The Management of the Multiple Injured Road Crash Victim: The Role of Ambulances

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DEDICATION

To my departed friend and colleague,

Dr Badru Olalekan Shakirudeen

1966-2002

MBCHB, FMCS (Ortho).

Consultant Orthopaedic Surgeon

OAUTHC Ile-Ife.

About road crashes

- RTA is the Second most common cause of trauma after falls.
- But it is the most common cause of fatality resulting from trauma.
- The first recorded case of RTA was in New York City in 1899.
- By the year 1998, More than 30 million people had been killed.
- In 1998, 1,170,694 road deaths were recorded worldwide.

About road crashes

- WHO data estimated that, in 1998, more children in Africa died from road crashes than from HIV and more young adults (aged between 15 and 44 years) were killed by road crashes than by malaria.

- By 2020, road traffic injuries are expected to become the sixth leading cause of death and the third leading cause of years of healthy life lost, due to death or disability, worldwide.

Causes of Road Crash

- Here are some examples……..

Okada!

PUNCH

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'80% of accidents in Lagos linked to okada'

SEPTEMBER 24, 2012 BY RASHEED BISIRIYU

Osun Defender — People First

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THE 6TH MOST VISITED NEWSPAPER WEBSITE IN NIGERIA

HOME | NEWS ACROSS NIGERIA | WORLD NEWS | PHOTO GALLERY | LEGISLATURE | HEALTH | AFRICA

Okada accidents killed 107 in two years – LASG

PHOTO GALLERY

100 soldiers storm boko haram suspects' hideouts in Lagos, recovers bomb and other weapon

Alamieyeseigha could be paid billions by

Recruiters are looking

Cars and motorcycles

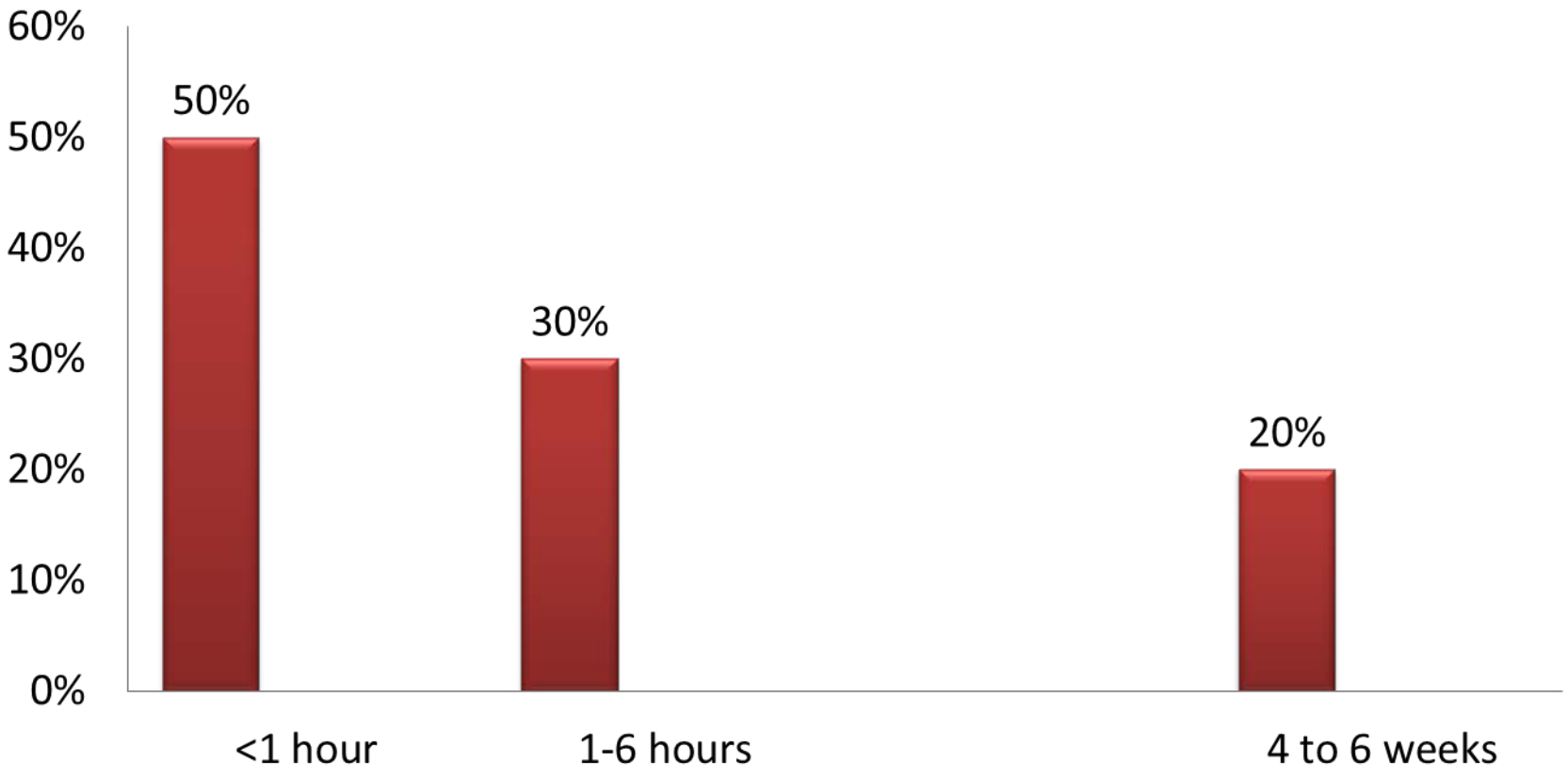
Roll Over

A common sight on our roads!

Where are you likely to be involved in the care of RTC victim?

- At the Crash Scene
- At the Accident and Emergency Unit
- Hospital wards or Intensive Care Units (ICU)

Treatment at the Crash Scene



"The Trimodal Distribution"

Immediate Death (< 1 Hr)

- **Complete airway Obstruction**
- **Brain Stem Laceration (Severe TBI)**
- **High C-Spine Lesion**
- **Aortic/Heart Rupture**

Early Death (1-6 Hrs)

- **Epidural Hematoma**
- **Subdural Hematoma**
- **Hemo/Pneumothorax**
- **Intra-abdominal Bleeding**
- **Pelvic Fractures**
- **Femur Fractures**
- **Multiple Long Bone Fractures**

Late Death(2-4 Weeks)

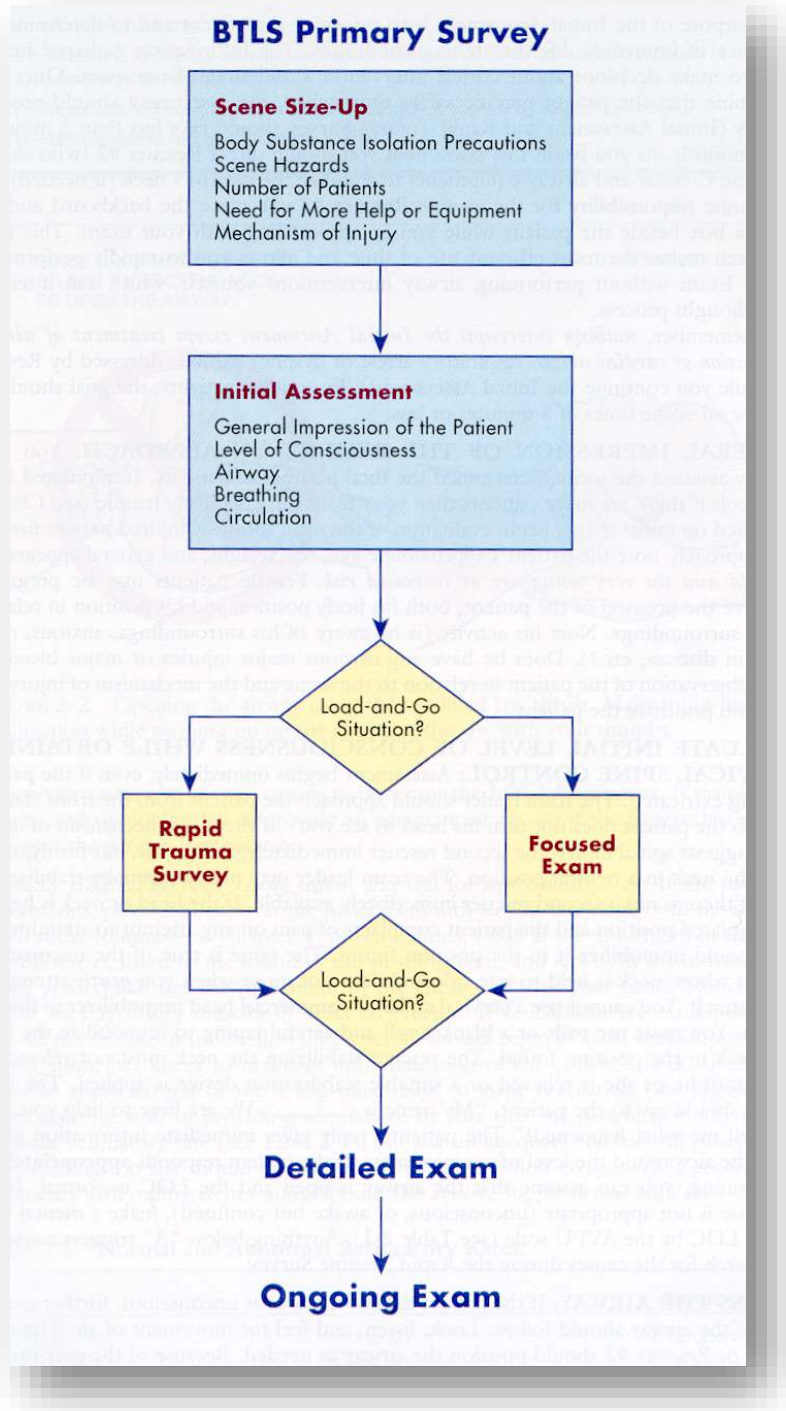
- **Sepsis (SIRS)**
- **Multiple Organ Dysfunction/ Failure MOD/MOF**

Implications for treatment

- There is little that can be done therapeutically to reduce immediate deaths. The only way to prevent these deaths is to prevent the trauma in the first instance.
- Early deaths are where the Trauma Team can have the most impact by starting trauma care as soon as they can:
- Within **6 hours**, the so called "***Golden Period***"
- Late deaths are usually due to complications of injuries or treatment.

