# Mass Casualty Management

**Department of Orthopaedics**

**Manipal Teaching Hospital**

# Road Traffic Accidents in Nepal

**Figure 4: Road Accidents in Nepal**

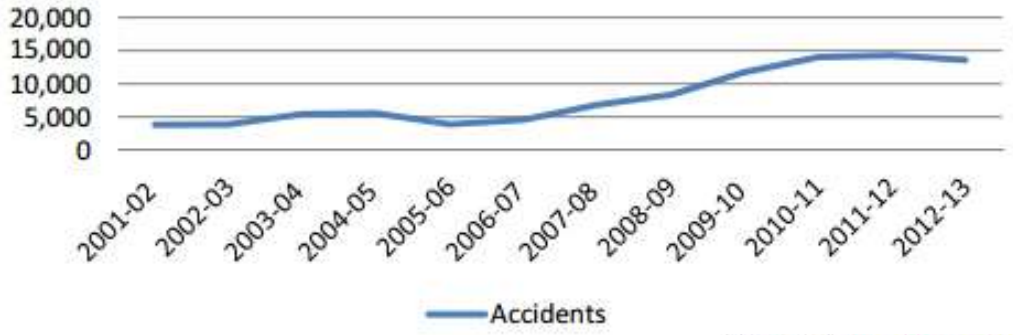



Table2: National statistical trends in road accident (2001-2010)

| Year | Accidents | Fatalities | Serious Injuries | Slight Injuries | Injury/ fatal ratio | Total vehicles | Fatality per 10000 vehicles |
|---|---|---|---|---|---|---|---|
| 2001-02 | 3,823 | 879 | 458 | 4,138 | 5.23 | 362,828 | 24.23 |
| 2002-03 | 3,864 | 682 | 785 | 4,442 | 7.66 | 400,438 | 17.03 |
| 2003-04 | 5,430 | 802 | 1,659 | 3,925 | 6.96 | 440,137 | 18.22 |
| 2004-05 | 5,532 | 808 | 1,795 | 4,039 | 7.22 | 480,668 | 16.81 |
| 2005-06 | 3,894 | 825 | 1,866 | 3,655 | 6.69 | 536,443 | 15.38 |
| 2006-07 | 4,546 | 953 | 2,583 | 5,331 | 8.30 | 625,179 | 15.24 |
| 2007-08 | 6,821 | 1,131 | 2,663 | 5,245 | 6.99 | 710,917 | 15.91 |
| 2008-09 | 8353 | 1356 | 3609 | 6457 | 7.42 | 813,487 | 16.67 |
| 2009-10 | 11747 | 1734 | 4130 | 7383 | 6.64 | 1,015,271 | 17.08 |
| 2010-11 | 14013 | 1689 | 4,018 | 8,503 | 7.41 | 1,175,824 | 14.36 |
| 2011-12 | 14,297 | 1837 | 4,018 | 7,811 | 6.44 | 1,342,927 | 13.68 |
| 2012-13 | 13,582 | 1816 | 3,986 | 8,000 | 6.60 | 1,545,988 | 11.75 |
| Sum | 54,010 | 9,170 | 19,548 | 44,615 | 7.00 | 1,545,988 | |

Source: Traffic Accidents Record[16], Traffic Directorate, Nepal Police, 2013

# RTA in Kaski District

| SN | Year | Vehicle | Death | Critically Injured | Injured |
|---|---|---|---|---|---|
| 1 | 068/069 | 112 | 51 | 53 | 45 |
| 2 | 069/070 | 70 | 24 | 52 | 94 |
| 3 | 070/071 | 127 | 36 | 74 | 85 |
| **TOTAL :** | | **309** | **111** | **179** | **224** |

# RTA in Manipal Teaching Hospital

- Casualty : 244
- Referral : 32
- Death : 4

***(Year 2070 – 2071)***

***Source : District Police Office Kaski***

THE RISING NEPAL
THE FIRST & FOREMOST NATIONAL DAILY



# Death toll in Sarangkot bus accident reaches five

Pokhara, March 6: The death toll in the Sarangkot bus accident has reached five and the number of injured 52.

The deceased have been identified as 50-year-old Hari Bahadur Khatri, 40-year-old Goma Luintel of Kaskikot, 50-year-old Hari Bahadur Khatri, 45-year-old Tara Thapa and 16-year-ild Diwas Timalsina of Pokhara Sub-Metropolitan City, said Superintendent of Police at the District Police office, Kaski, Hari Bahadur Pal told RSS on the phone.

Of the injured, condition of four is critical, according to the DPO, Kaski. Pal said critically injured eight-month-old Alis Thapa and 25-year-old Sabita Khadka have been airlifted to Kathmandu for treatment.

He said, "Preparations are underway to send the remaining critically injured Suman Thapa, 18, and Din Bahadur Dhakal, 25, of Pokhara Sub-Metropolitan City for treatment and waiting for helicopter."

The other injured are receiving medical treatment at different hospitals in Pokhara.

A bus (Ga 1 Kha 4849) heading towards Pokhara from Guntechour of Kaski, fell some 150 meters into a ravine, according to the DPO.

# Mass Casualty Incident (MCI)

- An incident which generates **more patients at one time** than locally available resources can manage using routine procedures.
- It requires **exceptional emergency arrangements** and additional or extraordinary assistance.
- The Objective of MCI is to **move** all patients to a medical facility as soon as possible.
- One has to do what is **practically possible** for the greatest number of victims.

# Disaster

- Any occurrence that causes damage, economic disruption, loss of human life and deterioration in health and health services on a scale sufficient to warrant an extraordinary response from outside the affected area or community.

