TAMILNADU ACCIDENT & EMERGENCY CARE INITIATIVE

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TAEI

Saving Lives Is Our Mission

TAEI SKILL GRADING

TRAINING OF TRAINERS

TRAINING MODULE

REGIONAL TRAINING CENTRE

RAJIV GANDHI GOVERNMENT GENERAL HOSPITAL

Chennai – 600 003

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Health Secretary,

The Government of Tamil Nadu has undertaken various initiatives to improve the quality of health care service in our State. With the increase in the number of mortalities and morbidities due to Road Traffic Accidents and various other emergencies, there was a dire need of one such initiative in order to save lives and to improve the quality of life for the unfortunate victims. Thus, was born the Tamil Nadu Accident and Emergency Care Initiative (TAEI).

It has been a year since the Initiation of TAEI at the Rajiv Gandhi Government General Hospital, and thanks to the tireless and dedicated work of all the medical personnel at the hospital, the mortality rate has been drastically reduced. But the concept of emergency medicine is vast and ever changing. Thus, the doctors, staff and other paramedical staff across the State need to be updated and trained in the field of Trauma and Emergency Management.

It is my great pleasure to announce that RGGGH, along with NHM has organised this training program for all the medical personnel across all the TAEI centres of Tamil Nadu. This training module, which covers all the core concepts of the training is a result of meticulous work of dedicated doctors of RGGGH. I congratulate the experts for their valuable contribution in bringing out this module, and I wish them all the very best in successfully in conducting this training program.

DME,

Assuring good quality of health care services provided to the public by the government institutions is instrumental in ensuring the health outcome of the people. The Tamil Nadu Accident and Emergency Care Initiative (TAEI) is one such project by the Government of Tamil Nadu to ensure that best quality of treatment is provided to the patients ailing from Trauma and other Medical Emergencies. The cornerstone for ensuring best quality care and outcome is the formulation of protocols and treatment guidelines and strictly adhering to it.

This Training Module is one such effort in the right direction. The module has been prepared with contributions from several experts of Rajiv Gandhi Government General Hospital. It is targeted to assist medical officers and other health care personnel to provide appropriate and standard health care for all the patients arriving at the Emergency Department, across all the government health care facilities all over the state. This will enable us to progress towards our goal of best health outcome for the patients.

I hereby appreciate RGGGH and NHM together for bringing out such a Training Module. I am sure that the Module will be extremely useful to all the medical practitioners and health care personnel in all the Medical Colleges and District Hospitals in the state. This will eventually ensure quality health care delivery to the patients in the Emergency Department.

WE ACKNOWLEDGE

Chief Advisor:
Prof. Dr. R. JAYANTHI M.D., F.R.C.P.(Glasg.) *DEAN, MMC & RGGGH, Chennai.*

Course Coordinator:
Prof. N. LATHA M.D., D.A. *Professor of Anaesthesiology, RGGGH, Chennai.*

Training Committee Members:
Prof. V. SINGARAVADIVELU M.S. Ortho, PHD *HTNO, RGGGH, Chennai.*
Prof. P. THANGAMANI M.S. Gen. Surgery *Chief In-Charge– ED, RGGGH, Chennai.*
Dr. V. RAJESH M.B.B.S *MO In-Charge– ED, RGGGH, Chennai.*

Contributors:
Prof. Bhavani
Prof. Rajashree
Prof. Justin Paul
Prof. Raghavendran
Prof. Nalli Yuvaraj
Prof. J. Jaganmohan M.S, M.Ch. HOD Plastic Surgery
Prof. Maniselvi
Prof.
Dr. A. Ganesh M.D. (Anaes) Asst. Prof.
Dr. A. Asha M.D.(Anaes) Asst. Prof.
Dr. A.V. Ashwin M.D.(Anaes) Asst. Prof.
Dr. V.J. Vikram M.S, D.L.O. Asst. Prof.
Dr. Elavarasi
Dr. Shanmugasundaram
Dr. M. Sivan M.S. General Surgery
Dr. Karthik
Dr. Shivashankar
Dr. Priyadarshini
Dr. Ramalingam M.D. Forensic Medicine
Mrs. Kalaivani Matron

TAEI Skill Grading - Training of Trainers
Training Module

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INTRODUCTION TO TAEI

The State of Tamil Nadu is the seventh most populous and highly urbanized in the country with 14,257 km of National and State highways. In 2016, the State accounted for 17,311 deaths due to Road Traffic Injury (RTI) which is 12% higher when compared to 2015. As per the Global Disease Burden report 2017, the DALY's lost due to Injuries is 13.5 % (Unintentional injuries, Self harm and Interpersonal Violence and Transport Injuries). RTA results in serious physical, mental and psycho-social impairment, bringing huge catastrophic expense to the family, crashing down its peace and security.

Other Non Communicable diseases are also increasing in incidence mostly attributable to the changing socio economic profile.

Because of the increasing incidence of Accidents, Infarctions, Cerebro Vascular Accidents (Stroke), Accidental and Deliberate (Self Harm) Poisoning and Burns, there is need of a dedicated programme aimed at addressing these conditions at all (Primordial, Primay, Secondary, Tertiary and Quarternary) levels of health care. Sensing the shift in the disease pattern, government of Tamil Nadu has proactively Formed "Tamil Nadu Accident and Emergency Care Initiative" (TAEI) for enabling various public hospitals across the state to effectively manage the emergency conditions.

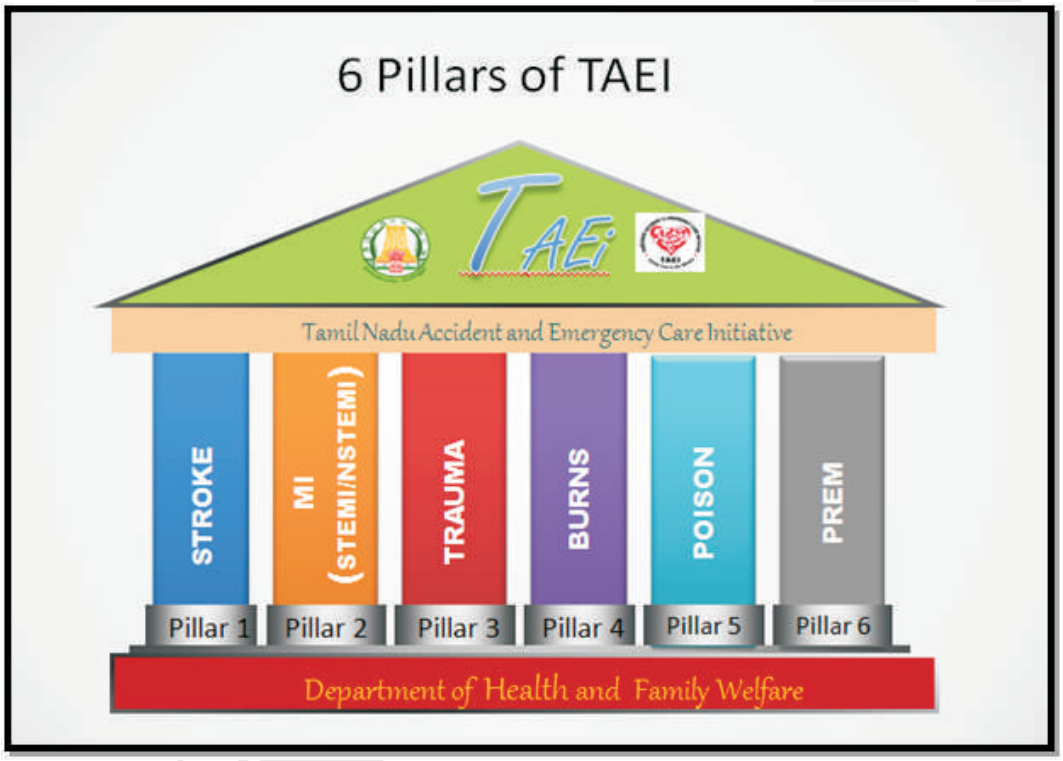
The Various Aims of TAEI are

1. To reduce the Mortality and Morbidity by initiating and maintaining a comprehensive health care set up.
2. To provide Protocol based Uniform and High Quality Care in Emergency Departments across All Hospitals in the state of Tamil Nadu.
3. To Provide emergency health care services
    a. Based on Clinical Needs for all patients
    b. With highest standards of excellence and professionalism
    c. Working across organisational boundaries and in partnership with other organisations in the interest of patients, local communities and the wider population
    d. In the most effective, fair manner with sustainable use of finite resources.
    e. Being accountable to the public, communities and patients

The Various Objectives of TAEI are

1. To attain the SDG Goal: To halve the number of deaths and injuries from road traffic accidents by the year 2020 globally.
2. To attain the State Goal: To achieve halve the number of deaths (8500) and injuries from road traffic accidents by year 2023 in TamilNaduState.
3. To Standardize Managements of All Medical and Surgical Emergencies based on specific and clear protocols.
4. To Triage Patients into Red, yellow and Green Categories and to institute appropriate management.
5. To ensure definitive treatment for the injured within the Golden Hour and to have "Time Norms" for procedures in the Emergency Department.
6. To Start the Process of Rehabilitation as early as possible.
7. To identify and designate TAEI Centres on the basis of need (case load) and location (national highways, Connecting two capital cities, Connecting major cities other than capital city, Connecting ports to capital city, Connecting industrial townships with capital city etc) as Level-1, Level-2, Level-3 centres.

8. To Augment the Hard (Civil Works, Equipments, Consumables, Drugs) and Soft (Human Resources- New Posts as well as Filling Vacancies, Training) Infrastructure in these centres as per need and implementation of Standard Operating Procedures in these centres
9. To install Basic Life Support Ambulances Level -IV on an evidence based approach along the Highways and Advanced Life Support Ambulance at Trauma Care Facilities for inter facility transfer.
10. To expand the ECC facilities provided already to all high accident density areas.
11. To initiate the development of a state-wide referral network with both public and private hospitals through empanelment of CMCHIS Insurance Scheme with forward and backward linkages.
12. To establish "State Trauma Surveillance Centre" with real time reporting of accident & trauma cases for the Trauma Registry which will provide evidence-based decision for policy making.
13. To converge and co-ordinate with engineering, road safety, law enforcement and Transport departments.
14. To initiate IEC/ BCC activities for educating and creating awareness among the public.



TRIAGE

TRIAGE:

Red - Most Critically Injured
Yellow - Less Critically Injured
Green - No life or limb threatening injury
Black - Death

	Red Criteria	Yellow Criteria	Green Criteria
Physiological	A : Noisy Breathing	A : Patent Airway	A : Patent Airway
	B : RR <10or > 24/min	B : RR 10 ☐ 24/ min SPO2> 95%	B : RR 10 ☐ 24/ min SPO2> 95%
	C : Radial Pulse ☐ Present / Absent Pulse < 50 or > 100/min SBP < 90mm Hg Capillary Refill > 2sec	C : Pulse 50 to 100 SBP > 90mm Hg Capillary Refill < 2sec	C : Pulse 50 to 100 SBP > 90mm Hg Capillary Refill < 2sec
	D : Responding only to Pain on AVPU GCS < 13 Spine Injury with Single Breath count More than 15	D : Responding to Verbal on AVPU GCS 13,14,15 Spine Injury with Single Breath Count < 15	D : Alert on AVPU Scale GCS 15

PRIMARY AND SECONDARY SURVEY

PRIMARY SURVEY:

- A : Airway maintenance with cervical spine control
- B : Breathing and ventilation
- C : Circulation and bleeding control
- D : Disability/Neurologic status
- E : Exposure/environmental control

BASIC AIRWAY MANAGEMENT

- Remove of foreign material from mouth & pharynx
- Suction
- Supplemental oxygen
- Chin lift and jaw thrust
- Oropharyngeal or nasopharyngeal airway
- Definitive airways
    - RSI for agitated patients with C-spine immobilization
    - ETI for comatose patients (GCS<8)

DEFINITIVE AIRWAY

1. Orotracheal intubation
2. Nasotracheal intubation
3. Surgical airway
    - Cricothyroidotomy
    - Tracheostomy

ASSESSMENT OF BREATHING:

- Respiration
- Chest movement
- Respiratory Rate
- Tracheal position
- Breath sound
- Subcutaneous emphysema
- Inspection of neck vein and wound

FACTORS AFFECTING BREATHING:

- Tension pneumothorax
- Flail chest
- Open chest wound
- Massive hemothorax

BREATHING INTERVENTIONS:

- Ventilate with 100% oxygen
- Needle decompression if tension pneumothorax suspected
- Chest tubes for pneumothorax / hemothorax
- Occlusive dressing to sucking chest wound
- If intubated, evaluate ETT position

CIRCULATION AND HEMORRHAGE CONTROL:

- Level of consciousness
- Skin color/capillary refill
- Pulses in four extremities
- BP & Pulse pressure
- Temperature
- Urine Output
- External bleeding site
- Internal bleeding site

ASSESSMENT OF DISABILITY:

- AVPU scale
- GCS
- Pupillary Reaction

EXPOSURE / ENVIRONMENTAL CONTROL:

- Undress
- Exam back region
- Assess all entry and exit wound
- Prevent hypothermia (warming light, warm blankets, warm resuscitation fluid, warm inspired air)

SECONDARY SURVEY:

- History
- Physical exam: head to toe
- "Tubes & Fingers in every orifice"
- Complete neurological exam
- Special diagnosis tests
- Re-evaluation

ADJUNCTS TO PRIMARY SURVEY – INVESTIGATIONS:

- CT
- Contrast x-ray studies
- Extremity x-ray
- Endoscopy
- Ultrasound

MAINTAINING AIRWAY AND BREATHING

	Oxygenation: Maintaining Airway and Breathing
Objectives	Upon completion of the lesson the trainee would be able to: • Maintain oxygenation • Identify airway patency and maintain it • Predict a difficult airway • Assess and manage airway problem • Assess and manage breathing problem

Core Concepts

- •Maintenance of oxygenation and tissue perfusion is the primary goal of resuscitation.
- Assessment and management of the airway takes precedence over all other management.
- •Oxygen must be administered to all critically ill or injured patients.
- Assessment is not a one-time requirement; reassessment is required as pathology may worsen

Airway obstruction

A blockage or obstruction in the airway may partially or totally prevent air from getting into the lungs. It may occur at any point from the mouth down to the trachea and bronchial tree. Airway obstruction may be partial or complete. Patients with complete airway obstruction rapidly get hypoxic, while in partial obstruction, the onset of hypoxia may be insidious.Upper airway obstruction occurs in the area from nose and lips to larynx.

Lower airway obstruction occurs in the area between larynx and lungs, generally caused by increased resistance in the bronchioles leading to reduction in the amount of air inhaled with each breath.

Predicting a difficult airway

Several factors such as facial hair, shape of jaw, abnormal or absent teeth, limited mouth opening, largetongue, short neck, high larynx, pregnancy, soft tissue swelling as a result of burns, allergy/angioedema, infection and haematoma, maxillofacial or mandibular trauma, cervical spine injury or arthritis and obesity may cause difficulty in managing the airway.

To predict difficulty in bag-mask ventilation, one may use the mnemonic

MOANS or BONES.

MOANS

- Mask seal difficult or impossible (e.g. facial abnormality)
- Obesity (BMI>26) or upper airway Obstruction
- Advanced age
- No teeth
- Snorer

BONES:

- Bearded individual
- Obesity (BMI>26)
- No teeth
- Elderly (age>55 years)
- Snorer

Assessment of Breathing

Look: Is patient's colour normal or appears cyanosed? Does he look distressed? Chest wall movement, is it normal and symmetrical? Is the patient using accessory muscles of respiration? Is the respiratory rate normal/slow/fast? Is breathing pattern regular/irregular?

Listen: Can patient speak in full sentence? Is breathing noisy? On auscultation, check that the breath sounds are bilateral, equal on both sides or not.

Feel: Is the trachea central? Is there distension of neck veins? Check for soft tissues (surgical emphysema/crepitus) and bony structure of chest wall for integrity.

STRIDOR (UPPER AIRWAY OBSTRUCTION)

Patient with history of smoking with hoarsness of voice with respiratory distress,should be suspected for obstruction in the larynx(voice box).The initial management is to start treating with intravenous injections of Deriphylline and decadran. A brief history must be elicited along with ausculktation of respiratory system.The oxygen saturation must be monitored. X-ray neck,soft tissue antero-posterior , lateral view , chest PA view must be taken.

In case of the lowered saturation , the of securing airway is of priority. This can be achieved by oro-tracheal intubation, remembering not to make repeated attempts, as it would precipitate odema , leading further narrowing of already compromised airway. ENT surgeon must be called for emergency tracheostomy.If the ENT surgeon is not available , patient must be referred to nearest TERITIARY CENTER WHERE THE FACILITIES OF EMERGENCY TRACHEOSTOMY ARE AVAILABLE WITHOUT ANY DELAY.

ENT surgeon will assess the breathing difficulty by indirect laryngeal mirror/videolaryngoscopy and subglottic aircolumn by x-rays.The emergency tracheostomy will be performed after blood investigations, ECG immediately to secure the obstructed airway.

In case of a situation where the obstruction could not be secured due to obstruction in upper airway and the patient saturation falling, CRICOTHYROIDOTOMY can be done, by making stab incision by palpating thyroid and cricoid cartilage and passing a small tube through it.

OXYGENATION

Oxygenation is the process of O2 diffusing passively from the alveolus to the pulmonary capillaries, where it binds to the hemoglobin in RBC or dissolve in the plasma. Oxygen is a drug: “Oxygen can neither be ingested nor injected but has to be inhaled and for that patent airway is the pre-requisite.”

AIRWAY: The passage through which the air passes during respiration from atmosphere to alveoli. It may be subdivided into

A) Upper airway – from the nares and lips to larynx (mouth, nose, naso-pharynx, Oro-pharynx, pharynx and larynx)

B) Lower airway – trachea-bronchial tree (trachea, bronchi, bronchioles and alveoli).

OXYGEN CASCADE:

Oxygen cascade is the process that describes the decrease in oxygen tension from atmosphere to the mitochondria. The key steps in Oxygen cascade are:

I. Uptake in the lungs (PO2 of dry atmosphere= 160mmHg, Humidified air= 150mmHg, Alveolar gas=105mmHg)

ii. Carrying capacity of blood (arterial blood PaO2= 100mmHg)

iii. Delivery from lungs to tissue capillaries(Capillary PO2= 45mmHg)

iv. Delivery from capillaries to interstitium

v. Delivery from interstitium to individual cells

vi. Cellular use of oxygen (venous blood PvO2= 45mmHg)

Factors affecting the Oxygen cascade:

a. Inspired oxygen(PiO2): Barometric pressure(PB) , Oxygen concentration(FiO2)
b. Alveolar gas (PAO2): oxygen consumption(VO2), Alveolar ventilation(VA)
c. Arterial blood(PaO2): Dead space ventilation(increased V/Q), Shunt(decreased V/Q)
d. Cellular PO2: Cardiac output(CO), Hemoglobin(Hb)

OXYGEN TRANSPORT:

- Transported from lungs to the tissues.
- Oxyhemoglobin: 97% of the O2 combines with the RBC Hgb
- Dissolved hemoglobin: Remaining 3% dissolved in the plasma and transported to the cells.
- The normal arterial partial pressure i.e., PAO2 is 90-100mm Hg.

HYPOXIA: Partial/complete lack of oxygenation delivery or utilization of oxygen at tissue level which changes the function and metabolism of the body

- ✓ Hypoxic Hypoxia: PAO2 is low
- ✓ Anemic Hypoxia: amount of hemoglobin to carry oxygen is low
- ✓ Stagnant Hypoxia: blood flow to the tissues is low
- ✓ Histotoxic Hypoxia: Tissues cannot utilize oxygen.

HYPOXEMIA: Partial pressure of the oxygen in blood (PAO2< 80mmHg) while breathing in room air.

Comparing SpO2 with PaO2:

- SpO2 90% - PaO2 60mm Hg
- SpO2 80% - PaO2 50mm Hg
- SpO2 70% - PaO2 40mm hg

ERRORS: improper placement of the probe, nail polish, hypothermia, rigors, methemoglobinuria, carboxyhemoglobinuria, electrical disturbances.

ASSESSMENT: Examine the following features for assessing better oxygenation.

I. Breathing: Normal/Tachypnea/Dyspnea/Shallow breathing/ Gasping/ Apnea
II. Hypoxic features: Restless, agitated/ Decreased consciousness/Cyanosis, Low PaO2
III. Hemodynamcs: Brady or tachyarrhythmia, low pulse volume, hypotension, circulatory collapse.

GOAL: The target goal of oxygen saturation is 94-98%.

OXYGEN THERAPY: INDICATIONS:

1.Spontaneous:

a. Obstructed(Partial/Complete)

I. Upper Airway: Tongue fall, trauma, secretions, foreign body, large goiter, angioneurotic edema

ii. Lower airway: COPD, BA, foreign body, Bronchiectasis

b. Non-obstructed: chest trauma, pneumothorax, pneumonia, obesity, effusion, high altitude, scuba diving,

2. Apneic/Critical patients: respiratory failure, MI, Shock, CCF, poisoning, severe burns, poly trauma, periarrest

MANAGEMENT:

1a: Upper airway obstruction: opening the airway with Triple maneuver (Head tilt, Chin lift, Jaw thrust), clearing the secretions and obstruction (foreign body, tongue fall), O2 Therapy with nasal cannula, simple face mask. For cervical spine injury, only jaw thrust is advisable with MILS.

