

EMERGENCY MEDICAL CARE



Training Manual for Doctors



Ministry of Health & Family Welfare
Government of the People's Republic of Bangladesh



NCOC
Directorate General of Health Services





Emergency Medical Care

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Emergency Medical Care

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Director General of Health Services
Government of the People's Republic of Bangladesh

Message

Emergency service is the window of the health care system of a country. The health care service delivery system of Bangladesh is yet to come up with effective emergency services. I believe strengthening the emergency services would be one step forward in improving the health care service delivery of the country.

The strengthening of the emergency services call for improvement in the infrastructure, adequate logistic support and well trained health workforce. These activities are complementary and would require support, commitment and dedication from the service providers.

The World Health Organization has responded positively to our request to help strengthen the emergency services of the country and has extended their full support at all phases of this endeavour.

With technical support from the World Health Organization this training manual for doctors on 'Emergency Medical Care' has been developed. I hope this manual is going to help equip doctors with advanced knowledge and skill to provide quality emergency medical care to the people of Bangladesh.

Professor Dr. Khondhaker Md Shefayetullah





Emergency Medical Care





Message

It is a great pleasure for me to see that a training manual for doctors on emergency medical care has been developed jointly by World Health Organization and Bangladeshi experts.

WHO Bangladesh is proud to have been an active partner in improving emergency medical services. Health professionals were sent abroad for training on emergency medical care and international experts were invited to provide technical assistance to develop comprehensive emergency services at the Dhaka Medical College Hospital which has been replicated in other hospitals of the country extending upto the upazila level.

While Bangladesh takes measures to bring effective changes in the emergency health care delivery system of the country, the World Health Organization, as always, is committed to walk hand in hand to make this journey forward.

Dr Thushara Fernando
WHO Representative to Bangladesh





Emergency Medical Care





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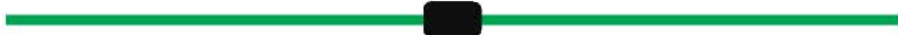


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Emergency Medical Care





Introduction

Cardiac deaths are highest cause of death in Bangladesh. Trauma, burn, poisoning and snake bite are commonly encountered in the emergency room of a hospital. Road traffic injuries, fire, collapse of a building etc. are sometimes bad to rush of a large number of patients to the emergency department of the hospitals. All service providers should be prepared to provide life saving services without any delay.

This manual, when combined with classroom education, will better prepare medical professionals in Bangladesh to identify patients at risk for cardiac arrest and trauma related emergencies, and provide essential life-saving skills. The course will build a foundation for emergency cardiac resuscitations by providing the essential basic and advanced life support knowledge and skills required.

The information contained in the educational manual is based on the current international standards, guidelines, and best practices. As much as possible, an evidence based approach to emergency medical care is used. Detailed references are included so the course participant can personally review the associated research or international standards.

The course participants are strongly encouraged to integrate the skills into their clinical practice. Some of the advanced procedures require specialized equipment, including cardiac defibrillation or intubation supplies, which are not available in all hospitals or patient wards.

The science of cardiac resuscitation is dynamic and rapidly developing and changing. International boards and panels of experts in resuscitation science carefully review and update guidelines on a regular basis. This training manual is an adaption of the current international standards and recommendations into the current context of Bangladesh.





Emergency Medical Care





Module 1: Basic Life Support & Resuscitation

Objective

Knowledge

At the end of this module, doctors should be able to:

- ✓ Identify patients at risk of cardiac or respiratory arrest
- ✓ Describe the early warning signs of heart attack and stroke.
- ✓ Describe the rationale for each of the steps in CPR.
- ✓ Define the components of cardiopulmonary resuscitation
- ✓ List the steps of one-rescuer and two-rescuer adult CPR
- ✓ Describe the technique of external chest compressions (including rate and quality) on an adult, child, and infant and Bag-Valve-Mask ventilation for rescue breathing.

Skills

At the end of this module, medical professionals should be able to:

- ✓ Demonstrate the proper technique of Head-Tilt-Chin-Lift and Modified Jaw Thrust
- ✓ Demonstrate the proper technique of Bag-Valve-Mask ventilation for an adult patient (1 breath every 6 seconds) and the use of basic airway adjuncts.
- ✓ Demonstrate proper technique to clear the airway of a conscious and unconscious choking patient
- ✓ Demonstrate the proper technique to perform CPR on an adult patient, on a child, on an infant.



Methods

- ✓ Lecture
- ✓ Discussion
- ✓ Practical demonstration
- ✓ Hands on training

Materials

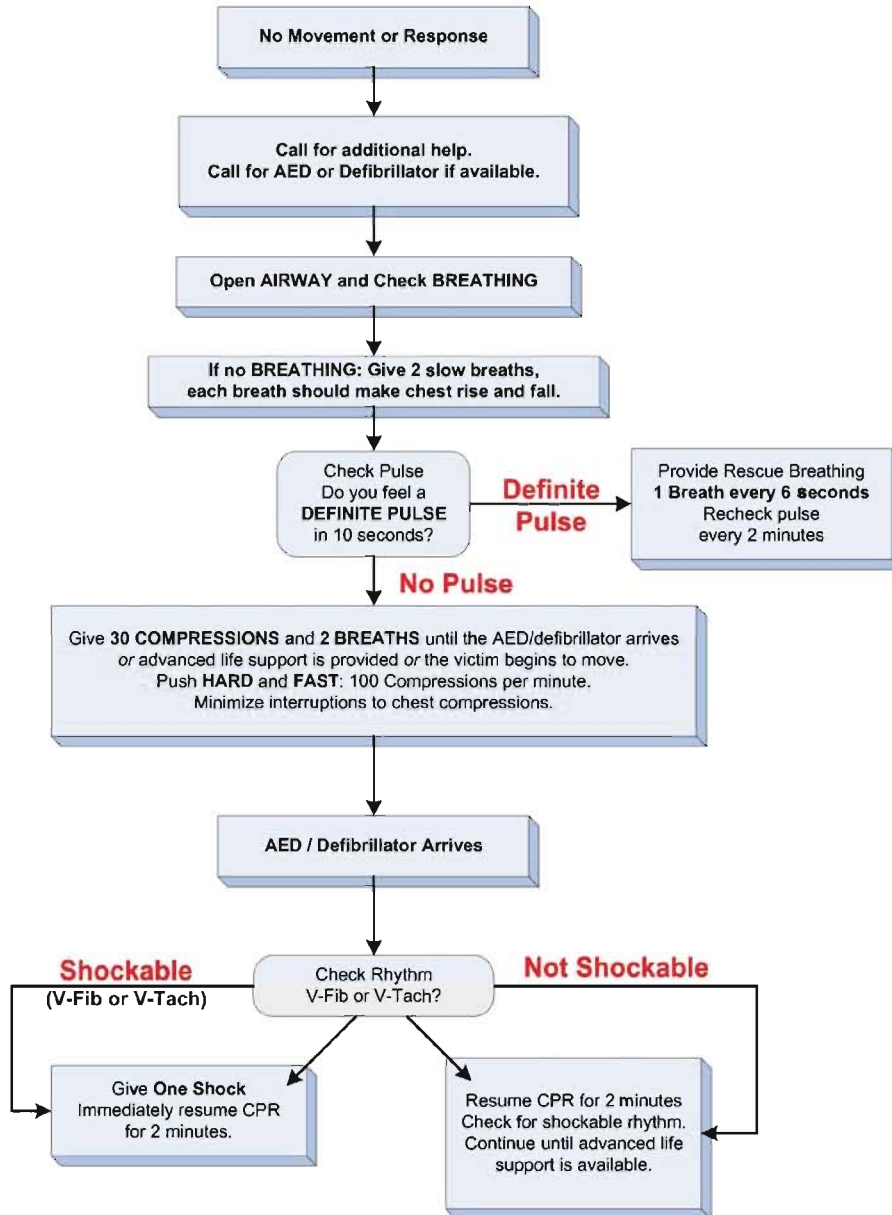
Training module, manikin, multimedia

Duration

2 hours

Schedule

Presentation	-	30 min
Discussion	-	30 min
Practical	-	30 min
Hands on training	-	30 min





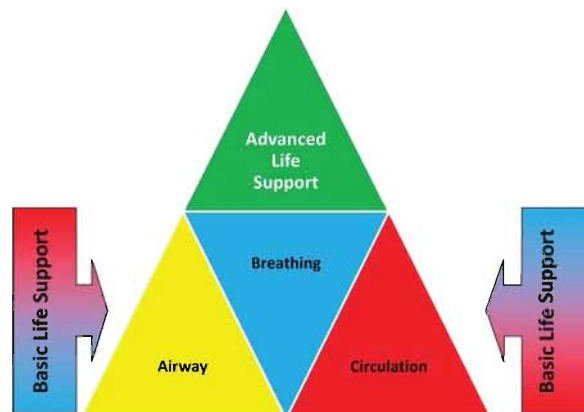
Basic Life Support

Basic life support includes many life-saving techniques focused on the "ABC"s of emergency care:

- ✓ **Airway:** Protecting and maintaining a clear airway passageway air to pass in and out of the lungs.
- ✓ **Breathing:** Ensuring an adequate volume and rate of air is inflating and deflating the lungs.
- ✓ **Circulation:** Ensuring an adequate amount of oxygen rich blood is supplied to the body, especially critical organs.

People normally maintain ABCs by themselves. In emergencies, due to illness or trauma, patients may lose the ability to maintain their airway, breathing and circulation. Basic Life Support identifies and corrects problems in patients unable to do so.

Airway management includes maintaining an open airway with positioning or the possible insertion of oral or nasal adjuncts, to keep the airway open. Breathing includes applying oxygen and artificial respiration. Circulation not only includes Cardiopulmonary Resuscitation (CPR) techniques, but also includes bleeding control. Proper and rapidly performed basic life support techniques are lifesaving, and serve as the foundation for all advanced life support procedures.





Cardiac Arrest

A cardiac arrest, also known as a cardio-pulmonary arrest, is the failure of the heart to circulate oxygenated blood to the patient's body and brain. During a cardiac arrest, the patient will not have a pulse and will not be breathing. According to the current international guidelines for CPR, a cardiac arrest is defined as the absence of "signs of life". The International Liaison Committee on Resuscitation defines a cardiac arrest as all casualties that are unconscious and not breathing properly.ⁱⁱ Without immediate intervention, a cardiac arrest will result in death. A cardiac arrest is different from a respiratory arrest. A respiratory arrest is the absence of breathing in a patient, whereas a cardiac arrest is the absence of both breathing and circulation. Without rapid intervention, a respiratory arrest will quickly become a cardiac arrest also.

Cardiac arrests are sometimes referred by the public as a 'heart attack'; however, this is not a proper definition. A heart attack is an interruption of adequate blood circulation to the myocardium (heart muscle). During a heart attack, the patient's heart continues to pump oxygenated blood to the body and brain. If untreated, patients suffering from heart attacks may deteriorate into cardiac arrest. Patients complaining of suspected cardiac related chest pain or chest pressure, difficulty breathing, left-arm pain, or jaw pain are at a higher risk for sudden-cardiac arrest.

The emergency medical professional should identify patients at risk for sudden cardiac arrest quickly and ensure the patient receives a quick diagnostic assessment and proper interventions including the administration of oxygen.ⁱⁱⁱ





Chain of Survival

Although there are many causes of cardiac arrest, the majority of sudden cardiac arrests (SCA) are the result of a myocardial infarction, a heart attack. When the patient experiences a myocardial infarction, the heart muscle become hypoxic and the normal organized contractions can become unorganized and chaotic. The most common presenting heart rhythm is ventricular fibrillation. Survival from the cardiac arrest requires early defibrillation.

The links in the 'Chain of Survival' are:



- ✓ **Early recognition** - Early recognition of the illness before the patient develops a cardiac arrest will allow the emergency team to implement treatment to prevent cardiac arrest.
 - o If the patient is already in cardiac arrest, the EARLY recognition that a cardiac arrest has occurred is key to survival - for every minute a patient is in cardiac arrest, their chances of survival decreases by 10%^{iv}.
- ✓ **Early CPR** - Early CPR is essential to keep vital organs perfused with oxygen while additional equipment, personnel, and supplies are available to identify and reverse the cause of the cardiac arrest.
 - o CPR is essential to keep the brain supplied with oxygenated blood, reducing the chances of neurological damage, and keeping the heart oxygenated to promote more effective defibrillation.
 - o The vital part of CPR is high quality chest compressions.



- ✓ Early defibrillation — Defibrillation is the only proven effective treatment for ventricular fibrillation, and pulse/less ventricular tachycardia.
 - o If defibrillation is delayed, then the rhythm is likely to degenerate into asystole, for which survival is rare. CPR, if combined with defibrillation within 3 to 5 minutes of the collapse of a patient restores circulation in as many as 75% of cases.
- ✓ Early advanced life support (ALS) - Early Advanced Cardiac Life Support is the final link in the chain of survival.
 - o Advanced cardiac life support providers are essential to properly identify the reason for the cardiac arrest, and treat the underlying conditions. The combination of CPR with medication, such as Adrenaline and advanced airway techniques may help stabilize resuscitation patient.

If the 'links' in the 'Chain of Survival' are missing or delayed, then the chances of survival drop significantly. If Early High Quality CPR is not performed, survival is not likely.

Prevention of Cardiac Arrest

The best way to prevent death from cardiac arrest is to identify and reduce the preventable causes of cardiac arrest. Many causes of cardiac arrest however can potentially be reversible if they are quickly identified. Identifying and treating the potential reversible cause of cardiac arrest is vital to a successful cardiac resuscitation.

- ✓ For example, an adult female presents to your emergency unit in cardiac arrest - no breathing and no pulse. Her family stated that she was eating and choked on some food. The patient's cause of cardiac arrest is hypoxia - a lack of oxygen to the brain and vital organs. Resuscitation of this patient first depends on you, the health care professional, to restore a patent airway and ventilation of the patient. If someone provided the Heimlich maneuver to dislodge the food, and ensured an open airway the patient's cardiac arrest would be prevented.



Critical Concepts for Resuscitation





Assessment

- ✓ First, check to be sure it is safe for you to care for the patient:
 - o Was the patient exposed to toxic chemicals?
 - o Is there a mob or a crowd?
 - o Are there multiple patients?
 - o Do you need additional help or resources?
- ✓ As you first see the patient, what is your general impression?
 - o Is the patient stable or unstable?
- ✓ Is the patient responsive?
 - o Ask the patient, "Are you ok?", or "What is wrong?"
 - o A talking patient is maintaining their airway.
- ✓ Use AVPU for a quick assessment:
 - o A - Alert
 - o V - Verbal
 - o p - Pain
 - o U - Unresponsive
- ✓ Do you suspect the patient has a cervical spine injury?



A

Airway Management

A skillful, rapid but thorough, assessment and management of the airway and breathing (ventilation) is required to prevent death and long-term neurological disability in all



medical and trauma emergency patients. Hypoxia, due to an insufficient airway, is a leading cause of cardiac arrest and a significant contributor to mortality. Airway compromise can occur slowly or rapidly, so frequent reassessment of the airway is essential. The tongue is the primary cause of airway obstruction in the unresponsive patient and can be managed with simple basic life support techniques. Basic Life Support airway management is the best choice for the initial management of most airways.

🕒 The first goal of patient care is to free the airway from obstruction and maintain a patent airway; the primary goal in airway management is not to intubate the patient. In most patients, if intubation is required, it can be performed after the initial stabilization of the patient is achieved. **BLS procedures are simple, but very effective.**



Preventable causes of death related to airway problems include the following:

- Failure to recognize the need for airway management Or an airway intervention
- Failure to recognize the need for ventilator assistance
- Inability to establish an airway
- Failure to recognize the incorrect placement of an airway
- Displacement of a previously established airway
- Aspiration of the gastric contents



Head-Tilt-Chin-Lift

The simplest and preferred way of ensuring an open airway in an unconscious patient is the head-tilt-chin-lift technique. This technique lifts the tongue from the back of the throat.

1. Place your hand on the patient's forehead.
2. Place the fingertips of your other hand on the patient's mandible.
 - a. Be careful to avoid placing your fingers on the soft flesh under the chin, as this can block the airway.
3. Apply firm, backward pressure with the palm of your hand tilting the head back while lifting the patient's chin with your fingertips.



Jaw thrust

The jaw thrust is a more difficult technique that is used on patients with a suspected spinal injury. The health care provider uses their thumbs to physically push the posterior (back) aspects of the mandible upwards. This technique is only possible on unconscious patients. As the mandible is displaced forward, the tongue also moves forward opening the airway.



Due to the difficulty in maintaining an airway with the modified jaw-thrust, in 2005 the International Liaison Committee on Resuscitation stopped advocating the use of the jaw thrust by lay rescuers, even for spinal-injured victims, although health care professionals still maintain the technique for specific applications. Lay rescuers are now advised to use the head-tilt for all victims.^y

- ✓ If you are not able to maintain an airway with the modified jaw thrust, even in a patient with a suspected spinal injury, use the head-tilt maneuver. The first priority is all patients is maintaining a patent airway.



Airway Assessment & Management

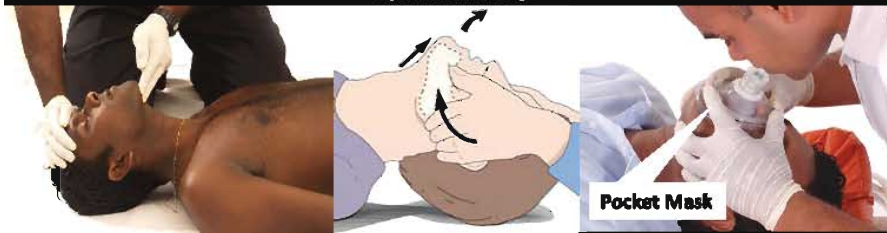
Assess Airway and Breathing

Airway Patency Respiratory Rate Effort & Adequacy Identify Potential Airway Threats

Respiratory Distress or Failure

The primary cause of airway obstruction is the tongue.

Open the Airway



Pocket Mask

Insert Oral or Nasal Airway

The patient's airway must be secured during the initial assessment, but many airway can be adequately protected with proper positioning and simple airway techniques.

Apply Oxygen

The size of an oral airway is selected by measuring the airway from the patient's earlobe to the corner of the mouth. The nasal airway is chosen by sizing the patient's nostril and inserted 'bevel' towards the patient's nostril.

- Select correct size mask and 'bag' (resuscitator).
(If a 'Ambu Bag' is not available, a pocket-mask should be used.)
- Maintain proper face seal — this is the most difficult part of using an 'Ambu Bag™' and may require two people.
- Use the "E-C" technique to achieve a mask seal.
- Do not over ventilate or hyperventilate.
- Verify chest rise and fall, observe for positive clinical effects.
- **1 Breath Every 6 seconds**



BVM

Consider Tracheal Intubation

If unable to secure airway consider Needle Cricothyrotomy or Surgical Cricothyrotomy.

Initially use a Modified-Jaw-Thrust for patients with suspected spinal injury, if unable to obtain an airway use the head-tilt-chin-lift.

Basic airway methods should be utilized to initially maintain all airways.

Consider Intubation Immediately in patients at risk for immediate airway compromise: anaphylaxis, facial burns, airway edema, massive facial trauma.

Hyperventilation in head trauma should only be considered in impending herniation syndromes. Look in patient's mouth for anything that is a potential threat to the airway: dentures, blood, broken teeth, vomitus, etc.

Listen for evidence of airway obstruction like snoring, gurgling or stridor.

Ambu is recognized to be a specific manufacturer, however in the local context a BVM is commonly referred to as an 'AMBU bag'.

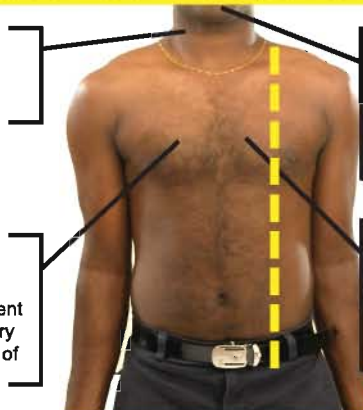


Breathing Assessment

Identify and **MANAGE anything** that interferes with **OXYGENATION** or **VENTILATION**.

Inspect the neck for:

- Tracheal deviation
- Jugular Vein Distention



Assess Oxygenation

- Cyanosis (Mucous)
- Oxygen Saturation
- Evidence of Hypoxia including:
 - Altered Mental Status
 - Tachycardia

Inspect the chest for:

- Contour
- Appearance
- Symmetry with movement
- Signs of soft tissue injury
- Paradoxical Movement of

Assess Ventilation

- Rate
- Depth
- Quality
- Effort
- Use of accessory muscles

The tongue is the most common cause of airway obstruction.

If Respiratory distress is noted, look for the cause. The chest must be exposed adequately to evaluate equality of expansion and any injuries that could pose a threat to respiration like open chest wounds or chest wall injuries.

OXYGEN



Provide oxygen to all trauma patients. Patients have a better outcome if **hypoxia is prevented**, rather than trying to reverse hypoxia.

ORAL AIRWAYS

Used in patients with no gag reflex.

Useful when the tongue or epiglottis falls back against the posterior pharynx in unconscious patients obstructing the airway. Be sure not to use the airway to push the tongue backward and block, rather than clear, the airway.



NASAL AIRWAYS



Can be used in conscious patients with a gag reflex. The length of the nasal airway can be estimated as the distance from the nares to the ear lobe and is usually 2-4 cm longer than the oral airway. Any tube inserted through the nose should be well lubricated and inserted 'bevel' towards the nasal septum.

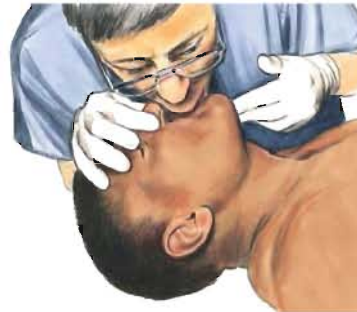


Breathing

B After ensuring the airway is open and protected, look, listen, and feel for breathing. If normal or adequate breathing is not recognized within 10 seconds, give two rescue breaths. If you are unwilling or unable to give rescue breaths, immediately begin chest compressions¹. If the victim has occasional gasps, which can occur in the first minutes after cardiac arrest, this is not effective or adequate breathing. Treat the victim who has occasional gasps, as they are not breathing and give rescue breaths and proceed with the steps of CPR.

Rescue Breaths

Rescue breaths should be delivered over one second with enough volume to produce visible chest rise. During CPR, the purpose of ventilation is to maintain adequate oxygenation.



- During the first minutes of an adult sudden cardiac arrest (VF SCA), rescue breaths are not as important as chest compressions because the patient's blood has an oxygen reserve level in the blood. During this stage of a cardiac arrest, oxygen delivery to the heart and brain is limited from a lack of circulation more than a lack of oxygen in the blood. During CPR blood flow is provided by chest compressions, therefore high quality chest compressions _ with limited interruptions _ is very important.
- In prolonged cardiac arrests, both ventilations and compressions are important as the oxygen in the blood is utilized.
 - o Ventilations and compressions are also important for victims of hypoxia related cardiac arrest, such as children and drowning victims.
- Hyperventilation should not be used in cardiac arrests victims. **Excessive ventilation is unnecessary and harmful.** Hyperventilation increases intrathoracic pressure, decreases venous return to the heart, diminishes cardiac output and reduces survival.^{vii}
- Breaths that are too large or too forceful are not required, and may cause gastric inflation and place the patient at increase risk for aspiration.



After providing rescue breathing for a long time, without an advanced airway (intubation), gastric inflation frequently develops. This can result in regurgitation and subsequently aspiration. With air in the stomach, the diaphragm is elevated, lung movement is restricted, and respiratory compliance decreased. If the air pressure in the esophagus exceeds the lower esophageal sphincter's opening pressure, air delivered with each rescue breath can enter the stomach. To minimize the potential for gastric inflation and its complications, deliver all breaths to the patient over one second and with just enough volume to produce visible chest rise.

Summary of Rescue Breathing

- ✓ All rescue breaths should be one second each.
- ✓ Give enough volume to produce visible chest rise.
- ✓ Avoid rapid or forceful breaths.
- ✓ After an endotracheal tube or LMA is inserted during 2-person CPR, ventilate the patient at a rate of 8 to 10 breaths per minute without synchronizing breaths between compressions.
 - o Chest compressions should be continuous at 100 per minute with no pause in chest compressions for delivery of ventilations.
 - o Ventilations should be at one every six seconds.
 - ☞ (Remember to count slowly.)

Bag-Valve-Mask ventilation (Adult)

A bag-valve-mask (BVM), sometimes referred to as an Ambu® Bag, is used to deliver positive-pressure ventilation to patients that are apneic (not breathing) or not adequately breathing. Bag-mask ventilation can be provided with room air (21% oxygen), or with supplemental oxygen (up to 100%) attached. A BVM inflates the lungs by applying positive-pressure to the lungs.

¹ Ambu® is actually one of many suppliers of resuscitation supplies, including bag valve - masks. In Bangladesh BVMs are commonly referred to as "Ambu-Bags". This manual does not have a preference towards any supplier.



Too often, the use of BVM ventilation is underestimated for its complexity and passed to under-trained medical providers. Bag-valve-mask ventilation is perhaps the most complex method of ventilation; improper use can impede resuscitation efforts by hypoxia (ineffective ventilation), gastric inflation (over ventilation), or impeded venous return (hyperventilation).

BVM use is a challenging skill that requires significant practice for competency and is best performed by two trained medical providers. While one person opens and maintains the airway and ensures that the mask is sealed to the patient's face, the other squeezes the bag. They both verify the effectiveness of ventilation by observing visible chest rise and fall. If the medical provider is alone, they must simultaneously maintain an open airway, hold a tight seal between the mask and the patient's face, and squeeze the bag while watching for proper chest rise and fall.

When placing the facemask on the patient, gently apply outward traction on the mask while fitting it over the patient's nose then mouth. This gently pulls the patient's skin slightly into the mask and improves the seal. Then, use the EC technique to maintain an adequate seal between the mask and patient's face.

- Use your thumb and index finger to form a C on the top of the mask.
- The remaining fingers form an E to hold the jaw to the mask.

Ensure your fingers are firmly on the patient's mandible, and are not on the soft area of the chin, as this can occlude the airway. Once a proper seal is formed, maintain an open airway by using the head-tilt _ chin-lift technique.

- Remember to hold the patient to the mask. Do not push the mask to the patient.

If the airway is open and there is a good seal between face and mask, squeeze the bag to provide enough air to see chest rise. The placement of an oral airway or a nasal airway greatly helps to maintain an airway. If an endotracheal tube is not in place and the CPR is in progress, deliver cycles of 30 compressions followed by two breaths each breath over 1 second.



If available, supplementary oxygen should be connected to the BVM with a minimum flow rate of 12 L/min. If the BVM is attached to an oxygen source, nearly 100% oxygen can be delivered with each breath.

Ventilating a patient is a critical, lifesaving skill. Too often ventilating a patient is considered a routine, or simple task and handed to inexperienced care providers resulting in improper ventilation!

- The rate of ventilation should not exceed 12/min.
- Maintaining a face seal is the most difficult aspect of the skill and often requires two personnel.
- Over ventilation of a non-intubated patient can quickly result in vomiting and aspiration.
- Subtle changes in ventilatory compliency can be an early indicator of airway compromise.



For successful BVM ventilation, proper positioning is a crucial. Generally, the “snifing” position, as demonstrated in the above figure, is a common position for ventilation, provided the patient does not require cervical spine immobilization.

The most difficult component of bag-valve-mask ventilation is maintaining an seal between the mask and the patient while keeping the airway open.



Circulation

C The importance of checking for a pulse was deemphasized in the current revised international standards for CPR. Community members and non-healthcare professionals are taught that the victim is in cardiac arrest if they are unresponsive and not breathing. Multiple studies have also indicated that healthcare professionals also have difficulty and take too long to check for a pulse in cardiac arrest patients. No more than 10 seconds should be used to check for a pulse. If a definitive pulse is not felt within 10 seconds, start CPR.^{viii-ix}

Myth: Performing chest compressions on a patient with a pulse causes damage.



For many years of CPR training there has been a strong emphasis on checking a pulse and having complete confidence that the pulse is absent prior to starting chest compressions. Medical professionals were concerned that by starting CPR on an adult patient, even with virtually no cardiac output, they would cause harm to the patient. More harm is done when CPR is not initiated, or delayed because of errors and time spent detecting pulses in patients with impending circulatory compromised or collapse.^x

Additionally, in old CPR recommendations, pulse checks immediately following defibrillation was emphasized. Now however, the international consensus is that two minutes of chest-compressions should be resumed immediately following defibrillation because even if an electrical rhythm is produced, cardiac output is in - effective.

For many years however, in Advanced Pediatric Life Support education, medical professionals were instructed to start CPR in children if the pulse was less than 60. Now, this same theory has been successfully applied to adult victims of cardiac arrest.



Cardio-Pulmonary Resuscitation

Cardiac arrest patients require immediate, high-quality CPR. The primary purpose of CPR is to provide a small but critical amount of blood flow to the heart and the brain. Effective CPR extends the amount of time Ventricular Fibrillation is present, thereby allowing an opportunity for defibrillation to terminate VF and let the heart resume an effective rhythm. If a cardiac defibrillator is not immediately available, CPR is an essential bridge allowing rescuers to bring a defibrillator to the patient. Every minute the patient is without proper CPR, survival from witnessed cardiac arrests decreases approximately 10%. However, when CPR is provided, survival from defibrillation may double or triple.

- ✓ Defibrillation does not actually “restart” the heart as commonly believed.
- ✓ Defibrillation actually stops all cardiac electrical activity. If the heart is still viable, normal pacemakers will resume firing and produce an effective ECG rhythm, and blood flow.