# Characteristics of Disaster

1. The **normal** function of a community is disrupted.
2. Disaster **exceed** the coping mechanism of community.
3. The disruption is of such magnitude that there is an inability to return to normal functioning without **external assistance**.

# Types of Disaster

| NATURAL | MAN MADE |
| --- | --- |
| Earthquake | Road Traffic Accident |
| Flood | Building Collapse |
| Hurricane | Conventional warfare |
| Volcanic Eruption | Hazardous chemical incident |
| Drought | Nuclear & Biological incident |
| | Air Craft Crash |

# Hospitals & Disaster

- Hospitals **serve** as the **major resource** for the intake, evaluation & treatment of patients affected by disaster.
- It is vital that hospital preparedness personnel identify **vulnerable** people, structures and services in their hospital community so that these can be made more resilient to the effects of disaster.

# Issues to be addressed by Hospital

1. Surge capacity for additional space for treatment and evaluation.
2. Medication and supply stockpiles
3. Structural integrity
4. Trained staff
5. Response protocol and proper disaster response procedures.
6. Functional hospital based disaster plan

# Role of Hospital in Disaster Management

- A disaster will involve the entire hospital there will be increased **demands** upon equipment and personnel
- The hospital's **response** will have to be **managed and coordinated**
- Staff will need to be **supported** throughout response and recovery.

# Steps in MCI Management

1. Triage
2. Primary Survery
3. Secondary Survey
4. Treatment
5. Documentation

# Triage

- [French, from trier, to sort]
- A method of quickly identifying victims who have immediately life-threatening injuries AND who have the best chance of surviving.
- Aim of triage : To achieve the ***greatest good*** for the greatest number of casualty

# Types of Triage

1. M.A.S.S. Triage : based on patients ability to **move**
2. S.T.A.R.T. Triage : determines **severity** of injuries
3. Advanced Triage : More fully assess injury priority

# Concept of “Golden Hour”

- Golden Hour is a concept of trauma care developed by Dr Adams Cowley
- Refers to the amount of time **from injury to definitive care** that should be allotted to maximize survival from traumatic injury.
- Most studies have shown, if care given within **first hour of injury** morbidity and mortality can be reduced.

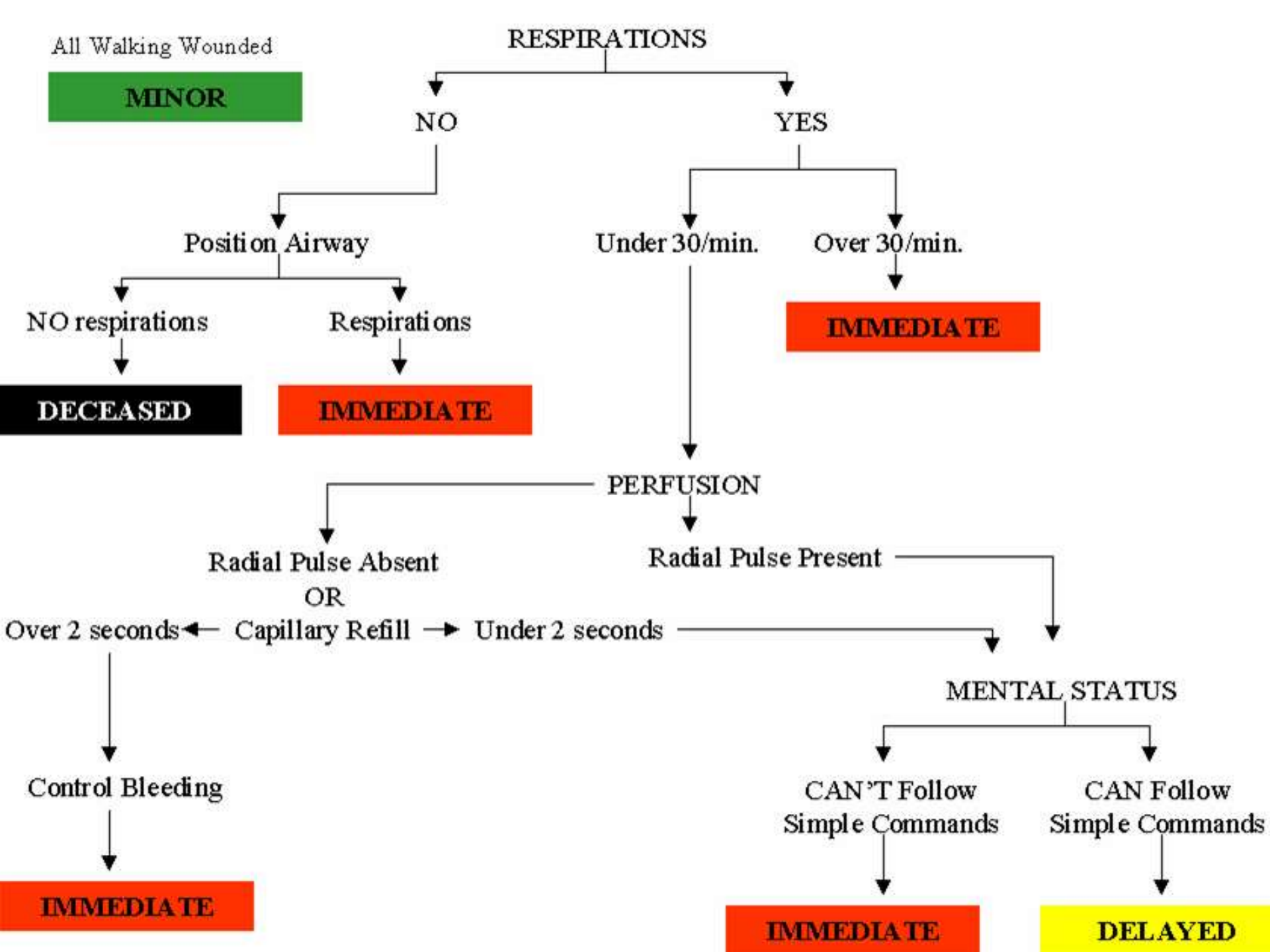
# START Triage

- START stands for Simple Triage & Rapid Treatment
- Rapid approach to triaging large numbers of causalities
- Fast, Easy to use, Easy to remember
- Allows the **most good for the most patients** with the least amount of resources.

