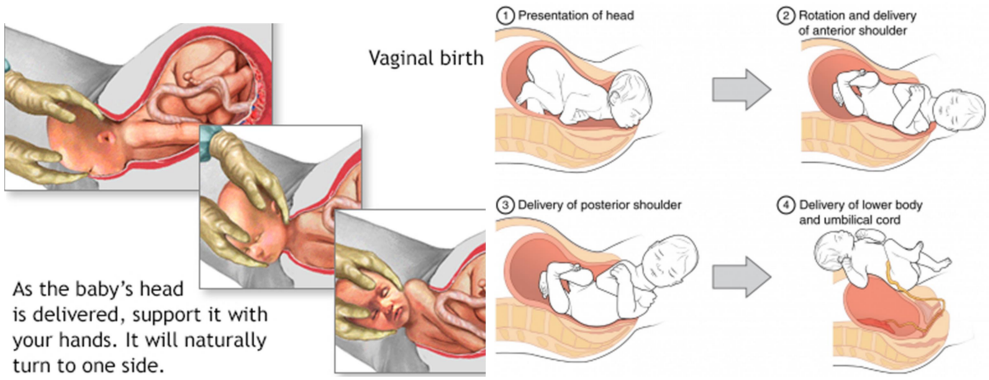


Fig 36: Second stage

c. **Third stage**

- Begins with delivery of the baby and ends once the placenta has been delivered
- Clamp the cord (at 3 cm and 6 cm from the baby) and use sterile surgical scissors or a scalpel to cut in between the clamps
- Cord lengthening and a small gush of blood indicate placental separation
- In view of the risk of cord rupture and uterine inversion, prehospital application of cord traction is discouraged
- Place a sanitary pad or sterile dressings over the vaginal opening and perineum
- Record the time of delivery, transport the mother, newborn, and placenta to the hospital

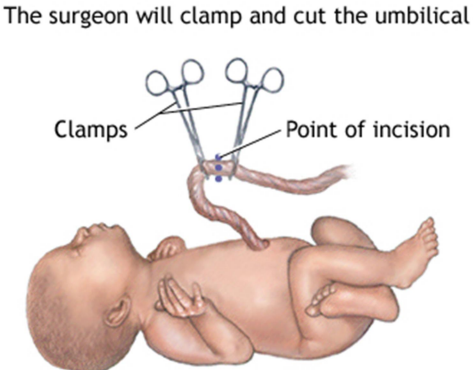


Fig 37: *Third stage*

Intrapartam complications (during delivery)

Cord prolapsed: Umbilical cord protrusion through vagina

What to do?

- Instruct the mother not to push
- Administer high-concentration oxygen
- Put patient in a knee-chest position or sims position
- Wrap the cord in warm moist towel.
- Transport mother to healthcare facility immediately

What not to do?

- Do not attempt to push cord back

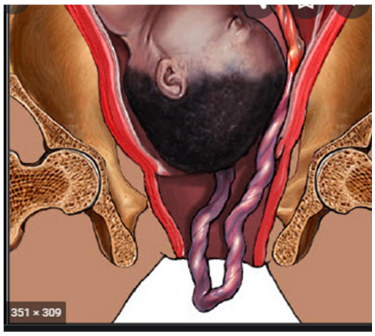
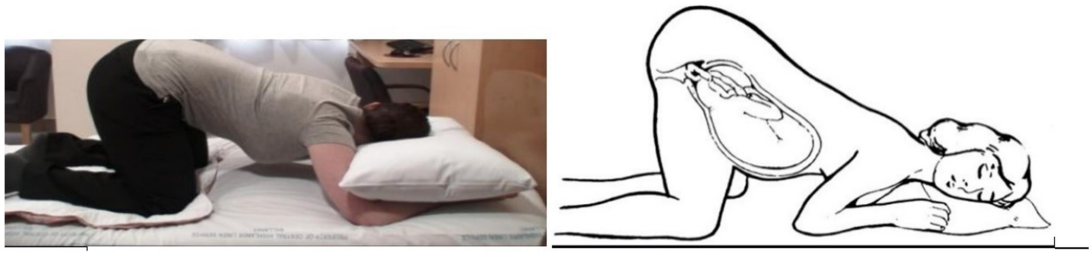


Fig 38: *Intrapartum complications*



Knee-Chest Position

Modified Sim's Position

Fig 39: *Modified chest position and modified sim's position*

Shoulder dystocia- failure of the shoulder to traverse the pelvis spontaneously after birth of head and requires special techniques.

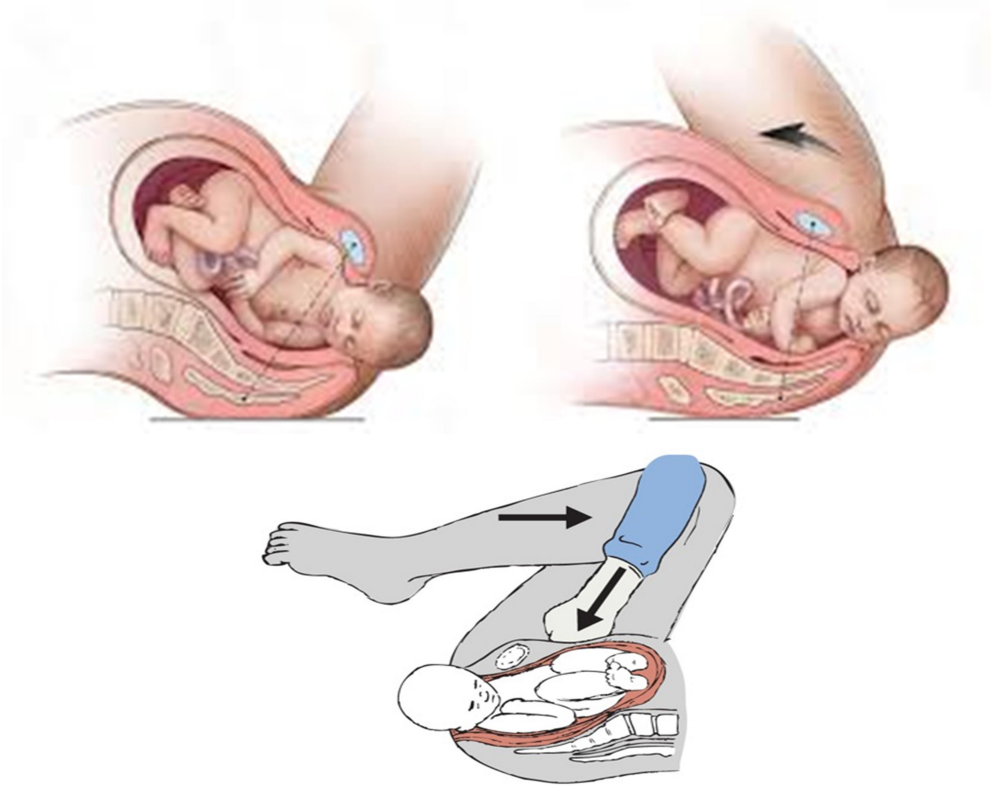


Fig 40: *Shoulder dystocia*

Postpartum Haemorrhage

Defined as a loss of >500ml blood occurs after vaginal delivery. This occurs due to abnormalities of **(4Ts)**

1. Uterine contraction (TONE)

2. Trauma to the genital tract (TRAUMA)
3. Retained products of conception (TISSUE)
4. Coagulation abnormalities (THROMBIN)

- These patients will be bleeding profusely and have signs of shock
- Paramedic or EMT should prepare the patient for rapid transfer to nearby obstetric care facility
- Early intravenous access and fluid resuscitation is important but should not delay transfer to hospital
- Tears can be managed by applying direct pressure.
- If the uterus feels atonic (soft and doughy) try massaging the uterine fundus
- Consider syntometrine early if available
- If this doesn't work and bleeding is continuing, bimanual (Figure) or aortic compression (Figure) may be employed during rapid transfer to hospital

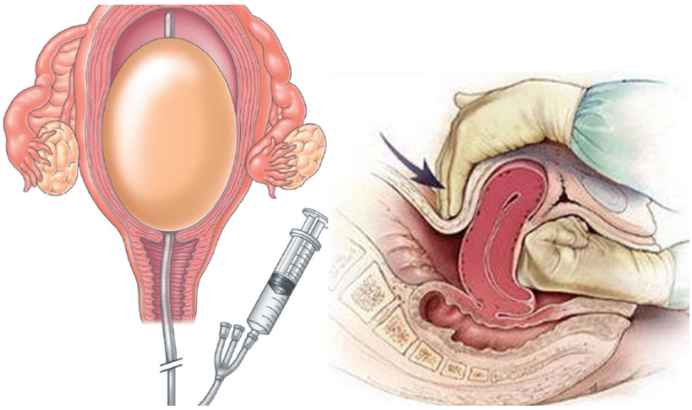


Fig 41: *Postpartum haemorrhage*

Disposition

Paramedic or EMT should transport all pregnant patients to the nearest facility capable of managing obstetric care. Providers should be aware of these facilities prior and should as far as possible give a pre-arrival notifications to these facilities.

Higher order thinking Skill (HOTS)/Red Flags

Imminent Delivery

- Has crowning occurred?
- Are contractions less than 2 minutes apart?
- Do they last 60-90 seconds?
- Does the patient have the urge to defecate?
- Does the patient has a strong urge to push?
- Is the patient's abdomen is extremely hard?

Resourcefulness; Frugal/Jugad

Decubitus for transporting pregnant patient to avoid aorto-cavel compression

Summary

The NRHM recommends that response time for the ambulance for reaching the beneficiary should be within 30 minutes and the woman should reach the health facility within the next 30 minutes as a quality benchmark. Childbirth is a natural process. At times Paramedics or EMTs may have to assist with out-of-hospital delivery. A paramedic should be prepared to manage any complications of pregnancy labour and delivery. Here an EMT will get know how to assess a pregnant patient in the pre-hospital phase, recognize and manage common antepartum emergencies such as placenta previa, placental abruption, uterine rupture, preeclampsia and eclampsia, understand how to assist with an emergency pre-hospital delivery, recognize and manage common intrapartum emergencies such as Emergency Pre-Hospital delivery in case the patient was not able to reach nearest health facility in time, stabilizing ABC, cord collapse and recognize and manage common postpartum emergencies such as postpartum bleeding where more than 500 ml blood loss is there after vaginal delivery. The EMTs here deal with 2 lives (mother and child) and both require assessment. Paramedic or EMT should transport all pregnant patients to the nearest facility capable of managing obstetric care. Providers should be aware of these facilities prior and should as far as possible give a pre arrival notifications to these facilities.

Chapter 4: Trauma Emergencies

Learning Outcomes

At the end of this chapter, reader will be able to-

- Priorities of initial approach in pre-hospital care of an injured.
- Timely assessment and management of exsanguinating haemorrhage.
- Steps of cervical spine stabilization.
- Steps of helmet removal.
- Steps of immobilizations of a fractured limb.
- Process of extrication of a victim from the vehicle.

Introduction

The holistic concept of trauma management aims at getting the right patient to the right place at the right time. Hence, the care of an injured patient immediately post-injury by well-organized pre-hospital care is a must to improve the overall outcomes of trauma care delivery. Pre-hospital care must be quick and safe. The time spent on the pre-hospital rescue should be minimal. The spectrum of trauma care provided by pre-hospital care is very wide and has many challenges. The primary role and goal of pre-hospital care are to render aid and transport the trauma patients to the appropriate facility, preferably to a trauma center. Factors like mechanism of injury, environmental or geographical conditions, resources and expertise available and possible hazards at the scene, etc. play a role in providing high-quality pre-hospital care.

Priorities of Initial approach in Pre-hospital Care

Appropriate precautions, situational awareness and prioritizing the need for trauma patients are the keys to high-quality PHC. The basic tenet of the initial approach in prehospital emergency services, especially concerning trauma, involves the following four priorities:

1. Scene assessment
2. A quick primary survey
3. Resuscitation, critical intervention & triage
4. Initiate transport of patients

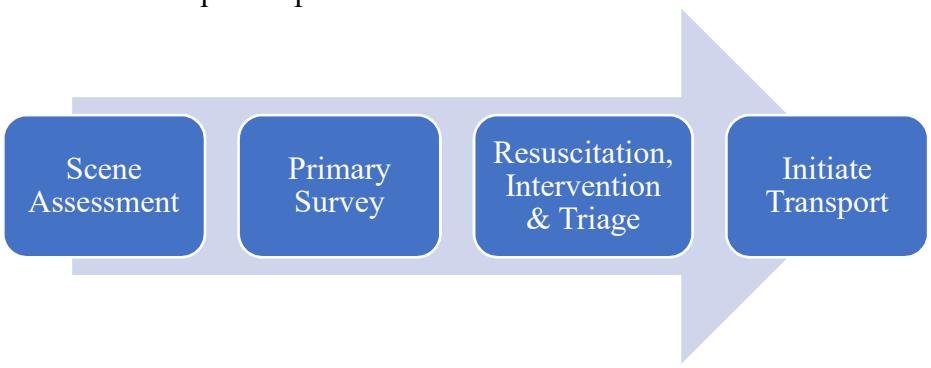


Fig 42: *Initial approach in pre-hospital care*

A. Scene Safety

Providing trauma care in every pre-hospital environment/ scene is challenging. Care provider must understand that some degree of risk is considered acceptable to achieve an acceptable level of service effectiveness.

- It is critical to reaching the scene safely without taking any undue risks.
- When close to the scene, approach slowly, with an awareness of possible hazards.
- After arriving at the scene safely, remember the "**Safety 123" approach**".
    1. **Safety of the Provider**: The safety of the provider is of prime priority. Caregivers should not put their well-being at risk and become the victim of the situation. One must be cautious at every step while delivering care to trauma victims. Use of a standard protective kit as per the system protocol and availability, with all measures as per the scenario, is necessary to ensure that the care provider is equipped and well-protected while approaching the scene safely.
    2. **Safety of the Scene:** Situational awareness and an idea about the mechanism of injury are important in assessing the scene safety. Caregivers approach the patient only when the safety of the scene is assured. Experience and training will help in the assessment of scene safety.
    3. **Safety of Patient**: The patient should be taken to a safe location and a quick assessment should be performed as per the Advanced Trauma and Life Support (ATLS) guidelines.

B. Primary Assessment (ABCDEs): "ATLS ways"

- Relevant history and information like a mechanism of injury should be collected.
- A team member must be assigned for cervical spine motion restriction and a cervical collar should be applied.
- A 10-second assessment by talking to the victim like "what is your name?" "How did you get injured?" should be done. Available monitoring devices should be attached.
- Airway should be opened with a chin lift or jaw thrust manoeuvre to visualize the oral cavity.
- Suctioning with suction cannula and removal of any visible objects or foreign body should be done.
- Oxygen mask with reservoir bag should be placed and connected to 10-15 L of oxygen if the airway is patent.
- Preparation for definitive airway should be done for threatened or compromised airway and additional help should be called for. One should be prepared for intubation failure.
- Jugular venous distention and tracheal deviation should be assessed.
- Chest should be visually assessed for any injury, symmetry and bilateral chest wall movement**.**
- Breath sounds and heart sounds should be auscultated and a percussion of the chest should be done to identify life threatening chest injuries.
- Chest should be palpated bilaterally for pain, crepitus and subcutaneous air.
- Life threatening chest injuries like tension pneumothorax, massive hemothorax, open pneumothorax, tracheobronchial injuries and cardiac tamponade should be identified and managed.
- Presence of shock should be ruled out by assessing pulse character, pulse pressure, skin status, level of consciousness, respiratory rate and capillary refill time.
- Hemorrhage should be identified and controlled (explained later).
- Pre-warmed crystalloids is preferred for intravenous resuscitation fluid.
- The need for blood transfusion should be assessed.
- IV Tranexamic acid to be given in severe hemorrhagic condition.
- Glasgow Coma Scale (GCS), size of pupils and their reaction to light, and any lateralizing signs should be assessed.

- All clothing should be removed and the patient should be fully examined, however, hypothermia should be prevented.
- The patient should be log-rolled and a spine board should be applied before transporting the patient to a near-by trauma center.
- Documentation of all the clinical findings for communication to the treating physician at the trauma center is essential.

C. Bleeding/ Hemorrhage Control

Objectives:

- To understand the need for early hemorrhage control in trauma patients.
- Be aware of the various available methods to control exsanguinating hemorrhage.

Introduction:
In Trauma patients, exsanguinating haemorrhage is the second most common cause of death after head injury. Haemorrhage control strategies should be deployed as soon as possible by the EMS provider. It takes priority over airway stabilization i.e., "**c**-ABCDE" approach in the pre-hospital care. External haemorrhage should be identified and controlled during part '**c**' of the primary survey. It will preserve the patient's blood volume and ensure adequate tissue perfusion to vital organs.
Clinical features of haemorrhage are:

- Cool and clammy peripheries,
- Tachycardia,
- Hypotension,
- Altered sensorium in the form of agitation/ obtundation,
- Poor capillary refill time.
- Pre-hospital external bleeding control can be achieved by the following steps
- Direct pressure
- Wound packing
- Compression dressings
- Elastic wrap
- Tourniquet-extremities

Approach to hemorrhage control:

Proper personal protective equipment should be used to avoid any blood borne infection.

STEP 1: The wound should be exposed and clothing should be cut.

STEP 2: Bleeding site should be mopped with gauze pads and inspected thoroughly.

STEP 3: A stack of gauze pads should be placed over the bleeding wound and direct pressure should be applied continuously for 5 -10 minutes. It should be done with a patient on a firm surface.

STEP 4: The patient is then re-assessed after 10 minutes. If bleeding is controlled, gauze pads should be secured with roll gauze or elastic bandage and trauma, the vascular or orthopedic surgeon should be informed, based on injury type.

STEP 5: If bleeding is not controlled and there is a cavity, gauze pieces should be placed into the wound with gloved fingers or forceps. The Wound should be tightly packed after ensuring that the gauze has reached the base of the wound. If more than one gauze pieces

are used, then its count is documented. If available, hemostatic gauzes should be used to achieve hemostasis.

STEP 6: Pressure is applied for an additional 3 minutes, and then bleeding is reassessed. If these steps fail to control the bleeding, one should proceed with the placement of a tourniquet.

STEP 7: Tourniquet should be applied 2 to 3 inches above the wound site. If a joint is encountered, then it should be applied above the joint.

STEP 8: Tourniquet should be secured tight by rotating a rod over the knot tied.

STEP 9: It is important to note the time the tourniquet application. If a marker is available, time should be written directly on the tourniquet.

