

Acute Trauma Management

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Program Goals

1. **Assess** a patient's condition rapidly and accurately.
2. **Resuscitate and stabilize** patients according to priority.
3. Determine whether a patient's needs exceed a facility's resources and/or a doctor's capabilities.
4. Arrange appropriately for a patient's interhospital or intrahospital **transfer** (what, who, when, and how).
5. Ensure that **optimal care** is provided and that the level of care does not deteriorate at any point during the evaluation, resuscitation, or transfer

The Need

- More than 9 people die every minute from TRAUMA
- 5.8 million people of all ages die every year from unintentional injuries and violence .
- 12% of the world's burden of disease.
- RTAs cause more than 1 million deaths annually and an estimated 20 million to 50 million significant injuries.
- RTAs are the leading cause of death due to injury worldwide.
- Trauma remains the leading cause of death in persons 1- 44 years of age.
- Significantly, more than 90% of motor vehicle crashes occur in the developing world.
- Injury-related deaths are expected to rise dramatically by 2020.

History

The delivery of trauma care in the USA before 1980 was at best inconsistent. A tragedy occurred in February 1976 that changed trauma care in the “first hour” for injured patients in the United States

An orthopedic surgeon was piloting his plane and crashed in a rural Nebraska cornfield. The surgeon sustained serious injuries, three of his children sustained critical injuries, and one child sustained minor injuries. His wife was killed instantly.

The care that he and his family subsequently received was inadequate by the day’s standards.

The surgeon, recognizing how inadequate their treatment was, stated: “When I can provide better care in the field with limited resources than what my children and I received at the primary care facility, there is something wrong with the system, and the system has to be changed.”

Trimodal Death Distribution

MODES OF MORTALITY

1. **Immediate deaths:** Occurs at the scene of injury, are caused by a fatal disruption of the **great vessels, heart, and lungs** or a **major disruption of body cavities**. Immediate mortality in trauma occurs at the scene of the injury. Prevention of these deaths requires a **multidisciplinary public health systems approach**.

2. **Early deaths:** May occur any time **from minutes to hours after the injury**. These patients frequently arrive at a hospital before death, which usually occurs because of a **cardiovascular and/or pulmonary collapse**.

3. **Late trauma mortality:** Peaks from **days to weeks** after the injury and is primarily due to **sepsis and multiple organ failure**.

Organized systems for trauma care are focused on the salvage of a patient from early trauma mortality, whereas **critical care** is designed to avert late trauma mortality.

Early trauma deaths result from failed oxygenation of the vital organs, massive central nervous system injury, or both.

- The mechanisms of failed tissue oxygenation include:
Air way compromise.
Inadequate (breathing) ventilation.
Circulatory collapse.
(problem in one or more of A,B,C).
- Massive central nervous system trauma leads to inadequate ventilation and/or disruption of brainstem regulatory centers.
- Early death: Due to defected ABC

Objectives of the initial evaluation and resuscitation of the trauma patient
(Primary survey)

- (1) To **identify (not diagnose)** life-threatening injuries.
- (2) To **stabilize or resuscitate(not treat)** life-threatening injuries.
- (3) To efficiently and rapidly **organize either definitive therapy or transfer** to a facility that provides definitive therapy.

INITIAL ASSESSMENT AND MANAGEMENT

Treatment of multiple injured patients requires **rapid assessment and management of life threatening conditions** in a systematic way that can be reviewed and practiced.

1. Preparation
2. Triage
3. Primary survey (ABCDE)
4. Resuscitation.
5. Adjuncts to primary survey and resuscitation.
6. Consider need for patient transfer.
7. Secondary survey (head to toe evaluation and history): starts when 3, 4, 5, and 6 are done.
8. Adjuncts to secondary survey
9. Continued post-resuscitation monitoring and evaluation.
10. Definitive care.

-Although the above steps(A,B,C,D,E) are mentioned in a linear way, in practice they are performed **simultaneously**.

- Repeat primary and secondary surveys to detect any deterioration and manage it.

PREPARATION

It aims at ensuring smooth and safe transition from prehospital to hospital care.

PREHOSPITAL PHASE;

Prehospital team **communicates** with the receiving hospital facility **to prepare** the staff and resources.

During the prehospital phase **maintain airway, control of hemorrhage and shock, immobilization**, and transfer to **closest appropriate** facility.