Important information about chest compressions:

- ✓ Properly performed chest compressions provide essential blood flow to the brain and heart.
- ✓ “Push **hard** and push **fast**.”
 - Compress the adult chest at a rate of 100 compressions per minute.
 - Each compression should be approximately 4 to 5 cm.
 - Allow the chest to recoil completely after each compression.
- ✓ **Prevent interruptions** in chest compressions.
 - Avoid stopping compressions for more than ten seconds.
- ✓ Blood flow increases with each successive chest compression.
- ✓ In adults, perform 30 compressions: 2 breaths



Chest Compressions

Chest compressions are the rhythmic application of pressure over the lower half of the sternum to create blood flow to the brain and heart. Chest compressions create a small amount of blood flow by increasing intrathoracic pressure and direct compression of the heart. This minimal amount of blood flow generated delivers a small, but critical, amount of oxygen to the heart and brain.

Chest compressions increase the likelihood that cardiac defibrillation will be successful. If the first shock is delivered after four minutes from when the patient initially fell into cardiac arrest, proper compressions are even more important.

Chest Compressions

Technique

All patients requiring chest compressions should be on a hard surface, with the rescuer standing or kneeling beside the victim's thorax. The lower half of the patient's sternum is compressed. The easiest way to find the proper landmark is for the rescuer to place one hand on the top of the second hand in the middle of the patient's chest, between the nipples. Depress the sternum approximately 4 cm. Allowing the chest to return to its normal position is important and allows venous blood to return to the heart. Complete chest recoil is necessary for effective CPR. Compress the patient's chest at a rate of 100 compressions per minute. For one and two person adult CPR, after 30 compressions pause long enough to deliver two breaths.^{xi}

The Journal of Circulation reported that during cardiac arrest cases, patients had no chest compression for up to 49% of the total cardiac resuscitation as the medical team was preparing interventions or delivering other therapy. Evidence indicates that effective chest compressions, with minimal interruptions are essential and linked to survival.^{xii} Continue CPR until a defibrillator arrives, or the victim begins to move. In the absence of a cardiac monitor, do not interrupt CPR to check for signs of circulation, pulses or a response. After the defibrillator is available, interrupt chest compressions as infrequently as possible. Interruptions should not be over 10 seconds, except for specific interventions such as insertion of an advanced airway or defibrillation.



Fatigue

Performing chest compressions is physically exhausting, and fatigue leads to inadequate compression rates or depth. Studies demonstrate that significant fatigue is evident after as little as one minute of CPR. However, if asked, people performing CPR deny that they are fatigued until after five minutes or more. If two people are available, who are trained in compressions, alternate after every two minutes.

Compression-Ventilation Ratio

A ratio of thirty (30) chest compressions, followed by two ventilations is recommended for all adult cardiac arrest patients. This increases the number of compressions, while reducing the chance for hyperventilation, and interruptions in chest compressions.

If the patient is intubated or has an LMA in place, CPR is not performed in cycles pausing for ventilation. Instead, continuous chest compressions are performed at a rate of 100 per minute without pauses for ventilation. Deliver breaths slowly, one every six seconds. To prevent exhaustion, remember to change the person performing chest compressions every two minutes.



Adult Cardiopulmonary Resuscitation

Emergency Action Steps

Assess Safety:	Can you safely care for the victim without placing yourself in danger?
Check Victim:	Unresponsive? No signs of life? Not Breathing?
Call for Help:	Alert others of an emergency! Call for help!
Care for Victim:	Airway, Breathing, Circulation



1

Open Airway Head-Tilt-Chin-Lift

The priority is to open the airway. In most patients, a head-tilt-chin-lift is the easiest, most effective method. In a patient with a suspected cervical spine injury, a modified jaw-thrust can be used.

Check for Breathing

Look for chest rise and fall.

Listen for air exchange.

Feel for exhaled air from the nose and mouth.

If the patient is not breathing, provide two rescue breaths. If available, use a Bag-Valve-Mask resuscitator attached to oxygen.

If not available, a pocket mask is very effective.

2

3

Chest Compressions

High quality chest compressions is the most important component of CPR when performed at a rate of **100 compressions per minute** with limited pauses or interruptions. Give **30 compressions** followed by **2 quick breaths**. Change the person doing compressions every two minutes to ensure high quality.

If the patient has an endotracheal tube or an advanced airway in place, perform **CONTINUOUS CHEST COMPRESSIONS** at a rate of 100 per minute and ventilate at a rate of 10 breaths per minute. Do not compromise chest compressions to place an endotracheal tube.

DEFIBRILLATE THE PATIENT, in Ventricular Tachycardia or Ventricular Fibrillation as soon as the defibrillator is available.



Defibrillation

CPR, without defibrillation, is generally ineffective in resuscitation efforts. Because Ventricular Fibrillation is the most common cardiac arrest rhythm, everyone trained in Basic Life Support should also be trained in defibrillation. Survival rates are higher when CPR is combined with defibrillation within three to five minutes. If the patient has been in cardiac arrest without CPR for over four minutes, studies demonstrated the patient responded better to defibrillation after two minutes of chest compressions.

Automated External Defibrillators

An automated external defibrillator, or simply stated an “AED”, is a portable defibrillator that when applied to a patient automatically diagnoses the presence of ventricular fibrillation or ventricular tachycardia. The AED, through voice prompts, indicate a defibrillation is required and with the push of a button by the operator, delivers the proper energy (joules) to the victim. AEDs are simple to use by both the general public and medical professionals.



International AED Sign

International Use of AEDs

Internationally, the use of AEDs has increased dramatically in recent years. AEDs are used by trained allied health personnel attending large events, in ambulances, and at hospitals. Thousands of public access units are located in businesses, government offices, shopping centres, airports, restaurants, casinos, hotels, sports stadiums, schools and universities, community centers, fitness centers, health clubs, airplanes, ships, workplaces and any other location where people may congregate.

In September 2008, the International Liaison Committee on Resuscitation approved a ‘universal AED sign’ to indicate the presence of an AED. In some places, particularly families with a person diagnosed with an existing heart conditions are purchasing AEDs for home use. In hospitals, the use of AEDs by nursing personnel in wards decreased the time from cardiac arrest to defibrillation and improved outcomes.

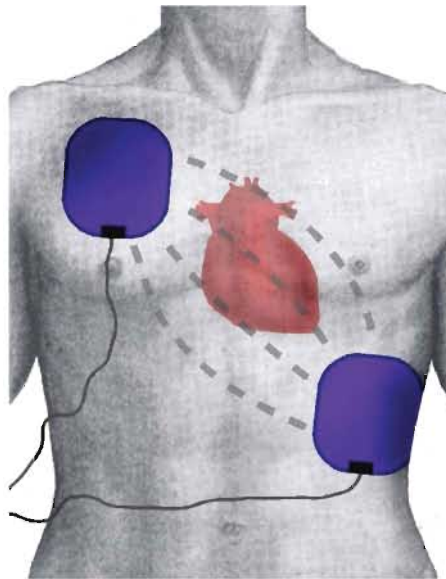


AED Use

When the AED is turned on, it will instruct the user with voice prompts to connect the pads to the patient. After the AED senses that the pads are attached, the AED will analyze the cardiac rhythm. If the patient is in ventricular fibrillation or ventricular tachycardia, the AED will prepare to deliver the required shock.

When charged, the AED instructs the rescuer to ensure no one is touching the victim, and then press a button to deliver the shock. After the shock is delivered, the user will be instructed to start two minutes of CPR¹. After two minutes, the cycle continues with the AED again analyzing the cardiac rhythm. Unlike manual defibrillators, an automated external defibrillator requires minimal training to use because it automatically determines the cardiac rhythm and determines if a shock is required.

AEDs are approved for use on both children and adults in cardiac arrest.^{xiv}



1-Correct placement of AED pads on an adult.

¹ AED models purchased prior to 2005 will deliver up to three shocks before CPR.



Child CPR

Child CPR is similar to adult CPR with a few modifications. Children are defined to include one year old until puberty. In children, use the same ratio of 30 chest compressions and 2 ventilations in one-person child CPR.



- o If two people trained in CPR are available, a ratio of 15 compressions followed by two breaths is recommended (15:2).
- o If the child is incubated, continuous chest compressions are delivered while rescue breaths are delivered at one every 6-8 seconds.

Depending on the size of the child, chest compressions may require either one or two hands. Compress the chest one third to one-half the depth of the chest. The primary cause of cardiac arrest in children is hypoxia and respiratory arrest. Therefore, medical professional should carefully evaluate the pediatric cardiac arrest for signs of airway compromise.





Pediatric Cardiac Arrest



Immediate CPR 30:2

<p>Asystole & Pulseless Electrical Activity Ensure Open Airway & Ventilation Obtain IV or IO Access CONTINUE HIGH QUALITY CPR</p>	<p>Ventricular Fibrillation Tachycardia Defibrillate: 2 joules / kg Resume Immediate CPR Obtain IV or IO Access</p>
<p>Administer Epinephrine (Adrenaline) 0.01 mg/kg. Use a 1:10,000 solution.</p>	<p>Administer Epinephrine (Adrenaline) 0.01 mg/kg. Use a 1:10,000 solution.</p>
<p>Consider and Treat Causes: Hypoxia Hypovolemia Tension Pneumothorax</p>	<p>Check Monitor Rhythm and Pulses VF/VT: Defibrillate 4 joules / kg Resume Immediate CPR (2 Minutes) Check Monitor Rhythm and Pulses VF/VT: Defibrillate 4 joules / kg</p>
<p>Administer Epinephrine (Adrenaline) 0.01 mg/kg. Use a 1:10,000 solution. <i>Repeat epinephrine (Adrenaline) every 3-5 minutes.</i></p>	<p>Administer Epinephrine (Adrenaline) 0.01 mg/kg. Use a 1:10,000 solution. <i>Repeat epinephrine (Adrenaline) every 3-5 minutes.</i></p>
<p>Reconsider Causes of Arrest Consider Termination of Efforts</p>	<p>Consider Antidysrhythmic Drugs: Amiodarone 5 mg/kg Lignocaine 1 mg/kg</p>

Cardiac arrest in children generally follows a primary respiratory arrest, and is almost always the result of hypoxia or a lack of perfusion from a noncardiac cause. Good treatment of pediatric cardiac arrest requires attention to performing high quality basic life support skills including basic airway management with ventilations, and effective chest compressions.



Infant CPR

CPR on infants, up to 1 year of age, includes:

- ✓ Infants in cardiac arrest are usually related to hypoxia. Ensure the airway is open. Use the 'sniffing' position: do not hyper-extend the neck.
- ✓ Compress the infant's chest just below the nipple line (on lower half of sternum).
- ✓ Compress the infant chest with a compression-ventilation ratio of 30:2 and a rate of 120 compressions per minute.
- ✓ Healthcare providers can use either two fingers to compress the infant chest, or two-thumbs encircling the chest.
- ✓ When two healthcare providers are performing CPR, the compression-ventilation ratio should be 15:2 until an advanced airway is in place.



Special Considerations

Drowning

Drowning is a preventable cause of death. In Bangladesh drowning is the leading cause of deaths for children between 1 and 17 years old.^{xi} In drowning cases, the duration and severity of hypoxia is the leading indicator of outcome. Immediately perform two minutes of CPR, with an emphasis on enriched oxygen breathing, as soon as an unresponsive victim is removed from the water.

Water and potential water aspiration does not act like a foreign body, therefore maneuvers to relieve a foreign body airway obstruction are not recommended for drowning victims. These maneuvers are not necessary and result in additional injury, vomiting, and aspiration and unjustified delays.



Recovery Position



Use the recovery position in all unresponsive adult victims with normal breathing and circulation. This position helps maintain a patent airway and reduces the risk of airway obstruction and aspiration. Place the patient on their left side with the lower arm in front of the body.

Foreign-Body Airway Obstruction (Choking)

Choking is the obstruction of airflow into the lungs; most commonly due to a foreign object lodged in the pharynx, larynx or trachea. The obstruction can be partial, or complete preventing breathing. With partial choking, some but inadequate, air will pass into the lungs. Prolonged or complete choking results in asphyxiation, when untreated results in hypoxia and death. In adults, most cases are caused by impacted food when the victim is eating. In infants and children, most episodes of choking occur during eating or play. Most cases of choking are witnessed, and attempts to dislodge the obstruction usually begins while the victim is still conscious.

The rescuer should provide assistance if the choking victim has signs of poor air exchange and difficulty breathing. Victims may have a 'silent cough', cyanosis, or the inability to speak. Victims may grab the neck, or demonstrate the universal sign for choking. Ask the person, "Are you choking?" If they say "yes", encourage them to cough. If the person indicates "yes" by nodding their head without speaking, they have an airway obstruction.



Relief of Foreign-Body Airway Obstructions

To prevent hypoxia and death, emergency personnel must act quickly to relieve the obstruction. If the victim is coughing forcefully, it is most likely a mild or partial obstruction, do not interfere with the patient's spontaneous coughing and breathing efforts. This may make partial obstructions, a complete obstruction.

- ✓ Attempt to relieve the obstruction if there are signs of severe obstruction:

the cough becomes silent, respiratory difficulty increases, stridor is present, or the victim becomes unresponsive.

Abdominal thrusts should be applied to the conscious victim in rapid sequence until the obstruction is relieved. If abdominal thrusts are not effective, chest thrusts may be used. In adult patients, approximately 50% of airway obstructions may not be relieved with a single technique, but success increases when combinations of back blows or slaps, abdominal thrusts, and chest thrusts are used. (Abdominal thrusts are not recommended for infants because they may cause injuries.) If the rescuer is unable to perform abdominal thrusts in obese or pregnant patients, chest thrusts should be used.

If the choking victim becomes unresponsive, immediately begin CPR. Do not perform abdominal thrusts on unresponsive patients. Cardiac chest compressions result in higher sustained airway pressures and are more effective at relieving obstructions than abdominal thrusts. During CPR, look for an object in the victim's mouth and if seen remove it. Use a finger sweep only if solid material obstructing the airway of an unresponsive patient is seen. 'Blind finger sweeps' have been linked to both harm to the patient and to the health provider.



Airway Obstruction: Adult & Children

Assess

Yes

Observe the patient.
Encourage them to cough.



Universal Sign for Choking

No

Perform Heimlich



Conscious **INFANT** Conscious: **Adult or Child**



Confirm complete airway obstruction.

Check for serious breathing difficulty, or ineffective cough and no strong cry.

Give 5 back slaps and 5 chest thrusts.

Repeat until object dislodged.



Perform

Heimlich Maneuver
5 Abdominal Thrusts
Below the xiphoid process
Repeat until object is dislodged

Be prepared:
The patient may become unconscious.

Unconscious **INFANT** Unconscious: **Adult or Child**



Check Airway for Obstruction
Do not perform blind finger sweep!
Remove obstruction if you can see it.

Check Airway for Obstruction
Do not perform blind finger sweep!
Look in the mouth and remove obstruction if you can see it.



Start CPR

Start CPR

Note the change: Before 2006, the international guidelines recommended performing abdominal thrusts on unconscious choking patients.



Airway Obstruction Follow Up Care



X-Ray courtesy of Dhaka Medical College demonstrating a child with a foreign body aspiration following presenting with a chief complaint of “choking that is resolved”. It is essential to carefully follow-up on all patients with a history of choking or aspiration.

If a patient with a foreign body airway obstruction (FBAO) becomes unconscious, start CPR....



WHY?

Higher airway pressures can be achieved by performing chest compressions, rather than abdominal thrusts. Each time the airway is opened, the rescuer should look for the foreign object and remove it.

If the foreign body is lodged in the trachea, all efforts are failing, and a bronchoscope is not available, then place an endotracheal tube. Advance the endotracheal tube in an attempt to advance the object past the carina and into the bronchus. The patient can be ventilated by one lung until the object can be removed after the resuscitation.



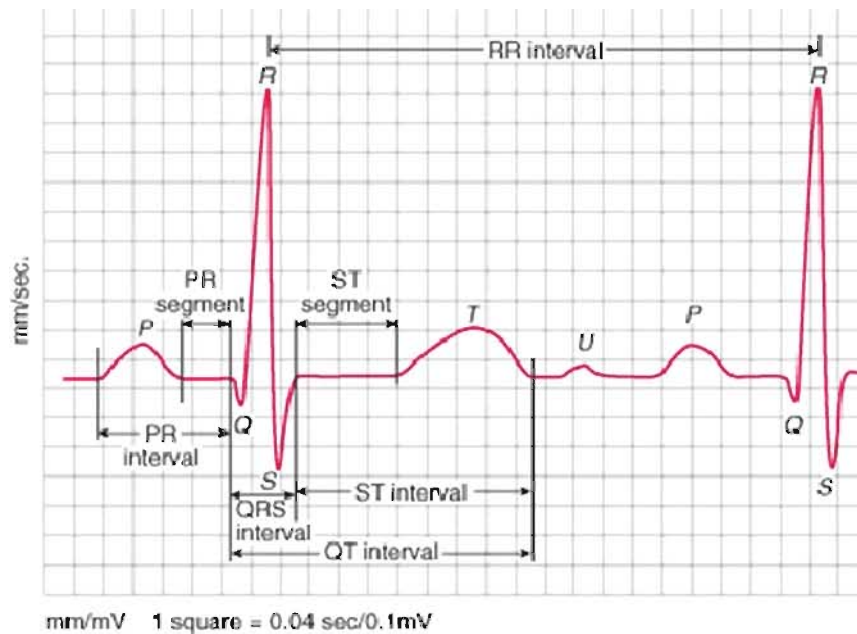
Module 2: Cardiac Arrest Rhythms

Objectives

Knowledge

At the end of this module, medical professionals should be able to:

- ✓ Identify Normal Sinus Rhythm
- ✓ Identify Bradycardia
- ✓ Identify Tachycardia
- ✓ Identify Asystole
- ✓ Identify Ventricular Tachycardia
- ✓ Identify Ventricular Fibrillation
- ✓ Describe Pulseless Electrical Activity





Methods

- Lecture
- Discussion

Materials

Training module, ECG tracings, multimedia

Duration

1 hr

Schedule

- | | | |
|--------------|---|--------|
| Presentation | - | 30 min |
| Discussion | - | 30 min |



Introduction

Four cardiac rhythms result in pulseless cardiac arrest:

- ventricular fibrillation (VF)
- rapid ventricular tachycardia (VT)
- pulseless electrical activity (PEA)
- asystole

Survival from cardiac arrest requires a combination of both basic life support (BLS) and advanced cardiovascular life support (ACLS). The foundation of Advanced Life Support is good Basic Life Support. For any cardiac arrest, survival is increased with high quality CPR and, for VF/pulseless VT, defibrillation within the first minutes of collapse. Advanced Life Support techniques, such as intubation and medication administration, have actually not been proven to show an increase in the rate of survival to hospital discharge.

This section outlines the core cardiac arrest related rhythms. All basic life support providers should be able to recognize Ventricular Fibrillation and ventricular tachycardia.



Normal Sinus Rhythm



Regularity: R-R intervals are regular, overall rhythm is regular.

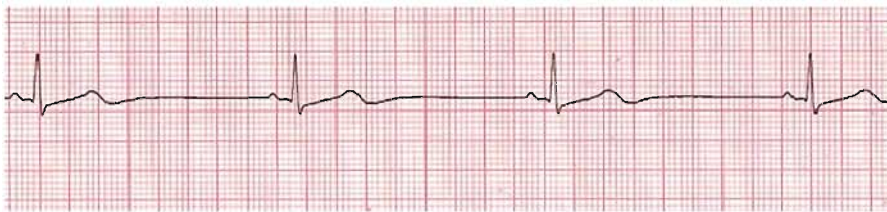
Rate: The rate is between 60 and 100 beats/min.

P WAVE: There is one p wave in front of every QRS. The P waves appear uniform.

PRI: Measures between 0.12 and 0.20 seconds in duration. PRI is consistent.

QRS: Measures less than 0.12 seconds.

Bradycardia



Regularity: R-R intervals are regular, overall rhythm is regular.

Rate: The rate is less than 60 beats/min, but usually more than 40 beats/min.

P WAVE: There is one p wave in front of every QRS. The P waves appear uniform.

PRI: Measures between 0.12 and 0.20 seconds in duration. PRI is consistent.

QRS: Measures less than 0.12 seconds.



Tachycardia



Regularity: R-R intervals are regular, overall rhythm is regular.

Rate: The rate is over 100 beats/min but usually less than 170 beats/min.

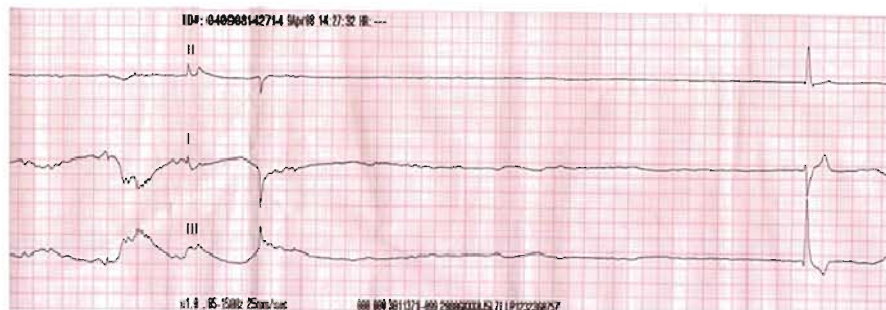
P WAVE: There is one p wave in front of every QRS. The P waves appear uniform.

PRI: Measures between 0.12 and 0.20 seconds in duration. PRI is consistent.

QRS: Measures less than 0.12 seconds.



Asystole



Asystole is cardiac standstill with no cardiac output and no ventricular depolarization and is eventually the terminal rhythm in all dying patients. Occasionally in early stages of asystole, random escape beats or random ventricular complexes may be observed (above).

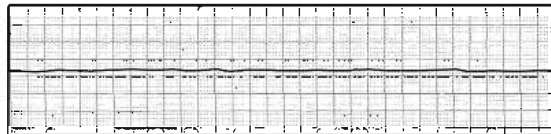
- ✓ Asystole should be verified in two or more leads.

~~DEFIBRILLATION~~

In asystole, there is no cardiac electrical activity, no contractions of the heart, no cardiac output, and no blood flow. If a patient is in asystole, the treatment options are limited and the chance of survival is grim. In asystole, the heart is already depolarized and it will not respond to defibrillation. The treatment of choice is CPR, combined with adrenaline and atropine.



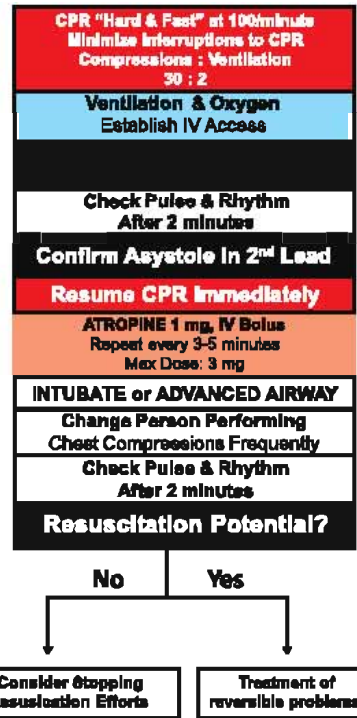
Asystole



Asystole

In asystole, you will see a straight or wavy ECG tracing and sometimes there may be occasional non-perfusing wide complexes. (While performing CPR it is expected to see some electrical activity)

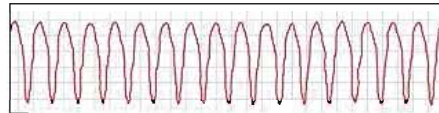
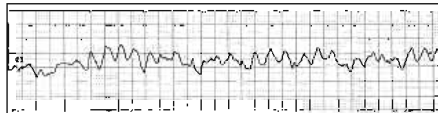
Asystole is the terminal event in many severe illnesses, but may be



Immediately Identify & Treat Possible Cause(s)			
Hypovolemia	Saline Bolus	Toxins	Identify toxin and treat appropriately
Hypoxia	Oxygen	Tamponade (Cardiac)	Consider pericardiocentesis
Hydrogen Ion (Acidosis)	Sodium Bicarbonate 1 mEq/kg	Tension Pneumothorax	Needle Decompression
Hypoglycemia	Dextrose 50g	Thrombosis (PE, AMI)	
Hypothermia	Rewarming	Trauma	Hemorrhage Control



Ventricular Fibrillation & Pulseless Ventricular Tachycardia



Automated External Defibrillators (AEDs)

Automated External Defibrillators (AED) are a cost effective, and highly accurate alternative to manual defibrillators and should be considered as an acceptable, and perhaps a preferred alternative. Internationally, the use of AEDs by both community members and professionals is strongly advocated.

Pharmacology Intervention

Antiarrhythmic:
Amiodarone 300 mg IVP is preferred. If unavailable: Lidocaine 1-1.5 mg / kg (Max Dose 3 mg/kg) may be considered.

**Torsades de pointes
Or Hypomagnesemia:**
Magnesium 1-2 Grams

Defibrillate Immediately
360J or "Effective Energy"^{**}
CPR "Hard & Fast" at 100/minute
Minimize Interruptions to CPR
Compressions : Ventilation
30 : 2

Ventilation & Oxygen
Establish IV Access

Check Pulse & Rhythm
After 2 minutes

Defibrillate Immediately
360J or "Effective Energy"^{**}

Resume CPR for 2 minutes
Immediately after all
defibrillations. Pulse checks are
after 2 minutes of CPR between
the defibrillations.

ADRENALINE 1 mg, IV Bolus
Repeat every 3-5 minutes

Check Pulse & Rhythm
After 2 minutes

Defibrillate Immediately
360J or "Effective Energy"^{**}

Resume CPR Immediately

Consider
INTUBATION or ADVANCED AIRWAY

Change Person Performing
Chest Compressions

Check Pulse & Rhythm
After 2 minutes

Defibrillate Immediately
360J or "Effective Energy"^{**}

Defibrillator Safety

Before discharging the defibrillator announce "stand clear."

No one should be touching the patient or anything that is touching the patient, including the resuscitation bag.

Use 12 kg of pressure on paddles to chest for good conduction.



^{**} The effective defibrillation energy (J) on modern 'biphasic' defibrillators is not uniform and varies depending on the defibrillator model you have. However, according to the 2005 International guidelines on cardiac care, all monophasic defibrillation energy doses should be 360J.

Immediately Identify & Treat Possible Cause(s)			
Hypovolemia	Saline Bolus	Toxins	Identify toxin and treat appropriately
Hypoxia	Oxygen	Tamponade (Cardiac)	Consider pericardiocentesis
Hydrogen Ion (Acidosis)	Sodium Bicarbonate 1 mEq/kg	Tension Pneumothorax	Needle Decompression
Hypoglycemia	Dextrose 50g	Thrombosis (PE, AMI)	
Hypothermia	Rewarming	Trauma	Hemorrhage Control



Ventricular Tachycardia



Regularity: R-R intervals are usually regular but not always.

Rate: The atrial rate cannot be determined. Ventricular rate is usually between 150 and 250 beats/min.

P WAVE: QRS complexes are not preceded by P waves. There are occasionally P waves in the strip, but they are not associated with the ventricular rhythm

PRI: PRI is not measured since this is a ventricular rhythm.

QRS: Measures more than 0.12 seconds. The QRS will usually be wide and bizarre. It is usually difficult to see a separation between the QRS complex and the T wave.



Ventricular Fibrillation



Regularity: There is no regularity to the rhythm because there are no complexes or waves present that can be analyzed.

Rate: There is no measurable rate.

P WAVE: There are no P waves present.

PRI: PRI is unable to be measured due to no P waves being present.

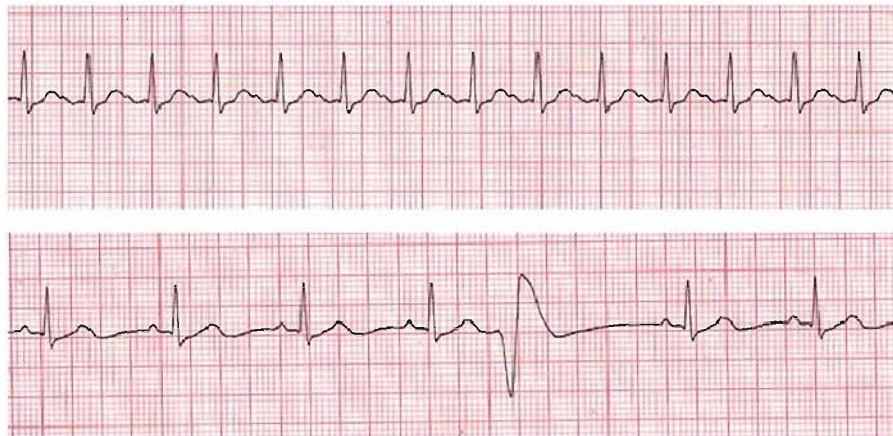
QRS: There are no QRS complexes present.

Ventricular Fibrillation is the first cardiac arrest rhythm in approximately 40% of patients not already admitted to hospital units. As seen above, VF is a chaotic, rapid, unorganized electrical activity in the heart; the heart is 'quivering' and unable to pump blood.

Many patients in sudden cardiac arrest can survive if rapid treatment is initiated including immediate CPR and defibrillation.



Pulseless Electrical Activity



Pulseless electrical activity (PEA) is a clinical condition identified as an unresponsiveness patient in cardiac arrest, without a palpable pulse in the presence of organized cardiac electrical activity. Previously, PEA was referred to as electromechanical dissociation (EMD). While a lack of cardiac electrical activity always results in a patient without a pulse, the reverse is not always true. In some cardiac arrests, the heart will continue to produce electrical activity, but there is no meaningful ventricular mechanical activity. “Meaningful” ventricular mechanical activity is activity that is sufficient to generate a palpable pulse.

ANY organized electrical activity present on the cardiac monitor, with the absence of cardiac output (pulses), is PEA. The rhythm strips above can accurately be interpreted as Sinus Tachycardia (top) and Sinus Rhythm with a PVC (bottom). However, if the patient were pulseless, both rhythms would be classified as PEA.

In a study, PEA was the first documented rhythm in 32% of in-hospital adult cardiac arrests, with a grim survival rate of only 11.2%. Early ACLS is key to treat PEA.