TREATMENT AT THE SCENE

This should follow the Basic Trauma Life Support (BTLS) guidelines



Treatment at the scene: Aims

- Prevent further accidents.
- If the patient is trapped in a vehicle: cut away the parts holding him.
- Lift the patient out of the vehicle

Treatment at the scene: Constraints

The major constraint in Nigeria is:

- Facilities are either limited or unavailable

Therefore:

- Aim is to rapidly transport the patient to the hospital

Treatment at the scene: Procedure

i. Protect yourself
ii. Scene size-up
iii. Call for help
iv. Move the patient
v. Transport the patient to the hospital

Treatment at the scene: Scene size-up

- Protect yourself
- Secure scene safety (prevent further accidents)
- Estimate total number of patients
- Estimate the need for essential equipment
- Are additional resources needed?
- Assess the mechanism of injury

Scene Safety

- Observe for any hazards
  - As you enter the scene
  - While approaching the patient

Vehicle Crash Hazards

- Traffic hazards
- Downed wires
- Risk of fire or explosion
- Unstable vehicles
- Hazardous materials

Potential Violence

- Area Boys
- Potentially violent patient or bystanders

Prevent Further Accidents

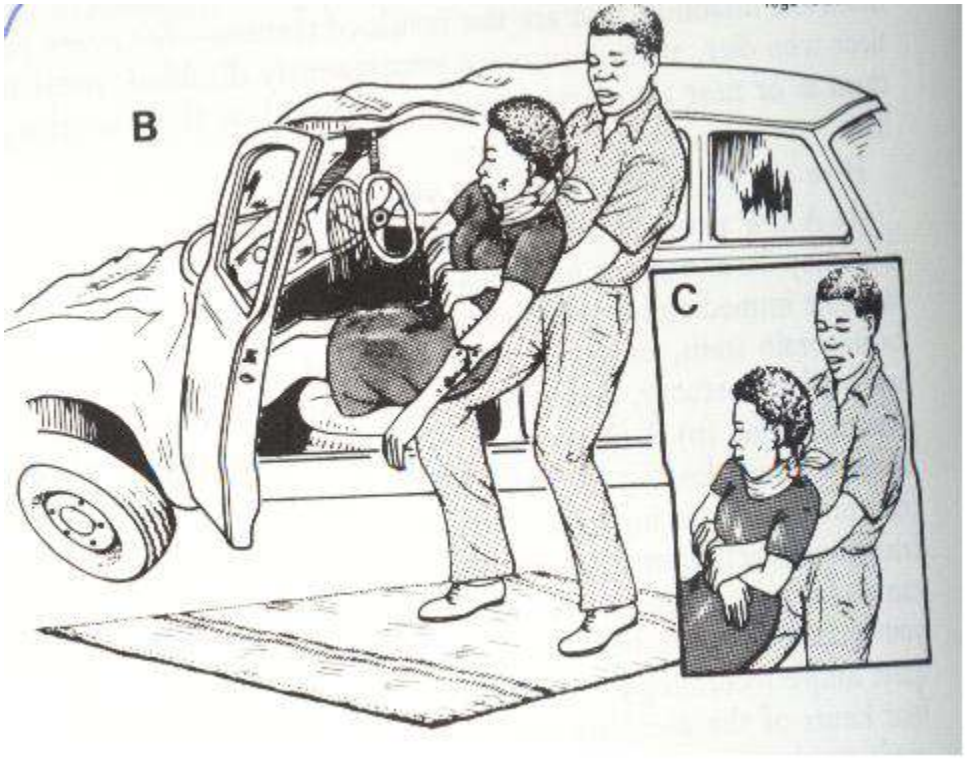
Prevent Further Accidents

When should you move patient before help arrives

- Threat of further injury
- Threat of fire
- Patient trapped
- Noxious agents spillage

Moving patient from vehicle (more than one rescuer)

Moving patient from vehicle (One rescuer)



Mechanism of Injury

- With trauma patient, scene size-up includes evaluating for clues about mechanism of injury
- Mechanism of injuries may suggest serious injury or presence of internal injuries

Consider the Mechanism

- What was specific type of road crash?
- Were patients thrown out or were they retained inside?
- What body area received the impact? What organs may be injured?
- How much force may have been involved?
- Might the force have been transferred from one body area to another?

Examples of Mechanism of Injury

- Head-on collision may cause head /spinal injuries
- Rear impact collisions may cause whiplash injuries
- Head on collision may cause posterior hip dislocation in a front passenger
- Rollover collisions may cause injuries to any part of the body.

Number of Patients

- Determine how many patients are involved
- Observe for clues and ask those present if everyone is accounted for
- Be certain you know how many patients are involved
- Call for additional help immediately for multiple patients
- If more patients than responders, triage patients first

BTLS:
PRIMARY SURVEY

COMPONENTS

- Initial assessment
- Rapid trauma survey or focused exam

BTLS INITIAL ASSESSMENT

- Performed when you reach patient to identify any immediate threats to life
- Helps determine patient's general condition and set initial priorities for care
- Begins with your initial impression of patient
- Check patient's responsiveness, airway, breathing, and circulation status

BTLS General Impression

- Is the patient moving?
- Does patient's appearance give clues about his/ her condition?
- Are there signs of serious injuries?
- Note patient's sex and approximate age
- Is the patient responding to you? (responsiveness)

Degree of responsiveness

Use the AVPU Scale:

- **A** – Alert
- **V** – responds to Verbal stimuli
- **P** – Responds to Pain
- **U** – Unresponsive to all stimuli

Assessing the airway and determine its adequacy

Quick Tip

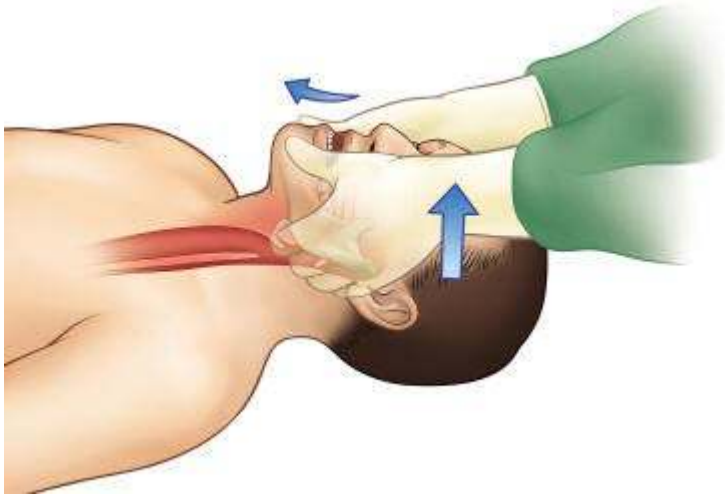
- If patient is talking, crying, or coughing, the airway is open
- Patient with weak, wheezing cough may have partially blocked airway

What to do if airway is obstructed

If patient is unconscious:

Do chin lift or jaw thrust.

- Apply cervical collar (If unavailable, support the head on either side with sandbags or weights



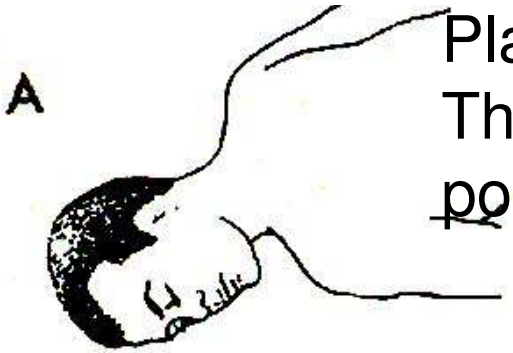
What to do if airway is obstructed

Inspect mouth for blood, loose teeth, vomit, or any other obstructions

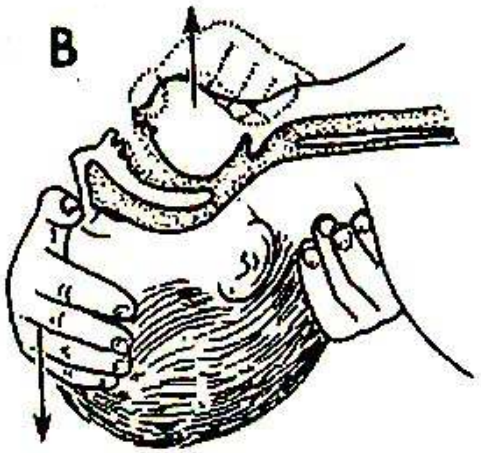
If airway is blocked:

- Clear the airway.

