Trauma

Surg 351
Academic Year ’20/‘21

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Outline

- Trauma, Epidemiology, Mechanisms
- Prehospital care
- Triaging and scoring
- ATLS
- Primary survey (The A,B,Cs), “Adjuncts”
- Secondary survey

"Crashes NOT accidents."

Trauma

Trauma most often refers to:

- Major trauma, in physical medicine, severe physical injury caused by an external source
- Psychological trauma, a type of damage to the psyche that occurs as a result of a severely distressing event
- Traumatic injury, sudden physical injury caused by an external force, which does not rise to the level of major trauma

Stats

- Leading cause of **death** for individuals up to the age of 45 years
- **Fourth** leading cause of death overall for all ages
- More than **5 million** trauma-related deaths world wide each year
- Road traffic crashes kill 1.2 million people annually around the world (3242 people a day)
- Estimated cost: $518 **billion** globally

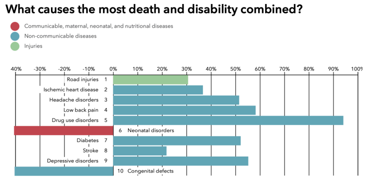
10 Leading Causes of Death by Age Group, United States – 2004

	Age Groups										
Rank	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	Total
1	Congenital Anomalies 5,622	Unintentional Injury 1,641	Unintentional Injury 1,126	Unintentional Injury 1,540	Unintentional Injury 15,449	Unintentional Injury 13,032	Unintentional Injury 16,471	Malignant Neoplasms 49,520	Malignant Neoplasms 96,956	Heart Disease 533,302	Heart Disease 652,486
2	Short Gestation 4,642	Congenital Anomalies 569	Malignant Neoplasms 526	Malignant Neoplasms 493	Homicide 5,085	Suicide 5,074	Malignant Neoplasms 14,723	Heart Disease 37,556	Heart Disease 63,613	Malignant Neoplasms 385,847	Malignant Neoplasms 553,888
3	SIDS 2,246	Malignant Neoplasms 399	Congenital Anomalies 205	Suicide 283	Suicide 4,316	Homicide 4,495	Heart Disease 12,925	Unintentional Injury 16,942	Chronic Low. Respiratory Disease 11,754	Cerebro-vascular 130,538	Cerebro-vascular 150,074
4	Maternal Pregnancy Comp. 1,715	Homicide 377	Homicide 122	Homicide 207	Malignant Neoplasms 1,709	Malignant Neoplasms 3,633	Suicide 6,638	Liver Disease 7,496	Diabetes Mellitus 10,780	Chronic Low. Respiratory Disease 105,197	Chronic Low. Respiratory Disease 121,987
5	Unintentional Injury 1,052	Heart Disease 187	Heart Disease 83	Congenital Anomalies 184	Heart Disease 1,038	Heart Disease 3,163	HIV 4,826	Suicide 6,906	Cerebro-vascular 9,966	Alzheimer's Disease 65,313	Unintentional Injury 112,012
6	Placenta Cord Membranes 1,042	Influenza & Pneumonia 119	Chronic Low. Respiratory Disease 46	Heart Disease 162	Congenital Anomalies 483	HIV 1,468	Homicide 2,984	Cerebro-vascular 6,181	Unintentional Injury 9,651	Diabetes Mellitus 53,956	Diabetes Mellitus 73,138
7	Respiratory Distress 875	Septicemia 84	Benign Neoplasms 41	Chronic Low. Respiratory Disease 74	Cerebro-vascular 211	Diabetes Mellitus 599	Liver Disease 2,799	Diabetes Mellitus 5,567	Liver Disease 6,569	Influenza & Pneumonia 52,760	Alzheimer's Disease 65,965
8	Bacterial Sepsis 827	Perinatal Period 61	Septicemia 38	Influenza & Pneumonia 49	HIV 191	Cerebro-vascular 567	Cerebro-vascular 2,361	HIV 4,422	Suicide 4,011	Nephritis 35,105	Influenza & Pneumonia 59,664
9	Neonatal Hemorrhage 616	Benign Neoplasms 53	Cerebro-vascular 34	Benign Neoplasms 43	Influenza & Pneumonia 185	Congenital Anomalies 420	Diabetes Mellitus 2,026	Chronic Low. Respiratory Disease 3,511	Nephritis 3,963	Unintentional Injury 35,020	Nephritis 42,480
10	Circulatory System Disease 593	Chronic Low. Respiratory Disease 48	Influenza & Pneumonia 33	Cerebro-vascular 43	Chronic Low. Respiratory Disease 179	Septicemia 328	Influenza & Pneumonia 891	Septicemia 2,251	Septicemia 3,745	Septicemia 25,644	Septicemia 33,373