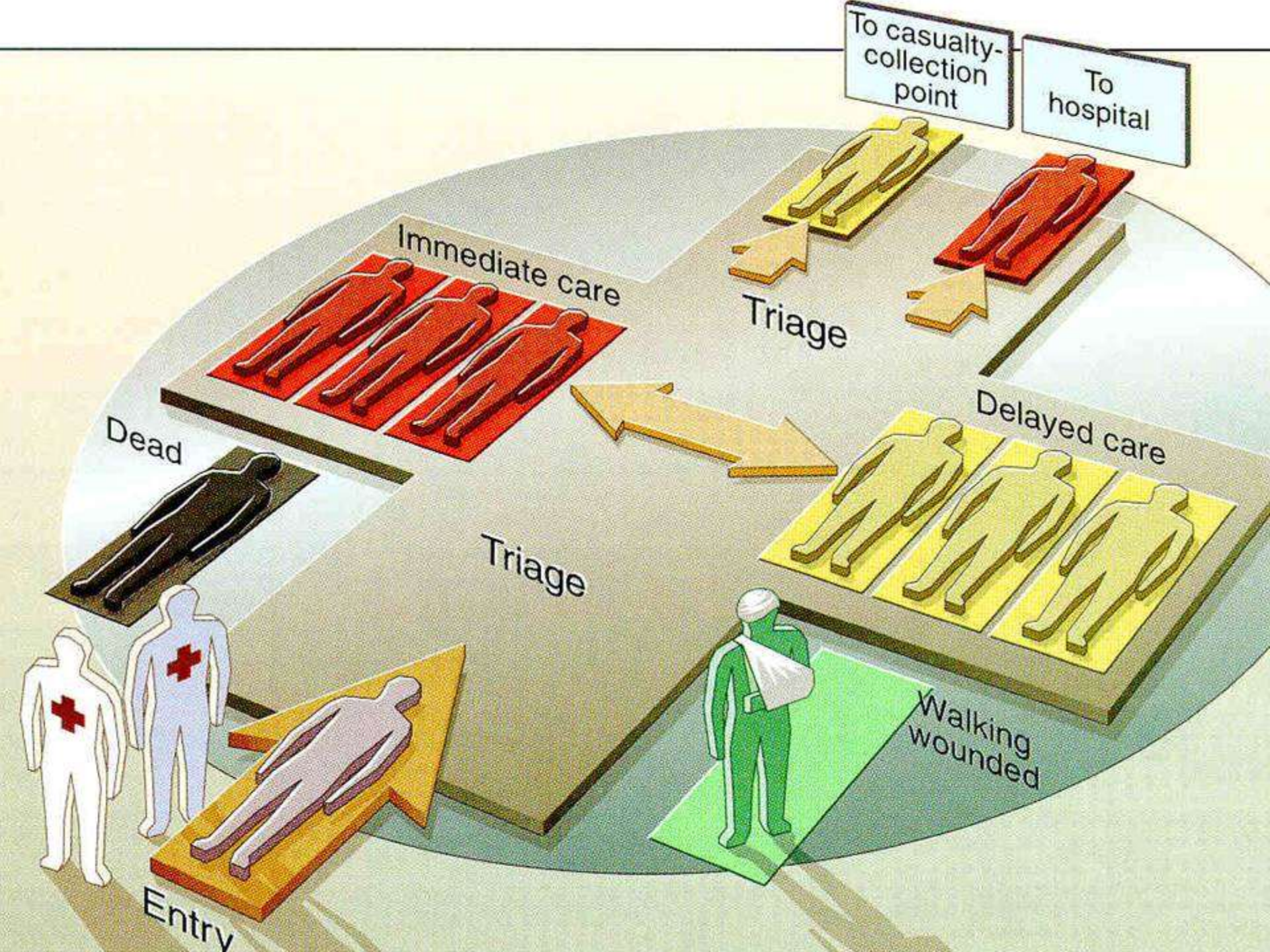
# START Triage

Clasification is based on three items

- Respiratory
- Perfusion
- Mental status evaluation


All Walking Wounded
MINOR
RESPIRATIONS
NO
YES
Position Airway
Under 30/min.
Over 30/min.
IMMEDIATE
NO respirations
Respirations
DECEASED
IMMEDIATE
PERFUSION
Radial Pulse Absent
OR
Capillary Refill
Radial Pulse Present
Over 2 seconds
Under 2 seconds
MENTAL STATUS
Control Bleeding
CAN'T Follow Simple Commands
CAN Follow Simple Commands
IMMEDIATE
IMMEDIATE
DELAYED

| GREEN | YELLOW | RED | BLACK |
|---|---|---|---|
| Ambulatory patients (Walking wounded) | Injured | Critically Injured | Dead |
| Abrasions, contusions, minor lacerations | Needs medical attention, but should not decompensate rapidly if care is delayed | • Obvious threat to life or limb<br>• Complications in their ABC's | •Unresponsive patients with no pulse<br>•Catastrophic head injuries and / or chest injuries. |
| Treatment within 24 hours | Treatment within 4 hours | Treatment within 2 hours | |
| Can be treated by other hospital personnel | Can be treated by orthopaedic surgeons | Treated by general surgery & Anesthesia team | |