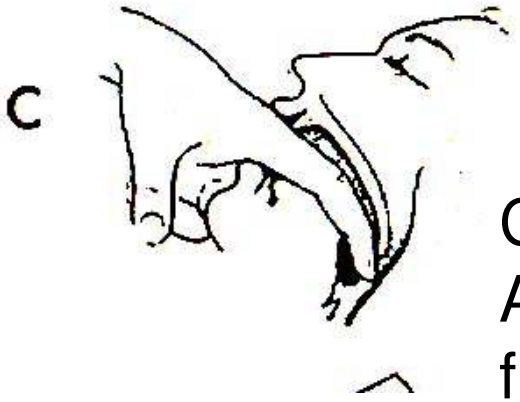
Clearing the airway at the accident site



Place in
The lateral
position



Jaw thrust
Or
Chin Lift



Clear the
Airway with
finger

BTLS INITIAL ASSESSMENT :
Breathing

- In a responsive adult, check for adequate breathing

Inadequate Breathing:

– Difficult or labored breathing

– Wheezing or gurgling sounds with breathing

– Cyanosis

– Respiratory rate ≤8 or ≥30 breaths/minute

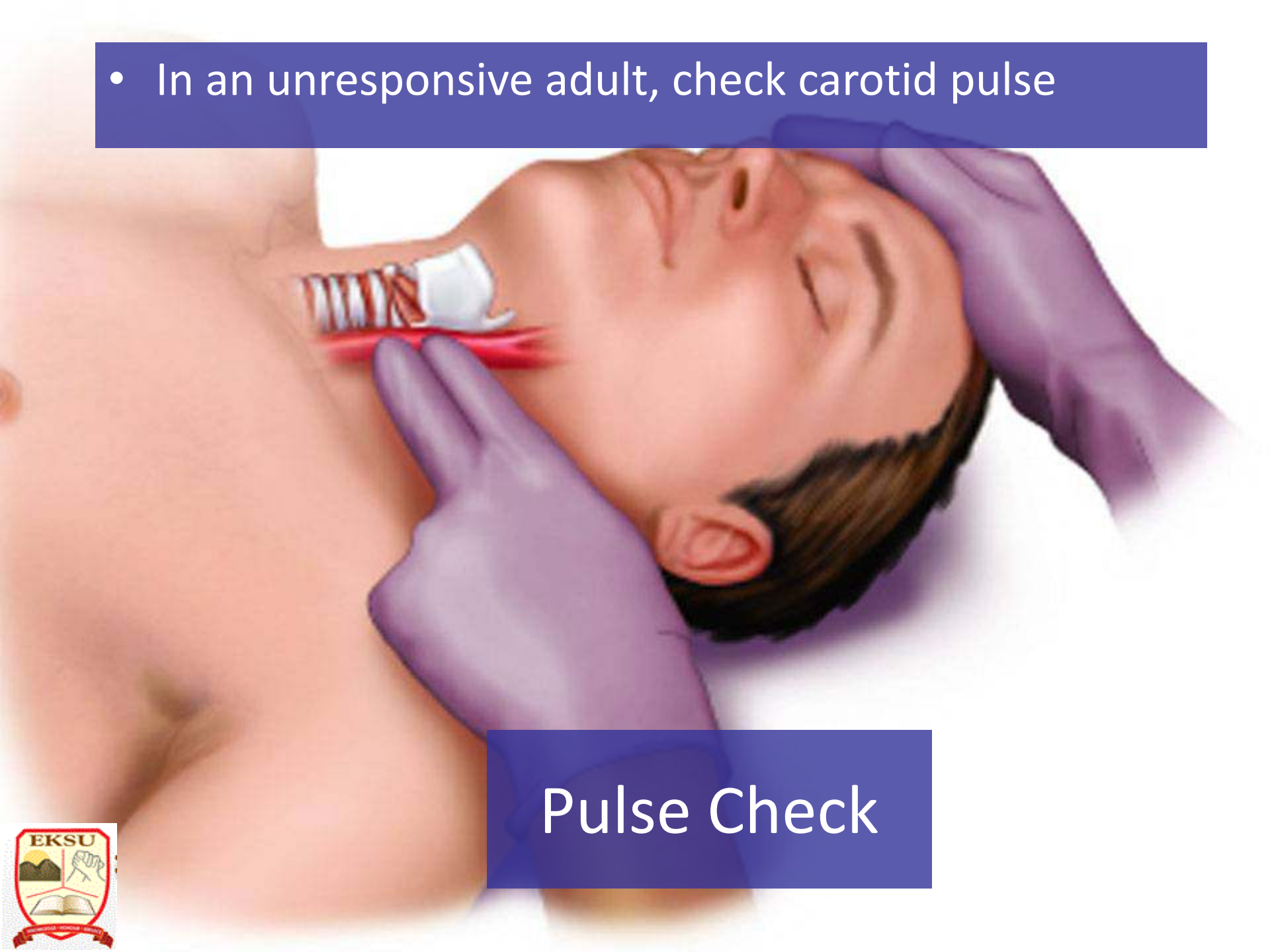
BTLS INITIAL ASSESSMENT :
Breathing

- Look for rise and fall of chest
- Listen for breathing
- Feel for breath

- In responsive adult or child, check radial pulse

Pulse Check

- In an unresponsive adult, check carotid pulse



Pulse Check

BTLS INITIAL ASSESSMENT :
Circulation

- Lack of pulse along with absence of adequate breathing signifies heart has stopped or is not beating effectively enough to circulate blood
- If patient lacks a pulse and is not breathing adequately, start CPR

BTLS INITIAL ASSESSMENT :
Circulation

- Look for life-threatening bleeding
- Arterial bleeding usually most serious
- Bleeding from vein is generally slower

BTLS INITIAL ASSESSMENT :
Circulation

- Control external haemorrhage – ideal way is by applying firm bandage dressing on wounds.
  Tourniquet use is likely to do more harm than good! Don't use it.

BTLS:
RAPID TRAUMA SURVEY OR FOCUSED EXAM?

- Significant Mechanism of Injury or altered mental status = Rapid Trauma Survey
- No Significant Mechanism of Injury or Dangerous Focus Injury or no significant life threat = Focused Exam

BTLS:
RAPID TRAUMA SURVEY OR FOCUSED EXAM?

- **Significant mechanisms of injury include:**

  i. Ejection from a vehicle
  ii. Death of other passengers in a MVC
  iii. Rollover vehicle collision
  iv. High-speed vehicle collision
  v. Vehicle-pedestrian collision
  vi. Motorcycle crash
  vii. Unresponsiveness or altered mental status
  viii. Penetrations of the head, chest, or abdomen

BTLS: RAPID TRAUMA SURVEY

- Brief assessment of head, neck, chest, abdomen, pelvis, and extremities to identify immediate life threats
- Brief History (SAMPLE)
- Baseline vital signs
- If altered LOC do brief neurological exam

BTLS: SAMPLE HISTORY

- Sample is an acronym for the basic information needed to care for the injured patient at this stage:
- **S** – SYMPTOMS
- **A** – ALLERGIES
- **M** – MEDICATIONS
- **P** – PAST MEDICAL HISTORY
- **L** – LAST MEAL
- **E** – EVENTS PRIOR TO INJURY

BTLS: IF ALTERED LEVEL OFCONSCIOUSNESS

- Do brief neurological exam to rule out increased intracranial pressure
  - Pupils
  - GCS or AVPU
  - Signs of Cushing's reflex

BTLS: Focus Trauma Assessment

In patients with Focused dangerous mechanism or no Significant MOI:

i. Examine the area that is injured.

ii. Take vital signs.

iii. Provide appropriate care (i.e. stabilize any injuries, control bleeding, dress wounds)

FINISHING THE BTLS PRIMARY SURVEY

- Check the patient's back for evidence of injury
- Arrange for transport
- Transfer the patient to the Vehicle

BTLS: WHEN SHOULD YOU PRIORITIZE TRANSPORT (LOAD AND GO SITUATIONS)

- Significant Mechanism of Injury or poor general impression
- Initial Assessment reveals:
  - Altered mental status
  - Abnormal airway or respiration
  - Abnormal circulation (shock or uncontrolled bleeding)

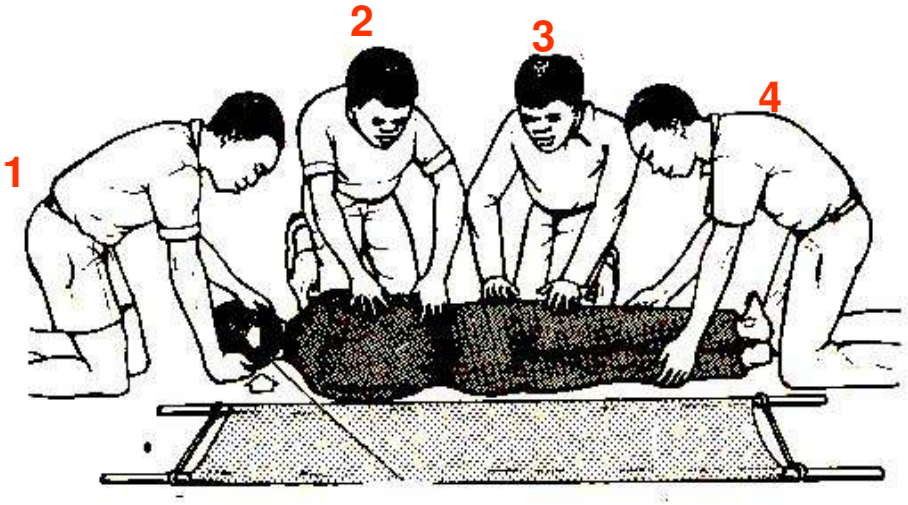
***Note**: You might not be equipped to manage these conditions at the site*

Moving and transporting the patient.