Source: National Vital Statistics System, National Center for Health Statistics, CDC.
Produced by: Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC.

Leading causes of death & disability in Saudi Arabia

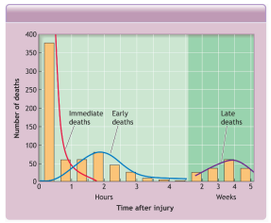
What causes the most death and disability combined?



Top 10 causes of disability-adjusted life years (DALYs) in 2017 and percent change, 2007-2017, all ages, number

IHME
Institute for Health Metrics and Evaluation

Mechanism of Injury



Trimodal Death Distribution

- Relatively few patients die after the first 24 hours following injury. Rather, the majority of deaths occur either at the scene or within the first four hours after the patient reaches a trauma center

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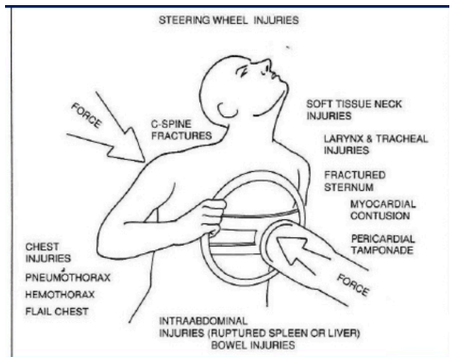
Mechanisms of injury

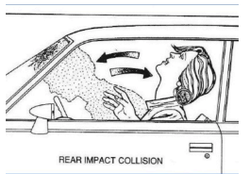
The World Health Organization (WHO) developed the International Classification of External Causes of Injury (ICECI).
Under this system, injuries are classified by:

- mechanism of injury
- objects/substances producing injury
- place of occurrence
- activity when injured
- the role of human intent

Mechanism of Injury

Blunt	Penetrating
• **MVC** • **Fall from height**	• High velocity (gun shot) • ***Low*** velocity (stabbing)





Triaging and scoring

Comparing and describing

- The Abbreviated Injury Scale (AIS) has been the most used anatomic system of injury classification since 1971
- In 1974, Baker and colleagues presented the Injury Severity Score (ISS), calculated by summing the squares of the AIS severity codes for the three most severely injured body regions
- ISS scores "injury severity grouping":
  - Minor < 9
  - Moderate 9-16
  - Serious 15-16
  - Severe > 25
- Revised Trauma Score (RTS)
- Glasgow Coma Scale (GCS)

TABLE 16-1 Abbreviated Injury Scale (AIS) Body Regions

AIS FIRST DIGIT	BODY REGION
1	Head
2	Face
3	Neck
4	Thorax
5	Abdomen
6	Spine
7	Upper extremity
8	Lower extremity
9	Unspecified

severity is graded from 1 "minimal severity" to 6 "fatal"

TABLE 16-3 Revised Trauma Score

Glasgow Coma Scale Score	13-15	4
	9-12	3
	6-8	2
	4-5	1
	3	0
Systolic Blood Pressure (mm Hg)	>89	4
	76-89	3
	50-75	2
	1-49	1
	0	0
Respiratory Rate (breaths/min)	10-29	4
	>29	3
	6-9	2
	1-5	1
	0	0
Total Revised Trauma Score		0-12