Module 3: Advanced Life Support

Objectives

At the end of this module, medical professionals should be able to:

- ✓ Demonstrate proficiency in providing BLS care, including prioritizing chest and describe the purpose of ACLS.
- ✓ Explain the importance of teamwork in resuscitation.
- ✓ Recognize and initiate early management of pre-arrest conditions.
- ✓ Describe and list routes and methods to achieve venous access for medication delivery.
- ✓ Recall indications, contraindications, doses, and routes of administration for adrenaline, atropine, amiodarone.
- ✓ Describe proper defibrillator settings, and energy (J) for VENT and perform defibrillation with minimal interruption of chest compressions.
- ✓ Describe the importance of intubation, and identify appropriate time to incorporate intubation.
- ✓ Perform basic airway management, and then intubate an apnea patient.

Methods

- Lecture
- Discussion
- Practical demonstration
- Hands on training

Materials

Training module, manikin, multimedia

Duration

2 hr

Schedule

Presentation	-	30 min
Discussion	-	30 min
Practical demonstration	-	30 min
Hands on training	-	30 min



Medication Administration & Venous Access

During a cardiac arrest, CPR combined with defibrillation is the priorities. Obtaining venous access and drug administration is of secondary importance. Few drugs administered during a cardiac arrest are proven to increase survival to discharge from the hospital. After CPR and defibrillation, medical providers can establish intravenous (IV) access, consider drug therapy, and insert an advanced airway, If multiple trained professionals are available, obtaining IV access and administering medication can be integrated as soon as possible without compromising the quality of CPR or delaying defibrillation.

If IV access cannot be easily obtained, intraosseous access is recommended in both adults and children. IO access is faster, requires less skill than central line placement, and has fewer complications.¹ Fears linked to a perceived increased incidence of osteomyelitis, or complications were disproved by research. IO access is not only a viable option if IV access is difficult, but also IO access is now the preferred venous access route in some emergency and trauma systems.

If both IV and IO routes cannot be obtained, medications including adrenaline and atropine may be administered via the endo-tracheal tube. However, tracheal absorption of medications is slow, unpredictable, and according to recent studies potentially harmful. (Reduced and slow absorption of adrenaline when delivered by the endotracheal route may produce transient beta-adrenergic effects resulting in hypotension, lower coronary artery perfusion pressure and reduced potential for return of spontaneous circulation).



Cardiac Medications

Adrenaline

Adrenaline, also known as epinephrine, produces beneficial effects in patients during cardiac arrest, primarily because of its vasoconstriction properties. The adrenergic effects of epinephrine can increase coronary and cerebral perfusion pressure during CPR.

Adrenaline should be administered every 3-5 minutes during an adult cardiac arrest in 1mg IV or IO doses.

HIGH CONCENTRATION ADRENALINE (1MG IN 1 ML) CAN CAUSE SEVERE LOCALIZED VASOCONSTRICTION. THEREFORE, 1MG OF ADRENALINE SHOULD BE DILUTED IN 9ML OF SALINE PRIOR TO ADMINISTRATION IN CARDIAC ARREST.

Dilution of Adrenaline 1mg in 1ml (1:1,000) to 1mg in 10ml (1:10,000)





Atropine

Atropine sulfate increases the heart rate, systemic vascular resistance, and blood pressure by reversing the cholinergic-mediated response. When asystole is linked to excessive vagal tone, atropine may be useful. Atropine is inexpensive, easy to administer, and has few side effects and should be considered for asystole or PEA. The recommended dose of atropine in cardiac arrest is 1 mg IV. Atropine can be repeated after 3 minutes to a maximum total of 3 mg.

Amiodarone HCl

Action: Amiodarone acts by prolonging the phase three potential and is a class III antiarrhythmic.

For patients in Pulseless VT/NF that have failed rapid defibrillation and standard treatments (Airway, IV Adrenaline) administer adults 300 mg of Amiodarone diluted in 30 cc of saline or D/W over one minute. Proceed with appropriate defibrillations. Supplementary rapid infusions of 150 mg in 15ccs may be given if the Vf/VT is recurrent or refractory. IV maintenance dose is 1 mg/ mm over the first 6 hours, then 0.5mg/mm beyond 6 hours.

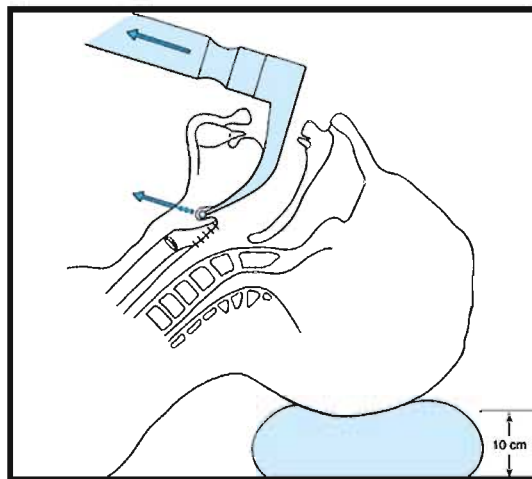


Intubation

Tracheal intubation is the placement of a flexible plastic endotracheal tube to protect the patient's airway and provide an easier means of mechanical ventilation. The most common tracheal intubation is oral intubation where, with the assistance of a laryngoscope, the endotracheal tube is passed through the mouth and vocal cords into the trachea. Most endotracheal tubes used in adult resuscitation have a cuff at the distal tip of the tube to help secure it in place and protect the airway from blood, vomit, and secretions. In some cases, nasal intubation may be considered where the tube is passed through the nose into the trachea.

Indications

Tracheal intubation should be considered for patients with inadequate ventilation or apnoea; unconscious or semi-conscious patients who are unable to maintain or protect their airway, and are at risk of aspiration; actual or potential airway obstruction (unconsciousness, burns, hematoma or edema); head injuries with a Glasgow Coma Score less than 8; and hypoxia unrelieved by other measures.





Predicting ease of intubation

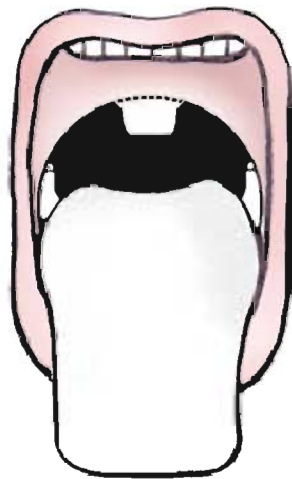
Even in most cases of emergency resuscitation, the medical professional should consider intubation as an elective procedure. Especially during the initial stages of a cardiac arrest, the focus should remain on high quality CPR and defibrillation. If intubation is performed, success is directly related to both the experience of the provider and adequate preparation.

Prior to intubating a patient, medical provider should evaluate if there are any indicators that the intubation may be complicated or classified as a difficult airway. Techniques to predict the ease of an intubation include:

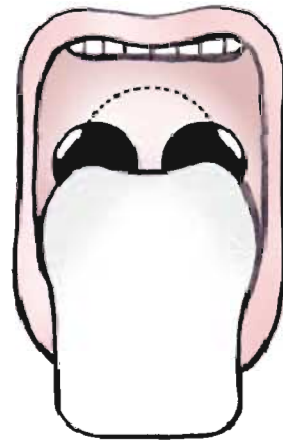
- ✓ Examine the patient externally for obvious signs of previous craniofacial traumas or previous surgery
- ✓ Evaluate the 3-3-2 principle.
 - o Three of the patient's fingers should be able to fit into his/her mouth when open.
 - o Three fingers should comfortably fit between the chin and the throat
 - o Two fingers in distance from thyroid cartilage to chin
- ✓ Mallampati score
- ✓ Obstructions: stridor breath sounds, wheezing, etc
- ✓ Neck mobility: can patient tilt head back and then forward to touch chest?



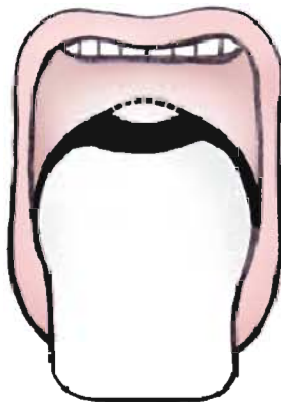
Mallampati classification



Class 1



Class 2



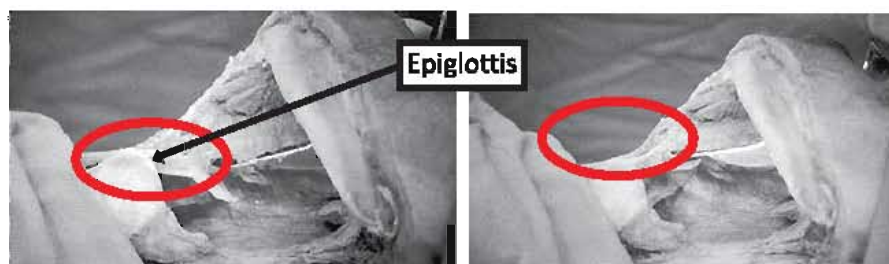
Class 3



Class 4



When intubating with a curved blade, the tip of the blade should be in the vallecula. The blade lifts the epiglottis indirectly.



Procedure

1. Prepare all equipment and have suction ready.
 2. Pre-oxygenate and slightly hyperventilate the patient for 1-2 minutes with OXYGEN.
 3. Open the patient's airway and holding the laryngoscope in the left hand, insert the blade into the right side of the mouth and sweep the tongue to the left.
 4. Use the blade to lift the tongue and epiglottis
 5. Once the glottic opening is visualized, slip the tube through the cords. Watch the cuff pass by the vocal cords.
 6. Remove the stylet and inflate the cuff with 5-10ml of air.
 7. Confirm tube placement.
- ⚠ Do not allow the patient to become hypoxic during intubation. No longer than 30 seconds per intubation attempt should be allowed, and intubation attempts should be limited to three. Take caution not to make a patient with a limited airway, a patient without an airway.



Observational methods to confirm correct tube placement

- ✓ Direct visualization of the tube passing through the vocal cords
- ✓ Clear and equal bilateral breath sounds on auscultation of the chest
- ✓ Absent sounds on auscultation of the epigastrium
- ✓ Equal bilateral chest rise with ventilation
- ✓ Fogging in the tube
- ✓ An absence of stomach contents in the tube

Instruments to confirm correct tube placement

- ✓ Colorimetric end tidal C/O₂ (i.c. CO₂) detector
- ✓ Waveform capnography
- ✓ Esophageal Detection Device
 - ⚠ An unrecognized esophageal intubation is fatal.
 - ⚠ If in doubt, remove the tube, ventilate, and re-intubate.

ET-Tube maintenance

After intubation, it is essential to protect the tube placement by securing it in place with tape or an endotracheal tube holder. During resuscitations, if available, use a cervical collar to prevent movement of the patient's head and neck. Movement of the patient's head and neck are a common source of tube displacement. Confirm tube placement should anytime the patient is moved, and after any unexplained change in the patient's clinical status.



Manual Cardiac Defibrillation

Early defibrillation is critical to survival from sudden cardiac arrest.

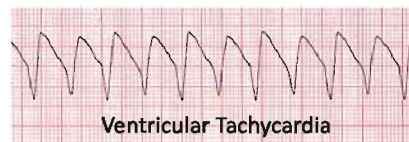
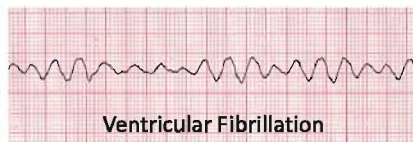
- ✓ The most frequent initial rhythm in witnessed cardiac arrest is ventricular fibrillation.
- ✓ The definitive treatment for VF is electrical defibrillation
- ✓ The probability of successful defibrillation diminishes rapidly over time.
- ✓ Ventricular Fibrillation deteriorates to asystole within a few minutes without CPR.
- ✓ Ventricular Fibrillation and Ventricular Tachycardia² require defibrillation.
- ✓ Do not defibrillate asystole.



Delays to START EITHER CPR OR DEFIBRILLATION reduce survival from cardiac arrest.

Pharmacology Intervention
Antiarrhythmic: Amiodarone 300 mg IVP is preferred. If unavailable: Lignocaine 1-1.5 mg / kg (Max Dose 3 mg/kg) may be considered.
Torsades de pointes Or Hypomagnesemia: Magnesium 1-2 Grams

Defibrillate Immediately 360J or "Effective Energy" ^{***} CPR "Hard & Fast" at 100/minute Minimize interruptions to CPR Compressions : Ventilation 30 : 2
Ventilation & Oxygen Establish IV Access Check Pulse & Rhythm After 2 minutes
Defibrillate Immediately 360J or "Effective Energy" ^{***} Resume CPR for 2 minutes immediately after all defibrillations. Pulse checks are after 2 minutes of CPR between the defibrillations.
ADRENALINE 1 mg, IV Bolus Repeat every 3-5 minutes
Check Pulse & Rhythm After 2 minutes
Defibrillate Immediately 360J or "Effective Energy" ^{***} Resume CPR Immediately
Consider INTUBATION or ADVANCED AIRWAY Change Person Performing Chest Compressions
Check Pulse & Rhythm After 2 minutes
Defibrillate Immediately 360J or "Effective Energy" ^{***}



² Ventricular Tachycardia may present with or without a pulse. If the patient has a pulse, and is clinically unstable, synchronized cardio-version is recommended. If the patient is in cardiac arrest, treat VT as ventricular fibrillation.



One Shock then CPR

Frequent and long interruptions in chest compressions for rhythm analysis, rescue breathing, or defibrillation is associated with reduced survival rates. Interruption in chest compressions also reduces the probability of conversion of Ventricular Fibrillation to another rhythm.



Rhythm analysis and defibrillation for a sequence of three defibrillations can result in periods up to one minute without chest compressions. If the first defibrillation fails to eliminate VF, the likeliness of a successful subsequent shock is low. Resumption of CPR provides more benefit to the patient than another immediate shock.

- ✓ When ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT) is present, deliver one shock and immediately resume CPR.
- ✓ Do not delay resumption of chest compressions to recheck the rhythm or pulse.
- ✓ After two minutes of CPR, analyze the cardiac rhythm and deliver another shock if indicated.
- ✓ If the rhythm is not VF/VT, check for a pulse and resume CPR immediately.

Monophasic - Biphasic

Defibrillation is the use of electrical current through the chest, and the heart, to depolarize myocardial cells and eliminate ventricular fibrillation or ventricular tachycardia. VF/VT frequently recurs even after successful shocks; the recurrence of VF/VT is not shock failure. Cardiac defibrillators use either monophasic or biphasic emergency to defibrillate the patient. The effectiveness of monophasic defibrillation is lower than first-shock effectiveness of biphasic shocks.



Monophasic waveform defibrillators were introduced first, but now almost all new defibrillators use biphasic energy. Monophasic waveforms deliver current in a single (mono) direction. Very few monophasic waveform defibrillators are still manufactured, but many are still in use. Biphasic waveform defibrillators require a lower-energy to terminate VF. However, biphasic defibrillators use two different waveforms, each with a different energy recommendation.

- ✓ For adult patients in cardiac arrest, if a monophasic defibrillator is used (common in Bangladesh), all defibrillations should be delivered at 360 J
 - If VF persists after the first shock, second and subsequent shocks should be given at of 360 J
- ✓ For adult patients in cardiac arrest, if a biphasic defibrillator is used, follow the manufacturer's recommendations.
 - If unknown, use the standard protocol of first defibrillation at 200J, second at 300J, and additional defibrillation at 360 J.

Minimal Delays

All medical professionals must practice efficient coordination between CPR and defibrillation. The goal is to minimize the time between chest compressions and shock delivery and between shock delivery and resumption of chest compressions. If ventricular fibrillation is present for more than a few minutes, the heart is depleted of oxygen and a brief period of chest compressions increases the likelihood that a perfusing rhythm will return after defibrillation. The shorter the time between a chest compression and the delivery of a shock, the more likely the shock will be successful; reducing the time between compressions to defibrillation, even by seconds, can increase the probability of shock success.

Thus, in the hospital, deliver one shock with a monophasic or biphasic defibrillator followed by the immediate initiation of CPR, beginning with compressions. In specific settings, experienced providers may modify this sequence.



Potential Reversible Causes of Cardiac Arrest

Reversible causes of cardiac arrest are referred to as the "H's and T's", allowing the emergency medical professional to easily remember the list during a cardiac arrest.

✓ **HYPOVOLEMIA** - Hypovolemia is the lack of circulating volume for the heart to pump. This is most often the result of significant, rapid blood loss. Patients suffering from severe dehydration, especially children with diarrhea are also at risk for hypovolemia related cardiac arrest. Hypovolemia is classified as absolute hypovolemia and relative hypovolemia.

- o **Absolute Hypovolemia** - is the reduction in circulatory (blood) volume due to the direct loss of fluid. As the examples above indicated, this includes hemorrhage and the loss of fluids.
- o **Relative Hypovolemia** - also known as distributive shock syndrome is the result of vascular dilation and the loss of peripheral vascular resistance. As blood vessels dilate, the volume required to keep the vessels full is increased. Without adequate volume, the heart is not adequately filled (pre-load) and its ability to pump blood ceases. Causes of relative hypovolemia are many including septic shock, anaphylactic shock, and neurogenic shock.

Treatment - Identifying and treating the cause of hypovolemia. Depending on the cause, this may include stopping major bleeding, blood transfusions, IV bolus of saline, or medications to induce vascular constriction.

Rapid identification of the cause of hypovolemia is the key to preventing and reversing subsequent cardiac arrest.



✓ **HYPOXIA⁴** - Hypoxia is the lack of oxygen available to the vital organs and can result from both acute emergencies and chronic conditions. If the brain becomes hypoxic, the patient quickly enters a state of unresponsiveness, left untreated brain death occurs in as little as five minutes. The cause of cardiac arrest in many victims of trauma, drug overdose, drowning, and in many children is hypoxia. CPR with both compressions and rescue breaths is critical for resuscitation of these victims.

- o Hypoxia is typically the result of either the loss of a patent airway or compromised breathing (respiration) in a patient. During the initial assessment of all patients, evaluate the status of the airway and breathing. Identify the potential for impending compromise.
- o In unresponsive patients, the most common cause of airway obstruction is the tongue.
- o Unlike scheduled operating theatre cases, emergency patients often present to the emergency unit after eating a meal. These patients are at a higher risk for airway compromise, and aspiration.

TREATMENT - Rapid identification of the cause of hypoxia is the key to preventing and reversing cardiac arrest from hypoxia. All patients at risk of cardiac arrest should have high concentration of oxygen applied with a mask, and careful attention provided to proper airway management.

⁴ In hypoxia, hypokalaemia may occur secondary to the hormonal 'stress response'. The respiratory drive will not be increased if hypoxia or hypercarbia is from hypoventilation.



Effects of Hypoxia	Effects of Hypercarbia
<p>Metabolic: anaerobic metabolism, metabolic acidosis</p> <p>Neurological: cerebral vasodilation and raised intracranial pressure - confusion, agitation, drowsiness, fits and coma.</p> <p>Cardiovascular: impaired contractility, dysrhythmias, bradycardia and ultimately asystole.</p> <p>Respiratory: increased respiratory drive.</p> <p>Renal: impaired renal function, acute renal failure.</p> <p>Gastrointestinal: hypoxic liver dysfunction.</p>	<p>Metabolic: respiratory acidosis, hyperkalaemia.</p> <p>Neurological: cerebral vasodilation and raised intracranial pressure - drowsiness and unconsciousness.</p> <p>Cardiovascular: hypertension, tachycardia and dysrhythmias.</p> <p>Respiratory: increased respiratory drive.</p>

✓ **HYDROGEN ION (Acidosis)** - An abnormal concentration of acid (pH) in the body can result in cardiac arrest. Acidosis can result from acute and chronic conditions. Some common causes of acidosis include

- o prolonged hypoxia (respiratory acidosis)
- o severe infection (sepsis)
- o diabetic ketoacidosis
- o renal failure (uremia)
- o ingestion of toxic agents or overdose of drugs

TREATMENT- Rapid identification of the cause of acidosis is the key to preventing and reversing cardiac arrest from acidosis. The specific treatment to reverse acidosis varies on the cause of acidosis, but always includes proper oxygenation.

✓ **HYPERKALEMIA** or **HYPOKALEMIA** - if the proper balance of potassium in the body is disrupted and shifts too high, hyperkalemia, or too low, hypokalemia, the patient can quickly suffer from cardiac rhythm disturbances and cardiac arrest.

In hypoxia, hypokalaemia may occur secondary to the hormonal 'stress response'. The respiratory drive will not be increased if hypoxia or hypercarbia is from hypoventilation.



- o HYPERKALEMIA - most commonly presents to the emergency centre as a renal failure patient, or renal dialysis patient, who missed dialysis. These patients will complain of weakness and nausea, but the key clinical finding will be prolonged (wide) QRS complexes on the ECG. Peaked 'T-waves' are also commonly seen on the ECG.
- o HYPOKALEMIA - Suspect low potassium in cases of malnutrition or severe diarrhea. The ECG of a patient with HYPOKALEMIA will demonstrate flat T-waves and a prolonged Q-T interval.

Treatment - Identifying if the patient is suffering from hyper- (high) or hypo- (low) potassium and restoring the patient back to acceptable potassium levels. The process of normalizing potassium takes time, however in cardiac arrest, or near cardiac arrest, treatment can be administered to temporarily adjust the potassium levels.

HYPERKALEMIA-The immediate treatment includes administering calcium solution intra-venous. This stabilizes the heart and reduces the chance of fatal arrhythmias. Definitive treatment requires excretion of excess potassium.

HYPOKALEMIA-Treatment of low potassium includes replacing potassium through an I.V. solution and treating the underlying cause.

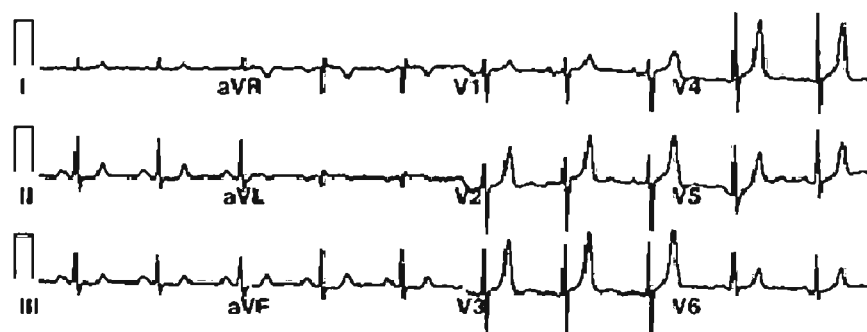


Figure 2-ECG demonstrating tall peaked t-waves associated with hyperkalemia xviii

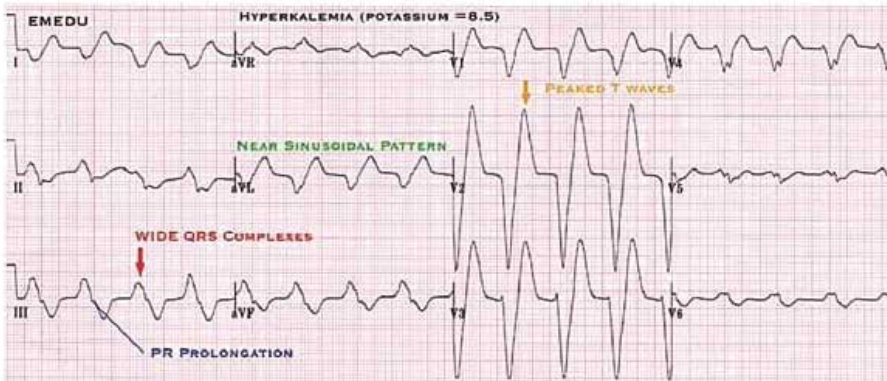


Figure 3-Hyperkalemia

✓ **HYPOTHERMIA** - clinically defined as a core body temperature less than 35°C. Although cardiac arrest from hypothermia would be uncommon in Bangladesh, it remains a possibility. With professional fishing, iceboxes and freezing food for transport is common. A patient trapped in these conditions for an extended period may present to your emergency centre.

- o **HYPOTHERMIA** patients are not dead, until they are warm and dead. Medical journals have documented amazing recovery for hypothermia patients in cardiac arrest patients.
- o Current research is indicating the inducing mild hypothermia during cardiac resuscitation protects the brain and improves survival rates.

Treatment - slowly rewarming the patient during the resuscitation.

✓ **HYPOGLYCEMIA** or **HYPERGLYCEMIA** - Hypoglycemia and hyperglycemia are generally not direct causes of cardiac arrest, but represent significant contributing factors leading to cardiac arrest.

- o Hypoglycemia, or low blood sugar, is generally not the direct cause of cardiac arrest, but can be the imposing factor. When a patient's blood sugar rapidly falls, often due to an overdose of oral hypoglycemic medications or too much insulin, the patient may quickly lose consciousness, and subsequently lose a patent airway.



Treatment - Hypoglycemia can rapidly be treated by administering dextrose via an IV. In adults, the typical dose is 25ml of a 50% glucose solution. However, if the patient has already suffered from cardiac arrest the primary cause of cardiac arrest is nearly always hypoxia resulting from a compromised airway.

- o When a patient's blood sugar raises, hyperglycemia, the process is generally slow. High concentrations of blood sugar push the body's metabolism into Diabetic Keto-Acidosis (DKA). The large amounts of excess sugar in the blood cause forces the body to excrete excessive water, in the form of urine. DKA patients present to emergency centers dehydrated, sometimes to the point of hypovolemia shock, frequently with kussmaul respirations, altered mental status, and a signature fruity odor on the breath.

Treatment - a cardiac arrest patient with the diagnosis of DKA should be treated for severe acute hypovolemia unless specific contradictions exist. However, DKA patients are at risk for cerebral edema and multiple electrolyte abnormalities.

✓ TABLETS / TOXINS-The team of emergency medical professionals should obtain a complete medical and social history of all cardiac arrest patients. The detailed history will provide valuable clues to the true cause of the cardiac arrest. Tablets, toxins, and drug overdoses are a common precipitating factor. Treatment requires identification of the substance, and if possible, a specific antidote administered.

Treatment depends on the specific toxin or drug ingested. Drug overdoses of narcotics, for example, result in respiratory depression and respiratory arrest. Treatment for a cardiac arrest resulting from a narcotic overdose would place an emphasis on managing HYPOXIA and airway management, but would typically not include reversing the narcotic. Yet, if a patient ingested an over-dose of tricyclic antidepressant, the emphasis may be on administering high concentrations of sodium in the form of sodium bicarbonate.

✓ TAMPONADE (CARDIAC) - A cardiac tamponade is a life-threatening condition in which blood or fluid accumulates in the pericardium surrounding the heart. As the fluid in the pericardium increases, pressure is applied to the heart. This prevents the ventricles from properly filling with blood (preload), If the ventricles do not properly fill, the heart is unable to pump blood adequately, resulting in obstructive shock, and often death. Patients suffering from a cardiac arrest due to a cardiac tamponade often present in PEA - pulseless electrical activity. (PEA is discussed in another module).



- o The pericardium can fill with blood quickly, as found in trauma cases, or it can fill slowly with excessive fluid resulting from infections or hypothyroidism. An adult's pericardial sac can slowly expand to contain over a liter of fluid prior to a tamponade occurring, but if the fluid occurs rapidly (after trauma), 100 ml can cause tamponade.
- o The diagnosis of a cardiac tamponade is difficult as there are many differential diagnoses including a tension pneumothorax. However, trauma patients without massive hemorrhage or a tension pneumothorax, but with PEA as the heart rhythm, are often suffering from a cardiac tamponade.
- Beck's triad is the common pre-arrest presentation of a cardiac tamponade.
 - Hypotension
 - Jugular-venous distension
 - Muffled heart sounds
- Other signs include pulsus paradoxus.
 - This is a drop of at least 10 mmHg in arterial blood pressure while the patient inspires.
- ST segment changes on the ECG
 - low voltage QRS complexes
 - Ischemia pattern in no correlating areas of the heart.
- General signs & symptoms of shock: tachycardia, shortness of breath, and a decreased level of consciousness.

Treatment - emergency management required the pericardial pressure to be relieved by either a pericardiocentesis, or a thoracotomy and an emergency pericardial window. The patient will require emergency surgery to seal the source of the bleed and repair the pericardium.

✓ TENSION PNEUMOTHORAX - A tension pneumothorax is a common cause of preventable and treatable cardiac arrest and death in trauma patients. A tension pneumothorax is due to a hole in the pleura allowing air to enter the space surrounding the lungs. With each breath, air is trapped between the chest wall and the lungs. As the pressure - tension - builds, the heart and lungs are compressed. Patients will experience hypoxia, difficulty breathing, and chest pain.



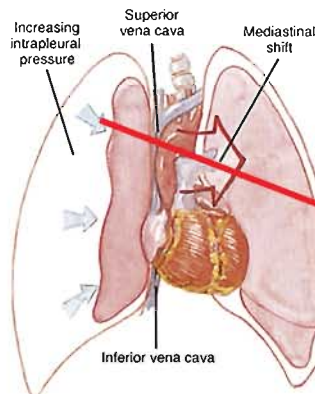
- o Clinical signs and symptoms include:
 - Decreased or absent breath sounds over the affected side
 - Difficulty breathing
 - Hypoxia
 - Rapid breathing
 - Unequal chest rise - Paradoxical movement
 - Hyperresonance with chest wall percussion
 - Tachycardia
 - Hypotension
 - Hypoxia
 - Subcutaneous emphysema
 - Cyanosis
 - Late signs include:
 - Jugular venous distension
 - Tracheal deviation - away from the affected side
- o A definitive diagnosis of a tension pneumothorax can be made with a chest x-ray, but the time required to obtain the x-ray is life threatening. Tension pneumothorax should be diagnosed clinically and treated.

Treatment - a tension pneumothorax is an emergency life-threatening condition. Left untreated, the patient will quickly deteriorate into cardiac arrest from obstructive shock. Quickly perform a needle decompression, or needle thoracostomy, by inserting a large gauge needle into the second inter-costal space on the midclavicular line. This will release the air tension from the pneumothorax and convert it temporarily into a simple pneumothorax. A chest tube (IC tube) should be inserted at the earliest opportunity.