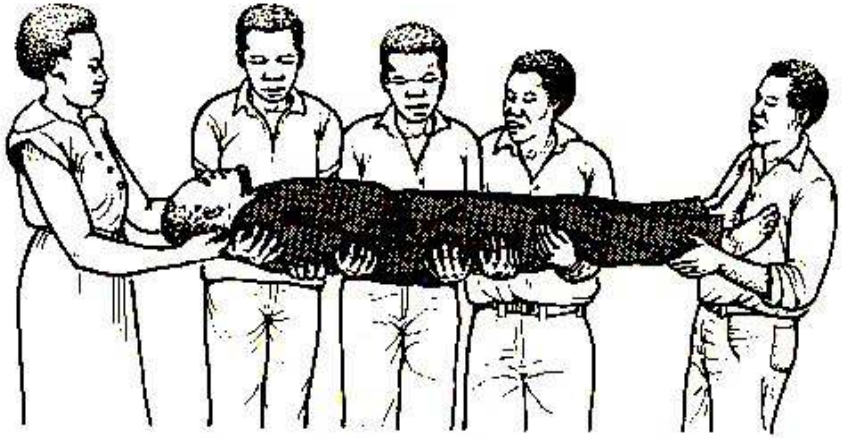
How should it be done?

No!!!

Yes!!!



Log-Roll the patient



Lift like a log

Yes!!!

Or use a stretcher

WHAT IS THE ROLE OF THE AMBULANCE SERVICE IN MANAGING THE INJURED RTC PATIENT IN NIGERIA?

Historically…

- ambulances were provided for rapid transportation of patients
- “Scoop and run” technique: Little was provided in the way of treatment
- Value of the ambulance service as a formal health service was realised during World War II

Now…

- Ambulance services are no longer regarded as a stand-alone operation
- Part of an Emergency Medical Service (EMS) setup
- The term Emergency Medical Service evolved to reflect a change from a simple transportation system ambulance service to a system in which actual medical care occurred in addition to transportation

What is EMS?

- EMS is a branch of emergency services dedicated to providing out of hospital acute medical care and/or transport to definitive care, to patients with illnesses and injuries which the patient, or the medical practitioner, believes constitutes a medical emergency.

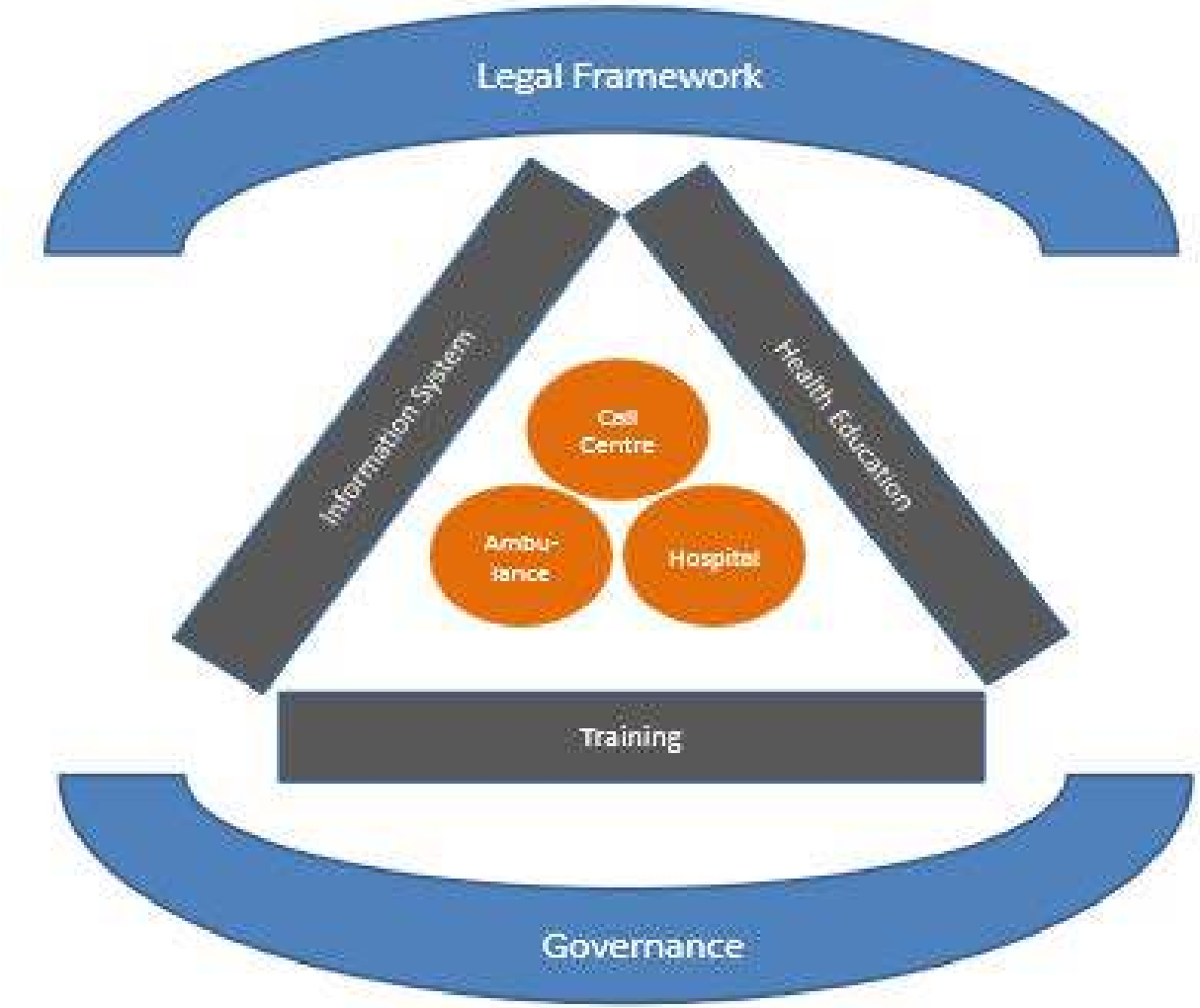
Level of EMS?

- Basic Life Support
- Advanced Life Support

EMS Models

- **Scoop and Run**: Patient transported to hospitals immediately
  - Anglo-American
  - led by paramedics
  - based on the “golden hour” theory
  - aims to transport patients within 10 minutes “the platinum ten minutes”
- **Stay and Play**: advanced care resources taken to the patient
  - Franco-German
  - physician led
  - high speed transportation considered unsafe
  - definitive care provided until patient is considered medically fit

Components of EMS?



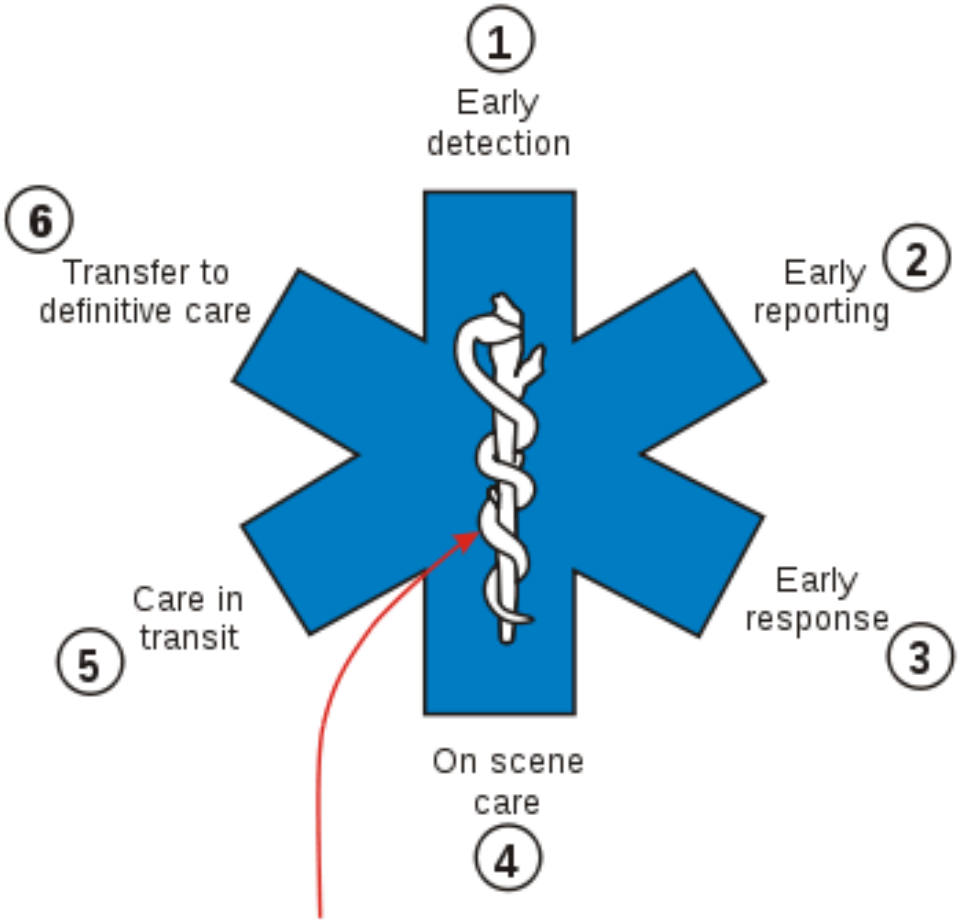
Goal of EMS

- Minimize further systemic insult or injury and manage life-threatening conditions through a series of well defined and appropriate interventions, and to embrace principles that ensure patient safety.
- Integral to this is the provision of a good ambulance service

