

Trauma and Disaster Team Response Course ©

Epidemiology of Trauma Injury

- Trauma is a leading cause of preventable death and disability in young persons around the world
- Leading cause of mortality in people aged < 44 years
- Outcomes after trauma are worse in lower resource environments

Course objectives

- Attain competency in trauma care and disaster response
- Identify a trauma team
- Understand the roles and responsibilities of the team members in resuscitating a trauma patient
- Describe the process of transferring patients to facilities with higher level of care
- Understand importance of injury surveillance and trauma registries

Course Outline

- Lectures
- Skills Sessions
- Team Exercises

Lectures

1. Introduction
2. Airway
3. Breathing
4. Circulation
5. Adjuncts and Secondary Survey
6. Immediate Life-Threatening Injuries
7. Secondary Life-Threatening Injuries
8. Special Considerations pt. 1 – Pediatrics and Pregnancy
9. Special Considerations pt. 2 – Burns, Extremity and Pain Management
10. Patient Transfer
11. Trauma Systems and Trauma Registries
12. Disaster Response and Triage

Skills Sessions

1. Airway
 - Basic
 - Advanced/surgical
2. Breathing
 - Finger thoracostomy
 - Chest Tube
3. Circulation and Venous Access
 - Intra-Venous
 - Intra-Osseous
 - Central Line
4. Extremity and Pelvic Injury
 - Basic Splinting
 - Tourniquet
 - Pelvic Wrap
5. Team Approach to Primary and Secondary Surveys

Team Exercises

1. Team Building Exercise
2. Single Injury Trauma Patient
3. Severely Injured Trauma Patient
4. Mass Casualty Incident



Mr. X

25 year old male transported to hospital by police

Was found lying down on Main Street at 3:15 AM, confused and disgruntled,

Vomit stains

Belligerent and confused/disoriented

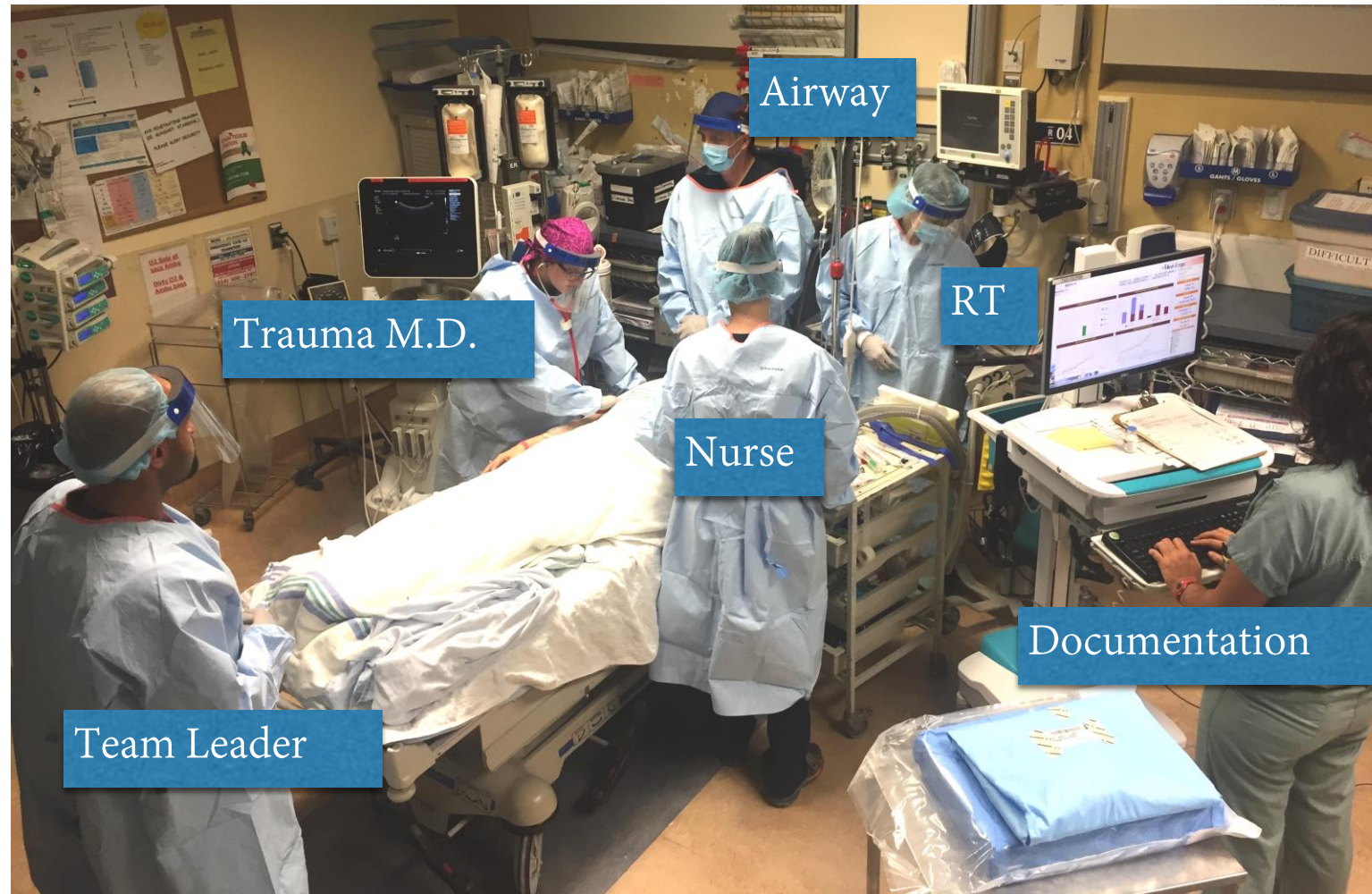
Severe bruising of the face with dried blood around the nose and mouth

- How do you compose a team to care for this patient?
- What equipment and set-up will you need?
- How will you manage this patient?

Example of a Trauma Team

- **Trauma Team Leader (TTL)**
 - Supervises team members in resuscitation
 - Assigns roles and tasks
 - Makes decision about interventions and patient disposition (Home, Intensive Care Unit, CT scan, Angiography, Operating Room, Morgue)
- **Trauma Surgeon +/- other consultants**
 - Not available in every location
 - Trainees / Physician extender
- **Nurse**
- **Respiratory Therapist**
- **Additional allied health professionals (pharmacy, radiology, etc)**

Example of a Trauma Team



Overview of Approach to Trauma Care

Primary survey

- A - airway
- B - breathing
- C - circulation
- D - disability
- E - exposure

Secondary survey

Adjuncts

- A- CXR
- B- Pelvis X-ray
- C- FAST +/- DPL

- Simultaneous assessment and treatment
- Simultaneous response to **Obvious, Life-Threatening Injuries**
 - “C-ABC”

Lecture 2: Airway

Outline

Case

How to Assess the Airway

Clinical Findings

Anatomic Findings

Important Considerations

Interventions and Techniques

Adjuncts





Case: Back to Mr. X

When you ask him his name he mumbles unintelligible sounds

Aggressive and belligerent

Pushing back nurses and orderlies

On further questioning he stops responding to verbal stimuli

→ What will you do now?

Primary Survey

A – Airway

B – Breathing

C – Circulation

D – Disability

E – Exposure

Delays in airway management / unrecognized airway problems may result in **preventable death**

How do I Assess the Airway

Talk to patient

Look and listen for signs of airway compromise

Clinical Findings

Common Causes of Airway Compromise

- Altered level of consciousness
 - Low Glasgow Trauma Scale (GCS) score
- Foreign body / Obstruction
 - Gurgling
 - Stridor
 - Shallow rapid breathing, in-drawing of the chest
- Severe facial trauma
 - Disrupted anatomy
- Severe burns, inhalation Injury
 - Suspect based on history
 - Soot, singed facial hair

Initiation of airway management

Graded response

- Non-invasive methods (e.g. nasal cannula oxygenation, bag mask ventilation)



- Definitive airway via endotracheal intubation (e.g. orotracheal intubation)



- Definitive surgical airway (e.g. cricothyroidotomy)

Important considerations

Cervical spine immobilization

Jaw thrust maneuvers

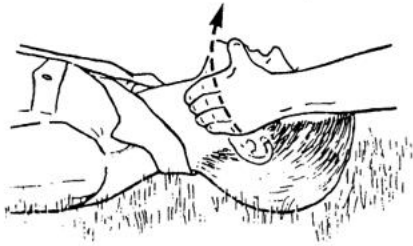
Suction

Oxygen

Need for definitive airway

Interventions and Techniques

- Jaw Thrust



- Oropharyngeal Airway (contra-indicated if awake)



- Nasopharyngeal Airway



- Suction



- Foreign body removal



Supplemental Oxygen

Always give high flow O₂

Bag Valve Mask (BVM) with airway adjuncts

Simultaneous nasal cannulas

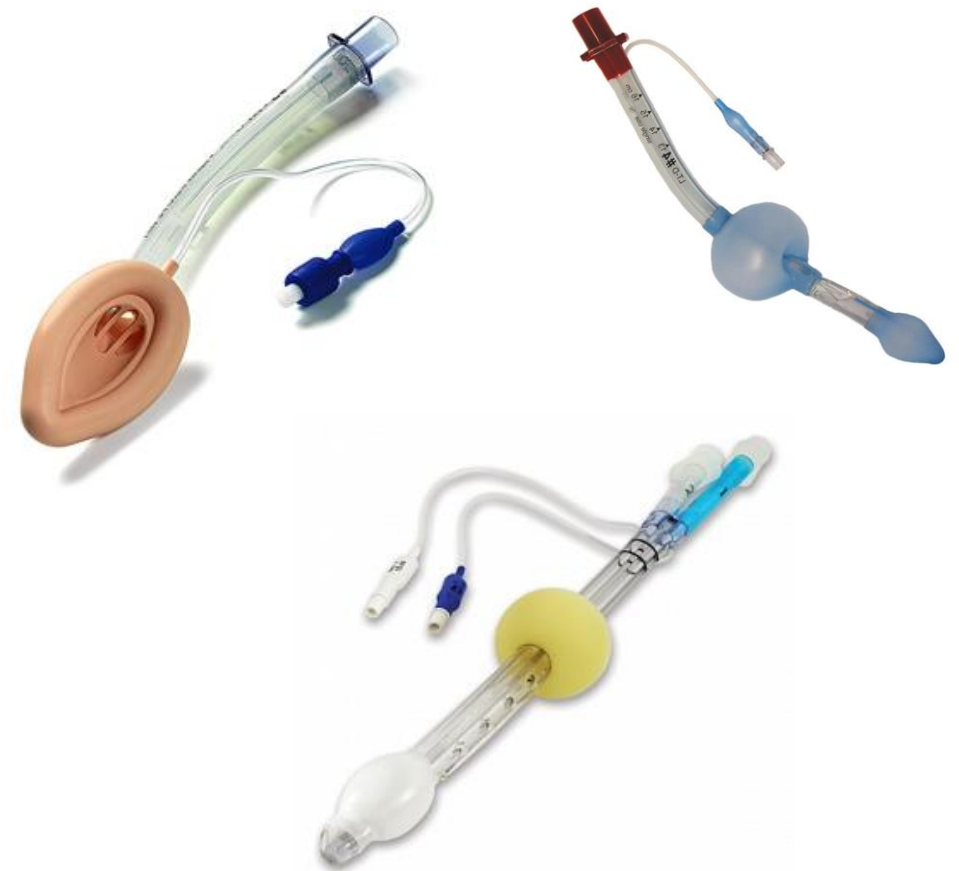


Indications for Intubation

- Inability to protect airway
 - Low GCS
 - Facial trauma
 - Shock
- Inability to ventilate/oxygenate
 - Apnea
 - Thoracic injury
- Imminent airway loss
 - Burn
 - Inhalational injury