To casualty-collection point
To hospital
Immediate care
Triage
Delayed care
Dead
Triage
Walking wounded
Entry

# Primary Survey

# Primary Survey

- The **first** survey done to assess the life threatening injuries and simultaneous treatment.
- Primary survery must be performed in no more than 2-5 minutes.
- Component of Primary survey : **ABCDE**

# Primary Survey

- **A = Airway with C spine**
- **B = Breathing**
- **C = Circulation**
- **D = Disability**
- **E = Exposure**

# Airway

- Always assume C-spine injury
  - C spine protection.
- Assess airway. Can the patient talk & breath freely?
- Signs of airway obstruction
  - Snoring  or gurgling
  - Stridor or abnormal breath sound
  - Agitation
  - Use of accessory muscles of ventilation
  - Cyanosis
  - Fracture (Facial & Cervical)
  - Injury to the neck (larynx & trachea)

# Airway Management

- Protect cervical spine as you maintain airway.
- Head tilt & Chin lift
- Manual removal of foreign body
- Suction
- Oropharyngeal airway
- Nasopharyngeal airway
- Definitive Airway
  - Endotracheal intubation (GCS<8)
  - Cricothyroidotomy
  - Tracheostomy


A

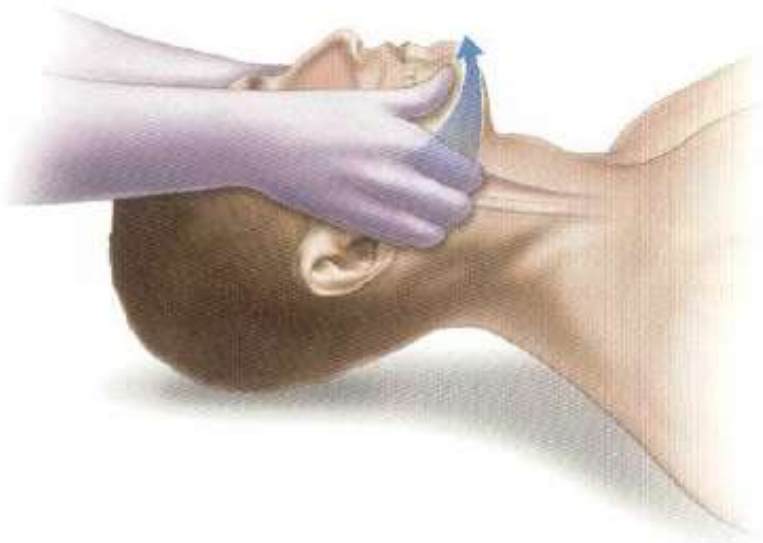
C

B

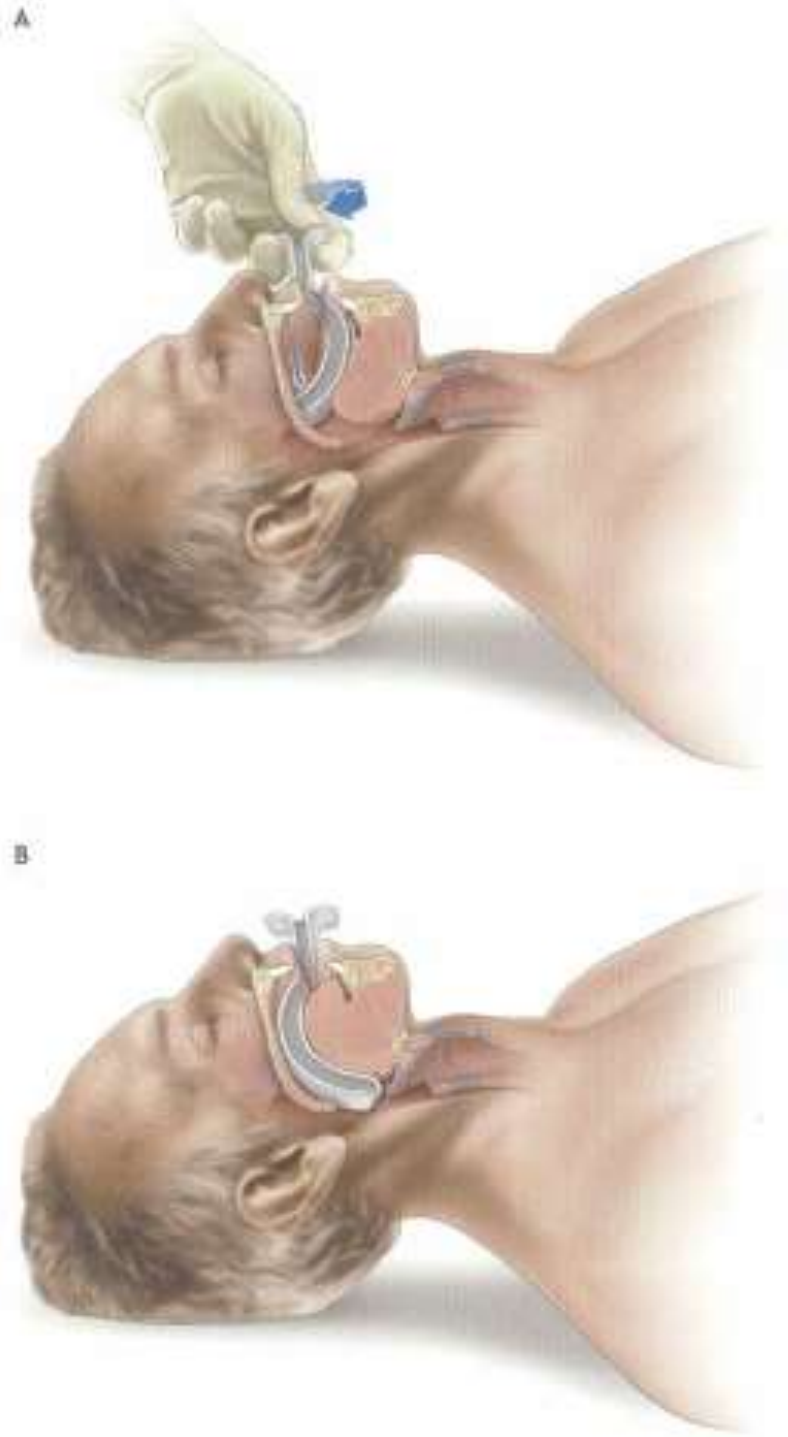
D

# Airway Maintenance

Chin Lift



Jaw Thrust




Insertion of Oropharyngeal airway

# Breathing

- Establishment of adequate ventilation
- Assessment
  - LOOK
    - Respiratory rate
    - Cyanosis
    - Penetrating injury
    - Presence of flail chest
    - Use of accessory muscle
  - FEEL
    - Tracheal Shift
    - Broken ribs
    - Subcutaneous emphysema
    - Percussion
  - AUSCULTN
    - Abnormal sound
    - Decreased sound

# Breathing Management

- Oxygen via face mask
- Bag & Mask Ventilation
- Intercostal chest drain

- Assess Ventilation
  - Chest movements
  - Pulse oximetry

# Circulation

- Is patient in shock?
  - Hemorrhagic
  - Non hemorrhagic
- Assess
  - Pulse
  - Temperature
  - BP
  - Capillary Refill Time
  - Urine Output
  - Level of Consciousness
  - Skin color

# Shock

- Hypovolemic shock (Most common in trauma)
  - Assess Blood loss
    - Large volume of blood may be hidden in abdominal & pleural cavity
    - Femoral shaft : 2 liters of blood
    - Pelvic fracture : 2 L
- Cardiogenic Shock
  - Myocardial contusion
  - Cardiac tamponade
  - Penetrating wound in heart
- Neurogenic Shock
  - Spinal cord injury
  - Hypotension without reflex tachycardia or cutaneous vasoconstriction