Lower airway obstruction: Propped up position, oxygenation, nebulisation with O2 Therapy with nasal cannula, simple facemask.

1b: Non-obstructed airway:

- Mild hypoxia(SpO2 90-94%): Simple or venturi face mash
- Moderate hypoxia(SpO2<75-89%): Non breathing mask/BMV(Ambu bag)
- Severe hypoxia(SpO2< 75%): Non breathing mask/ BMV,
  - If patient improves, NPPV(alert patients)
    If Sp02 declines, IPPV(Apneic patients)

2. Apneic/Critical patients: BMV O2 Flow (12-15L/min, IPPV, Surgical airway.

OXYGENATION DEVICES:

1) Spontaneous:

a. Nasal prongs: 24-35% FiO2 at 1-4L/min. Comfort, cost efficient, long term O2 therapy.

b. High flow nasal cannula: 21-80% FiO2 at 6-12L/min. Humidification and easy titration across wide FiO2range.

c. Simple face mask: 40-0% FiO2at 5L/min. higher FiO2 than nasal cannula.

d. Venturi facemask: 24-60% FiO2. Controlled FiO2 at 24%, 26%, 28%, 31%, 35%, 40%, 50% (colour coded/single rotating device for appropriate concentration)

e. T-piece device.

f. Nonrebreather mask: 60-90% FiO2 at 15L/min. Delivers higher FiO2 than simple mask.

2) Apneic: 0

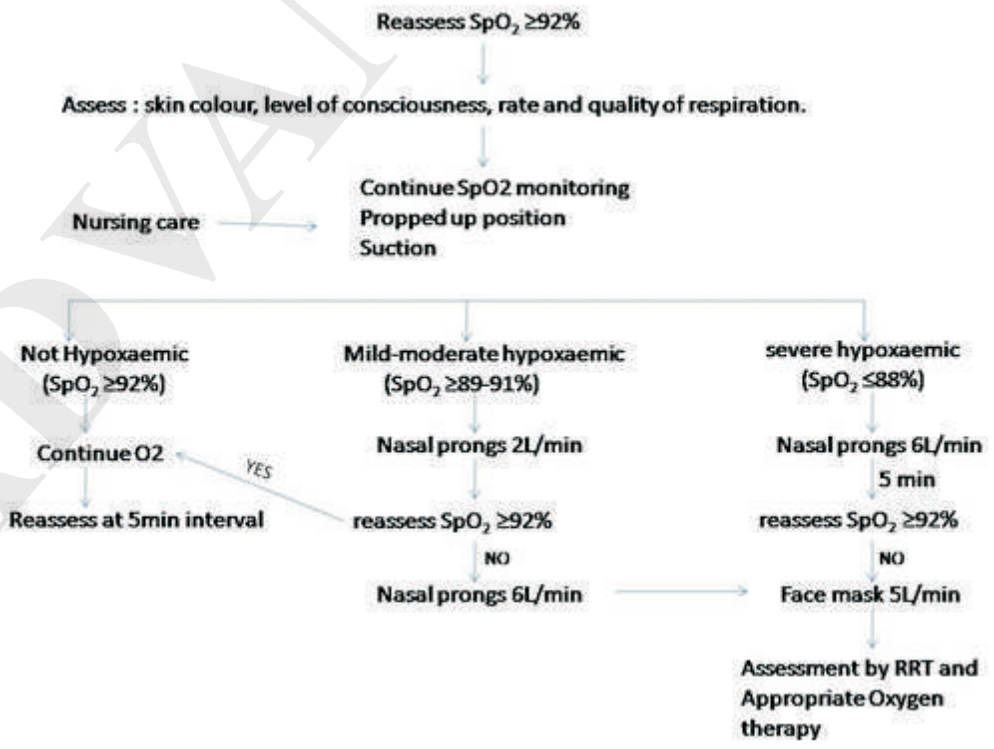
a. AMBU/BMV: 90-100% FiO2 with reservoir bag at flow 12L/min. Unidirectional valve, Self inflating, IPPV

b. Transport ventilator.

c. Translaryngeal oxygen jet insufflations.

Other devices- LMA, ILMA, PLMA, ETT.

INITIATION AND TITRATION OF OXYGEN THERAPY



RRT: Rapid Response Team

HUMIDIFICATION and BACTERIAL FILTERS:

- ❖ All oxygen therapy should be given with humidifier and bacterial filters.
- ❖ All devices should be disposable.

"CENTRAL LINE" AKA (SUBCLAVIAN, JUGULAR, FEMORAL) CENTRAL VENOUS ACCESS

Practical Procedures:

- Central Line Insertion - Internal Jugular approach
- Central line insertion should be real-time ultrasound guided Internal jugular is preferred to sub clavian where possible as it is less likely to lead to pneumothorax

Indications for central line Insertion:

- Administration of medications that require central access e.g. amiodarone, inotropes, high concentration electrolytes
- Fluid balance monitoring with CVP
- Intravenous access (long term or difficult peripherally)

Complications associated with insertion:

- Haemothorax
- Pneumothorax
- Haematoma
- Inadvertant arterial puncture

Equipment required:

- Ultrasound and sterile ultrasound sheath
- Sterile trolley
- Sterile field, gloves, gown and mask
- Seldinger central line kit
- Saline flush
- Chlorhexidine
- Lignocaine
- Suture
- Scalpel
- Sterile dressing
- Pressure bag to attach to monitoring

Contraindications to procedure:

- Coagulopathy
- Local infection
- Avoid in raised intracranial pressure- aim for a femoral approach if required
- Patient non compliance

Pre Procedure:

- Consent patient if conscious otherwise document why the procedure is in the patients best interests
- Consent should include: Infection, bleeding (arterial puncture, haematoma, haemothorax), pain, failure, damage to surrounding structres (including pneumothorax), thrombosis.
- Set up sterile trolley
- Position patient with head down if they can tolerate it, with head facing away from side of insertion o This ensures maximum venous filling
- Ultrasound area to define anatomy
- Having a nurse or assistant is helpful

The Procedure:

- Wash hands and don sterile gown and gloves
- Clean the area and apply sterile field
- Apply sterile sheath to the ultrasound probe
- Confirm anatomy
- Under ultrasound guidance insert lignocaine cutaneously, subcutaneously and around internal jugular.
- Whilst lignocaine has time to work flush all lumens of the line and then clamp all lumens except the Seldinger port
- Ensure caps are available for the lumens
- Under ultrasound guidance take Seldinger needle attached to syringe and insert into the internal jugular vein.
- When blood is freely aspirated remove syringe and inset Seldinger wire. This should pass easily.
- Use scalpel to make an incision in the skin
- Pass the dilator over the wire and gently but firmly dilate a tract through to the internal jugular.
- Remove the dilator and pass the central line over the Seldinger wire, do not advance the line until you have hold of the end of the wire.
- Remove the wire
- Aspirate and flush all lumens and re clamp and apply lumen caps
- Suture the line to allow 4 points of fixation
- Dress with a clear dressing so the insertion point can be clearly seen

Post Procedure:

- Attach central line to pressure bag to allow CVP monitoring o Nursing staff can show you how to do this or will do it for you
- Run a blood gas to ensure a venous sample
- Chest x-ray to confirm placement and to check for pneumothorax
- clear documentation of date of insertion and monitor for infection

In the event of failure:

- Stop procedure
- Seek senior help

Top Tips for central line insertion:

- Central lines can have multiple lumens. Most commonly 3,4 and 5 lumen lines are inserted. Confirm what the line will be used for and how many infusions a patient has to aid your selection of the line with the correct amount of lumens
- Always ensure you are happy with your anatomy before commencing the procedure
- Ensure your sterile trolley is well set up with the kit lined up in the order you will use things and a clear area for sharps. This will make your life easier.

• **NEVER LET GO OF THE SELDINGER WIRE!**

N.B. The Seldinger central line kit should contain the line, Seldinger wire, dilator, Seldinger needle and syringe, scalpel and suture point fixation.

FLUID RESUSCITATION IN TRAUMA PATIENTS

Shock is defined by clinical evidence of hypoperfusion and a failure of adequate oxygen delivery to tissues of the body. The primary goal of resuscitation from haemorrhagic shock is to identify the source of haemorrhage and control it as rapidly as possible. Damage control resuscitation is a new paradigm for patients with massive bleeding which includes permissive hypotension, hemostatic resuscitation and transfusion strategies and damage control surgery. It aims to reduce bleeding and optimise coagulation.

PERMISSIVE HYPOTENSION.

High blood pressure may displace the clot. Mean arterial pressure in the range of 50 to 60 mmHg is the endpoint of hypotensive resuscitation. Spontaneous hemostasis and long term survival were maximised by reduced administration of resuscitation fluids during the period of active bleeding in an attempt to keep perfusion only just above the threshold for ischemia. It is not followed in traumatic brain injury patients, where a MAP of >70 mm Hg is maintained.

Mean arterial pressure:

Is an average blood pressure in an individual during a single cardiac cycle. It is a function of cardiac output and the amount of resistance provided by the blood vessels. MAP= DBP + PP/3 or (2DBP + SBP)/3 .

Resuscitation is of two types: early and late.

EARLY RESUSCITATION is done while active bleeding is still ongoing

How to start resuscitation?

Infusion with isotonic crystalloids are started at 20ml/kg or **1 litre** rapidly, **bolus of 4ml/kg or 200 ml** fluid may be given intermittently to maintain systolic blood pressure of **80 to 100 mm Hg,** MAP of 50 to 60 mm Hg, urine output of 0.5 ml/kg/hr, normal mental status, normothermia.

Non responders- start colloid infusion until blood and blood products reach. For patients with deteriorating clinical signs (poor mental status, pallor, sweating, hemodynamic instability, continued bleeding), blood and blood products transfusion started. Dopamine and other inotropes also started in such patients.

The American college of surgeons identified four categories of acute blood loss

CLASS	% OF TOTAL BLOOD VOLUME LOST	CLINICAL FINDING
I	≤15%	**Compensated phase:** normal bp, HR >100bpm.
II	15 to 30 %	**Sympathetic vasoconstriction:** Pt anxious, cold to touch, sweating, tachycardia HR >120bpm, bp maintained in supine position, exaggerated postural hypotension & dizziness, urine output 20-30ml/hr.
III	30 to 40 %	**Decompensated phase / Hypovolemic shock:** Pt agitated or confused, sbp<90mm Hg, Tachypneicrr>20/min, u/o 5-15ml/hr.
IV	>40%	**Irreversible phase:** Pt unresponsive or in coma, profound hypotension, Marked tachycardia, u/o <5ml/hr.

RESUSCITATION FLUIDS.

ISOTONIC CRYSTALLOIDS: (Normal saline, Ringer lactate, Plasmalyte-A are the initial resuscitative fluids administered to any trauma patient.

COLLOIDS: starch solutions, albumin,gelatine,dextran.

HEMOSTATIC RESUSCITATION AND TRANSFUSION STRATEGIES.

Coagulopathy in trauma is due to endogenous systemic anticoagulant, hyperfibrinolysis, hemodilution following intravenous fluid administration, hypothermia.

The strategy enables to achieve adequate tissue perfusion and oxygenation while correcting any coagulopathy. The need to transfuse blood arises when patient is hemodynamically unstable inspite of ongoing fluid resuscitation(class III & IV patients), at a falling haemoglobin level (usually less than or equal to 7g/dl in young healthy adults), uncontrolled hemostasis at trauma site, liberal fluid resuscitation.

LATE RESUSCITATION.

Begins once bleeding is definitely controlled by surgery. Fluid administration is an integral, mandatory component. The adequacy of resuscitation should not be judged by the presence of normal vital signs, but by normalisation of organ and tissue perfusion.

TRAUMATIC BRAIN INJURY – A SHORT REVIEW

Definition:

- **Traumatic Brain Injury** is defined as "brain damage resulting from external forces, as a consequence of direct impact, rapid acceleration or deceleration, a penetrating object or blast waves from an explosion."

Indian Scenario:

- Incidence -120 per 100,000
- Causes:
    - Road Traffic Accidents – 60%
    - Accidental Fall – 20-30%
    - Assaults – 10%
- 7th leading cause of mortality in India and (78% of these deaths are due to RTA alone
- ***Alcohol involvemen*t** is known to be present among majority of TBIs at the time of injury

Pathophysiology:

- ***Primary injury*** – Happens at the time of accident
- ***Secondary injury*** – Damage to brain tissue happens due to events happen after the primary injury

Grading of TBI:

- Most commonly used method is by using GCS score

Glasgow Coma Scale:

- Mild TBI – GCS 14-15
- Moderate TBI – GCS 9-13
- Severe TBI – GCS 8 or less

Management of Traumatic Brain Injury:
Danger Signs of Head Injury: LOC, Vomiting, ENT Bleed and Seizures

Initial Management:

- ABCDE in Trauma Management
    - **A: Airway (and c-spine protection)**
    - **B: Breathing and ventilation**
    - **C: Circulation with hemorrhage control**

Remember: Head Injury never causes Hypotension. No one can bleed enough blood into cranial cavity severe enough to cause hypotension. As an exception, in infants, enough blood can be lost intracranially to cause hypotension

- **D: Disability/Neurologic status**
    - Neurological assessment
        - GCS , Pupil and Limb movements
    - Signs of Raised ICP
        - Pupillary dilatation (unilateral or bilateral)
        - Asymmetric pupillary reaction to light
        - Decerebrate or decorticate posturing
        - Progressive deterioration of neurologic examination not attributable to any extracranial factors
    - If there is signs of raised ICP,
    - **Mannitol:** 0.25 to 1 gm/kg over 20mins repeated every 4 to 6 hours
    - **Anti epileptic drugs:** to prevent Early Post Traumatic Seizures (within 7 days)
        - Phenytoin is commonly used
        - Loading dose: 15-20mg/kg in 20mins
        - Maintainance: 5mg/kg in three divided doses
- **E: Exposure/Environmental control**

Scalp Injuries:

- Highly vascular and when lacerated, bleeds copiously
- Scalp is highly resilient, and only the most severe avulsing injuries leads to permanent damage

- TREATMENT:
    - Control bleeding by direct pressure
    - Wash wound with clean water/normal saline. Primary suturing f/b sterile dressing If there is no underlying skull fracture

Skull Fractures:
Management of Skull Fractures:

- **Medical management**: In most cases
    - Wound care
    - Analgesic
    - Antibiotics if wound is infected
- **Surgical management :** Elevation or Excision of depressed fracture

Lucid interval:

- Seen in 14 – 21% of cases
- Initial loss of consciousness and tranisient complete recovery followed by progressive neurological deterioration

Imaging: Biconvex Hyperdense lesion on CT

THORACIC TRAUMA

CORE CONCEPTS

- Chest injuries contribute to 25% to 60%of trauma deaths.
- Resuscitative measures, airway management and tube thoracostomy can salvage about 80% of all thoracic injuries.
- Poor perfusion may affect airway, breathing, circulation and sensorium.

CLASSIFICATION

Chest injuries are broadly classified into 2 types

1. LIFE THREATENING INJURIES :
   Diagnosed during primary survey and treated immediately.
2. POTENTIALLY LIFE THREATENING INJURIES :
   Diagnosed during secondary survey andInitiate treatment.

IMMEDIATELY LIFE THREATENING INJURIES

- Airway Obstruction
- Tension Pneumothorax
- Open Pneumothorax
- Flail Chest
- Massive Hemothorax
- Cardiac Tamponade

POTENTIALLY LIFE THREATENING INJURIES

- Simple Pneumothorax
- Pulmonary Contusion
- Tracheobronchial Tree Injury
- Blunt Cardiac Injury
- Traumatic Diaphragmatic And Aortic Injury
- Blunt Esophageal Rupture

MODE OF INJURY

- Blunt injury
- Penetrating injury
- Deceleration and compression injuries.

PATHOPHYSIOLOGY

- It affects both oxygenation and perfusion
- Results in hypoxia, hypercarbia, acidosis
- Myocardial contusion causing pump failure manifests as Cardiac Failure.

ASSESMENT

Attend promptly to **AIRWAY,BREATHING & CIRCULATION.**

LOOK

- Signs of laboured or abnormal breathing
- Rate and depth of respiration
- Symmetry of chest movements
- Use of accessory muscles
- Distended neck veins
- Open chest injury
- Flail segment and chest deformity
- Cyanosis and CRT (Capillary Refilling Time)

LISTEN FOR :

- Stridor, snoring and gurgling sounds- obstructed airway
- Hyper resonant/dull/normal percussion note
- Air entry and adventitious sounds
- Heart sounds

FEEL FOR :

- Position of trachea
- Subcutaneous emphysema
- Bony crepitations and tenderness

ACTION :

- Maintain a patent airway
- Oxygen administration and SpO2 monitoring
- Assist ventilation with BMV with oxygen at high flow[12-15l/min] if breathing is rapid,shallow and ineffective/apnoeic
- Definitive airway- secure airway with cuffed ETT/cricothyroidotomy and maintain EtCO2 of 35 to 45mmHg

MANAGEMENT OF SPECIFIC SITUATIONS :

TENSION PNEUMOTHORAX :

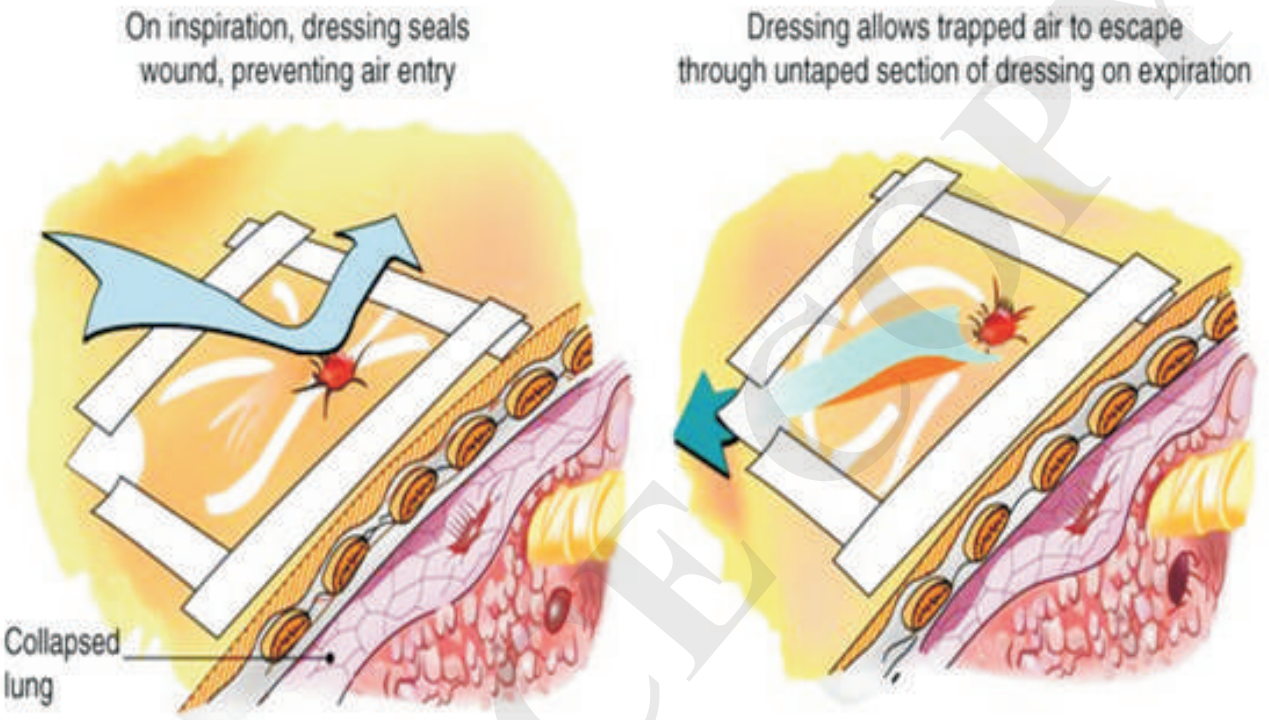
- Chest pain, anxiety, dyspnea and tachypnea
- Hyper-resonant chest on the affected side with diminished/absent breath sounds
- Late findings
    1. Tracheal deviation to opposite side
    2. Engorged neck veins with elevated JVP
    3. Hypotension and cyanosis
    4. Air hunger
    5. Decreased level of consciousness.

MANAGEMENT OF TENSION PNEUMOTHORAX :

- Needle thoracostomy at 5th ICS in midaxillary line with 16G needle
- It must be followed by tube thoracostomy
- Secure vascular access and administer crystalloids
- Administer antibiotics and analgesics
- Take surgical consult.