Preserve Life, Prevent Further Injury, and Promote Recovery

Role of EMS

- Early detection
- Early reporting
- Early response
- Good on-scene care
- Care in transit
- Transfer to definitive care



Role of EMS

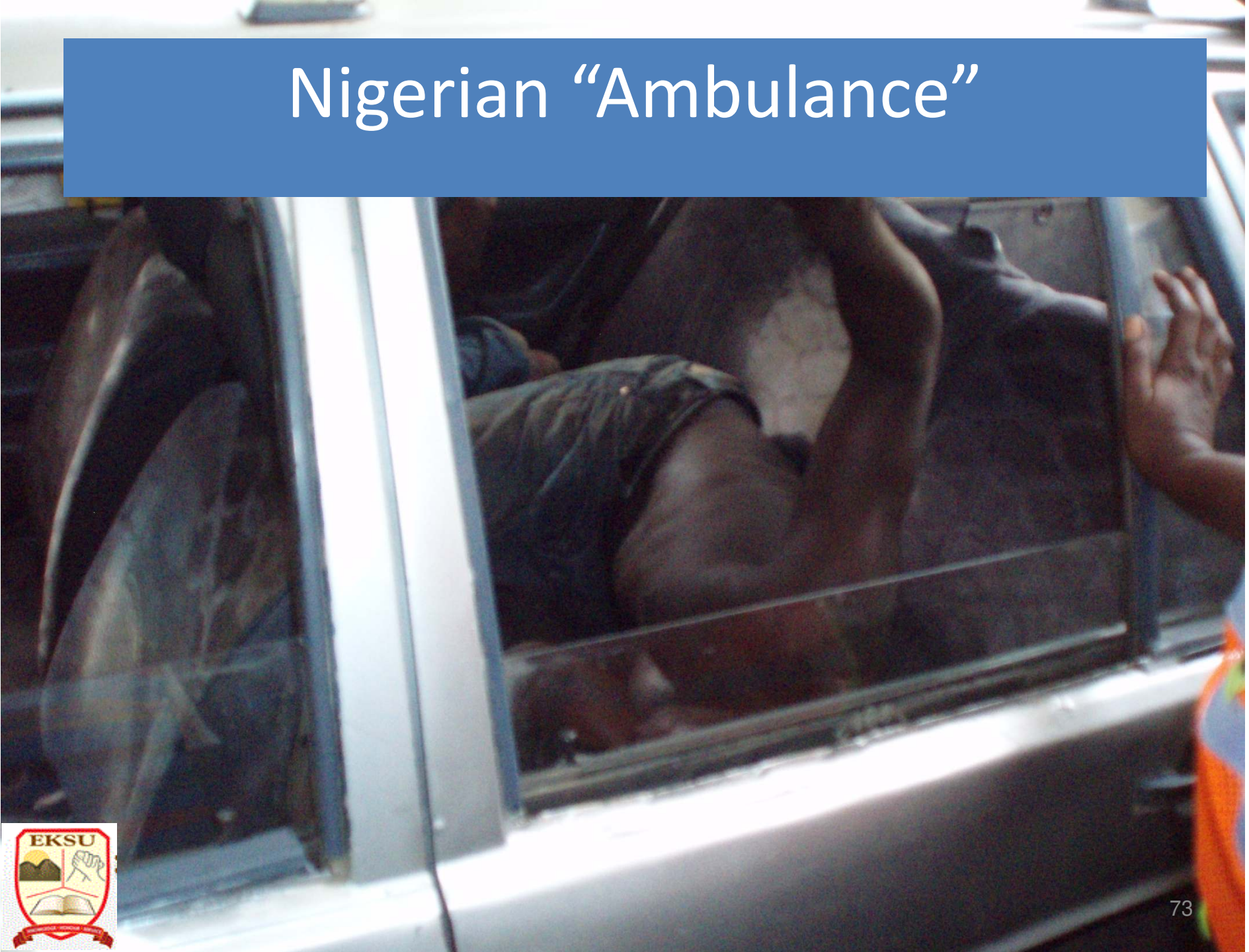
- **Early detection**: Members of the public, or another agency, find the incident and understand the problem
- **Early reporting**: The first persons on scene make a call to the emergency medical services and provide details to enable a response to be mounted
- **Early response**: The first professional (EMS) rescuers arrive on scene as quickly as possible, enabling care to begin

Role of EMS

- **Good on-scene care**: The emergency medical service provides appropriate and timely interventions to treat the patient at the scene of the incident
- **Care in transit**: the emergency medical service load the patient in to suitable transport and continue to provide appropriate medical care throughout the journey
- **Transfer to definitive care**: the patient is handed over to an appropriate care setting, such as the emergency department at a hospital, in to the care of physicians

The ambulance is the safest way to transport injured patients to the hospital

Nigerian “Ambulance”

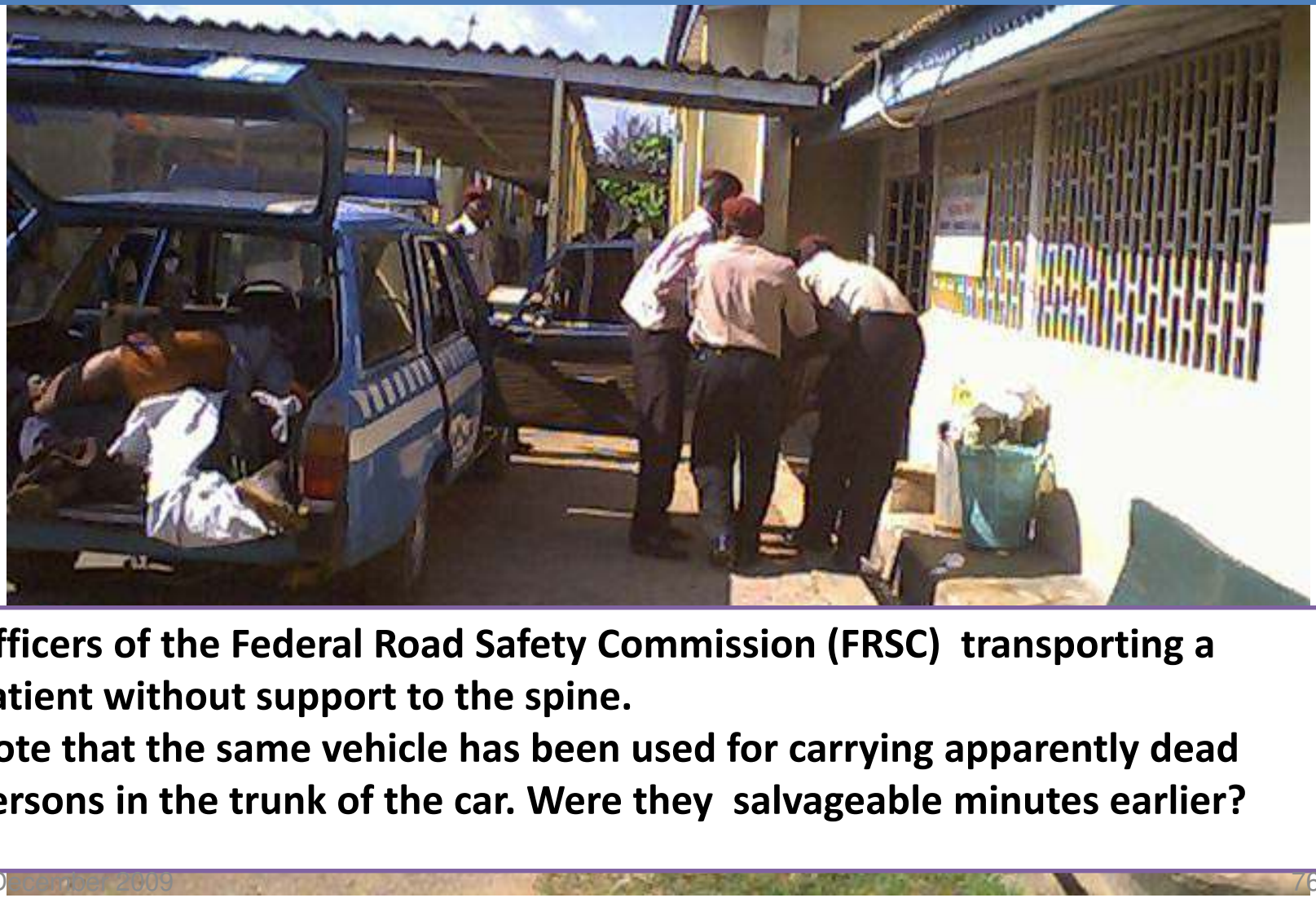


African “Ambulance”

Nigerian “Ambulance”

Crashed vehicle used to bring victims to the hospital.
Note nurses and other persons around the ER milling around the vehicle

Nigerian “Ambulance”



Officers of the Federal Road Safety Commission (FRSC) transporting a patient without support to the spine.
Note that the same vehicle has been used for carrying apparently dead persons in the trunk of the car. Were they salvageable minutes earlier?