Needle Decompression

TENSION PNEUMOTHORAX IS A LIFE THREATENING CONDITION!



- Insert a large-bore (i.e., 14-gauge or 16-gauge) needle into the second intercostal space, **over the third rib** at the midclavicular line, 1-2 cm from the sternal edge (i.e., to avoid injury to the internal thoracic artery).
- Once the needle is in the pleural space, listen for the hissing sound of air escaping.
- Secure the needle in place.
- Prepare the patient for a tube thoracostomy.

Tension Pneumothorax



Tension pneumothorax is a life-threatening, time critical emergency.

Do not use a chest radiograph to confirm the diagnosis of a tension pneumothorax before treatment. The decision to proceed with needle decompression must be made *clinically* by observing the acute presentation and reviewing relevant clinical history.



Figure 4 - A large right sided pneumothorax

✓ **THROMBOSIS** - Specifically, a thrombosis resulting in a myocardial infarction, resulting in a cardiac arrest. Patients suffering from AMI (acute myocardial infarctions) are at high risk for cardiac arrest. As the heart muscle is suffering from hypoxia, it is at risk for lethal cardiac arrhythmias including ventricular fibrillation and ventricular tachycardia.

- o Signs and Symptoms of a heart attack includes
 - Chest pain, pressure, or discomfort lasting more than twenty minutes. In some patients, the pain radiates into the left arm, the neck, or jaw.
 - Nausea, difficulty breathing, and diaphoresis (sweating)
 - Elderly persons, diabetics, and some women may present to the emergency centre with atypical or vague symptoms including weakness, dizziness, or shortness of breath.
 - Approximately 33% of acute myocardial infarctions have been estimated to be either silent (without symptoms) or had atypical symptoms.^{xxii}
- o Prevention and early recognition of heart attacks are essential for patient survival. Risk factors for myocardial infarction include:



- Diabetes (the single most important risk factor for ischemic heart disease)
 - Tobacco smoking
 - High cholesterol especially high low density lipoprotein and low high density lipoprotein
 - High blood pressure
 - A family history of heart disease
 - Obesity
 - Age: Male risk increase at 45 years, while a woman's risk increased at age 55.
 - Stress
 - Prolonged use of high quantities of alcohol
- o Diagnosis - Pre-cardiac arrest diagnosis of an Acute Myocardial Infarction according to the World Health Organization criteria is ^{xxiii},
- Clinical history of ischemic chest pain lasting for more than 20 minutes
 - Changes in serial ECG tracings
 - Rise and fall of serum cardiac biomarkers such as creatine kinase-MB fraction and troponin. A cardiac troponin rise accompanied by typical symptoms, pathological Q waves, ST elevation or depression or coronary intervention are diagnostic of MI.
- o An AMI patient in cardiac arrest typically presents in ventricular fibrillation or ventricular tachycardia.

Treatment - Patients in ventricular fibrillation or ventricular tachycardia required cardiac defibrillation. Patients suffering from an AMI should be treated with oxygen, nitroglycerin, aspirin, and pain management immediately followed by rapid treatment to restore myocardial perfusion.

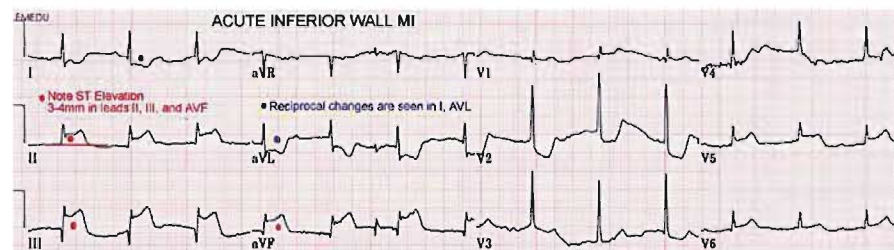


Figure 5- Example of an AMI (Inferior Wall)



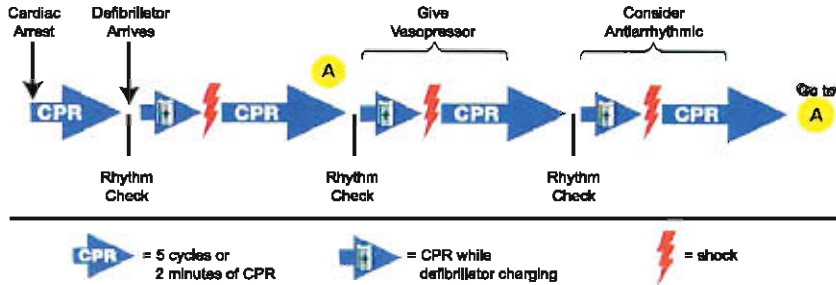
✓ **THROMBO - EMBOLISM (Pulmonary embolism)** - A Pulmonary embolism that hemodynamically compromises the patient are typically fatal and prognosis is generally poor.

✓ **TRAUMA** - Trauma patients in cardiac arrest initially require the same initial basic and advanced life support as the patient with a primary cardiac arrest, with a focus on supporting the airway, breathing, and circulation. In a trauma related resuscitation, a rapid Primary Assessment - carefully evaluating and treating problems related to the airway, breathing, and circulation. This is followed by a more detailed Secondary Survey to detect more subtle but potentially fatal injuries.

- o Cardiac arrest related to trauma is associated with multiple potential causes:
 - Hypoxia, from primary respiratory arrest, airway obstruction, pneumothorax, tracheobronchial injury, or thoracoabdominal injury
 - Injury to vital structures, such as the heart, aorta, or pulmonary arteries
 - Severe head injury with secondary cardiovascular collapse
 - Underlying medical problems or other conditions contributing to the trauma, such as sudden cardiac arrest of a driver of a motor vehicle.
 - Diminished cardiac output, PEA, from a tension pneumothorax or pericardial tamponade
 - Massive blood loss leading to hypovolemia and diminished delivery of oxygen
- o Even in situations with complete trauma teams on immediate stand-by, patients presenting to the emergency care unit in cardiac arrest associated with trauma rarely survive.

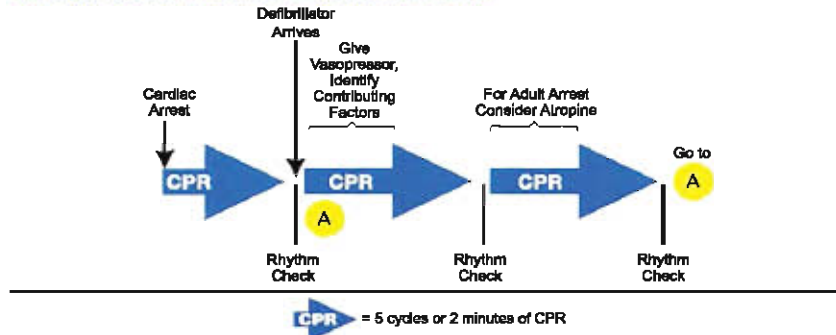


A. Ventricular Fibrillation/ Pulseless VT

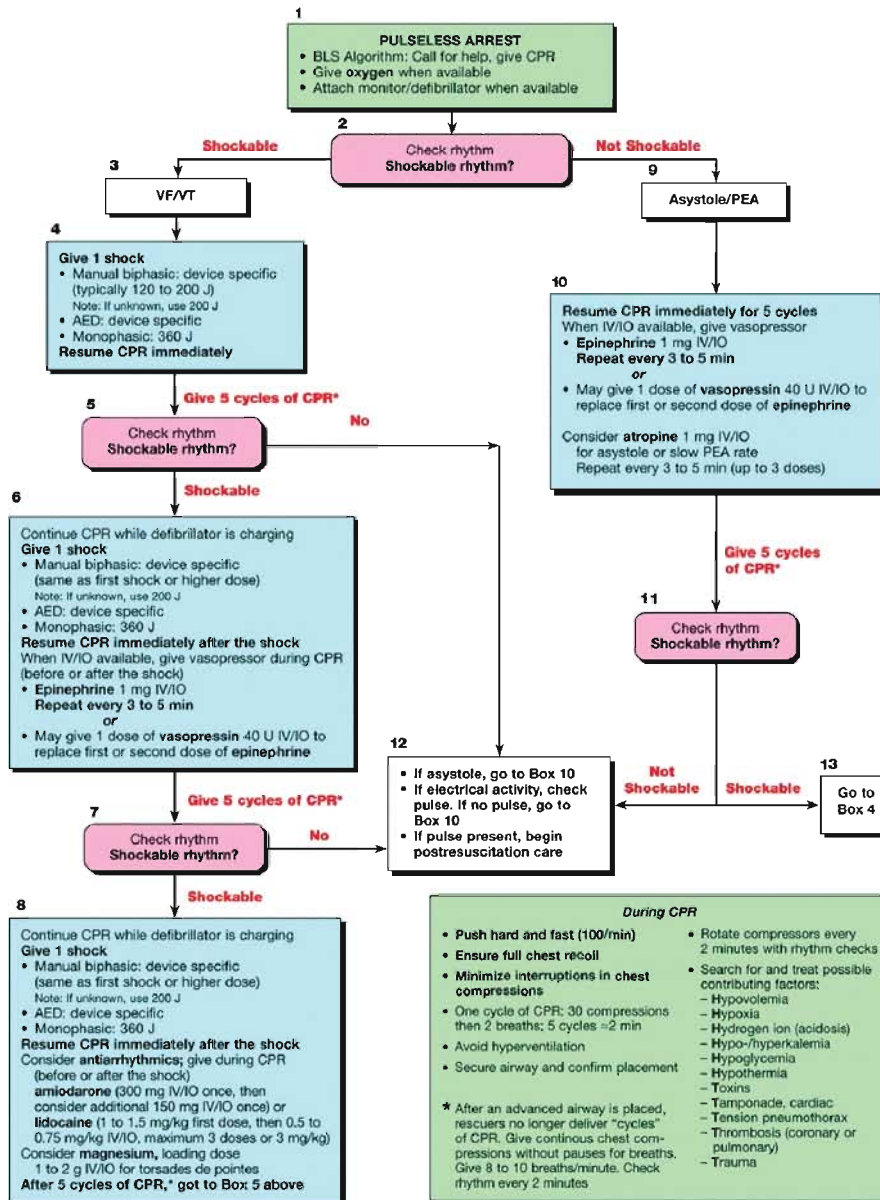


Ventricular Fibrillation/Pulseless Ventricular Tachycardia Sequence: Prepare next drug prior to rhythm check, Administer drug during CPR, as soon as possible after the rhythm check confirms VF/pulseless VT. Do not delay shock. Continue CPR while drugs are prepared and administered and defibrillator is charging. Ideally, chest compressions should be interrupted only for ventilation (until advanced airway placed), rhythm check, and actual shock delivery.

B. Asystole and Pulseless Electrical Activity



ACLS and PALS Treatment of Asystole and Pulseless Electrical Activity (PEA) Sequence: Prepare next drug prior to rhythm check. Administer drug during CPR, as soon as possible after the rhythm check confirms no VF/pulseless VT. Continue CPR while drugs are prepared and administered. Ideally, chest compressions should be interrupted only for ventilation (until advanced airway placed) and rhythm check. Search for and treat possible contributing factors.





Module 4: Trauma Life Support

Objective

At the end of this module, medical professionals should be able to:

- ✓ List the systematic steps of a trauma assessment and perform trauma assessment
- ✓ List major causes of preventable morbidity and mortality in trauma patients
- ✓ Describe how to maintain an airway in a trauma patient and demonstrate techniques to maintain an airway in a suspected spinal trauma patient
- ✓ Identify life-threatening conditions affecting a patient's breathing and identify patients requiring oxygen therapy.
- ✓ Identify signs/symptoms of a tension pneumothorax then demonstrate a needle decompression
- ✓ Demonstrate steps to stop hemorrhage in a trauma patient and calculate proper initial fluid bolus administration
- ✓ Describe a physical assessment technique used to rule-out suspected cervical spinal injury and demonstrate the proper technique to secure a suspected spinal injury
- ✓ Identify the physical assessment signs/symptoms of a pelvic fracture and demonstrate the procedure for application of a pelvic sling
- ✓ Describe AVPU and the GCS
- ✓ List signs and symptoms of head-trauma and list treatment priorities for head trauma patients
- ✓ Describe the difference between blunt and penetrating abdominal trauma and demonstrate an abdominal assessment



Methods

- Lecture
- Discussion
- Practical demonstration
- Hands on training

Materials

Training module, manikin, multimedia

Duration

2 hr

Schedule

Presentation	- 30 min
Discussion	- 30 min
Practical demonstration	- 30 min
Hands on training	- 30 min



Medication Administration & Venous Access

Preventing Trauma Death

Death from trauma is categorized based on the time of death related to the trauma incident: immediate, early, and late.

- ✓ Immediate deaths occurs within seconds or minutes of the injury
 - o Lacerations to the brain, brainstem, upper spinal cord, heart, aorta, or other large vessels usually cause these deaths
 - o Most patients with these injuries cannot be saved

The only way to reduce immediate trauma deaths is through effective prevention programs.

- ✓ Early deaths occurs within the first two to three hours following the injury and are generally caused by:
 - o Subdural or epidural hematoma
 - o Hemo-pneumothorax
 - o Ruptured spleen
 - o Lacerated liver
 - o Pelvic fracture
 - o Multiple injuries associated with blood loss

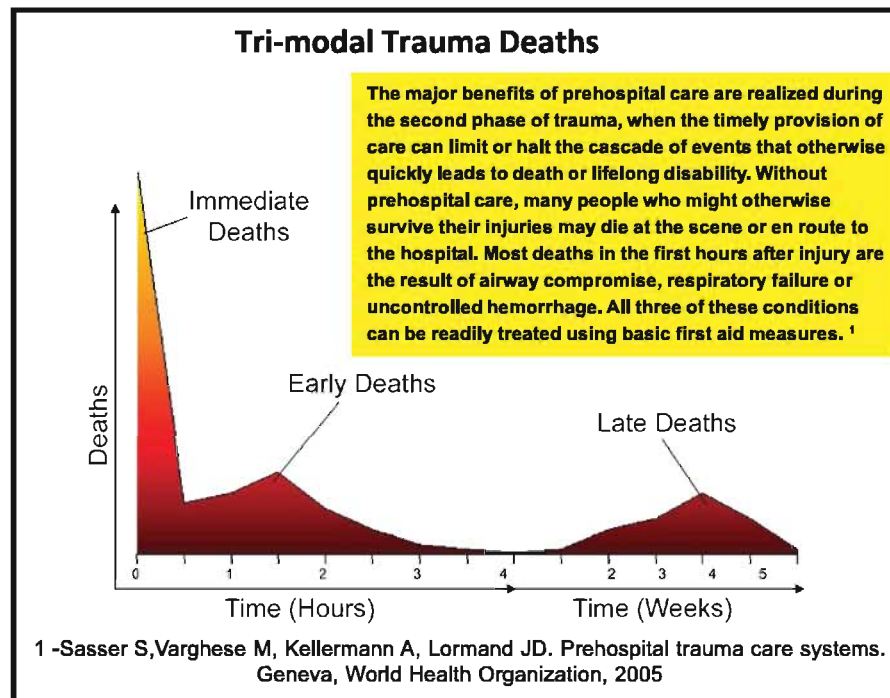
Most injuries, and deaths, are treatable if the patient receives prompt emergency care. The time between the injury and definitive care is critical for survival.

- ✓ Late trauma deaths occur days or even weeks after the injury.
 - o Most of these deaths are the end result of sepsis, infection, and multiple organ failure

These deaths can be reduced and prevented by appropriate, early emergency trauma care focused on prevention of shock.



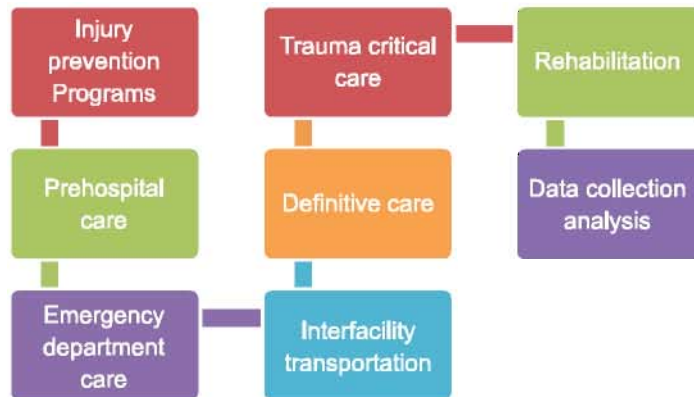
Prevention and reduction of trauma related death requires a systematic approach to trauma. All components of the trauma system must be functional to reduce preventable death and disability.





Trauma Systems

Trauma systems are designed to reduce preventable death and disability. Eight key components of trauma systems have been identified:



- 👉 Consider the elements of trauma care available in your community, in your hospital, in your district. How can you improve your trauma care system?

Blunt Trauma

Blunt trauma injuries _ falls, vehicle crashes, hit by objects -are produced from compression and change of speed. Understanding the mechanism of injury provides the emergency medical professional a better understanding of what injuries may be present. Although presenting an exhaustive list correlating mechanisms of injury to predictable injury patterns would fill volumes of encyclopedias, by exploring the example of motor vehicle collisions the importance of identifying the mechanism of injury will be evident.



Motor vehicle collisions

Injuries from a vehicle crash depend on the type of collision, the position of the occupant inside the vehicle, and the use (or nonuse) of safety restraints. During a motor vehicle collision, there are three separate impacts:



The type of impact during a MVC (motor vehicle collision) helps to predict injury patterns:

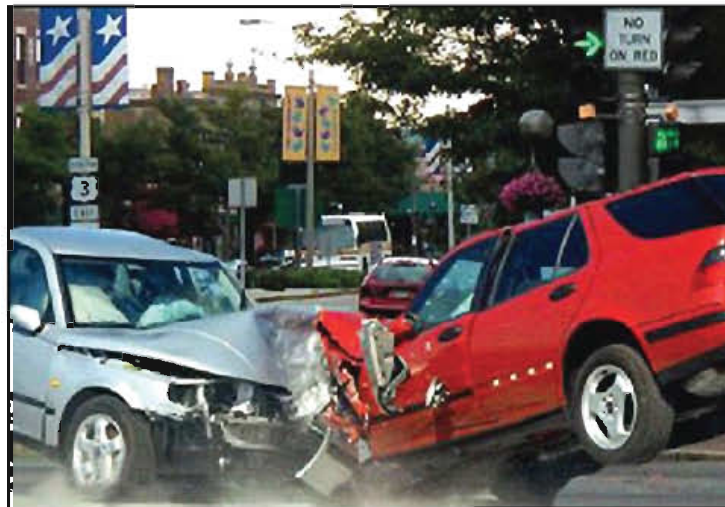
✓ Head-on impact: The force of the energy is the sum of both speeds at the time of impact. (60km/hr + 80km/hr = a total impact speed of 140 km/hr). The occupant usually travels in one of two pathways in relationship to the dashboard:



- Down and under- The occupant travels downward into the vehicle seat and forward into the dashboard or steering column
 - Knees become the leading part of the body, striking the dashboard
 - Predictable injuries include knee dislocations, patellar fracture, femur fracture, fracture or posterior dislocation of the hip, fracture of the acetabulum, vascular injury, and hemorrhage.
 - After the knees absorb the energy, the body continues forward as the chest impacts the steering column or dashboard.
 - Predictable injuries from this transfer of energy include rib fracture, ruptured diaphragm, hemopneumothorax, pulmonary contusion, cardiac contusion, myocardial rupture, and vascular disruption (most notably, aortic rupture).
- Up and over — In this mechanism, the ribs and thorax absorb the majority of the force.



- Kidneys, liver, and spleen are subject to vascular tears from supporting tissue, including the disruption of renal vessels from their points of attachment to the inferior vena cava and descending aorta
 - Predictable injuries include liver laceration, spleen rupture, internal hemorrhage, and abdominal organ incursion into the thorax (ruptured diaphragm).
 - If the head impacts the window glass, other predictable injuries include trauma to the brain (e.g., concussion, contusion, shearing injury, and edema) and intracranial vascular disruption resulting in subdural or epidural hematoma.





- ✓ Lateral impact is when the vehicle is struck from the side.
 - o The impact force intrudes the external shell of the vehicle deep into the passenger compartment; the lateral aspect of the occupant's body absorbs the force.
 - Predictable injuries include fractured ribs, pulmonary contusion, ruptured liver or spleen (depending on the side involved), fractured clavicle, fractured pelvis, and head and neck injury.
 - o The occupant may also be abruptly, and forcefully pulled laterally with the car
 - Effects of inertia on the head, neck, and thorax produce lateral flexion and rotation of the cervical spine resulting in neurological injury and tears or strains of the lateral ligaments and supporting structures of the neck
- ✓ Rear-end impact- In rear-impact collisions, the force is the difference between the two speeds. (80 km/hr - 60 km/hr 20 km/hr).
 - o Predictable injuries in rear-end collisions include back and neck injuries and cervical strain or fracture caused by hyperextension.
- ✓ Rollover accidents - The occupant tumbles inside the vehicle and is injured wherever the body strikes the vehicle. Multiple impacts occur at many different angles, providing the potential for multiple system injuries
 - o Predictable injuries sustained in roll-over collisions are difficult to categorize.





Blast Injuries

A 'blast injury' is a generic term used to describe injuries sustained after the patient is exposed to a pressure field produced from an explosion. Explosions release large amounts of energy as both pressure and heat. Blast injuries are further categorized as Primary, Secondary, and Tertiary.



Primary	Secondary	Tertiary
<ul style="list-style-type: none">• Hollow, gas filled organs suffer the most severe damage.• Ears, Lungs, Central nervous system, Gastrointestinal tract• Predictable damage<ul style="list-style-type: none">• Hearing loss• Pulmonary hemorrhage• Cerebral air embolism• Abdominal hemorrhage• Bowel perforation• Thermal burns from direct exposure to heat	<ul style="list-style-type: none">• Injuries from flying debris<ul style="list-style-type: none">• Lacerations• Fractures• High-velocity penetrating trauma from<ul style="list-style-type: none">• nails• screws• casing fragments• shrapnel	<ul style="list-style-type: none">• Occur when victims are propelled through the air by an explosion and strike a stationary object• Injuries are similar to blunt trauma• The sudden deceleration from the impact causes more damage than the acceleration.• Forces may damage abdominal viscera, CNS, and musculoskeletal system



Penetrating Trauma

Penetrating trauma, of all types, cause tissue damage from two types of forces (1) crushing and (2) stretching. The amount of damage is determined by: the characteristics of the object (bullet, knife), the speed of the object, and the type of tissue the object passes through.

As the object (bullet) passes through the body, a pressure wave forces tissue away from the projectile. Injuries from penetrating trauma are categorized based on the energy involved: low, medium, and high.

- ✓ Low energy penetrating trauma includes knives and needles. The damage is generally related to their sharp, cutting edges. The amount of tissue crushed is minimal because the amount of force applied small.
 - o The more blunt the penetrating object is, the more force is required to cause penetration. More force = more tissue crushed.
 - Damage resulting from low-energy injuries is generally limited to the pathway of the projectile. (What was the direction of the stab wound? How long was the blade?)
- ✓ Medium and High-energy injuries result from gunshot wounds. Handguns are typically medium velocity and military grade rifles are high energy.
 - o The damage not only includes the direct path of the projectile, but also tissue around the projectile. Medium-energy weapons usually generate cavitation that is 2 to 3 times the diameter of the projectile
 - An entrance wound over soft tissue is typically:
 - Round or oval
 - May be surrounded by an abrasion rim or collar
 - May show powder burns (tattooing) if shot was at close range.
 - Exit wounds are typically:
 - If present, are generally larger than entrance wounds
 - o Ragged and torn tissue edges
 - o Splitting and tearing often produces a star-burst



Trauma Patient Management

Trauma is a time-sensitive, surgical disease. Preventing death and disability requires a well-organized systematic, team approach. Trauma patients require a rapid assessment, and prioritization, of injuries and application of life-saving interventions. All trauma patients should receive an initial assessment, or primary survey to identify and treat direct threats to life. The focus of the emergency medical provider should be to stop the progression, or worsening, of the emergency as fast as possible while preventing secondary injuries.

✓ Identify and treat the greatest threat(s) to life first.

Citizens must be educated to recognize an emergency while providing immediate emergency care. Mass media should be used to educate the public on how to recognize an emergency. Community education and preparedness should be integrated in to various programs from community health activities through school lessons.

Besides trauma, recognizing an emergency early is critical in many medical patients:

- Cardiac Emergencies
- Strokes
- Childbirth/OB Emergencies
- Respiratory Emergencies
- Recognize a safe and unsafe 'scene'





Cervical Spine Stabilization Techniques

Suspect a cervical spine injury in any patient with head injuries

- Avoid movement of the cervical spine in a patient with possible spine injury.
- Do not apply manual traction to the spine, but immobilize the spine.
- If a cervical collar is used, it must be the correct size because inappropriate sizes can hyperextend or hyper-flex the cervical spine!
- In the absence of a cervical collar, the cervical-spine can be immobilized with rolled towels or foam blocks.

The decision to stabilize the cervical spine is based on mechanism of injury, the degree of injuries, and the presence of cervical pain.



1
Provide manual stabilization of the cervical spine by placing one hand on each side of patients head while the patient is lying supine with neck in a natural position.



2
Select appropriate size rigid cervical collar by measuring from angle of the jaw to the clavicle. (Follow manufacturer Instructions.)



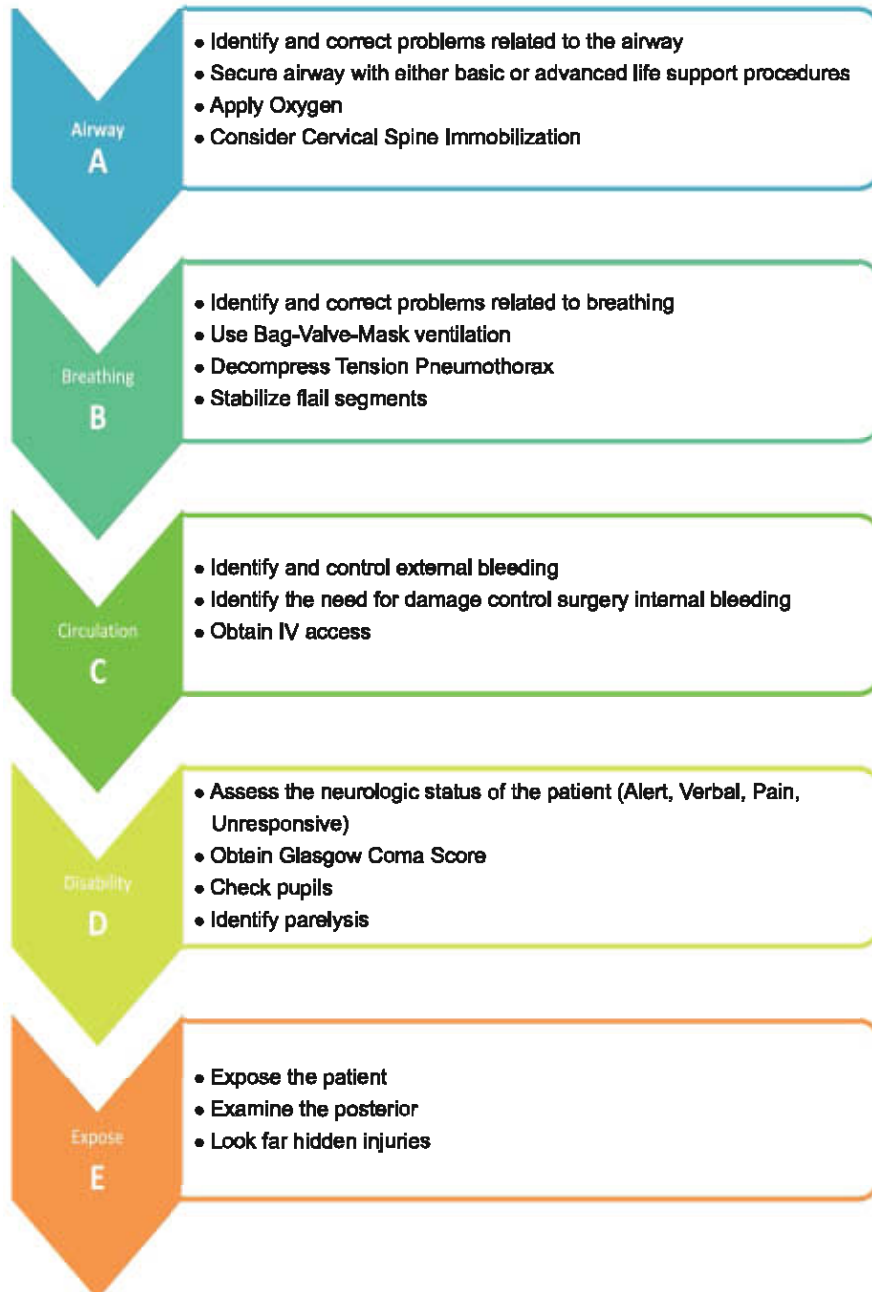
3
Select appropriate sized rigid cervical collar by comparing measurements.



4
Assess the neck, then carefully apply the cervical collar without moving the patient's head or spine. Be sure the collar is not up side-down!



5
Continue to hold manual stabilization. To truly immobilize a cervical spine, the patient should be fixed to a long-spineboard.






Primary Survey

In trauma patients, use a logical sequence, a pattern, and a routine to identify all potential threats to life. The common approach for the sequence is the ABC's of trauma care.

- Airway maintenance with cervical spinal immobilization if indicated
- Breathing and ventilation management
- Circulation and hemorrhage control
- Disability
- Expose the patient and Environmental control

During the primary survey, identify and simultaneously treat the major threats to life. The concept is "Treat as you go." In trauma, time is directly related to outcomes. Therefore, you should start reasonable treatment prior to a definite diagnosis.