STEP 10: After application of a tourniquet, peripheral pulses should be checked.

STEP 11: If the bleeding does not stop with one tourniquet, another one can be placed 2 inches above the first one.

Step 12: Tourniquet should be loosened after one hour and if the bleeding has not stopped, then it is reapplied and retained till definitive intervention.

(a) Combat action tourniquet (b) SOFTT-W tourniquet

Fig 43: Commercially available tourniquets include Combat action tourniquet and Special Operations Forces Tactical **Tourniquet** - Wide (SOFTT-W)

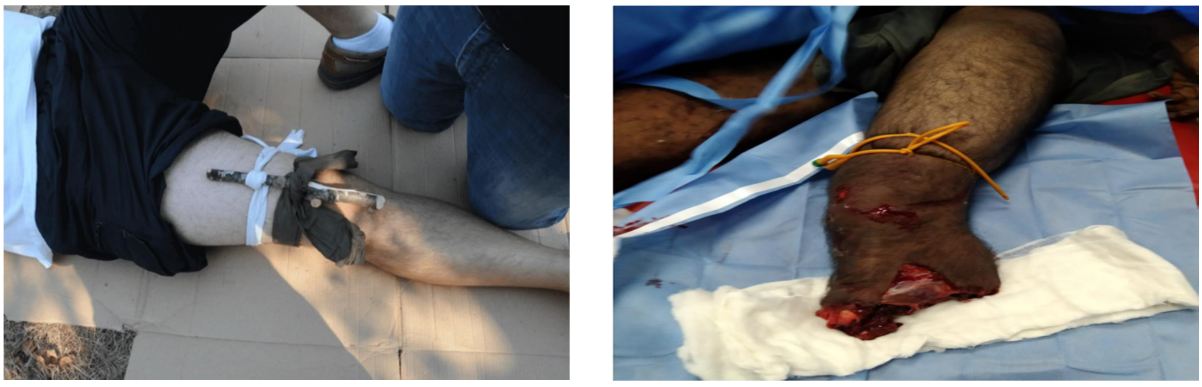


Fig 44: *Improvised tourniquets can be made out of daily use materials like belts, ties, bag straps, etc. and Foley catheter, as shown in the pictures below*

D. Cervical Spine Stabilization & Cervical Collar Application

Introduction: Identification of patients with a need for cervical spine stabilization is the most integral aspect of clinical judgment during PHC. It must be initiated during the initial assessment and should be maintained during transportation of the patient from the scene of trauma to the definitive care. Excessive manipulation and inadequate restriction of spinal movements can cause additional neurological damage and may lead to deleterious patient outcomes.

Clinical Evaluation: A rapid assessment of neurological status can be done by asking the patients to move his/her limbs. Detailed neurological examination should not be performed in the pre-hospital setting as it will only delay the transport of the patient to definitive care. The simple way of stabilizing an injured patient with a potential cervical spine injury is to apply a rigid cervical collar. The patient should be placed in a supine position on a long spinal board. The purpose of the cervical collar is not to provide complete immobilization of the neck. Rather, it serves to limit the head movements – flexion is limited by 90%, whereas extension, rotation and lateral flexion are limited by 50%. It prevents axial compression of the spine when unavoidable movements occur between the head and the torso.

The clinical scenarios in the prehospital phase where an injured patient may have a potential cervical spine injury are following:

1. Dangerous mechanism of injury: Sudden acceleration or deceleration injuries, high speed motor vehicle crash (MVC), fall from height etc.
2. Posterior midline tenderness or complaint of pain in the neck.
3. Altered mental status – due to traumatic brain injury, alcohol or intoxication, GCS < 15.
4. Unable to communicate effectively: People at extremes of age (children and elderly), people with language barriers.
5. Neurological deficit or complaint – paralysis, paresis, numbness, tingling.
6. Visible anatomic deformity of the spine.
7. Evidence of painful distracting injuries.

Steps of cervical collar application: Rigid cervical collars are commercially available and must be readily available during pre-hospital care.

STEP 1: The patient should be kept in supine position. An assistant maintains manual in-line stabilization of the head and neck from the head end.

STEP 2: Neck and the upper part of the chest is exposed.

STEP 3: Appropriate size of the collar is estimated by using one's extended hand to measure the distance between the patient's shoulders and jawline. A large collar can impede the mouth opening and may cause distraction of the cervical spine, while a small collar will not be as effective in limiting head movements.

STEP 4: While the assistant maintains in-line cervical stability, the posterior part of the collar is slided behind the neck. Any movement of head and neck should be restricted.

STEP 5: Anterior part of the cervical collar is placed over the patient's neck with the chin placed properly over the chin holder. The collar should rest on upper sternum, posterior thoracic spine, clavicles and trapezius muscles below, and at the chin, angle of mandible and the occiput above.

STEP 6: The cervical collar is secured with hooks, straps or velcro as provided. It is ensured that neither the collar is too tight nor it is loosely applied. A too tightly applied collar leads to compression of neck veins and may raise the intracranial pressure. A too loosely applied collar will provide inadequate spine protection and may accidentally obstruct the air way access.

STEP 7: It is then confirmed that the collar does not impede mouth-opening or respiratory movements.	**STEP 9:** Before transport, the patient should be log-rolled and a long spinal board should be placed beneath the patient. Patient's head, torso and legs are strapped to the spinal board. Pressure points are avoided. 
STEP 8: Manual in-line stabilization is discontinued.	

STEP 3: In austere environment, where a cervical collar may not be available – the alternative methods of cervical spine stabilization include placing sand-bags or blankets/towels on either side of the patient's head and strapping them together with a tape.

E. Care of Amputated Body Part

Re-implantation of amputated limbs and fingers is a possibility. It is important to know the optimal care and proper transportation of the amputated part from the scene to the facility, for good reimplantation outcomes.

Steps of care of amputated part:

STEP 1: The amputated part should be examined and cleaned with the isotonic solution (Ringer's lactate, normal saline solutions).

STEP 2: In austere circumstances, if isotonic solutions are not available then clean tap water may be used. Gross debris and contamination should be removed.

STEP 3: Amputated part should be wrapped in moist sterile gauze or cloth if gauze is not available.

STEP 4: The amputated part is then placed in a clean plastic bag or a container.

STEP 5: This plastic bag or container is then placed in another big container filled with crushed ice.

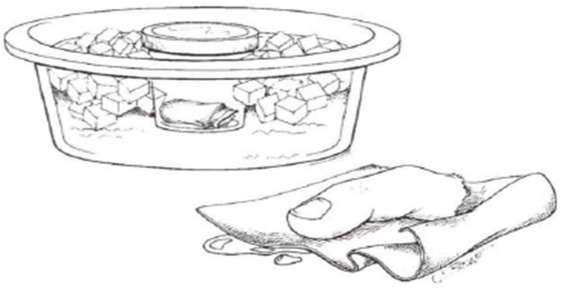


Fig 45: *Amputated part care*

STEP 6: Amputated part should be labelled and then sent along with the patient.

Cooling decreases the metabolic rate and inhibits bacterial growth. Some precautions to be taken are:

1. Amputated part should never be frozen. Placing it directly in the ice or adding any other coolant, such as dry ice should be avoided as it may irreversibly damage the tissue.
2. Debridement or exploration of the amputated part should not be attempted in the field. It must be done in the operating theatre.

F. HELMET REMOVAL

Objectives

- A safe and well-coordinated approach of helmet removal.
- At least two rescuers should be available for a safe helmet removal. The steps to remove a helmet safely are as follows:

<table>
<tr>
<td>STEP 1: First rescuer does manual inline stabilization of head with helmet.
   </td>
<td>STEP 4: Second rescuer then removes or cuts the strap of helmet.
  </td>
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<tr>
<td>STEP 2: Second rescuer checks the peripheral pulse and asks the patient to squeeze the hand.</td>
<td rowspan="2">STEP 5: Second rescuer then stabilizes head with manual inline stabilization anteriorly.</td>
</tr>
<tr>
<td>STEP 3: Second rescuer then removes the windshield and communicates with the patient.</td>
</tr>
</table>

STEP 6: First rescuer pulls helmet apart and slowly removes it.

STEP 7: First rescuer takes over manual inline stabilization from head end.

STEP 8: Second rescuer applies cervical collar.

G. Extrication of Victim from Vehicle and Safe Transfer

Introduction: Rapid extrication is selected only when life-threatening conditions are present and not on the basis of personal preference. The extrication of victim is indicated in the following situations:

1. When the patient has life-threatening conditions identified during the primary assessment that cannot be corrected where the patient is found**.**
2. When the scene is unsafe and clear danger to the pre-hospital care provider and patient exists, necessitating rapid removal to a safe location**.**
3. When the patient needs to be moved quickly to access other, more seriously injured patient.

The steps for extrication of a victim are:

STEP 1: Manual in-line stabilization of the patient's head and neck in a neutral position should be done and a proper sized cervical collar should be applied.

STEP 2: While manual stabilization is maintained, the patient's upper torso and lower torso and legs should be controlled. The pre-hospital care provider should rotate the patient in short controlled movements until the control of manual stabilization can no longer be maintained from behind and inside the vehicle.

STEP 3: A second pre-hospital care provider should assume manual stabilization from the first prehospital care provider while standing outside of the vehicle.

STEP 4: The first pre-hospital care provider moves outside the vehicle and reassumes manual stabilization from the second pre-hospital care provider

STEP 5: The rotation of the patient should continue until the patient can be lowered out of the vehicle door opening and onto the long backboard.

STEP 6: The long backboard is then placed with the foot end of the board on the vehicle seat and the head end on the ambulance cot.

STEP 7: Once the patient's torso is down on the board, the weight of the patient's chest along with patient's pelvis and lower legs should be controlled.

STEP 8: The patient should be moved upward onto the long backboard. The prehospital care provider who is maintaining manual stabilization should be careful not to pull the patient, but to support the patient's head and neck.

STEP 9: After the patient is positioned onto the long backboard, the prehospital care providers should secure the patient to the board and the board to the ambulance cot.

STEP 10: The patient's upper torso should be secured first, then the lower torso and pelvis area, and then the head. The patient's legs are secured last. If the scene is unsafe, the patient should be moved to a safe area before being secured to the board or cot

H. Splinting of Broken Limb

Objectives:

- Selection of an appropriate splint and splinting method.
- Understanding the considerations when splinting a long bone fracture and a pelvic injury.

Introduction: Musculoskeletal injuries are rarely life-threatening with the exceptions being pelvic injuries and multiple long bone fractures. Displaced long bone fractures, particularly when accompanied by lacerated wounds (compound or open fractures), have a rather dramatic presentation. It is important for the prehospital care provider not to be distracted by this dramatic presentation and maintain the assessment priorities.

The role of the pre-hospital care provider as far as musculoskeletal injury is concerned is:

i. To identify them as a potential cause for life-threatening hemorrhage.
ii. To treat every painful musculoskeletal injury as a potential fracture or dislocation.
iii. Quickly immobilize or splint it to limit the potential for further injury and enable patient transport to a nearby hospital.

Applying gentle traction and splinting the broken limb in this scenario helps in alleviating the patient's pain, attenuates muscle spasm, controls hemorrhage, prevents further neurovascular compromise and reduces the ongoing soft tissue injury due to fracture displacement. The key principle is to support and immobilize the long bone that is fractured, in addition to the joint above and below it. There are several types of splints available and broadly, they may be categorized into rigid splints, formable splints and traction splints.

The common splints that a prehospital care provider is likely to encounter or required to use are Thomas splint, Krammer wire splint and a pelvic binder.

The steps to splint a fractures limb are:

STEP 1: It should be ensured that life threatening injuries has been addressed during primary survey.

STEP 2: Injured extremity should be completely exposed and all the clothing should be removed. All accessories like jewellery, watches and other circumferential wear-on should be removed.

STEP 3: The wound of the open fracture should be thoroughly washed with 5 to 6 liters of normal saline and all contaminating material (soil, dirt, road tar, etc.) should be removed. If the bone is jutting out of the wound, gentle traction should be applied to reduce the fractured segment inside the wound.

STEP 4: A neurovascular examination of the extremity should be performed, both before and after applying the splint and it should be documented.

STEP 5: A careful reduction manoeuvres should be performed. This consists of gentle traction and attempt to realign a deformed extremity to its normal alignment. No more than two attempts at reduction should be made.

STEP 6: If there is any resistance in movement, the extremity should be splinted in the existing position until a specialist review. Reduction of dislocated joints should not be attempted without specialist supervision.

STEP 7: Fractured long bone should be supported and immobilized, in addition to the joint above and below it.

STEP 8: Pad should be applied, especially at bony prominences like the heel, the malleoli, the greater trochanter or the olecranon process.

STEP 9: After application of the splint, limb should be elevated, and ice packs be applied to reduce the swelling.

Splinting a limb, some key points to remember are: -

- For upper extremity long bone fractures, a Krammer wire splint usually serves the purpose. A Krammer wire splint should be well-padded with a Gamgee roll and secure the limb on the splint with a bandage – and contour it to the desired position of immobilization.
- For lower extremity fractures (femur and tibia), a Thomas splint is the initial splint of choice for prehospital care. The Thomas splint consists of a padded oval ring, to which are attached outer and inner metal side bars. The side bars bisect the oval ring and are of unequal length – so that the padded ring is set at an angle of 120 degrees to the inner side bar. At the foot-end, the two side bars are joined together to form a 'W'. Traction can be applied by fixing adhesive foam and tying it to this 'W'. The padded ring comes in different sizes, and its circumference should exceed the oblique circumference of the thigh at the level of trochanters by 2 inches to account for additional swelling.
- A pelvic binder should be applied in suspected or documented pelvic injuries potentially associated with internal bleeding. A commercially available pelvic binder with Velcro straps may be applied, if available. If it is not available, an indigenous pelvic binder can be fashioned from a bed sheet and towel clips. Pelvic binder should be applied at the level of the greater trochanter and should be left on for no more than 24 hours.

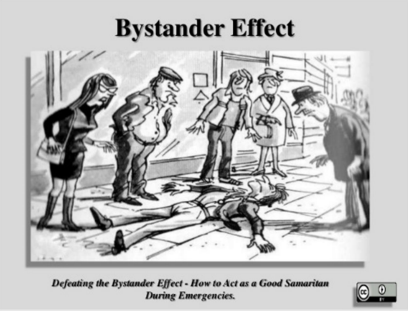
Good Samaritan Law

India's **Good Samaritan Law** was passed as a Bill by the Supreme Court of India on March 30, 2016, and gave the "Force of Law" to the guidelines for the protection of Good Samaritans and then issued by the Ministry of Road Transport and Highways.

Important features of the law: -

- The law protects you from being harassed by police and hospital.
- No one (police/ambulance staff/hospital staff) can compel you to disclose identity (name/address/phone no.)
- No hospital can ask and hold (detain) you for the bill payment.
- You will not be compelled to become an eye witness for any MLC (Medico legal cases) without your own wish (willingness).

Bystander Effect in which a person is less likely to help the victim in the presence of other people.
Three out of four people in the country are hesitant to help injured accident victims due to fear of police harassment, detention at hospitals, and prolonged legal formalities.



Bystanders can help in the absence of established emergency medical services:

1. They can call for help.
2. Provide first-aid to the injured.
3. Take them to the nearest hospital, if an ambulance does not arrive in time.

Be a Good Samaritan!!

Many people at accident site, less likely to help the accident victim

Case Scenario: A 45-year-old man, a non-restrained passenger got ejected from his car and is found lying on the road following a motor vehicle crash from behind. He has sustained lower extremity trauma with bleeding from the amputated right limb with multiple abrasions over the anterior chest wall. He is conscious, alert and yelling for help. As a pre-hospital care provider, you are asked to rescue this patient from the scene. What should be your priorities in assessing this patient?

Summary

The holistic concept of trauma management aims at getting the right patient to the right place at the right time. Hence, the care of an injured patient immediately post-injury by well-organized pre-hospital services (PHS) is a must to improve the overall outcomes of trauma care delivery. PHS must be quick and safe. The time spent on the pre-hospital rescue should be minimal. The primary role and goal of PHS are to render aid and transport the trauma patients to the appropriate facility, preferably to a trauma center. At the end of this chapter, the reader should be able to understand priorities of initial approach in pre-hospital injury care of an injured which include Scene Assessment, a quick Primary Survey Resuscitation and recognize common life-threatening conditions such as pnuemothox, Critical intervention & Triage Initiate Transport of patients and Timely Assessment and management of

exsanguinating hemorrhage by direct pressure, wound packing, compression bandage or by torniquet. The EMT will be familiarized with the concept of cervical spine stabilization, steps of helmet removal, steps of immobilization and splitting of a fractured limb by using Krammer wire, Thomas splint or pelvic binder in case of pelvis injury, care of amputated part and process of Extrication of a victim from the vehicle and at the end how to transport each patient safely to nearest health facility so that they get the best treatment at the earliest. The reader will also be introduced to India's Good Samaritan Law which by introduced by Supreme court for the protection of Good Samaritans.

Chapter 5 - Triage

Learning Outcomes

At the end of this chapter, reader will be able to-

- Explain the need for triage
- Define triage in pre-hospital settings
- Explain general principles of pre-hospital triage and the factors that must be considered during the triage process
- Triage both medical and trauma patients in pre-hospital settings

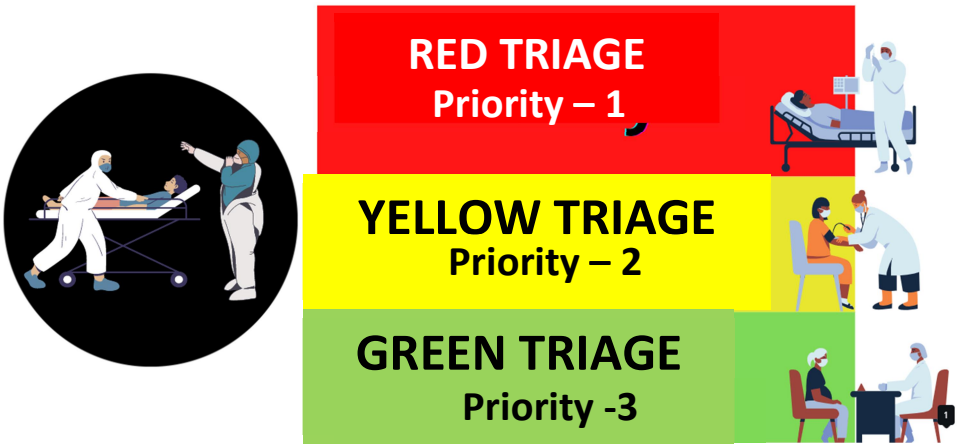


Fig 46: *Triage categories*

Introduction

Triage systems are methods for systematic prioritizing of patients' treatment according to how urgent they need care. The triage result should influence the order and priority of emergency treatment, the order and priority of emergency transport, or the transport destination for the patient.