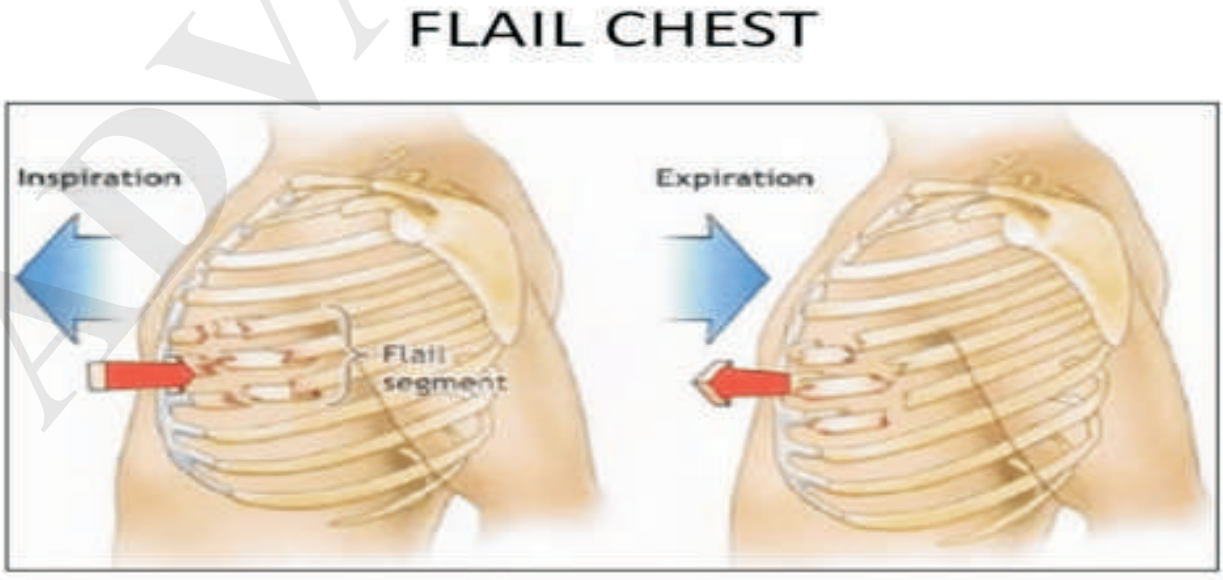
OPEN PNEUMOTHORAX (SUCKING CHEST WOUND):

- This is due to large openings in the chest wall, which remain open.
- If the defect is more than or equal to 2/3 diameter of trachea, air passes through the defect from atmosphere and impairs ventilation.
- Three sided dressing-putting a occlusive dressing which is taped on three sides
- This creates a flutter valve on the non taped side and allows air to escape during expiration
- Insert ICD away from the wound as soon as possible.



FLAIL CHEST :

- This occurs when fracture of two or more ribs occurs at two or more sites.
- A bony segment moves independent of chest wall and moves paradoxically during ventilation
- Underlying lung injury leads to accumulation fluid and blood in alveolar spaces



SIGNS AND SYMPTOMS :

- There will be tachypnea, dyspnea and severe pain
- Paradoxical chest wall movements, splinting of chest wall and tenderness on affected side
- Cyanosis/hypotension and anaemiamay or may not be present.

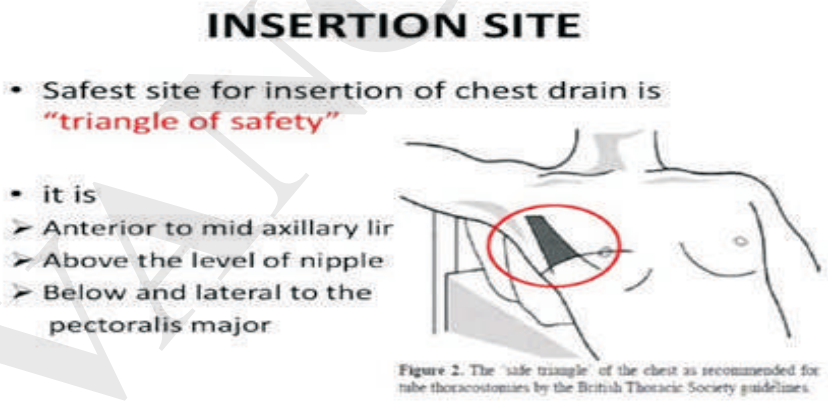
MANAGEMENT :

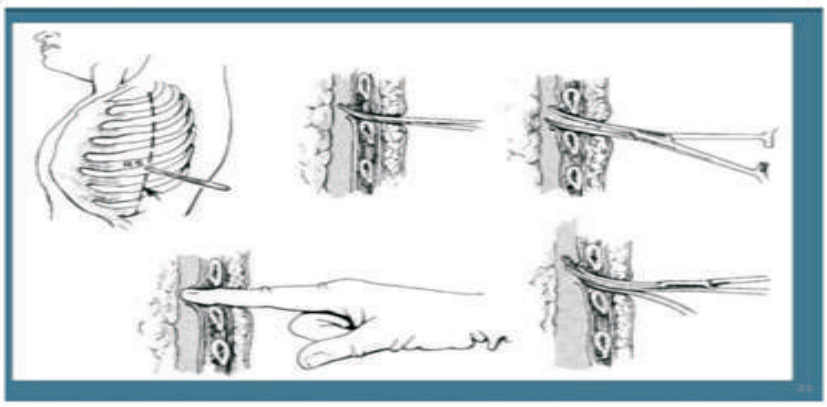
- Appropriate Oxygen supplementation
- Ensure adequate ventilation.
- Reassess RR, SpO2, EtCO2, sweating and colour of the patient. If possible do ABG.
- Intubation if RR more than 40 or PaO2 less than 60mmHg with FiO2 of 60%
- Judicious use of IV fluids
- Multimodal delivery of analgesics
- urgical fixation rarely

MASSIVE HEMOTHORAX :

- Accumulation of more than 1500 ml of blood in the thoracic cavity following injury to systemic or hilar vessel
- Usually followed by penetrating injury
- High degree of suspicion is needed in injuries medial to nipple line and scapula
- Patient will be dyspneoic,tachypneoic ,pale, hypotensive with flat neck veins
- Decreased chest movements and absent breath sounds and dull note on percussions

TUBE THORACOSTOMY





CARDIAC TAMPONADE :

- Pathophysiology - intra-pericardial pressure exceeds filling pressure of right heart.
- Impairs venous return and cardiac filling leading to hypotension, narrow pulse pressure, PEA
- "Beck's Triad" –
    1. Hypotension,
    2. Neck vein distension,
    3. Muffled/absent heart tone
- Signs and symptoms masked by hypovolemia
- Treat with immediate volume replacement to ↑ CVP, pericardial decompression

MANAGEMENT OF CARDIAC TAMPONADE :

- Pericardiocentesis
- Can be done under USG guidance and cardiac monitor attached
- Needle inserted inferior to xiphoid directed towards the left shoulder.
- Observe for hemodynamic improvement

PULMONARY CONTUSION :

- Commonest potentially lethal chest injury can occur with or without fracture ribs
- Respiratory failure is subtle and occurs over time
- These patients needs to be constantly reevaluated
- Intubation and ventilation –significant hypoxia on room air.

SIMPLE PNEUMOTHORAX :

- Lung laceration with air leakage is the commonest cause
- Diminished breath sounds with hyper-resonant chest-causes ventilation perfusion mismatch
- Upright chest X ray helps in diagnosis
- ICD insertion at 4th or 5th ICS followed by check Xray
- Always place ICD insertion before IPPV/GA

SIMPLE HEMOTHORAX :

- Caused by lung laceration or bleeding vessel[intercostal or internal mammary]
- Usually self limited and no operative treatment is needed
- 36 to 40 fr ICD for large hemothorax on CXR
- Persistent bleeding or drainage of more than 200ml/hr for 4hrs-thoracotomy

MYOCARDIAL CONTUSION :

- Difficult to diagnose, because patient's complaints of chest pain is attributed to musculoskeletal
- Elevated CVP in the absence of obvious cause may indicate right heart contusion
- May manifest as hypotension, dysarhythmias and wall motion abnormalities
- Multiple PVC, unexplained sinus tachycardia,AF, BBB, ST segment changes
- Requires monitoring for sudden dysrhythmias for 24hrs.

DIAPHRAGMATIC RUPTURE :

- More common with penetrating injury. Blunt trauma produces radial tears
- Appearance of NG tube in the thorax on X rays should rise the suspicion
- Treatment is direct repair

TRACHEO BRONCHIAL INJURY :

- Occur within 1 inch of carina following a blunt trauma
- Patient presents with hemoptysis, subcutaneous emphysema/tension pneumothorax
- Inadequate expansion after ICD or persistent leak/placement of more than one ICD is needed
- Bronchoscopy confirms the diagnosis
- Temporary intubation of opposite mainstem bronchus
- Immediate operative intervention is needed

OESOPHAGEAL TRAUMA :

- Most commonly follows penetrating injury
- Blunt trauma to upper abdomen –linear tear in oesophagus-mediastinitis
- Suspect in patients with left hemo/pneumothorax without rib fracture, shock or pain out of proportion to injury and those who received severe blow to lower sternum or upper abdomen.
- Diagnosed by Presence of food particle in ICD/presence of mediastinal air, Esophagoscopy/contrast studies.
- Wide drainage of mediastinum and pleural space and primary repair.

RIB FRACTURES :

- Rib fractures results in splinting and decreased ventilation
- Fractures of 1 to 3 ribs –look for severe associated injury
- 4th to 9th ribs sustain most of the fractures
- Localized pain, tenderness and crepitations
- Pain relief by multimodal approach.

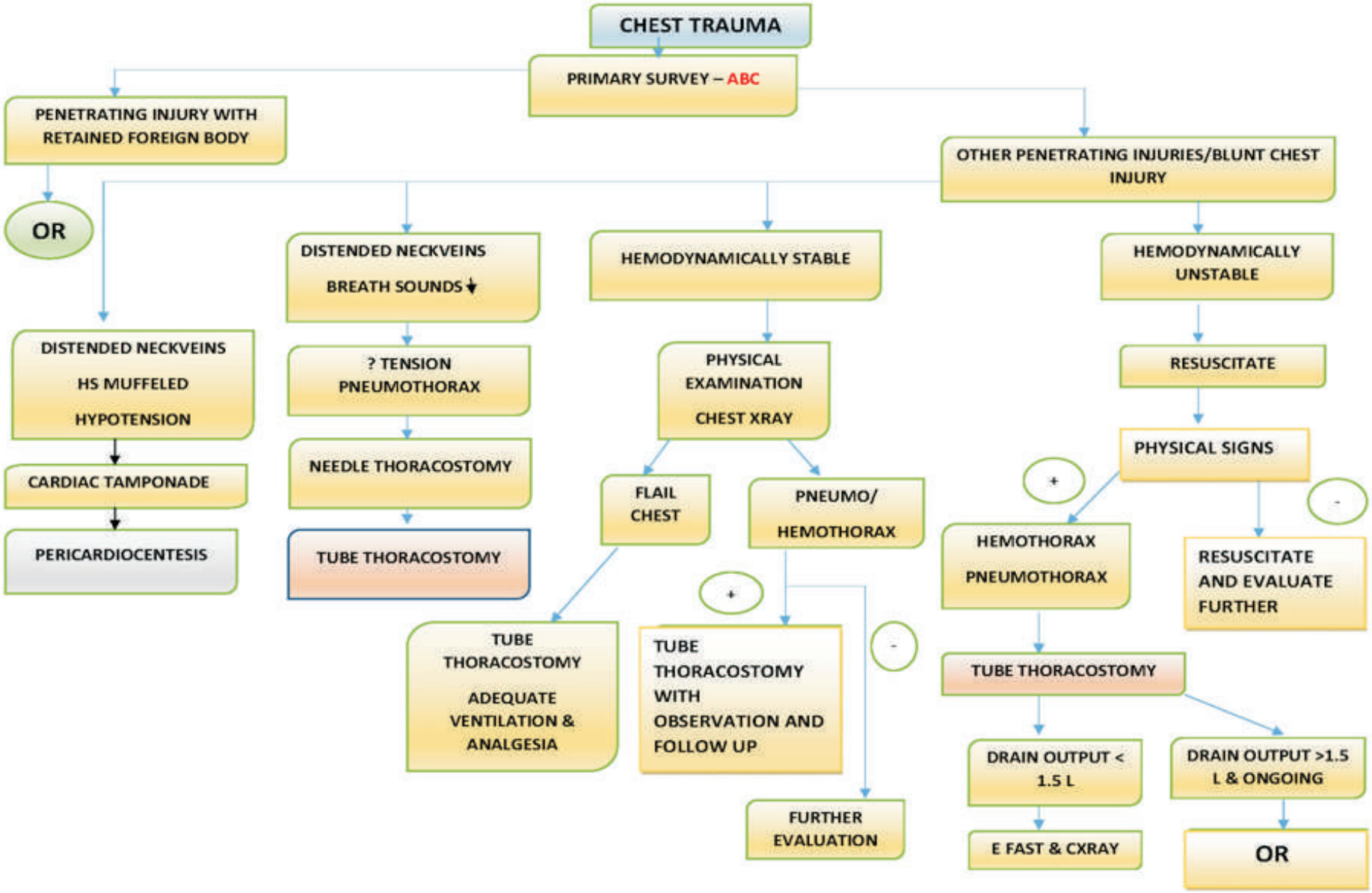
LARYNGOTRACHEAL INJURY :

- It may be complete or incomplete and uncommon
- The patient may present with stridor, hoarseness, subcutaneous emphysema, tenderness, bruising of chest wall and neck.

Treatment

- Administer oxygen
- If the patient has an obvious difficulty in breathing or cannot breath- attempt ETT/surgical airway

RECOMMENDED MANAGEMENT PROTOCOLS



ABDOMINAL TRAUMA

CORE CONCEPTS:

*Identification
Diagnosis
Management

MECHANISM OF INJURY

- BLUNT INJURY
- PENETRATING INJURY

ORGANS INJURED

- SOLID ORGANS
- HOLLOW ORGANS
- OTHERS

ORGANS INJURED

Initial assessment includes (ABC)

Hemodynamically normal patients without signs of peritonitis may undergo a more detailed evaluation to determine the presence of injuries that can cause delayed morbidity and mortality.

In hypotensive patients, the goal is to rapidly identify an abdominal injury and determine whether it is the cause of hypotension.

On physical examination, the following injury patterns can predict the potential for intra abdominal trauma

- Abdominal distention and contusion
- Auscultation of bowel sounds in the thorax may indicate a diaphragmatic injury.
- Abdominal bruit: may indicate underlying vascular disease or traumatic arteriovenous fistula.
- Ecchymosis involving the flanks (Grey turners sign) or the umbilicus (Cullen's sign) indicates retroperitoneal hemorrhage, but is usually delayed for several hours to days
- Fullness and doughy consistency on palpation – may indicate intra abdominal hemorrhage
- Evisceration of abdominal contents
- Lap belt marks- they could correlate with small intestine rupture
- Local or generalized tenderness, guarding, rigidity or rebound tenderness suggest peritoneal injury
- Steering wheel shaped contusions.

HISTORY

Mechanism of injury to ascertain the severity of injury
Blunt trauma -
Penetrating trauma

EXAMINATION

- *Inspection*: Look for any bruises, abrasions, penetrating wound, evisceration, entry and exit wounds in case of bullet injuries.
- *Palpation*: Look for guarding, rigidity, tenderness, rebound tenderness.
- *Percussion*: Look for free fluid in abdomen, obliteration of liver dullness.
- *Auscultation*: Bowel sounds

- Log roll the patient cautiously to inspect the back
- Urethral, Perineal and rectal examination: Look for any blood at external urethral meatus, scrotal/ perineal ecchymosis. Per rectal examination should be done to assess sphincter tone,high riding prostate, mucosal integrity or blood on withdrawing finger.
- Vaginal examination in females: Should be done if mechanism of injury suggest vaginal involvement.
- Gluteal examination: Important because it, may be associated with intra abdominal injuries in penetrating injuries.
- It is important to remember that associated injuries e.g. injuries to the ribs or spine, may distract the clinician

ACTION

- Fluid Management
- Blood Investigations
- Urinary Catheterisation if urethral injury is excluded.
- (? To be Clarified)Nasogastric tube insertion is performed to decompress stomach. Presence of blood in the aspirate without associated maxillary and facial trauma suggest esophageal /UGIT injury.
- Appropriate antibiotics to prevent intra abdominal sepsis

OTHER SUPPORTIVE INVESTIGATION

- X Ray
- FAST (Focussed assessment sonography in trauma) - Look for presence of fluid in Pericardial sac/right upper quadrant/left upper quadrant and pelvis.
- CT scan Abdomen

FAST & EXTENDED FAST (E FAST)

PLAIN X RAY FILMS

- Fractures near damaged viscera
- Free intra peritoneal air
- Foreign bodies and missiles

COMPUTED TOMOGRAPHY (CONTRAST ENHANCED)

- Accurate for solid visceral lesions and intra peritoneal hemorrhage and retroperitoneal injuries
- Guides on non operative management of solid organ damage
- IV contrast