 For example, if you are conducting the primary survey on a patient with difficulty breathing, low O₂ saturation, and decreased breath sounds on the right side, the appropriate intervention would be an immediate needle decompression of the right chest. Delay for an x-ray to confirm the diagnosis would be detrimental to patient outcome.

To assist with ensuring a systematic process is always followed in trauma patients, a trauma flow chart is highly recommended. This not only allows you to record the information, but it also serves as a mental reminder of the essential assessment priorities.

Approach

Prior to physically assessing the patient, or touching the patient the emergency medical response team should be collecting valuable information about the mechanism of injury and the significant events leading to the injury. This allows you to better focus the examination and avoid common mistakes.



As you approach the patient, you are forming your general impression about the injuries and condition of the patient. Do they look sick? Are they hemodynamically compromised? Are they conscious?

Stick to the assessment plan and do not deviate. A compound, angulated radial fracture may be obvious and obtrusive, but this may not be an immediate life threat!

If the patient is conscious, start by asking a simple question, "What hurts?" This will provide immediate and valuable information about the airway, breathing, and cerebral perfusion. Failure of the patient to respond is an obvious indication of a critical condition.

- As you continue the assessment, your team members can start collecting the vital signs: respiratory rate, pulse, blood pressure, oxygen saturation, ECG monitoring, and temperature are all important.

In trauma patients, trending vital signs are much more important than a spot-check of vital signs.

👉 A blood pressure of 110/60 would generally be considered normal of any patient. However, if the patient is always hypertensive with a pressure of 160/120, this could be an indicator of shock.

PRIMARY SURVEY	
C-SPINE Normal	<ul style="list-style-type: none"> ① Suspected Injury ② Pain ③ Paralysis
AIRWAY: Normal Oxygen Applied	<ul style="list-style-type: none"> ① Compromised ② Intubated ③ Surgical Airway
BREATHING: Normal RATE:	<ul style="list-style-type: none"> ① Abnormal ② Tracheal Deviation ③ Major Chest Wall Trauma ④ Tension Pneumothorax ⑤ Massive haemothorax
CIRCULATION: Normal PULSE RATE:	<ul style="list-style-type: none"> ① Radial Pulse Present ② Hemorrhage <ul style="list-style-type: none"> ③ Internal ④ External ⑤ Controlled ⑥ Un-Controlled ⑦ Systolic BP greater than 90 mmHg
NEUROLOGICAL: Alert Verbal Pain Unresponsive GCS:	History of <ul style="list-style-type: none"> ① Loss of Consciousness ② Seizure / Fits ③ Paralysis of Extremities ④ Chemical Paralysis

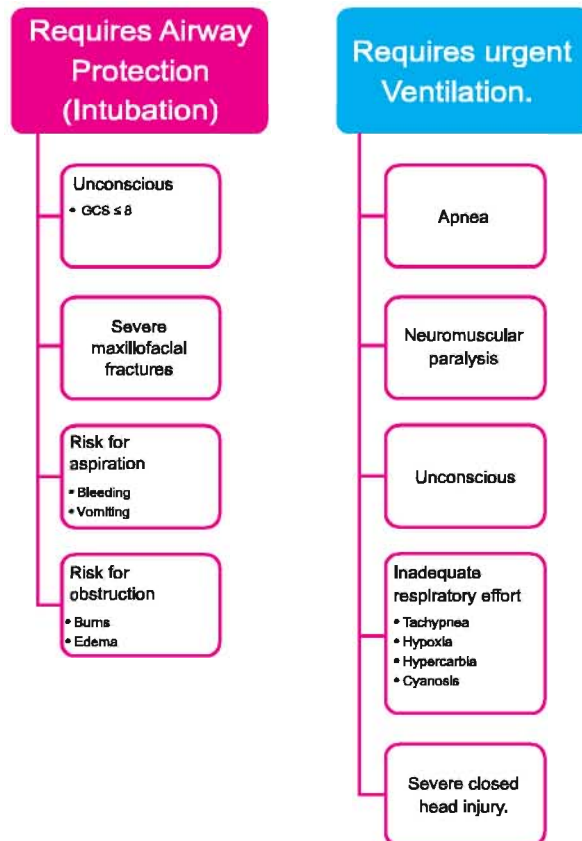


(A) Airway, assessment and management

Ensure all patients have an open airway. The first priority is NOT to intubate the patient, but your first priority is to ensure the patient has an OPEN airway. In most patients, this is achieved with simple basic life support procedures including positioning, suction, and insertion of an oral or nasopharyngeal airway.

✓ All trauma patients should receive high flow oxygen until hypoxia is ruled out.

Any airway obstructions are a direct threat to life and should be treated immediately. Untreated, a compromised airway lowers the PaO₂, increases the CO₂ and





results in hypoxic damage to the brain, kidneys, heart and eventually cardiac arrest. A depressed level of consciousness can be either the cause of airway compromise or the result of airway compromise. Confusion and agitation are both common warning signs of hypoxia.

- ✓ Central cyanosis and decreased pulse oximetry reading are both very late signs of airway compromise or obstruction.
- ✓ Indications For Definite Airway
 - o In some trauma patients, the establishment of a definitive airway will be the immediate life-threat to the patient and should be prioritized as such.

Cervical Spine Considerations in Airway Management

Injuries to the cervical spine are relatively rare, but occur in approximately 2% of blunt trauma patients. If the trauma victim has a Glasgow Coma Score less than eight or if there is a focal neurologic deficit, the probability of cervical spinal injury is higher. The standard of care for all potential spinal trauma includes immobilization of the cervical spine. Ensuring and maintaining a functional airway in patients suspected of spinal trauma is challenging. All airway interventions cause spinal movement.

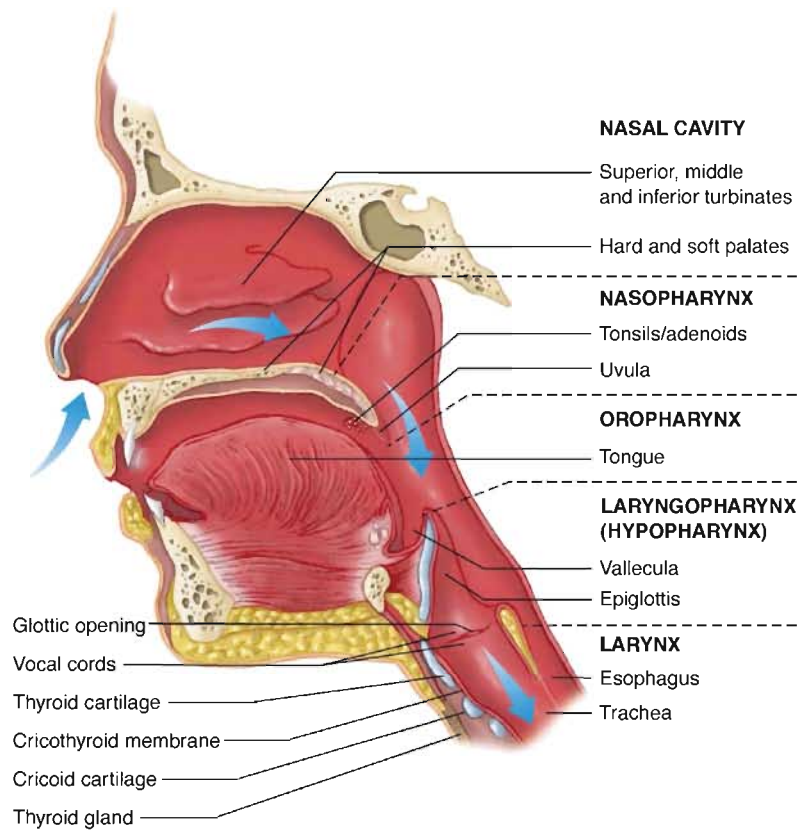
Immobilization techniques, including cervical collars, may limit spinal movement during airway interventions, but does not prevent cervical spine movement.^{xv}

Understanding the risk versus benefit of airway management, and the establishment of a secure airway in trauma patients are vital to survival. While maintaining the cervical spine in a neutral position, with manual immobilization, secure the airway with the most effective method available. Limit cervical spinal movement, while being careful not to impose hypoxia.



Considerations

Assessment of the trauma patient's airway is a dynamic process that should be frequently repeated. Not only consider the immediate threats to the airway, but also consider impending areas of airway compromise. Trauma patients are at a high risk for airway compromise. Procedures, including intubation are at risk of becoming dislodged. Each move presents a high risk for ET tube displacement.





Chest Trauma

25% of trauma deaths are due to chest trauma, and 1/3 of these deaths occur immediately after the incident or during transportation to the hospital. Chest trauma may be from simple rib fractures to exsanguinating life threatening injuries.

Management of chest trauma starts with simple ABC care, followed by specific care. However, most of the chest trauma can be managed by simple analgesic and chest physiotherapy and tube thoracostomy when needed.

OPEN PNEUMOTHORAX

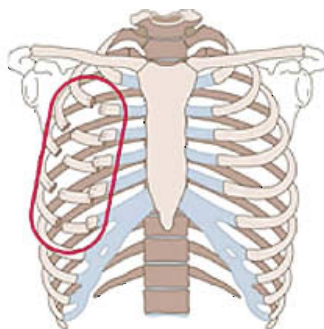


Apply an occlusive dressing to open chest wounds and tape (seal) down on three sides.

Common Life Threatening Injuries

- Airway Obstruction
- Open pneumothorax
- Tension pneumothorax
- Massive hemothorax
- Flail Chest
- Diaphragmatic Rupture (tear)
- Bronchial Disruption
- Esophageal Injury
- Pulmonary Contusion
- Myocardial Contusion
- Cardiac Tamponade

FLAIL CHEST



Flail chest segments (fracture of three or more ribs in two or more locations with paradoxical movements) A flail chest is usually associated with a pulmonary contusion. The flail chest should initially should be stabilized with the care providers gloved hand and slight pressure. This can be replaced by taping bulky dressings over the segment. **Do not use sandbags** to stabilize a flail segment, this can result in ventilatory impairment.

Good analgesia including intercostal blocks, allows much better ventilation, with improved tidal volume, and increased blood oxygenation, antibiotics, medications including furosemide and *methyl prednisone*, and ventilation. Do not overhydrate the patient.

“Treat as you go!”



(B) breathing, assessment and management

While you are physically evaluating the airway, you are also evaluating the quality and quantity of breathing. Identify and treat any compromise in the quality or quantity of the breathing. Assessment of the breathing involves more than the respiratory rate; the complete respiratory system should be quickly assessed for current and potential threats to life.

Visual inspection of the face, neck, and chest are essential. Apply the principles of look, listen, and feel. If the patient has spontaneous respirations, look carefully for equal rise and fall of the chest and the use of accessory muscles. Carefully look and feel for evidence of obvious chest wall trauma, flail segments (two or more ribs fractured at two or more location) and open chest wounds. Look at the neck for venous distention, subcutaneous emphysema, and tracheal positioning. Listen for breaths sounds.

👉 In the hypovolemia patient, volume may be insufficient to produce JVD related to a tension pneumothorax

Identify and MANAGE anything that interferes with OXYGENATION or VENTILATION.

Inspect the neck for:

- Tracheal deviation
- J V D
- Sounds of obstruction

Assess Oxygenation

- Cyanosis (Mucous)
- Oxygen Saturation
- Evidence of Hypoxia

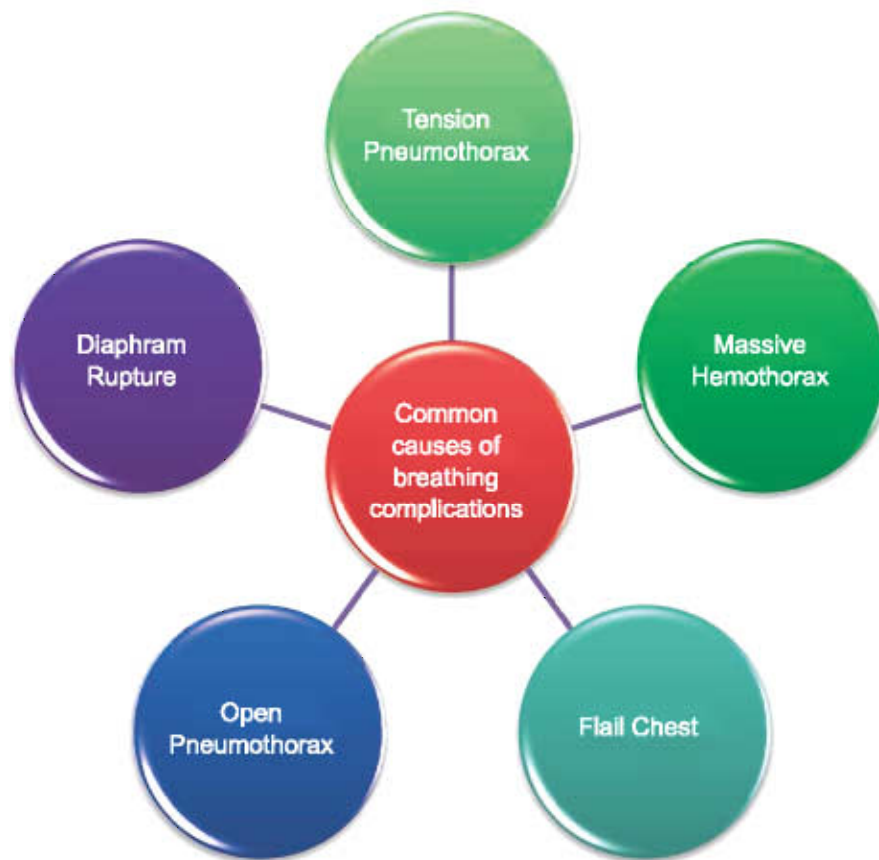
Inspect the chest for:

- Contour
- Appearance
- Symmetry with movement
- Signs of soft tissue injury
- Paradoxical movement of the chest wall

Assess Ventilation

- Rate
- Depth
- Quality
- Effort
- Use of accessory muscles
- Presence of Breath Sounds

If Respiratory distress is noted, look for the cause.



- ✓ Common procedures to manage breathing complications:
 - o Bag-Valve-Mask ventilation: 1 breath every 6 seconds with oxygen
 - o Relieve a tension pneumothorax immediately with a needle decompression
 - Place a chest tube after primary life-threats are identified
 - o Seal an open pneumothorax



(C) Circulation, assessment and management

Circulation Assessment

Rapidly complete a head to toe check for evidence of major hemorrhage. **Stop** external hemorrhage. **Identify** potential internal bleeding.



Palpate and compare the Radial and Carotid pulses and quickly evaluate the general rate (fast or slow), rhythm (regular or irregular) and quality (bounding, weak).

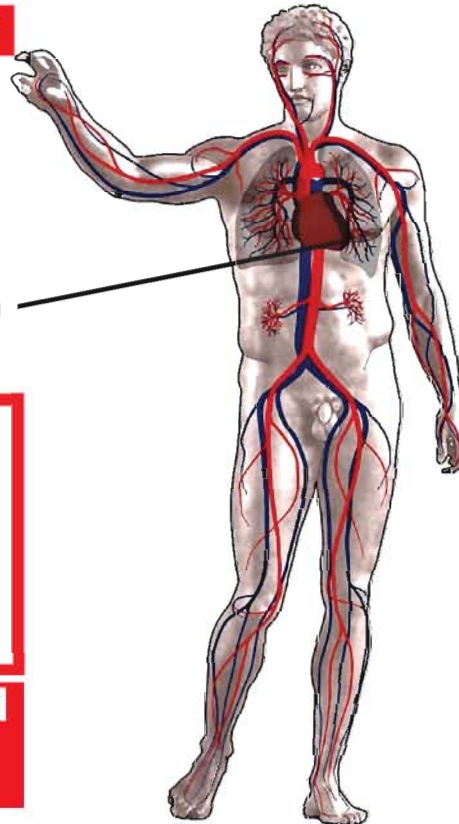


SUSPECT INTERNAL BLEEDING

If the patient shows signs of hypovolemia without an obvious source of external bleeding.

Remember, patients with external hemorrhage may also have unrecognized internal injuries.

Tension pneumothorax, cardiac tamponade and cardiac dysfunction due to direct cardiac injury can all lead to inadequate cardiac output and hypo-perfusion.



Approximate Internal Blood Loss

- Fracture ~ Blood Loss
- Rib 125 mL
- Radius / Ulna 250-500 mL
- Humerus 500 - 750 mL
- Tibia 500 - 1000 mL
- Femur 1000 - 2000 mL
- Pelvis 1000 mL ++

**If no pulse is found
Start CPR**

“Treat as you go!”



Uncontrolled hemorrhage accounts for up to 40% of all trauma related death, and is subsequently a leading contributor to delayed death from organ failure and shock syndromes. Hypotension in trauma patients is hypovolemia unless proven otherwise. Identify and control all major hemorrhages with standard techniques or damage control surgery.

Remember that circulation can be compromised by non-circulatory system factors including a tension pneumothorax.

Assessment

- ✓ Vital signs, if obtained by an additional team member, are helpful in evaluating the circulation if only obtaining vital signs (blood pressure) does not delay identification of hemorrhage.
- ✓ Measure the capillary refill time (CRT) by applying cutaneous pressure on a fingertip, held at heart level, and counting the time it takes for the capillary bed to refill after pressure is released.
 - o The normal value for CRT is two seconds or less.
- ✓ Look at the skin color and temperature.
- ✓ Palpate peripheral and central pulses.
 - o Assess for presence, rate, quality, regularity and equality.
- ✓ Carefully examine the patient for uncontrolled external hemorrhage and evidence of concealed hemorrhage.
 - o Specifically consider intrathoracic, intrabdominal, and pelvic or long bone fractures.



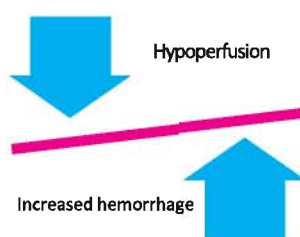
Obtain venous access

Insert one, or more, large gauge (14 or 16 G) intravenous cannulae. Short, widebore cannulas, in the upper extremity is preferred. If IV access cannot be easily achieved, alternative routes for access should be considered including:

- Intraosseous: acceptable in adult & children.
 - o Do not place in a potentially fractured extremity.
- Venous cut-down
- Central Line

Fluid administration in trauma

The administration of intra-venous fluid as part of the resuscitation of trauma patients has historically been emphasized and considered a central part of trauma care. All trauma patients historically received an initial fluid bolus of two liters of saline (NS) or ringer's lactate (RL). If hypotension continued, isotonic fluid was continued until blood was available. In recent years however, the process of large volume fluid resuscitation in trauma has become controversial. Research has demonstrated that aggressive fluid resuscitation in penetrating trauma, without access to immediate damage control surgery, resulted in higher mortality and morbidity. In many trauma systems, permissive hypotension resuscitation is now used for the initial resuscitation of trauma patient. However, in victims of crush related injuries, large volumes of fluid (20ml/kg) are required to reduce the danger of hyperkalemic cardiac arrest when the entrapped tissue is released.

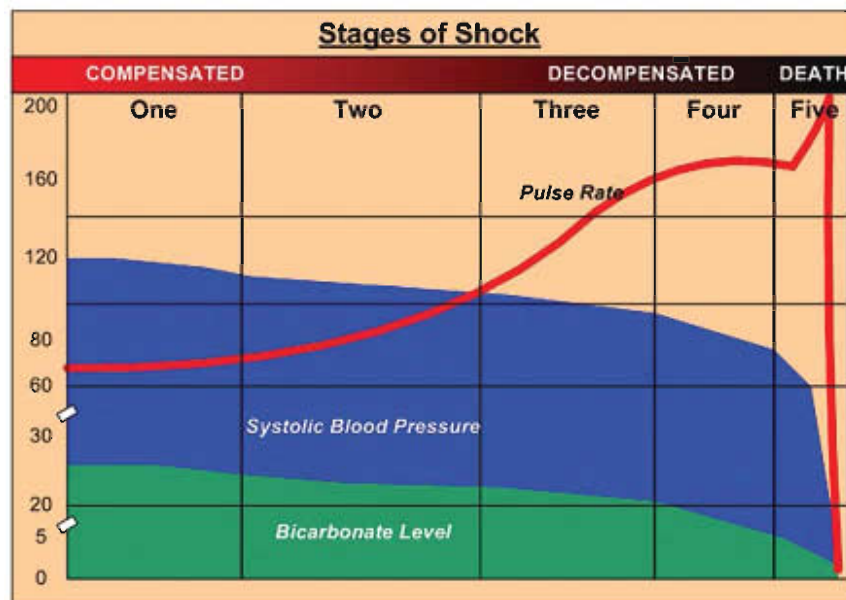


Should IV fluid bolus be part of the trauma resuscitation Hypoperfusion protocol? Unfortunately, there is not a single guideline to answer this question. Volume for organ perfusion must be balanced against the risk of increased bleeding as blood pressure rises. Excessive fluid resuscitation may increase bleeding and re-bleeding. Prior to definitive hemorrhage control, a lower-than-normal blood pressure may be accepted. The specific decision on the most appropriate fluid management of the trauma patient will need to be individually considered for each patient.



General considerations to guide fluid resuscitation can include:

- If the adult patient is conscious, does not have a head-injury, and the time to definitive surgical care is over 30 minutes it is acceptable to provide fluid boluses in increments of 200ml to achieve a systolic blood pressure of 90 mmHg.
- In the adult patient with potential head trauma, maintaining a systolic blood pressure over 90mmHg is essential, One episode of hypotension (less than 90mmHg systolic) can be detrimental.



Changes in blood pressure or pulse rate are a late sign of shock.



Hemorrhage Control

“Stop the bleeding!”

- ✓ Hemorrhage is the leading cause of preventable trauma death.

Hemorrhage Types

External

- ✓ External hemorrhage is generally due to an extremity injury with an open fracture or an amputation.
- ✓ Scalp and torso wounds also contribute to external hemorrhages.

Treatment / Control

- Direct pressure at site of injury is the most effective and preferred method of hemorrhage control.



A bandage alone is not direct pressure! A bandage may actually wick blood from the wound without stopping the bleeding or hiding ongoing bleeding.

- o If direct pressure fails to stop the hemorrhage, the wound is deep, massive, or an arterial injury that and will require surgery.
- o Hold pressure for at least 5 minutes before looking to see if it is effective.

Impaled foreign bodies should not be removed because profuse bleeding may occur.

- Elevation of the extremity will decrease most bleeding-this is an under-appreciated technique.
- Pressure Point compression of the proximal artery.
 - o May help slow bleeding while attempting to gain better control at the wound site.
 - o May require compression at the pressure point for up to 20 minutes to provide hemostasis.
- Limb splints will decrease bleeding associated with fractures and soft tissue injury by aligning, stabilizing, and returning the limb to length.



- Tourniquets
 - A tourniquet should be applied if previous techniques fail.
 - Use a tourniquet early, rather than allow ongoing blood loss.
 - Substitutes for issued tourniquet include belt, torn cloth, gauze, and rope, among others.
 - Rapid method to secure hemorrhage control.
 - Does not require constant attention; allows first responder to care for others — extends resources.
 - Tourniquets should not be removed until the hemorrhage can be reliably controlled or until arrival at surgery.
- ☞ Tourniquet placement on the forearm or leg may not compress the vessels, which lie between the double long bones. Tourniquets for upper extremity injuries should be placed on the upper arm. If bleeding from the lower extremity is not controlled by a tourniquet on the leg, it should be moved to the thigh where the vessel may be more easily compressed.
- ☞ Risk_benefit decision: Do not avoid a tourniquet in order to save a limb, and then lose a life! Use of tourniquet does not always lead to limb loss.
 - Scalp bleeding: can be significant due to the rich vasculature of the scalp but usually can be managed with direct pressure.
 - Compression dressings must be applied if you cannot provide ongoing direct pressure.
 - Difficult to apply and maintain direct pressure.
 - Requires circumferential head application.
 - Vertical mattress suture closure sometimes is necessary to control bleeding scalp edges.
 - A readily identified bleeding vessel can be clamped, but the wound should generally not be explored.
 - Avoid pushing fragments into brain when applying pressure, but control hemorrhage even at the expense of exposed brain.
 - Protection of exposed brain with non-adherent gauze or plastic can minimize injury.

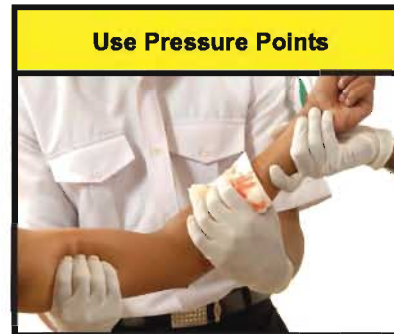


Internal Hemorrhage

- ✓ Chest, abdomen, pelvis, and closed extremity fractures.
- ✓ Internal hemorrhages are associated with a high mortality rate if the hemorrhage is not quickly treated.
- o Most patients with internal hemorrhage require damage control surgery.

Treatment/Control

- ✓ Blood loss into the abdomen or chest immediate damage control or definitive surgery.
- ✓ Stabilize Pelvic fractures by wrapping the pelvis tightly with a wide strap or a folded sheet.
- ✓ Immobilize suspected fractures
- ✓ Open torso injuries
 - o If direct pressure does not stop the hemorrhage, consider tamponading the injury with a balloon (Foley) catheter, Insert the Foley into the wound, inflate the balloon and pull back to compress the bleeding site.



A combination of techniques for hemorrhage control may be effective when bleeding is resistant to direct pressure.

REMEMBER:
Elevating the blood pressure in a trauma patient with uncontrolled hemorrhage:
Accelerates the hemorrhage
Dilutes clotting factors
Disrupts clotting process

Trauma is not a generic disease! A gunshot wound to the abdomen is not treated the same as head trauma.

Whole blood transfusion is the ultimate life saving treatment for hemorrhagic shock.

A Blood Pressure cuff can be used to stop bleeding.



Consider:

- Insert two large bore IV cannula (14 or 16 gauge)
- Infuse IV fluid bolus of 1 liter normal saline to maintain central circulation
- Continue fluid replacement as indicated by response of vital signs
- Consider sending the patient immediately for surgical interventions to stop internal bleeding.



- ✓ Dressings and bandages
 - o Dressings assist with the clotting process, protect wounds from additional injury and contamination, immobilize tissues, and provide physical and psychological support to the patient.
 - o Before applying dressings, assess the neurologic status and circulation in the extremity. Reassess after the bandage is applied.
 - o Dressings should cover the entire wound.
 - o Leave fingers and toes exposed.
- ✓ Do not remove the dressing after it is applied, as this will break coagulation. If the dressing is saturated, add additional dressings, apply direct pressure, and consider a proximal tourniquet.

(D) Disability

In the initial assessment perform a rapid, but abbreviated neurological exam to assess the level of consciousness (AVPU), record the Glasgow Coma Score, pupil reactivity, and motor function. If the patient has any paralysis or numbness, evaluate and record the level.

Common causes of unconsciousness include profound hypoxia, hypercapnia, cerebral hypoperfusion, or the recent administration of sedatives or analgesic drugs. Measure the blood glucose using a rapid glucose meter or stick method to exclude hypoglycaemia



AVPU

Alert **V**erbal **P**ain **U**nresponsive

OXYGEN **INTUBATION**

- Alert: Patient is appropriately responsive to verbal stimuli.
- Verbal: Patient vocalizes incomprehensibly or inappropriately.
- Pain: Patient responds only to painful stimuli like a sternal rub.
- Unresponsive: Patient is unresponsive to painful Stimuli.

Glasgow Coma Score

ADULT			CHILD		
EYE	Spontaneous	4	EYE	Spontaneous	4
	To Voice	3		To Voice	3
	To Pain	2		To Pain	2
	None	1		None	1
VERBAL	Oriented	5	VERBAL	Oriented	5
	Confused	4		Confused	4
	Inappropriate	3		Inappropriate	3
	Incomprehensible	2		Incomprehensible	2
	None	1		None	1
MOTOR	Obeys	6	MOTOR	Obeys	6
	Localizes Pain	5		Localizes Pain	5
	Withdraws Pain	4		Withdraws Pain	4
	Flexion Pain	3		Flexion Pain	3
	Extension Pain	2		Extension Pain	2
	None	1		None	1

 A GCS of eight requires intubation and airway management.

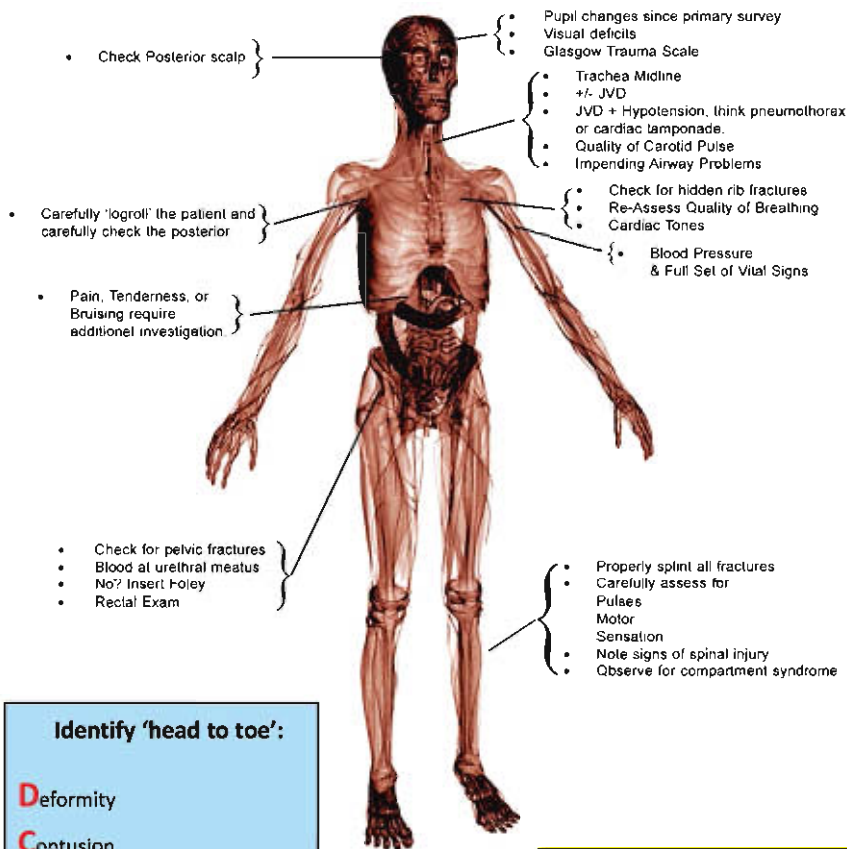


(E) Exposure/Examination

All significant trauma patients should receive a full, detailed physical examination to ensure details and hidden trauma is not missed. Expose patients in a way to respect the dignity of the patient and prevents heat loss. Logroll the patient and check the back.