In an acute case, triage assessment is usually done in at least one setting of the EMS, and sometimes triage takes place in all relevant settings of the acute chain, i.e., by the emergency telephone responder, by the first ambulance crew on scene, by primary care physician(s), at the emergency clinic, and at the emergency room/emergency department (ED) in a hospital. Modern approaches to triage assessment of acutely ill or injured patients are usually based on trace and trigger tools for vital signs, and include a systematic questionnaire for each chief complaint and generally physiological findings. The most common triage systems are those for use in the ED developed during the 1990s and 2000s. Of these, the Australian Triage Scale (ATS), the Manchester Triage Scale (MTS), the Canadian Emergency Department Triage and Acuity Scale (CTAS), and the Emergency Severity Index (ESI) have disseminated around the world. Systematic triage assessment of all patients according to validated methods is less common in the pre-hospital setting. However, telephone triage utilizes protocols to help sort symptoms presented by the caller and to activate appropriate dispositions. Recently, the medical

emergency triage and treatment system (METTS), developed in Sweden, introduced METTS-pre specifically for the use in ambulances services

1. Triage in pre-hospital settings

Emergency medicine services (EMS) are the front-line personnel that are the first eyes and ears on patients. Their clinical decision making is just as important as physicians when it comes to the outcome of a patient. These can include difficult decisions being made by physicians, EMS, and nurses regarding who to provide care for immediately, who can wait, and who cannot be saved.

a. In case of multiple casualties:

There have been many different algorithms in how to properly triage patients in the field to help responders develop a system on care. One of these algorithms is called START triage, which stands for "simple triage and rapid transport." As emergency responders arrive at the scene, victims are asked to walk to a designated area marked off for care. Anyone who can follow these commands and walk to this area is designated as "minor" and given a green tag to signify minor injury status. Once the "minor" injuries are out of the area, responders should begin to move and triage patients with the RPM acronym; respirations, perfusion, and mental status. This includes making sure the individual has a manual respiration rate that is roughly greater than 30 breaths a minute, peripheral pulses are present with a capillary refill of fewer than 2 seconds and can follow commands. If a patient has none of these, the patient is declared deceased, given a black tag, and moved to the black coded area. If individuals can breathe spontaneously, follow simple commands, and have distal pulses with a normal capillary refill, they are tagged delayed and given the code yellow. The rest of the individuals who have poor respirations or cannot protect their airway, have absent or decreased peripheral pulses, and unable to follow simple commands are tagged immediately and given the color red. With this method, providers can quickly rule in and rule out individuals who require immediate medical attention, who can wait, and who nothing can be done for. However, the assignment of individuals in this algorithm is purely based on vital signs that can change rapidly in the field.

b. In case of a single patient:

The title and color markings for each triage category should be determined at a system-wide level as part of planning and rehearsal. Many options are used around the world. One common, simple method is to use tags with the colors of a stoplight: red, yellow, and green. Red implies life-threatening injury that requires immediate intervention and/or operation. Yellow implies injuries that may become life- or limb-threatening if care is delayed beyond several hours. Green patients are the walking wounded who have suffered only minor injuries. These patients can sometimes be used to assist with their own care and the care of others. Black is frequently used to mark deceased patients.

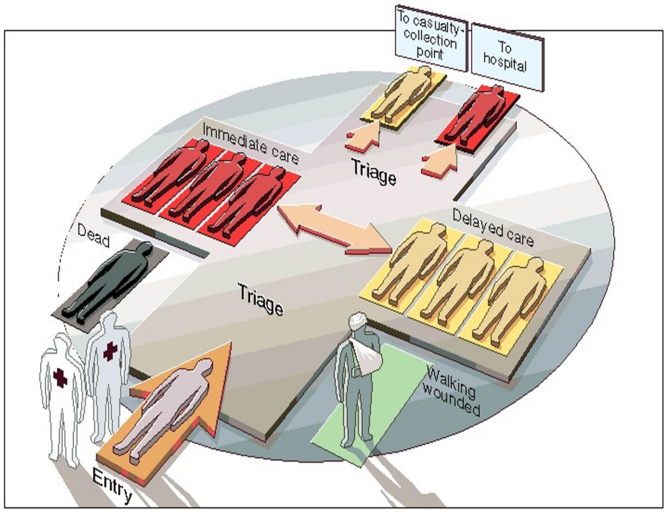


Fig 47: *Triage system for a patient*

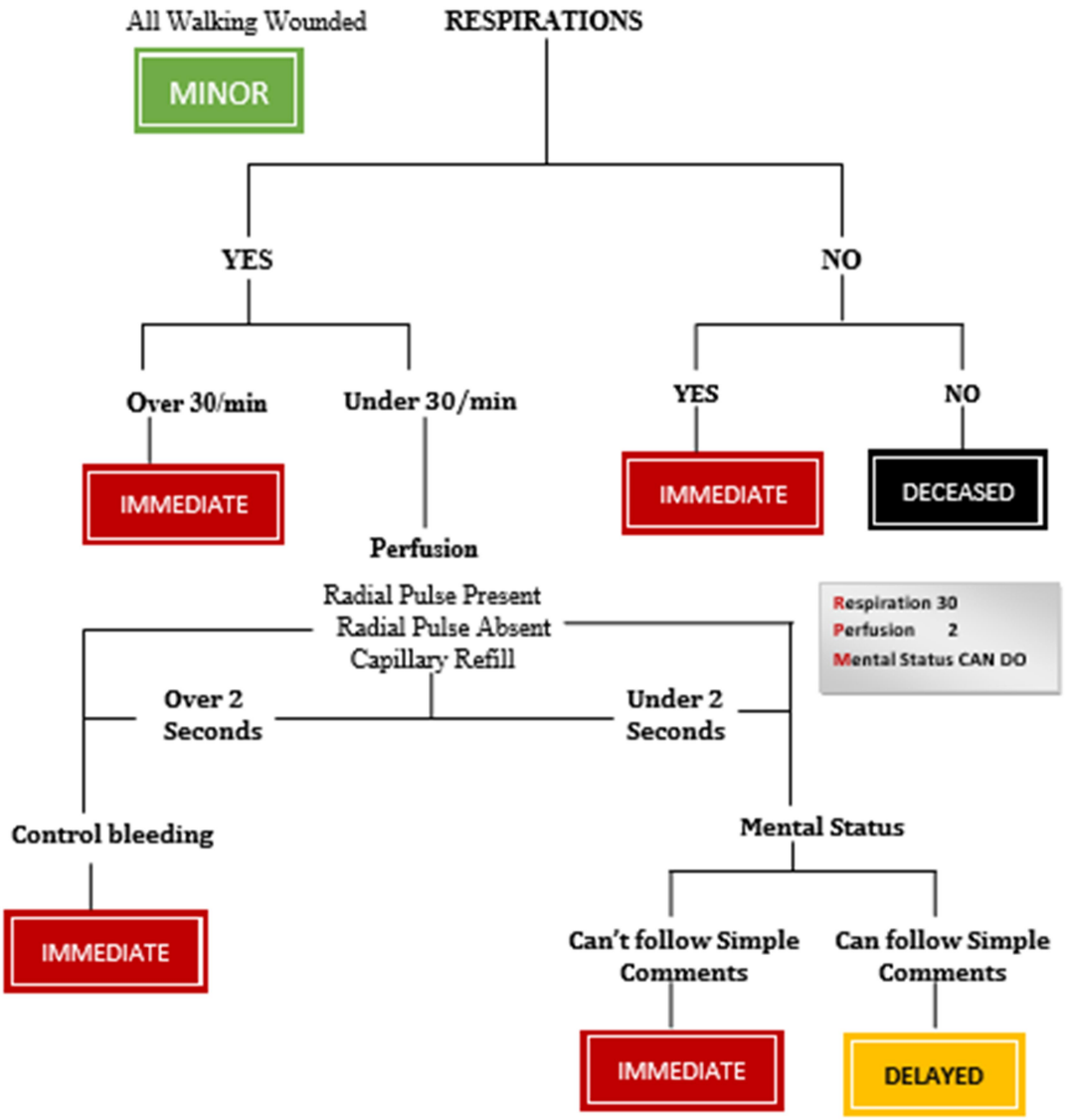


Fig 48: *Flow chart*

Case Scenario

You are summoned to a safe triage area at a shopping mall where 5 people are injured in a mass shooting.

The shooter has killed himself. You quickly survey the situation and determine that the patients' conditions are as follows:

PATIENT A—A young male is screaming, "Please help me, my leg is killing me!"

PATIENT B—A young female has cyanosis and tachypnoea and is breathing noisily.

PATIENT C—An older male is lying in a pool of blood with his left pant leg soaked in blood.

PATIENT D—A young male is lying face down and not moving.

PATIENT E—A teenage girl is lying on the ground crying and holding her abdomen.

Establish the patient priorities for further evaluation by placing a number (1 through 5, where 1 is the highest priority and 5 is the lowest) and briefly outline the rationale behind your priorities.

Summary

- Recognize that rescuer safety is the first priority.
- Do the best for the most patients using available resources.
- Make timely decisions.
- Prepare for triage to occur at multiple levels.
- Know and understand the resources available.
- Plan and rehearse responses with practice drills.
- Determine triage category types in advance.
- Triage is continuous at each level.

Chapter 6 – Disaster Management

Learning Outcomes

At the end of this chapter, reader will be able to -

- Define the terms disaster, multiple casualty incident (MCI) and mass-casualty event (MCE)
- Describe the "all hazards" approach and its importance in disaster management
- Identify the four phases of disaster management, and describe the key elements of each phase, including challenges for trauma teams
- Describe the key principles and necessary competencies for prehospital disaster management

Introduction

Scenario: News of a landslide at Itanagar breaks. Being the first responder at the community level,

a. What are the next steps of disaster management on field?
b. What are the steps of disaster management cycle?
c. How do you define the terms – "disaster", "multiple casualty incident" and "mass casualty event"

Fig 49: *Landslide picture*

The World Health Organization defines a disaster as a sudden ecologic phenomenon of sufficient magnitude to require external assistance.

The Centre for Research on the Epidemiology of Disasters (CRED; Brussels, Belgium) defines disaster as "a situation or event that overwhelms local capacity necessitating a request at the national or international level for external assistance; and unforeseen and often sudden event that causes great damage and destruction and human suffering."

- **Multi-casualty incidents (MCIs)** are situations in which medical resources (i.e., prehospital and hospital assets) are strained but not overwhelmed.

- **Mass casualty events (MCEs)** result when casualty numbers are large enough to disrupt the healthcare services in the affected community or region. Demand for resources always exceeds the supply of resources in an MCE

Management

Paramedical staff are usually the first responders in any disaster situation before the hospital medical teams arrive on field. Hence it is of paramount importance to possess formal training in disaster management for all paramedical staff.

Phases of disaster management:

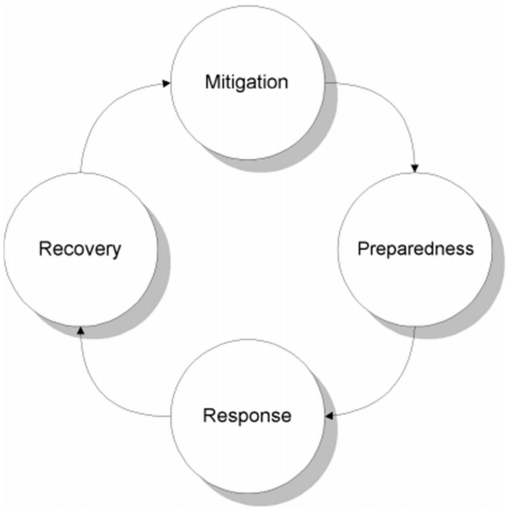


Fig 50: Phase of disaster management

Paramedical staff contribution at the community level is crucial during all four phases of disaster management.

Necessary competencies

Literature states two groups of disaster competency domains specific to paramedics:

1. General Core Competency Domains, suitable for all paramedics (both ALS and BLS)
2. Specialist Core Competencies, which are deemed necessary competencies to enable a response to certain types of disaster or major incident, such as CBR incidents, Hazmat incidents, humanitarian response, or those incidents that require a tactical medicine response.

   Three separate and discrete types of competency domains exist in the literature:

   1. Core Competencies
   2. Technical/Clinical Competencies
   3. Specialist Technical/Clinical Competencies.

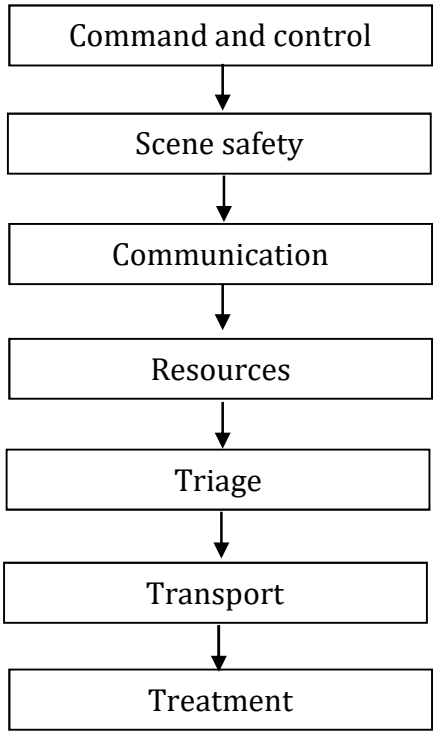
   Most commonly cited competences are as follows:

   a. Austere Environment
   b. Flexibility
   c. Adaptability
   d. Improvisation

e. Self-Care, Physical
f. Self-Care, Psychological
g. Innovation
h. Interpersonal Relationships

Steps of disaster management:

As per DMAT training in Japan, Disaster management has been described in following steps:



Treatment

In a disaster scenario, paramedical staff are the manpower involved in most of the rescue events till medical teams reach the affected area and play a crucial role.

Resourcefulness; Frugal/Jugad (Make in India)

According to NIMS (National Incident Management System) Resource Management Planning, resources typically fall into seven general groupings:

1. **Personnel:** Includes emergency operations center staff and onsite responders.
2. **Facilities:** Includes emergency operations center, field command posts, and staging areas.
3. **Equipment:** Includes equipment required for PPE, personnel support, communications, response operations, and emergency operations center support.
4. **Vehicles:** Includes automobiles, trucks, buses, and other vehicles required for transportation, emergency medical, and response operations.
5. **Teams**: Includes specially trained and equipped responders and management personnel.
6. **Aircraft:** Includes aircraft for surveillance, medical evacuation, or cargo transportation operations.

7. **Supplies:** Includes a wide range of materials from potable water to plywood.

NIMS recommends the following resource management practices be incorporated into a response plan for implementation during future response operations:

1. **Identify:** Identify what equipment is needed, where and when it is needed, and who will be receiving or using it. Some resources will be specific to one risk or consequence, while others may be useful for multiple risks or consequences.
2. **Procure:** Take into account lead-time required for resources that cannot be obtained locally.
3. **Mobilize:** Plan transportation and logistics needs based on response priorities and equipment requirements to ensure timely arrival of necessary equipment.
4. **Track and report:** Identify specific location of resources on a continual basis in order to assist staff in preparing to receive resources, to ensure safety and security of equipment and to ensure efficient use, coordination, and movement of equipment.
5. **Recover and demobilize:** Ensure timely demobilization of equipment, including decontamination, disposal, repair, and restocking activities, as required. This step pertains to both expendable and nonexpendable resources.
6. **Reimburse:** Ensure that a mechanism is in place to track costs and provide timely payment for incident expenses, including contractors, equipment, transportation services, and other costs
7. **Inventory and Replenish:** Utilize a resource inventory system or equipment checklist to assess the availability of on-site equipment and supplies. Procure additional resources as needed to be prepared for future events. Consider lessons learned from previous responses to assess on-site requirements.

Case scenario-based question:

News of a landslide at Itanagar breaks. Being the first responder at the community level,

a. What are the next steps of disaster management on field?
b. What are the steps of disaster management cycle?
c. How do you define the terms – “disaster”, “multiple casualty incident” and “mass casualty event”

Summary

- Comprehensive emergency management consists of four phases: mitigation, preparedness, response, and recovery.
- Mass casualty planning should account for the fact that traditional transport and communications systems will break down.
- Field personnel should be specifically trained in mass casualty triage and stabilization because austere field conditions change management strategies.
- All plans must protect caregivers and rescue personnel.

Chapter 7 - Telemedicine

Learning Outcomes: -

At the end of this chapter, reader will be able to

- Understand the concept of Telemedicine
- Understand where Telemedicine can be helpful
- Use telemedicine equipment for patient benefit
- Provide pre-hospital resuscitative measures to victims using telemedicine guidance

Introduction

As a pre-hospital care provider, you are likely to use your telephone for communication and seeking guidance from doctors. This is the simplest example of telemedicine.

In telemedicine practice, we use technology to share information regarding the patient with experts and seek their help in managing the case.

Telemedicine consultation can happen in many ways like patient to doctor, pre-hospital provider to doctor or junior doctor to senior doctor.

The effective use of telemedicine has been done using Tele-ECG where providers share pictures of ECG with the experts to help them diagnose heart related conditions. Heart attacks form specific patterns on ECG which if diagnosed early can be treated in the ambulance or even at home by giving Aspirin or even pre-hospital thrombolysis using agents like tenecteplase and streptokinase injection treating myocardial infarction within window periods.

Similarly, Diagnosis of Stroke can be confirmed by sharing symptoms of the patient with the experts. Stroke needs to be treated using injections within 4.5 hours of onset. So, if you suspect that the patient has had a stroke, you can consult doctors for appropriate next steps in management of stroke.

There are numerous other examples where you can help patient by using technology to communicate with the doctors. Mobiles are the best platforms to share such information.

Equipment

Although every provider can start telemedicine consultation using his smartphone but that may not be the best equipment for such purposes, so there are many systems developed by various companies to seek telemedicine advise.

All such units contain a camera, a display device, internet connectivity, an input device like a keyboard, a scanner, a printer and a storage device. These terms may appear scary but, in a nutshell, all these things are present in a standard computer or a tablet device.