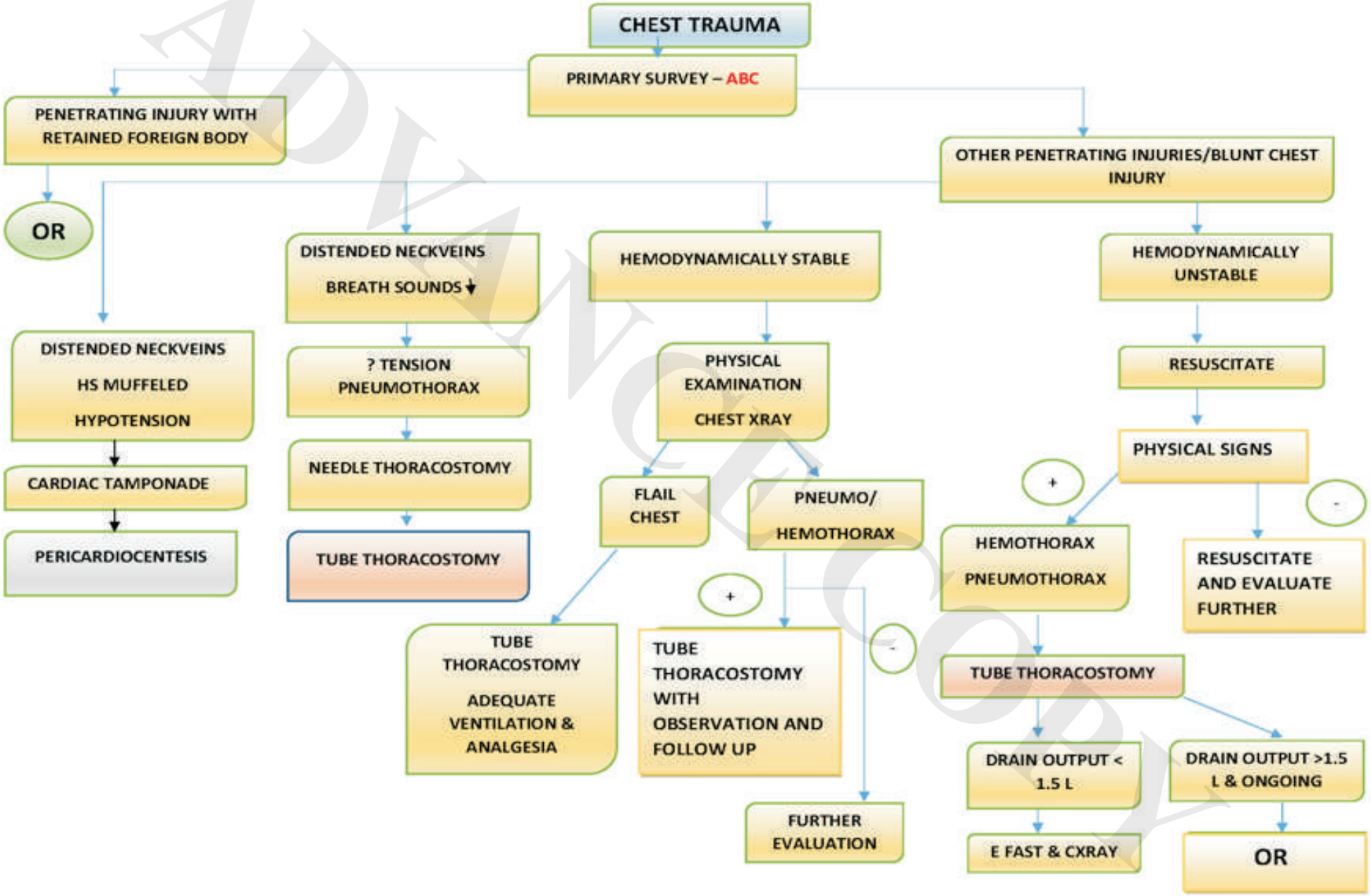
INDICATION FOR EMERGENCY LAPAROTOMY

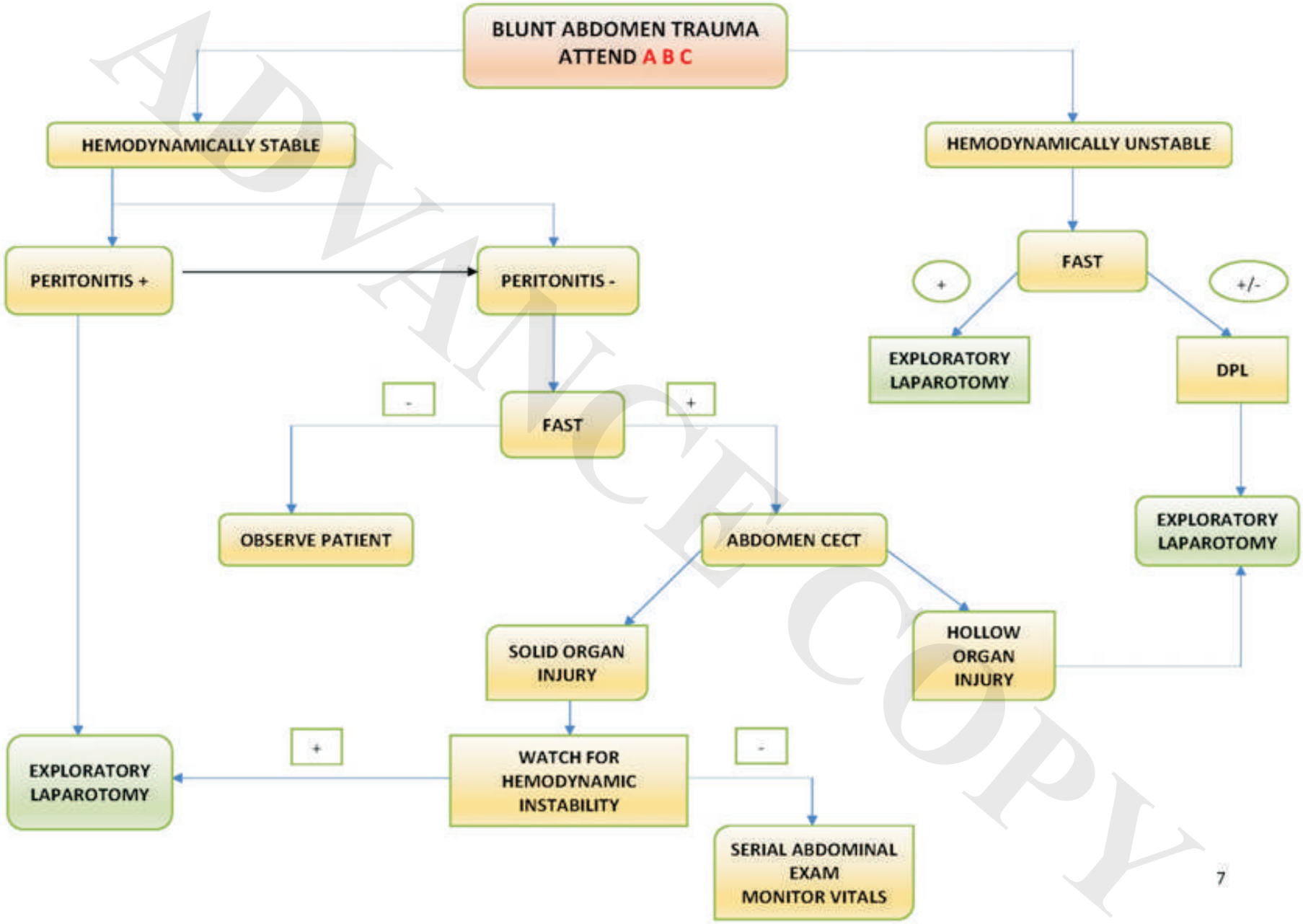
- evisceration of abdominal contents
- signs of peritonitis
- free air on xray
- diaphragmatic injury
- Hypotension with an abdominal wound that penetrates the anterior fascia
- Gunshot wounds that traverse the peritoneal cavity
- hemoperitoneum findings on FAST
- bladder rupture
- hypotension with evidence of abdominal injury
- clinical deterioration during observation
- hypotension despite adequate resuscitation

NON OPERATIVE MANAGEMENT

- Close monitoring of vital signs
- Repeated reassessment

RECOMMENDED MANAGEMENT PROTOCOLS





VASCULAR INJURIES

INTRODUCTION:

Vascular Injuries present

- in a variety of settings viz **COMMUNITY BASED or HOSPITAL ACQUIRED**
- severity ranges from life threatening hemorrhage to minor injury
- some may present without physical findings as occult injury

OBJECTIVES:

To identify Blunt vs Penetrating vascular injuries

- To interpret the mechanism,setting and pattern of injury
- To be familiar with HARD and SOFT signs of Arterial injury
- To retain the patient for investigation or shift to OR
- To identify other associated injuries

WHY ARE THEY IMPORTANT ?

- Emergent with altered physiology of the patient
- Technically demanding to treat
- Major vessel injuries can be life threatening
- Minor peripheral vessel injuries can be limb threatening

INJURY SETTINGS COMMUNITY BASED

- Road traffic accidents
- suicidal attempt
- cut throat /domestic violence
- combat injuries.
- Self fall/building collapse
- unintentional cut injuries
- stab injuries
- athletic injuries

HOSPITAL ACQUIRED

CLASSIFICATION

1. **MAJOR** vascular injuries : involving thoraco abdominal vessels
   MINOR vascular injuries : involving peripheral vessels in extremities.
2. **PENETRATING** vs **BLUNT** vascular injuries
3. **ARTERIAL** vs**VENOUS** injuries
4. **COMMUNITY ACQUIRED** : due to road traffic accidents,violentcrime,etc. Vs
   HOSPITAL ACQUIRED :due to inadvertent iatrogenic vascular injuries during procedures.

THE MECHANISM,SETTING AND PATTERNS OF INJURY

- Mechanism ,setting and patterns of injury helps to diagnose **occult blunt cerebrovascular and thoracic** injuries
- **Bleeding at the scene of injury and prehospital phase** to be assessed
- Be careful about extremity vascular injury which has ceased bleeding
- in **patients presenting with shock**

ASSESSMENT

To know the type of vascular injury whether blunt/penetrating or arterial / venous and to decide whether patients need immediate operative or non operative management with further investigations

PRIMARY SURVEY

Acute hemorrhage should be addressed with simultaneous management of **airway ,breathing and circulation.**

For acute **external**haemorrhage

- Direct manual pressure or tourniquet application (Extremity damage is less if tourniquet time< 2 hours)
- Avoid blind clamping of vessels to avoid damage to nerves and veins

For acute **internal**haemorrhage

- Operative intervention.Pulse examinations at wrist and foot should not be overcalled or missed.

SECONDARY SURVEY:

- Thorough examination of the patient and look for hard and soft signs of arterial injury

HARD AND SOFT SIGNS OF VASCULAR INJURY HARD SIGNS

- Pulsatile hemorrhage
- Expanding hematoma
- Bruit of thrill over area of injury
- Absent extremity pulses
- Arterial pressure index <0.9

SOFT SIGNS

- History of hemorrhage
- Wounds of neck or extremities and unexplained hemorrhagicshock
- Neurologic deficit in peripheral nerve in proximity to vessels
- High-risk fracture, dislocation, or penetrating proximity wound

SIGNS OF VENOUS BLEED

- low pressure dark colored bleed.
- non expanding hematoma.
- shock is rare unless associated with arterial bleed.

DOPPLER ULTRASOUND ADJUNCTIVE MEASURES:

The best use of continuous wave Doppler in the evaluationfor extremity vascular injury is in conjunction with a bloodpressure cuff at the wrist or ankle.

METHOD:

Doppler probe is placed over a distal artery in the injuredextremity, and the cuff is slowly inflated. The pressure at whichthe Doppler signal is no longer audible should be recorded asthe arterial pressure in that extremity. This ankle or wrist pressureis then compared to the occlusion pressure of the other,noninjured extremity.

INTERPRATION :

The ratio of the arterial occlusion pressurein the injured extremity compared to that in the normalextremity should be 0.9 or greater.Normal ankle-brachialindex (ABI) in an uninjured healthy young person is 1.0

ACT

- Attend to **airway , breathing and circulation**
- Start on 2 large bore iv lines and start on warm iv crystalloids (<4 litres/24 hours)
- Collect blood samples for grouping typing and cross matching,pregnancy test for all females ,arterial blood gas analysis.
- Adequate analgesics – iv morphine
- TT and tetglob injection and antibiotics if indicated.
- Avoid hypothermia
- Early transfusion of balanced ratios of packed red cells ,fresh frozen plasma and platelets
- eFAST
- CT scan
- Investigations to rule out associated injuries

  Chest x ray
  Pelvis x ray
  X ray local part
  CT scan local part

CONTAINMENT OF BLEEDING

- **PRESSURE**
- **PACK**
- **PLACE A TOURNIQUET**
- **LIGATE**

  Small caliber vessels especially veins can be ligated. Almost all veins including IVC can be ligated in emergency

A WORD OF CAUTION

NEVER REMOVE the foreign object from the penetrating wound AT THE EMERGENCY DEPARTMENT

CLEARING TRAUMA PATIENTS WITH VASCULAR INJURY

- To avoid unnecessary imaging
- To avoid delay in treatment of other associated injuries

HEAD AND NECK

- Alert, hemodynamically stable patient
- Absence of high-risk mechanism
- Normal neurologic/ physical examination
- Absence of cervical spine or basilar skull fractures

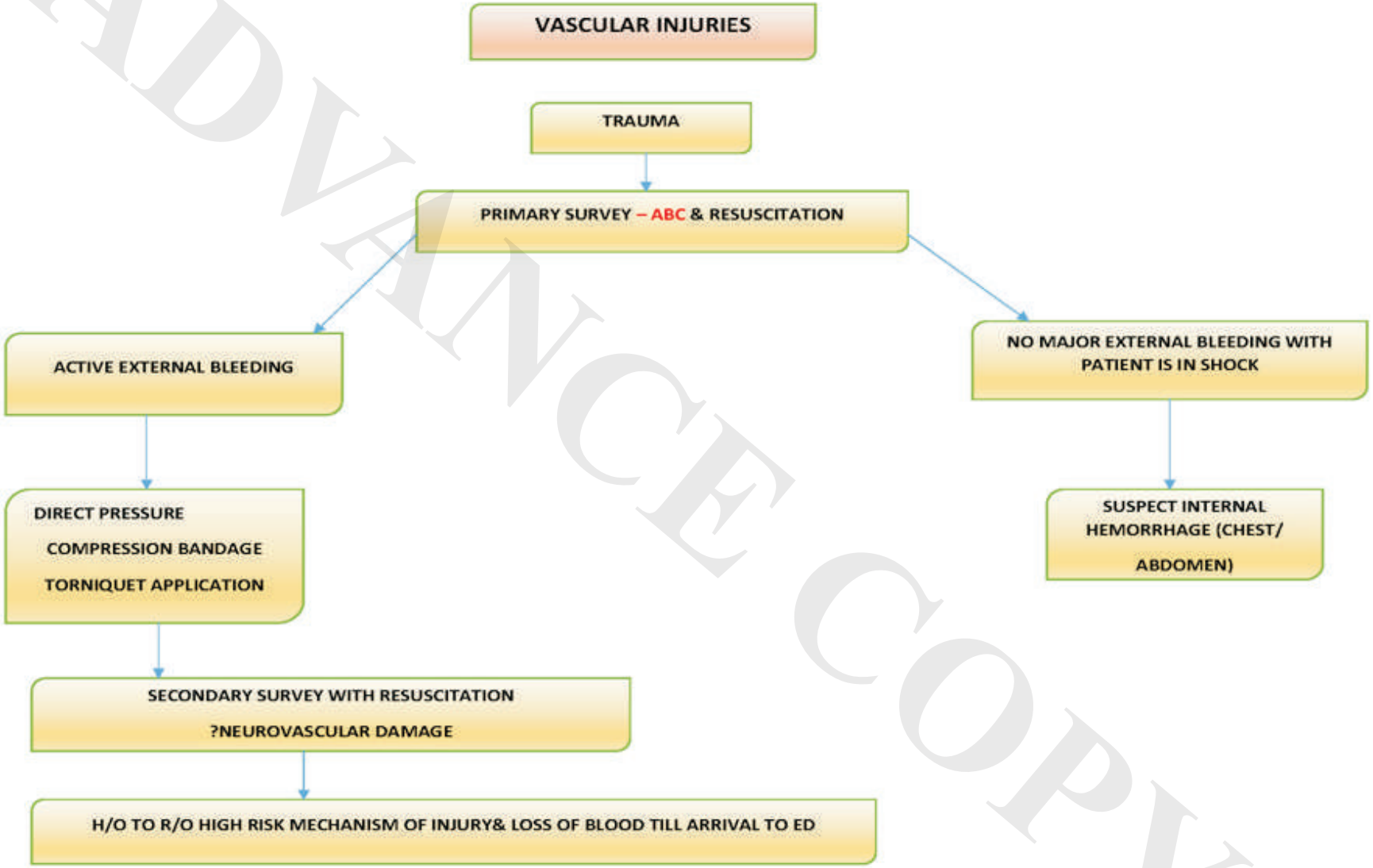
CHEST AND ABDOMEN

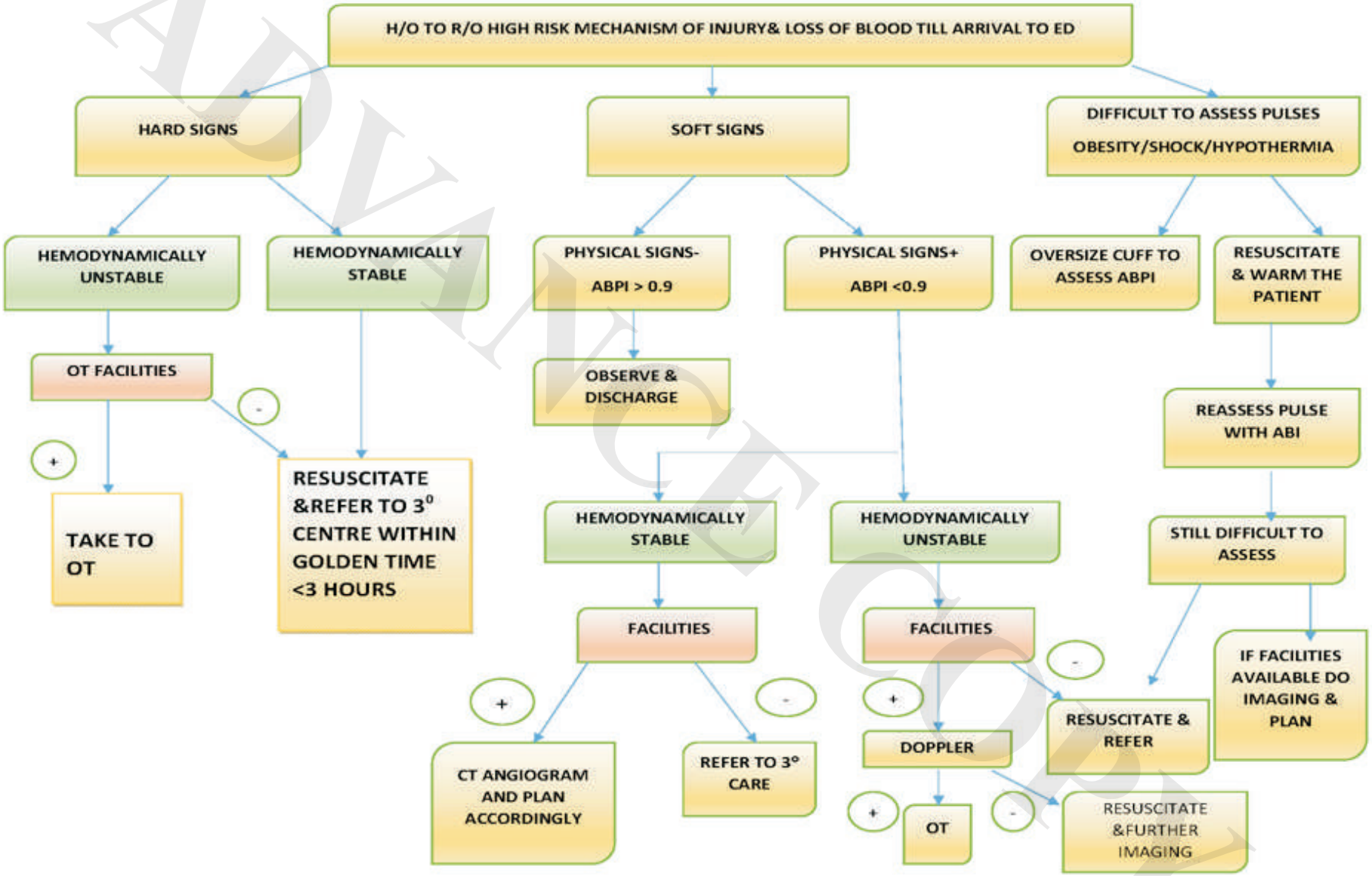
- Normal chest and abdominal examination
- Absence of high-risk mechanism
- Normal chest and pelvis x-rays and negative FAST

EXTREMITIES

- Alert, hemodynamically stable patient
- Normal upper and lower extremity neurovascular examination
- If upper/lower extremity fracture or penetrating proximity injury
- Absence of significant hematoma or hemorrhage
- Absence of neurologic deficit distal to the injury
- Normal pulse examination or wrist pressure index $\geq$ 0.9

RECOMMENDED MANAGEMENT PROTOCOLS




H/O TO R/O HIGH RISK MECHANISM OF INJURY& LOSS OF BLOOD TILL ARRIVAL TO ED
HARD SIGNS
SOFT SIGNS
DIFFICULT TO ASSESS PULSES
OBESITY/SHOCK/HYPOTHERMIA
HEMODYNAMICALLY UNSTABLE
HEMODYNAMICALLY STABLE
PHYSICAL SIGNS- ABPI > 0.9
PHYSICAL SIGNS+ ABPI <0.9
OVERSIZE CUFF TO ASSESS ABPI
RESUSCITATE & WARM THE PATIENT
OT FACILITIES
+
-
TAKE TO OT
RESUSCITATE &REFER TO 3⁰ CENTRE WITHIN GOLDEN TIME <3 HOURS
OBSERVE & DISCHARGE
REASSESS PULSE WITH ABI
HEMODYNAMICALLY STABLE
HEMODYNAMICALLY UNSTABLE
STILL DIFFICULT TO ASSESS
FACILITIES
FACILITIES
+
-
CT ANGIOGRAM AND PLAN ACCORDINGLY
REFER TO 3° CARE
+
-
DOPPLER
RESUSCITATE & REFER
IF FACILITIES AVAILABLE DO IMAGING & PLAN
+
-
OT
RESUSCITATE &FURTHER IMAGING

MODULE FOR ORTHOPAEDICS –TAEI

1) Introduction to basics of fracture management

- Simple and Compound fracture
- Description of fracture pattern
  Clinical parameters
  Open vs. Closed
  Neurovascular status
  Clinical deformity
  Radiographic parameters
  Location
  Pattern
  Displacement
  Angulation
  Shortening

2) Basics of Xray

- AP & lateral views
- Identification of fractures
- Description of fracture pattern in xray

3) Compound fracture management

- Importance of primary wound debridement & its principles
- Identification of associated neurovascular injury
- ATS/AGGS

Recommendations for Management of Traumatic Wounds:

a. All wounds should be cleaned and debridement should be undertaken if necessary.
b. A diligent effort should be made to obtain the patients' history of tetanus immunization if possible
c. Tetanus toxoid (Tt)* should be administered if the history of the last booster was greater than 10 years. If the history is not available, Tt may be considered when convenient
d. If the history demonstrates that the last immunization was over10 years ago, then Tetanus Immune Globulin (TIG) should be administered
e. The severity of the wound should not be a factor in the administration of TIG.

Tetanus toxoid (Tt) Dosing:

Age >=7: 0.5 ml (5 IU) IM.
Age < 7: Use Pediatric DTP or DTaP instead of Tt. If a contraindication to pertussis immunization exists, use Pediatric DT.
Typical dose is 0.5 ml IM.

Tetanus Immune Globulin (TIG) Dosing:

Adult prophylaxis: 250 –500 U IM in opposite extremity to tetanus toxoid
Paediatric prophylaxis: 250 U IM in opposite extremity to tetanus toxoid.
Note: Dosages in used clinical tetanus typically are 3,000 – 10,000 U IM

4) Compartment syndrome

- Early identification of signs & symptoms
  Signs
  - Pain
  - Paresthesia
  - Pallor
  - Paresis
  - Pulselessness
- Timely use of emergency fasciotomy
  " Absent pulse is not a contraindication for fasciotomy"

5) Pelvis fracture

- Clinical diagnosis
- Prompt identification and hypovolemia management
- Associated injuries
  Urethra
  Urinary bladder
  Blunt injury abdomen
- Pelvic binder application
- Basic principles of external fixation

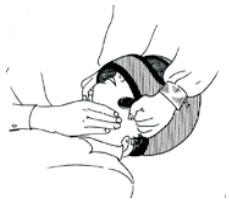
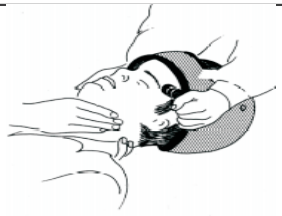
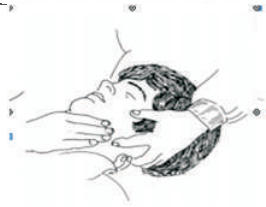
6) Common orthopaedic splints(video demonstration in powerpoint)

- Thomas splint
- Arm sling
- Plaster of Paris application techniques
  Above and below elbow
  Above and below knee

HELMET REMOVAL FROM INJURED PATIENTS

Physicians who treat the injured should be aware of helmet removal techniques. The varying sizes, shapes, and configurations of motorcycle and sports helmets necessitate some understanding of their proper removal from victims of motorcycle crashes. The rescuer who removes a helmet improperly may unintentionally aggravate cervical spine injuries

The helmet interferes with a proper assessment of possible head injury and would cause the cervical spine into a flexion position while the patient is supine..