Airway Establishment in Trauma

- Temporizing supraglottic devices
 - Laryngeal Mask Airway (LMA)
 - Laryngeal Tube Airway (e.g. King)
 - Multilumen esophageal airway (e.g. Combi-Tube)
- Definitive airway
 - Orotracheal intubation
 - Surgical airway



Intubation

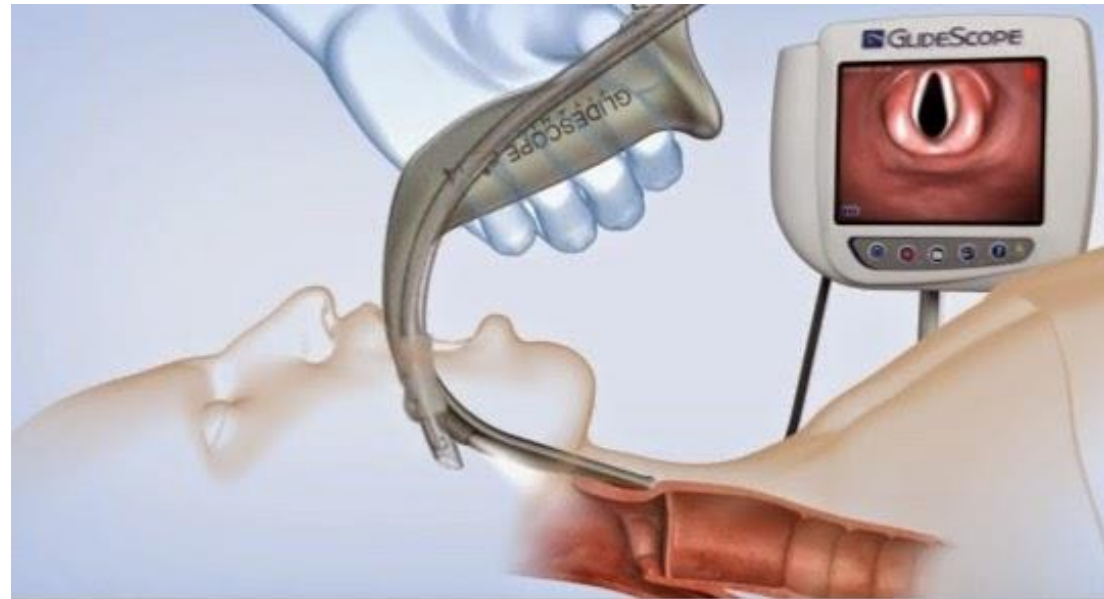
Immobilize the C-Spine

Adjuncts for Difficult Intubation

Bougie



Video-Assisted Laryngoscopy





Back to Mr. X

On first intubation attempt, direct laryngoscopy is used

- Lots of blood in pharynx
- Loose teeth
- Glottis is not seen

Second intubation attempt

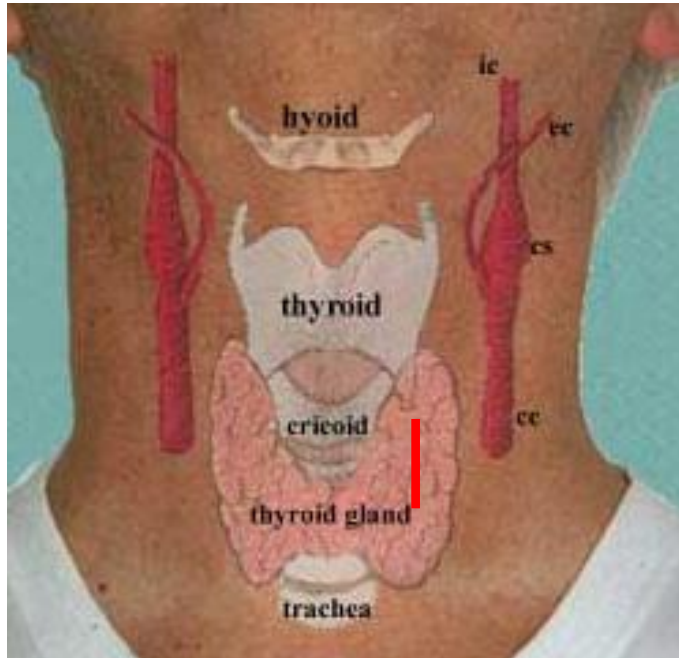
- Better view
- Inadvertent esophageal intubation

Third look

- Very edematous glottis with rapidly deteriorating O₂ despite adequate BVM technique

→ What can be done next?

Surgical Airway



We will review this in the Airway Skills Station !

Lecture 3: Breathing

Primary Survey

A – Airway

B – Breathing

C – Circulation

D – Disability

E – Exposure

Outline

Case

How to Assess Breathing

Clinical Findings

Pathologies

Interventions and Techniques

Adjuncts



Case - Back to Mr. X

After establishing a surgical airway and initiating positive pressure ventilation, the patient's blood pressure drops to 60/40 and heart rate increases to 145 beats/minute.

You note absent breath sounds on the left side and subcutaneous emphysema over the left thorax

What should you do next?

How do Assess Breathing

Look

- Bilateral chest rise
- Significant bruising
- Penetrating wounds

Listen

- Auscultate
- Confirm equal air entry

Feel

- Crepitus
- Fractures

Clinical Findings

Respiratory distress

Asymmetric chest expansion

Increased or decreased respiratory rate

Absent or reduced breath sounds

Obvious penetrating injury to chest

Sucking chest wound

Severe chest bruising, flail chest, subcutaneous emphysema

Intercostal retractions / indrawing

Tracheal deviation

Pathologies

Pneumothorax

- Simple
- Tension

Hemothorax

- Simple
- Massive

Open pneumothorax

Flail chest with pulmonary contusion



Interventions and Techniques

Triangle of Safety for chest
tube thoracostomy



Interventions and Techniques

Partially occlusive dressing for
open pneumothorax

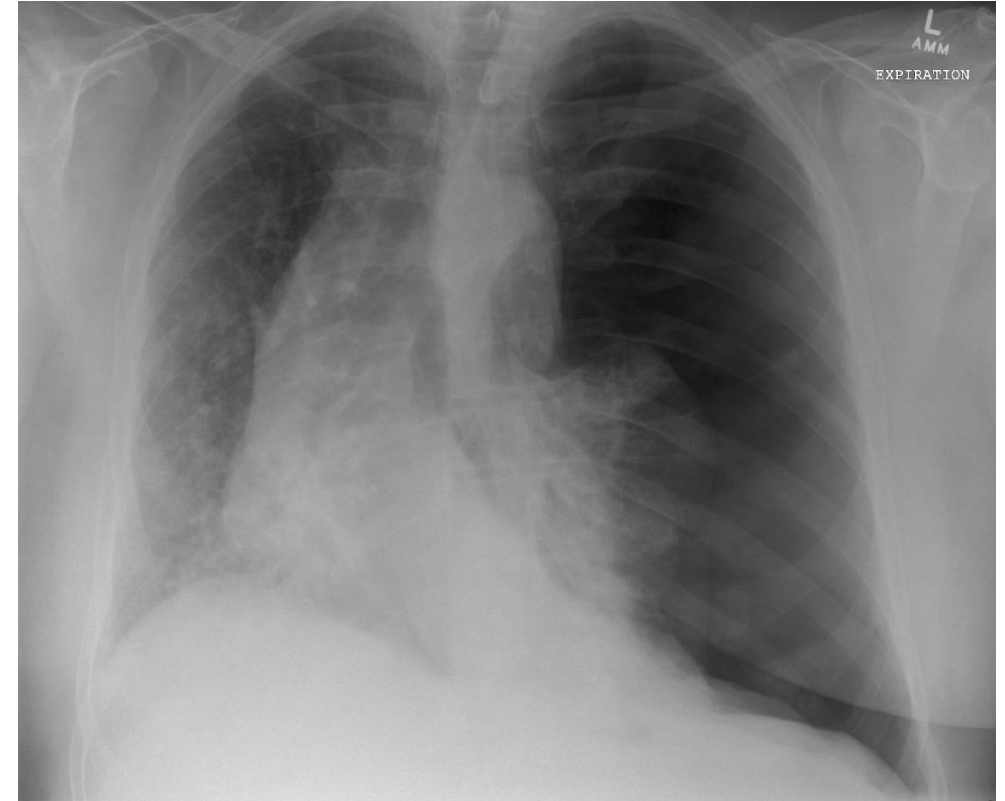


Adjuncts - Chest X-Ray

Identifies 85% of thoracic trauma

Confirms chest tube placement,
endotracheal tube, other hardware

Does not replace clinical findings for
the diagnosis of severe obstructive
shock (i.e., tension pneumothorax)



Lecture 4: Circulation

Outline

Case

Defining shock

How to Assess the Circulation

Sites of Life Threatening Hemorrhage

Principles of Early Management

Interventions and Techniques

Adjuncts



Case - Back to Mr. X

Despite insertion of left 36-French tube thoracostomy, the patient still has a low blood pressure of 90/50 and a heart rate of 115

Patient has deformity with significant swelling of right thigh.

Pelvis feels unstable.

What do you suspect?

How will you assess and manage this situation?