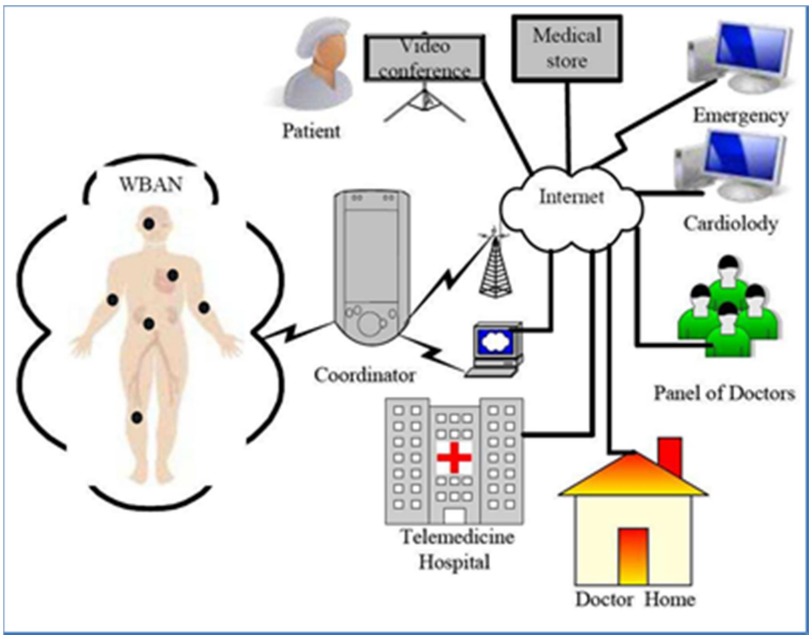


Fig 51: *Telemedicine set-up*

Some units have capabilities to attach medical equipments like blood pressure monitor, electronic thermometer, pulse oximeter, spirometer, ECG machine, glucometer, urine analyzer, point of care machines, electronic stethoscopes etc to the computer.

Data from all these medical devices can be then directly transmitted by the computer to the doctor.

It may be Life Saving

Telemedicine may be lifesaving in heart attacks, stroke patients, medical emergencies and trauma victims provided it is used in an efficient and timely manner.

Sharing the information

While seeking telemedicine advise, provider must have a clear idea of what he/she seeks from the expert.

We must understand that the experts are busy people and we need to utilize their time efficiently and avoid unnecessary and avoidable consultations.

We should collect good history of present illness, past illness and treatment, examination details like BP, pulse, respiratory rate, SpO_2 etc, investigations like ECG, Hb, blood sugar etc before seeking consultations.

When conducted with a clear goal, telemedicine can be a very handy tool.

Disease specific actions:

Heart Attacks: Take ECG, do troponin test, share ECG and troponin results and manage accordingly.

Stroke: Take history about what body functions are lost or are impaired, examine to confirm the same. Share the history with the doctor. Take to patient to the nearest center with CT-scan and Thrombolysis facility.

Poisoning: Take history of type of poison. If at home try to click picture of the container, packet of poison. Share this history with the experts. Give first aid accordingly.

Medical Emergencies: Take history of present complaints, note physical examination findings, conduct point of care investigations like blood sugar, temperature etc, click pictures of medical records and medication being taken. Share information with medical experts and treat accordingly.

Trauma: Stabilize the patient, check airway, breathing and circulation. For specific types of trauma, note the mechanism of injury and type of injury e.g., injury to the eye. Seek help for first aid in such atypical injuries.

Miscellaneous: You can also initiate telemedicine consultation for cases that you are unable to understand. Example an unconscious patient, psychiatric illness, drug abuse case, pediatric case, obstetric case etc.

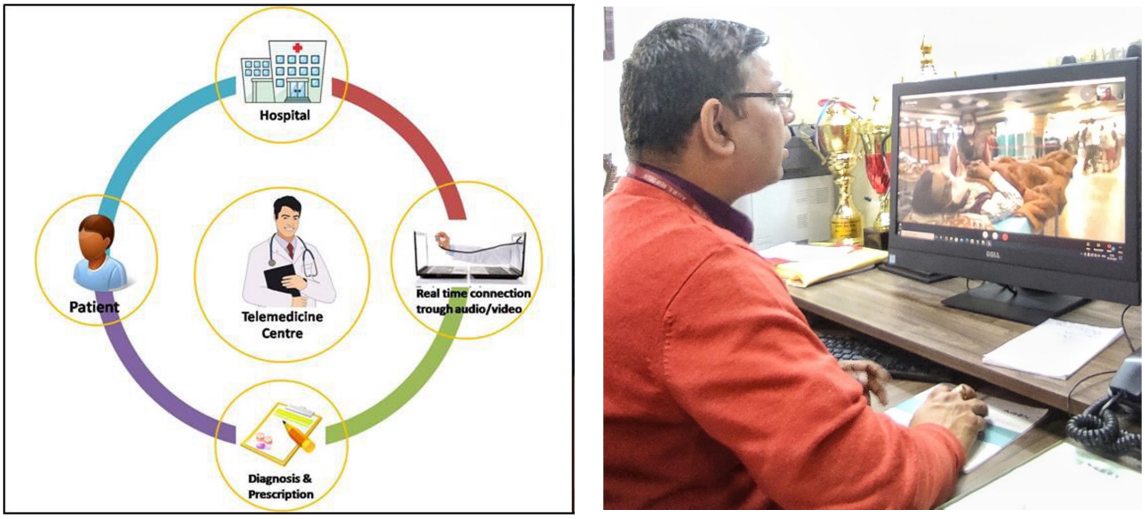


Fig 52: *Process of telemedicine consultation*

Summary

As a pre-hospital care provider, you are likely to use your telephone for communication and seeking guidance from doctors. This is the simplest example of telemedicine how we can use technology to share information regarding the patient with experts and seek their help in managing the case. Here the reader will be able to understand the concept of telemedicine, where telemedicine can be helpful for patient benefit and provide pre-hospital resuscitative measures to victims using telemedicine guidance. Mobiles are the best platforms to share such information but tablet devices can also be used All such units contain a camera, a display device, internet connectivity, an input device like a keyboard, a scanner, a printer and a storage device. Telemedicine may be lifesaving in cases of heart attacks, stroke patients, medical emergencies, poisoning, paediatric, obstetric cases and trauma victims provided it is used in an efficient and timely manner.

Chapter 8 – Infection Control Practices

Learning Outcomes

At the end of this chapter, reader will be able to -

- Understand the need of infection control
- Understand the need of standard precautions
- Understand the need for Hand hygiene
- Understand the use of personal protection equipment (PPE)
- Understand the need for cleaning environment
- Understand the cleaning of body secretions, vomitus & faeces
- Understand the care of linen and facilities available for laundry

Introduction

Infection prevention and control (IPC) is an applied discipline that affects all patient care activities in healthcare settings. IPC, including prevention of antimicrobial resistance (AMR), is an essential component of healthcare quality and patient safety.

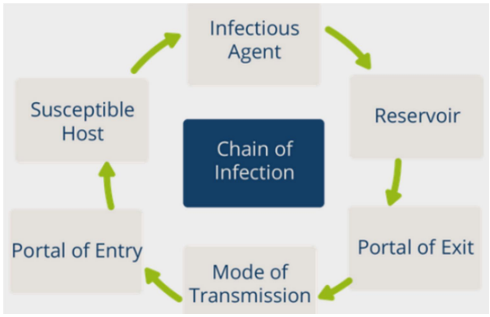


Fig 53: *Chain of infection*

Standard precautions

Standard Precautions are used for all patient care. They're based on a risk assessment and make use of common-sense practices and personal protective equipment use that protect healthcare providers from infection and prevent the spread of infection from patient to patient.

Hand Hygiene

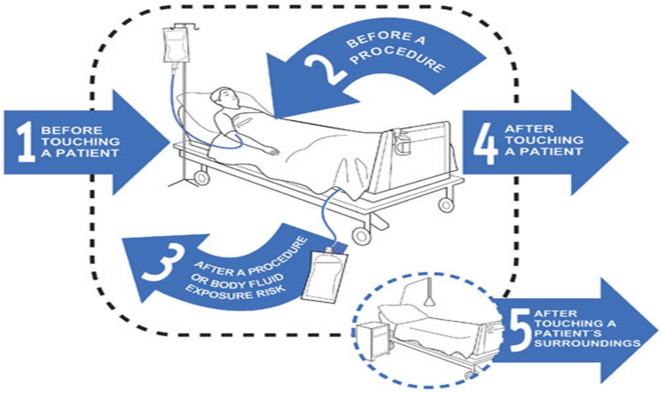


Fig 54: *Hand hygiene*

5 moments of hand hygiene

1. Before touching a patient,
2. Before clean/aseptic procedures,
3. After body fluid exposure/risk,
4. After touching a patient, and.
5. After touching patient surroundings

Hand washing and drying

The simple and easiest way of preventing the transfer of infection is Hand Washing. Keeping hands clean is one of the most important steps we can take to avoid getting sick and spreading germs to others. Many diseases and conditions are spread by not washing hands with soap and clean, running water. CDC recommends cleaning hands in a specific way to avoid getting sick and spreading germs to others. The guidance for effective handwashing and use of hand sanitizer was developed based on data from a number of studies.

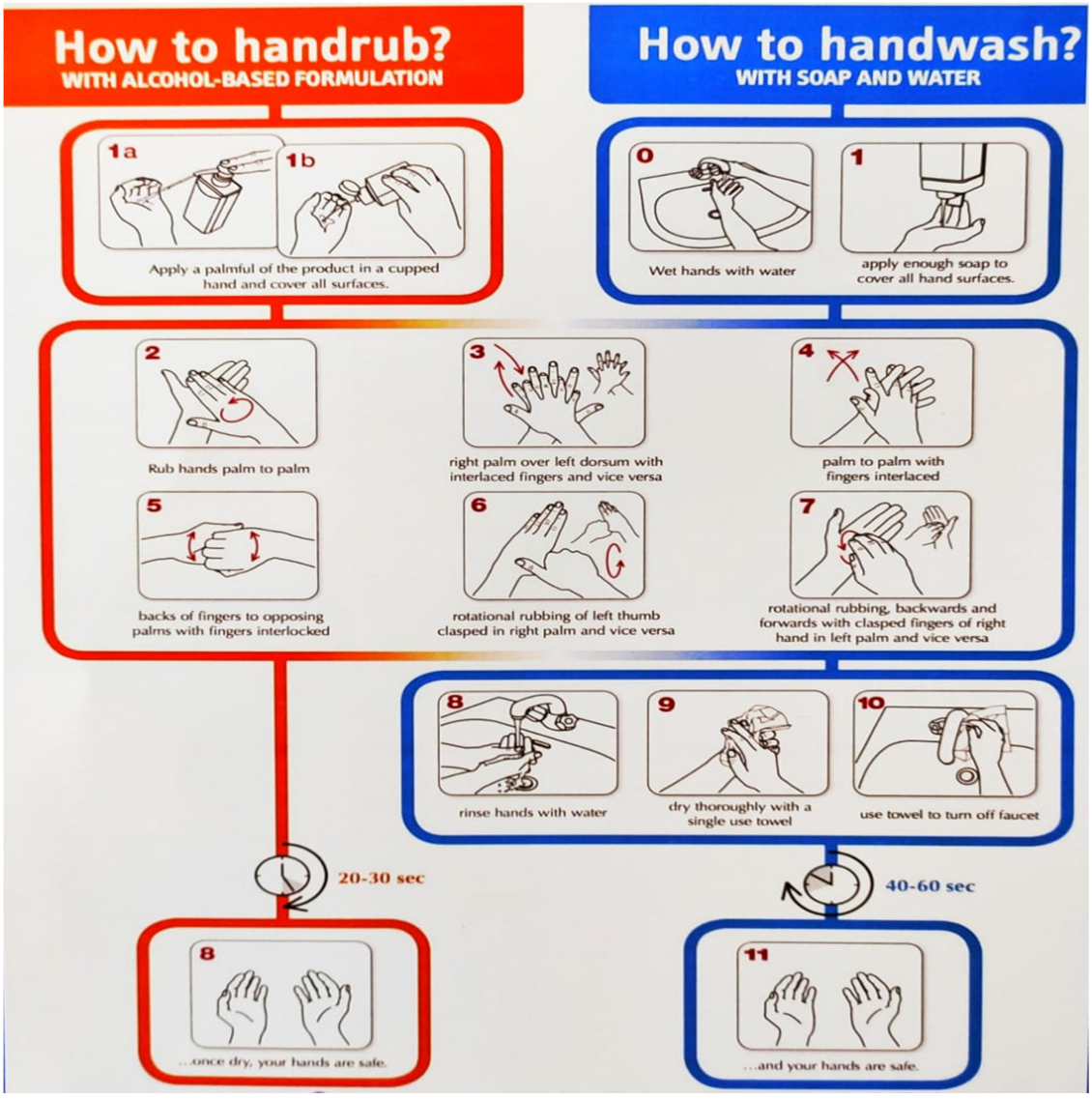


Fig 55: *Steps of hand washing and drying*

- Wash your hands with soap and water when your hands are visibly soiled.
- Lather up the soap, making sure to spread it up to your wrists, between your fingers, and on your nails and fingertips.
- Rub your hands together vigorously for at least 20 seconds.
- Rinse your hands well.
- Dry your hands thoroughly with a clean and dry cloth hand towel.

Alcohol-based preparations

- Alcohol-based hand rubs are very easy to use.
- Skin disinfectants formulated for use without water (e.g., 70–80% alcohol-based solutions) can be used to decontaminate hands when handwashing facilities are not available.
- Alcohol-based hand rubs are more effective against most bacteria and many viruses.
- Use an alcohol-based hand rub when your hands are not visibly soiled.

Personal protective equipment

- "Specialized clothing or equipment worn by an employee for protection against infectious materials"
- PPE typically includes: gloves, coveralls, eye protection, respirators, etc.

Gloves

- Disposable gloves should be worn if having direct contact with ill persons and when it is likely that hands will be contaminated with faeces or vomit
- Hands must be washed before and after using disposable gloves, which should be single use only
- If gloves are not available, it is essential that hands be washed immediately after any contact with ill and well people during an outbreak

Dos and Don'ts of Glove Use

- Work from "clean to dirty"
- Limit opportunities for "touch contamination" protect yourself, others, and the environment
- Don't touch your face or adjust PPE with contaminated gloves
- Don't touch environmental surfaces except as necessary during patient care

Masks

Make wearing a mask a normal part of being around other people. The appropriate use, storage and cleaning or disposal of masks are essential to make them as effective as possible.

Here are the basics of how to wear a mask:

- Clean your hands before you put your mask on, as well as before and after you take it off, and after you touch it at any time.
- Make sure it covers both your nose, mouth and chin.
- When you take off a mask, store it in a clean plastic bag, and every day either wash it if it's a fabric mask, or dispose of a medical mask in a trash bin

Gowns

- A medical/surgical gown is a personal protective garment intended to be worn by health care personnel during surgical procedures to protect both the patient and health care personnel from the transfer of microorganisms, body fluids, and particulate matter.
- Impermeable gowns and plastic aprons will protect clothing and skin from contamination with faeces and vomit. Ideally, aprons will be single use that can be disposed of, although reusable plastic ones can be washed with detergent and water between uses.
- If the items have been visibly contaminated with faeces or vomit a bleach solution should be used to decontaminate. Protective clothing contaminated with faeces or vomit should be removed as soon as possible and disposed of without generating aerosols.

Eyewear-Goggles

- Appropriately fitted, indirectly-vented goggles* with a manufacturer's anti-fog coating provide the most reliable practical eye protection from splashes, sprays, and respiratory droplets.
- The eye protection chosen for specific work situations depends upon the circumstances of exposure, other PPE used, and personal vision needs.
- There is wide variety in the types of protective eyewear, and appropriate selection should be based on a number of factors, the most important of which is the nature and extent of the hazard.

Shoe cover

- Shoe cover is an optional PPE if expected contamination from airborne viruses, particulate matter or body fluids during the patient care.
- Put on your boot covers. Make sure that all areas of the foot are covered and the boot or shoe covers are snug over your ankle and calf.

Face shield

An optional PPE if expected an epidemic viral infection.

Environmental cleaning and cleaning of ambulance

Cleaning equipment and agents

- Bleach should be applied to hard, non-porous, environmental surfaces at a concentration of 0.5%. However, cleaning with bleach should be preceded where possible with a neutral detergent clean, the detergent providing a surfactant to release oils and bio-burden to enable penetration of the chemical.
- Detergents used for environmental cleaning should remove soil or dirt, suspending this in water, to be followed by rinsing the area free with little or no residue. Neutral pH detergents are best for environmental cleaning because they are less likely than acid or alkali detergents to damage metals such as stainless steel or to cause skin irritation

Decontamination Site Setup

- Select an appropriate site for ambulance decontamination that protects the vehicle and the decontamination team from weather elements, preferably a well-ventilated large enclosed structure.
- Establish a secure perimeter for safety of the public and decontamination personnel.
- Include considerations for waste management, security plan, public perception, and media visibility when selecting decontamination site.
- Depending on the location, the ability for climate control is beneficial.
- Define and mark hot, warm, and cold zones of contamination around the ambulance that require PPE to enter

During Decontamination

- Disinfect the outside of any prepositioned but unused medical equipment (still inside the protective bags they were placed in) and pass it to the warm zone. If the equipment was removed from a protective bag in transit, assess the equipment to determine if it can be properly decontaminated and disinfected, or disposed of.
- Any areas that are visibly contaminated with the patient's body fluids should be decontaminated first with an approved Environmental Protection Agency (EPA)-registered disinfectant for the appropriate contact time before soaking up the fluid with absorbent materials.
- If the interior of the ambulance was draped prior to transport, remove the draping by rolling the drapes down outside in, from the ceiling to the floor of the unit starting at the front of the compartment and moving to the rear.
- Roll flooring drapes from the front to rear of the compartment, rolling drapes outside in.
- To facilitate packaging and transport, drapes can be gently cut into segments.
- It is important that all drape materials are in sections that are small enough to facilitate the insertion of the biohazard bags into an autoclave or pre-determined Category A infectious substance packaging for disposal.
- Two people in PPE should manually disinfect the interior of the patient care compartment with particular detail for high-touch surfaces such as door handles and steps using care to limit mechanically generated aerosols and using the surface wipe method to disinfect.
- Disinfect the interior as a team so that the team members can talk each other through the process and expedite the decontamination process.
- Once the manual interior wipe down has been completed, collect and package all waste as Category A waste.
- Manually wipe down the ambulance's exterior patient loading doors and handles, and any areas that may have been contaminated, with disinfectant. The exterior of the ambulance does not require a full disinfectant wipe down.
- Once the outside of all surfaces (including waste bags) has been wiped with disinfectant, then doffing can occur.