	One rescuer maintains inline immobilization by placing his hands on each side of the helmet with the fingers on the victim's mandible. This position prevents slippage if the strap is loose.
	A second rescuer cuts or loosens the strap at the D-rings.
	The second rescuer places one hand on the mandible at the angle, the thumb on one side, the long and index fingers on the other. With his other hand, he applies pressure from the occipital region. This maneuver transfers the inline immobilization responsibility to the second rescuer
	The rescuer at the top moves the helmet. Threefactors should be kept in mind: ▪ The helmet is egg shaped and therefore must be expanded laterally to clear theears. ▪ If the helmet provides full facial coverage,glassesmust be removedfirst. If the helmet provides full facial coverage, the nose may impede removal. To clear the nose, the helmet must be tilted backward and raised overit.
	Throughout the removal process, the second rescuer maintains inline immobilization from below to prevent unnecessary neck motion.
	After the helmet has been removed, the rescuer at the top replaces her hands on either side of the victim's head with her palms over the ears.
	Inline immobilization is maintained from above until a backboard is in place and a cervical immobilization device (collar) is applied

Main principles regardless of helmet type:

1. Removal should occur with consideration of a possible cervical spine injury,
2. Continual communication between the two officers removing the helmet is paramount,
3. Removal should not require excessive force.

Additional Information.

Ifthepatientisprone,maintaininline immobilisationandlogroll intothelateralorsupinepositionbeforeremoval wherepossible. If bystander assistance is required, the paramedic shouldtaketheprimaryroleandprovide inline immobilization of spine. If the patient requires transport, ensure the helmet goes with them in order for hospital staff to assess damage.

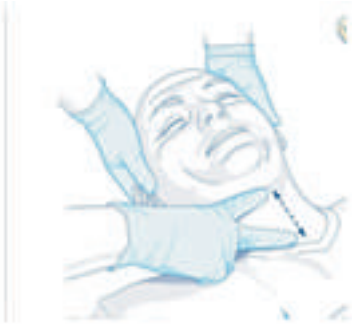
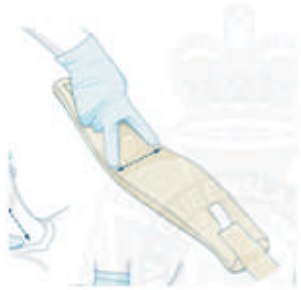
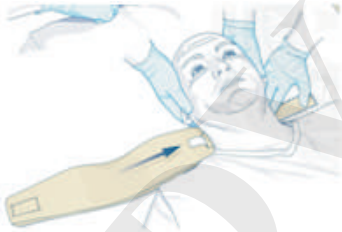
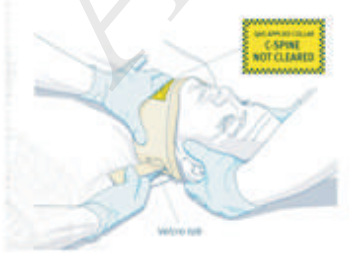
APPLICATION OF CERVICAL COLLAR

Indications:

- SuspicionofacervicalspineorSCI.

Contraindications:

- Surgicalairway
- Penetrating necktrauma

	Gently align the patient's head to a neutral anatomical position or position of greatest comfort. Measure the distance between the chin and the suprasternal notch.
	Select the appropriate size collar by comparing the patient's neck measurements to the width of the collars chin support.
	Slide the collar under the patient's neck (right to left) until the adhesive Velcro strap is clearly visible.
	The Velcro strap is securely fastened ensuring snug fit of the cervical collar.

CERVICAL COLLAR APPLICATION

Explain to the patient what is happening and why

Apply Manual inline Stabilisation (MILS)

Clothing may need to be moved aside or cutaway to facilitate collar to be fitted against bare skin. Jewellery and earings must be removed

Measure the patient's neck against anatomical landmarks and adjust collar to the appropriate size .

With patient's head secured, insert back piece of collar behind the neck. Pressing the collar into the mattress surface prevents friction with patient's skin.

The front of collar is brought round into position and the Velcro strap fastening is secured

Check sensory and motor function

LOG ROLLING IN TRAUMA

Introduction

The log rolling procedure is implemented on all patients suspected of having a possible spinal injury, prior to the cervical spine and/ or thoracolumbar spine being cleared.

Prevents catastrophic neurologic injury and preventions occurence of pressure sores.

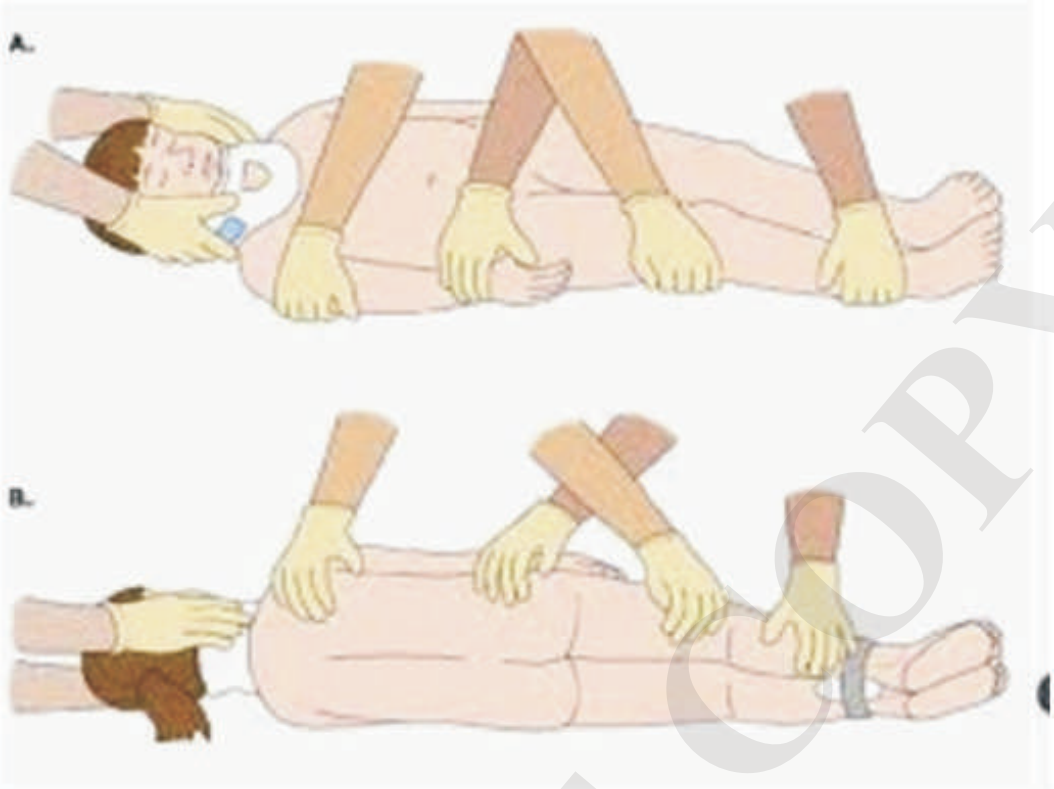
Indications

- Examination of the patient's back.
- Cervical collar care
- Pressure care
- To facilitate chest physiotherapy

Technique

1. A minimum of four staff members are required to assist in this procedure:
    - 1 to hold the patient's head and direct the procedure:
        The head holder ensures that all of the team members are ready to turn in a coordinated manner (decide if rolling on three or after three).
    - 2 to support the chest, abdomen and lower limbs
    - 1 to carry out the planned activity i.e. pressure care etc.
        In some cases, (e.g. morbidly obese patients or patients with lower limb traction) three assistants may be required to support the chest, abdomen and lower limbs).
2. Explain the procedure to the patient regardless of conscious state and ask thepatient to lie still and to refrain from assisting
3. Ensure that the cervical collar is well fitting prior to commencement.
4. If applicable, ensure that devices such as indwelling catheters, intercostal catheters, ventilator tubing etc. are repositioned to prevent overextension and possible dislodgement during repositioning.
5. If the patient is intubated or has a tracheostomy tube, airway suctioning prior to log rolling is suggested, to prevent coughing which may cause possible anatomical malaligment during the log rolling procedure.
6. The bed must be positioned at a suitable height for the head holder and assistants.
7. The patient must be supine and anatomically aligned prior to commencement of log rolling procedure.
8. The patient's proximal arm must be adducted slightly to avoid rolling onto monitoring devices e.g. arterial or peripheral intravenous lines. The patient's distal arm should be extended in alignment with the thorax and abdomen , or bent over the patient's chest if appropriate i.e. if the relevant arm is uninjured. A pillow should be placed between the patient's legs.
9. Assistant 1, the assistant supporting the patient's upper body, places one hand over the patient's shoulder to support the posterior chest area, and the other hand around the patient's hips.
10. Assistant 2, the assistant supporting the patient's abdomen and lower limbs, overlaps with assistant 1 to place one hand under the patient's back, and the other hand over the patient's thighs.
11. On direction from the head holder, the patient is turned in anatomical alignment in one smooth action with the patient's head and body remaining in anatomical alignment at all times.
12. On completion of the planned activity, the head holder will direct the assistants to either return the patient to the supine position or to support the patient in a lateral position with wedge pillows.

The patient must be left in correct anatomical alignment.



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PLASTIC SURGERY – TRAUMA EMERGENCY PROTOCOLS

FACIO-MAXILLARY INJURIES – EMERGENCY MANAGEMENT

- Assess if Patient is conscious and if airway is clear.
- If Patient is Unconscious – examine for patency of Airway and also Rule out other Vital Injuries.
- If there is Airway obstruction, Clear Airway of Blood and secretions by suction of nose and Throat.
- Look for broken teeth / Denture/ FB and Remove them if present by sweeping with a finger. Magill's forceps can be used to grasp larger objects.
- Look for Airway obstruction by soft tissue

DEGLOVING INJURIES OF LIMBS – EMERGENCY MANAGEMENT OF FRESH INJURIES

- Degloving, also called avulsion which happens when the skin and subcutaneous tissue are ripped off from the underlying muscle or bone. It can affect any part of the body, but it's more common in the legs. Degloving injuries are often life-threatening. This is because they involve large amounts of blood loss and tissue necrosis.
- Degloving injuries could be open degloving or closed degloving.

Open Degloving Injuries

- When muscle or bone is exposed — it's known as open degloving. In some cases, the skin might still be partially attached and hanging as a flap at the wound.

Dos

- Wash the wound anddegloved tissues with saline.
- Apply compression saline pads over raw area to control Bleeding
- Redrape the degloved tissue back into anatomical position
- Apply dressing and Splint the limb
- Arrange for Blood Transfusion in Major Blood loss
- Shift to Emergency Theatre for Exploration and Definitive Management

Closed Degloving Injuries

- Closed degloving injuries aren't always evident. In some cases, a bruise may be the only visible symptom.
- Many closed degloving injuries cause separation of skin and subcutaneous tissue from deeper tissues, leaving a space under the degloved tissue. These spaces are known as Morel-Lavallée lesions. The space can get filled with lymph, blood and dislodged fat.

Dos

- Wash the limb with saline
- Apply mild compression dressing over degloved limb
- Splint the limb
- Arrange for Blood Transfusion in Major Blood loss
- Shift to Emergency Theatre for Exploration and Definitive Management

DONTs

- Never discard degloved skineven if non- viable. Skin graft can be harvested from such degloved skin and can be used for covering the wound.

CARE OF THE AMPUTATED BODY PART FOR REPLANTATION

- Wash the amputated portion with saline.
- Use clean water if saline is not available- to remove contaminants.
- Wrap the amputated part with dry, sterile gauze or other clean cloth.
- Put the wrapped amputated part in a plastic bag and seal it waterproof.
- Place the bag with the wrapped part on a bed of ice in a thermocol box or flask.
- Keep the amputated part cool, but DO NOT freeze.
- Transport it to the emergency theatre for dissection and preparation for replantation - which can be done while the patient is being resuscitated and even before shifted to undergo surgery.

For all Plastic surgical Reconstructive procedures in trauma, the other Resuscitative, prophylactic immunisation, antibiotic cover, sterility etc. are to be followed in as in any other major trauma.

BURNS MANAGEMENT – PROTOCOL

TYPES OF BURNS

BURN DEPTH

1. I degree burn

a. Involves injury to epidermal layer

b. Erythema (pink to red)

c. Skin blanches

d. Painful with tingling sensation pain is eased by cooling

e. Discomfort lasts for 48 hrs - healing occurs in 3 to 5 days

f. No scarring; intact skin

2. Superficial II degree burn

a. Involves injury to the epidermis and the superficial layers of the dermis

b. Large blisters may cover an extensive area

c. Pink to red base and broken epidermis, with wet, shiny and weeping surface

d. ExcruciatingPain

e. Heals in 10 to 21 days

f. Some scarring and minor pigment changes may occur

3. Deep II degree burn

a. Involves injury of most of the dermal layer

b. Pain is reduced

c. Wound surface is red and dry with white areas in deeper parts

d. May heal in 3-6 weeks or can become deeper and turn into III degree burn

e. Scar formation with hypertrophy/contractures

4. III degreeburn

a. Involves injury and destruction of the epidermis and the wholedermis.

b. Appears dry, hard, leathery eschar

c. colour may be waxy white, deep red, yellow, brown, or black.

d. Absence of sensation because of nerve ending destruction

e. The wound will not heal by re-epithelialization and hence skin grafting may be required

f. Scarring and wound contractures are likely to develop without preventive measures

5. IV degree burn

a. Extends beyond the skin into underlying fascia and tissues with damage to the muscle, bone, and tendons

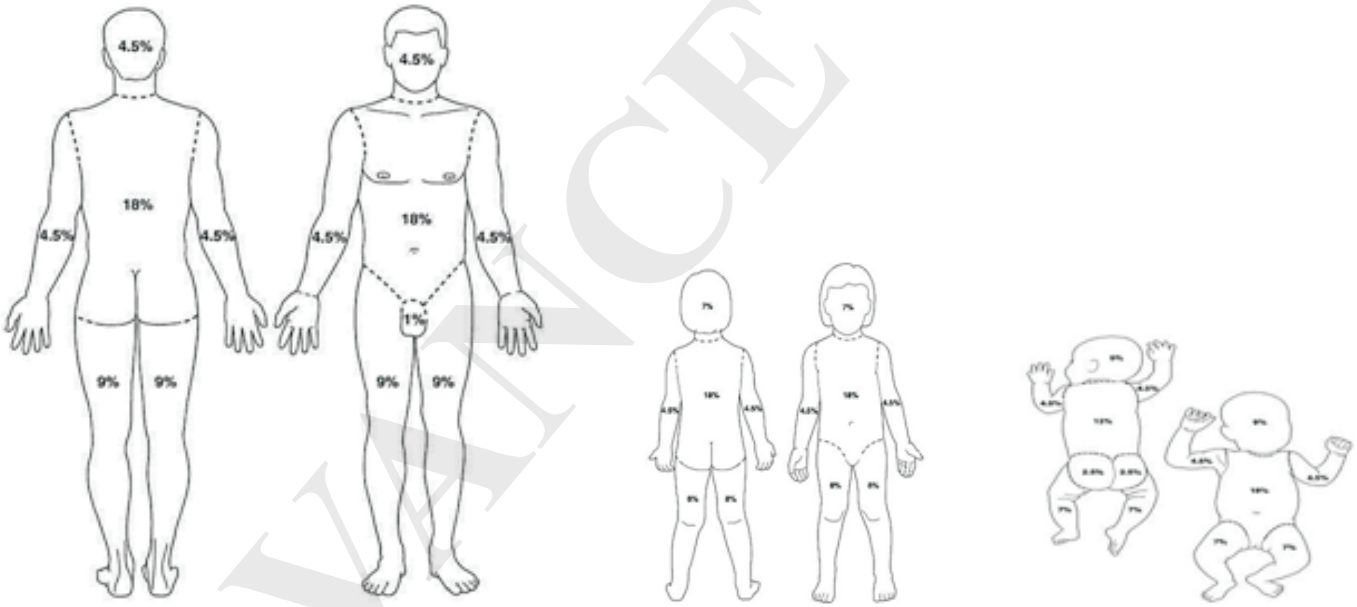
b. Injured area appears black and sensation is completely absent

c. Eschar is hard and inelastic

d Flap cover is required and healing time takes months

ESTIMATING THE EXTENT OF THE INJURY

- **Rule of nines**: assigns percentages in multiples of nine to major body surface areas



- Lund–Browder method: divides the body into very small areas and provides an estimate of the proportion of total body surface area (TBSA) accounted for by the corresponding body parts its most accurate of all the methods .This method is most often used to measure burns in infants and young children because it allows for developmental changes in percentages of body surface area. A separate chart is used because the surface area of the head and neck of children is larger and the limbs are smaller than adults.
- Palm method: used in patients with scattered burns, the patient's palm is calculated as approximately 1% of TBSA.

Fluid resuscitation

First 24 hours

- Modified Parkland Formula : 3ml /kg body wt / % for first 24 hours
- Give one-half of the fluid calculated in the first 8 hours postburn (i.e. from the time of burn)
- Give the balance in next 16 hours postburn

Fluid Administered :

- For Adults : Ringer Lactate only
- For Children : Ringer Lactate as calculated by formula
- In addition 5% Dextrose
- 100ml /kg body weight till 10 kg
- 50ml /kg body weight for 11-15 kg and 30 ml/ kg above 15 kg body weight
- The Dextrose fluid calculated is divided into 3 equal doses for administration every 8 hours.This is given because Children have poor Glycogen storage in their Liver and hence prone for Hypoglycemia.

Monitoring the fluid Administration

a. The amount of fluid administration depends on how much intravenous fluid per hour is required to maintain a urine output of 30 to 50 ml/hr
b. Successful fluid resuscitation is evaluated by stable vital signs, an adequate urine output, palpable peripheral pulses, and a clear sensorium
c. Urinary output is the most common and most sensitive noninvasive assessment parameter for cardiac output and tissue perfusion
d. Intravenous fluid replacement may be titrated (adjusted) based on urinary output plus serum electrolyte levels to meet the perfusion needs of the patient with burns
e. If the hemoglobin and hematocrit levels decrease or if the urinary output exceeds 50 ml /hr, the rate of IV fluid administration may be decreased
f. Prophylactic antibiotics are to be administered
g. Basic investigations are to be done

Ideal rate of Urine output

Adults : 0.5 to 1.0 ml /kg / hr
Children : 1.0 to 1.5 ml /kg / hr
Infants : 1.5 to 2.0 ml /kg / hr

Dressings for burns

1. Standard dressing involves use of gauze with topical antibiotic and wrapped with Bandage
2. Biologic dressings are temporary skin covering with tissue or membranes from human or animal donors until skin grafting can occur
3. Biosynthetic (combination of biologic and synthetic) or synthetic dressings (dressings of silicone)

MODULE FOR EMERGENCY RADIOLOGY

CHEST TRAUMA

Rib fractures

- Segmental rib #:≥2 fractures in same rib
- Flail chest Radiographic findings: -ribs 4-9 most commonly fractured
- -fractures usually multiple.
- -Flail chest radiographic finding; Costal hook sign-elephant trunk shaped ribs due to rotation of segmental #.
- -Double check ribs 1-3 -Arterial or venous rupture, Rupture of bronchus, Brachial plexus injury
- -Scapula-Injury to subclavian vessels
- -Double check ribs 11-12- for possibility of injury to liver spleen and kidneys.
- -Sternal Fracture only lateral radiography shows direct visualisation of sternal fracture which is usually transverse and non displaced.

PNEUMOTHORAX

RADIOLOGICAL IMAGING FEATURES: (best diagnostic clue)

- Visualisation of visceral pleural line surrounded by free pleural air and absent peripheral vascular lung markings
- Deep sulcus sign: basilar pneumothorax in supine patient pleural air results in deepening of costophrenic angles
- Double diaphragm sign: air outlines anterior and posterior aspects of hemidiaphragm visualisation of two diaphragmatic contours.

Tension Pnemothorax

- Increased volume of affected hemithorax
- Increased separation of ipsilateral ribs,ipsilateral flattening of heart border and contralateral mediastinal shift
- Flattening of ipsilateral hemidiaphragm, Rapid expansion of pneumothorax on serial radiography
- Initial radiography may not demonstrate pneumothorax , then follow up serial chest radiography every 6 hrs on first day after trauma.

Haemothorax

RADIOGRAPHIC FINDINGS:

- Blunt costophrenic angle on upright radiography.
- Increased density of ipsilateral lung due to layering pleural fluid on supine radiography.
- May accumulate laterally on supine radiography.
- Large hemothorax cause ipsilateral lung atelectasis and opaque hemothorax.
- Large hemothorax producescontralateral mediastinal shift and tension hemothorax.