Defining Shock

Definition: Inadequate tissue perfusion

Shock in trauma is hemorrhagic until proven otherwise

- Find the bleeding!
- Stop the bleeding!
- simultaneous resuscitation

Evaluating the Circulatory System

- Blood pressure
 - Non-invasive blood pressure (NIBP) measurement at regular intervals
 - Systolic blood pressure: “110 is the new 90”¹
 - Can estimate using palpable pulses
 - Carotid: 60-70 mmHg
 - Femoral: 70-80 mmHg
 - Radial: >80 mmHg
- Pulse rate
 - Tachycardia
 - Bradycardia
- Objective evidence of organ hypoperfusion
 - Lactate²
 - Base Excess

1. Brown JB *et al.* J Trauma Acute Care Surg. 2015
2. Odom SR *et al.* J Trauma Acute Care Surg. 2013

Hemorrhage

5 possible sites of life-threatening exsanguination

- 1) Chest
- 2) Abdomen
- 3) Pelvis/Retroperitoneum
- 4) Long bones
- 5) External (e.g. scalp)

Diagnosing and/or Treat Hemorrhage

Suspect and treat based on mechanism and hemodynamics **while simultaneously resuscitating**

| | Hemodynamically Stable | Hemodynamically Unstable |
|------------------------|------------------------------------|--|
| Chest | CXR, extended FAST, \pm CT | Bilateral chest tubes \pm CXR |
| Abdomen | FAST , serial exams, \pm CT | FAST \pm DPL \rightarrow OR if + |
| Pelvis/Retroperitoneum | Pelvic X-Ray \pm CT | Pelvic wrap/binder, angiography/embolization \pm OR |
| Long Bones | Examination \pm X-Ray, Splinting | Examination, Splinting, \pm OR |
| External | Examination, Pressure/Suture | Pressure/Suture, \pm OR |

Principles of early resuscitation

- Access: 2 Large Bore IV (16 Ga or larger)
 - ± intra-osseus if difficult access
 - ± central venous access if difficult access or vasopressor requirement
 - Ideal catheter large bore and short length
- Fluid: Up to 2L of warm crystalloid (avoid excessive non-blood resuscitation)
 - Rapid infuser
 - **Frequent reassessment of fluid requirement/responsiveness**
 - **Early consideration of blood**
 - Consider massive transfusion protocol (MTP)

Response to resuscitation

Responder: Definitive normalization of hemodynamics

Partial responder: Temporary normalization of hemodynamics

Non-responder: Absent normalization of hemodynamics

→ Escalate decision making based on this assessment

Find and stop the bleeding!!

Intra-osseous Access (IO)

Emergency vascular access when other attempts have failed

- Should be placed after 1-2 failed attempts

Various insertions sites

- Tibia
- Humeral head
- Sternum

Can be used to infuse any blood product, fluid or medication

Intra-Osseous Access



Central Venous Access

- Avoid triple lumen catheters (inadequate maximal infusion rate)
- Consider diameter and length of catheter Possible insertion sites
 - Internal Jugular
 - Sub-clavicular
 - Femoral
 - Careful selection based on injury pattern
- Use of Ultrasound guidance recommended when available

Blood product transfusion

If inadequate response to crystalloid resuscitation, progress to blood transfusion

Massive transfusion protocol¹

- 4 units pRBC initially
- 1:1:1 transfusion (pRBC:platelets:FFP) afterwards
- Consider Tranexamic Acid²

1. McDaniel LM *et al.* Transfus Med. 2014.

2. Roberts I *et al.* CRASH-2 Trial. Health Technol Assess. 2013.

Other potential causes of shock

Obstructive shock

- Secondary to cardiac tamponade or tension pneumothorax/hemothorax
- Role of pericardiocentesis controversial

Cardiogenic

Distributive shock

- Sepsis¹
- Adrenal Insufficiency
- Neurogenic

1. Singer M *et al.* Sepsis-3. JAMA. 2016

Lecture 5: Adjuncts and Secondary Survey

Outline

- Case
- Adjuncts to Primary Survey
 - Monitoring
 - Diagnostics
- Secondary Survey
 - History
 - Exam
 - Considerations



Case - Back to Mr. X

The patient has stabilized after you resuscitated him, splinted his leg and wrapped his pelvis

What should you do now before proceeding towards definitive management?

Adjuncts to Primary Survey

Monitoring Adjuncts

Vital Signs
Arterial/Venous Blood Gas
CO₂ capnography
Electrocardiogram (ECG)
Urinary Output
Urinary/Gastric Catheters

Diagnostic Adjuncts

Chest X-ray
Pelvic Xray
FAST

Note: Adjuncts are selectively done based on the patient's injuries and physiological derangements

Monitoring Adjuncts

Vital Signs

HR, BP, RR, O₂ saturation, temperature

ABGs/VBGs

Oxygenation/Ventilation

Organ perfusion (lactate, base deficit level)

Capnography

Detects presence of CO₂ in exhaled gas

ETT placement confirmation

ECG

Dysrhythmias can suggest blunt cardiac injury



Monitoring Adjuncts

Urinary Catheter

A Foley catheter should be inserted to monitor urine output

Relative contraindications

- Blood at urethral meatus, perineal ecchymosis, high-riding prostate
- Pubic fracture

Gastric Intubation

Reduces stomach distention

NOTE: If basal skull fracture suspected, should be inserted **ORALLY**

Diagnostic Adjuncts

Chest X-ray

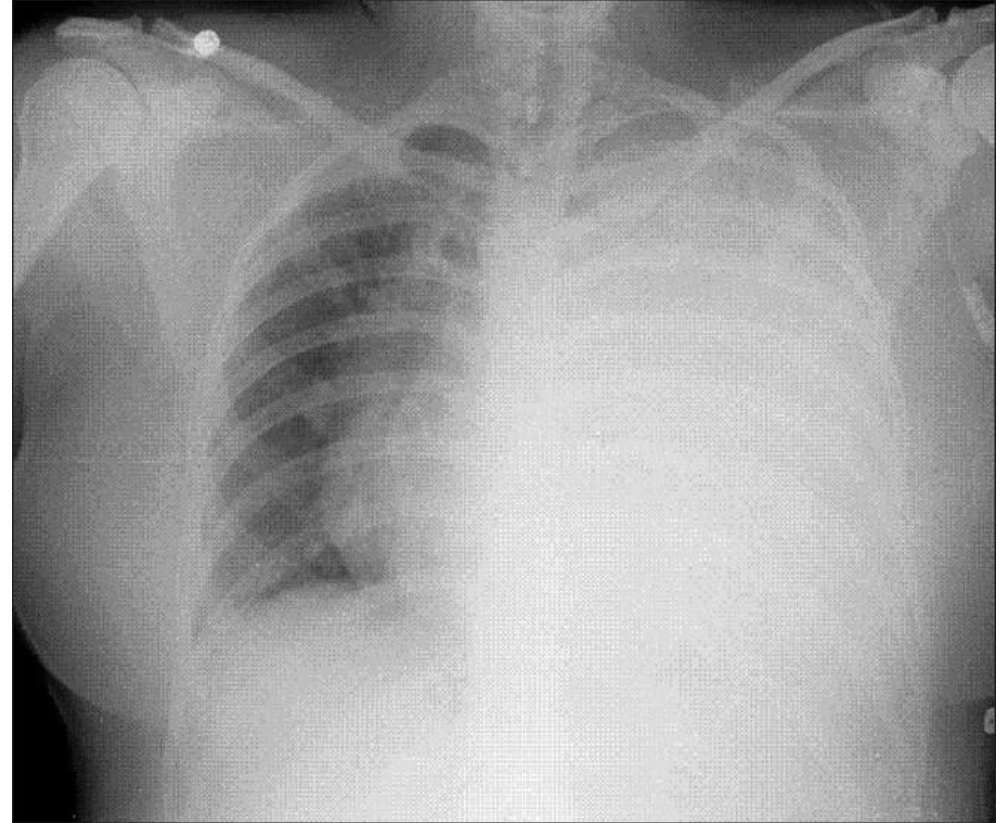
Antero-posterior (AP) view

Should not delay patient resuscitation

Do not delay chest tube placement when warranted by clinical findings

Help identify chest injuries in 1^o survey

- Pneumothorax
- Hemothorax
- Chest wall injury



Diagnostic Adjuncts

Pelvic X-ray

Antero-posterior (AP) view

Pelvic fractures can be a cause of major hemorrhage and shock

Do not wait for X-Ray confirmation before pelvic wrapping if indicated



Diagnostic Adjuncts

FAST - Focused Abdominal Sonography in Trauma

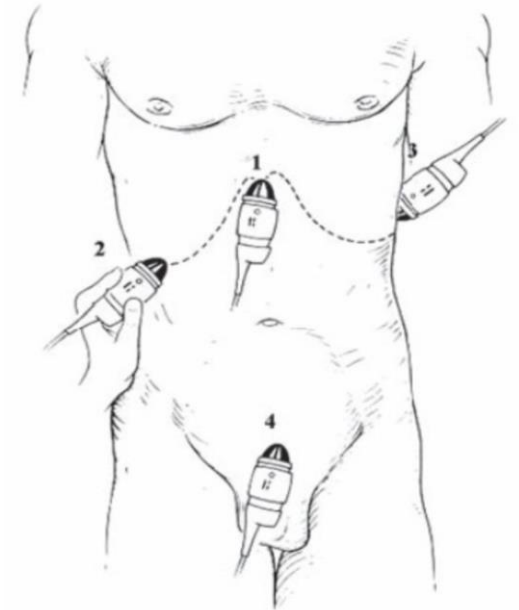
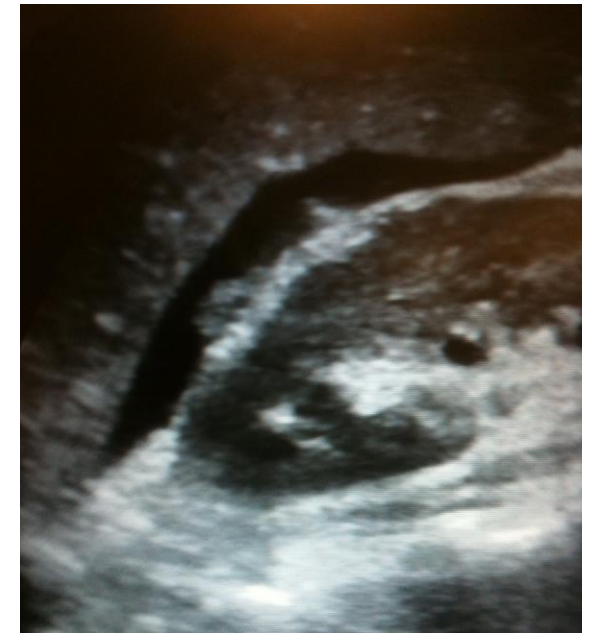
Assess for fluid within the abdomen