Care of body secretions and Vomitus

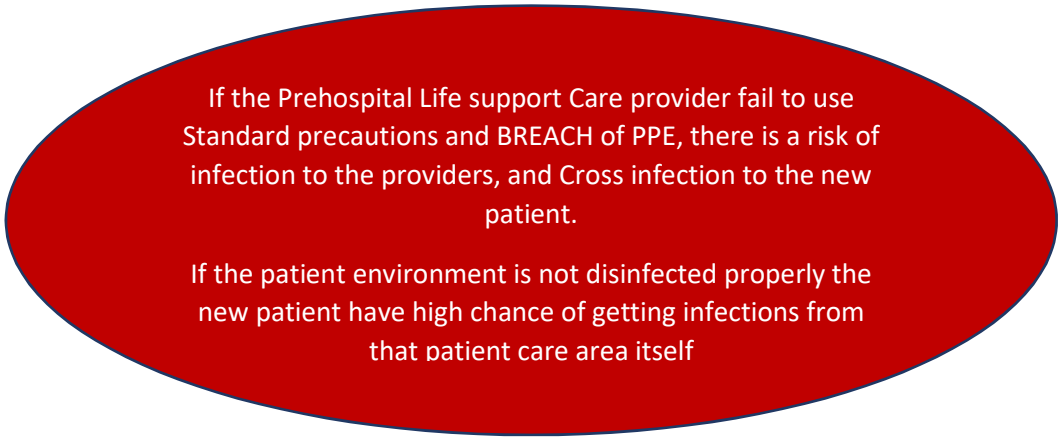
Person cleaning Vomit or Faeces should wear gloves, apron and mask. Paper towels can be used to soak up excess vomit and faeces and disposed of in a leak proof plastic bag.

The area should be cleaned with detergent and warm water using a disposable clothe, and discarded into a leak proof plastic bag.

Care of linen and facilities available for laundry

All infected linen / linen soiled with body fluids will be soaked in 0.5% bleaching solution for 30 minutes then washed with water & detergent to remove bleach before handing over for washing.

Red flags



Summary

Pre-hospital providers face the growing number of multidrug-resistant organisms. In addition to protecting themselves from possible infection, pre hospital providers must ensure that their vehicles and equipment are adequately cleaned and disinfected so as not to expose future patients.

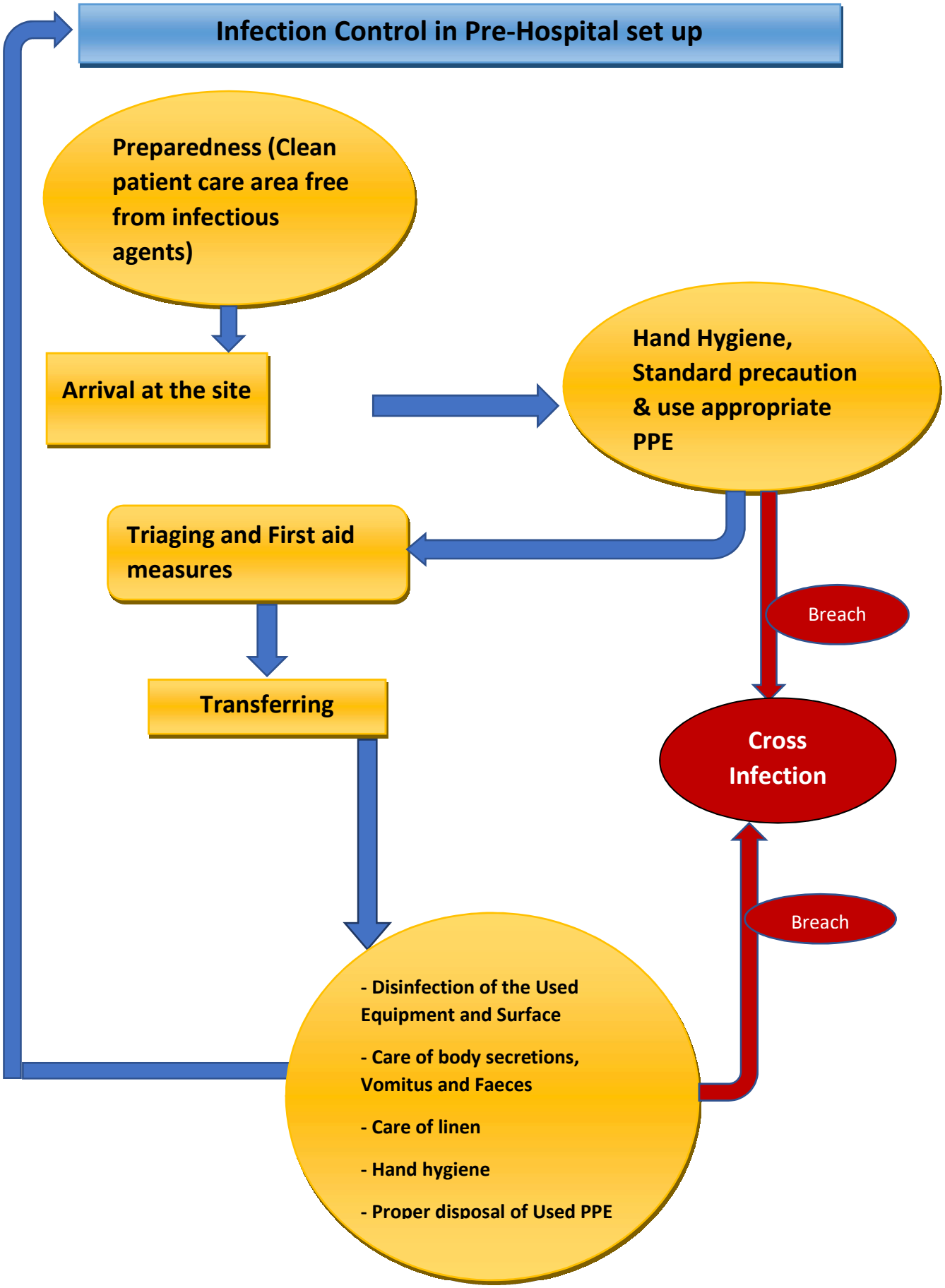


Fig 56: *Infection control in pre-hospital setup*

Chapter 9: Special Scenarios

Learning Outcomes

At the end of this chapter, reader will be able to -

- Recognize CBRNE event
- Initiate appropriate initial response
- Aware of decontamination measures
- Aware of control zones of a chemical event
- Help as an essential part of response team in a CBRNE event
- Help in community-based disaster training and management

Introduction

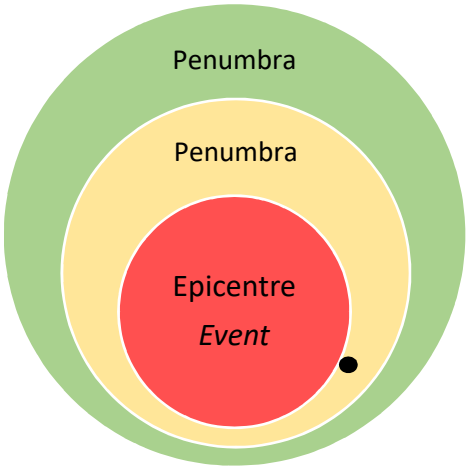
CBRNE refers to chemical, biologic, radiologic, nuclear, and explosive agents. The term "weapons of mass destruction" is also used at times. CBRNE events are deemed to be catastrophic hence making emergency preparedness essential.

Radiation/Nuclear Hazard **Bio Hazard** **Chemical Hazard**

Fig 57: *Hazards symbol*

- What has been learned from CBRNE incidents is that when chemicals are released, the agents create a penumbra effect, in which true chemical emergencies occur in the epicenter and a larger surrounding area of fear and panic arises in individuals with lower, usually nontoxic levels of exposure.
- Planning for chemical disasters must take into account both the chemical emergency occurring near the center of any chemical release and the chaos that can ensue through fear of exposure.
- What makes these events overwhelming for an individual ED is the larger number of victims who are ambulatory, frightened, and make their own way to the hospital, bypassing any scene triage or decontamination.
- Appropriate planning for management of this large, self-extricated Population is paramount to the concept of disaster preparedness for chemical emergencies and perhaps even more important than specific antidotes for rare agents that might be encountered.

Examples for CBRNE events: Bhopal gas tragedy (Chemical), Hiroshima explosion.



Epicentre:
- ✓ Area where chemicals released
- ✓ Highest exposure, True emergencies
- ✓ Sickest patients requiring urgent attention

Penumbra:
- ✓ Larger surrounding area of fear & panic
- ✓ Lower, usually non-toxic level of exposure
- ✓ Ambulatory, frightened population; bypass triage/ decontamination, self-extricate & overwhelm hospitals if not well tackled

Fig 58: *Example of CRBNE events: Bhopal gas tragedy*

Clinical Manifestation

Group of Chemical agents	Manifestation
Irritants Ex: Ammonia, Chlorine	✓ Highly water soluble ✓ Excellent warning properties (due to mucosal irritation) ✓ significant eye irritation and edema, burning in the throat, and at higher concentrations, constriction of the upper airway ✓ Low soluble gas→ Less warning signs→ more lung injury Ex: Phosgene
Asphyxiants • Displace O_2 from air • Interrupt O_2 delivery • Impair O_2 utilization	✓ Early symptoms of reducing oxygen - Headache, nausea, and fatigue ✓ Patients with h/o heart disease may have chest pain ✓ Late manifestation- seizure, loss of consciousness
Nerve agents	✓ Symptoms: Defecation, urination, pin-point pupils ✓ Vomiting, lacrimation, salivation, low heart rate ✓ Increased respiratory secretions, breathing difficulty ✓ Muscle fasciculation(twitching), weakness, paralysis ✓ Seizure, coma
Incapacitating agents	✓ Chemicals that immobilize victims ✓ Ex Tear gas, Narcotic vapours
Vesicants (Blister producing)	✓ cause damage to eye, skin, mucous membrane, lungs ✓ blisters, second degree burns (may be delayed onset)

Bio-terrorism

Bioterrorism is the release, or the threat of a release, of a biologic agent among a civilian population for the purpose of causing illness or death in humans, animals, or agriculture that results in the spread of fear and disruption of daily life.

Classification

Biological toxins & Infectious organisms (Contagious & non-contagious). Ex: Anthrax, Plague, Ebola.

Features of Bio toxin Ex: Botulinum, Ricin ✓ Occurrence of a disease or syndrome that rarely occurs naturally ✓ Multiple victims of a similar disease with no classic risk factors ✓ Epidemiology suggesting a point source or localized exposure ✓ Possible animal and human morbidity in the same area ✓ High mortality in an otherwise healthy population

Radiation Hazard

Intentional or accidental exposure of radiation.
Ex: Dirty bomb, nuclear explosion, radio-active substance in industries/lab/power plant
Clinical symptoms depend on dose of exposure & duration from exposure
Higher the dose of exposure earlier and more severe the symptoms

Local radiation injury	✓ Transient erythema (6 Gy), hyperesthesia, and itching (early) ✓ Local hair loss (2nd week) ✓ Delayed – Skin tenderness, swelling, ulcer (necrosis)
Acute radiation syndrome Exposure > 2 Gray	**1st phase - Prodrome:** Nausea, vomiting, loss of appetite, diarrhoea, fever, headache, fatigue, sweating
	2nd phase - Latent phase: Symptom free interval (Shorter in severe exposure; longer period in mild exposure)
	3rd phase - Manifest disease (> 12 Gy): Neurovascular syndrome – occurs in hours Nausea, vomiting, Bloody diarrhoea, low blood pressure, fatigue Lethargy, seizure, tremors, disorientation, imbalance (>6 Gy): GI syndrome – occurs in hours Nausea, vomiting, diarrhoea, abdominal pain (>2Gy): Hematologic syndrome – onset in days Low blood count, infection, fever, bleeding

Management: **HAZMAT guidelines**

Community risk assessment	✓ Occurs before disaster ✓ State & local level Emergency response plans to be made ✓ The chemical facilities (industry etc.) to share information & annual inventory reports with local emergency management agencies & fire departments
Recognition of an event	✓ Based on early warning properties, including a noxious or unusual odour, eye or upper airway irritation ✓ Subtle clues such as large numbers of dead animals in an outdoor environment ✓ Non-irritant exposure based on leak monitors at the industries

Identification of the substances	Based on clinical syndromes &investigation at the exposure site
Isolation & Scene control	✓ EMS team to establish incident command system & designate Hot, warm and cold zones ✓ Only trained personnel in fully encapsulated protective gear should be allowed to enter Hot. Warm zone ✓ Protocol for isolation process (refer Figure 3)
Decontamination	✓ Decontamination of victim & equipment to prevent secondary contamination ✓ Remove contaminated clothing, brushing off solid particles, and washing and towelling the face ✓ Water is the universal decontamination agent ✓ 5 minutes decontamination with warm water to prevent shivering (in warm zone) ✓ Patients with severe symptoms require rapid decontamination and simultaneous treatment in the warm zone
Stabilization & Triage	✓ 1st step: remove from the source, avoid continued exposure ✓ Triage to be done in cold zone ✓ Cold zone should be upwind/ uphill from Hot zone ✓ Stabilize airway, breathing, circulation ✓ IV access – priority in patients with seizure, hypotension, dysrhythmia ✓ Specific antidote if available

Approach/Flow chart

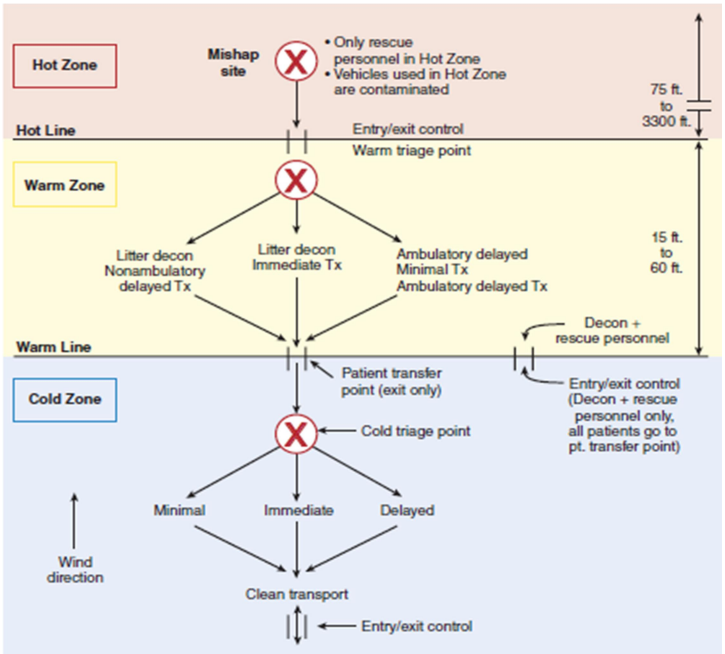


Fig 59: *Control zones in a chemical event*

Resourcefulness; Frugal/Jugaad (Make in India)

- ✓ PPE
- ✓ Decontamination area (Shower tents)

Disposition

Triage as in mass casualty and shift to nearest health facilities after decontamination and appropriate initial management

Summary

- Scene safety and appropriate personal protection is crucial in managing CBRNE.
- Robust planning is necessary to tackle self-extricated, low priority patients who bypass decontamination, create chaos, panic and overwhelm health care facilities.
- Decontamination & management of acute life-threatening conditions should take place simultaneously. Resuscitation takes higher preference.
- Aerosol dispersal is a likely route that terrorists may use to deploy biologic weapons, so victims will present primarily with respiratory complaints.

Chapter 10: Communication, Logistics and Documentation

Learning Outcomes

At the end of this chapter, reader will be able to -

- Learn communication system used in pre-hospital settings
- Learn about pre – hospital notification
- Gain knowledge of Inventory of different type of ambulances and ambulance checklist

Introduction

Pre-hospital treatment must be appropriate in order to minimize the risk of mortality in serious situations such as traffic accidents, heart attacks, and other medical emergencies. One of the most common and essential aspects of pre-hospital care emergency services is communication. The use of an effective and reliable communication system in pre-hospital treatment will help to save a person's limb or life.

- In India, the numbers **100 (Police), 101 (Fire), and 102/108 (Ambulance)** are widely used for various types of emergencies.
- India has recently launched **"112" as a new National Emergency Number** for all three emergency services under a single toll-free phone number.

The advancement in information technology have created new opportunities for emergency service providers to develop state-of-the-art Centralized Control Rooms, which are currently present in few states in India. These Centralized Control Rooms are equipped with a Call Center, Data Center, Voice Loggers, GIS/GPS activated devices mounted in ambulances, Mobile Data Terminals (MDTs)/Mobile Phones, a Computer Aided Dispatch (CAD) System, and various software applications for operational performance.

Steps

Centralized Ambulance Service Control Rooms are accessible through 102/108 (toll free) numbers

- When calls are received, the Control Room software displays the caller's phone number as well as the caller's address & location (only in a few states).
- The Control Room staff gathers the relevant information from the caller such as the location of emergency and type of emergency (mandatory information) as well as the name, age & sex of patient/injured patient, allergies and so on (optional information).
- The software application recommends the nearest available ambulances based on the caller's information and Control Room staff selects the appropriate ambulance and dispatches the call to the identified ambulance(s).

- For communication purpose, ambulances are equipped with Mobile Phone/ Mobile Data Terminals (MDTs) for receiving assigned calls through text messages/software application-based notifications.
- The ambulance personnel acknowledge the calls and through software application/text messages create the time logs for all pre-identified activities i.e., time of acknowledgement of call, starting movement from parking location to the incident site, reaching the incident site, moving from the incident site to an appropriate hospital, arriving at the hospital, patient handover time and movement from hospital to ambulance parking location.

