

# Polytrauma

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# What are the causes of death?

1. Cardiovascular disease (IHD, strokes) 52%
2. Tumors 26%
3. Trauma(external causes) 7%
  - a. Traffic, work, sports, home, industrial, criminal

BUT !!!!

★ Trauma under 40y ..... 1st place !



# Polytrauma

- Injury of 2+ organ systems and at least one of them is life threatening
- Active approach of diagnostics and treatment
- Co - operation
- Centralisation
-

# Body regions and injured systems:

- Head, neck, and cervical spine
- Face
- Chest and thoracic spine
- Abdomen and lumbar spine
- Limbs and bony pelvis
- External (skin)

- Limbs 90%
- Skull and brain 72%
- Chest 53%
- Abdomen 29%
- Pelvis 24%
- Spine 10%
- Heart&vessels 10%

# Polytrauma

- High energetic trauma
- 3R rule: right patient, right hospital, right time
- scoring systems:

## prediction of injuries and survival

- Glasgow coma scale
- Abbreviated injury scale (AIS)
- Injury severity score (ISS)
- AO classification
- Tscherne, Gustillo-Anderson

# ISS skóre

## Injury Severity Score; ISS

Region	Injury Description	AIS	Square Top Three
Head & Neck	Cerebral Contusion	3	9
Face	No Injury	0	
Chest	Flail Chest	4	16
Abdomen	Minor Contusion of Liver Complex Rupture Spleen	2 5	25
Extremity	Fractured femur	3	
External	No Injury	0	
Injury Severity Score:			50

AIS Score	Injury
1	Minor
2	Moderate
3	Serious
4	Severe
5	Critical
6	Survivable

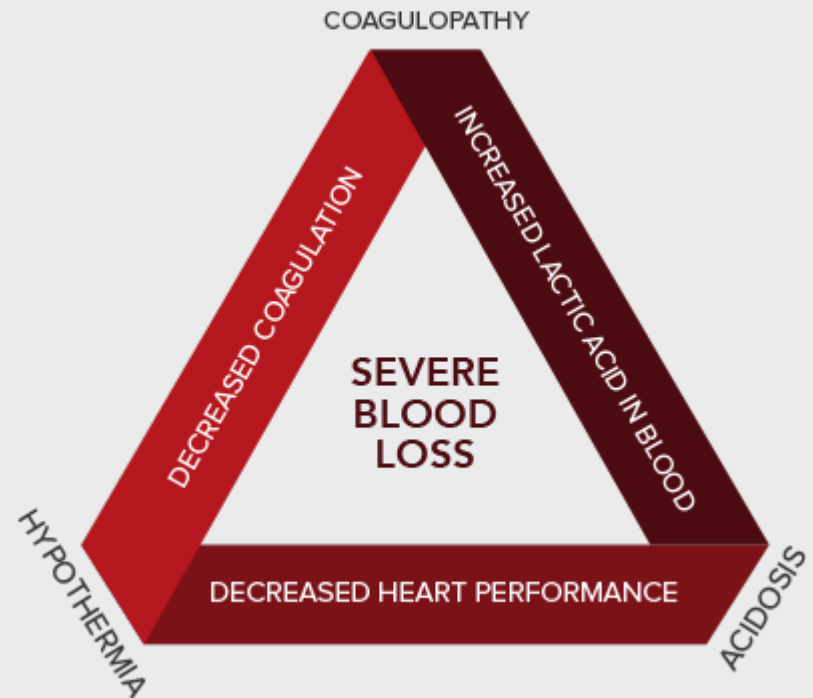
ISS	
1-8	Minor
9-15	Moderate
16-24	Serious
25-49	Severe
50-74	Critical
75	Maximum

# Field triage - ATLS

- **Mechanism of injury**
  - Falls > 6 meters (second floor)
  - High risk auto crash (ejection, intrusion, death of another passenger, telemetry)
  - Motorcycle crash > 30 km/h
  - Auto vs. pedestrian/bicyclist > 30 km/h
- **Consider special conditions**
  - Age < 6y or > 55y
  - Cardiopulmonar comorbidity
  - Pregnancy
  - etc
- **Vital signs and level of consciousness**
  - GCS < 13
  - Systolic blood pressure < 90
  - Respiratory rate < 10 or > 29 (or need for ventilatory support)
- **Anatomy of injury**
  - All penetrating injuries
  - Pelvic fractures
  - Two or more proximal long-bone fractures
  - Crushed, degloved, mangled, or pulseless extremity
  - Amputation proximal to wrist or ankle
  - Open or depressed skull fracture
  - Paralysis