Pneumomediastinum

CXR findings

- CONTINUOUS DIAPHRAGM SIGN . Mediastinal gas can dissect along this tissue plane .consequently the entire surface of the diaphragm may be visible
- Lucent halo surrounding the heart
- Air around the pulmonary artery (black ring appearance)
- Air around the arteries arising from the aortic arch(“ring around the artery sign” or “tubular artery sign)
- The thymic “angel wing sign”in young children and neonates

Haemopericardium

RADIOGRAPHIC FINDINGS:

- In frontal radiograph: -global enlargement of the cardiac silhouette.
- In lateral radiograph: -"fat pad sign"pericardial fat outlined by air in the retrosternal region. .

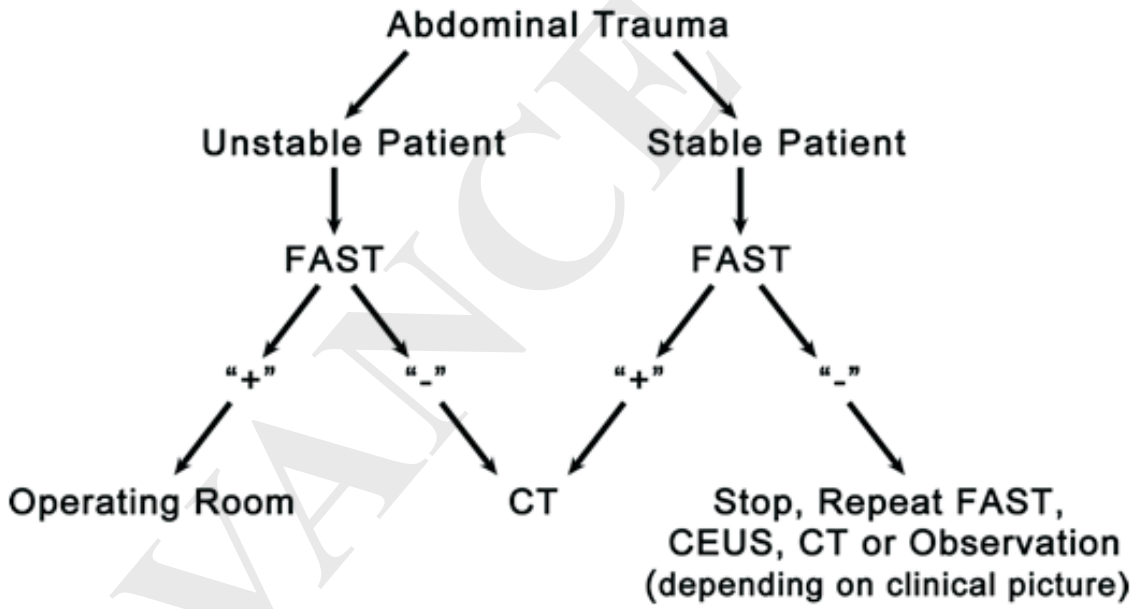
Acute abdomen
PNEUMOPERITONEUM

- Central tendon, Double wall sign, Football sign,Falciform ligament, Parahepatic gas, visualisation of Urachus and umbilical ligaments

Intestinal Obstruction

- Two basic radiographic views are done, supine and upright/ erect abdomen
- Dilated bowel loops with air-fluid levels and transition point(dilated bowel and fluid levels proximally and non-related loops distally), although on X-ray the lesion and transition are usually not directly visible)
- Plain X-rays are still used frequently for cases of lower suspicion (as a "rule-out")
- the dilated loops of small bowel containing air-fluid levels, but with small amounts of air in non-dilated colon which has no air-fluid levels, indicating a small bowel obstruction.

FAST



FAST TECHNIQUE AND INTERPRETATION

The four views for the original FAST scan:

A = right upper quadrant,
B = left upper quadrant,
C = suprapubic view,
D = subxiphoid view of the heart

UPPER QUADRANT VIEW:

- The perihepatic area and hepatorenal recess or Morison pouch are visualised.

LEFT UPPER QUADRANT VIEW:

- The spleen is targeted for examination of the splenorenal fossa and perisplenic area.
- Cephalad scanning enables visualization of the left pleural space.
- Moving the probe caudally brings the inferior pole of the left kidney and paracolic gutter into view.

SUPRAPUBIC VIEW:

- The suprapubic view allows assessment of the most dependent space in the peritoneal cavity.
- The transducer is placed above the pubic symphysis in a sagittal plane and swept side to side then rotated transversely and repeated.Reverse Trendelenburg positioning may enhance detection of free fluid in the pelvis.In female patients of reproductive age,amounts exceeding 50 mL should be regarded as pathologic in the setting of trauma free fluid found at the rectovesicular space in men is pathologic.

EVALUATION OF THORAX
HEART:

- Subxiphoid images of the heart are obtained by placing the transducer on the upper abdomen and aiming superiorly toward the left shoulder.
- Fluid surrounding the heart is seen as an anechoic space surrounding the myocardium.
- If there is difficulty obtaining the subxiphoid view, parasternal, apical four chamber, and subcostal approaches can be attempted.

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Hemothorax or Pleural Effusion:

- The right pleural space may be scanned for free fluid , as well as the interface between the dome of the liver and diaphragm
- Upright or reverse Trendelenburg positioning may improve detection of pleural fluid

IVC ASSESSMENT

- Ultrasonography method to estimate intravascular volume status especially in hypotensive patients.
- A subxiphoid approach is made with the transducer in sagittal orientation.
- Superiorly, the IVC enters the right atrium at the cavoatrial junction.
- The IVC diameter is measured 2 cm below the cavoatrial junction.
- Inspiratory and expiratory diameters are obtained for comparison

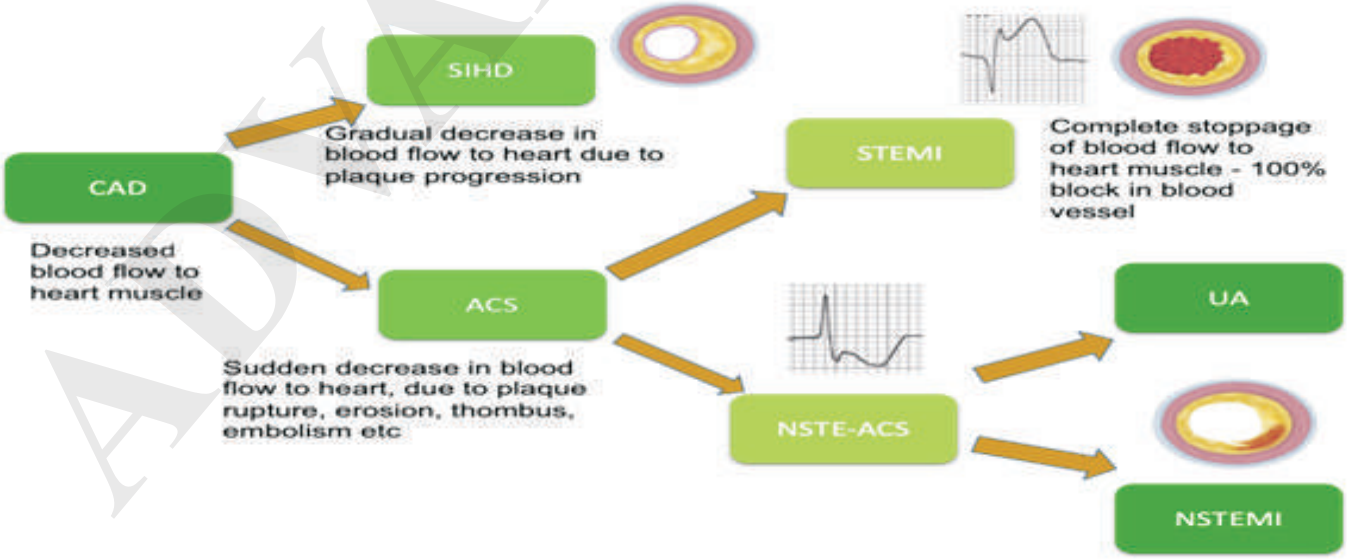
EXPIRATORY IVC DIAMETER(CM)	ESTIMATED CVP(CM
<1.5 – TOTAL COLLAPSE	0-5
1.5-2.5 >50% COLLAPSE <50%COLLAPSE	 6-10 11-15
>2.5 <50% COLLAPSE NO CHANGE	 16-20 >20

MANAGEMENT OF CHEST PAIN SUGGGESTIVE OF ACS

TN Government STEMI care system

Introduction:

Acute coronary syndrome [ACS] is a clinical syndrome caused by rupture/erosion of an atherosclerotic plaque followed by thrombus formation, leading to abrupt reduction or cessation of coronary blood flow causing myocardial ischemia or infarction. Based on presence or absence of ST Elevation in ECG, ACS is differentiated into two types as STE-ACS and Non STE- ACS. The spectrum of acute coronary syndrome includes–Unstable angina, Non-ST elevation myocardial infarction [NSTEMI] and ST elevation myocardial Infarction [STEMI]



As shown above STEMI is characterised by total occlusion of the involved coronary artery. While in NSTEMI, where there is often a non- total occlusion. Thus a delay in reestablishment of the blood flow in the occluded coronary artery in STEMI, can lead to irreversible cell death, while it need not be the case in NSTEMI

	Unstable Angina	NSTEMI	STEMI
Pathology	Non occlusive thrombus	Non occlusive thrombus	Complete thrombotic occlusion
ECG changes	Non specific ECG	ST depression+/- T inversion	ST elevation
Cardiac biomarkers	Normal Cardiac Biomarkers	Elevated Cardiac Biomarkers	Elevated Cardiac Biomarkers
Treatment strategy	LOADING DOSE (Antiplatelets, Statins) Anticoagulants		LOADING DOSE (Anti-platelets ,statins) Anticoagulants
	Fibrinolysis contraindicated		Immediate Fibrinolysis/PPCI

Thrombolytic therapy using streptokinase, Tenecteplase or Reteplase within 6 hours of onset of STEMI had been the primary approved therapy for STEMI for long. Primary Percutaneous Coronary Intervention[PPCI] is now the recommended therapy for STEMI as the patient outcomes are better compared to thrombolytic therapy. However due to logistic difficulties PPCI is not possible for many patients with STEMI. Ultimately many of them end up with having stand-alone thrombolytic therapy. Pharmaco-invasive therapy [PIT] is a new concept that was developed to overcome the difficulties encountered in offering PPCI for STEMI. This strategy involves timely thrombolysis followed by early coronary angiography within 2 to 24 hrs and PCI if needed. PIT has shown to be superior to stand alone thrombolytic therapy and almost equivalent to PPCI.When timely PPCI is not possible Pharmaco-invasive strategy is recommended.

CLINICAL RECOGNITION/APPROACH TO STEMI

Timely recognition of patients ACS symptoms is critical in the management strategy. Thus the clinical approach includes a quick and a systematic evaluation with history, clinical examination, electrocardiography, cardiac enzymes, echocardiography.

HISTORY AND EXAMINATION

The chest pain in ACS is usually retro-sternal, compressive in nature associated with sweating, shortness of breath, radiating from chest to jaw, both upper limbs, back and epigastrium. Sometime patient may not present withchest pain but with angina equivalent symptoms like jaw or shoulder pain in the absence of chest pain, dyspnea, nausea or vomiting and diaphoresis. A thorough physical examination with monitoring of vital parameters is necessary in these patients.

High risk patients like those with hemodynamic abnormalities, signs of heart failure, should be identified in the initial triage. These patients need appropriate early management as outlined below.

ELECTROCARDIOGRAPHY

Electrocardiography is the key in the diagnosis of ACS/ STEMI. ECG should be taken within 10 minutes of First Medical Contact. If the ECG is not diagnostic, it may be repeated after 15 minutes and at 30 minutes interval or earlier when chest pain recurs or worsens to look for dynamic / progressive ECG changes. Extra leads such as V7-9 or V3R-V5Rif needed, to identify the culprit artery lesion not represented in 12 lead ECG. Availability of an earlier ECG helps to identify early or subtle ECG changes.

Criteria for ST changes in ECG

ST Elevation

- New ST elevation at J point in two contiguous leads :
  $\geq$0.1 mV in all leads (except V2-V3)
- Leads V2-V3:
  $\geq$0.2 mV in men $\geq$40 years
  $\geq$0.25 mV in men <40 years
  $\geq$0.15 mV in women

CARDIAC BIOMARKERS

Troponins are key for diagnosis of NSTEMI. NSTEMI is characterized by presence of elevated troponins in the absence of ST elevation in the ECG. In this setting ECG may be normal or may show non-diagnostic ST / T wave changes. Cardiac specific troponin [T or I] is the preferred cardiac biomarker. If presentation troponin is negative, and clinical setting is appropriate, repeat troponins in 6-12hours later.

When the ST Elevation in ECG is diagnostic of STEMI, cardiac biomarkers have no further role in diagnosis. In doubtful cases absence of troponin elevation 12 hours after symptoms onset rules out STEMI.

ECHOCARDIOGRAM

Echocardiogram is useful in patients with diagnostic difficulties in ECG as new regional wall motion abnormalities suggest coronary artery occlusion. Other uses of echo includeidentification of other causes of acute chest pain and breathlessness like acute pulmonary embolism, pericardial disease, to identify mechanical complications of STEMI like free wall rupture, ventricular septal rupture, papillary muscle dysfunction / rupture. Echocardiogram and cardiac biomarkers help to add to the diagnostic yield in difficult scenarios.

TREATMENT OF STEMI

Loading dose at FMC

Once the diagnosis of STEMI is confirmed, loading dose should be given at the FMC. This includes 300 mg chewable aspirin, 300 mg of Clopidogrel [600 mg if primary angioplasty is planned] and atorvastatin 80 mg or 40 mg of Rosuvastatin.

REPERFUSION STRATEGY

Thrombolytic therapy

Thrombolytic therapy is given **only when timely primary PCI is not possible.** Thrombolytic therapy should be administered as early as possible with a target door to needle time < 20 minutes. Agents used include Streptokinase / Tenecteplase / Reteplase. Before starting thrombolysis verify fibrinolytic check list and look for the contraindications to fibrinolytic therapy. Complications include bleeding risks and allergic complications, reperfusion arrhythmia / others.

THROMBOLYSIS CHECK LIST:

Absolute Contra-indications:[do not give if any of the following is ticked yes]

	YES	NO
1. Previous ICH or stroke of unknown origin at any time	☐	☐
2. Ischemic stroke beyond 4.5 hours and less than 6 months	☐	☐
3. CNS damage or neoplasms or AV malformation	☐	☐
4. Recent major trauma/surgery/head injury (within the preceding 3 weeks)	☐	☐
5. GI bleeding within the past month	☐	☐
6. Known bleeding disorder (excluding menstruation)	☐	☐
7. Aortic dissection	☐	☐
8. Non-compressible punctures in the past 24 h (e.g. liver biopsy, lumbar puncture)	☐	☐

Relative Contraindications:

1. Transient ischemic attack in the preceding 6 months	☐	☐
2. Oral anticoagulant therapy	☐	☐
3. Pregnancy or within 1 week postpartum	☐	☐
4. Refractory hypertension (systolic >180 mmHg and/or diastolic >100 mmHg)	☐	☐
5. Advanced liver disease	☐	☐
6. Infective endocarditis	☐	☐
7. Active peptic ulcer	☐	☐
8. Prolonged or traumatic resuscitation	☐	☐

Dosage of Thrombolytic agents:

- Streptokinase: 1.5 million units intravenous infusion over 60 minutes
- Tenecteplase: Single IV bolus injection adjusted to weigh [60 Kg (30mg); 60-69 Kg (35 mg); 70-79 Kg (40 mg); 80-89 Kg (45 mg); > 90 Kg (50 mg)]
  - UFH: Give 60 units / kg IV bolus [maximum dose of 4000U] before TNK. Start 12 U/kg/ hr infusion of UFH [maximum dose of 1000U / hr] after TNK FOR 24-48hrs
  - Enoxaparin: Give 30 mg IV bolus before TNK. Enoxaparin 1mg/kg bid 15 minutes after TNK should be started subcutaneously at a dose of 1 mg/Kg every12th hourly.
- Reteplase: Double Bolus of 10 U + 10 U IV injections given 30 minutes apart

Adjunctive antithrombotic therapy alongside reperfusion:

This includes UFH or enoxaparin

- UFH IV bolus of 60 units/kg (maximum, 4000 units) followed by an infusion of 12 units/kg/ hr (maximum, 1000 units) initially, adjusted to maintain the APTT at 1.5-2.0 times control ($\approx$ 50-70 sec) for 48 hror until revascularization.
- Enoxaparin: If age < 75 yr: 30-mg IV bolus, followed in 15 min by 1 mg/kg subcutaneously every 12 hr (maximum, 100 mg for the first 2 doses). If age $\geq$ 75 yr: no bolus, 0.75 mg/kg subcutaneously every 12 hr (maximum, 75 mg for the first 2 doses)
- Although thrombolysis is quick and easy with universal availability it restores normal flow only 50-60% of patients and chances of re-occlusion is very high with stand-alone thrombolysis.

Primary PCI [Primary angioplasty]

Performing urgent balloon angioplasty (with or without stenting), as the primary mode of reperfusion therapy in patients with STEMI is called primary PCI. It is the recommended therapy for STEMI. This restores angiographically normal flow in 90% patients. PPCI should be performed with atarget door to balloon time of less than 90minutes to offer maximal benefits.

If the expected door to balloon time is likely to exceed 120 minutes, the benefit of PPCI is lost. In such a scenario the patient should be thrombolysed and referred for Pharmaco-invasive therapy.

Pharmaco – Invasive Therapy(PIT)

Pharmaco – Invasive Therapy is a strategy of full dose fibrinolysis followed by transfer to PCI capable hospital for coronary angiogram within 2 – 24 hours, and PCI if necessary. Pharmaco-invasive therapy offers equivalent benefit as primary angioplasty.

Time frame in the management of STEMI

Time is muscle and Muscle is life. Timely reperfusion reduces the infarct size, improves the LV function and decreases the mortality. STEMI management delays can be grouped as patient related delay and system delay. System delay is more readily modifiable by organizational measures and it is a predictor of outcomes.

In order to reduce the system delay and to improve treatment outcome in STEMI patients the Government of Tamil Nadu has implemented the hub and spoke model of STEMI care. In this model the hospitals treating the STEMI / NSTEMI patients are classified into hub hospitals and spoke hospitals depending on the type of service they offer and the facilities they have. These hospitals are networked in a hub and spoke model such that the patients arriving at these hospitals get good care irrespective of the facilities they have.

Hub Hospital:

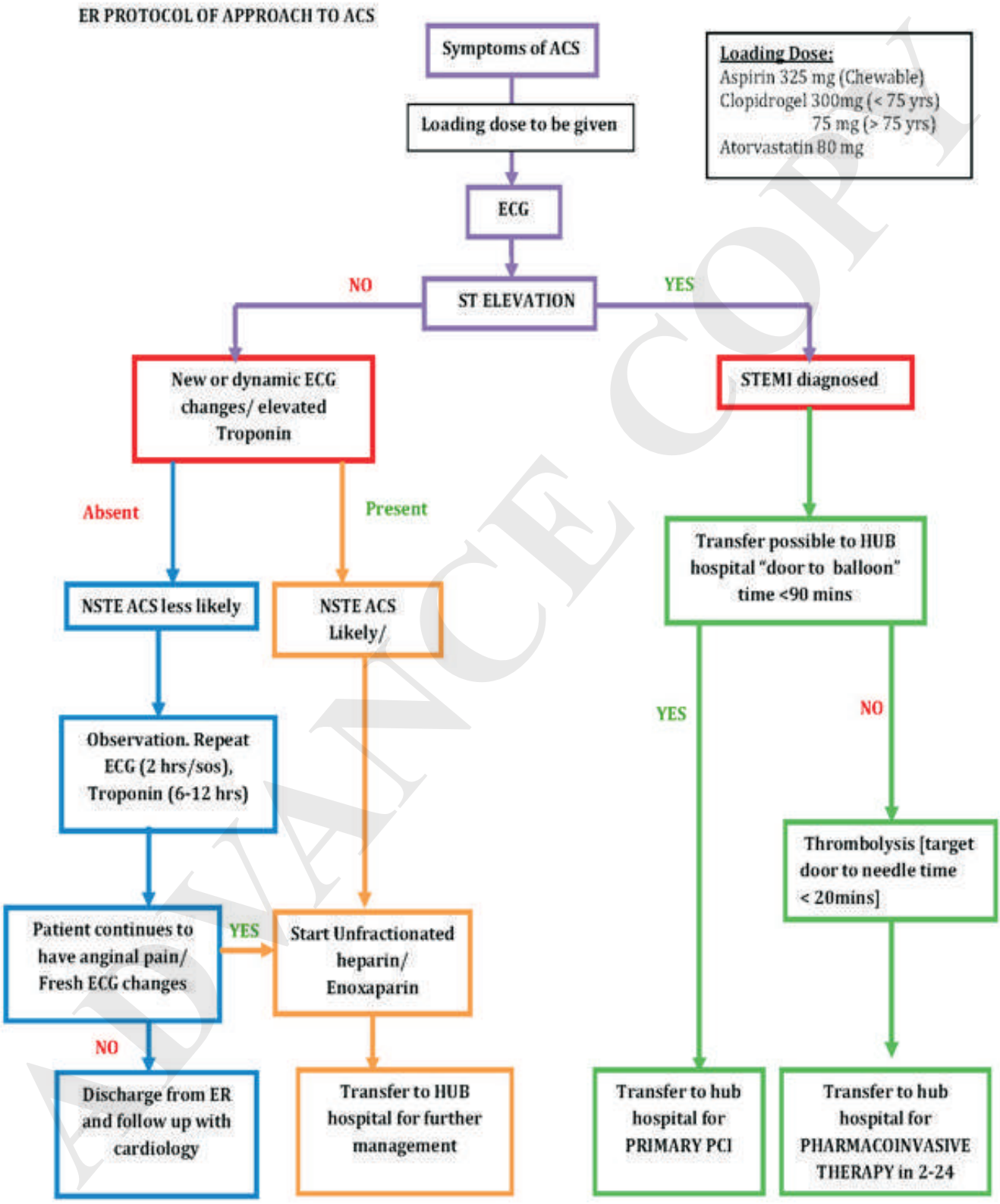
Hospitals capable of offering PPCI for patients with STEMI are called hub hospitals. They may offer PPCI either 24 x 7(round the clock Hubs) or only during office hours (Office hour Hubs)

Spoke Hospital:

Hospitals in the STEMI network, with facility to diagnose STEMI and capable of thrombolysis, but don't have CATH lab/PCI facility.