Ambulance utilization in Nigeria

- Very rudimentary stage

Author	Year	City	% transported by ambulances
Aderounmu et al	2003	Ile-ife	0
Oluwadiya et al	2004	Ile-Ife	4.3%
Solagberu et al	2003	Ilorin	6%
Okeniyi et al	2005	Ilesa	None
Solagberu et al	2012	Lagos	5.2%

Gaps in Nigerian EMS

- Hospital infrastructure, especially in public hospitals, for treating and managing emergencies need further strengthening
- Lack of training and training infrastructure for training health staff (public or private) and other stakeholders in EMS
- Virtual non-existence of many ambulances
- Where they exist, they are not networked into a trauma system for efficient running

Gaps in Nigerian EMS

- Legal framework defining and regulating roles and liabilities of various stakeholders (like ambulance operators, emergency technicians, treating hospitals and staff, etc.) needs further clarity/transparency, standardization and enforcement across the states.

Suggested Solution

No matter how basic, Nigeria ought to have a well-organized EMS.

Suggested Solutions

- **Ambulance** - operations and maintenance
- **Call Centre** - for ambulance dispatch and control
- **Empanelled health facilities/hospitals** - ensuring quality of care
- **Information System and Knowledge Management** - using multimedia and multichannel data management
- **Training** - for emergency case management on site, in transit, and in hospitals
- **Health Education** - among general public
- **Legal framework** - to define roles and liabilities of various stakeholders
- **Governance** - for transparency and regulation

Current solutions…

Ondo State

Current solutions…

Oyo State

Current solutions…

Osun State

Current solutions…

Ekiti State

Current solutions…

Lagos State

Current solutions… Lagos State

- Awareness campaign on the preventive aspect of emergencies .
- Training of personnel in pre-hospital and hospital-based management of trauma
- Establishment of an efficient radio-communication network linking the public, LASAMBUS, LASEMS and the Ministry of Health, with this including the dedicated (easy-to-remember) phone hotline (123).
- Free treatment within the first 24 hours of emergency policy.
- 15 ambulance points established throughout the State.
- Mobile intensive care unit (MICU) ambulances (with capacity to administer advanced life support) to the fleet of ambulances.
- Establishment of the Marine Rescue Unit consequent upon increased incidence of vehicles plunging across the bridges into the lagoon.
- Strengthening of the hospital-based care/recovery through the Lagos State Emergency Medical Services (LASEMS) in Lagos State University Teaching Hospital (LASUTH), Ikeja, General Hospital Lagos and General Hospital Gbagada

Current solutions…

FRSC

Summary:
Interventions that may be done on-scene

- Initial airway management
- Ventilatory assistance / Oxygen (If available)
- CPR
- Control bleeding
- Seal sucking chest wounds

Summary:
Interventions that may be done on-scene/in transit

- Stabilize flail chest
- Decompress tension pneumothorax
- Stabilize impaled objects
- Immobilize spine
- Stabilize fractures

Treatment At the Hospital

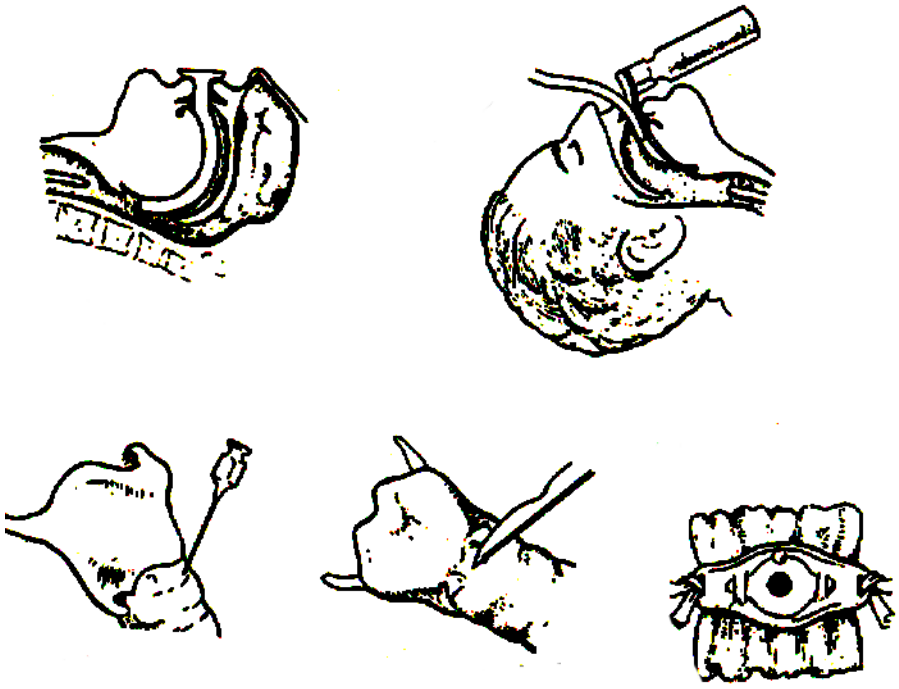
- 1st Contact of most patients in this part of the world with trained medical personnel.
- 1st priority is ***to identify and treat immediate life-threatening injuries.*** This is called the ***primary survey***.

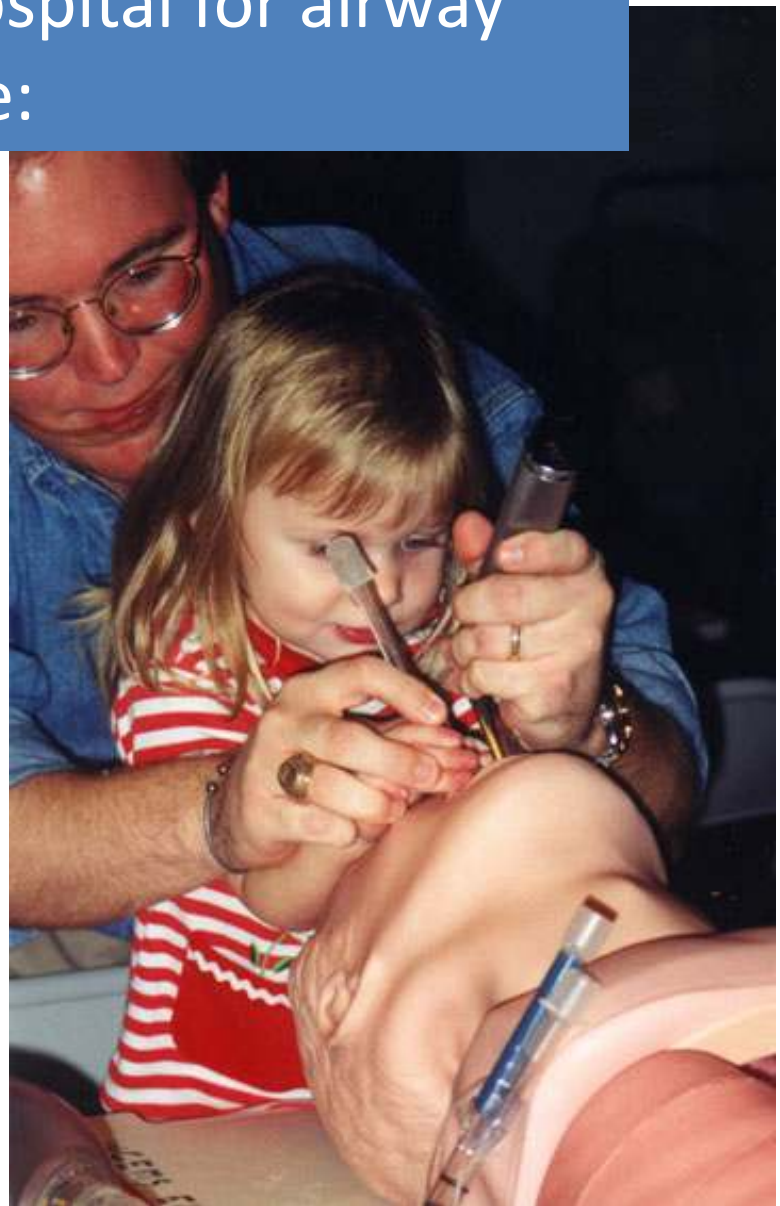
Primary survey: Method.

- ***A:*** Airway Control
- ***B:*** Breathing
- ***C:*** Circulation with control of external bleeding
- ***D:*** Disability or neurological status
- ***E:*** Exposure while also protecting patient from hypothermia system.

A

Methods available in the hospital for airway maintenance:





B

Assessing Breathing

- Is the patient distressed?
- Is the patient tachypnoeic?
- Are signs of disruption to the chest wall present?
- Is paradoxical movement of the chest wall present.
- Palpate for the trachea. Is it central?
- Percussion and auscultation of the chest (pneumothorax or haemothorax)

C

Circulation

- Identify and apply firm dressing on external haemorrhage
- Treat shock

Causes of Shock in trauma patients

- Most common cause in RTC is hypovolemia.