## What will kill your patient

- Hemorrhagic shock
- Any other shock
- Bacterial contamination
- immunosuppression
- Lethal triad
- SIRS...MODS...MOF





# Approach to polytraumatized patient

**Pre-hospital** care (pre-medical, technical, medical)

Transport to the **trauma center**

**Damage control**

**Definitive treatment**

# Management of polytrauma

- Primary survey /ABCDE/- ATLS principles
- Resuscitation
- Secondary survey
- DCS, DCO
- Stabilisation of patient
- Definitive treatment

# Airway + C-spine protection

- Obstruction

(foreign body, blood vomit, tongue, fracture, outter compression...)

- Maneuvers - chin lift, jaw thrust, NO head tilt!!!

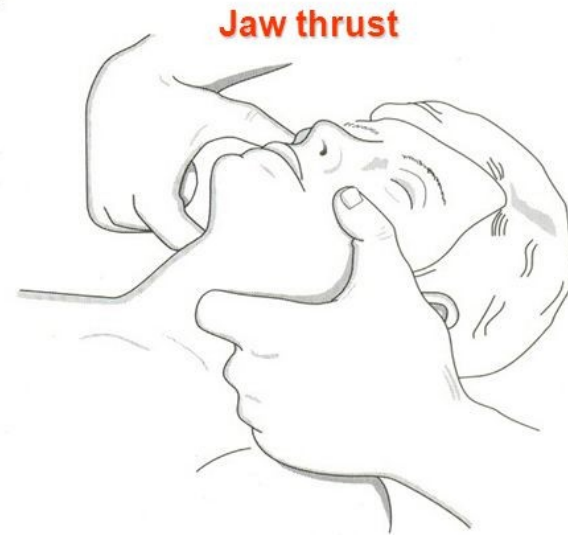
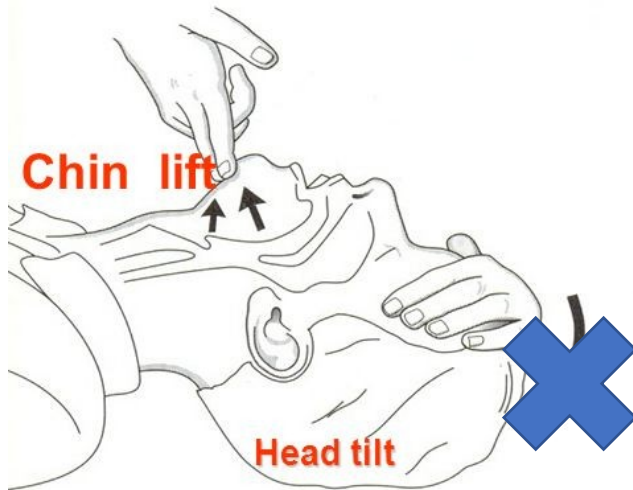
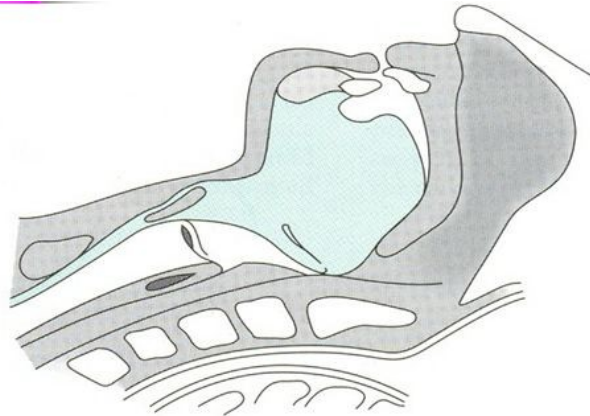
- Succion, airways, SGD, OTI, NTI, surgery

- C spine control- neck collar, head blocks, manual imobilization

- GCS 8 nad less... intubate!