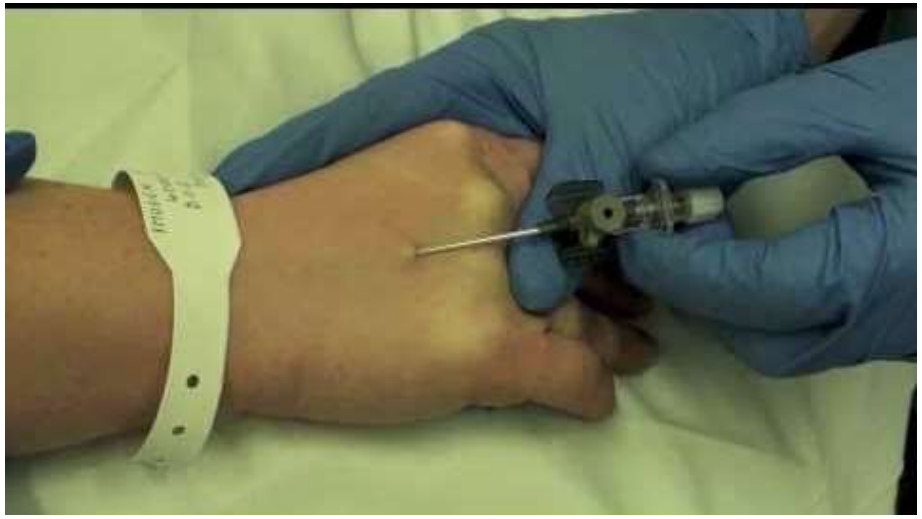
# Hemorrhagic Shock

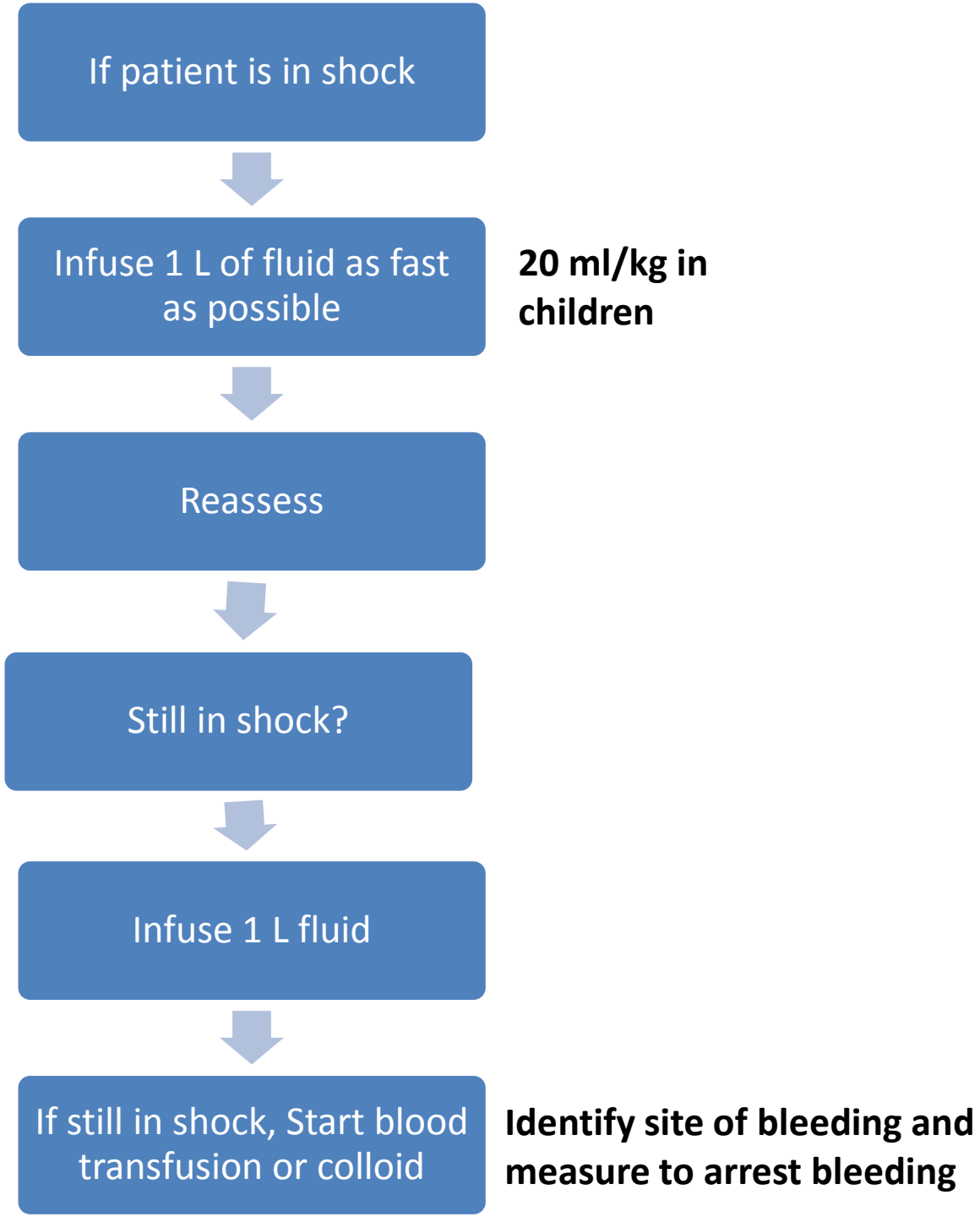
**TABLE 3-1 ■ Estimated Blood Loss[a] Based on Patient's Initial Presentation[b]**

| | CLASS I | CLASS II | CLASS III | CLASS IV |
|---|---|---|---|---|
| **Blood loss (mL)** | Up to 750 | 750–1500 | 1500–2000 | >2000 |
| **Blood loss (% blood volume)** | Up to 15% | 15%–30% | 30%–40% | >40% |
| **Pulse rate** | <100 | 100–120 | 120–140 | >140 |
| **Blood pressure** | Normal | Normal | Decreased | Decreased |
| **Pulse pressure (mm Hg)** | Normal or increased | Decreased | Decreased | Decreased |
| **Respiratory rate** | 14–20 | 20–30 | 30–40 | >35 |
| **Urine output (mL/hr)** | >30 | 20–30 | 5–15 | Negligible |
| **CNS/mental status** | Slightly anxious | Mildly anxious | Anxious, confused | Confused, lethargic |
| **Fluid replacement** | Crystalloid | Crystalloid | Crystalloid and blood | Crystalloid and blood |

# Circulatory Resuscitation Measures

- Aim is to restore oxygen delivery to tissues.
- 2 large bore IV cannula (14-16G)
- Infusion fluid (NS) warmed to body temperature
- Avoid solutions containing glucose
- Monitor urine output
  - 0.5ml/kg/hr (Minimum)
  - 1ml/kg/hr (Adequate)
- Dynamic fluid response
- Arrange & Cross match blood




If patient is in shock
Infuse 1 L of fluid as fast as possible
Reassess
Still in shock?
Infuse 1 L fluid
If still in shock, Start blood transfusion or colloid
3:1 Rule
20 ml/kg in children
Identify site of bleeding and measure to arrest bleeding

| Pulse | Systolic BP |
| --- | --- |
| Carotid | >60 mm Hg |
| Femoral | >70 mm Hg |
| Radial | >80 mm Hg |