Adjuncts to the Primary Survey

- ✓ ECG Monitoring
- ✓ Urinary Catheter
- ✓ Gastric Catheter
- ✓ Pulse oximeter
- ✓ Blood pressure
- ✓ X-rays
 - o APCXR
 - o AP pelvis
 - o C-spine
- ✓ Diagnostic peritoneal lavage
- ✓ Abdominal ultrasonography (FAST)
- 👉 Consider the requirement to transfer the patient to definitive care.



- Identify 'head to toe':**
- D**eformity
 - C**ontusion
 - A**brasion
 - P**uncture/Penetrating Injury
 - B**urns
 - T**enderness
 - L**aceration
 - S**welling

- Reassess and check all interventions:**
- Intubation
 - Basic Airway Interventions
 - Oxygen Supply
 - Open Pneumothorax Dressing
 - Needle Decompression
 - Splints
 - Pelvic Stabilization
 - Bleeding control & dressings



Secondary Survey

The secondary survey does not begin until the primary survey is completed, resuscitation efforts are well established, and the patient is demonstrating normalization of vital functions. In major trauma patients, the secondary survey, or a complete detailed survey, of the patient may be significantly delayed.

The secondary survey is a detailed, systematic assessment and complaint focused, physical examination of the patient. Obtain a complete set of vital signs, and start trending the vital signs watching for subtle changes.

Detailed Patient History:

Obtain a detailed patient history, if possible, directly from the patient. If language, culture, disability or patient condition interferes, consult family members, significant others, scene bystanders or first responders. Record "AMPLE" patient history: Allergies, Medication, Past medical history, Last oral intake, and Events leading to the injury.

During the secondary survey, carefully and critically evaluate all interventions performed during the primary assessment. Order relevant laboratory investigations, x-rays, or special procedures.

Physical Exam

- ✓ Head and Face
 - o Observe and palpate skull (anterior and posterior) for signs of trauma (contusions, abrasions, deformity, crepitus, or lacerations)
 - o Check the eyes for: equality and responsiveness of pupils, movement and size of pupils, foreign bodies, discoloration, contact lenses
 - o Check nose and ears for foreign bodies, fluid, or blood
 - o Recheck mouth for potential airway obstructions (swelling, dentures, loose or avulsed teeth, vomit, malocclusion, absent gag reflex) and odours, altered voice or speech patterns, and evidence of dehydration



- ✓ Neurologic Exam
 - o A brief neurologic exam, limited to AVPU and GCS, was performed during the primary assessment. Repeat the GCS score and a complete neurologic examination.
- ✓ Neck
 - o Observe and palpate for signs of trauma, jugular venous distention, use of neck muscles for respiration, tracheal shift or deviation, cervical spine tenderness, stoma
 - ☞ Any unresponsive trauma patient or a patient with significant injury above the clavicle should be considered to have a potential cervical spine injury until ruled out.
- ✓ Chest
 - o Observe and palpate for signs of trauma, implanted devices (pacemaker), medication patches, chest wall movement, asymmetry, retractions and accessory muscle use
 - o Have a patient take a deep breath, observe and palpate for signs of discomfort asymmetry, and air leak from any wounds
 - o Auscultate breath sounds bilaterally
 - Pain from rib fractures may compromise ventilation
- ✓ Abdomen
 - ☞ All trauma patients must have abdominal injuries excluded. Detecting the presence of blood in the abdomen is more important than identifying the source at this stage of trauma management.
 - o Observe and palpate. Look for signs of trauma, scars, diaphragmatic breathing and distention.
 - o Palpation should occur in all four quadrants taking special note of tenderness, masses and rigidity



- ✓ Pelvis/Genito-urinary
 - o Observe and palpate for signs of trauma or asymmetry, incontinence, priapism, blood at urinary meatus, or presence of any other abnormalities
 - o Gently palpate lateral pelvic rims and symphysis pubis for tenderness, crepitus, or instability
 - ☞ Pelvic fractures are often associated with other intra-abdominal injuries
 - o Palpate bilateral femoral pulses
- ✓ Extremities
 - o Observe and palpate for signs of trauma, asymmetry, skin color, capillary refill, edema, medical information bracelets, track marks, and equality of distal pulses
 - o Assess sensory and motor function as indicated
- ✓ Back
 - o Observe and palpate for trauma, asymmetry, spinal tenderness, and sacral edema

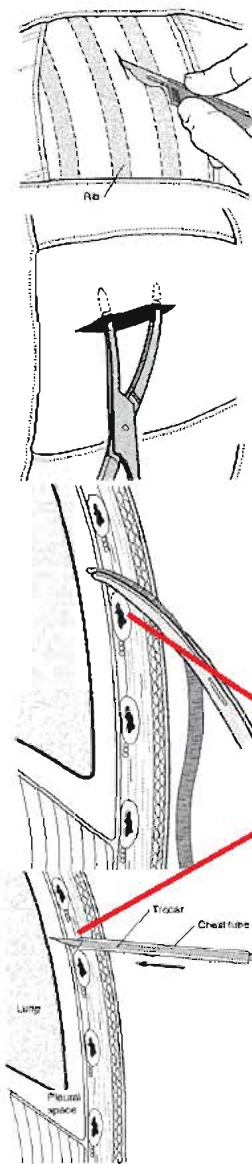


Summary principles of trauma care

- ✓ Use a systematic approach, based on airway, breathing and circulation (i.e., the ABCDEs) to assess and treat the acutely ill patient.
- ✓ Undertake a complete initial assessment and re-assess regularly.
- ✓ Always assess the effects of treatment or other interventions.
- ✓ Always correct life-threatening abnormalities before moving on to the next part of assessment.
- ✓ Recognize the circumstances when additional help is required and ask for it early.
- ✓ Use all members of the multidisciplinary team.
- ✓ Communicate effectively.
- ✓ The underlying aim of the initial interventions should be seen as a “holding measure” that keeps the patient alive, and produces some clinical improvement, in order that definitive treatment may be initiated.
- ☞ Remember that it often takes a few minutes for resuscitative measures to have an effect.



Insertion of Chest Drain



Indications for Underwater-Seal Drainage are:

- Pneumothorax
- Hemothorax
- Hemopneumothorax
- Acute empyema.

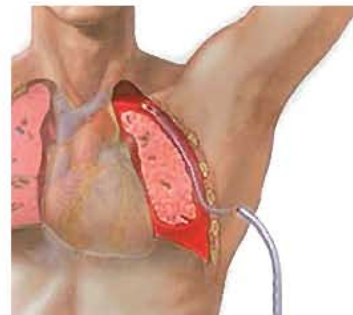
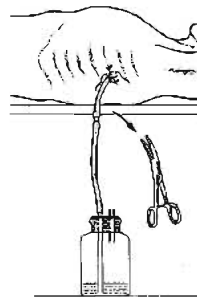
Technique

1. Prepare the skin with antiseptic and infiltrate the skin, muscle and pleura with 1% lidocaine at the appropriate intercostal space, usually the fifth or sixth, in the mid-axillary line.
 - Note the length of needle needed to enter the pleural cavity; this information may be useful later when you are inserting the drain.
2. Aspirate fluid from the chest cavity to confirm your diagnosis.
3. Make a small transverse incision just above the rib to avoid damaging the vessels under the lower part of the rib.

In children, it is advisable to keep strictly to the middle of the intercostal space.
4. Using a pair of large, curved artery forceps, penetrate the pleura and enlarge the opening. Use the same forceps to grasp the tube at its tip and introduce it into the chest.
5. Close the incision with interrupted skin sutures, using one stitch to anchor the tube. Leave an additional suture untied adjacent to the tube for closing the wound after the tube is removed. Apply a gauze dressing.
6. Connect the tube to the underwater-seal drainage system and mark the initial level of fluid in the drainage bottle.

Only Sterile Saline should be used in the "water" seal.

Insert the chest drain over the rib.





Head Trauma

General Physical Condition:

Basal Skull Fracture, inspect for:

- Raccoon Eyes • Battle Signs • CSF Rhinorrhea • CSF Otorrhea • Hemotympanum

Cranio-Cervical auscultation:

- Auscultation over carotid arteries
- Auscultation over globe of eye

Observe:

- Sign of trauma to spine
- Evidence of seizure

Cervical Spine Stabilized
Spinal trauma (Injuries) are common with head trauma.)

Ensure Open Airway & Adequate Breathing

Do Not Hyperventilate
Neurosurgical consultation should be requested, if possible, before beginning aggressive hyperventilation.

Evaluate Circulation
Maintain Systolic Blood Pressure above 90 mmHg

Neurologic Exam

Cranial Nerve Exam

Optic nerve:

- Rosen Baum near vision card
- count finger/hand movement
- light perception
- swinging flashlight test (if unconscious)

Motor Examination

- (i) If patient is *uncooperative*, check for movement of all 4 extremities to *noxious stimuli*.
 - See Motor Examination Reference Chart
- (ii) If any doubt about integrity of spinal cord, check "resting" tone of anal canal.

Sensory examination

- (i) Cooperative patient:
 - pinprick,
 - touch,
 - joint position sense in a major dermatome
- (ii) Uncooperative patient:
 - check for central response to noxious stimuli

Establish IV Access
Isotonic IV Fluids 100 ml / hour

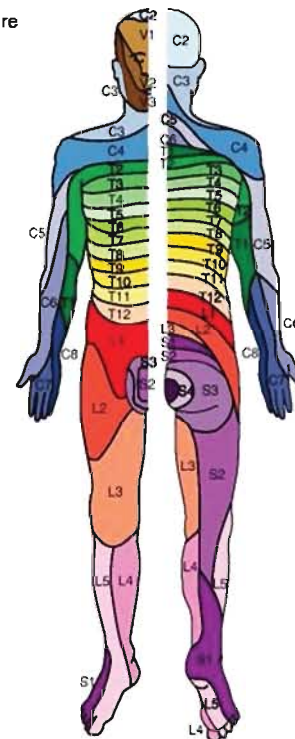
Continuing Care

Clinical Examination with Neuro Checks
Repeat every 2 hours

Keep patient NPO until alert
Then clear fluids, advance as patient can

Mild Analgesics
Paracetamol PO/PR

Antiemetic
(Avoid phenothiazine)



Motor Examination Reference Chart

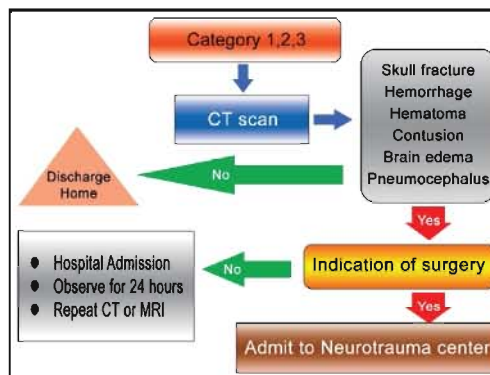
Grade	On examination
0	No contraction
1	Flicker of contraction
2	Movement not against gravity
3	Movement against gravity not against resistance
4	Weaker movement against resistance
5	Normal power



Categorization of Head Trauma

Categorization of head trauma is based on:

- Glasgow Coma Score
- Loss of Consciousness
- Post Traumatic Amnesia
- Risk Factors
 - Ambiguous Accidental History
 - Continued Post Traumatic Amnesia
 - Retrograde Amnesia > 30 Minutes
 - Sign of Skull Fracture
 - Vomiting
 - Focal Neurological Deficit
 - Coagulopathy
 - Mechanism of Injury in a high speed collision
 - Patient Age is less than 2 years or Over 60 years



Glasgow Coma Scale

Eye Opening Response

- 4 Points
- 3 Points
- 2 Points
- 1 Point

- Spontaneous—open with blinking at baseline
- To verbal stimuli, command, speech
- To pain only
- No response

Verbal Response

- 5 Points
- 4 Points
- 3 Points
- 2 Points
- 1 Point

- Oriented
- Confused conversation, but able to answer questions
- Inappropriate words
- Incomprehensible speech
- No response

Motor Response

- 6 Points
- 5 Points
- 4 Points
- 3 Points
- 2 Points
- 1 Point

- Obeys commands for movement
- Purposeful movement to painful stimulus
- Withdraws in response to pain
- Flexion in response to pain (decorticate posturing)
- Extension response in response to pain (decerebrate posturing)
- No response

GCS:

No eye opening, no ability to follow commands, no word verbalizations (GCS 3-8)

Head Injury Classification:

Severe Head Injury
GCS score of 8 or less

Moderate Head Injury
GCS score of 9 to 12

Mild Head Injury
GCS score of 13 to 14

Minimal Head Injury
GCS score of 15

General Discharge Advise for Patients Should Include

- Seek medical attention when:**
- Deterioration in level of consciousness
 - Abnormal behavior
 - Increased headache
 - Slurred speech
 - Weakness or decreased sensation in any limb
 - Persistent vomiting
 - Seizures
 - Increase swelling of lesion

- DO NOT:**
- ✓ Take strong sedative or pain medication for 24 hours.
 - ✓ Take Aspirin or other anti-inflammatory medication
 - ✓ Take alcohol for 48 hours from injury



Abdominal Trauma

Basic Care Principles

The top priority in evaluating a patient with abdominal trauma is to recognize conditions that require prompt surgical intervention. The most common mistake in abdominal trauma is prolonging a physical exam and delaying required emergency surgical intervention.

Primary survey and resuscitation: Identify and treat immediate life threatening problems

- A - Airway with cervical spine control
- B - Breathing and provision of oxygen to maintain saturation 90%-92%
- C - Circulation with control of bleeding to maintain SBP 90-100mmHg
- D - Disability
- E - Exposure with control of environment

Emergency Interventions

- IV access with two 16G – 18G catheters
- Maintain control of fluid infusions to achieve a SBP 90-100mmHg. Do not infuse excessive fluids prior to surgical exploration.
- Blood Transfusions: If shock persists after 2-3 L of crystalloids switch to blood or blood products.
- NPO / Nasogastric Tube
- Foley's Catheter
Inspect external genitalia and look for blood at external meatus prior to inserting catheter; insert a suprapubic catheter if ruptured urethra
Measure urine output
- Investigations to be completed after initial resuscitation and stabilization of the patient:
 - CXR
 - AXR
 - USG if available
- Consider:
Antibiotics for open and penetrating injury
Tetanus prophylaxis

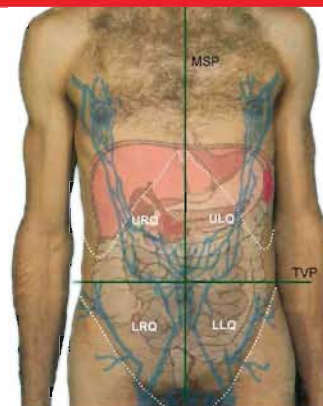
Refer the patient to expert care.

Most Common Injuries:

ORGAN	FREQUENCY
• Spleen	25%
• Liver	15%
• Small & Large Intestines	
• Kidney	12%
• Pancreas	3%
• Urinary Bladder	6%
• Urethra	2%
• Vascular	2%

Keynotes of Abdominal Trauma

- Missed abdominal injuries and haemorrhage are frequent causes of morbidity and mortality.
- Do not send abdominal trauma patients for specific investigations until resuscitation is complete and patient is stable.
- Physical abdominal examinations are unreliable due to many reasons including an altered mental status, drug and alcohol intoxication, distracting injuries.
- Lower rib fractures can be associated with liver (ribs 7-9) and spleen (ribs 9-10) injuries.
- A gastric tube should be placed to evacuate stomach contents and check for the presence of blood. (Unless contraindicated)
- Frequent abdominal reevaluations of patients with a significant mechanism of injury is critical.
- A rectal examination should be performed.





Pelvic Fractures

Pelvic Ring Fractures

- Pelvic fractures occur as a result of high-energy trauma and are frequently accompanied by injuries to the genitourinary system and abdominal organs.
- Internal blood loss caused by fracture of the pelvis and soft organ damage causes hypovolemic shock
- Stable fractures are those with a single fracture component.
- Unstable patterns result from fractures at two or more sites, or those associated with disruption of the symphysis pubis or sacroiliac articulation.
- Unstable fractures are associated with significant blood loss and multiple system injury
- Treat initially with systemic resuscitation and temporary pelvic compression
- Complications include deep vein thrombosis, sciatic nerve injury and death from bleeding or internal organ damage.

Evaluation

Physical examination findings include:

- Flank ecchymosis
- Labial or scrotal swelling
- Abnormal position of the lower extremities
- Pain with pelvic rim compression.

If the fracture is unstable, you will feel differential motion of the pelvic components when gently manipulating them.

Place your hands on the iliac wings and gently rock the pelvis. Confirm the diagnosis with an anterior-posterior X-ray of the pelvis. Additional inlet and outlet views help determine the extent of the fractures.

Remember to focus on a systematic examination of the whole patient.

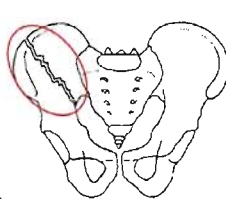
Treatment: Stable Fractures

- Focus the initial management on general resuscitation efforts
- Manage stable pelvic fractures with bed rest and analgesics.
- Stable fractures are rarely associated with significant blood loss.

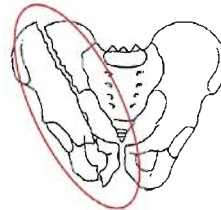
Unstable fractures

Unstable fractures are associated with visceral damage and there is often significant bleeding. As an emergency procedure:

1. Place compression on the iliac wings, using a sheet or sling to close the pelvic space and tamponade active bleeding.
2. Treat with a pelvic sling and/or traction on the leg to reduce the vertical shear component of the fracture.
3. Maintain the traction until the fracture has consolidated. Refer to orthopedic consultation.



Stable Fracture



Unstable Fracture

Pelvic Ring Fractures

- Death from pelvic fracture is due to severe internal hemorrhage in unstable pelvic fractures.
- Pain on side-to-side and Antero-Posterior compression on pelvis is diagnostic of pelvic fractures.
- Bleeding from meatus is diagnostic of ruptured urethra with a pelvic fracture. Do not insert foleys catheter, but use a suprapubic access catheter in this case.
- Closely Monitor Pulse and Blood Pressure
- Place large gauge IV catheter
- Check for blood group
- Place pelvic bandage (sling, Urna or Gamcha) to reduce hemorrhage

- Aggressively manage hypotension
- Stabilize fracture immediately
- Suspect intra-abdominal organ damage



Burns

Management of Burns

The burns patient has the same priorities as all other trauma patients.

Assess:

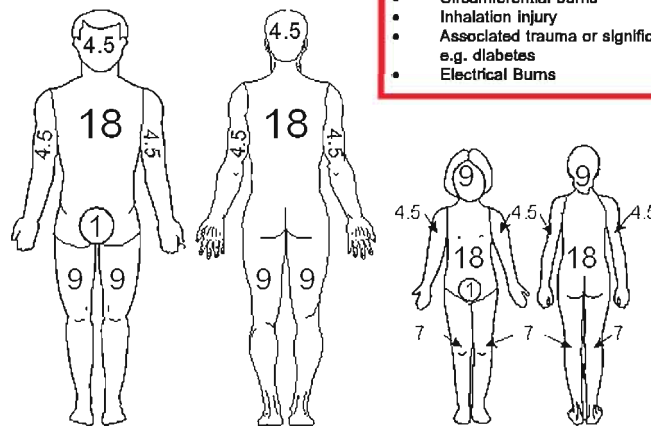
- Airway:** Maintain high suspicion for inhalation burns
- Breathing:** Anticipate rapid airway compromise
- Circulation:** IV Access / fluid replacement
- Disability:** decompress compartment syndrome (May seek expert advice.)
- Exposure:** remove clothing, jewelry, etc. Look for other injuries.
- Estimate:** percentage area of burn.
- Fluids:** Refer to parkland formula.
- Foley Catheter:** Monitor urine output.

Essential management points:

- Stop the burning process immediately, cool the burn
- Determine the percentage area of burn (Rule of 9's)
- Establish IV access (14G or 16G)
- Initiate early fluid replacement.
- Initiate pain management (Morphine)
- Consider Antibiotics and Tetanus Immunization

The severity of the burn is determined by:

- Burned surface area
- Depth of burn
- Other considerations.



Parkland Burn Formula 4 mL x Burn % x weight (kg)

Patient is given 1/2 in first 8 hours.
Remainder over next 16 hours.

The burned surface area

- Morbidity and mortality rises with increasing burned surface area. It also rises with increasing age so that even small burns may be fatal in elderly people.
- Burns greater than 15% in an adult, greater than 10% in a child, or any burn occurring in the very young or elderly are considered serious.

Burns in adults

The "Rule of 9's" is commonly used to estimate the burned surface area in adults.

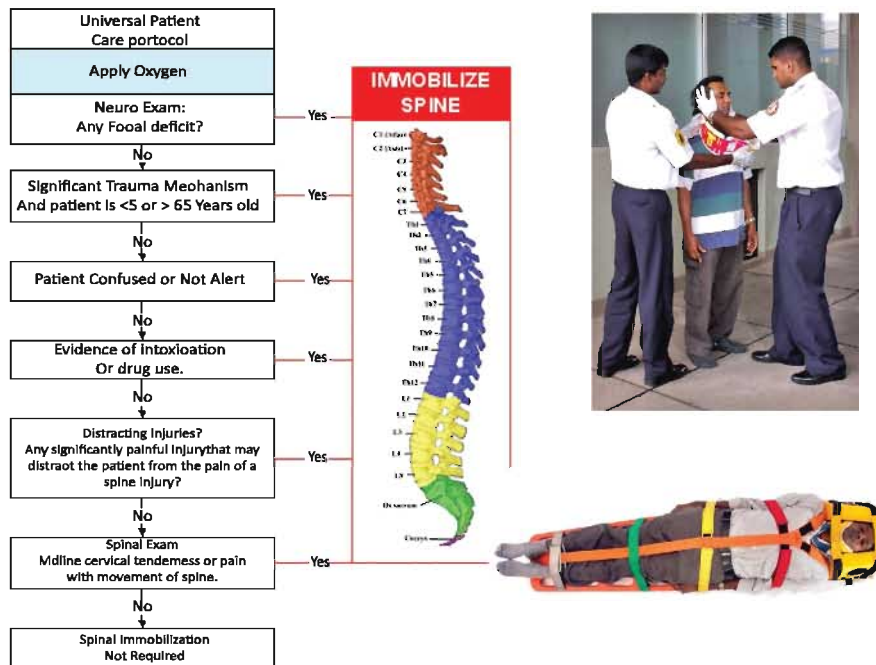
The body is divided into anatomical regions that represent 9% (or multiples of 9%) of the total body surface. The outstretched palm and fingers approximates to 1% of the body surface area. If the burned area is small, assess how many times your hand covers the area.

Serious Burns

- Adults with >15% BSA Burns
- Children with >10% BSA Burns
- Any burn in the very young or the elderly
- Full thickness burns
- Burns involving face, hands, feet, perineum
- Circumferential burns
- Inhalation injury
- Associated trauma or significant pre-burn illness: e.g. diabetes
- Electrical Burns



Spinal Immobilization



Significant mechanism includes high-energy events such as ejection, high falls, and abrupt deceleration crashes and may indicate the need for spinal immobilization in the absence of symptoms.

- Range of motion should NOT be assessed if patient has midline spinal tenderness. Patient's range of motion should not be assisted. The patient should touch their chin to their chest, extend their neck (look up), and turn their head from side to side (shoulder to shoulder) without spinal process pain.
- The acronym "**NSAIDS**" can be used to remember the steps in this protocol.
- "**N**" = Neurologic exam. Look for focal deficits such as tingling, reduced strength, or numbness in an extremity.
- "**S**" = Significant mechanism in extremes of age.
- "**A**" = Alertness. Is patient oriented to person, place, time, and situation? Any change to alertness with this incident?
- "**I**" = Intoxication. Is there any indication that the person is intoxicated (impaired decision making ability)?
- "**D**" = Distracting injury. Is there any other injury which is capable of producing significant pain in this patient?
- "**S**" = Spinal exam. Look for point tenderness in any spinal process or spinal process tenderness with range of motion.



Sample Secondary Assessment Form

HEAD: Evidence of Trauma

Battle Sign
 Raccoon's Sign
 Nose/ Ear Drainage
 Lacerations
 Fractures

NECK: Evidence of Trauma

Tracheal Shift
 JVD
 Suspected C-Spine Injury

CHEST: Breath Sounds R _____ L _____

Evidence of Trauma
 Pneumothorax
 Haemothorax
 Chest Wall Injury

ABDOMEN:

Evidence of Trauma
 Contusion / Abrasion
 Distension
 Tenderness
 Guarding
 Pregnancy

PELVIS:

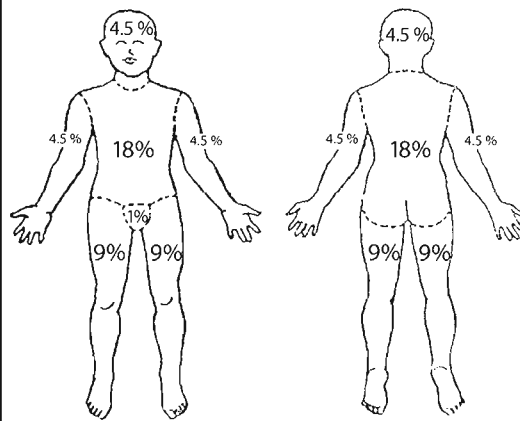
Evidence of Trauma
 Crepitus/ Instability
 Blood at Meatus, Rectum, Vagina

BACK:

Evidence of Trauma
 Contusion / Abrasion

EXTREMITIES:

Evidence of Trauma
 Contusion / Abrasion
 Distension
 Tenderness
 Fracture(s)



Document

Abrasions
 Amputations
 Burns
 Contusions
 Crepitus
 Deformity
 Ecchymosis
 Fractures
 Gun Shot Wound
 Hematoma

Punctures / Penetrating
 Tenderness
 Lacerations
 Swelling



Module 5: Triage

Objectives

At the end of this module, medical professionals should be able to:

- ✓ Describe the concept and purpose of triage
- ✓ Determine situations to apply triage at your hospital
- ✓ Demonstrate rapid triage

Triage is a dynamic process of sorting casualties to identify the treatment priority of the wounded, given the limitations of the current situation and the available resources (time, equipment, supplies, personnel).

Methods

- Lecture
- Discussion
- Practical demonstration

Materials

Training module, triage card, multimedia

Duration

2 hr

Schedule

Presentation	- 30 min
Discussion	- 30 min
Practical demonstration	- 30 min



Triage

Triage is the process of prioritizing patients based on the severity of their condition based on the resources available. In all situations, resources are limited: even in the largest, most advanced trauma centres in the world patients are triaged. This process ensures the **right** patients are treated with the **right** resources at the **right** time.

Triage is not reserved only for mass casualties, but should be used on all patients. During a mass casualty situation, the emergency nursing officer or medical officer may need to modify the normal triage process, or implement disaster triage. Triage occurs at every level of patient care, and should be repeated. Even now, perhaps without the formal knowledge of the caregiver, they are using a form of triage to determine what patient requires immediate surgery or what patient needs immediate treatment.

The word **TRIAGE** is from the French verb 'trier', meaning to separate, sort, sift or select.

Triage Categories

- ✓ Traditionally triage categories are **IMMEDIATE**, **DELAYED**, **MINIMAL**, and **EXPECTANT**. This classification method is useful for both mass casualties involving both surgical and medical patients.
- ✓ **IMMEDIATE**: **IMMEDIATE** patients require lifesaving emergency surgery or emergency medical intervention. In mass casualty situations, the surgical procedures performed should be "damage control operations". Procedures should be enough to stabilize the patients, and should not be time consuming. Immediate patients should have high chances of survival following the procedure.
 - o Patients generally in this category may include respiratory obstruction, unstable casualties with chest or abdominal injuries, or emergency amputation.
- ✓ **DELAYED**: **DELAYED** patients have severe wounds that need time-consuming surgery, but whose general condition permits a delay in the surgical treatment without unduly endangering life. Sustaining treatment will be required until surgery is available including IV fluids, splinting fractures, administration of antibiotics, catheterization, gastric decompression, and pain management.



- o The types of injuries include large muscle wounds, fractures of major bones, intra-abdominal and/or thoracic wounds, and burns less than 50% of total body surface area (TBSA),
- ✓ **MINIMAL** : These patients have relatively minor injuries and also known as the “walking wounded”. In a disaster, they can effectively care for themselves or initially attended to by nonmedical personnel
- o Examples of ‘**MINIMAL** patients’ may include minor lacerations, abrasions, fractures of small bones, and minor burns.
- ✓ **EXPECTANT**: Casualties in this category have wounds that are so extensive that even if they were the only casualty and had the benefit of all of the available resources, their survival would be unlikely. During a disaster situation, the patients categorized as “expectant” should not be abandoned, but if possible, they should be separated from the view of other casualties. These casualties should be cared for with a minimal but competent staff, providing pain management and comfort measures for these patients.
- ✓ **EXPECTANT** casualties may include unresponsive patients with penetrating head wounds, high spinal cord injuries, mutilating explosive wounds involving multiple anatomical sites and organs, second and third degree burns in excess of 60% TBSA, profound shock with multiple injuries, and agonal respiration.