The start of Trauma Organization

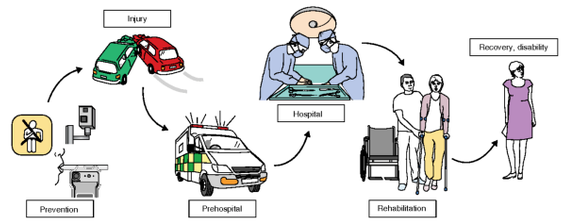
"When I can provide better care in the field with limited resources than what my children and I received at the primary care facility there is something wrong with the system, and the system has to be changed."

James Styner, MD, FACS 1977

Advanced Trauma Life Support® for Doctors

ATLS®

Trauma systems



Trauma systems include the entire care continuum, starting at the time of the injury with a patient's access to care, and extending through the rehabilitation process

Prehospital care

- The goal is to move a patient to a location capable of providing definitive injury management **as quickly** as possible
- The approach to the injured patient in the prehospital setting includes four key priorities:
  1. Evaluate the scene.
  2. Perform an initial assessment.
  3. Make triage-transport decision.
  4. Initiate critical interventions and transport the patient.

Standard concept

- **ABCDE approach to evaluation and treatment**
- **Treat greatest threat to life *first***
- **Definitive diagnosis *not* immediately important**
- **Time is of the essence**
- **Do no further harm**

The ATLS concept

Primary survey

Airway with c-spine protection

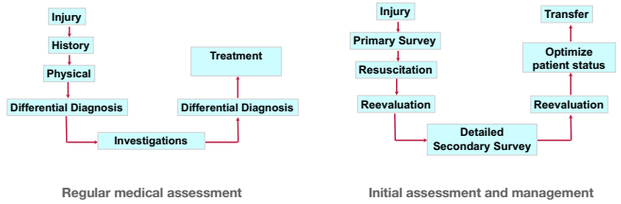
Breathing / ventilation / oxygenation

Circulation: stop the bleeding!

Disability / neurological status

Expose / **E**nvironment / body temperature

The approach to the trauma patient



Case

- **24-year-old male involved in a motorcycle crash in to a truck**
- **Not wearing a helmet**
- **Arrives at hospital with the red crescent**
- **BP 80/40, P140, RR 33, and central cyanosis**
- **C-collar, Oxygen at 8L/min, Dressing to forehead & thigh soaked in blood**
- **Has a wrist splint & is on a spinal board**

Standard Precautions

P.P.E.

- Cap
- Gown
- Gloves
- Mask
- Shoe covers
- Goggles / face shield

Quick assessment

What is a quick, simple way
to assess a patient in 10 seconds?

Quick assessment

What is a quick, simple way to assess a patient in 10 seconds?

- Identify yourself
- Ask the patient his/her name
- Ask the patient what happened

Appropriate response confirms ..

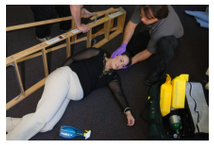
A **Patent airway**
B **Sufficient air reserve to permit speech**
C **Sufficient perfusion to permit cerebration**
D **Clear sensorium**

The primary Survey

A Airway with c-spine protection
B Breathing with adequate oxygenation
C Circulation with hemorrhage control
D Disability
E Exposure / Environment

Special Considerations

- Trauma in the elderly
- Pediatric trauma
- Trauma in pregnancy



Primary Survey

Airway

Establish patent airway and protect c-spine

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Occult airway injury
Progressive loss of airway
Equipment failure
Inability to intubate

Primary Survey

Basic Airway Techniques

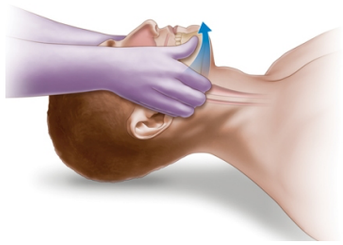
Chin-lift Maneuver

No Head tilt !