Others are:

  - Tension Pneumothorax
  - Spinal cord injuries and
  - Cardiac tamponade.

Treating Shock

- Give an initial bolus of IV Fluid (at least 10ml/Kg)
- Assess response to this by monitoring the SPO_2 urinary output, vital signs and neurological status.

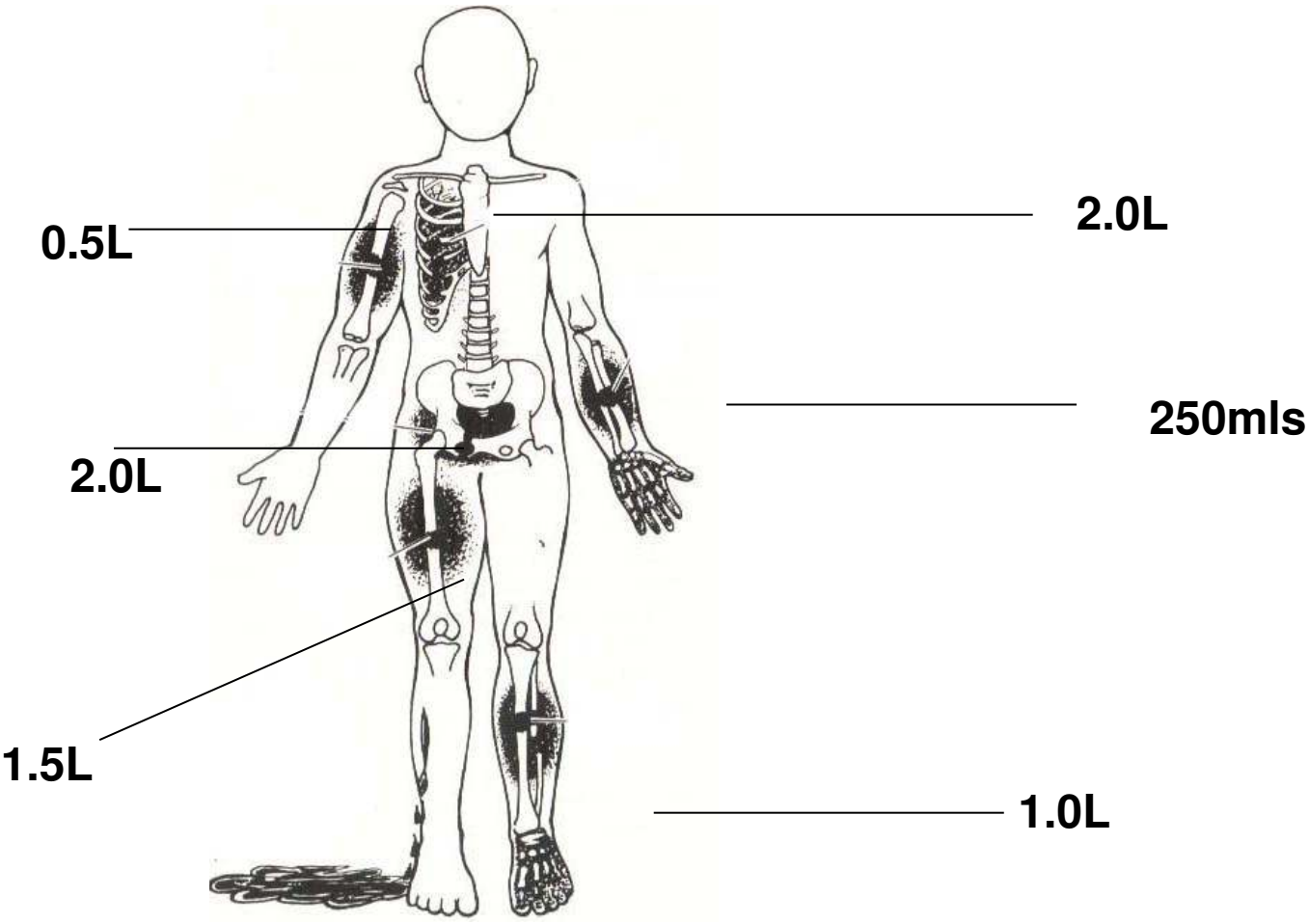
Hypotension unresponsive to an initial bolus of 2000mls implies an ongoing heamorrhage.

Ongoing heamorrhage?

A quick systematic examination to detect the source of hypovolemic shock is necessary.

- External (i.e., scalp, skin etc)
- Pleural space
- Peritoneum
- Pelvis
- Long bone fractures

Estimated Blood Losses from Fractures



D Disability

Aim: To detect neurological deficit

- The posture
- The pupils
- Glasgow Coma Scale

E Exposure

- To help ensure that significant injuries are not missed. Take precautions to avoid hypothermia.

Ongoing monitoring

- Urinary catheters
- Gastric tubes
- Vital signs
- Arterial gases, CVP, ECG etc

Secondary Survey

- Detailed history
- Complete physical examination
- Investigations.
  - X-rays (Trauma Series)
  - Ultrasound
  - C.T. Scans
  - Diagnostic Peritoneal Lavage
  - Focused Abdominal ultrasound in Trauma (FAST)
  - Angiograms

Definitive Management

- Tension Pneumothorax
- Massive Haemothorax
- Flail Chest
- Cardiac Tamponade
- Head Injuries

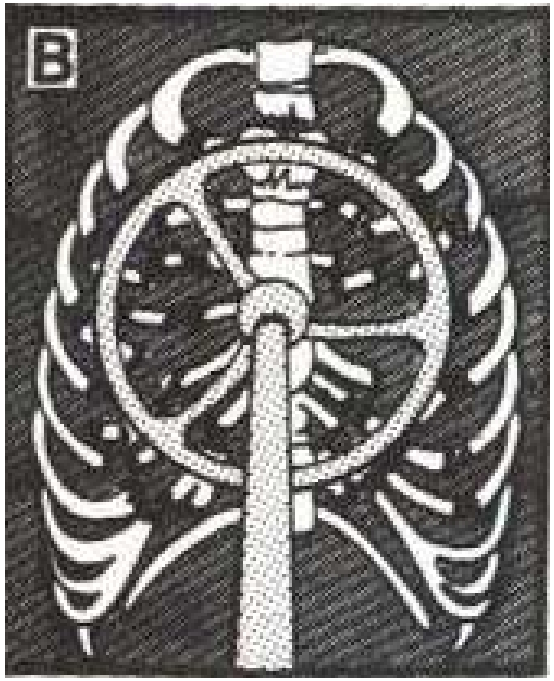
Tension pneumothorax

- ***Diagnosis*** is Clinical!
  - Severe distress, tracheal deviation, distended neck veins absent breath sounds and shock.
- **Treatment** : Insert wide bore needle to decompress (may be done at accident scene). Then drain with chest tube.

Massive Haemothorax

- **Diagnosis**: Hypovolemia, absent breath sounds and dullness to percussion.
- **Treatment** : Volume replacement and simultaneous large-bore chest tube insertion for decompression.
- **X-ray** can then be done to confirm the diagnosis.

Flail chest



- **Diagnosis** : Paradoxical chest wall movement.
- **Treatment**
  - ABC control (IPPV and pleural drainage may be needed,
  - Adequate pain relief.

Cardiac tamponade

- **Diagnosis**: Beck's Triad
  - Hypotension
  - Engorged neck veins (elevated CVP)
  - Reduced heart sounds.
- **Treatment**
  - Pericardiocentesis
  - ± Pericardiotomy

Head injury : The hard facts

- Closed-head injury occurs commonly in the setting of major trauma and contributes significantly to poor outcomes.
- Despite advances in all aspects of trauma care, severe head trauma carries a mortality rate of 30%
- Survivors of severe and moderately severe head injuries are likely to be left with some degree of disability