# Manual maneuvers

**CPR...  
AIRWAY**



# Airway management No1.

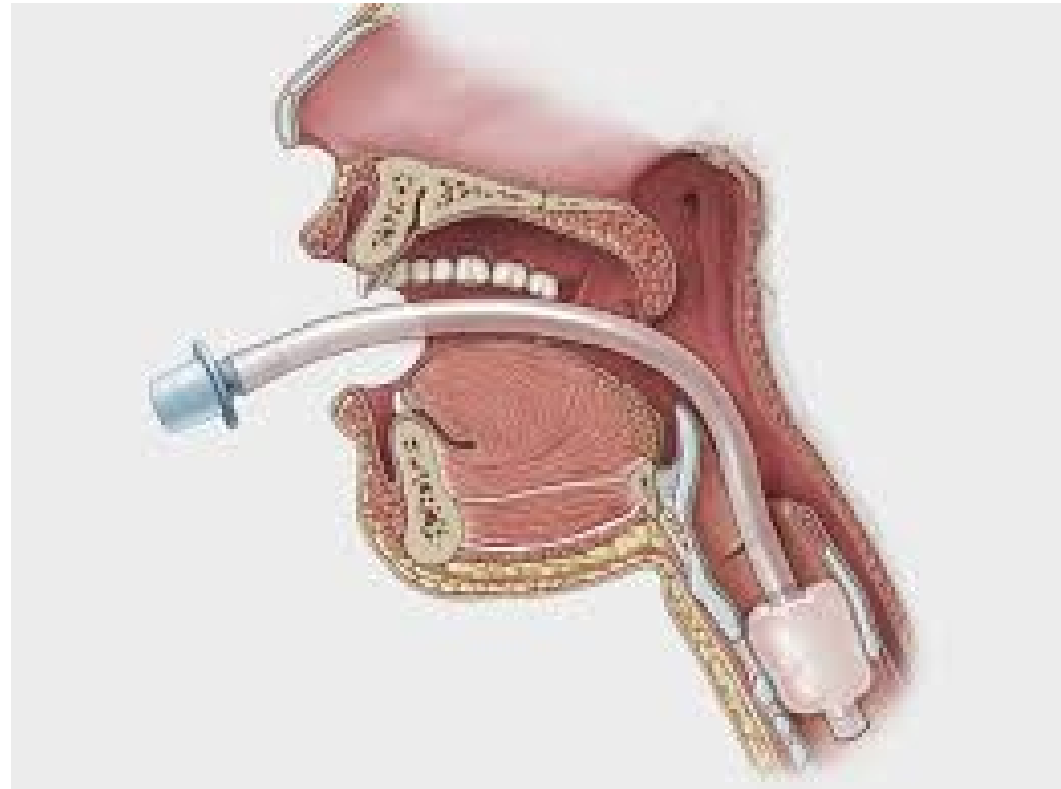
Airway - nasal, oral