Triage is a dynamic process that will be repeated. Approximately 10% of patients may initially be under-triaged because symptoms are masked or delayed.

Daily Triage

During normal hospital operations, without a disaster, patients are still triaged according to their needs and the resources available. The notable modification is the classification of **EXPECTANT** patients. These patients would be triaged as **IMMEDIATE**.

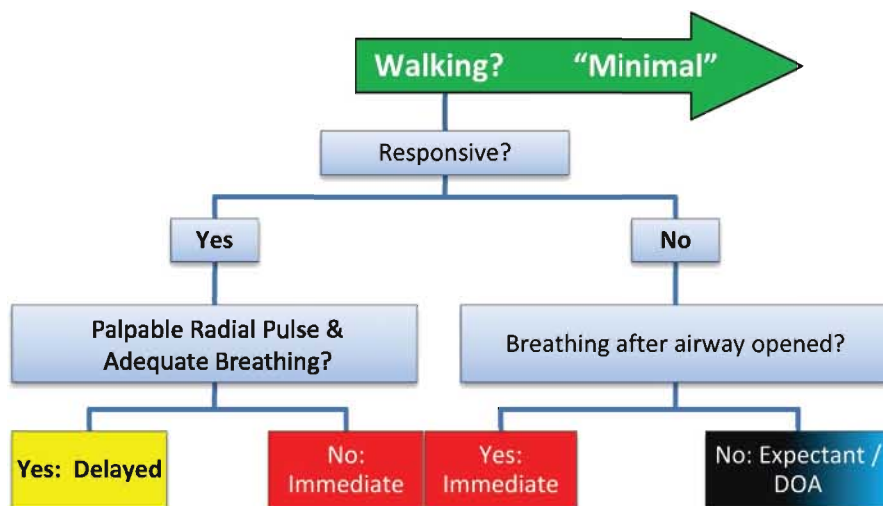


Triage Systems

Internationally, there are many different types of triage systems and unfortunately there is not a true international standard yet defined. Triage systems range from a three-point system to a five point system. Some systems label patients with colored tape and some use complex or computerized forms.

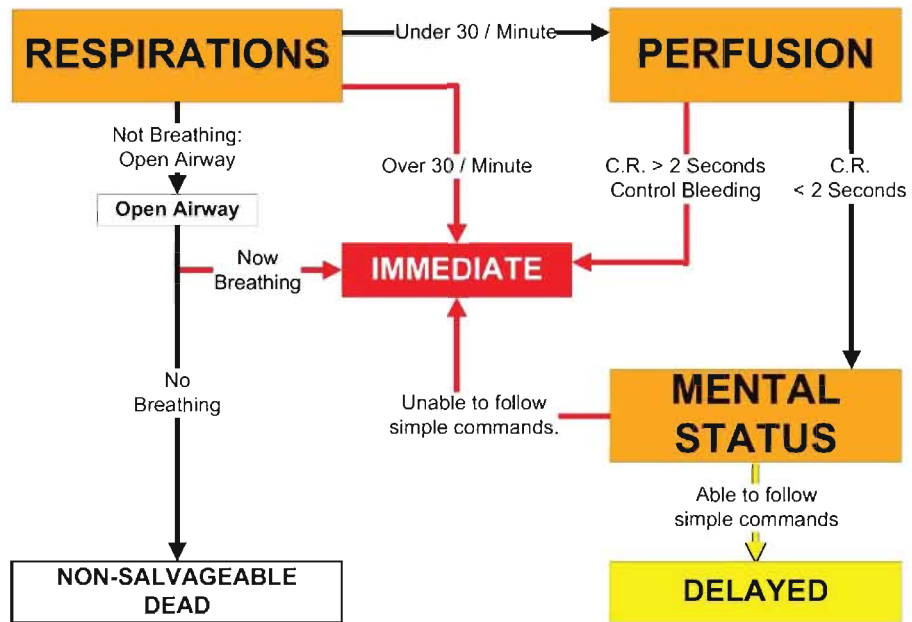
The key for triage to be successful in your institution is that it must be known by everyone involved, and frequently used. By using an approach to triage, as presented in module, it can easily be used on a daily basis.

Trying to including all of the factors that influence triage in a reference book would be ineffective and futile. Rather, triage education is focused on building a general framework for critical decision making strategies. The complexity of decision making in triage varies greatly depending on the knowledge and experience of the triage officer, the location and the nature of the emergency. At the scene of a mass casualty (like a bomb blast), first responder triage officers must determine what patients require immediate evacuation to the hospital. While at the hospital, the triage officer determines what patients the current treatment priorities are. Below is an example of a simple decision tree for mass casualties.





The RPM Method of 'START' Triage





The RPM method of triage looks at the Respirations, Perfusion, and Mental status of the patient to determine the triage category.

- ✓ First triage all walking wounded as Minimal or Green.
- ✓ Check the RESPIRATIONS.
 - o If the patient is not breathing, or resumes spontaneous respirations with positioning or an oral airway, the patient is classified as nonsalvageable /expectant / or dead.
 - o If the patient has respirations over 30 per minute, the patient is immediate.
- ✓ If respirations are less than thirty check capillary refill and RESPIRATIONS.
- ✓ If perfusion is compromised, the patient is immediate.
- ✓ If the patient has normal respirations, and normal perfusion check the MENTAL STATUS.
- ✓ If the patient is unable to follow commands, the patient is immediate.
- ✓ All other patients are delayed.



**Immediate
Red
Priority 1**

- They require immediate surgery or other life-saving intervention, and have first priority for surgical teams or transport to advanced facilities; they "cannot wait" but are likely to survive with immediate treatment.

**Delayed
Yellow
Priority 2**

- Their condition is stable for the moment but requires watching by trained persons and frequent re-triage, will need hospital care (and would receive immediate priority care under "normal" circumstances).

**Minimal
Green
Priority 3**

- They will require a doctor's care in several hours or days but not immediately, may wait for a number of hours or be told to go home and come back the next day (broken bones without compound fractures, many soft tissue injuries).

**Expectant
Black / Blue
Priority 4**

- They are so severely injured that they will die of their injuries, possibly in hours or days (large-area burns, severe trauma, lethal radiation dose), or in life-threatening medical crisis that they are unlikely to survive given the care available (cardiac arrest, septic shock, severe head or chest wounds); they should be taken to a holding area and given painkillers as required to reduce suffering.



Module 6: Integration

Objectives

At the end of this module, medical professionals should be able to:

- ✓ Identify opportunities to integrate BLS techniques and ACLS techniques
- ✓ Identify opportunities to integrate trauma management techniques and triage techniques

Methods

- Lecture
- Discussion
- Practical demonstration

Materials

Training module, triage card, multimedia

Duration

1 hr

Schedule

- | | |
|--------------|----------|
| Presentation | - 30 min |
| Discussion | - 30 min |



Integration into your hospital

The Ministry of Health and Family Welfare, and your local leadership, are implementing this course to provide you with the current knowledge and international best practices for emergency medical and trauma care. The primary purpose of this training manual, and the classroom education course, is to change the way you care for trauma and emergency patients in your hospital, and ultimately to improve the Bangladesh trauma case system. Knowledge, without application fails to achieve this goal.

Some of the methods and procedures presented in this manual require specialized equipment, or supplies that may not be currently available in your facility. For example, your hospital ward may not have intubation equipment, or perhaps even basic airway equipment. Consider How can you implement the training now? 'What do you need to advocate for?'

- Perform an inventory of your equipment and supplies
- Identify what critical or essential items are missing
- Advocate to your leadership for essential equipment or supplies

Next, implement as much of the training into your routine patient care immediately. Even if your unit does not have intubation equipment, start implementing the other elements of the training program as soon as possible. In a cardiac arrest, the essential components of resuscitation is chest compressions. Therefore, ensure that all future cardiac arrest patients are receiving proper chest compressions.

Finally, review, record, and report your progress. Upgrading trauma and emergency care takes time and dedication to achieve a series of small victories. Set individual goals for your ward, your hospital, or individually. Share these goals with your co-workers and members of your resuscitation team. Record your progress, and report your progress back to your team and your superiors. Your goals will depend on your unit and your resources. Below are some sample goals to help you get started:

- For a Cardiac Care Unit
 - o All patients in cardiac arrest will be defibrillated within two minutes of a recognized cardiac arrest (VF-VT).
 - o An organized resuscitation drug tray will be available



- For Emergency Units
 - All patients with hemorrhage will have hemorrhage controlled prior to admission to the ward.
- For Upazila Health Centres
 - Prior to transferring patients, fractures will be splinted and IV access secured.

These are simple achievable goals based on your current context. In addition to patient care goals you may also want to create an advocacy or equipment goal: By 2014, a cardiac defibrillator will be available in the emergency center.



Perform an Inventory

Perform an inventory of your equipment, supplies, knowledge, and skills related to emergency care in your unit. The World Health Organization has identified care items for emergency medical and trauma care. Based on the tables below, evaluate your equipment, supplies, and staff knowledge.

		Knowledge & Skills	WHO Classification	Present
Airway Management		Assessment of airway compromise	Essential	
		Manual manoeuvres (chin lift, jaw thrust, recovery position, etc.)	Essential	
		Insertion of oral or nasal airway	Essential	
		Use of suction	Essential	
		Assisted ventilation using bag–valve–mask	Essential	
		Endotracheal intubation	Desired	
		Cricothyroidotomy	Desired	
		Equipment and Supplies	WHO Classification	% Meets Standard
Airway Management		Oral or nasal airways	Essential	
		Suction device (manual)	Essential	
		Suction device (electric)	Desired	
		Rigid suction tip (Yankaeur)	Essential	
		Laryngoscope	Essential	
		ET Tubes(Adult)	Desired	
		ET Tubes(Pediatric)	Desired	
		Oesophageal detector device	Desired	
		Bag-Valve-Mask	Essential	
		Magill Forceps	Desired	
		Capnography	Desired	
	Other Advanced Airway Equipment	Desired		



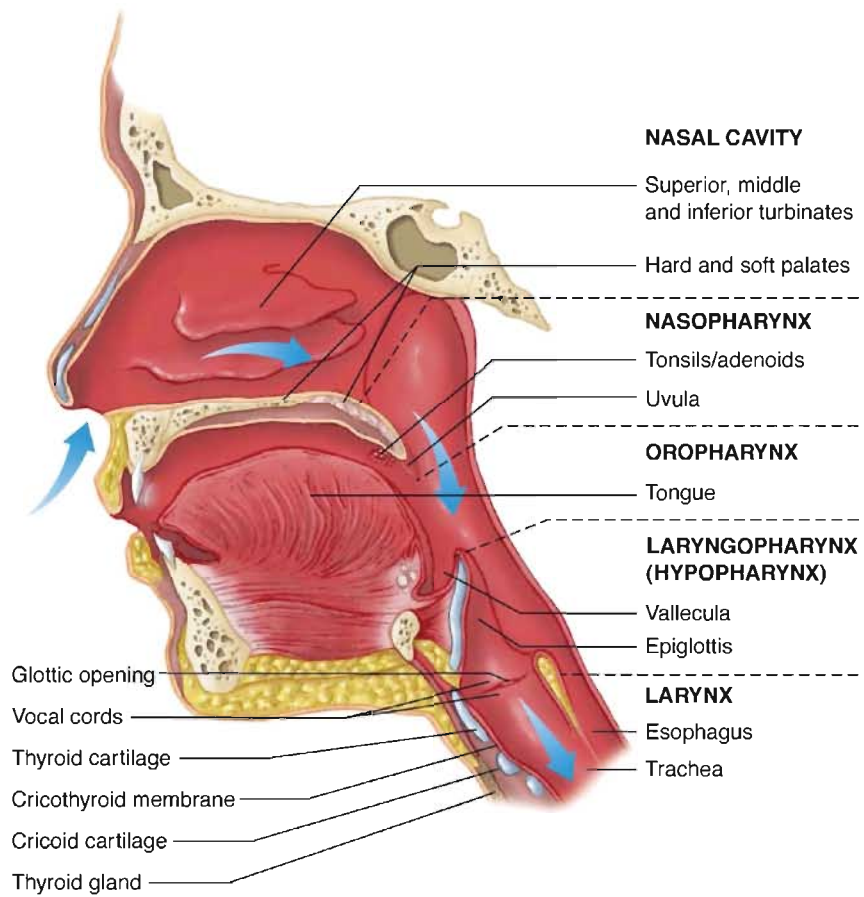
		Knowledge & Skills	WHO Classification	Present
Breathing		Assessment of respiratory distress and adequacy of ventilation	Essential	
		Administration of oxygen	Essential	
		Needle thoracotomy	Essential	
		Chest tube insertion	Essential	
		Three-way dressing	Essential	
		Equipment and Supplies	WHO Classification	Present
Breathing Management		Stethoscope	Essential	
		Oxygen supply	Essential	
		Nasal prongs, face mask, and associated tubing	Essential	
		Needle (18g or larger) & syringe	Essential	
		Chest tubes	Essential	
		Underwater seal bottle (or equivalent)	Essential	
		Pulse oximetry	Desired	
		Arterial blood gas measurements	Desired	
		Bag–valve–mask	Essential	
		Mechanical ventilator	Essential	



Knowledge & Skills		WHO Classification	Present
Circulation / Hemorrhage	Assessment of shock	Essential	
	Compression for control of haemorrhage	Essential	
	Assessment of shock		
	Arterial tourniquet Use	Essential	
	Use of suction	Essential	
	Splinting of fractures for hemorrhage control	Essential	
	Deep interfascial packing for severe wounds	Essential	
Pelvic wrap for haemorrhage control	Essential		
Knowledge & Skills		WHO Classification	Present
Circulation / Fluids / Shock	Knowledge of fluid resuscitation	Essential	
	Peripheral percutaneous intravenous access	Essential	
	Peripheral cutdown access	Essential	
	Central venous access for fluid administration	Essential	
	Intraosseous access	Essential	
	Transfusion knowledge and skills	Essential	
	Differential diagnosis of causes of shock	Essential	
	Use of fluids and antibiotics for septic shock	Essential	
Equipment and Supplies		WHO Classification	Present
Circulation / Shock Management	Clock or watch with second hand	Essential	
	Stethoscope	Essential	
	Blood pressure (BP) cuff	Essential	
	Gauze and bandages	Essential	
	Arterial tourniquet in extreme situations	Essential	
	Fluid resuscitation: Crystalloid	Essential	
	Intravenous infusion set (lines and cannulas)	Essential	
	Intraosseous needle or equivalent	Desired	
	Central venous lines	Desired	
	Urinary catheter	Essential	
	Electronic cardiac monitoring	Essential	
	Laboratory facilities for haemoglobin or haematocrit	Essential	
	Nasogastric (NG) tube	Essential	
	Thermometer	Essential	

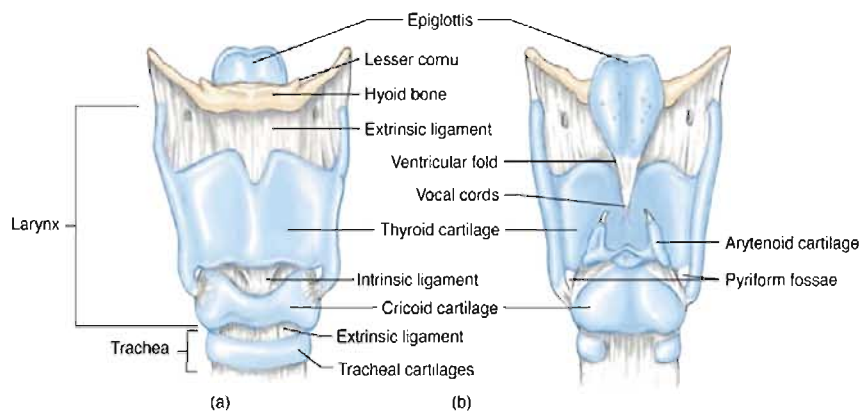


Airway Anatomy





Upper Airway Anatomy



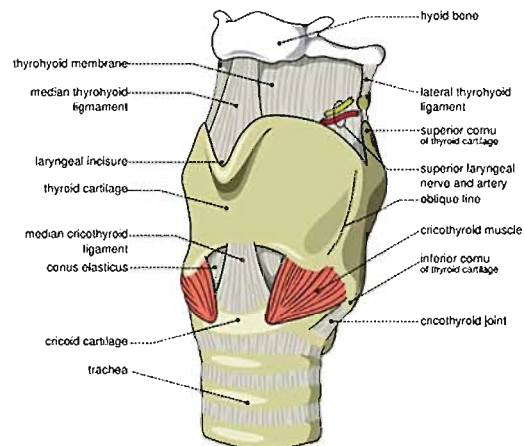


Emergency Surgical Cricothyrotomy

A cricothyrotomy is an invasive surgical procedure aimed at obtaining a patent airway in patient where nonsurgical airways have failed. To be successful, speed is of the essence. However, do not allow the urgency of the situation to take precedence over reasonable judgment or action.



Make incision through cricothyroid membrane



Insert hemostat to dilate incision or turn scalpel handle until opening sufficient to allow passage of small endotracheal tube. (6.0 - 7.0 mm)

To identify the thyroid cartilage, palpate the prominent cricothyroid notch. The space between the cricoid and thyroid cartilage is the cricothyroid space. This is the location of the cricothyroid membrane



Pass endotracheal tube about 1 to 1.5 inches into trachea. Inflate cuff and ventilate patient with high flow O₂. Check for breath sounds bilaterally and secure with tape



Standard Precautions

1. Hand hygiene

Summary technique:

Hand washing (40–60 sec): wet hands and apply soap; rub all surfaces; rinse hands and dry thoroughly with a single use towel; use towel to turn off faucet.

Summary indications:

Before and after any direct patient contact and between patients, whether or not gloves are worn.

Immediately after gloves are removed.

Before handling an invasive device.

After touching blood, body fluids, secretions, excretions, non-intact skin, and contaminated items, even if gloves are worn.

During patient care, when moving from a contaminated to a clean body site of the patient.

After contact with inanimate objects in the immediate vicinity of the patient.

2. Gloves

Wear when touching blood, body fluids, secretions, excretions, mucous membranes, nonintact skin.

Change between tasks and procedures on the same patient after contact with potentially infectious material.

Remove after use, before touching non-contaminated items and surfaces, and before going to another patient.

Perform hand hygiene immediately after removal.

3. Facial protection (eyes, nose, and mouth)

Wear (1) a surgical or procedure mask and eye protection (eye visor, goggles) or (2) a face shield to protect mucous membranes of the eyes, nose, and mouth during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions.

4. Gown

Wear to protect skin and prevent soiling of clothing during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions.

Remove soiled gown as soon as possible, and perform hand hygiene.

5. Prevention of needle stick and injuries from other sharp instruments

DO NOT RECAP USED NEEDLES.**Use care when:**

Handling needles, scalpels, and other sharp instruments or devices.

Cleaning used instruments.

Disposing of used needles and other sharp instruments.

6. Patient care equipment

Handle equipment soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and transfer of pathogens to other patients or the environment.

Clean, disinfect, and reprocess reusable equipment appropriately before use with another patient.



Scrubbing hands for 30 seconds with soap is essential to prevent disease transmission.

Modified from the WHO HIV "Priority Interventions" for more details, see <http://www.who.int/hiv/mediacentre/en/>





Example: Cervical Spine Collar



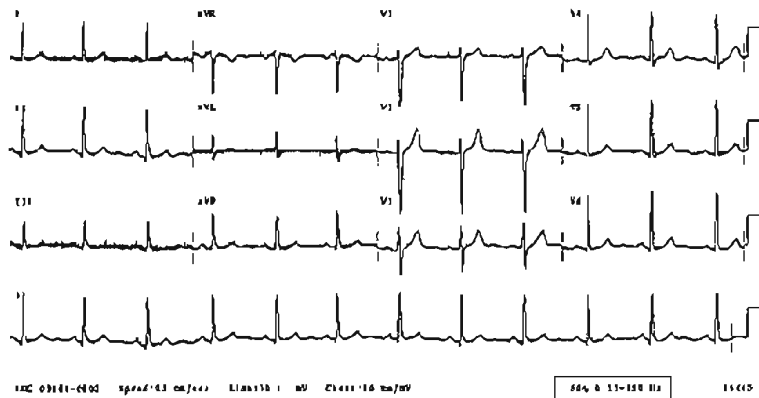
Cervical collars, also known as C-Collars, are produced by many manufactures. However, if a commercially produced c-collar is unavailable, the spine can be immobilized with improvised techniques. Although once a common practice, sandbags or IV solution should generally not be used to stabilize the spine. As the patient is transported, the shifting weight of the sandbags can actually result in movement of the cervical spine. Therefore, lightweight alternatives should be used including rolled towels or rolled cloth, or foam blocks are an excellent alternative.



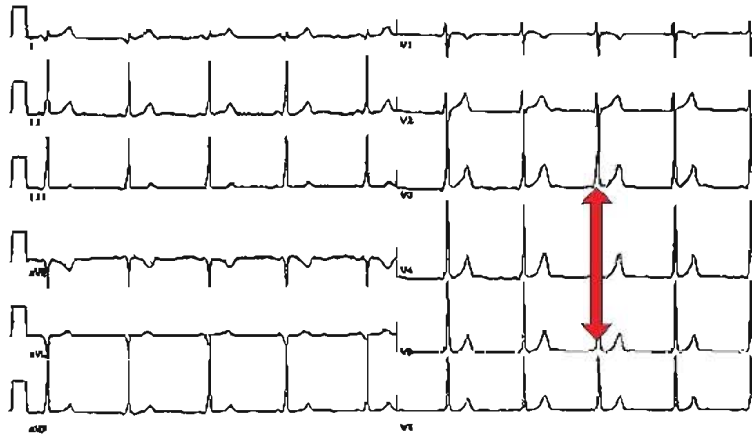


12-Lead ECG Examples

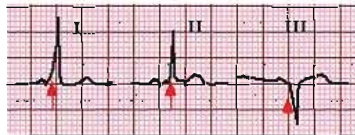
Normal Adult 12-Lead



Example of WPW Syndrome



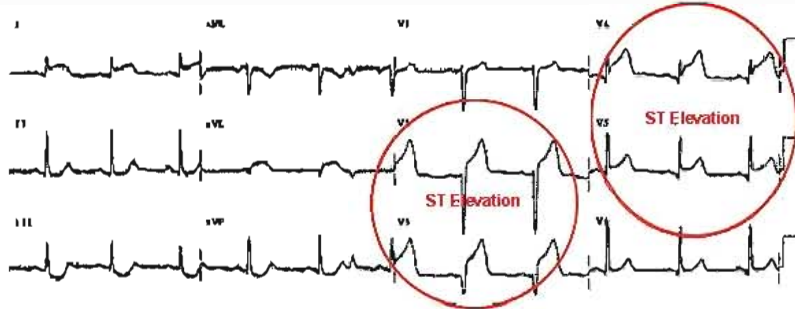
Note the delta waves.



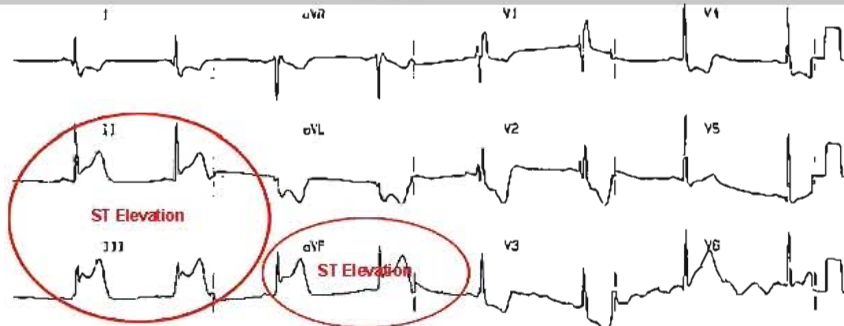


"Acute MI"

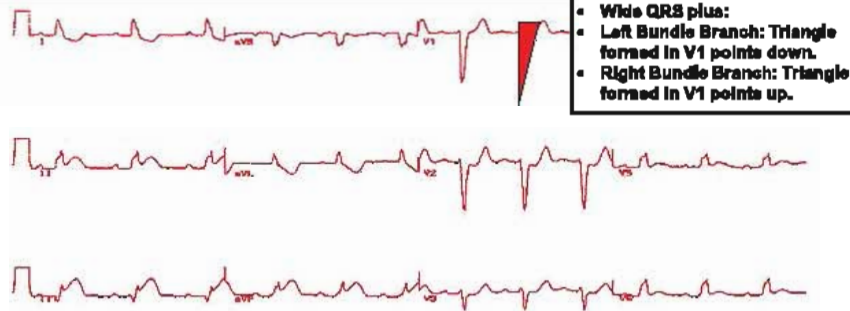
Acute Anterior MI



Acute Inferior MI



Left Bundle Branch – With Chest Pain, assume MI





Unconsciousness

Unconsciousness may have many causes including:

- Substance intoxication / ingestion
- Head injury
- Hypoglycemia
- Ketoacidosis
- Cerebrovascular event
- Hypoxia
- Hypotension
- Hypertension and eclampsia

Assessment

Assess the response to stimuli (Verbal, Pain, Unresponsive)

Look at the pupils initially and reexamine them later to identify changes.

Look for unequal pupils or other localizing signs that may show intracranial hematoma developing.

In many instances, you may attend to and stabilize other systems first and await the return of consciousness as cerebral perfusion and oxygenation improves.

After cardiac arrest, a patient who initially had fixed dilated pupils may show smaller pupils after effective CPR. This indicates that a favorable outcome may be possible.

The supine unconscious patient with a full stomach is at grave risk of regurgitation and aspiration due to the unprotected airway.

Differential Diagnosis of Decreased Level of Consciousness

A = Alcohol
E = Epilepsy
I = Insulin
O = Opiates
U = Urea
(metabolic)

T = Trauma
I = Infection
P = Psychological
P = Poisons
S = Shock



Patient in recovery position.



Snake Bites

Clinical syndromes of snake bite – although there may be considerable overlap of clinical features caused by venoms of different species of snake, a “**syndromic approach**” may be useful, especially when the snake has not been identified and only monospecific antivenom are available.

Carefully Evaluate Airway, Breathing, Circulation
OXYGEN If clinically indicated
Identify the snake.
Position Patient Supine Immobilize Area or Limb Keep Patient Calm Irrigate wound with a normal saline solution.
Inspect the area of the bite. Note erythema and associate edema. Document level of pain.
Measure and document the circumference of the affected limb at multiple sites above and below the injury. Be alert for compartment syndrome.
Document extent of systematic reaction. Paralysis, nausea, weakness, etc.
Perform Blood Clot Test
Evidence of Envenomation
IV Access (2 Large Gauge) Consider 20 mL/KG Saline Bolus Large volumes of fluid may be required if the patient is in shock. Assess tetanus status and update if required.
Indications for Antivenom Therapy
Progression of local injury Coagulopathy Systemic Effects

First Aid Methods – NOT Recommended:	
<ul style="list-style-type: none"> • Traditional tight tourniquets. • Incisions at the site of snake of bite or any other place. • Local suction either by mouth or by application of chick. Application of herbal medicines, stones, seeds, saliva, potassium permanganate solution. • Ingestion of herbal products like oil, ghee, pepper to induce vomiting. • Unnecessary delay in reaching specialized care. 	

Clinical Syndromes of Snake Bites	
Syndrome	Notes and Symptoms
1	Local envenomation (swelling extremities etc.) with bleeding / clotting disturbance (20 WBCT)
Viperidae	
Syndrome	Notes and Symptoms
2	Local envenomation (swelling etc.) with bleeding/clotting disturbances, shock or renal failure with ptosis, external ophthalmoplegia, facial paralysis etc. and dark brown urine.
Russell's Viper	
Syndrome	Notes and Symptoms
3	Local envenomation (swelling etc.) with paralysis with no sign of bleeding or clotting disturbances
Cobra or King Cobra	
Syndrome	Notes and Symptoms
4	No local envenomation with paralysis
Bit on land while sleeping: Krait Bite while in Sea: Sea Snake	
Syndrome	Notes and Symptoms
5	Paralysis with dark brown urine and renal failure, no local envenomation, no bleeding, or clotting disturbances, severe muscle pain.
Sea Snake	

Anti-snake venom therapy:

Dose: Each dose consists of 10 vials of polyvalent antivenom irrespective of patient age or sex of the victim.

Time and administration:

Each vial is diluted with 10 ml. of distilled water. 10 such vial (100 ml) is further diluted or mixed with 100 ml of fluid (Dextrose water or saline). Then it is administered with intravenous infusion within 40 – 60 min (60 – 70 drops/min).

20-Minute Whole Blood Clotting Test (20 WBCT)

- Place a few mls of freshly sampled venous blood in a small glass tube and leave undisturbed for 20 minutes at ambient temperature, erect. Tip the tube once
- If the blood is still liquid (unclotted) and runs out, the patient has hypofibrinogenaemia (incoagulable blood) as a result of venom induced consumption coagulopathy. In perspective of Bangladesh, incoagulable blood is diagnostic of a viper bite and rules out an elapid bite.

Warning: If the tube used for the test is not made of ordinary glass, or if it has been used before and cleaned with detergent, its wall may not stimulate clotting of the blood sample in the usual way and test will be invalid. If there is any doubt, repeat the test in duplicate, including a “Control” (blood from a healthy person).



Organophosphate Ingestion

If the clinical presentation is not clear: administer atropine 0.6–1 mg. A marked increase in heart rate (more than 20–25 beats/min) and flushing of the skin suggest that the patient does not have significant cholinergic poisoning and further atropine is not required.

I/V Fluid: While waiting for the atropine to have effect, ensure that the two IV drips have been set up (one for fluid and drugs, the other for atropine). Give 500–1000 ml (10–20 ml/kg) of normal saline over 10–20 min.