- Hepatorenal space
- Splenorenal space
- Pelvic space
- Pericardial space

Main roles:

- Guide therapy in unstable blunt trauma (laparotomy indicated if +)
- Assess for cardiac tamponade

E-FAST for thoracic evaluation (pneumothorax)



Secondary Survey - History

A – Allergies

M – Medications currently used

P – Past medical history/Pregnancy

L – Last meal

E – Events/Environment related to the injury

Secondary Survey – Physical Exam

Head to toe physical examination and reassessment of vital signs

Does not begin until the primary survey is completed and patient has responded to resuscitation

Helps identify most injuries or any potentially life threatening injuries

A rapid cursory secondary survey may be warranted prior surgical intervention (identifying all wounds in penetrating and blunt trauma)

Secondary Survey

Adjuncts as needed:

X-rays

CT scan

Angiography ± embolization

Transesophageal echocardiogram

Endoscopy

Consider:

- Tetanus
- Antibiotics

Secondary Survey

Comprehensive list of all possible injuries

Comprehensive list of imaging plan

Disposition plan/transfer

Summary

You are now aware of the adjuncts available to you in the primary survey, important to use them selectively based on your assessment of the patient

The secondary survey is as important as the primary survey. A thorough history and physical exam will avoid any missed or potentially life threatening injuries

Proper documentation of findings in secondary survey is crucial

Lecture 6: Immediate Life Threatening Injuries

Outline

Airway Loss

Obstructive Circulatory Shock

- Tension Pneumothorax
- Massive Hemothorax
- Cardiac Tamponade

Uncontrolled Bleeding

Airway Loss

Rapid identification of lost or imminently compromised airway is critical

Look and listen:

- Low GCS
- Stridor
- Cyanosis
- Severe facial trauma or burn

Airway Loss

Act Fast

- Institute airway management plan (basic→advanced→surgical as necessary)
- Have backup plan at hand
- Call for help

Obstructive Circulatory Shock

- 1) Tension Pneumothorax
- 2) Cardiac Tamponade
- 3) Massive Hemothorax (rare)

1) Tension Pneumothorax

Look, Listen

- Absent/decreased air entry
- Tracheal deviation

Urgent decompression

- Needle thoracostomy → 2nd intercostal space, midclavicular. Temporizing measure
- Finger thoracostomy → 5th intercostal space, mid axillary line. temporizing measure
- Chest tube placement → connect to underwater seal

Treat based on clinical suspicion/physiology → No diagnostic CXR

2) Massive Hemothorax

- Look, listen
 - Penetrating or blunt chest injury
 - Decreased air entry
 - Sometimes indistinguishable from tension pneumothorax on initial assessment
- Management:
 - Rapid Chest Tube Insertion
 - Aggressive blood transfusion, including blood. Consider auto-transfusion
- Consider thoracotomy in OR if pleural cavity output ≥ 1.5 liters at once or continuing blood loss ($>200\text{mL/h}$ for 3-4h) or hemodynamic instability

3) Cardiac Tamponade

Hypotension, Tachycardia

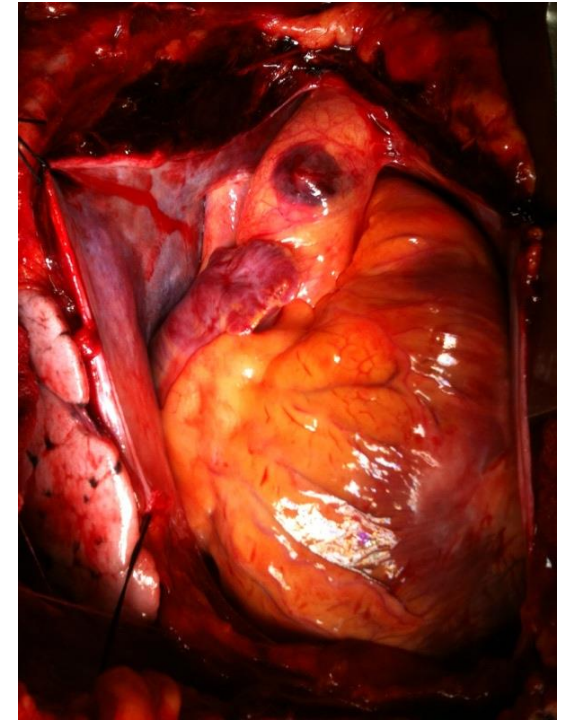
Classic signs of tamponade not easily detected on primary survey

- Elevated JVP
- Muffled heart sounds

Ultrasound (FAST) is helpful → subxyphoid view (pitfall- decompression into pleural cavity may render FAST unreliable)

Subxyphoid pericardial window can confirm diagnosis, release tamponade

Will need definitive therapy → Thoracotomy, sternotomy



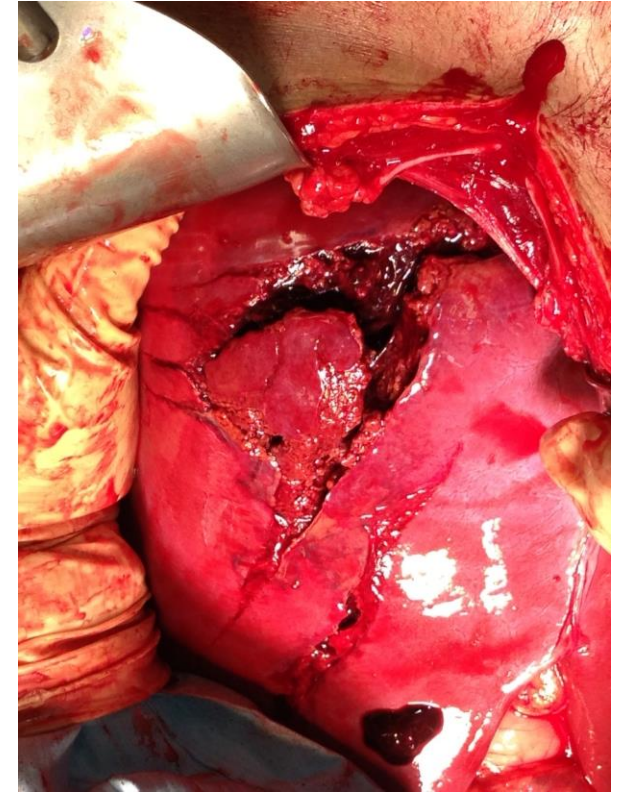
Uncontrolled Hemorrhage

FIVE possible sites of life-threatening exsanguination

- 1) Chest
- 2) Abdomen
- 3) Pelvis/Retroperitoneum
- 4) Long bones/Extremity
- 5) External

Escalate treatment rapidly to control bleeding from these sites

- Definitive treatment will be needed → OR, angio suite or both



Immediate Life-Threatening Extremity Injuries

Uncontrolled hemorrhage from long bone fractures can be significant

- Fluids + blood products for resuscitation
- Immobilization, re-alignment, and splinting (**should not delay resuscitation**)
- Tourniquet – should be used carefully for major arterial hemorrhage of extremities
 - Neuromuscular compromise after 6 hours

Apply sterile pressure for bleeding open fracture → Will need debridement and early antibiotics

Immediate Life-Threatening Extremity Injuries

Traumatic amputations

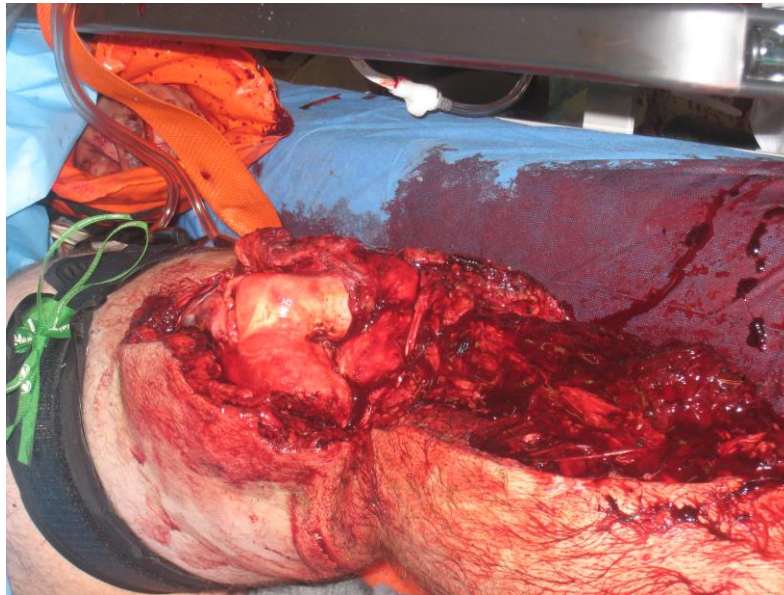
- May benefit from tourniquet use
- Require a surgical consult
- Priority is resuscitation and emergency surgery



Disposition

Inadequate response to resuscitation requires ACTION

- Uncontrolled bleeding from chest or abdomen → OR
- Uncontrolled bleeding from long bone → Splint/Traction/OR
- Uncontrolled bleeding from pelvis/retroperitoneum → Pelvic Wrap/Angio/OR
- Uncontrolled bleeding from wound → Pressure/Closure/OR



Immediate vs Definitive Management

Always think ahead

Treat the immediate life threatening physiology

Often the underlying pathology/injury will require resource intensive setting for definitive management

TEAM role in management of all life threatening injuries

Think about transfer!