108 EMRI Ambulance:

The targeted optimal first medical contact is less than 10 minutes from the time patient calls for help. 108 EMRI ambulances play a key role in picking up the patients from their place of call. The EMRI will be able to take the ECG and transmit to the STEMI system, to recognise the ACS symptoms, to give the loading dose and follow instructions. 108 EMRI services also play an important role in transferring patients from spoke to hub hospitals.



SCRIPT

(Standard Operating Protocol for Stroke Care and Rapid Intervention with Plasminogen activator and Thrombectomy in Tamil Nadu state)

Acute Ischemic Stroke : Stroke is defined as sudden focal or global neurologic deficit of vascular origin lasting greater than 1 hour. If symptoms are fully reversible in <1 hour, it should be labelled as Transient Ischemic Attack (TIA).

Recognizing stroke:

-Sudden onset of weakness of one half of the body or one part of the body
-Sudden onset of inability or difficulty in speech or sudden trouble understanding
-Sudden onset of imbalance, dizziness, blindness
-Sudden severe headache, loss of consciousness
-Sudden numbness in one half of the body.

The stroke management at the district level will be taken care of by:

1) Emergency Medical Officer: Emergency Medical Officers will have an important role in the management of stroke patients. Being first assessors of the patient they will be required to read basic CT Brain and to take decisions regarding management of these patients.

2) Staff Nurses: Staff nurses working in the Emergency rooms of the district hospitals would be trained in rapid assessment and institution of immediate care (Measuring RBS, INR, setting up of 21V cannulas, starting the patient on oxygen etc.) of the stroke patients.

Thrombolysis for Acute Ischemic Stroke (AIS):

Imaging protocol: A non-contrast CT scan should be carried out at the earliest in case of suspicion of stroke.

CT scan signs of early ischemic stroke

1) Hyperdense middle cerebral artery sign
2) Obscuration of lentiform nuclei
3) Obliteration of insular ribbon
4) Grey matter swelling

Inclusion criteria for thrombolysis(Must be all YES)

1) Age >18 years
2) Time of onset well established to be less than 4.5 hours
3) Clinical diagnosis of ischemic stroke with neurologic deficit
4) Head non-contrast CT scan (NCCT) without hemorrhage.
5) Consent form/risks/benefits: Discussed and documented in chart
6) Premorbid modified ranking scale < 3

Things not to do in patients after starting

No nasogastric tube (NGT) insertion
No urinary catheter insertion

These can be inserted during the initial evaluation before starting thrombolysis

Exclusion criteria for thrombolysis(Must be all NO)

1) SBP >185mm Hg or DBP > 110mm Hg despite simple measures to lower it acutely. (i.e. after 2 doses of labetalol 10-20mg)
2) Coma or severe obtundation
3) Stroke or head trauma in last 3 months
4) Symptoms of subarachnoid hemorrhage/ history of intracranial hemorrhage
5) Gastrointestinal/urinary or respiratory hemorrhage in last 21 days.
6) Known bleeding diathesis/peritoneal or hemodialysis
7) Major surgery within last 14 days
8) Arterial puncture at a non-compressible site within last 7 days
9) MI in the last 6 weeks
10) INR > 1.7
11) RBS <50 and>400mg%

Regimen for treatment of acute ischemic stroke with IVtPA:

1) Insert two IV lines in emergency department- one for rtPA and other for IV fluids and labetalol infusion or contrast for CTA, if needed.
2) Infuse rtPA 0.9mg/kg (maximum of 90mg) over 60 minutes with 10% of the dose given as a bolus dose over 1 minute

   The use of anticoagulants and antiplatelet agents should be delayed for 24 hours after treatment
3) Perform neurological assessment every 15 minutes during the infusion of rtPA and every 30 minutes for the next 6 hours and then every hour until 24 hours from treatment.
4) If the patient develops severe headache, acute hypertension, nausea or vomiting, discontinue the infusion and obtain a CT scan of the brain in emergent basis
5) Measure blood pressure every 15 minutes for the first 2 hours, every 30 minutes for the next 6 hours and then every hour until 24 hours from the initiation of the treatment.

6)Management of blood pressure

Administer anti-hypertensive medications to maintain blood pressure at or below these levels. Maintain BP at <180/105 during rtPA infusion

a) If diastolic BP is 105-120mm Hg or systolic BP is 180-220mm Hg, administer 10mg of labetalol intravenously over 1-2 minutes. The dose of labetalol may be repeated or doubled every 10-20 minutes to a maximum dose of 300mg/bradycardia (As an alternative, may start with the initial bolus dose of labetalol (20mg) and then follow with a continuous labetalol infusion at the rate of 2-8mg/min)

b) If diastolic BP is 121-140mm Hg or systolic BP >230 mm Hg, administer 10 mg of labetalol over 1-2 minutes. The dose of labetalol may be repeated or doubled every 10 minutes to a maximum dose of 300mg/bradycardia (If the blood pressure is not controlled, consider starting infusion of sodium nitroprusside)

c) If diastolic blood pressure is >140 mm Hg, start infusion of sodium nitroprusside at a rate of 0.5mg/kg/min or nitroglycerin intravenously in drip

8) Antiplatelet therapy can be started if there is no hemorrhage in CT scan after 24 hr of thrombolysis (small petechial hemorrhages are not a contradiction)
9) Statin can be started immediately after diagnosis of ischemic stroke. Atorvastatin is usually given at a dose of 40-80 mg/day at night.

10) Management of ICP: Patients with features of raised intracranial hypertension (altered sensorium, bradycardia, severe hypertension and massive cerebral odema in CT Brain) are treated with following measures

- Elevate head of bed to 30 degrees
- Analgesia and sedation as needed
- Inj. Mannitol - Bolus 0.5 – 2.0 gm /kg over 10 –15 minutes and 0.25 - 0.5gm, Q 6th hourly, IV for two to three days
- Inj. Lasix - 20 mg 6 hourly
- Hypertonic saline - 3% saline (Na- 513 meq/L)
- Hyperventilation once patient is intubated (pCO2 35 mm Hg)

11) Management of Glucose: Blood glucose on admission predicts an increased risk of mortality and poor outcome in patients with and without diabetes and treated with insulin (Target blood sugar level is 140-180mg/dl)

12)Temperature management: Fever has been related to worsening outcome. Antipyretics should be given to maintain core body temperature at around 33 degree

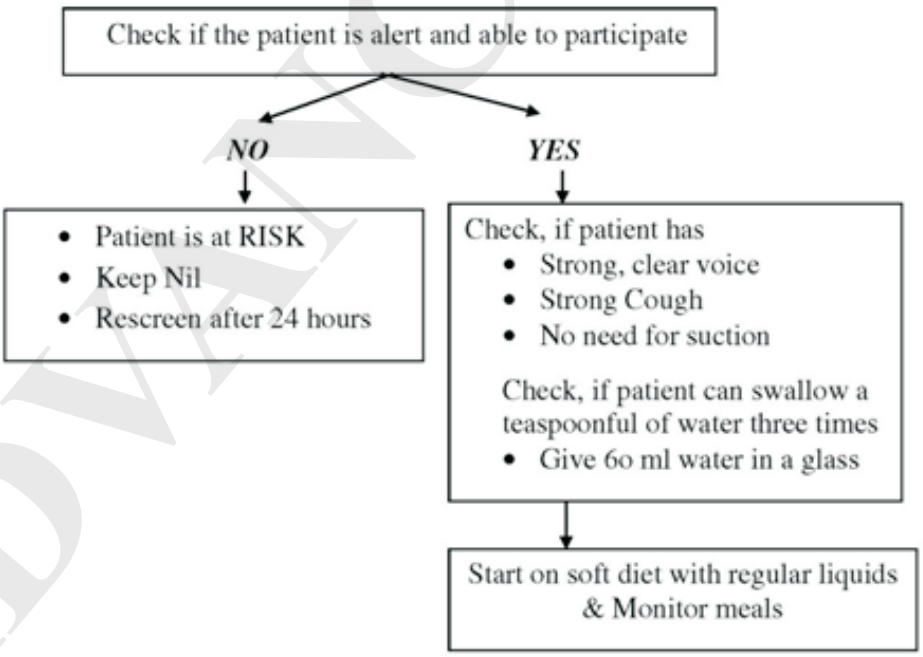
12)Prevention of deep vein thrombosis:

This has to be started after 24 hours of thrombolysis or in case IV thrombolysis not done, it can be started within first 24 hours. It is indicated in patient who have paralysis of lower limbs (unable to move the limb). Unfractioned heparin 5000 U s/c BD or low molecular weight heparin (Enoxapain 40mg s/c OD is given.

13) Antiepileptics are indicated only when seizure occurs – INJ Levatiracetam 20 mg/kg iv twice daily.

Swallowing test: (To be carried out by the stroke nurse on a daily basis)

Before giving any oral feed to the patient it is important to conduct swallowing test. Position patient upright at 90° for screening



Signs of patient having difficulty in swallowing:

1) Gurgly, wet sounding voice
2) Coughing while swallowing
3) Left-over food in mouth

If NPO for three days and more: Start non-oral feeds such as naso-gastric tube feeding

Management for stroke at basic stroke care center: (Stroke ready hospitals)

Stroke ready hospitals: At present the district hospitals should be designated as stroke ready hospitals which can provide basic care to all strokes being admitted. In addition, they should be able to diagnose type of stroke (ischemic/hemorrhagic) based on non-contrast CT scan and start basic care including tPA if patient fulfills criteria. They should be trained to identify patients which need to be referred to PSC.

Referral to Primary Stroke Center:

Large district hospitals / medical colleges which fulfil requirements should be designated as PSCs. They will be receiving stroke patients directly and referred from stroke ready hospitals (Dhs). They would be capable of handling most strokes and give care except the most complicated strokes which would be referred to tertiary care hospital.

When to refer

- All stroke cases should undergo CT scan (if not available locally) to document ischemic versus hemorrhagic subtypes (mandatory for stroke prevention).
- Altered consciousness, Uncontrolled seizures, Uncontrolled severe hypertension
- Irregular breathing , Recurrent TIAs
- Cardioembolic strokes for secondary prevention with anticoagulants and INR monitoring.

Referral to Tertiary Center:

Medical colleges with neurovascular intervention facility available comes under Tertiary centre.

When to refer

- Acute ischemic strokes with large vessel involvement who require mechanical thrombectomy if, within the window period (6-24 hr). In general, all ischemic strokes with NIHSS > 12 should be considered as having large artery occlusion and possible candidates for Mechanical thrombectomy. These patients should be shifted after starting IV tPA if they fulfilled the conditions.
- Large hemispheric infarct on CT scan, cases for decompression hemicraniectomy
- Large intracerebral hemorrhage or cerebellar haemorrhage for decompression surgery
- Comprehensive evaluation for Stroke in young/ cardioemobolic strokes/ large vessel extra cranial disease/ recurrent strokes/ stroke of unknown etiology.

Intracranial Hemorrhage (ICH): ICH is diagnosed when patient present with stroke symptoms and CT Brain shows hyperdense lesion (white). Most important cause of haemorrhagic stroke is systemic hypertension.

Management:

Mainstay of ICH therapy is to treat the underlying cause when possible. General treatment approach is always patient specific depending on clinical condition

Blood pressure control: Blood pressure control plays a crucial role in the management of Hemorrhagic stroke. It is different from that of ischemic stroke. Systolic blood pressure (SBP) should be reduced to <180 mm Hg within 1 hour and maintained for next 24 hours. But INTERACT study suggests more aggressive therapy with goal SBP <140 mm Hg leads to better outcomes.

The following drug protocol is recommended:

1) If diastolic blood pressure (DBP) >140 mmHg, IV infusion of Sodium Nitroprusside (0.5 – 1.0 mcg/ kg/ min) and titrate till DBP decreases by 20%
2) SBP >230 mmHg &/or DBP >121 – 140 mmHg, Labetalol (10 mg IV over 1 –2 minutes). Repeat / double every 10 minutes up to 150 mg. If refactory, sodium nitroprusside should be used
3) SBP = 180-230 mmHg &/or DBP = 105-120 mmHg, Labetalol 10mg IV every 10 – 20 minutes up to 150 mg
4) SBP < 180 mmHg &/or DBP < 105 mmHg, antihypertensive are not indicated

Reversal of coagulopathy: Patients with elevated INR due to oral anticoagulant (warfarin) use should be given intravenous Vitamin K and Fresh Frozen Plasma. Patients with a severe coagulation factor deficiency or severe thrombocytopenia should receive appropriate factor replacement therapy or platelets, respectively

Surgical intervention: Patients with cerebellar hemorrhage who are deteriorating neurologically or who have brainstem compression and/ or hydrocephalus from ventricular obstruction should undergo surgical decompression. These patients should be referred to tertiary care centre.

POISONING

Core principles of management of Acute Poisoning

- Resuscitation and stabilization
- Reduce exposure
- Diagnose type of poison involved by history and examination (Toxidrome) and simple laboratory tests
- Reduce absorption of poison by various gut decontamination methods
- Enhance excretion of already absorbed toxin
- Use of antidotes
- Supportive treatment

Approach to a patient with Acute Poisoning

Remember, as in any other emergency, the first step in managing a patient with poisoning is resuscitation and stabilization using ABC approach. Other steps are undertaken concurrently (and not sequentially) following initial resuscitation

Assess:

- ABCDE(Airway,Breathing,Circulation,Disability,Environment)

Actions:
Resuscitation and Stabilization

- Stabilize ABC as in any other emergency.
- Decontaminate the skin and eyes in case of an external exposure to a Toxic/Chemical agent.

Specific consideration in ABCs

- In case of caustic ingestion, evaluate the oropharynx for signs of injury and auscultate over the neck and chest for any stridor. Airway should be protected early by prompt intubation or emergency Tracheostomy.
- In case of ingestion of hydrocarbons like kerosene oil, aspiration is common which may require intubation and ventilation.

- Infusion of large volumes of intravenous fluids is not recommended. However, volume deficit if present should be corrected. For example, in lithium overdose, volume depletion needs to be corrected by intravenous fluids as this will enhance excretion of lithium.
- If a patient is hypotensive following overdose of beta blocker or calcium channel blocker agents, infuse fluids carefully as large volume of fluids may precipitate congestive heart failure.

Specific medication used during resuscitation and stabilization:

These include dextrose, naloxone, thiamine, atropine and flumazenil.

Dextrose

- Hypoglycemia can mimic several conditions including stroke. Several agents such as insulin, oral anti-diabetic agents, alcohol, salicylates and quinine may produce hypoglycemia.
- Dextrose should be given if blood glucose is below 80 mg/dl or is between 80-100 mg/dl if patient has focal neurological deficits. Dose is 2 ml/kg of 50% dextrose in adults or 4 ml/kg of 25% dextrose in children and 5 ml/kg of 10% dextrose in infants.

Naloxone

- It is an opioid antagonist. Presence of respiratory rate less than 12 per minute is the single most sensitive indicator for its administration in opioid poisoning.
- If the patient has respiratory depression - initial dose is 0.1-0.2 mg/iv and to be repeated as 0.4mg if no improvement and no features to indicate withdrawal (yawning, tachycardia, piloerection, sweating, etc.), subsequent dose is 2 mg every 2 minutes for a total of 10 mg.
- Since duration of action of naloxone is only 30-60 minutes, the patient should be observed for recurrence of opioid toxicity. .

Atropine

- It is the main antidote for organophosphates and carbamates.
- It is indicated if the patient has excessive sweating, poor air entry due to bronchorrhoea and bronchospasm, bradycardia, miosis and hypotension. If these features are not present, patient should be observed for at least 12 hours.
- Initial dose of atropine is 1.8 to 3.0 mg intravenously. Five minutes after administration, check for cholinergic toxidrome. Double the dose after 5 minutes, if improvement has not occurred,
- Target end-points for atropine therapy are: Clear chest on auscultation with no wheeze, heart rate >80 beats/min, systolic blood pressure>90 mmHg, dry axillae and pupils no longer pin-point.
- Once atropinized, set up an infusion of atropine at an hourly dose of 10-20% of the total dose of atropine given initially. Review the patient every 15 minutes to see that target end-points are maintained. Further boluses may be given, if required.

Thiamine

- Thiamine may be administered in alcoholics and malnourished patients.
- Dose is 100 mg intravenously.

Flumazenil

- Flumazenil is a benzodiazepine antagonist. It is indicated in pure benzodiazepine overdose with respiratory depression.
- Flumazenil may precipitate seizures in patients on chronic therapy with benzodiazepines and cardiac arrhythmias in mixed-drug overdose.
- The initial dose of flumazenil is 0.2 mg IV(10 mcg/kg) over 1 minute and followed 1 minute later with 0.3 mg, if the patient does not respond.

Further Assessment and Actions
Toxidromic approach to Diagnose Type of Poison

A toxidrome is defined as the presence of constellation of signs and symptoms produced by a group of poisons to which the patient has been exposed. To identify the toxidrome, a detailed history and physical examination including vital signs, pupillary size, skin whether dry or moist and bladder whether empty or full is performed.

Cholinergic Toxidrome

- The commonest toxidrome in Indian setting is cholinergic toxidrome, produced by organophosphate and carbamate insecticides, and chemical warfare agents like sarin and soman. These agents inhibit cholinesterases leading to accumulation of acetylcholine at various receptor sites.
- The features of cholinergic toxidrome are muscarinic, nicotinic and CNS.

Muscarinic features (DUMBELS)	Nicotinic features	CNS features
• D – Diarrhea • U - Urination • M – Miosis (common) • B – Bronchorrhoea, Bronchospasm, Bradycardia • E - Emesis • L – Low blood pressure, Lacrimation • S – Salivation, Sweating	• Mydriasis (uncommon) • Tachycardia • Muscle weakness • Hypertension • Fasciculations	• Confusion • Coma • Convulsions

- The three 'Bs' of mnemonic for muscarinic effects are known as killer 'Bs'.

Anticholinergic toxidrome

- This toxidrome is produced by agents such as Datura, tricyclic antidepressants, phenothiazines, antihistamines, anti-parkinsonian drugs and atropine. These agents block the action of acetylcholine at muscarinic receptor sites
- This toxidrome is opposite to the muscarinic effects of cholinergic toxidrome.
- The patient develops tachycardia and cardiac arrhythmias, hypertension, hyperthermia, mydriasis, dry eyes, dry mouth, dry and flushed skin, reduced bowel sounds and retention of urine. CNS features include confusion, delirium, and seizures.

Sympathomimetic Toxidrome

- Sympathomimetic toxidrome is produced by amphetamines, cocaine, phencyclidine, etc. Features are similar to those of anticholinergic poisoning, except that the skin is wet and sweaty, there is no retention of urine and intestinal motility is normal.

Opioid toxidrome

- Opioid toxidrome is produced by opium, codeine, morphine, heroin, pethidine, diphenoxylate (LomotilTM), tramadol, pentazocin, propoxyphene, hydrocodone, etc.
- The features are respiratory depression, hypotension, pin-point pupils and coma.
- Miosis is not present in all cases. In addition, mydriasis may occur in severely poisoned patients secondary to hypoxia.

Sedative-hypnotic toxidrome

- Produced by benzodiazepines, barbiturates, alcohol, anticonvulsants, antipsychotics.
- Features include decreased level of consciousness, hypoventilation, hypotension and bradycardia. Barbiturates also produce hypothermia and miosis.

Investigations

Electrocardiogram

- ECG should be obtained in all patients with acute poisoning, especially tricyclic antidepressants, digoxin, aluminium phosphide, organophosphate and cocaine. It can also reveal associated electrolyte abnormalities.

Other laboratory tests:

- Urine may show oxalate crystals in ethylene glycol poisoning. These crystals appear like envelopes.
- In methemoglobinemia, blood is chocolate in colour.
- Anion gap: It is the difference between measured anion gap and calculated anion gap.