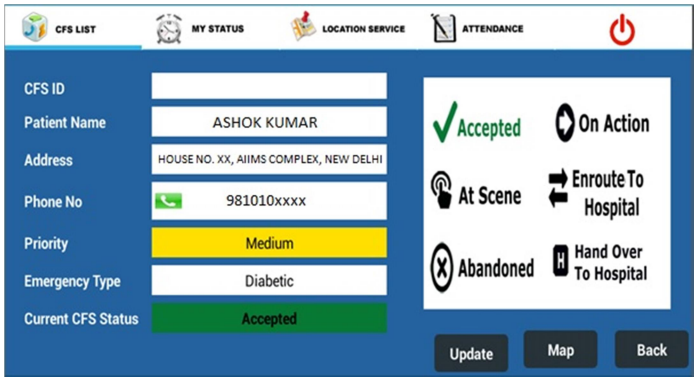


Fig 60: *Centralized Ambulance Service Control Rooms*

In addition to these event logs, the Mobile Data Terminals are also used to capture patient status, vitals and care rendered during the transportation. Furthermore, the software program notifies the chosen hospital of the ambulance's arrival in advance, as well as the patient's details collected during transportation. The information/data of all calls are recorded and stored in physical hardware storage devices/cloud storage and can be retrieved for medico legal cases and as well as for quality review and performance analysis.

1. Pre-Hospital Notification

Pre-hospital notification is the communication sent by ambulance personnel to a receiving hospital for arrival of a patient requiring emergency care.

It notifies the receiving hospital by providing prior information for Estimated Time of Arrival (ETA) along with patient vitals such as AVPU/GCS scale score, Blood Pressure, Pulse Rate, Oxygen Saturation Rate, Respiration Rate, etc. which helps the receiving hospital to improve preparedness for reception and resuscitation of a critically injured or ill patient.

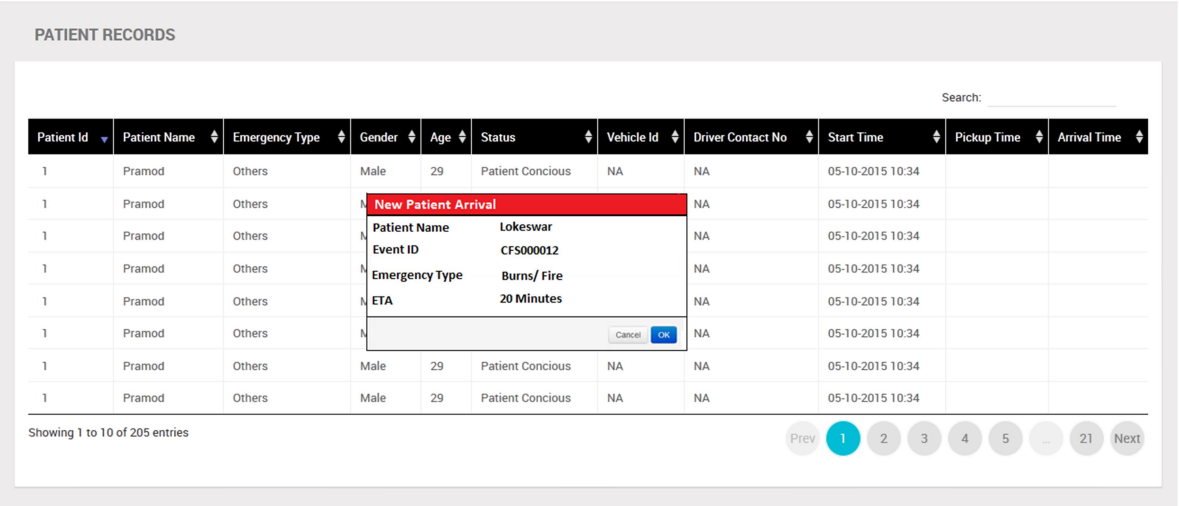


Fig 61: *Pre-hospital notification*

2. Inventory of different type of ambulances

The ambulances should be equipped with appropriate equipment/inventories on the basis of the category of ambulances in order to attend emergency calls and patient handling as well as care during transport. The list of medical and other equipment, consumables and other items is as follows:

S. No.	List of medical and other Equipment	ALS	BLS	PTA
Patient Handling Equipment				
1.	Collapsible chair cum Trolley Stretcher			
2.	Scoop stretcher			
3.	Wheel Chair (Foldable)			
4.	Canvas Stretcher/Transfer Sheet			
Immobilization Equipment				
5.	Spine Board with restrains			
6.	Lower Extremity Traction Devices			
7.	Splint sets (wooden/Metallic/Other)			
8.	Pneumatic Splints			
9.	Upper and Lower extremity immobilization Devices			
10.	Cervical Collar			
11.	Head Immobilizer			
Life Saving Equipment				
12.	Fixed Oxygen Cylinder with accessories and key			
13.	Portable Oxygen Delivery Kit with key			
14.	Electric Portable Suction Machine			
15.	Manual Portable Suction Machine			
Diagnostic Equipment				
16.	B.P. Apparatus with Cuff			
17.	Stethoscope			
18.	Thermometer			
19.	Pulse Oximeter			
20.	Device for Blood Sugar determination			

	(Glucometer)			
21.	Diagnostic Light/Pen Light with battery			
22.	Torch with battery			
Equipment for management of Life-Threatening situations				
23.	Cardiac Monitor cum Defibrillator			
24.	Transport Ventilator			
25.	Automated External Defibrillator (AED)			
26.	Syringe Pump			
27.	Ambu Bags (Adult, Paeds& Neonatal)			
28.	Laryngoscope with suitable blades			
29.	Pocket Mask			
30.	Oropharyngeal Airways			
31.	Magill's Forceps			
32.	Nebulization Device			
33.	Thorax Drainage Kit			
Bandaging and Nursing				
34.	Bedding Equipment			
35.	Blanket			
36.	Material for treatment of wounds			
37.	Material for treatment of burns and corrosives			
38.	Kidney Tray			
39.	Bedpan			
40.	Urine Pot			
41.	Vomiting Bags			
42.	Sharp Container			
43.	Gastric Tubes with accessories			
44.	Waste Bags			
45.	Emergency Delivery Kit			
46.	Sterile and non-sterile Surgical Gloves			
47.	Clinical Waste Bags			
48.	Non-woven Stretcher Sheet			
49.	Scissors			
50.	Torch			
51.	Tourniquet			
Rescue Tools				
52.	Rescue Tools Kit (Cutters, Spreaders, Hammer, Axe, Wrecking Bar, Crow Bar)			
53.	Seat Belt Cutter			
54.	Warning Triangle Lights			
55.	Spot Light/Search Light			
56.	Fire Extinguisher ABC Type			
57.	Cleaning and Disinfectant material			
Personal Protective Equipment				
58.	Basic Protective Clothing including high visibility reflective jacket or			

	tabard			
59.	Advanced Protective Wear			
60.	Safety/Debris Gloves			
61.	Safety Shoes			
62.	Safety Helmet			
63.	Personal Protective Equipment against infection			

Medical/Surgical Consumables

S.No.	List of consumable Items	ALS	BLS	PTA
1.	Surgical Gloves			
2.	LMA Disposable			
3.	Wide bore Needle			
4.	Disposable L.P. Needles			
5.	Syringes ABG (2 & 5ml)			
6.	Three way stop cock			
7.	IV Lines			
8.	Disposable suction pumps			
9.	ECG Electrodes			
10.	Lighted Stylets of different sizes			
11.	Guedel's Airway			
12.	Nasal Airways (all sizes) & catheters			
13.	Bi-nasal Cannula			
14.	Combi Tube			
15.	Tracheostomy Tube Cuff & plain			
16.	Mini Tracheostomy Kit			
17.	Ventimask			
18.	Facemask with nebulizer			
19.	Pressure Infusion Bags			
20.	Right angled Shivel Connector			
21.	G.V. Paint			
22.	I.V. Fluids (NS/DNS/RL/Dextrose)			
23.	Micro Drip-set and Drip set			
24.	Nasogastric Tubes			
25.	Burn Pack (Standard Pack, clean burn sheets)			
26.	Triangular Bandage			
27.	Bandages Rolled			
28.	Gauze Sponges			
29.	Cotton Rolls			
30.	Gauze Rolls			
31.	ABDs			
32.	Elastic Bandages			
33.	Occlusive Dressing			
34	Adhesive Tapes			
35.	Cold Packs			
36.	Teeth Guard			
37.	Savlon solution			
38.	Betadine Lotion			
39.	Leucoplast			

40.	Pain Spray			
41.	Vinodine Spray			
42.	Coolax Spray			
43.	Face Mask Disposable			
44.	Sample Collection Kits			
45.	E.T. Tube			
46.	Suction Catheter			

Injections and Medicines

S.N	Name of Medicine	ALS	BLS	PTA
1.	Inj. Adrenaline			
2.	Inj. Atropine			
3.	Inj. Calcium Carbonate			
4.	Inj. Dopamine			
5.	Inj. Dobutamine			
6.	Inj. Noradrenaline			
7.	Inj. Nitroglycerine			
8.	Inj. Sodium Bicarbonate			
9.	Inj. Hydrocortisone			
10.	Inj. Frusemide			
11.	Inj. Diazepam/Midazolam			
12.	Inj. Deriphyllin			
13.	Inj. Phenytoin Sodium			
14.	Inj. Avil			
15.	Inj. Metochlorpropamide			
16.	Inj. Ondansetrone			
17.	Inj. KCL			
18.	Inj. Lignocaine 2%			
19.	Inj. Amiodarone			
20.	Inj. Magnesium Sulphate 25%			
21.	Inj. Mannitol 20%			
22.	Inj. Morphine/Inj. Pethidine			
23.	Inj. Noradrenaline Bititrate 4mg			
24.	Inj. Nafoxone HCL			
25.	Inj. Fentanyl			
26.	Inj. Sodium Valporate			
27.	Inj. Voveran			
28.	Inj. Paracetamol			
29.	Activated Charcoal			
30.	Water for Injection			
31.	Inhaler Salbutamol			
32.	Inhaler Beclomethasone			
33.	Tab. Ecospin 75mg			
34.	Tab. Sorbiterate 5MG/10MG			
35.	Tab. Paracetamol 500mg			
36.	Sterile Water or Normal Saline solution for irrigation			

3. **Ambulance Checklist:** The ambulance vehicle that will be sent for emergency calls must be in good working order and fitted with all of the appropriate equipment. Before rendering an ambulance operational in each shift/duty, the following aspects must be checked in all ambulance vehicles:

S.No.	Other Items	Available/ Not Available	Working/ Not Working
1.	MDT/Mobile Phone		
2.	GPS Device		
3.	Bio Metric/Attendance Register		
4.	Cleanliness of Ambulance		
5.	Air -Conditioner		
6.	Siren		
7.	Beacon		
8.	Hygienic Storage of Medical and other Items		
9.	Fuel Level		
10.	Engine Oil Level		
11.	Radiator Coolant Level		
12.	Brake Fluid Level		
13.	Headlight and Indicator Lights		
14.	Horn		
15.	Patient Cabin Lights and Fan		
16.	Tyre Pressure		
17.	Side Mirrors		
18.	Brake		
19.	Fire Extinguishers		
20.	Registration Certificate, Fitness Certificate, Insurance and Pollution Under Control Certificate		

Summary

Communication, logistic management and documentation skills form a major part the essential soft skills required for efficient functioning of healthcare system. Effective and reliable inter-personal, inter-professional and system communication in the form of pre-hospital notification is crucial for preparedness and smooth transition of patient care.

Logistic management is an important managerial skill to be developed by emergency service providers for orchestrating transfer and efficient management of mass casualty and disasters. Accurate and succinct communication and documentation of the pre-hospital care provided, with time stamping can contribute to quality improvement of emergency patient care.

The current advances in information technology have led to development of state-of-the-art centralized control rooms for emergency service providers equipped with a call center, data center, voice loggers, GIS/GPS activated devices mounted in ambulances, Mobile Data Terminals (MDTs)/mobile phones, a Computer Aided Dispatch (CAD) System, and various software applications for operational performance. It is important for pre-hospital personnel to stay updated with recent advances in communication and documentation interfaces for efficient utilization of the same in various scenarios.

Chapter 11: Frugal Innovations

Learning Outcomes

At the end of this chapter, reader will be able to –

- Understand the importance of resourcefulness or frugal innovations
- Understand various transportations modifications in pre-hospital settings
- Learn about locally available resources

Introduction

Resourcefulness is the ability to find quick and clever ways to overcome difficulties. Resources are always limited in our setting, so with our common sense and experience we should be able to use the nearby available resources in best possible ways.

Emergency Medicine is a branch where anything can be useful at any time for patient's survival. India is a country with so much diversity in climate and resources, we should always try to use what is easily available to us. Every region in India has different problems with different solutions.

Key factors:

- Time (anything which saves time is precious)
- Distance (transportation)
- Cost effective (resources which are locally available and economical at the same time)

As a pre-hospital medical care provider, we have to look for resourcefulness at every point.

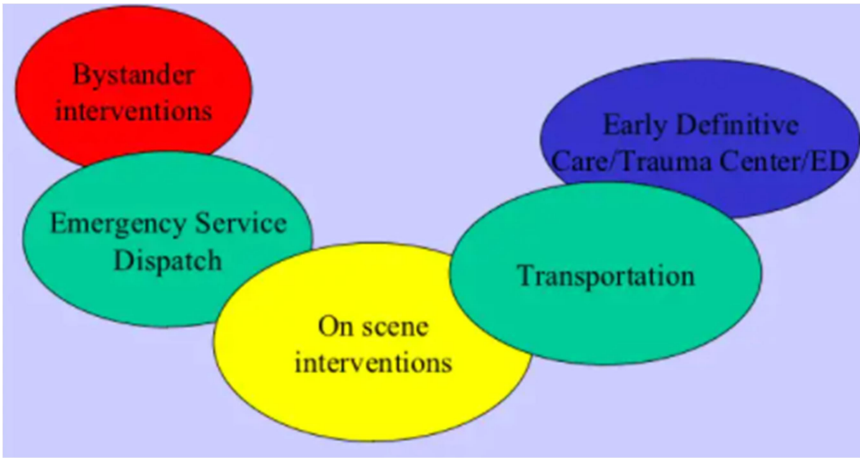


Fig 62: *Pre-hospital care*

Bystanders

Always call for help for the local people, they will increase the man power who will be able to guide you better in terms of resources available locally and at what distance and where exactly. They will be very helpful for communications too.

Transportations

- **Bike-modified ambulance** e.g., Mission Delhi program (for transporting chest pain patients)

Fig 63: *Bike ambulance*

- **E-rikshaw modified ambulance**

Fig 64: *E-rikshaw modified ambulance*

- **Ambulance van**

Fig 65: *Van ambulance*

- **Zip –line**
  Can be used in mountain and hilly areas or even crossing a river to save a lot of time

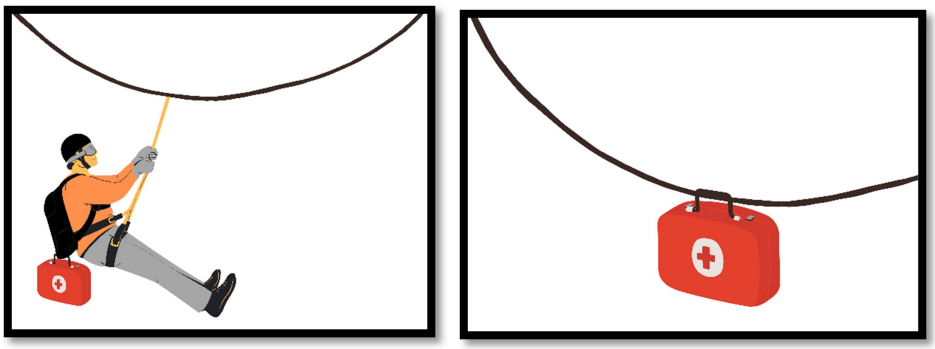


Fig 66: *Zip line*

- **Air ambulance**
  Used by military in mountains

Fig 67: *Air ambulance*

- **Medical drones (advanced approach)** can be used in areas where reaching is difficult. Emergency drugs can easily be transported to such places immediately (most commonly used by military persons). This medical drone acts as a tool kit which flies to various emergency situations ambulance and the hospital team so that they will be ready to serve to the needs of the patients. The proposed prototype model is used to support the people who need immediate attention.

Fig 68: *Medical drones*

Using resources which are already with us

- Using BP apparatus as a compression bandage.
- In case of bee sting injury-while bringing to hospital try to remove the tentacles from body on the way-use any plastic card or brush to remove tentacles - it prevents anaphylactic shock and for pain put hot water and vinegar).
- Any needle or sharp objects can be put in 5th intercostal space for tension pneumothorax which can save patients life.
- In case of emergency delivery new sterile shaving blade can be used to cut umbilical cord and thread can be used if clamp is not available.

Fig 69: *Resources*

Using resources which are available locally

- In case of pelvic fracture if pelvic binder is not available any cloth can be used in triangular style to stabilise pelvis or even wore pant can be used to do the same.
  For- (pelvic fracture stabilisation)

Fig 70: *Local resources usage*

- Using cloth piece in multiple ways-
  - Use as a sling (to reduce pain and stabilise the limb in case of fractures)
  - Use for compression bandage (to control bleeding)
  - Making a stretcher to transport patients

Fig 71: *Use of cloth piece*

- Tourniquets are used to control bleeding from vessel injuries and it can easily be made from rubber bands (for fingers) and straps or exercise bands for arm and legs (even elastic hairbands) (not more than 5-10 min).

Fig 72: *Use of tourniquets*

- For splinting, materials like rod, cardboard, bamboo stick, wooden stick, even the handle of gun - military can be used.

Fig 73: *Splinting with use of cardboard*

Tarp Stretcher

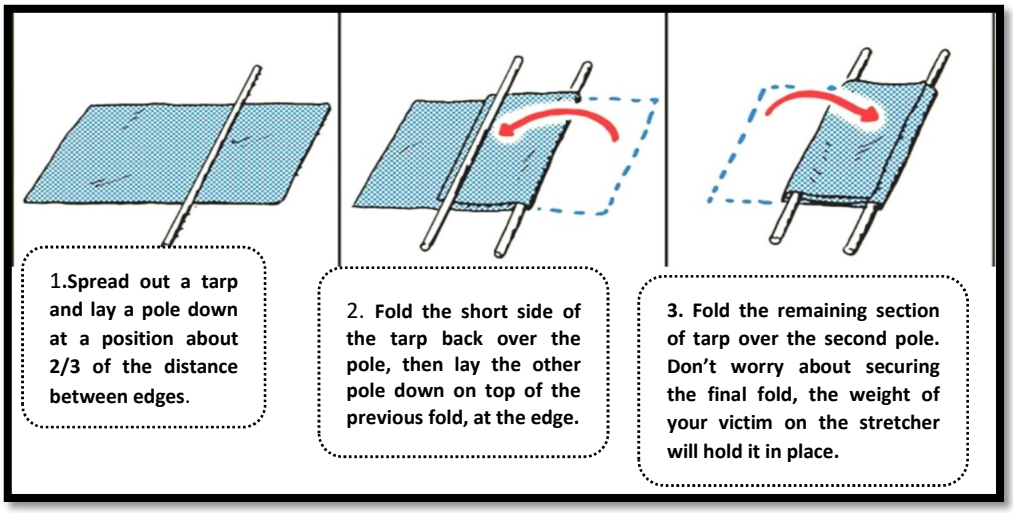


Fig 74: *Trap stretcher*

Miscellaneous

- Smart phones have different apps to measure saturation in case saturation probe not available.
- Vacuum cleaner can be used for suction to protect airways (with modifications at nozzles).
- In covid scenarios-splitting oxygen with bifurcates-if only one port is available (2 patients with same oxygen port.
- Using split techniques foe ventilator-2 patients at a time.
- Removing foreign body from ear using a wire modified if –forceps not available.
- Ring removal using thread techniques or applying soap to prevent necrosis in case of oedematous finger or trauma.
- Using 2- saline bottles and tying with tight cloth or bandage around the head if C collar not available.