Minimize scene time.

Obtaining and reporting information that helps the hospital staff to triage and manage patients (time and mechanism of injury, treatments given and relevant patient history).

HOSPITAL PHASE:

- **Advanced planning** for patient management
- **Resuscitation area.**
- Proper airway equipments should be ready, tested and properly placed.
- Warm intra-venous fluids
- A plan to summon additional support.
- Alert the radiological and laboratory departments.
- Transfer agreements with other trauma centers.
- All health care providers should be protected from communicable diseases as hepatitis and AIDS: face mask, eye protection, gloves, water proof apron and leggings.

TRIAGE

sorting of patients based on the severity of their injuries and need for treatment and the availability of resources.

Prehospital team should ensure that injured patients are sent to **appropriate medical centers** that can provide optimal care.

Field triage becomes necessary when the number of casualties overwhelms the capabilities of the on-scene care providers or the resources of local receiving facilities.

Two types of triage situations exist

Multiple casualties: The first situation occurs when number of patients and their injuries **do not** exceed the resources of the field providers or local treatment facilities. In this situation, all injured patients are treated and transported immediately, and **triage** focuses on identifying the priority of treatment needs for each patient.

Mass casualties: When the number of patients and their injuries exceed the resources of the field providers or local treatment facilities, in this situation **triage** is required to identify potentially **salvageable** patients with life-threatening conditions that require immediate treatment and transport.

PRIMARY SURVEY

GOLDEN HOUR

- During this time, life-threatening injuries are identified(not diagnosed) and resuscitated (not treated). Simultaneously.
- This means: Unstable patient is stabilized.
- This means also: Faulty A,B,C,D are corrected.

PRIMARY SURVEY

- Only adjuncts to primary survey are allowed.
- Ends when patient is stable (normal ABCDE)
- At the end of primary survey a decision should be made: to proceed to secondary survey or to transfer the patient to a facility where a definitive management can be offered.
- Identification of life-threatening injuries does not mean exact diagnosis of the condition.
- A simple mnemonic, ABCDE, is used as a memory aid for the order in which problems should be addressed.
- Although the steps are mentioned in a linear way, in practice they are performed simultaneously.
- Repeat primary and secondary surveys to detect any deterioration and manage it.
- Priorities for children, pregnant women and the elderly are the same, although each category of those has its own issues.
- Secondary survey begins when the patient is fully resuscitated and stable.

A - Airway Maintenance with Cervical Spine Protection

- The first priority.
- The ability of air to pass unobstructed into the lungs.
- Inadequate delivery of oxygenated blood to brain and other vital organs is the **quickest killer** of the injured patients.

Oxygen supplement must be provided to all injured patients.

Early preventable deaths from airway problems result from:

1. Failure to recognize the need for airway
2. Inability to establish an airway.
3. Failure to recognize an incorrectly placed airway.
4. Displacement of previously established airway.
5. Failure to recognize the need for **ventilation**.
6. Aspiration of gastric contents.

RECOGNITION OF THE NEED FOR AIRWAY MAINTENANCE

- ***Obstruction of the airway*** due to direct injury, edema, or foreign bodies.
- ***Inability to protect and maintain the airway patency,*** because of a depressed level of consciousness due to head injury, alcohol intoxication or medications, when GCS is less than 9.

CAUSES OF AIRWAY COMPROMISE:

- **Maxillofacial trauma:** fractures, hemorrhage, increased secretions, dislodged teeth; fractures of mandible may cause loss of tongue support.
- **Neck trauma:** hemorrhage due to penetrating injury, disruption of larynx or trachea, bleeding in the tracheobronchial tree, neck edema.

OBJECTIVE SIGNS OF AIRWAY OBSTRUCTION;

talking patient: clear airway

coherent talk: good oxygenation

LOOK: Agitation suggests hypoxia, obtundation suggests hypercarbia, cyanosis suggests hypoxemia(late sign), retractions and use of accessory muscles of ventilation.

LISTEN:

Noisy breathing, snoring, stridor, hoarseness.(partial obstruction)

Silent breathing: complete obstruction.

FEEL: palpable fracture of larynx, tracheal shift.