Target endpoints for atropine therapy

- ❖ Clear chest on auscultation with no wheeze
Heart rate >80 beats/min
- ❖ Pupils no longer pinpoint
Dry axillae
- ❖ Systolic blood pressure >80 mmHg

Carefully Evaluate Airway, Breathing, Circulation
OXYGEN If clinically indicated
Confirm the ingested substance and amount. Decontaminate the patient if skin was exposed.
If ingestion was very recent: Consider gastric lavage and activated charcoal.
IV Access
<p style="text-align: center;">Atropine</p> <p>For an unconscious patient, give atropine 1.8–3 mg (three to five 0.6 mg vials) rapidly IV into a fast-flowing IV drip. During the 5 min after atropine administration, record three signs of cholinergic poisoning against which atropine dosing will be titrated (1) air entry into lungs; (2) blood pressure; (3) heart rate; (4) Pupil size; (5) Dryness of axillae.</p>

Assess whether enough atropine has been given – is the patient atropinised? Three to five minutes after giving atropine, check the five markers. A uniform improvement in most of the five parameters is required, not improvements in just one. However, the most important parameters are air entry on chest auscultation, heart rate, and blood pressure. Pupil dilatation is sometimes delayed. Check frequently and carefully that the other parameters are improving. When all the parameters are satisfactory, the patient has received enough atropine and is 'atropinised'.

Continuation of bolus atropine loading to reach atropinisation: If after 3–5 min a consistent improvement across the five parameters has not occurred, then more atropine is required. **Double the dose, and continue to double each time that there is no response. Do not simply repeat the initial dose of atropine.** Some patients need tens or hundreds of mg of atropine, so repeating 3 mg doses will mean that it may take hours to give sufficient atropine.

Atropine treatment after atropinization

Once atropinised, (using one of the two IV cannulae) give 10–20% of the total amount of atropine that was required to load the patient every hour. If very large doses (more than 30 mg) were initially required, then less can be used. Larger doses may be required if oximes are not available. It is rare that an infusion rate greater than 3–5 mg/ hour is necessary. Such high rates require frequent review and reduction as necessary.

Observation of the patient

Review the patient and assess the five parameters every 15 min or so to see whether the atropine infusion rate is adequate. As atropinisation is lost, with for example recurrence of bronchospasm or bradycardia, give further boluses of atropine until they disappear, and increase the infusion rate. Once the parameters have settled, see the patient at least hourly for the first 6 hours to check that the atropine infusion rate is sufficient and that there are no signs of atropine toxicity. As the required dose of atropine falls, observation for recurrence of cholinergic features can be done less often (every 2–3 hours). However, regular observation is still required to spot patients at risk of, and going into, respiratory failure.

Atropine toxicity

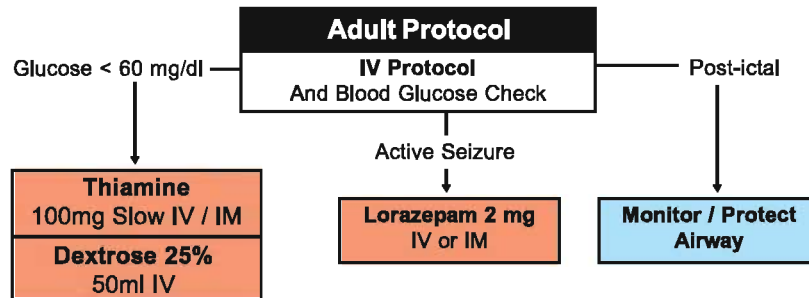
Excess atropine causes agitation, confusion, urinary retention, hyperthermia, paralytic ileus and tachycardia. During regular observation check for the features. The presence of these suggest that too much atropine is being given. Stop the atropine infusion. Check again after 30 min to see whether the features of toxicity have settled. If not, continue to review every 30 min or so. When they do settle, restart at 70–80% of the previous rate. The patient should then be seen frequently to ensure that the new infusion rate has reduced the signs of atropine toxicity without permitting the reappearance of cholinergic signs. Do not follow heart rate and pupil size because they can be fast or slow, and big or small, respectively, depending on the balance of nicotinic and muscarinic features. Tachycardia also occurs with rapid administration of oximes and with pneumonia, hypovolaemia, hypoxia, and alcohol withdrawal, and is not a contraindication to giving atropine. Catheterize unconscious patients soon after resuscitation is complete. Look for urinary retention in an agitated confused patient; agitation may settle after insertion of the catheter.



Seizures

<p>History:</p> <ul style="list-style-type: none"> • Reported / witnessed seizure activity • Previous seizure history • Medical alert tag information • Seizure medications • History of trauma • History of diabetes • History of pregnancy 	<p>Signs and Symptoms:</p> <ul style="list-style-type: none"> • Decreased mental status • Sleepiness • Incontinence • Observed seizure activity • Evidence of trauma 	<p>Differential:</p> <ul style="list-style-type: none"> • CNS (Head) trauma • Tumor • Metabolic, Hepatic, or Renal failure • Hypoxia • Electrolyte abnormality (Na, Ca, Mg) • Drugs, Medications, Noncompliance • Infection / Fever • Alcohol withdrawal • Eclampsia • Stroke
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Do not put anything in the patient's mouth during a seizure. This increases chance of airway compromise, and oral trauma.



Exam: Mental Status, HEENT, Heart, Lungs, Extremities, Neuro

Status epilepticus is defined as two or more successive seizures without a period of consciousness or recovery. This is a true emergency requiring rapid airway control, treatment, and transport.

Grand mal seizures (generalized) are associated with loss of consciousness, incontinence, and tongue trauma.

Focal seizures (petit mal) affect only a part of the body and are not usually associated with a loss of consciousness

Jacksonian seizures are seizures which start as a focal seizure and become generalized. Be prepared for airway problems and continued seizures. Assess possibility of occult trauma and substance abuse.

For any seizure in a pregnant patient, follow the OB Emergencies Protocol and suspect eclampsia.



Suspected Stroke

<p>History:</p> <ul style="list-style-type: none"> • Previous CVA, TIA's • Previous cardiac / vascular surgery • Associated diseases: diabetes, hypertension, CAD • Atrial fibrillation • Medications (blood thinner) • History of trauma 	<p>Signs and Symptoms:</p> <ul style="list-style-type: none"> • Altered mental status • Weakness / Paralysis • Blindness • Sensory loss • Aphasia / Dysarthria • Syncope • Vertigo / Dizziness • Vomiting • Headache • Seizures • Respiratory pattern change • Hypertension / Hypotension 	<p>Differential Diagnosis:</p> <ul style="list-style-type: none"> • Transient ischemic attack • Seizure • Hypoglycemia • Stroke <ul style="list-style-type: none"> • Thrombotic • Embolic • Hemorrhagic • Tumor • Trauma
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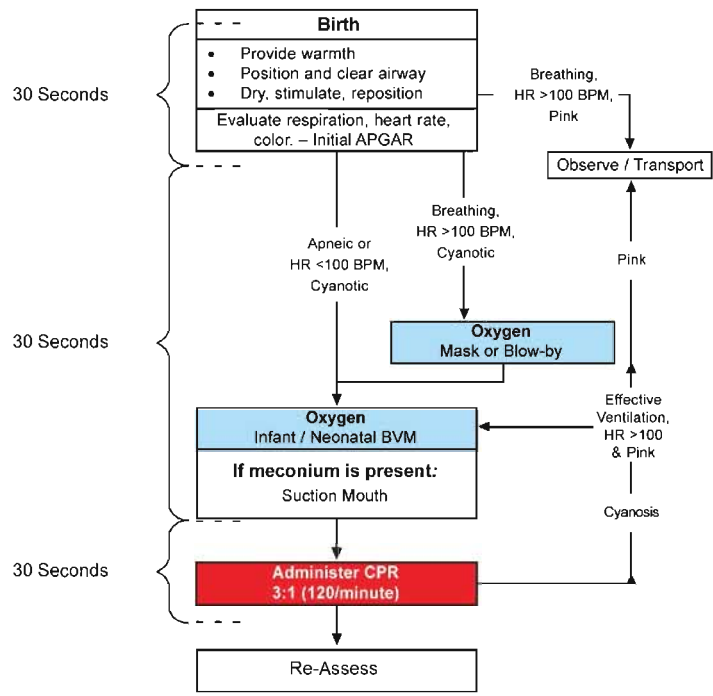
Apply Oxygen	
Perform Rapid Stroke Scale	
Facial Droop	
Have the patient show teeth or smile.	
Normal	Abnormal
Both side of the face move equally.	Both side of the face move equally.
Arm Drift	
Have patient close eyes and extend arms out palms up for 10 seconds.	
Normal	Abnormal
Both arms move equally.	One arm does not move, or one arm drifts when compared to the other.
Abnormal Speech	
Have the patient repeat a common phrase, after you.	
Normal	Abnormal
Patient uses correct words with no slurring.	Patient slurs words, uses wrong words, or is unable to speak.

If one of the these three signs is abnormal, the probability of a stroke is 72%.



Newborn Care

<p>History:</p> <ul style="list-style-type: none"> • Newly born • Term gestation? • Amniotic Fluid – clear? • Breathing or crying? • Initial muscle tone? • Preexisting conditions? • Multiple Births? 	<p>Signs and Symptoms:</p> <ul style="list-style-type: none"> • Unresponsive • Apnea • Pulseless 	<p>Differential:</p> <ul style="list-style-type: none"> • Maternal complications
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**APGAR score**

Sign	0	1	2
Appearance	Pale or cyanotic	Pink Body Blue extremities	Completely Pink
Pulse	Absent	Slow < 100 beats/min	Normal > 100 beats/minute
Grimace	No response	Grimace	Cough, Cry
Activity	Limp	Some Flexion	Active
Respirations	Absent	Slow Irregular	Good Crying

The APGAR Score should be performed at one and five minutes after birth, and may be repeated later if the score remains low.

Scores below 3 are generally regarded as critically low, with 4 to 7 fairly low and over 7 generally normal.

Low scores at the one minute test may require intervention from the health provider, but are not an indication of longer term problems, particularly if there is an improvement by the stage of the five minute test.

If the Apgar score remains below 3 at later times such as 10, 15, or 30 minutes, there is a risk that the child will suffer longer term neurological damage. The purpose of the Apgar test is *not* designed to make long-term predictions on a child's health.

Peripheral cyanosis is common and is not a reflection of inadequate oxygenation. If central cyanosis is present in a breathing newborn during stabilization, early administration of 100% oxygen is important while the neonate is being assessed for need of additional resuscitative measures.

Evaluate heart rate by one of several methods: auscultation apical beat with a stethoscope or palpate the pulse by lightly grasping the base of the umbilical cord. NOTE: Pallor may be a sign of decreased cardiac output, severe anemia, hypovolemia, hypothermia or acidosis.

The APGAR scoring system provides a mechanism for documenting the newborn's condition at one (1) and five (5) minutes of age. The APGAR score should be documented but should not be used to determine need for resuscitation because resuscitative efforts, if required, should be initiated promptly after birth.



Pediatric Considerations

Cardiac Arrest

The primary cause of pediatric cardiac arrest is respiratory arrest. Airway management and correction of hypoxia is essential!

Defibrillation Energy:

1st Defibrillation: **2 Joules per KG**
 All subsequent Defibrillations: **4 Joules per KG**

Example: 15 KG Child in V-Fib:

- 1st Defibrillation is 30J (2J/kg x 15kg = 30J)
- 2nd Defibrillation is 60J (4J/kg x 15kg = 60J)
- 3rd Defibrillation is 60J (4J/kg x 15kg = 60J)

Fluid Resuscitation

20 mL KG administered by I.V. or I.O. Bolus

Medications

The pediatric doses for common emergency medications are given as a reference. However, the proper indications and contraindications should be known and evaluated prior to



<p>Adrenaline 1:10,000 0.01 mg/kg (0.1 mL/kg) IV/IO Repeat every 3-5 minutes</p>
<p>Magnesium Sulfate 25 to 50 mg/kg IV/IO Max: 2 Grams</p>
<p>Atropine Sulfate 0.02 mg/kg IV/IO Minimum dose 0.1 mg; Max dose for child is 1 mg. Max dose for adolescent is 2 mg</p>
<p>Sodium Bicarbonate 1 mEq/kg IV/IO Max: 2 Grams</p>

Conscious Child: Choking

Conscious Infant: Choking





DHAKA MEDICAL COLLEGE HOSPITAL – EMERGENCY SERVICES

DATE	TIME	PATIENT NAME	SEX	BIRTH DATE	AGE
/ /	:		Male Female	/ /	
TRAUMA EVENT INFORMATION		PATIENT HISTORY			
Injury Date: Today _____		Weight: _____ KG Estimate if Actual		Tetanus Status: _____ Less 5 years Over 5 years Unknown	
Location: Mechanism of Injury: Traffic Crash _____ km/Hr Pedestrian _____ Motor-Bike CNG Other Bum _____ Fall Assault Stab Gun Shot Wound(s) _____ Blunt Blunt Injury _____ Crush Injury Other _____		PERTINENT PMHx / PSHx / FMHx:		LMP: _____ G / P _____ Alcohol Drugs Smokes	
		ALLERGIES: None Known		CURRENT MEDICATIONS: None	
PRIMARY SURVEY		SECONDARY SURVEY			
C-SPINE: _____ Normal Suspected Injury Pain Paralysis		HEAD: Evidence of Trauma Battle Sign Raccoon's Sign Nose/ Ear Drainage Lacerations Fractures			
AIRWAY: _____ Normal Compromised Oxygen Applied Intubated Surgical Airway		NECK: Evidence of Trauma Tracheal Shift JVD Suspected C-Spine injury			
BREATHING: _____ Normal Abnormal Tracheal Deviation Major Chest Wall Trauma Tension Pneumothorax Massive haemothorax					
RATE: _____ Normal Radial Pulse Present Haemorrhage					
CIRCULATION: _____ Normal Internal External Controlled Un-Controlled Systolic BP Greater than 90 mmHg		CHEST: Breath Sounds R _____ Evidence of Trauma Pneumothorax Haemothorax Chest Wall Injury			
PULSE RATE: _____		ABDOMEN: Evidence of Trauma Contusion / Abrasion Distension Tenderness Guarding Pregnancy			
NEUROLOGICAL: _____ Alert Verbal Pain Unresponsive History of Loss of Consciousness Seizure / Fits Paralysis of Extremities Chemical Paralysis		PELVIS: Evidence of Trauma Cephalic Instability Blood at Meatus, Rectum, Vagina			
GCS: _____		BACK: Evidence of Trauma Contusion / Abrasion			
TRIAGE: _____ Red Yellow Green		EXTREMITIES: Evidence of Trauma Contusion / Abrasion Distension Tenderness Fracture(s)			
GLASGOW COMA SCALE					
ADULT		CHILD			
EYE		EYE			
Spontaneous 4		Spontaneous 4			
To Voice 3		To Voice 3			
To Pain 2		To Pain 2			
None 1		None 1			
VERBAL		VERBAL			
Oriented 5		Normal 5			
Confused 4		Cries, Concoctile 4			
Inappropriate 3		Permanently intubate 3			
Incomprehensible 2		Agitated, moaning 2			
None 1		None 1			
MOTOR		MOTOR			
Obeys 6		Purposeful, spontaneous 6			
Localizes Pain 5		Localizes Pain 5			
Withdraws Pain 4		Withdraws Pain 4			
Flexion Pain 3		Flexion Pain 3			
Extension Pain 2		Extension Pain 2			
None 1		None 1			
PUPIL SIZE					
PAIN SCALE					
Time	BP	Pulse	RR	GCS	



DHAKA MEDICAL COLLEGE HOSPITAL – EMERGENCY SERVICES

ADMISSION ORDERS										ADMISSION NOTES										
Vital Signs	30min	1-Hr	4-Hr	8-Hr																
Neuro Check	1-Hr	4-Hr	8-Hr																	
Oxygen	_____ L by Mask / Minute																			
NG Tube	OG Tube																			
Foley Catheter																				
IV Catheter	Fluid	Rate																		
Monitor	IO																			
Diet:	NPO	Clear	Soft	Normal																
Medications:																				
Metronidazole 500mg IV drip																				
Clprofloxacin 400mg IV drip every 12 hours																				
Ceftriaxone 1gm IV drip every 12 hours																				
Benzathine Penicillin G 2.4 M IU (IM)																				
Famotidine 20mg IV every 12 hours																				
Pethidine _____mg IV every _____ hours																				
Tramadol _____mg IV every _____ hours																				
Morphine _____mg IV every _____ hours																				
Ketamine _____mg IV every _____ hours																				
Midazolam																				
Propofol																				
Notify Surgeon URGENTLY if: BP less than 90 mmHG Heart rate less than 60 bpm or greater than 120 bpm T is over 39 C Urine output is less than 120 ml/very 4 h Decline in neuro status (GCS) greater than 2 Chest tube output greater than 150 ml/h x 2 h																				
SIGNATURE																				
TIME	BP	PULSE	RR O2 %	TEMP	GCS				PUPIL SIZE		NOTES & MEDICATION RECORD									
					E	V	M	=	R/L	N										
24 HOUR I & O		AMOUNT		PROCEDURE NOTES / LAB WORK / RADIOLOGY NOTES																
Oral																				
IV Fluid																				
Blood Products																				
Other																				
Total Input																				
Blood Loss																				
Urine																				
Chest Tube #1																				
Chest Tube #2																				
NG / OG Tube																				
Other																				
Total Output																				
Net Gain/Loss																				
24 Hour Disposition:																				
Desty DOA Admit to _____ ICU Observation OR Transferred to another facility Discharged Refused Care																				



Abbreviations

ABC's	airway, breathing, circulation
Abd	abdomen
ACLS	advanced cardiac life support
a-fib	atrial fibrillation
ALS	advanced life support
AMI	acute myocardial infarction
amp	ampule
ASA	aspirin
AVPU	alert/ responds to voice/pain/unresponsive
BBB	bundle branch block
BLS	basic life support
bp	blood pressure
BSI	body substance isolation
BVM	bag-valve-mask
C	centigrade
cc	cubic centimeter
CHF	congestive heart failure
CO	carbon monoxide
COPD	chronic obstructive pulmonary disease
CO ²	carbon dioxide
CP	chest pain
CPR	cardiopulmonary resuscitation
CSF	cerebrospinal fluid
CVA	cerebrovascular accident
c-spine	cervical spine
ECG (EKG)	electrocardiogram
EMS	emergency medical service
ETA	estimated time of arrival
ET	endotracheal tube
FB	foreign body
GCS	Glasgow Coma Scale
Gyn	Gynaecology
HEENT	head, ears, eyes, nose, throat
Hg	mercury



HIV	human immunodeficiency virus
HPI	history of present illness
HR	heart rate
hx	history
IM	Intramuscular
inj	Injection
IO	Intraosseous
IV	Intravenous
JVD	jugular venous distention
kg	kilogram
L	liter
LLQ	left lower quadrant
LOC	loss of consciousness
LUQ	left upper quadrant
m	meter
mEq	milliequivalent
Mg	milligram
MI	myocardial infarction
mmHg	millimeters of mercury
NPO	nothing by mouth/ Nothing Per Oral
NRB	nonrebreathing (mask)
NSR	normal sinus rhythm
NTG	nitroglycerin
O ₂	oxygen
P	pulse
PALS	pediatric advanced life support
PMS	pulse, motor, sensory
PMH	past medical history
p.o.	by mouth
p.r.n.	as needed
Pt	patient
PSVT	paroxysmal supra ventricular tachycardia
PVC	premature ventricular contraction
Px	physical exam
R	respiration
RLQ	right lower quadrant



RR	respiratory rate
RUQ	right upper quadrant
SIDS	sudden infant death syndrome
SL	sublingual
SOB	shortness of breath
SQ	subcutaneous
STEMI	ST Elevation Myocardial Infarction
subcu	subcutaneous
SVT	supra ventricular tachycardia
T	temperature
TB	tuberculosis
TIA	transient ischemic attack
TKO	to keep open
URI	upper respiratory infection
UTI	urinary tract infection
v fib	ventricular fibrillation
VS	vital signs
v tach	ventricular tachycardia
VT	ventricular tachycardia
WNL	within normal limits
<	less than
>	more than
=	equal to
°	degree

**Pre-Test / Post-Test**

Name: _____ Date: _____

Principles of Emergency Care – PRE-TEST/ POST-TEST

Multiple Choice: Each question has only one correct answer. Identify the letter of the choice that best completes the statement or answers the question.

- _____ 1. Tidal volume is the amount of air:
1. Inhaled or exhaled during a normal breath
 2. Left in the lungs after a forceful exhalation
 3. One can inhale after a maximal inhalation
 4. Always present in the alveoli
- _____ 2. A 45-year-old man appears to be choking on a piece of food during dinner; he is coughing forcefully, and is saying "I am choking", you should:
1. Perform back blows
 2. Attempt a finger sweep
 3. Observe the man and encourage him to keep coughing
 4. Give abdominal thrusts
- _____ 3. The primary cause of airway obstruction in **unconscious** patients is:
1. The tongue
 2. Loose-fitting dentures
 3. Toys or other small objects
 4. Incompletely chewed food
- _____ 4. The most reliable indication that adequate tidal volumes are being delivered during artificial ventilation (Ambu Bagging) is:
1. The oxygen saturation improves
 2. The patient's color improves
 3. Adequate chest rise is observed
 4. The stomach inflates slightly



- ___ 5. The greatest *difficulty* in using a bag-valve-mask device for ventilation is maintaining:
1. Proper oxygen flow
 2. Adequate mask seal
 3. Consistent bag inflation
 4. None of the above.
- ___ 6. Oropharyngeal airways are designed to:
1. Push the tongue into the oropharynx
 2. Prevent the tongue from obstructing the glottis
 3. Allow for better visualization during endotracheal intubation
 4. Provide a guide for suction catheters
- ___ 7. Ideally, a patient should be hyper-oxygenated for _____ before intubation.
1. 30 seconds to 1 minute
 2. 1 to 2 minutes
 3. 2 to 3 minutes
 4. 3 to 5 minutes

Intubation Scenario: Lung sounds are heard *after* intubation only over the **right** lung of an adult patient. The ET tube is at 27 cm at the teeth.

- ___ 8. The most likely explanation for the findings in the Intubation Scenario is:
1. Right main stem intubation
 2. Occlusion of the endotracheal tube
 3. Left-sided pneumothorax
 4. Right-sided hypertympany
- ___ 9. All patients must have a patent airway established during the:
1. Secondary Assessment
 2. Initial assessment
 3. After transferred to the ward
 4. Detailed physical examination



- ___ 10. The first step in determining the presence of a life-threatening condition is to assess the patient's:
1. Level of consciousness & Airway
 2. Breathing
 3. Circulation
 4. Blood Pressure & Pulse Rate
- ___ 11. What does the letter "V" represent in the mnemonic memory device AVPU?
1. Ventilations
 2. Vagus
 3. Verbal stimuli
 4. Vehicle
- ___ 12. If you want to administer 200 mL/hour of normal saline with a 10 drops/mL administration set, the flow rate will be:
1. 10 drops/minute
 2. 20 drops/minute
 3. 33 drops/minute
 4. 66 drops/minute
- ___ 13. The only effective way to prevent **immediate** trauma deaths is through:
1. Doctor's presence at the site of the injury
 2. Rapid transport to a Upazila Health Clinic
 3. Injury-prevention programs
 4. Trauma surgery within 20 minutes of the injury at a Medical College Hospital
- ___ 14. **Late** trauma deaths most often result from:
1. Hemorrhage
 2. Major head injury
 3. Pneumothorax
 4. Sepsis



- _____ 15. In trauma care, the “golden hour” begins:
1. Immediately at the time of injury
 2. When the first responder starts care
 3. When the patient enters the Operating Theatre
 4. When the arrives at a Medical College Hospital
- _____ 16. Treatment of an open pneumothorax includes:
1. An occlusive dressing that is taped on three sides
 2. A sterile gauze that allows for measured air exchange
 3. Withholding fluids if the patient also presents with shock
 4. A large, bulky dressing that is taped in place

Chest Trauma

A 26-year-old male was hit in the left chest wall by a cricket ball. He felt a “pop” and thinks some of his ribs were broken. His heart rate is 100 beats per minute, blood pressure of 90/60, and distended neck veins. He is working very hard to breathe and you note cyanosis around his lips. Lung sounds are decreased on the left chest wall.

- _____ 17. Immediate management for this condition includes:
1. Needle thoracostomy
 2. Occlusive dressings
 3. Pericardiocentesis
 4. Cricothyrotomy
- _____ 18. The correct placement for a needle thoracostomy (or needle thoracocentesis) would be:
1. The 2nd intercostal space, under the 3rd rib, midclavicular line
 2. The 2nd intercostal space, over the 3rd rib, midclavicular line
 3. The 5th intercostal space, over the 6th rib, midclavicular line
 4. The 3rd intercostal space, over the 4th rib, midaxillary line
- _____ 19. An ECG strip shows a regular rhythm with a QRS complex of 0.08, a rate of 145, a PR interval of 0.12, and one upright P wave before each QRS complex. You suspect that this rhythm is:
1. Sinus tachycardia
 2. Ventricular tachycardia
 3. Atrial fibrillation with rapid ventricular response
 4. Atrial flutter with rapid ventricular response



____ 20. Which of the following is an easily correctable cause of Pulse Electrical Activity (PEA / EMD)?

1. Tension pneumothorax
2. Pulmonary embolism
3. Myocardial infarction
4. Ischemia during resuscitation

____ 21. Defibrillation of patients in **asystole**:

1. Is recommended so as to avoid missing cases of ventricular fibrillation

2. Should occur at 200 joules initially
3. Should be the first line treatment
4. Is not recommended

____ 22. The initial **pediatric** defibrillation should occur at:

1. 1 J/kg
2. 2 J/kg
3. 3 J/kg
4. 4 J/kg

____ 23. To help reduce impedance to electrical current:

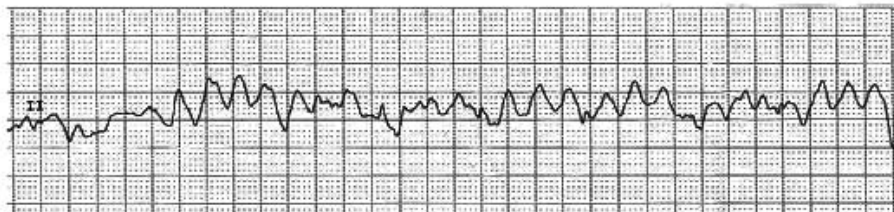
1. Apply saline pads to the patient's chest prior to defibrillation
2. Wait at least 3 minutes between defibrillation attempts
3. Apply 12 KG or 25 pounds of pressure with the paddles against the chest wall
4. Place the paddles no more than 3 inches apart from each other on the chest wall

____ 24. When performing CPR on an adult, the preferred rate of compressions is:

1. 60 per minute (15:2)
2. 80 per minute (15:2)
3. 100 per minute (30:2)
4. 150 per minute (30:2)



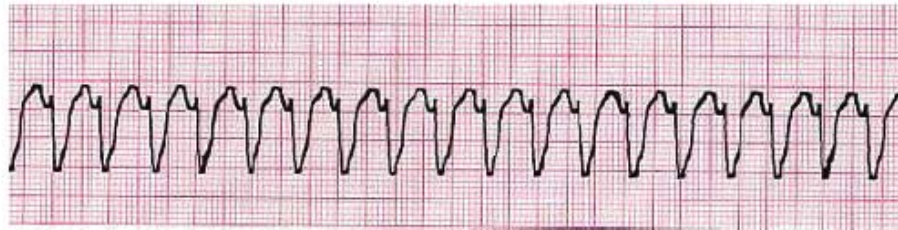
- ___ 25. In a 100 KG patient with a total body surface area burned of 20%. Which of the following fluid boluses would be most appropriate for this patient in the first 24 hours?
1. 4 liters
 2. 8 liters
 3. 800 mL
 4. 400 mL
- ___ 26. In a mass casualty incident with multiple patients, by international color coding and prioritized standards, a patient identified as having immediate needs is tagged with the color:
1. Red
 2. Yellow
 3. Green
 4. Black
- ___ 27. The first fluid bolus for a hypovolemic child should be:
1. 1 mL/kg
 2. 5 mL/kg
 3. 10 mL/kg
 4. 20 mL/kg
- ___ 28. Identify the following cardiac rhythm:



1. 2nd Degree AV Block
2. Ventricular Fibrillation
3. Asystole
4. Ventricular Tachycardia



____ 29. Identify the following cardiac rhythm:



1. 2nd Degree AV Block
2. Ventricular Fibrillation
3. Asystole
4. Ventricular Tachycardia

____ 30. Identify the following cardiac rhythm:



1. 2nd Degree AV Block
2. Ventricular Fibrillation
3. Asystole
4. Ventricular Tachycardia



Pre-Test / Post-test Principle of Emergency Care

Name: _____

Date: _____

Fill in the circle of the correct answer. One answer per question.

- 1. (1) (2) (3) (4)
- 2. (1) (2) (3) (4)
- 3. (1) (2) (3) (4)
- 4. (1) (2) (3) (4)
- 5. (1) (2) (3) (4)
- 6. (1) (2) (3) (4)
- 7. (1) (2) (3) (4)
- 8. (1) (2) (3) (4)
- 9. (1) (2) (3) (4)
- 10. (1) (2) (3) (4)
- 11. (1) (2) (3) (4)
- 12. (1) (2) (3) (4)
- 13. (1) (2) (3) (4)
- 14. (1) (2) (3) (4)
- 15. (1) (2) (3) (4)
- 16. (1) (2) (3) (4)
- 17. (1) (2) (3) (4)
- 18. (1) (2) (3) (4)
- 19. (1) (2) (3) (4)
- 20. (1) (2) (3) (4)
- 21. (1) (2) (3) (4)
- 22. (1) (2) (3) (4)
- 23. (1) (2) (3) (4)
- 24. (1) (2) (3) (4)
- 25. (1) (2) (3) (4)
- 26. (1) (2) (3) (4)
- 27. (1) (2) (3) (4)
- 28. (1) (2) (3) (4)
- 29. (1) (2) (3) (4)
- 30. (1) (2) (3) (4)



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Directorate General of Health Services



World Health
Organization
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