There are multiple ways in which our common sense and quick decision can prevent fatal injuries and save patients life. In current situation during peak of covid lot of examples are there where we use jugaads to save patients because we all know **"necessity is the mother of inventions".**

Summary

"Frugal innovations "or JUGAAD is the ability to find quick and clever ways to overcome difficulties. The pre-hospital medical care provider can find better and smart ways to save a life of patients in case of emergency. The key factors in this are any skill and technique which saves time, modification in transportation which decreases distance to health facility and definitely things which are cost effective and are locally and easily available. New technologies like medical drones, medical apps both are of great benefit to our emergency health system. Drones can reach even in the places where we cannot reach when required. Pre-hospital medical care provider must know and should be able to use things in multiple ways which are already with them e.g., BP apparatus can also be used as tourniquet and compression bandage to stop bleeding. Similarly, use of things which are locally available e.g., rods, woods, cardboard can be used as splints in case of fractures in trauma. Necessity is the mother of inventions, whatever saves life in emergency is useful even small needle has a value in case of tension pneumothorax, so jugaads are nothing but immediate inventions at the time of need.

Chapter12: Point of Care Testing

Learning Outcomes

At the end of this chapter, reader will be able to -

- Role of POCT in pre-hospital care
- Role of EMS providers pertaining to POC
- Application of POCT in the pre-hospital setting

Introduction

Laboratory testing is an important link in diagnosing medical conditions and instituting definitive care. Traditional Laboratory testing involves collection of blood sample from a patient and transporting it for analysis to a lab. This approach delivers a high level of test accuracy but results can take several hours. For majority investigations, this remains as the standard of care. Though advancement in technology and need to identify markers for early detection of time sensitive medical conditions lead to the advent of Point of Care Testing (POCT). POCT is a form of testing that is done in the vicinity of patient care. It uses technology to obtain rapid results, that aid in early disease recognition and more immediate clinical care decisions.

Role of POCT in pre-hospital care

Point-of-care tests are easy to operate, cost effective and yield quick and accurate response. In the prehospital care setting, they can help in early triaging, thereby allowing for the 'Right patient to reach the right place at right time'. They can also help in escalating therapy and early institution of definitive care for example in patients with hypoglycaemia. Prior information of a sick patient arriving can allow hospitals to prepare in advance. This will add value to patient care and can help improve patient outcome.

Role of EMS providers pertaining to POCT

Utilization of point-of-care testing requires providers not only be able to read lab results, but also understand their context and significance in a particular clinical situation. They should report positive or abnormal results to the base and the receiving hospital. The providers should also be able to modify interventions based on the result.

The following parameters find application in the pre-hospital setting:

1. **Blood Glucose Measurement:**

A variety of medical conditions and patient presentations warrant pre-hospital blood glucose analysis. This may include:

- Altered mental status
- Focal neurological deficits, slurring of speech, weakness
- Seizures, especially in paediatric patients

There are many types of glucose monitoring devices available in the market. Kindly consider referring to the manufacturer's guide prior to using the device. Also calibrate the device as per manufactures recommendation.

Performing a Blood Glucose Estimation:

- Point of care glucose estimation requires a Blood glucose monitor, test strips, alcohol swabs, dry sterile swabs, single use lancet device.
- Turn on the glucometer and ensure the device is calibrated.
- Finger of the hands is the only recommended site for obtaining a blood glucose reading. Consider obtaining the sample from the non-dominant hand.
- Place the hand in dependent position for at least 10-15 seconds. Consider obtaining the sample from the 3rd or 4th finger. Fingers that are swollen, cyanotic or scarred should be avoided.
- Cleanse the site using alcohol swab, and allow the alcohol to dry prior to obtaining the sample. This avoids dilution of blood with alcohol that may alter the reading.
- Utilize a single use lancet device to prick the finger. Puncture the fingertip in fleshy part of the finger slightly to the side of the centre and across the groves. This allows for the formation of drop of blood on the fingertip.
- Dispose the device into a suitable sharp's container.
- If considered necessary, light pressure may be applied at the site to obtain a drop of blood for estimation. Avoid milking of the fingertip as this may lead to haemolysis and increased tissue fluid in the blood thereby altering the blood glucose reading.
- The drop of blood then needs to be applied to the test strip. This may be prior to after insertion of the test strip into the glucometer, which varies with the device. (Refer device manual for the same). Record the reading on the monitor. In case of an error, consider a retest and report the same.
- Apply pressure with a cotton wool at the site of puncture to stop bleeding.

Normal Value: The Normal range of blood sugar is 70-120mg/dl.

Intervention: Consider Oral/IV glucose in patients with blood glucose levels less than 70mg/dl.

Monitoring: A patient with an altered mental status must be re-assessed every 5 minutes. Recognise signs and symptoms of any improvement and deterioration.

2. Troponin

Chest pain is a common reason for availing pre-hospital ambulance services, and almost half of the patients with acute coronary syndrome come to emergency department via ambulance.

While attending a patient with chest pain, ensure connecting the patient to a cardiac monitor early in the course of evaluation. Consider obtaining a 12 lead ECG while the ambulance is still stationery. If the ECG is inadequate, repeat the ECG to determine patient management. Always remember software interpretation is not always accurate. Consider reviewing and interpreting ECG by yourself. Transmit ECG to the base and the receiving hospital for further inputs.

In patients with ECG suggestive of STEMI, transportation to a centre equipped with PCI facilities is desirable. The base would inform the receiving hospital and transmit the ECG provided by the ambulance. Give aspirin 325mg chewable tablet to the patient. If patient complaints of persistent chest pain, nitro glycerine 0.4mg SL can be given. (Ensure a SBP > 100mmhg, and no history of sildenafil (similar medication) intake in last 48 hrs)

In patients with ECG changes not suggestive of STEMI, a brief history and POC Troponin result can help determine destination. About 15% of patients with chest pain presenting to emergency have ACS. Most of these patients can be identified during the prehospital care by careful evaluation, a 12 lead ECG and brief medical history aided by point of care troponin test. Patients with a positive troponin test (NSTEMI) need to be shifted to hospital with Cath lab facilities. Patient with a negative test, normal ECG and low suspicion of ACS can be initially shifted to a local hospital for further evaluation. There are different types of devices available for performing a point of care troponin test. Kindly consider going through the manufacture's guide prior to using any such device. In case of a Troponin Card test, the following steps may be followed.

Performing a Troponin Test: (Card Test)

- Read manufacturer's instructions carefully before performing the test.
- Materials required:
    - Test device containing membrane strip in a sealed pouch.
    - Disposable dropper, or pipette with disposable tips.
    - EDTA vacutainer
- Collect venous blood sample in an EDTA tube.
- Optimal results are obtained when samples are tested immediately after collection.
- Remove the test device from the seal pouch just before use.
- Label the device with an identification number.
- Using a disposable syringe aspirate the sample from the EDTA vacutainer.
- Inject the blood into the sample well of the test device.
- Read the result at 15 mins or manufacturer recommended time.
- Results are determined by the naked eye.
- A single red coloured line at the control area "C" without any line at the test area is a valid negative result.
- The appearance of two red bands indicates a positive test.
- A test result in not valid if no lines appear and may have to be repeated.

3. Lactate

Serum Lactate levels are commonly measured in hospital settings to assess severity of specific medical conditions and monitor adequacy of resuscitation. They serve as a marker for tissue hypoxia and rise as result of anaerobic metabolism. It is a key marker for evaluating patients with sepsis, where levels greater than 4 mmol/L qualifies for administration of early quantitative resuscitation therapy. similarly in patient with trauma, a lactate level of greater than 2.5 mmol/L indicates hypovolemia and early levels of shock. Pre-hospital lactate measurement may be more sensitive than systolic blood pressure in determining need for resuscitative care. So, any patient with trauma and an elevated serum lactate level should be considered for transfer to a level 1 trauma centre. Similarly, any patient with fever or suspicion of sepsis and with raised lactate level should be transferred to a tertiary care hospital with prior information, so that they can prepare themselves in advance to receive the patients.

Devices are now available to measure serum lactate levels independently, that are hand held and easy to use. They are very similar to blood glucose monitor, consisting of a test

strip and analyser. The steps are very similar to that of measuring blood glucose levels, though consider reading the manufacturers guide prior to using the device.
Normal lactate levels range from 0.5-1 mmol/L and any value above 2mmol/L is considered significantly abnormal. Though remember that lactate levels may be raised in patients after strenuous exercise or an episode of seizure.

4. **Arterial blood gases and electrolytes:**

Performing an arterial blood gas procedure and obtaining results for the same is described as a moderately complex procedure and hence may not always be feasible. Portable devices are available and maybe utilized in critical care ambulances while caring for a mechanically ventilated or very sick patient. It has more value in long inter-hospital transfers requiring monitoring of adequacy of ventilation in the ambulance. ABG can also provide important information on electrolyte imbalance. Both hypokalaemia and hyperkalaemia are life-threatening emergencies that may be experienced by any patient. Normal potassium levels are 3.5–5 mEq/L. Correction of potassium levels can have immediate implications and can be lifesaving. Though performing the test in an ambulatory environment maybe a major challenge.

5. **Haematocrit and haemoglobin**

The baseline values of haematocrit and haemoglobin in a normal patient range from 35%–45% and 12–16 g/dL respectively. A patient's haemoglobin measures their actual haemoglobin level (the oxygen-carrying protein on red blood cells), while haematocrit is the percentage of the blood's volume in red blood cells. EMS providers can use these to detect anaemia, as well as to monitor more acute conditions such as GI bleeding. Field responders and critical care teams can establish baseline haematocrit and haemoglobin levels for later trending in the emergency department and during the patient's hospital admission. While in acute blood loss these levels will not immediately decrease, a decline can be seen as fluid is administered (as little as 1–2 liters) and within about an hour of the body compensating for the blood loss.

6. **Point of Care Ultrasonography**

Point of care ultrasonography has gained significant attraction since the last two decades. It has proved to be an indispensable toll in acute management of patients presenting to emergency as well as for continued care in intensive care units. Similarly, pre-hospital ultrasound has many clinical applications that may reduce morbidity and potentially improve outcome for life threatening conditions. Use of pre-hospital ultrasound has become increasingly common in Europe, where they have found it to be useful in the field. In a prospective study using prehospital ultrasound for FAST examination, a series of 202 trauma patients were examined. The sensitivity, specificity and accuracy of pre-hospital FAST were 93%, 99% and 99% respectively, in comparison to physical exam at the scene of 93%, 52% and 57% respectively.
Some have hypothesized that ultrasound can be applicable in up to one-sixth of EMS patients, while not delaying treatment or transport to receiving centres given relatively short exam times. Field trials suggest paramedics can adequately obtain and interpret images gathered in the pre-hospital environment, striking an important first step in delivering this modality from the in-hospital environment.

The successful incorporation of ultrasound in a pre-hospital setting would require a robust, high quality training program that should include FAST, obtaining pleural windows to screen pneumothorax and pulmonary edema and assessment of hemodynamic status.
With the decreasing prices of portable ultrasounds in India, the chances of them being incorporated in pre-hospital care in the near future in India are very high, hence EMS providers should seize any opportunity to acquire this skill.

Summary

Point of care testing (POCT) plays a very important role in the pre-hospital care by providing an opportunity to commence care prior to patient's arrival at health facilities, thereby improving patient's chances of survival.

POCT involves easy to use, handheld devices that can provide rapid and accurate results.

When attending a patient, the carer should identify and utilize the most appropriate POCT, that would impact patient outcome.

The commonly available point of care tests in Pre- hospital care includes blood glucose, troponin i, lactate, hematocrit and arterial blood gas (in advanced care ambulances).

Use of point of care ultrasonography in pre-hospital care has been gaining attraction in developed countries and has been found to be useful. The use of POCUS though involves inter-operator variability and its successful incorporation would require a robust, high quality training program.

Regular trainings need to organized for operators of POCT devices, and total compliance of POCT handling and management guidelines should be considered by each device operator.

Chapter - 13 Soft Skills

Learning Outcomes

At the end of this chapter, reader will be able to -

- Differentiate what are technical and soft skills
- Know the different types of soft skills
- Understand the importance of soft skills in clinical practice
- Know the key areas to work on, to improve quality of patient care

Introduction

Skills are of two types: technical and soft skills. Technical skills are the abilities and knowledge needed to perform specific tasks. Ex: Inserting an IV cannula, ambu bagging, intubation etc.

Soft skills are more related to your personal qualities and habits than your technical abilities. These skills are the cognitive and social skills that complement your technical skills'. These are 'what the best practitioners do in order to achieve consistently high performance and what the rest of us do on a good day'. Many technical skills are learned and practiced to ensure that you are confident and capable of treating patients in various situations. However, non-technical skills are often overlooked.

The generic soft skills are: communication; situation awareness; teamwork; decision making; leadership. This chapter provides a framework for understanding these skills in theory and practice.

- **Communication skills**

Developing the ability to effectively communicate with patients, co-workers, other health care providers such as nurses, doctors, cannot be undermined. Emergency personnel will have to communicate with a variety of people in a number of different ways just during one single transport of a patient. Establishing the ability to effectively communicate during emergency situations will drastically improve the patient care. Though some people have good communication skills naturally, with practice anyone can improve their communication skills and provide better patient care.

  - **Communicating with a patient**

    As a prehospital health care provider, you are the first to treat the patient. So effective communication is important to gain the confidence of the patient. In many cases, you will be responding to patients on one of the worst days of their lives. Patients and their relatives can be anxious, scared or stressed. This is when the ability to effectively communicate will be most crucial. You should try to communicate in a way that the patient relaxes, gains confidence and builds trust in you. In some situations, communicating in a calm and compassionate manner is the most helpful thing you can do for a patient. People tend to do a lot better during crises when you are able to remove their fear. Statements such as, "We're here to take care of you and we're going to do everything we can to help", make a world of difference for someone during an emergency.

An important skill when communicating with a patient is the ability to actively listen. Active listening "requires intense concentration and attention to everything the person is conveying, both verbally and non-verbally". It strengthens the bond between you and the patients, as it shows empathy and allows patients to feel understood. Patients are more likely to talk with you when they know they are being heard. Some techniques for active listening include paying attention to patient's complaints, making eye contact, asking relevant questions, and repeating key parts of what they are saying. If you need to take notes or entering information on the phone/tablet, tell them that you are doing so, but assure them that you are still listening.

Communication skills are not limited to verbal methods, and are often demonstrated through non-verbal methods. Showing empathy towards patients, being calm and compassionate during treatment, your facial expressions, gestures, tone of voice, body language, and appearance all have an impact on patient's trust in you.

- **Communicating with other health care professionals**
  Effective communication with coworkers and other health care providers, such as nurses and doctors, plays an important role in the overall care of the patient. EMTs have an enormous responsibility in that, sometimes, the only information the doctors will receive, is the information EMTs gather while on the scene. EMTs must be able to accurately describe scene and communicate it effectively so that the emergency physicians can treat the patient accordingly.

  An effective way of avoiding miscommunication is by closed loop communication. This provides a pattern of communication that ensures that everyone is operating under the same goals, plans, and situational understanding. it is the process of confirming and cross-checking information for accuracy.

The three steps in closed loop communication are:

1. Sender communicates the message.
2. Receiver repeats back the message.
3. Sender confirms that the message was received or gives clarification.

Example:

***Nikhil**: Vinay, start the patient on oxygen by face mask at 6L/min*

***Vinay**: Ok, oxygen started by face mask at 6L/min.*

***Nikhil**: Thanks.*

ISBAR communication: This is a communication model to make sure the right information gets to the right people in the shortest timeframe in an emergency setting. The model is explained in the following table below (Table 1).

Introduction	Your introduction	Your name and designation
Situation	What is the situation? Urgent issues?	Pt name age & gender, Chief complaint. Urgent concerns up front
Background	What happened up to this point? Past history?	Presenting complaint & symptoms. Significant past medical history
Assessment	How is the patient now? Stable/unstable?	General impression. Clinical findings
Rx/Recommendation	What treatment done? Effective?	Treatments given & pt response. Restate concerns Respond to questions

Example:

Hi. I am Vikas, EMT. We have a patient Mr. Prakash, 60-year-old male patient who complains of severe chest pain for last 2 hours (Pain score -9/10). He has diabetes and hypertension and takes regular medications. On assessment, his pulse rate is 110/min, BP-140/90mm Hg, RR – 20/min, SpO2- 96% on room air. He is anxious and in extreme discomfort. We have given him sorbitrate 5mg sublingual twice. His pain has reduced to 50% of the original. His ECG was sent to the doctor through the mobile app. They suspect Myocardial Infarction (Heart attack). They instructed us to given Aspirin 300mg and shift the patient to the nearest hospital. We will be reaching your hospital in 10 minutes. Do you have any questions?

The ability to effectively communicate in a clear, concise and respectful manner with patients and health care providers is vital for the safety of the patient and the continuity of care.

- **Situational awareness**

Situation awareness is defined as 'the perception of environment, the comprehension of its meaning, and the projection of their status in the future' (Figure 1).