Lecture 7: Secondary Life and Limb Threatening Injuries

Assessment of Pain

Patients who are alert and cooperative:

- Document pain severity (can use visual scales)
- Assess response to medication

Patients who cannot communicate:

- Suspect pain if grimacing, wincing, or signs of sympathetic activation (tachycardia, hypertension, diaphoresis, tachypnea)

Pain Management – Rationale

Inadequate pain management leads to increased morbidity and mortality

- Cardiovascular: dysrrhythmias, MI
- Respiratory: atelectasis, pneumonia, ventilatory failure
- Gastro-intestinal: decreased motility
- Increased chronic pain

Appropriate treatment of pain in trauma → essential to optimize outcomes

Analgesic Agents

Analgesics

- Acetaminophen
- NSAIDs
- Cox-2 inhibitors

Opioids

Local anaesthetics

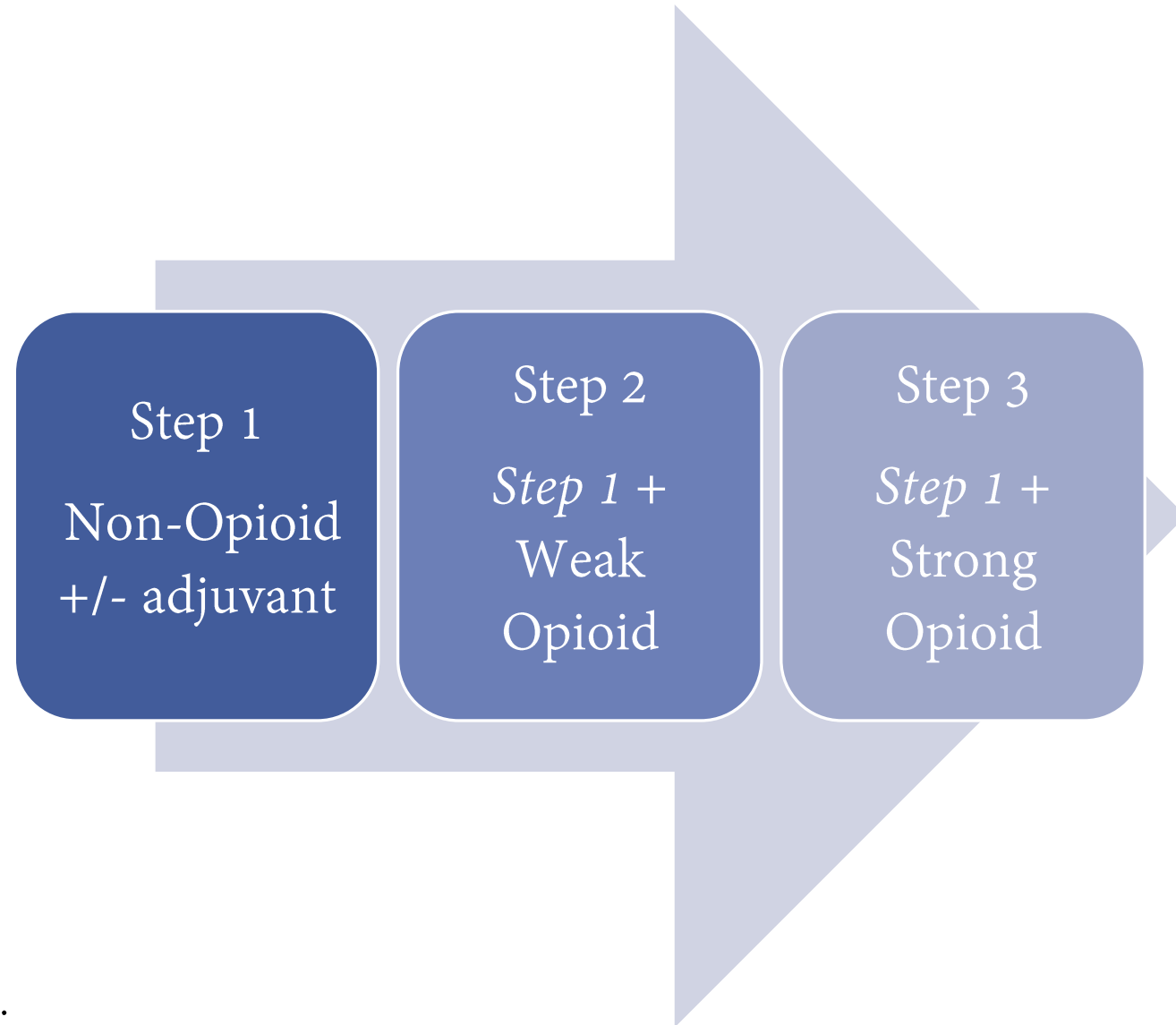
Epidural analgesia

Adjuvants

- Ketamine
- Gabapentinoids

WHO Analgesic Ladder

For acute pain, analgesic ladder can be applied in the opposite direction, as acute pain in trauma should usually decrease with time. ¹



1. World Health Organization,(2009). WHO's Pain Relief Ladder.

Pain Management – Key Points

Trauma patients suffer from significant physical pain

Start treating pain early but be aware of pitfalls (hypotension, respiratory failure)

Multimodal analgesic therapy should be used rather than single agents

Can use the WHO analgesic ladder to guide incremental pharmacotherapy

Adequate pain management improves outcomes in trauma patients

Rib fractures and chest wall injuries require aggressive pain control with epidural analgesia if possible

Immediate vs Definitive Management

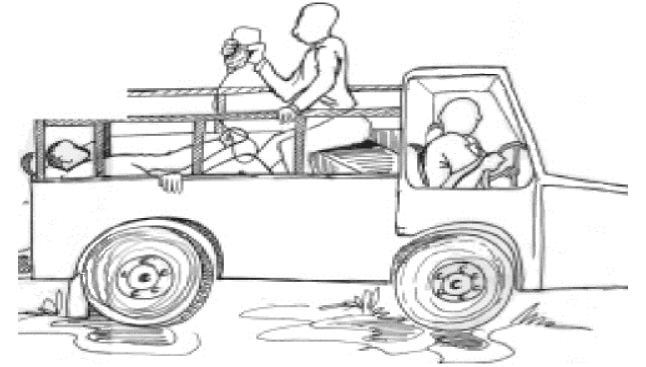
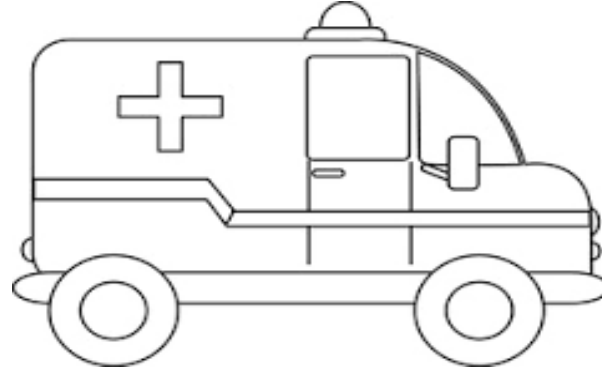
Always think ahead

TEAM role in management of

all potentially life threatening injuries

Think about transfer!





Lecture 10: Transferring the injured patient

Outline

Case of Ms. K

Objectives

Guiding Principles

Potential Risks

Pitfalls and Considerations

Diagnostic Tests

Summary

Case of Ms. K

- 52 year old woman, fell from 12 foot ladder and hit her head.
- Arrives to your regional hospital
- Airway and breathing clear, blood pressure 110/70, heart rate 110.
- GCS of 13 on arrival, pupils equal and reactive.
- Displaced right femur fracture
- Your hospital has an OR, orthopedic and general surgeons on call at home but no neurosurgeons. No CT Scan available

What are your priorities with this patient?

Would you call anyone from your hospital or other institutions?

What do you think is the final plan for this patient?

What needs to be in place to carry this plan out safely?

Objectives

- Identify patient and institutional circumstances that would require patient TRANSFER to another facility
 - When is transfer necessary?
 - Who needs to be transferred?
- Develop an understanding of the requirements for a safe and timely TRANSFER
 - How to set up a safe transfer



Regional Trauma Systems

Regional trauma systems are critical to optimize transfer procedures

Know your limitations and know your network

Important for a trauma TEAM to think of a protocol

Overview

- When definitive care or subspecialty needs exceed local capabilities, must transfer.
- For safe transfer, must anticipate possible deterioration PRIOR to transport
 - A: Consider intubation
 - B: Insert chest tubes as needed (e.g. small simple pneumothorax but patient intubated)
 - C: Adequate IV access, fluids/blood for transport, pelvic wrap, tourniquet (in extremis)
 - D: If expected GCS worsening, consider definite airway
 - E: Keep patient warm, external pressure to wounds
- Adjuncts: C-Spine collar, nasogastric tube, Foley catheter, oxygen, monitoring
- Investigations prior to transport: CXR, Pelvis X-Ray, blood work

Guiding Principles

- Early Decision Making
 - Do not delay transfer for full work-up or investigations
 - Call the local transport coordinators and the receiving medical teams/facilities early to give them enough time for preparation
 - Ensure that the transport vehicle has necessary tools if available (oxygen, monitor, medications)
 - if not then may not be safe to transport patient
 - Surgical hemorrhage control if surgeon available

Potential Risks

- Common challenges
 - Weather
 - Means of transport
 - Should a health professional accompany patient?
 - Infrastructure
- Know where the patient is going
 - Ensure appropriate capacity is available at receiving hospital (Level 1 trauma center, subspecialty availability)
 - Know transfer times and potential delays - choose safest appropriate facility

A Word about Diagnostic Tests

- Ask the following questions to decide if indicated
 - Will it change management of the patient?
 - Can you manage the findings of your diagnostic test (e.g., Head CT with no Neurosurgeon)
 - Will it delay the transfer too much?
 - Is the test better performed at the receiving institution?
 - Is it detrimental to the patient?

Summary

- Decide early and call early – weigh the risk/benefit of transfer
- Limit non essential laboratory and imaging tests
- Manage the injured patient and prepare for transport to the best of your ability and available resources
- Think of pitfalls/deterioration during transfer and plan for them

Lecture 11: Trauma Systems and Trauma Registries

Outline

Trauma Systems

Benefits

Trauma Data and Registries

Adapting Data Collection to Low
Income Settings – Examples



The screenshot shows the iTrauma Registry software interface. The top navigation bar includes 'Main Menu', 'Patients list', and a 'Log out' button. The main content area is divided into four tabs: 'Demographics', 'Mechanism', 'Injuries', and 'Outcome'. The 'Cause of injury' section is currently active, displaying a list of injury types such as 'Motor vehicle crash', 'Fall', 'Blunt assault', 'Stab / cut', 'Gunshot', 'Blast / Mine', 'Burn', 'Drowning', 'Bite', and 'Other'. Below this, there are sections for 'Intent' (Unintentional / Accidental, Self-inflicted, Assault, Unknown) and 'Alcohol' (No, Suspected / confirmed, Unknown). The 'Road traffic accident' section is also visible, with options for 'Type of vehicle' (Car, Motorcycle, Tricycle / triporter, Bicycle, Unknown, Other), 'Role on the road' (Driver, Passenger, Pedestrian, Unknown), and 'Helmet' (Yes, No, Unknown). The bottom of the screen features the 'CENTRE FOR GLOBAL SURGERY' logo and the website 'www.cglobalurgery.com'.

Transferred from other hosp. ☐ Yes ☐ No If yes, which one?

Date & time of trauma

Date & time of arrival

Attended by Dr.