| Dorsalis Pedis | >90 mm Hg |

# Response to Fluid Resuscitation

**TABLE 3-2 ■ Responses to Initial Fluid Resuscitation[a]**

| | RAPID RESPONSE | TRANSIENT RESPONSE | MINIMAL OR NO RESPONSE |
|---|---|---|---|
| **Vital signs** | Return to normal | Transient improvement, recurrence of decreased blood pressure and increased heart rate | Remain abnormal |
| **Estimated blood loss** | Minimal (10%–20%) | Moderate and ongoing (20%–40%) | Severe (>40%) |
| **Need for more crystalloid** | Low | High | High |
| **Need for blood** | Low | Moderate to high | Immediate |
| **Blood preparation** | Type and crossmatch | Type-specific | Emergency blood release |
| **Need for operative intervention** | Possibly | Likely | Highly likely |
| **Early presence of surgeon** | Yes | Yes | Yes |

# Disability (Neurologic Evaluation)

- Rapid neurologic evaluation
- There is no time to do the GCS so a
  - A : Awake
  - V : Verbal response
  - P : Painful response
  - U : Unresponsive
- Assess pupil bilaterally

# Exposure/Environmental Control

- Undress patient and look for head to toe examination
- If the patient is suspected of having a neck or spinal injury in line immobilization is important.
- Prevent hypothermia

# Common Life Threatening Conditions

| Airway | Obstruction |
| --- | --- |
| Breathing | Haemothorax |
| | Tension pneumothorax |
| | Flail Chest |
| Circulation | Hypovolemic Shock |

# Secondary Survey

# Secondary Survey

- Secondary survey is undertaken when the patient's **ABCs are stable**
- To identify all **minor injuries** missed in primary survey
- If any deterioration occurs must be interrupted by Primary survey.