Primary Survey

Basic Airway Techniques

Jaw-thrust Maneuver



Primary Survey

Advanced Airway Techniques

Orotracheal intubation

The definitive airway control

Now, what if this fails?

Primary Survey

Breathing

Assess and ensure adequate oxygenation and ventilation

- Respiratory rate
- Chest movement
- Air entry
- Oxygen saturation

Primary Survey

Breathing

The Immediate life threatening injuries

- **Laryngeotracheal injury / Airway obstruction**
- **Tension pneumothorax**
- **Open pneumothorax**
- **Flail chest and pulmonary contusion**
- **Massive hemothorax**
- **Cardiac tamponade**

Primary Survey

Circulation

- **Level of consciousness**
- **Skin color and temperature**
- **Pulse rate and character**

Primary Survey

Circulatory Management

- **Control hemorrhage**
- **Restore volume**
- **Reassess patient**
- **Lethal triad**

Primary Survey

Disability

- Baseline neurologic evaluation
- Glasgow Coma Scale score
- Pupillary response

Table 4. Pediatric Glasgow Coma Scale For Nonverbal Children.

Eye Opening	
Spontaneous	4
To speech	3
To pain	2
No response	1
Verbal Response	
Coos, babbles	5
Irritable cry	4
Cries to pain	3
Moans to pain	2
No response	1
Motor Response	
Follows commands	6
Localizes pain	5
Withdraws to pain	4
Decorticate flexion	3
Decerebrate extension	2
No response	1

Primary Survey

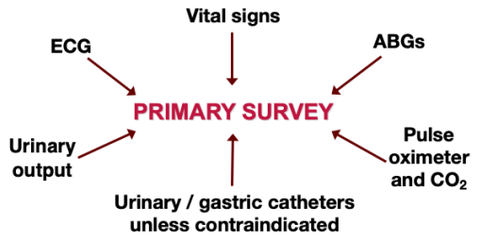
Exposure / Environment

Completely undress the patient

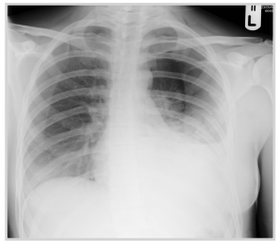
Resuscitation

- Protect and secure airway
- Ventilate and oxygenate
- Stop the bleeding!
- Vigorous shock therapy
- Protect from hypothermia

Adjuncts to Primary Survey



Adjuncts to Primary Survey

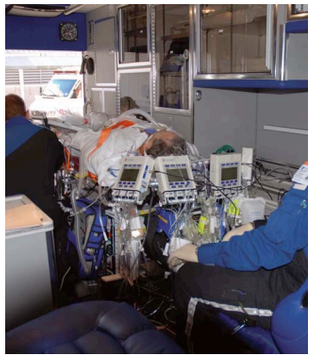


Adjuncts to Primary Survey

Diagnostic Tools

- **FAST**
- **DPL**

Adjuncts to Primary Survey

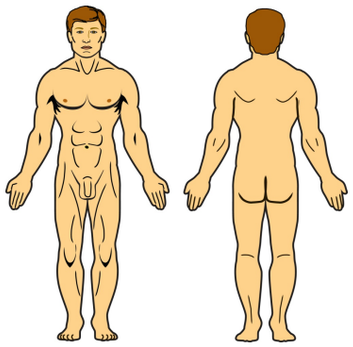


Consider Early Transfer

- Use time before transfer for resuscitation
- Do not delay transfer for diagnostic tests

Secondary Survey

The *complete* history and physical examination



Secondary Survey

When do I start the secondary survey?

After

- Primary survey is completed
- ABCDEs are reassessed
- Vital functions are returning to normal

Secondary Survey

What are the components of the secondary survey?

- History
- Physical exam: Head to toe
- Complete neurologic exam
- Special diagnostic tests
- Reevaluation

Summary

- **ABCDE approach to trauma care**
- **Do no further harm**
- **Treat the greatest threat to life first**
- **One safe way**
- **A common language**

?