Patient Name

Identification Number, if any

Patient demographic data

Age Sex ☐ Male ☐ Female

Patient's Occupation

☐ Child or student
☐ Employed: Manual labourer
☐ Employed: Office Work
☐ Employed: Police/Army/Security
☐ Employed: Farmer
☐ Employed: Mining
☐ Employed: Other
☐ Unemployed
☐ Retired

Origin of patient (suburb, locality, district, area)

Region

District

Place of injury (suburb, locality, district, area)

Region

District

Mechanism

Cause of injury

☐ Motor Vehicle Collision
☐ Fall
☐ Blunt Assault
☐ Stab/Cut
☐ Gunshot
☐ Blast/Landmine
☐ Burn
☐ Drowning
☐ Bite

Settings

☐ Transportation Accident
☐ Work
☐ Home
☐ School
☐ Leisure/Sport
☐ Unknown

Intent

☐ Unintentional/Accidental
☐ Self-inflicted
☐ Assault
☐ Unknown

Alcohol

☐ No
☐ Suspected/Confirmed
☐ Unknown

Road Traffic Incident

Motor Vehicle Collision

☐ Car
☐ Motorbike
☐ Tricycle/Triporter
☐ Bicycle
☐ Unknown

Role on the road

☐ Driver
☐ Passenger
☐ Pedestrian
☐ Unknown

Type of Vehicle

☐ Private Vehicle
☐ Public Transit
☐ Commercial Vehicle

Helmet

☐ Yes
☐ No
☐ Unknown

Seatbelt Use

☐ Yes
☐ No
☐ Unknown

Injuries

Arterial Pressure

☐ >89mmHg/radial
☐ 50-89 mmHg/femoral-carotid
☐ < 50 mmHg
☐ Not detectable

Respiratory Rate

☐ 10-29 /minute
☐ 30+ /minute
☐ ≤ 9/minute

Neurological Status

☐ Alert
☐ Responds to verbal stimuli
☐ Responds to painful stimuli
☐ Unresponsive

Serious Injuries

☐ None
☐ One serious injury
☐ More than one serious injury

Open / Closed

☐ Facial fracture
☐ Fracture spine no paralysis
☐ Fracture spine with paralysis
☐ Fracture upper extremity
☐ Pelvic fracture
☐ Fracture lower extremity
☐ Skull fracture
☐ Head injury
☐ Neck injury
☐ Thoracic injury
☐ Abdominal injury
☐ Cut/Open wound
☐ Human bite
☐ Animal bite
☐ Sprain/Strain
☐ Dislocation upper extremity
☐ Dislocation lower extremity
☐ Burn

Outcome

Outcome from casualty department

☐ Treated and sent home
☐ Admitted to hospital ward
☐ Taken to operating theatre
☐ Admitted to intensive care
☐ Died
☐ Referred to another hospital
☐ Unknown

If referred, which hospital?

Outcome filed by (MD, nurse, clerk)

Outcome at 2 weeks

☐ Discharged
☐ Ran away
☐ Admitted to hospital
☐ Died
☐ Referred to another hospital
☐ Unknown

If referred, which hospital?

Outcome filed by (MD, nurse, clerk)

Physician Signature _____

Trauma Systems

A public health approach to injury control

Administrative

- Lead Agency
- Funding
- Facilitating Legislation
- Development & Evaluation

Clinical

- Pre-hospital
 - Access, Triage, Transport
- Acute Care Facilities
 - Trauma Referral Centres
- Rehabilitation

Public Health

- Injury Surveillance & Prevention
- Emergency Preparedness
- Research, Education, Training

Trauma systems reduce mortality by 15-20%

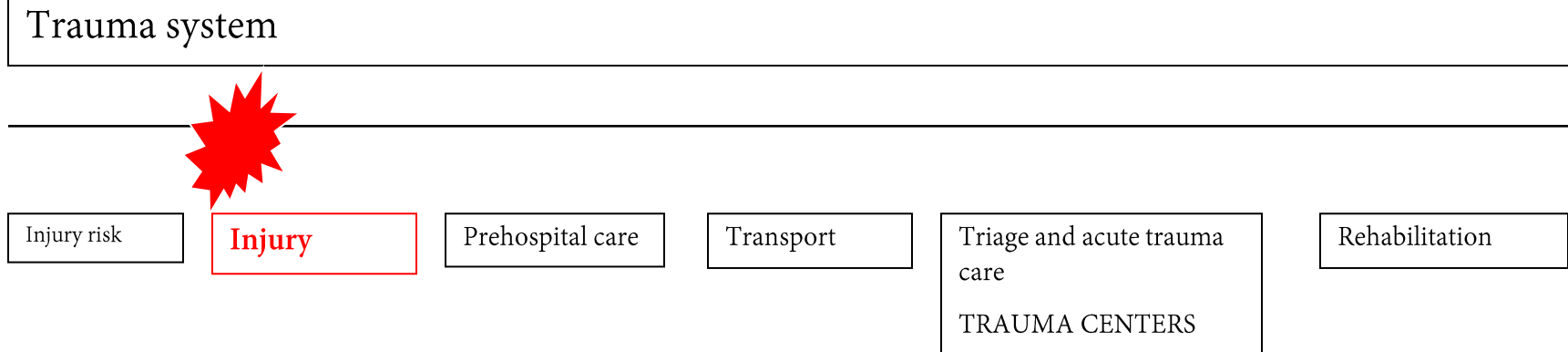
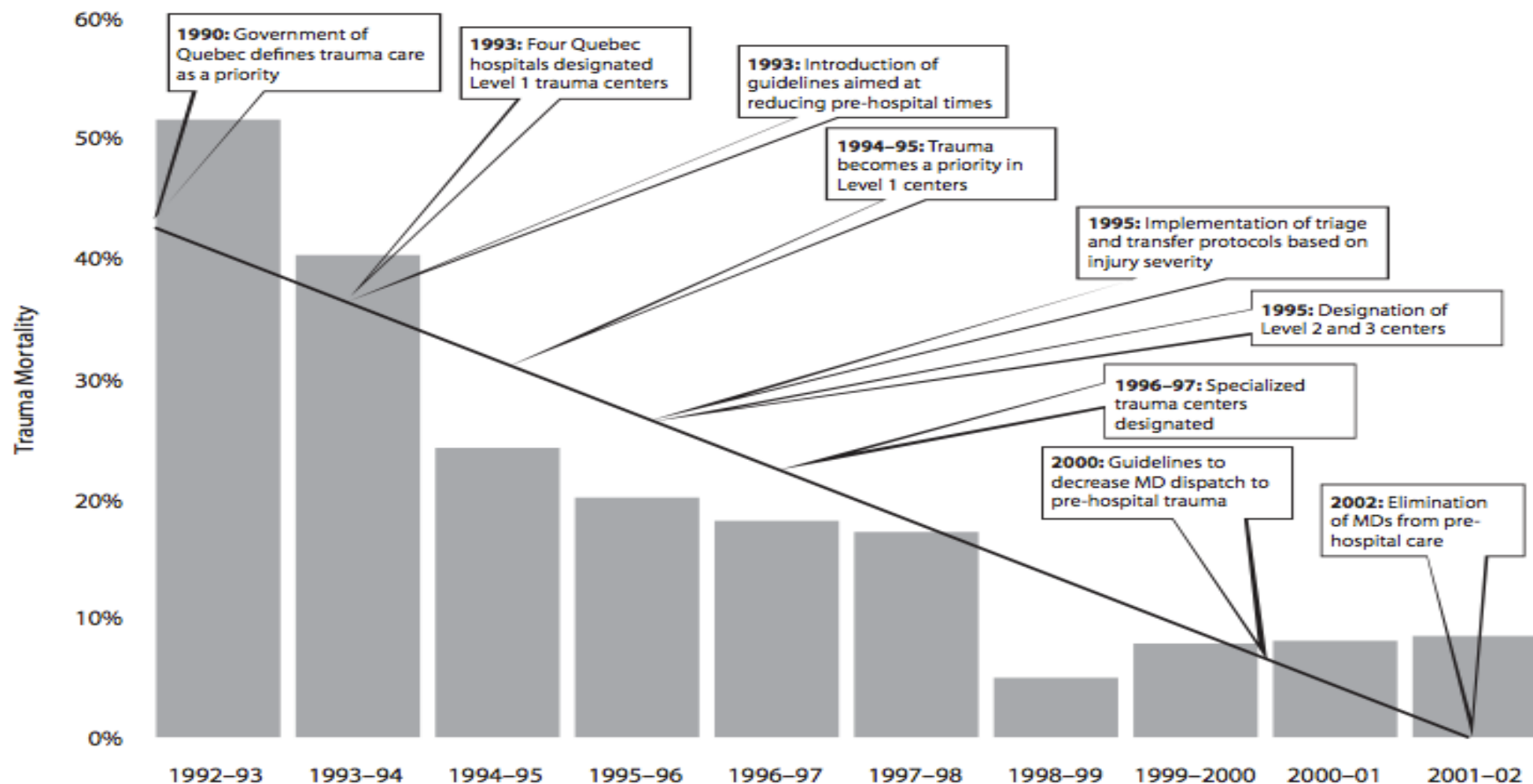