# Secondary Survey

- Patient History
- Head to Toe examination
- Complete neurological examination
- Diagnostic Tests
- Re-evaluation

# Patient History

- A – Allergies
- M – Medication currently used
- P – Pregnancy / Past Illness
- L – Last Meal
- E – Events

# Head Trauma

- Look for
  - Scalp & ocular abnormality
  - External ear & tympanic membrane
  - Periorbital soft tissue injuries
  - Fractures

- Immediate recongnition of conditions
  - Acute extradural hematoma
    - Lucid Interval
    - Hemiparesis
  - Acute subdural hematoma
  - Base of skull fracture
    - Battle sign ; Racoon eyes
  - Cerebral concussion

# Head Trauma

- Remember..
  - Isolated head trauma doesn’t causes hypotension.
  - GCS < 8 : Severe Head Injury
  - Cushing response is physiological but has poor prognosis sign

# Management of Head Trauma

- Intubation & Hyperventilation
- IV Fluids
- Nurse in head up position

# Chest Trauma

- Examine
  - Clavicles & ribs fracture
  - Breath sounds & Heart sounds
- Early deaths in thoracic trauma includes airway obstruction, cardiac tamponade & aspiration.

# Chest Trauma

- Tension pneumothorax
- Haemothorax
- Pulmonary contusion (Delayed deterioration in RR)
- Myocardial contusion (Sternal #, ECG)
- Cardiac tamponade (Beck's triad)
- Great vessels & Aortic rupture

# Abdomen trauma

- Penetrating wound
- Abdomen distension
- Tense and tenderness
- Bowel sound

# Abdominal Trauma

- Patient with serious accident is considered to have abdominal trauma until proved otherwise.
- Unrecognized abdominal injury remains frequent preventable cause of death.
- 20% of patients with acute hemoperitoneum have no sign of periotneal irritation at first examination.

# Abdominal Trauma - Management

| | STABLE | UNSTABLE |
|---|---|---|
| No Abdominal Sign | Observe | DPL/FAST Scan |
| Abdominal Sign | CT Scan | Laparotomy |

# Abdominal Trauma – Associated Injuries

- Urethral Injury
  - Triad : Butterfly rash in perineum, Blood in ext urethral meatus, Urinary bladder distension
- Rectal injury

# Spinal Trauma

- Examination  must be done in neutral position.
- Mobilization by log roll
- Transport in neutral position in spinal board.

# Limb Trauma

- Look
  - Color
  - Deformity
  - Wound
  - Swelling
- Feel
  - Tenderness
  - Crepitation
  - Temperature
  - Distal neurovascular status
- Move

# Limb Trauma – Special Issues

- Active bleeding
- Open Fracture
- Compartment syndrome
- Amputated Extremity

# Principles of Mass Casualty Management

# Mass Casualty Management in ER - Principles

1. Policies and Procedures
2. Emergency or Disaster Plan
3. Operating Theatre
4. Staffing Requirements of the ER
5. Overcrowding
6. Equipment & Supplies of the ER
7. Contingency
8. Observation & Holding Area
9. Referral & Transfer

# Policies & Procedures

- All hospital & emergency department must have clearly written & disseminated policy & procedures.
- Policy must be reviewed after each major emergency or disaster scenario.

# Emergency or Disaster Plan

- Emergency plan has to be well written and contain important elements such as triage criteria & the incident command system.
- Important questions
  - Who needs to be prioritised for definitive care?
  - Who is in charge?
  - What are the functions of each & every member of the emergency team?

# Operating Theatre

- Access to functioning OT allows for early definitive care and minimises unwanted morbidity or preventable mortality.

# Staffing Requirements of ER

- Nurses
  - Nursing staff in ER must have training in triage, trauma management, disaster management.
  - The nursing staff must be able to
    - Work with emergency medical doctors and the surgeons treating injured patients.
    - Ensure resuscitation equipment and drugs are available & adequate.
    - Help triage patients during a mass casualty incident.

# Staffing Requirements of ER

- Emergency Medicine Physicians
  - Emergency doctors help triage & institute initial management to injured patients while surgeons deliver definitive care.
- The Trauma Team
  - Comprises surgeons, anesthesiologist & trauma nurses.
  - Delivers definitive care

# Overcrowding

- In developing countries, ER are lacking resources for day-to-day problem even before the occurrence of disaster.
- Modern principles of emergency medicine don’t exist.
- After a mass casualty incident, hospital is flooded with visitors which makes the working environment chaotic and difficult which needs to be controlled.

# Equipment & Supplies

- Airway devices
  - Oxygen tanks, nasal prongs, oropharyngeal airway devices, nasopharyngeal airway device
  - Intubation equipments
- Management of Shock
  - Surgical gauge pack, roll bandages, IV cannula, crystalloids and colloid, Access to blood bank, Traction splints
- Emergency Drugs
- The equipments & drugs should be in bulk and readily available during mass casualty incident.

# Contingency

- Planning is the key to the proper response to a mass casualty incident.
- Worst case scenario must be thought through and procedures developed for each possibility.