Anion gap is calculated as: Sodium – (Chloride + Bicarbonate)

Normal anion gap is 8-14 mmol/L. The mnemonic to remember causes of increased anion gap is MUDPILES:

- M – Methanol, Metformin ingestions
- U – Uremia
- D – Diabetic ketoacidosis
- P – Paracetamol
- I – Iron, Isoniazid
- L – Lactic acidosis
- E – Ethylene glycol
- S – Salicylates

Decontamination: should be undertaken after appropriate personal protection – gown, gloves, mask, eye-wear, etc.

- Skin: Patients soiled clothes should be removed and the skin washed with copious amounts of water.
- Gastrointestinal system
- Several gastrointestinal decontamination procedures may be used to reduce absorption of toxin from the gut.

However, before performing any procedure, consider three factors:

- Is the ingestion potentially toxic?
- Can the procedure remove significant amount of toxin?
- Whether the benefits of the procedure outweigh its risks

Gastric Lavage

- If patient has altered level of consciousness, then the airway should be protected before performing gastric lavage.
- A large-bore orogastric tube should be passed into the stomach with the patient in left lateral position.
- Contraindicated in ingestion of Caustics and Hydrocarbons.
- May not be very much helpful in case of delayed presentation $\geq$ 4 hours.

Activated Charcoal

- The dose is 1 g/kg mixed with 150 ml of water not more than 100grams, repeated 6th hourly for 24- 48 hours depending upon the compound.
- Certain toxins are poorly adsorbed to activated charcoal and include lithium, iron, cyanide and hydrocarbons, hence not recommended.
- It is contraindicated in Caustic & Hydrocarbon ingestion and presence of ileus.

Dialysis and Hemoperfusion

- Hemodialysis is effective in removing dialyzable toxins including salicylates, lithium, methanol, isopropanol, ethylene glycol, theophylline, and phenobarbital.
- In addition, hemodialysis may be required in patients who develop acute kidney injury following poisoning or who develop severe electrolyte imbalance. An example is lactic acidosis associated with metformin toxicity.

Antidotes

- This table gives a list of commonly used antidotes. If specific antidote is available, it should be administered.

Antidote	Specific Poison
Amyl nitrite, sod. nitrite, sodium thiosulphate	Cyanide
Antisnake venom	Snake bites
Atropine	Carbamates
Calcium gluconate	Beta-blockers, calcium channel blockers, fluorides
Deferoxamine	Iron
Dextrose	Hypoglycemia
Ethanol	Methanol, ethylene glycol
Flumazenil	Benzodiazepines
Magnesium sulphate	Toxins producing prolongation of QT interval
Methylene blue	Methemoglobinemia
N-acetylcysteine	Paracetamol
Naloxone	Opioids
Oxygen	Carbon monoxide, cyanide, hydrogen sulphide, other hypoxia-producing agents
Physostigmine	Anticholinergics (severe)
Pralidoxime	Organophosphates
Pyridoxine	Isoniazid, ethylene glycol
Sodium bicarbonate	Toxins producing prolongation of QRS complexes

Snake Bite

80% of snakes are non venomous
Famous four

- Cobra
- Krait
- Russels viper
- Saw scaled viper

Snake envenomation can result in life threatening Systemic envenomation – Neurotoxicity or coagulopathy Local envenomation which is localized cellulitis at the bite site

Neurotoxicity

- descending type of paralysis
- cranial nerves are first to be involved
- respiratory failure is fatal if not promptly treated

Hemotoxity

- venom induced consumption coagulopathy Spontaneous bleeding tendency usually occurs few hours after snake bite May be life threatening Acute renal failure is quite common

Assess:

- ABCDE

Actions:
Resuscitation and Stabilization

Stabilize ABC as in any other emergency

D- Disabilty
In case of Weakness of limbs or Impending respiratory failure – Intubation & Mechanical Ventilation

Hemotoxicity assessment

20Minute Whole Blood Clotting test
Take 3-5ml blood in a fresh,clean, dry, glass test tube and keep aside for 20 mins, if not clotted in 20 mins indicates Venom induced coagulopathy

Specific treatment
Inj ASV -8 vials in 200ml of NS initially 10 drops/min, to be completed in maximum one hour.

- ASV induced Allergy

  Steroids and Antihistamines may be used for minor Allergic reaction. Life threatening Anaphylaxis should be treated with Inj Adrenaline 0.5ml, 1:1000 preparation IM, preferably Deltoid region.

Scorpion Sting

Toxin binds to Na channels in cell membranes and inhibits inactivation of the membrane potential resulting in release of Acetyl choline from parasympathetic and Epinephrine & Nor Epinephrine from sympathetic ganglion ultimately leading to Autonomic Storm

Clinical diagnosis, no specific investigation needed

Assess:

- ABCDE

Actions:

Resuscitation and Stabilization

Stabilize ABC as in any other emergency

Disability

If the patient is having focal weakness of Limbs, ie hemiparesis do CT to diagnose ICH

Local infiltration of Lignocaine without adrenaline, may alleviate pain at sting site.

Specific treatment

Prasozin- 30ug/kg is useful in management of Autonomic mediated sympathetic manifestations. First dose hypotension to be watched for. Cardiomyopathy is a potentially lethal complication- Dopamine / Dobutamine infusion 5-20ug/kg/min to improve cardiac contractility

Supportive Treatment

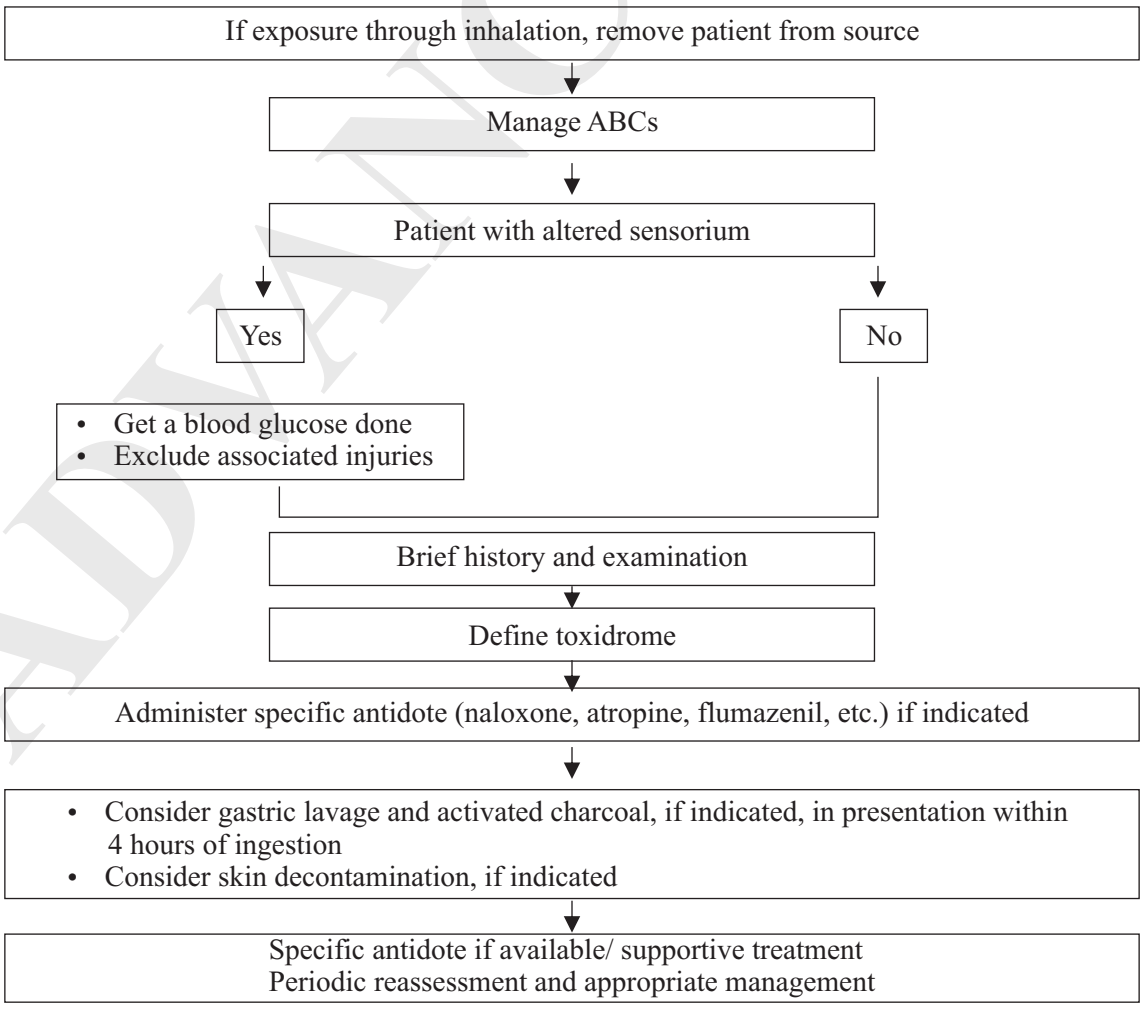
The most important treatment for patients with poisoning is the supportive treatment:

- Central nervous system - control of seizures and care of comatose patient
- Cardiovascular system - control of hypotension and cardiac arrhythmias
- Respiratory system - adequate oxygenation / ventilation
- Support of renal function
- Correction of fluid, electrolyte, and acid-base disturbances.
- Correction of hypothermia or hyperthermia

Algorithm for a Patient with Acute Poisoning

If exposure through inhalation, remove patient from source

Algorithm for a Patient with Acute Poisoning



- Provide supportive treatment
    - Maintain oxygenation and ventilation
    - Control of hypotension, hypertension, cardiac arrhythmias, congestive heart failure
    - Control of seizures, care of the comatose patient
    - Correct hypothermia or hyperthermia
    - Correct electrolyte imbalance

EMERGENCY OBSTETRIC MANAGEMENT

Index

1. Management of a patient with bleeding per vaginum
2. Management of a severe abdominal pain
3. Resuscitation of a patient with seizures
4. Resuscitation of patients with pulmonary edema in pregnancy
5. Management of a patient with trauma during pregnancy
6. Management of a patient with perineal injuries
7. Management of a patient with postpartum haemorrhage
8. Management of a woman/girl with sexual assault

Management of a patient with bleeding per vaginum

Women with bleeding per vaginum

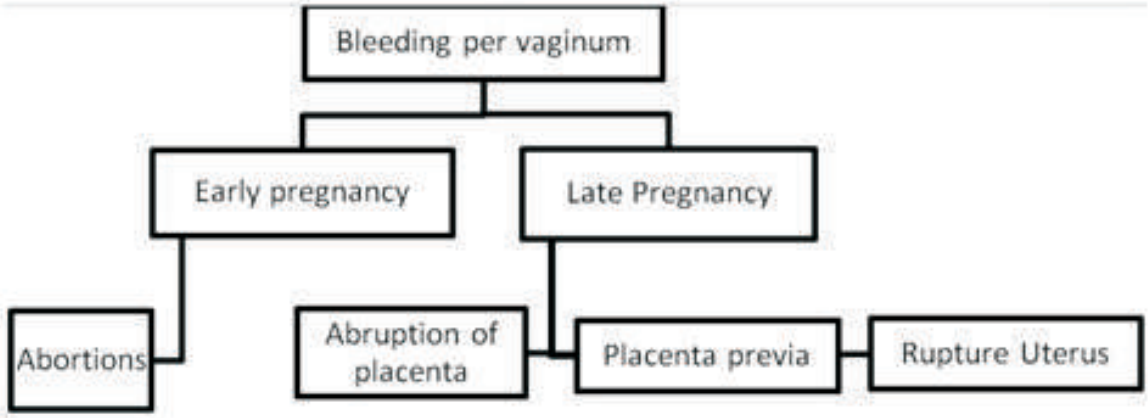
Ask about

1. History of duration of bleeding
2. History of period of Amenorrhoea

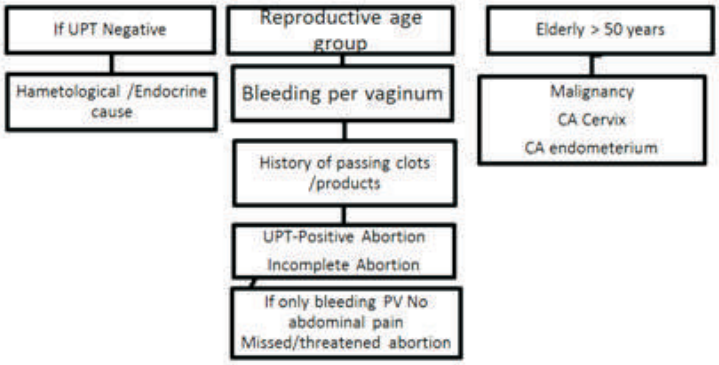
   Do urine pregnancy test - if positive, think of ectopic pregnancy

   History of regularity of menstrual cycles
3. History of association with severe abdominal pain.

   Do urine pregnancy test- if positive/weakly, positive think of ectopic pregnancy



Age group of management of patients with Bleeding per Vaginum



Resuscitation of a patient with seizures

If pregnant – Antepartum Eclampsia

Recently delivered - Postpartum Eclampsia

Do NOT ask any history

Immediate resuscitation:

1) Head tilt to one side.
2) Mouth gag
3) Nasal oxygen
4) Suctioning of secretions.

Because any seizures during pregnancy to be considered as Eclampsia and treated as such.

Actions

Secure IV line

Inj. MgSO4 4gms IV stat+5gms+5gms IM on each side

Catheterisation

Examination

Pulse rate, Blood Pressure, SPO2, Urine Albumin, PIH investigations. History taking only for documentation

Resuscitation of patients with pulmonary odema

1.Undelivered (pregnancy)

- severe preeclampsia
- heart disease
- written consent DIL/fetal risk

2.Delivered

- fluid overload
- pulmonary embolism
- heart disease

3.Resuscitation

- Back rest/propped up position
- Oxygen therapy -
  - ventimask
  - cPAP
  - controlled ventilation
- Fluid administration with CVP guidance
- Fruosemide 40mg IV stat and maintained as needed

Management of patient with trauma during pregnancy

Clarify RTA/ Accidental fall/Assault/Anything register as MLC

- Examination for pallor/vitals(PR,BP)
- P/A (if tenderness present –think of abruptio placenta/rupture of uterus/organ injury
- L/E- Bleeding PV if yes-may be abruptio placenta;
- Catheterize, if hematuria –think of rupture uterus/DIC

Resuscitation

- ABC
- IV line
- Crystalloids
- Blood transfusion immediately
- Investigations including coagulation profile (DIC)
- USG abdomen and pelvis – look for abruption
- DIL for mother and fetus

Perineal injuries

History of assault /fall/accident/self inflicted-anything register as MLC

- Resuscitation
- ABC
- Reassurance
- Examination with female attender
- Pallor
- P/A- if tenderness

Think of internal injuries

L/E: Vulva
Vagina
Urethra
Rectum

S/E: Cervix

P/V: palpate for uterine tenderness

Management

- Informed and written consent
- Opinion- Gynaec/surgery
- If injuries are there pack and give pressure
- Urgent investigations

Post partumhaemorrhage

Ask history

- Place of delivery
- Mode of delivery(instrumental/ natural)
- Prolonged second stage
- Obstructed labour
- Undue fundal pressure
- Retained placenta
- Placenta previa
- Secondary PPH

Examination

- Pallor, pedal edema
- PR, BP, SPO2,RR, CVS, RS
- Stabilise the patient and rule out the cause for PPH
- P/A- uterus contracted or flabby

- P/S- to rule out traumatic injuries in the vagina, cervix and fornices.
- P/V- look for well contracted uterus.
- Catheterize bladder and look for urethral and paraurethral tears

PPH tray should be kept ready in Casualty

- In shock- call for help
- Nasal o2
- Check for vitals
- Secure 2 iv line
- Catheterise the bladder
- Blood for cross matching
- Transfusion immediately
- Oxytocin 40 u in 500ml ns/rl
- T.misoprostal 800 mcg per rectally Injcarboprost 250 mcg im .can be repeated upto 8 doses in 15 minutes interval.
- bimanual uterine compression
- nasg suite.
- if not controlled plan for exploration and laparotomy if needed.

Management of a woman/ girl with sexual assault register as MLC

- History to be elicited without attendees if major/ with attendees if minor, subnormal intelligence.
- Informed and written consent for examination, specimen collection, report submission to the concerned authorities.
- Should be accompanied by police officer, if not inform police officer.
- First give mental reassurance.
- Make her comfortable, if sick resuscitation and then history taking without police officials.
- IV line/fluids/analgesics
- Examination Head to Foot
- Register all injuries, bleeding, swelling, tenderness, discharge injuries-site, size, shape, colour
- Evidence collection
    - Vaginal Swab
    - Urethral Swab
    - Two slides for semen examination
    - Foreign bodies
    - Abnormal hair clippings to be registered
- All evidence should be packed and handed over to the police officer
- Age of the patient should be estimated clearly
- Date of examination, start and end time of examination to be mentioned
- Two identification marks mandatory
- At the end of examination ,no conclusion to be written or verbalised

TEAM FORMATION AND THEIR ROLES

A team in ED aims to,Rapidly resuscitate and stabilize the patientReduce the time to diagnosis and treatment. Overall objective is to improve survival rate Ensures the **early mobilization** and **involvement of more experienced medical staff** and thereby improving patient outcome

OBJECTIVES OF THE TEAM:

- Distribution of the several tasks in a "Horizontal Approach".
- Assessment and Primary Survey.
- Resuscitation of the patient.
- Documentation.

COMPONENTS OF TEAM:

- Team Leader (Usually a Surgeon)
- Doctors
  - –Anaesthetist
  - –Senior Resident
  - –Junior Resident
- Nurse
  - –Primary Nurse
  - –Secondary Nurse

Team Leader

- Coordinates the resuscitation and ensures adherence to Advanced Trauma Life Support (ATLS) guidelines.
- Initial Assessment and Survey.
- Resuscitation.

Anaesthetist

- Airway management.
- Intubation.
- Ventilation.
- Central Venous Access.

Senior Resident

- Primary Survey of the patient.
- Resuscitation and Reevaluation.
- Procedures like ICD insertion, Splinting, Securing Airway.
- Assists in any other procedures assigned by the Team Leader.

Junior Resident

- Records Vital Signs.
- Venous Access/Draws Blood.
- Grouping, Cross Matching, Getting Blood.
- Assists in any procedures.

Primary Nurse

- Assists with Airway Management.
- Places Monitoring Devices.
- Sets up Ventilator.

Secondary nurse

- Calls Alerts.
- Records Vital Information.
- Assists with procedures.

PERSONAL SAFETY

What is personal safety and why?

- The safety of healthcare providers from workplace-induced injuries and illnesses.
- The presence of healthy and well-rested health care providers is critical to providing vigilant monitoring, empathic patient care, and vigorous advocacy.

Hazards during patient care

Hazards during patient care can impair health both acutely and in the long term. ***Health Outcomes***

- Musculoskeletal injuries/disorders,
- Other injuries,
- Infections,
- Changes in mental health,
- Cardiovascular, metabolic, and Neoplastic diseases

Musculoskeletal injuries' prevention

- Use proper lifting and transfer techniques—use the knees, not the back
- So report even these things immediately
- Keep the objects or patients being lifted as close to the midsection as possible and bend from the back
- Wear comfortable shoes with good shock absorption to counteract the effects of prolonged standing and walking
- Maintain muscle strength and flexibility

Needle sticks and Sharp Injuries prevention

- Instituting universal precautions and using needleless IV systems.
- Administering oral medications instead of IV medications, when appropriate.
- Utilizing blunt-tip needles or self-sheathing needles.

Cross infection prevention

- Proper thorough hand washing
- Use mask, gown and gloves
- Precaution during collection of specimens
- Disinfect the articles and instruments used
- Maintain cleanliness
- Safe disposal of wastages

Report all hazards immediately

- Reduced Exposure to hazardous drugs such as antivirals, hormone therapy or those used for cancer treatment.
- Wearing gloves and other types of protective gear (such as masks and eyewear).
- Following the appropriate protocol every time the nurse may come into contact with the hazardous medication.
- In most other cases and places, spills and leaks aren't considered a huge danger.
- Things that leak can be more dangerous than injuries obtained by slipping on wet floor. mostly of the biological matter like blood and other bodily fluids that might potentially contain infectious bacteria/strains.
- So report even all such cases and also any violence in work place.

BIO MEDICAL WASTE

Waste generated as a result of diagnosis, treatment and immunization of human beings or animals or in research activities pertaining to production of testing of biological including human waste, animal waste etc

Why is it Important?

- Reused needles and syringes can spread disease and harm workers and communities.
- Medical waste potentially impacts patients, workers, community, and economy because of the volume and permanence of waste
- The waste may produce an unpleasant look for the community and create a foul smell

BIOMEDICAL WASTES (Management and Handling) RULES-1998

Classification of health care waste

Infectious waste, Pathological waste, Sharp, Pharmaceutical waste, Genotoxic waste,Chemical waste, Wastes with high content of heavy metals, Pressurized container, Radioactive waste

Colour coding	Waste category	Treatments
Yellow	Cat 1, Cat 2, Cat , Cat 6	
Red	Cat 3, Cat 6, Cat 7	
Blue/White/Translucent	Cat 4, Cat 7	
Black	Cat 5, Cat 9 and cat 10	

- Approaches for managing Bio Medical Waste
- Disinfection of segregated waste
- Monitoring and record maintenance
- Transportation
- Autoclaving, Incineration, Chemical infection