- **Perception** is being aware of and/or gathering available information relevant to a situation. Example: taking a clinical history, examining a patient, reviewing the results of investigations and tests, receiving a handover, conducting a briefing, etc.
- **Comprehension** is the ability to form a mental model that makes sense of the available information. Example: this would be similar to forming a diagnosis, or a differential of diagnoses.
- **Projection** is the ability to use an operating mental model of a situation to foresee potential future states. Example: Form a decision to act upon

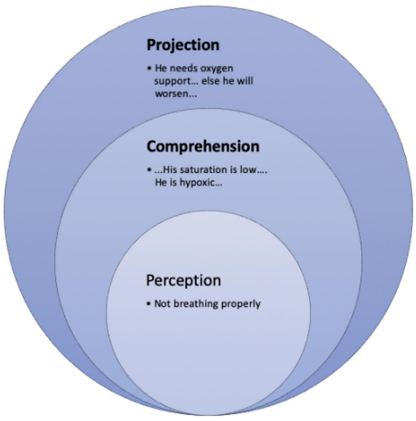


Fig 75: *Situational awareness*

The skills of situational awareness should be acquired by training repeatedly in emergency scenarios.

- **Team work**

Team work is the skill of working in a group with cohesion towards a common goal. The team includes everyone involved in patient care- ambulance driver, EMT, hospital attendants, security guards, nursing staff, doctors etc. It is essential that everyone works in harmony and coordination to ensure successful EMS response and treatment of patients. Working in teams, leads to greater productivity, more effective use of resources, better decisions and problem solving, better services, and increased innovation and creativity. Team work relies on trust. Trust is based on honesty, openness, consistency and respect, which is essential to building a collaborative climate so you can stay focused, be open with one another, listen to each other, feel free to take appropriate risks and be willing to compensate for each other while caring for patients.

- **Other soft skills**

Decision making: The skill of reaching a judgement or choosing a course of action based on the needs of the current situation. During the course of an emergency call, you are required to take numerous decisions on how best to deal with the situation in front of them. These decisions include how to treat the patient's presenting condition, whether to provide treatment on scene (stay and play) or to provide it on route to hospital (scoop and run). While providing treatment, to what extent treatment can be provided prehospital.

Leadership: It involves the skill of motivating, directing and setting the standards of a group or team. Leadership is an important non-technical skill which can potentially influence patient outcomes. The factors which characterize a good leader are: direction and command, task assignment, decision making, effective communication, planned tasks, initiates tasks. Leadership should be shared between individuals of the team to ensure effective response to critical emergency situations.

All these soft skills can be mastered by continuous training and repeated simulations of emergency situations.

Summary

Soft skills are the cognitive and social skills that complement your technical skills. Establishing the ability to effectively communicate during emergency situations will drastically improve the patient care. Utilizing passive and active listening techniques strengthen the bond between you and the patient. Communication skills are not limited to verbal methods, and are often demonstrated through non-verbal methods. ISBAR technique is an effective way of communication with other health care professionals in emergency settings. Situation awareness, teamwork, decision making and leadership skills are other non-technical skills which make you a better EMT. All these soft skills can be mastered by continuous training and repeated simulations. Technical skills along with soft skills play a vital role in delivering quality services to patient and accomplishing the goal of a smooth transition from prehospital to definitive care.

Chapter 14: Mental Wellbeing

Learning Outcomes

At the end of this chapter, reader will be able to: -

- Understand common factors responsible for mental stress in workplace
- Learn early signs and symptoms of mental stress
- Understand ill effects of mental stress
- Develop an understanding of strategies for coping mental stress
- Understand concept of sustaining mental wellbeing

Introduction

Responding to medical emergency situation is both rewarding and challenging work. First responders i.e., emergency paramedics and emergency medical technicians undergo high rates of mental distress, mental illness, and the associated physical effects of psychological injury.

The nature of work, the uncontrolled and often unpredictable experience of trauma, and increasing number of trauma cases daily, all play a key role in the development of mental distress and psychological injury. Thus, it is vital to ensure the socio - psychological support for emergency personnel to improve their mental health.

Fig 76: *Emergency personnel*

Common factors responsible for mental stress in workplace

Sources of stress for emergency responders may include: -

	Work characteristic	Factors leading to mental stress
1	**Emotional factors**	Witnessing human suffering, life-and-death decisions, risk of personal harm, separation from family
2	**Quantity and quality**	Work overload or underload, high levels of pacing or time pressure
3	**Work schedule**	shift working, high uncertainty in work, inflexible work schedule, unpredictable working hours, poorly manageable duty roasters
4	**Organizational function and culture**	poor communication, non- cooperative team, non- supportive culture, role conflict, Poor task environment
5	**Financial & social value of profession**	Poor pay, job insecurity and redundancy, low social value to work
6	**Interpersonal relationships at work**	Poor relationships with supervisors, interpersonal conflict and violence, lack of social or practical support at home
7	**Decision control**	Low participation in decision-making, lack of control over work

Fig 77: *Different factors responsible for mental stress*

Early signs and symptoms of mental stress

Emergency personnel may experience physical, cognitive, emotional, or behavioural symptoms of stress. Some people experience these reactions immediately at the scene, while for others symptoms may occur weeks or months later.

Commonly observed signs and symptoms are:

Physical symptoms - It's a natural reaction to a threat, demand, or challenge where body systems react to these stimuli with physical responses. These symptoms require medical attention.

- **Cognitive symptoms –** Cognitive symptoms arises due to changes in cognitive functioning i.e., the mental action through thought, experience, and the senses. The person has trouble remembering, learning new things, concentrating, or making decisions that affect their everyday life. These symptoms require work break and medical attention.

- **Emotional symptoms** - sign or symptom characterised by exaggerated changes in mood. The person experiencing emotional symptoms usually feels like they do not have control over their emotions. These symptoms if continued for several weeks require mental health support.

  Emotional symptoms seen in emergency professionals are: -
  - Sadness, depression, or apathy
  - Easily frustrated, intense anger
  - Blaming of others, irritability
  - Lacking feelings, indifferent
  - Isolation or disconnection from others
  - Poor self-care (hygiene)
  - Tired, exhausted or overwhelmed
  - Feeling like:
    - Failure
    - Nothing you can do will help
    - You are not doing your job well
    - You need alcohol/other drugs to cope
    - Low energy
    - The feeling that other's trauma is yours

- **Behavioural symptoms** - Persistent or repetitive behaviours that are unusual, disruptive, inappropriate, or cause problems. These symptoms if continued for several weeks requires counselling. Behavioural symptoms seen in emergency professionals are: -
  - Withdrawal
  - Aggression
  - Excessive alcohol consumption/ drug use
  - Hostility
  - Inattention, secrecy
  - Self-harm

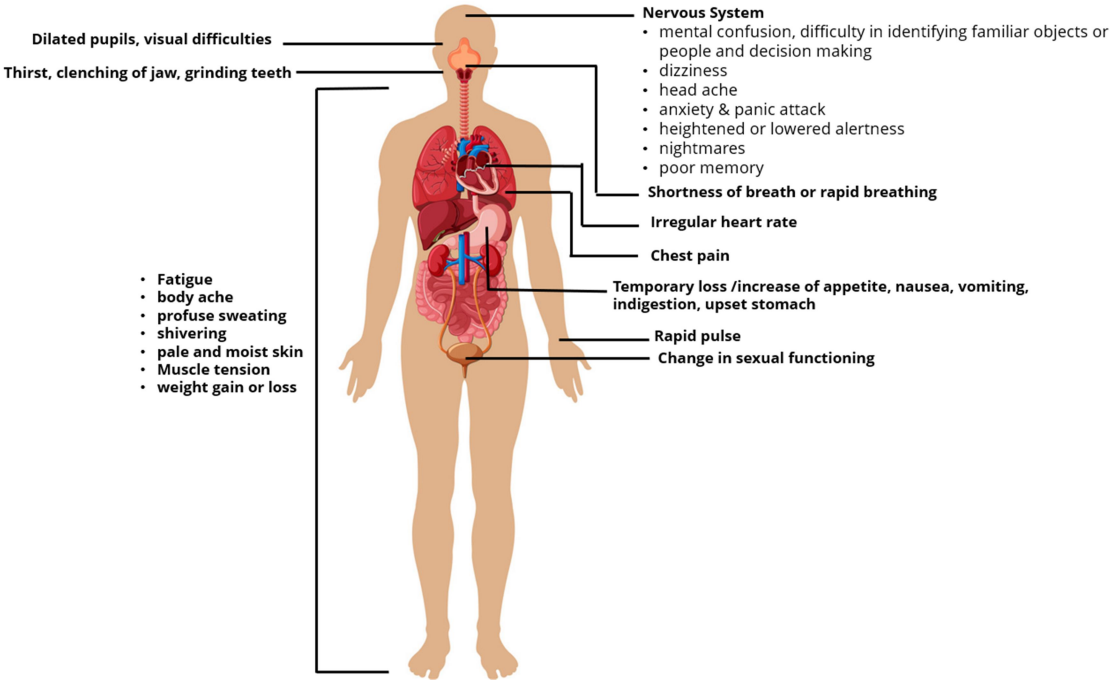


Fig 78: *Early signs and symptoms of mental stress*

Ill effects of mental stress

The repercussion of mental health problems in the workplace are outlined as follows: -

- **Absenteeism**
  - Increase in overall sickness absence, particularly frequent short periods of absence
  - Poor health (depression, stress, burnout)
  - Physical conditions (high blood pressure, heart disease, ulcers, sleeping disorders, skin rashes, headache, neck- and backache, low resistance to infections)

- **Work performance**
  - Reduction in productivity and output
  - Increase in error rates, increased number of accidents
  - Poor decision-making, deterioration in planning and control of work

- **Staff attitude and behaviour**
  - Loss of motivation and commitment
  - Burnout, staff working increasingly long hours but for diminishing returns
  - Poor timekeeping

- **Relationships at work**
  - Tension and conflicts between colleagues
  - Poor relationships with patients
  - Increase in disciplinary problems

Fig 79: *Ill effects of mental stress*

Strategies for coping mental stress

Stress prevention and management is important for emergency personnel to keep their psychological health better. There are important steps emergency personnel and managers (managing the emergency personnel team) should implement at work place and in their personal life.

- **Self-Care Techniques**
  - Personnel need to take care of their own mental health to maintain the constant vigilance they need for their own safety.
  - Limit working hours to no longer than 12-hour shifts.
  - Work in teams and limit amount of time working alone.
  - Share your work experiences and feelings with your loved ones at regular intervals or whenever you are comfortable.
  - Maintain a healthy diet and get adequate sleep and exercise.
  - Avoid or limit caffeine and use of alcohol.
  - Perform meditation daily.

- **Immediate actions to be taken in emotional crisis response**
  - Practice breathing and relaxation techniques.
  - Take breaks or quick naps.
  - Seek immediate help from counsellor or medical health support team.
  - Get as much physical activity as possible.
  - Think about the coping skills used at other difficult times, and use them now.
  - Talk to someone with whom you feel comfortable while taking.
  - Watch your favourite or any refreshing video on your phone.

- **Promotion of mental wellbeing at workplace**
  - Develop a Buddy System- In a buddy system, two responders' partner together to support each other, and monitor each other's stress, workload, and safety.
  - Connect with counsellor at your hospital/ health facility.
  - Try to learn as much as possible about what your role would be in a response.
  - Maintaining a proper duty roster with manager.

- Conduct training workshops incorporating mental health education to reduce stigma.
- Promote team-building exercises to encourage supportive workplace relationships.
- Participation in psychoeducational training through online mode or via educational leaflets could be appropriately incorporated into their existing training.
- Take health and mental stress update of emergency personnel from their family.
- Develop mental health-oriented questionnaire and its monthly reporting system for emergency personnel.
- Working on manpower in case of emergency staff shortage.

Sustaining mental health and quality of life

No matter what the event or an individual's reaction to it, workers can follow some basic steps to help themselves adjust to the experience:

- Recognize and accept what you cannot change—the chain of command, organizational structure, waiting, equipment failures, etc.
- Reconnect with family, spiritual, and community supports.
- Accept that "It's normal to seek mental health support".
- Spend time with others or alone doing the things you enjoy to refresh and recharge yourself.
- Remember that "getting back to normal" takes time. Gradually work back into your routine.
- Avoid overuse of drugs or alcohol.
- Get plenty of rest and normal exercise. Eat well-balanced, regular meals.

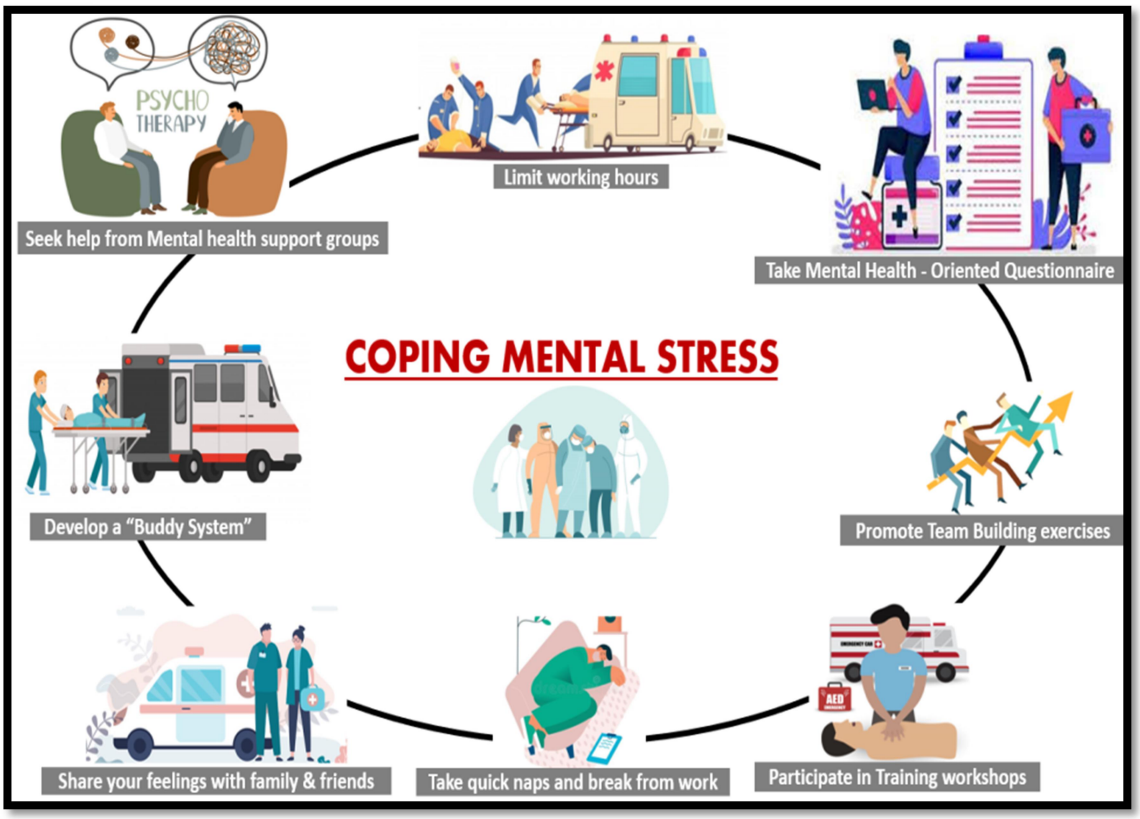


Fig 80: *Strategies to cope mental stress*

Psychological Welfare of Victim

Emergency situations intensify the risk of mental health conditions. Nearly all people affected by these emergencies will experience psychological distress, with one in five likely to have a mental disorder such as depression, anxiety, post-traumatic stress disorder, bipolar disorder or schizophrenia. However, while emergencies have a detrimental effect on mental health, they have also been shown to provide opportunities to build sustainable mental health care systems in the period following the event.

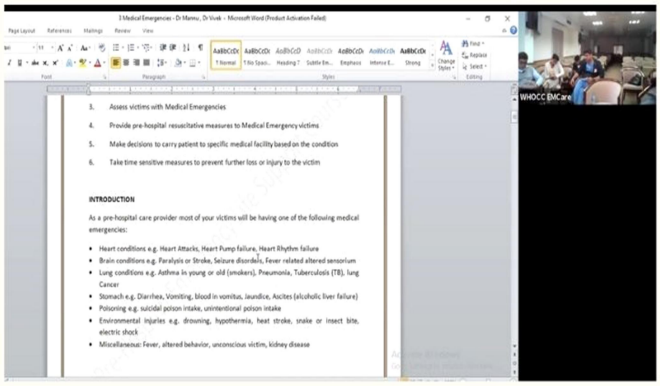
Healthcare providers and government all have a role to play in helping victims and their known ones to cope effectively and manage their stress during emergency condition. They can:

- **Establish a system to identify and provide care for mental health conditions-** put in place a system (along with at least one staff member trained) to identify and provide care for patients with common and severe mental health conditions during this time.
- **Facilitate additional training for frontline staff** - As time and resources permit, frontline workers should have training on basic psychosocial care principles and psychological first aid.
- **Provide clear understandable communication to patients -** Use "plain English or regional language" while communicating with patients or their relatives, and employ communication approach that do not rely solely on written information wherever possible.
- **Incorporate guidance about stress into general care practices-**Emotional distress and anxiety are common during emergency condition. It is important to help patients to acknowledge that stress exists and it's normal. Basic strategies can be used to teach them how to recognize signs of stress (such as worry, fear, insomnia, etc.) and ways to reduce them (e.g., healthy diet, exercise, talking to loved ones, meditation, etc.).

Summary

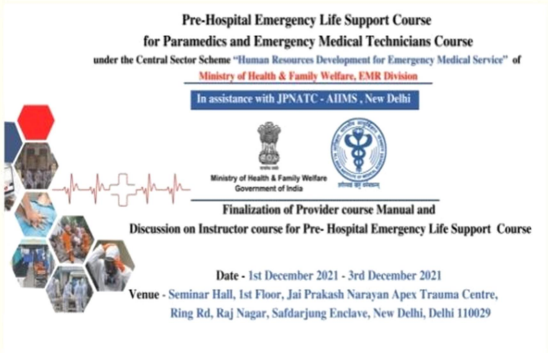
- First responders i.e., emergency paramedics and emergency medical technicians undergo high rates of mental distress, mental illness, and the associated physical effects of psychological injury.
- The nature of work, the uncontrolled and often unpredictable experience of trauma, and increasing number of trauma cases daily, all play a key role in the development of mental distress and psychological injury.
- It is vital to ensure the socio - psychological support for emergency personnel to improve their mental health.
- Stress prevention and management is important for emergency personnel to keep their psychological health better.
- Healthcare providers and government plays a key role in helping victims and their known ones to cope effectively and manage their stress during emergency condition.

Finalization of Provider Course Manual



Day -1

Discussion on Instructor Course Manual



Day -2

Pilot run of Pre-Hospital Emergency Life Support Provider Course

Day -3

Skill assessment during the Pilot run of Pre-Hospital Emergency Life Support Provider Course