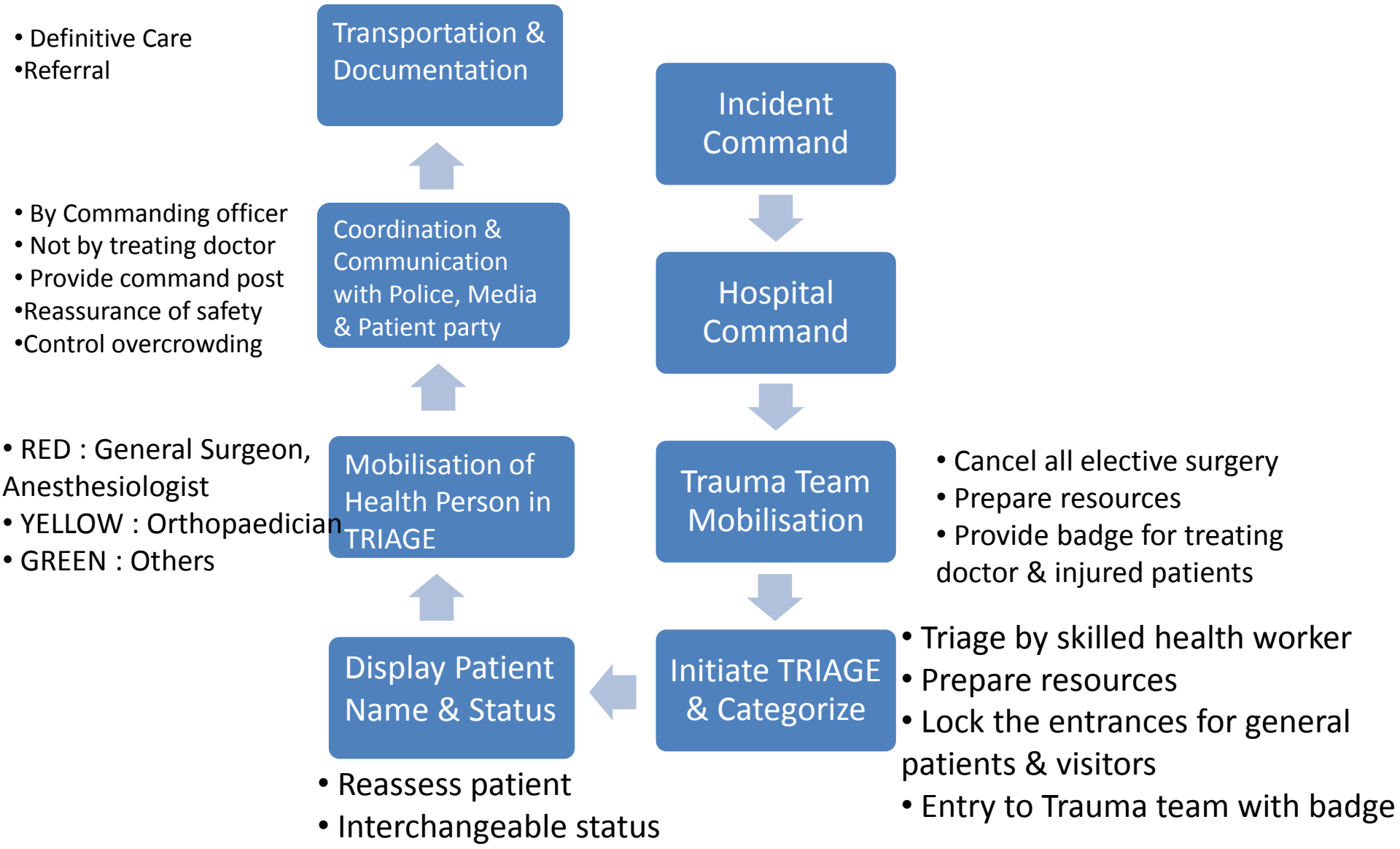
# Observation & Holding Area

- During an influx of patients to a hospital temporary patient care areas may have to be established like lobby areas & corridors.

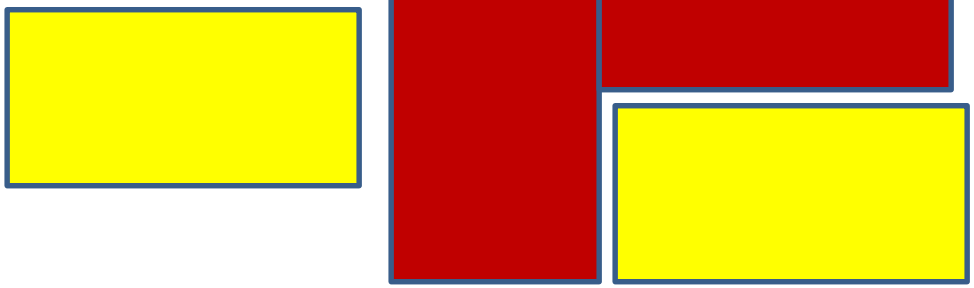
# Referral & Transfer

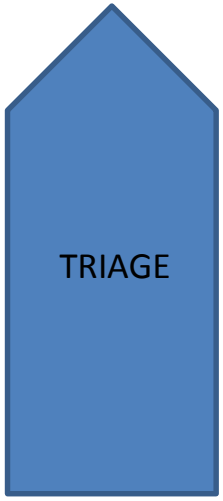
- When the hospital is flooded to its capacity, the process of referral & transfer to other hospitals must be considered.

# Mass Casualty Incident Management



# Triage Selection Area in ER






ENTRANCE

Display

# Conclusion

- Hospitals should be prepared in handling mass casualty incidents with well written policy and guidelines.
- Triage system should be followed in ER
- Well equipped ER with skilled manpower can save lives in mass casualty incident.
- Initial treatment in ER by Emergency staffs is life saving whereas definitive treatment is delivered by specialist.


THANK YOU