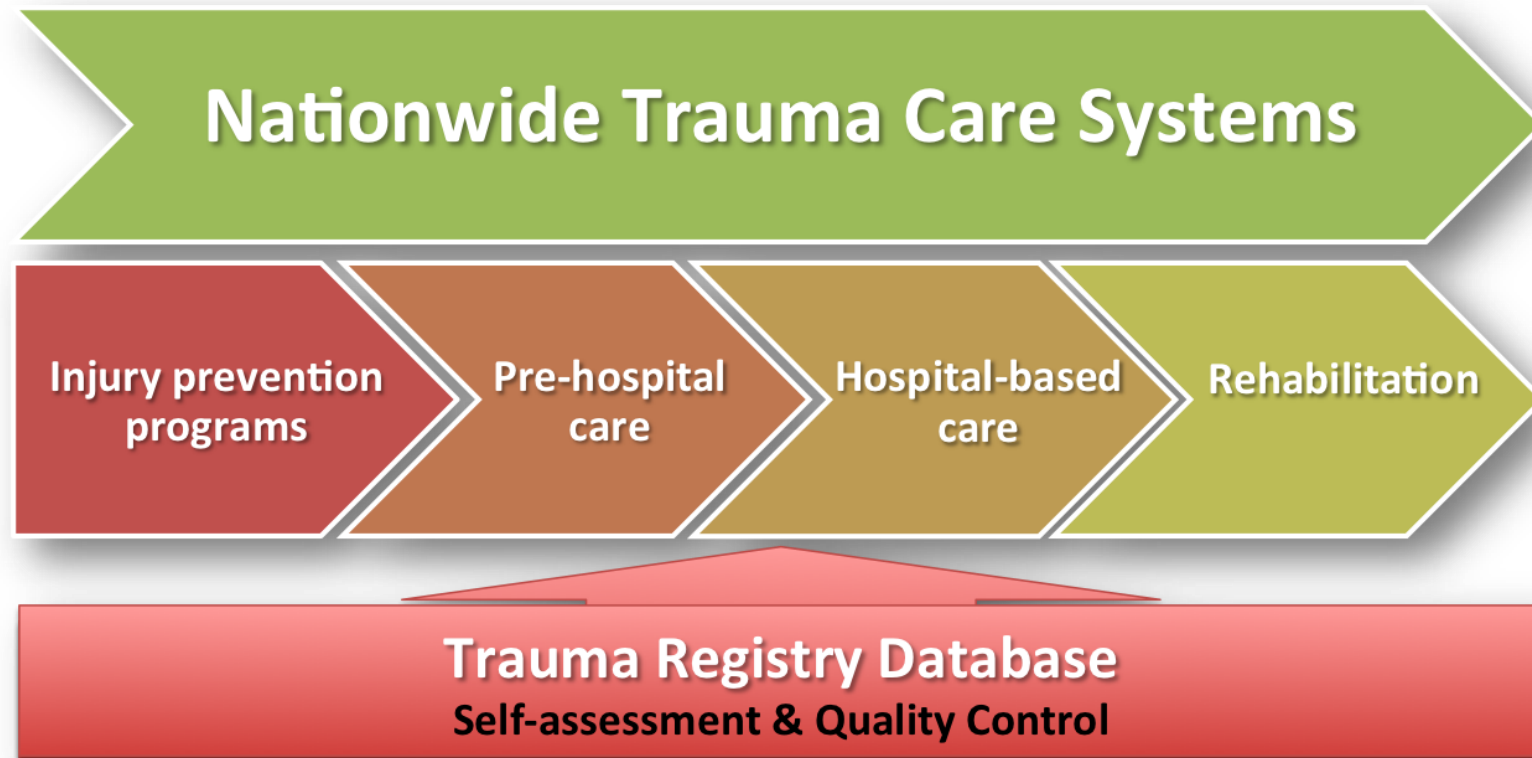
Figure 1 **Mortality among severely injured patients (by year) in Quebec**



Inclusion criteria specified death as a result of injury or an Injury Severity Score (ISS) exceeding 12, a Prehospital Index exceeding 3, two or more injuries with an Abbreviated Injury Scale score of 3 or higher, or a hospital stay exceeding 3 days. Note: small year-to-year fluctuations in percentage mortality are expected. The overall trend, however, is steadily downward. MDs = doctors.

Data collection

Evolution through evaluation



#Adapted from: Mock C. Strengthening care for the injured: success stories and lessons learned from around the world. 2010.
Zehtabchi; Academic Emergency Medicine 2011.

What is not measured cannot be improved.

Lord Kelvin

Introduction

Evolution through evaluation

0022-5282/90/3011-1356\$02.00/0
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The Major Trauma Outcome Study: Establishing National Norms for Trauma Care

HOWARD R. CHAMPION, F.R.C.S. (EDIN.), F.A.C.S., WAYNE S. COPES, Ph.D.,
WILLIAM J. SACCO, Ph.D., MARY M. LAWNICK, R.N., B.S.N., SUSAN L. KEAST, R.N., B.S.N.,
LAWRENCE W. BAIN, JR., MAUREEN E. FLANAGAN, M.S., AND
CHARLES F. FREY, M.D., F.A.C.S.*

MTOS (Major trauma outcome study)

- 139 North American, UK, Australian hospitals
- 80,544 patients
- Descriptive study of injury severity and outcome
- Set benchmarks for expected outcomes, allowing for quality assessment and quality improvement

J Trauma. 1990 Nov;30(11):1356-65.

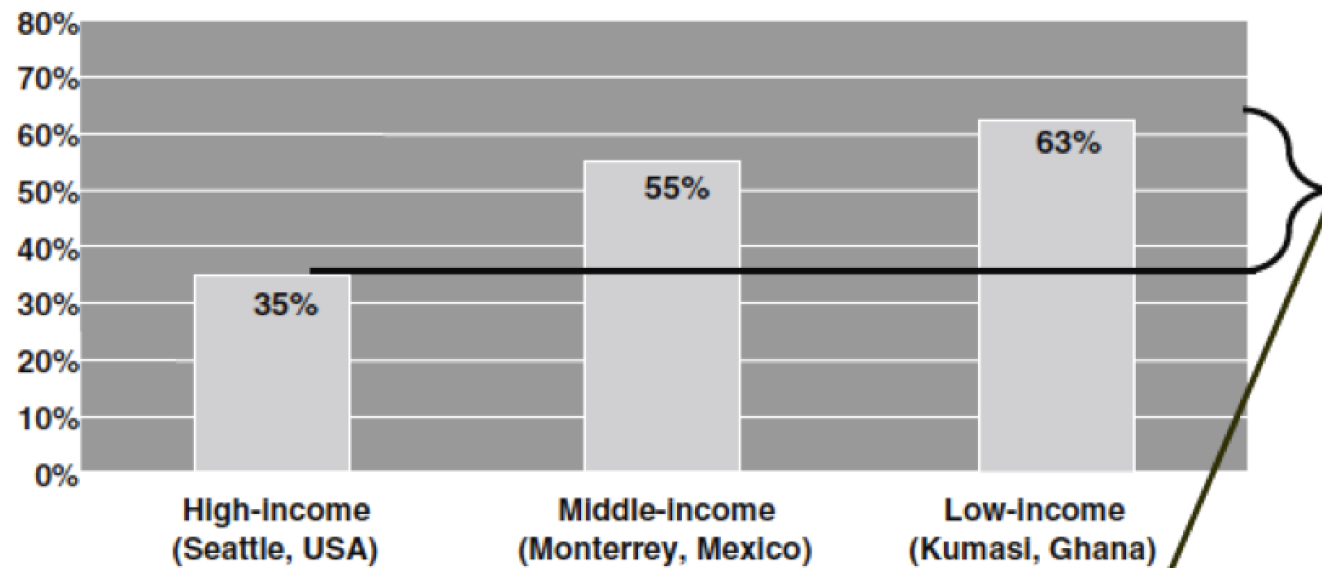
Can trauma systems be built in lower resourced settings?



The International Association for Trauma and Surgical Intensive Care (IATSIC) and the World Health Organization (WHO), along with a number of prominent trauma organizations from around the world, set out to identify **fundamental priorities for trauma care that must be achieved regardless of the level of individual or societal wealth.**



1,965,000 lives



Excess mortality



Key strategy – Before getting there

Data collection in resource-limited settings

Keep it simple

- Simple Registry
- Simple Scoring system

Guidelines for injury surveillance



**World Health
Organization**

Future directions

- Setting trauma outcome *benchmarks* appropriate for the socio-economic *context*
 - Ongoing *standardized* self-assessment/improvement
 - Within & Between institutions
 - MTOS for under-resourced environments

Lecture 12: Disaster Response and Triage

Outline

Mass Casualty

- Perspective
- Challenges

Triage in Mass/Multiple Casualty Scenarios

- START RPM triage system

Triage exercises

Perspective

Natural disasters have claimed more than 3.5 million lives in past 20 years and affected over 80 million

- Earthquake in Bam, Iran
- The Tsunami
- Hurricane Katrina
- Earthquake in South Asia

Armed conflicts have claimed far more lives...

How?

Must be prepared for situations where resources are overwhelmed.

Triage is key in such circumstances



Triage

The process of sorting the wounded according to the severity of their injuries and assigning priorities of treatment with regard to limited resources

The aim is to provide the greatest good for the greatest number of people

The aim of triage is to categorize the wounded according to

- the severity of injury
- the need for treatment
- the possibility of good quality survival

Factors influencing the triage process

- the number and nature of the wounded
- their condition
- the facilities and personnel available to treat them
- the lines of evacuation and duration of transport

Triage – Key points

Triage decisions should be made by the most experienced nurse or doctor

Triage decisions must be respected by the team

Triage is a continuous process. Patient reassessments are important

START

Simple Triage and Rapid Transport

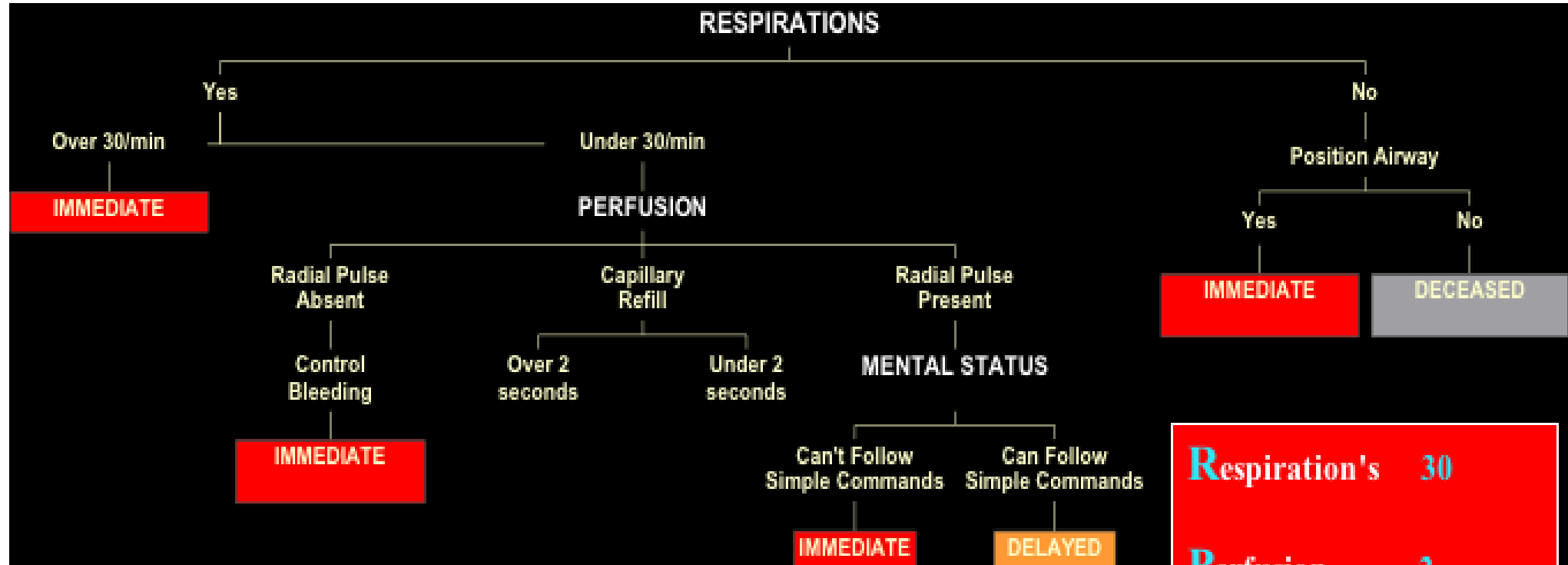
Allows for rapid triage of a large number of patients without specialized training.