AIRWAY MANAGEMENT: cervical spine should be protected

1. Airway maintenance techniques: Suction of blood and vomit and removal of foreign bodies and fractured teeth.
2. Chin lift, jaw thrust, oropharyngeal airway, nasolaryngeal airway, laryngeal mask airway.
2. Definitive airway: endotracheal intubation
3. Definitive airway: surgical airway

B — Breathing and Ventilation;

The chest must be examined by inspection, [palpation](#), [percussion](#) and [auscultation](#). [Subcutaneous emphysema](#) and tracheal deviation must be identified if present.

The aim is to identify and manage life threatening thoracic conditions that affect ventilation:

[Airway Obstruction](#), [Tension Pneumothorax](#), [Massive Haemothorax](#), [Open Pneumothorax](#), [Flail chest](#) segment with [Pulmonary Contusion](#).

C- CIRCULATION WITH HEMORRHAGE CONTROL

1. Blood volume and cardiac output

Hemorrhage is the predominant cause of preventable post-injury deaths.

Hypovolemic shock is caused by significant blood loss.

Significant blood loss is seen in thorax, abdomen, long bone fractures, Isolated head injury does not cause shock.

- Level of consciousness: cerebral perfusion may be impaired resulting in impaired level of consciousness.
- Skin color: Ashen gray color of face, pallor of extremities are signs of hypovolemia.
- Pulse: rapid and thready pulse is seen in hypovolemic shock.
- Low blood pressure
- Tachypnea
- Low urine output

CLASSIFICATIONS OF SHOCK: To be discussed later. However shock should be treated initially as hypovolemic shock, other types of shock should be recognized and treated.

Bleeding should be controlled by:

- ❖ Direct manual pressure.
- ❖ Pneumatic splinting devices
- ❖ Tourniquets should not be used because they cause crush tissues and distal ischemia.
- ❖ Hemostats should not be used as they cause injury.
- ❖ Reduction of fractures and splinting of pelvic fracture.

D - Disability (Neurologic Evaluation)

AVPU (alert, verbal stimuli response, painful stimuli response, or unresponsive).

A more detailed and rapid neurological evaluation is performed at the end of the primary survey.

Glasgow Coma Scale .

Hypoglycemia and drugs, including alcohol, may influence the level of consciousness.

If these are excluded, changes in the level of consciousness should be considered to be due to traumatic brain injury until proven otherwise.

E - Exposure / Environmental control

- ❖ Patient should be completely undressed.
- ❖ Prevent hypothermia .
- ❖ Patient privacy should be maintained.
- ❖ Intravenous fluids should be warmed and a warm environment maintained.

ADJUNCTS TO PRIMARY SURVEY

Done to: MONITOR, RESUSCITATE OR IDENTIFY.

- **ECG monitoring.**
- **Monitoring of vital signs: blood pressure, pulse pressure, heart rate, body temperature and respiratory rate**
- **Monitoring: arterial blood gases, pulse oximetry, and colorimetric CO₂ monitoring.**
- **Urinary and gastric catheters.**
- **X-Rays and diagnostic studies: AP chest and AP pelvis and lateral cervical spine.**
- **FAST or DPL.**

UNIRARY CATHETERS

Urine output is a sensitive indicator of volume status and tissue perfusion, monitoring of urine output is best achieved by bladder indwelling catheter. Trans-urethral catheter is contraindicated when urethral injury is suspected in the following conditions:

- Blood at the urethral meatus
- Perineal ecchymosis.
- Blood in the scrotum.
- Non-palpable or overriding prostate.
- Pelvic fracture.

GASTRIC CATHETER:

Usually inserted nasally (NGT) to:

- Reduce gastric distension and reduce aspiration
- Treat acute gastric dilatation that may produce hypotension due to vagal stimulation.
- Diagnose upper GIT bleeding.
- Before DPL.

Nasogastric tubes are contra-indicated if craniiform plate fracture is present or suspected

SECONDARY SURVEY

1. When the primary survey is completed, resuscitation efforts are well established, and the vital signs are normalizing, the secondary survey can begin.
2. The secondary survey is a **head-to-toe evaluation** including a complete **history and physical examination**, including the reassessment of all vital signs.
3. Each region of the body must be fully examined.
4. **X-rays indicated by examination are obtained.**
5. If at any time during the secondary survey the patient deteriorates, **another primary survey** is carried out as a potential life threat may be present.

HISTORY

A: Allergies.

M: Medications/ Mechanism of trauma.

P: Past medical history.

L: Last meal.

E: Events/ Environment related to injury