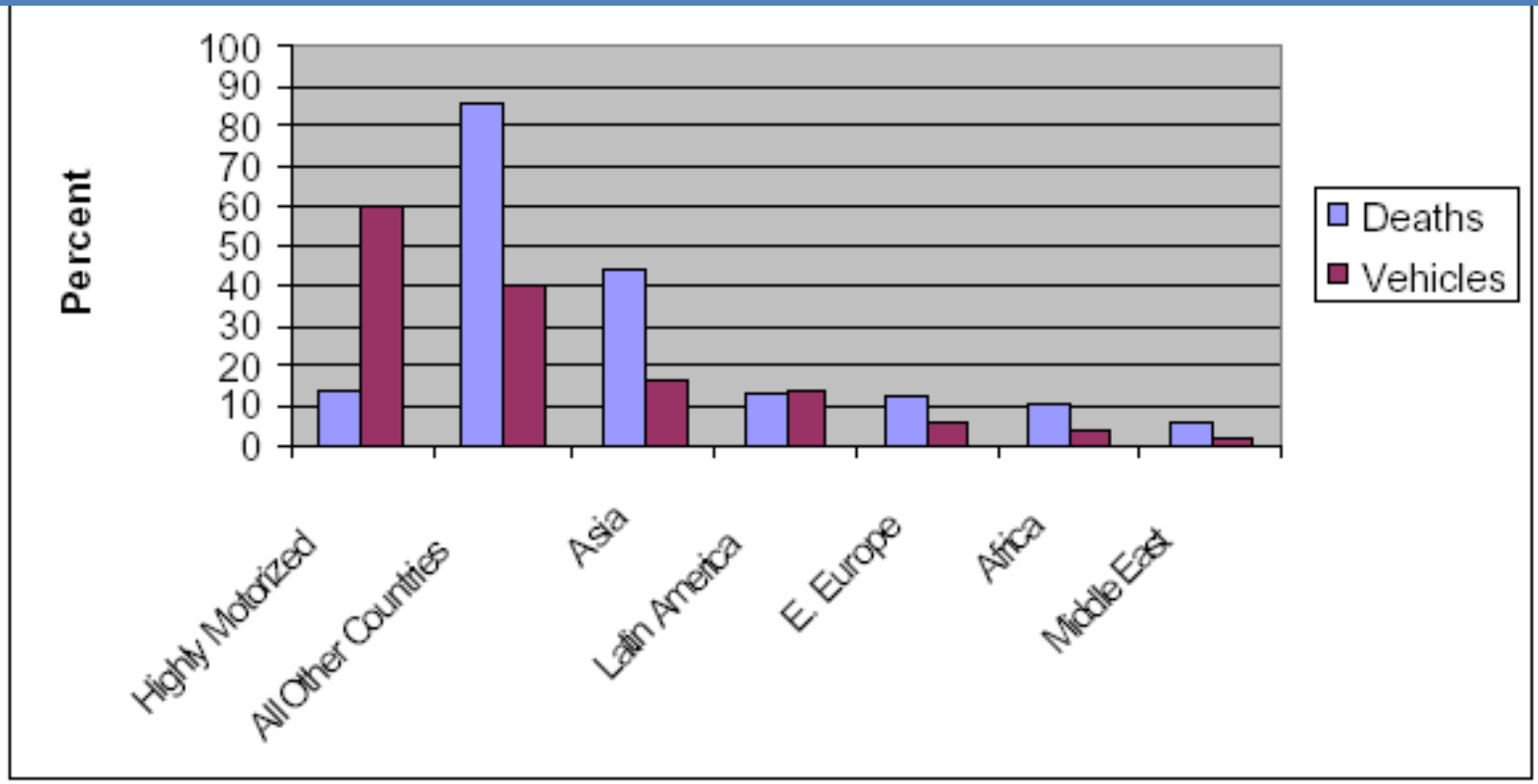
Head injury : Treatment

- Prevent secondary brain injury:
- Adequate oxygenation.
- Maintain PCO_2 at 35-40mmHg.
- Rehydrate.
- Mannitol (0.5-1mg/Kg) may be given to those with lateralizing signs.
- Transfer to ICU.

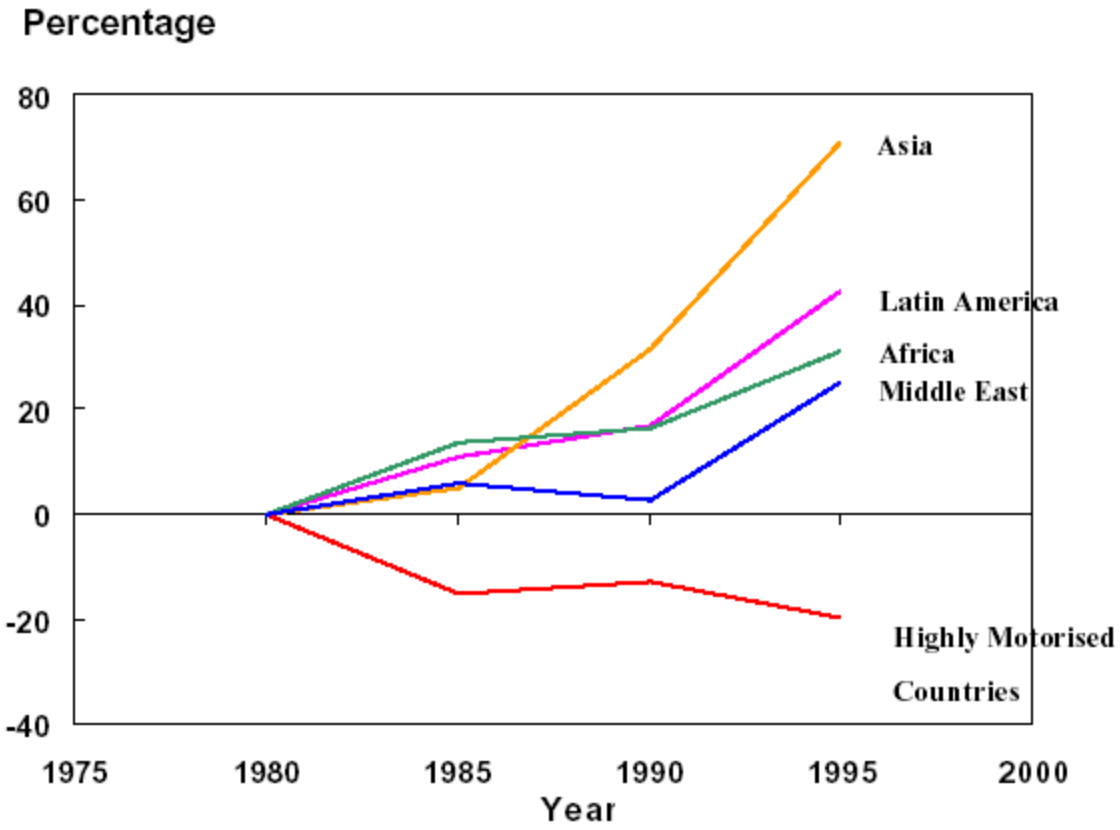
Head Injuries: indications for surgery.

- Significant mass effect from contusion or hemorrhage, resulting in a shift of intracranial structures
- Penetrating head injury with necrotic foreign body tracks
- Foreign body removal if compromising neurologic function
- Significantly depressed (>1 cm) skull fractures

Comparison of the regions



Regional trend in road fatality: ’80-’95.



System of trauma care.

- Advanced planning, preparation, and coordination are essential for optimal response and care.
- A trauma care system is an organized effort, coordinated by a goverment agency, to deliver the full spectrum of care to injured persons in a *defined geographic area*. Such a system requires specially trained practitioners as well as adequate resources, equipment, and support personnel.

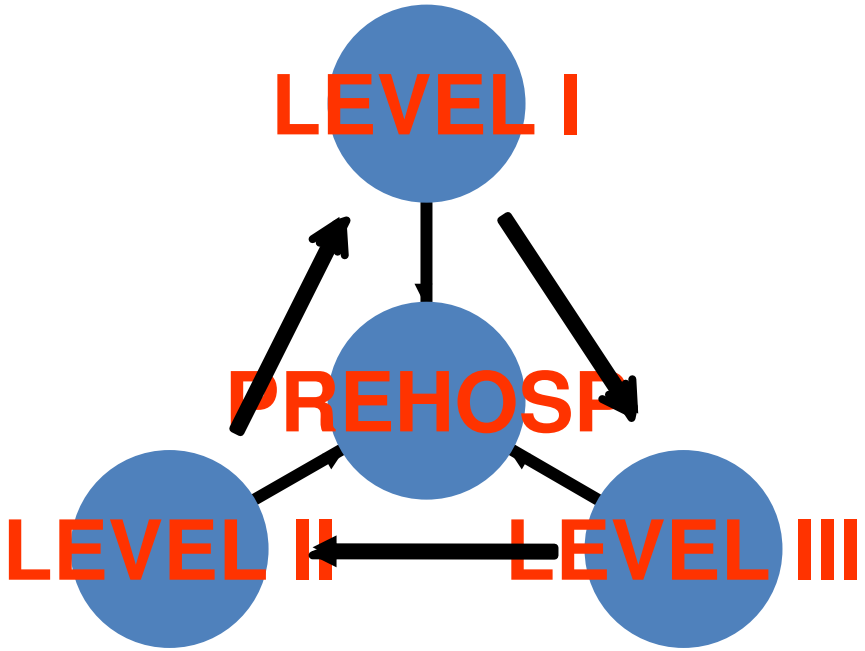
Components of system of trauma care

- Injury Prevention
- Prehospital Care
- Acute Care Facilities
- Post-hospital Care

Steps to developing trauma care

- Regionalization of Trauma Care
- Disaster Preparedness
- Trauma as a Disease Process
- Continuum of Care
- Trauma Requires a Multidisciplinary Approach
- Audit and cost effectiveness

Organization of system of trauma care.



The underlining principle is ***TRIAGE***

Triage

- The process of sorting injured patients on the basis of the actual or perceived degree of injury and assigning them to the most effective and efficient regional care resources, in order to insure optimal care and the best chance of survival.

Triage criteria

- Measures or methods of assessing the severity of a person's injuries that are used for patient evaluation, *especially in the prehospital setting*. These include anatomic and physiologic considerations together with the mechanism of injury.

Benefits of Trauma Care System

- A reduction in deaths caused by trauma.
- A reduction in the number and severity of disabilities caused by trauma
- An increase in the number of productive working years.
- A decrease in the costs associated with initial treatment and continued rehabilitation of trauma victims
- A decrease in the impact of the disease on "second trauma" victims-families.

The Future

- The golden fleece is PREVENTION.
- Better road networks, better road behaviour and the use of vehicle restraints are ways of attaining this.

The End

Thank You