Initial patient assessment and treatment should take less than 30 seconds for each patient

START Triage

All Walking
Wounded

MINOR



Respiration's **30**

Perfusion **2**

Mental Status **CAN DO**

Triage Categories

Red

Immediate:

Life-threatening but treatable injuries
requiring rapid medical attention

Yellow

Delayed:

Potentially serious injuries, but are stable
enough to wait a short while for medical
treatment

Triage Categories

Green

Minimum:

Minor injuries that can wait for longer period of time prior to treatment

Black

Expectant:

Death or lack of spontaneous respirations after airway is opened

Triage Priorities

Your initial goal during triage is to find **IMMEDIATE** patients.

Your efforts should focus on locating all **IMMEDIATE** patients, getting them treated and transporting them as soon as possible.

Once **IMMEDIATE** patient has clear airway and massive bleeding controlled, move on to next patient.

Once **IMMEDIATE** patients have been treated and transported, reassess all **DELAYED** patients

Note for Black Category Victims

Unless clearly suffering from injuries incompatible with life, victims tagged in the BLACK category should be reassessed once critical interventions have been completed for RED and YELLOW patients.

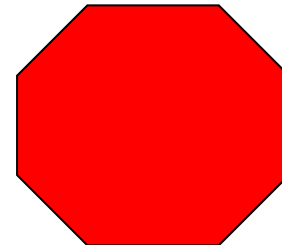
What's your call?

A young school aged boy is found lying on the roadway 10 ft from the bus.

Breathing 10/min

Good distal pulse

Groans to painful stimuli



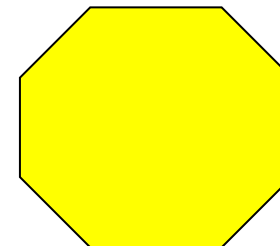
What's your call?

An adult kneels at the side of the road, shaking his head. He says he's too dizzy to walk.

RR 20

CR 2 sec

Obeys commands

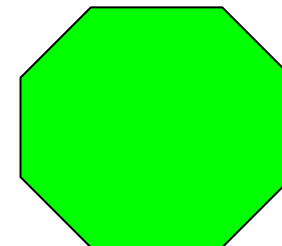


What's your call?

A school aged girl crawls out of the wreckage. She's able to stand and walk toward you crying.

Jacket and shirt torn

No obvious bleeding



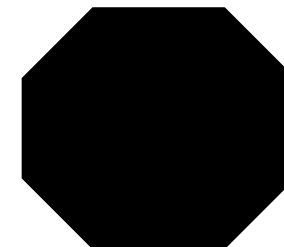
What's your call?

A toddler lies with his lower body trapped under a seat inside the bus.

Apneic

Remains apneic with modified jaw thrust

No pulse



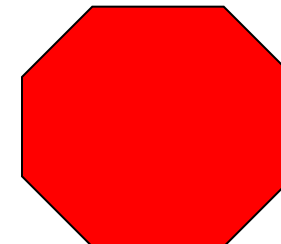
What's your call?

Adult female driver still in the bus, trapped by her lower legs under caved-in dash.

RR 24

Cap refill 4 sec

Moans with verbal stimulus



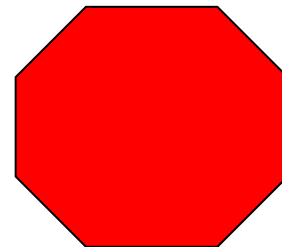
What's your call?

A toddler lies among the wreckage.

RR 50

Palpable distal pulse

Withdraws from painful stimulus



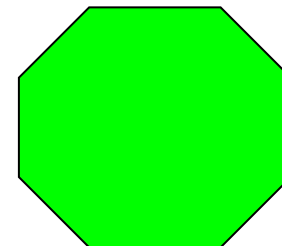
What's your call?

A woman is carrying a crying infant. She is able to walk.

RR 20

CR 2 sec

Obeys commands



What's your call?

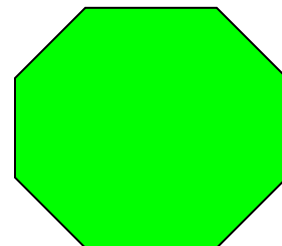
An infant is carried by the previous victim.

He's screaming but the woman quiets him to RR of 34

Good distal pulse

Focuses on rescuer, reaches for mom.

No obvious significant external injuries.



What's your call?

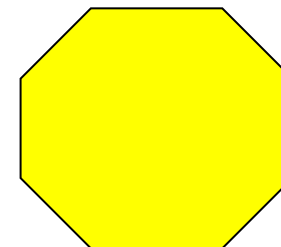
A young school aged boy props himself up on the road.

RR 28

Good distal pulse

Answers question and commands.

Has obvious deformity of both lower legs.



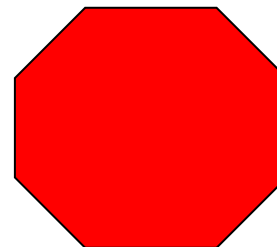
What's your call?

Toddler found outside the bus, lying on the ground in a heap.

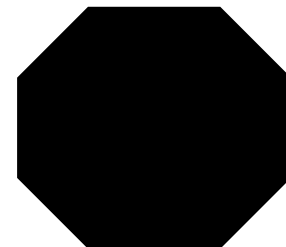
Apneic

Remains apneic with jaw thrust

Faint distal pulse palpable.



OR



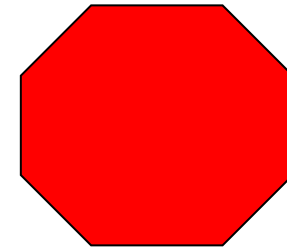
What's your call?

A school aged girl lies among the wreckage.

RR 40

Absent distal pulse

Withdraws from painful stimulus



What's your call?

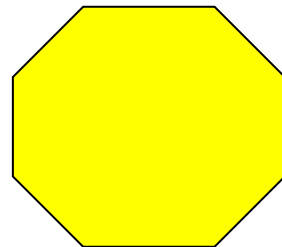
A screaming infant is found among the bushes at the side of the road.

RR 38

Good distal pulse

Focuses and reaches for you.

Has a partial amputation of the foot without active bleeding.

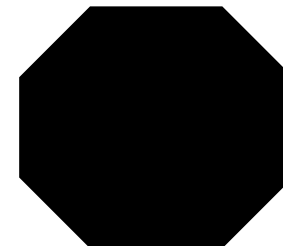


What's your call?

An adult male lies inside the bus.

Apneic

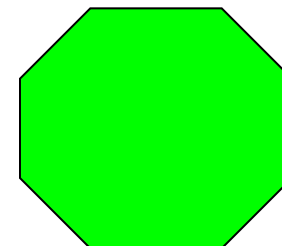
Remains apneic with jaw thrust



What's your call?

A youngster is up and walking around but is limping

Alert, crying hysterically for his mother



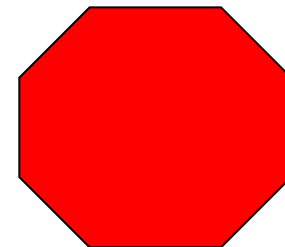
What's your call?

A school aged boy lies close to the bus.

RR 36

Absent distal pulse

Sluggishly looks at you when you talk to him



What's your call?

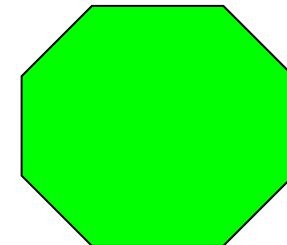
A young teen girl lies among the wreckage, crying for someone to help her up. A man with her says she needs her wheelchair.

RR 22

Palpable distal pulse

Alert

Has minor cuts and bruises



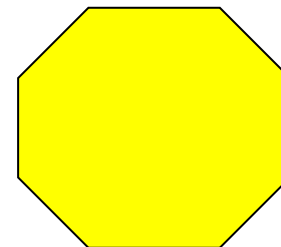
What's your call?

An adult male lies on the ground

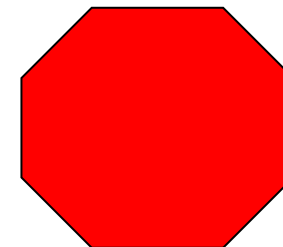
RR 20

Good distal pulse

Obeys commands but cries that he can't move his legs



OR



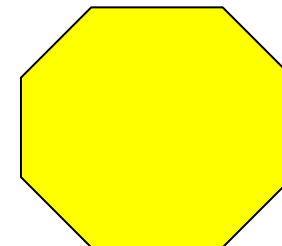
What's your call?

An older school aged child is found sitting outside the bus.

RR 28

Good distal pulse

Groggy, confused and slowly follows commands but won't get up and walk.



Course Summary

Take Home Points

Preparation

Systematic Approach

Teamwork

Disposition

Preparation

Trauma System

There have been consistent examples of improving survival after traumatic injury following development of organized regional trauma systems

Facilitates transfer and appropriate care to injured patients

Trauma Team

An organized trauma team, composed of a variety of allied health professionals, will facilitate a structured team approach to caring for injured patients

Define roles and know your setting, equipment, and limitations !

Systematic Approach

Initial assessment and management of any trauma case should follow the same flow

Primary Survey

A-Airway

B-Breathing

C-Circulation

D-Disability

E-Exposure

+ Adjuncts

Secondary Survey

AMPLE

Head to toe physical Examination

Teamwork

Communication

Preparation

Know your role

Know other person's role

Have a plan

Disposition

Transfer to definitive care will happen internally or externally, depending on institutional capacity and patient's status

Internal

- Admit for observation → monitored setting
- Further investigation → Imaging, etc..
- Intervention → Angio, Operating Room

External

- Early decision to transfer is key
- Package patient appropriately for **safe** transfer
- Stabilize and send
- Do not delay transfer for investigations that won't change management!

THANK YOU

Questions?