Combitube

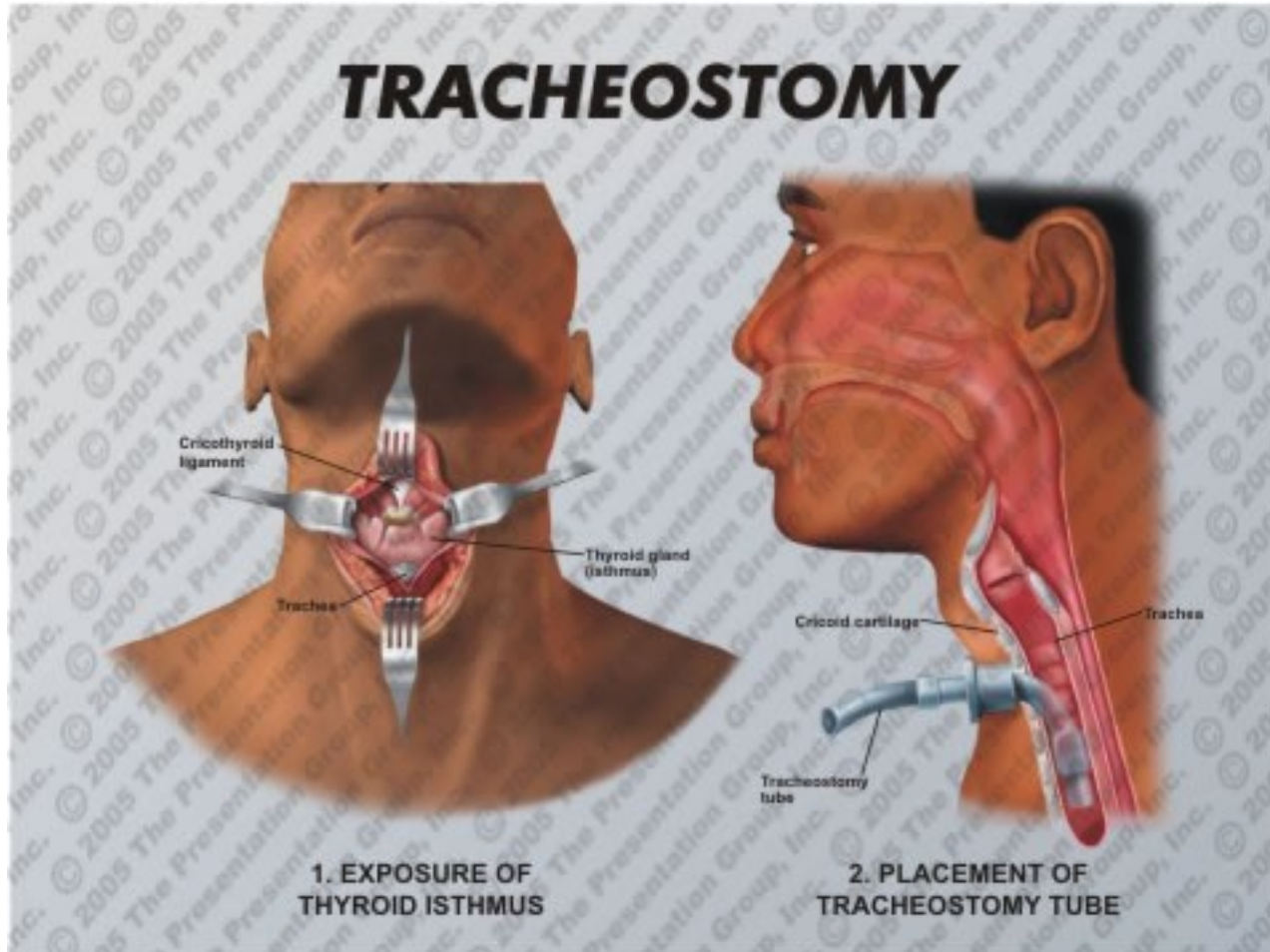
Laryngeal mask



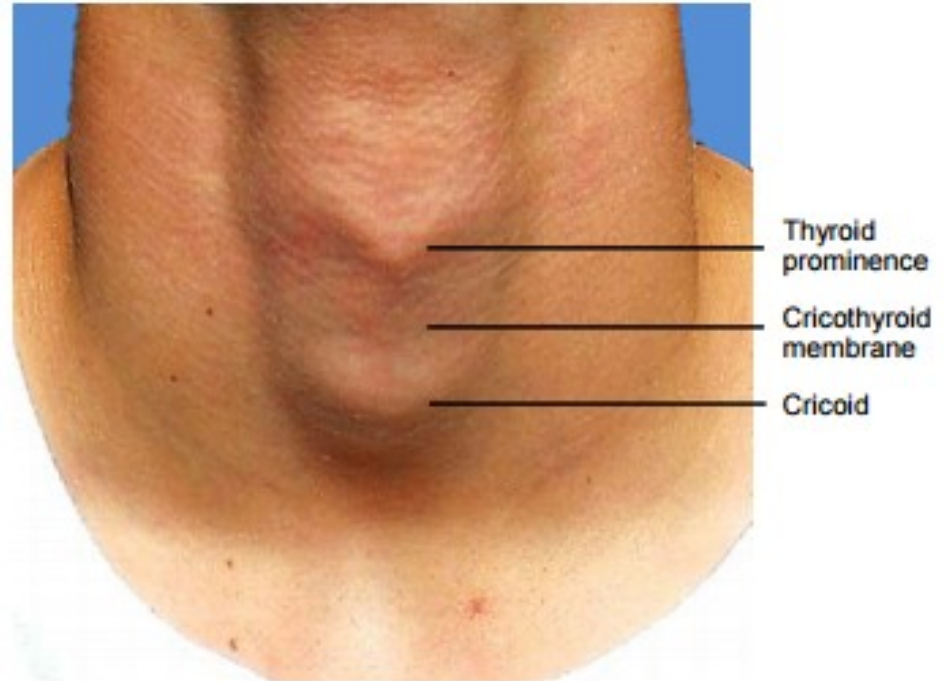
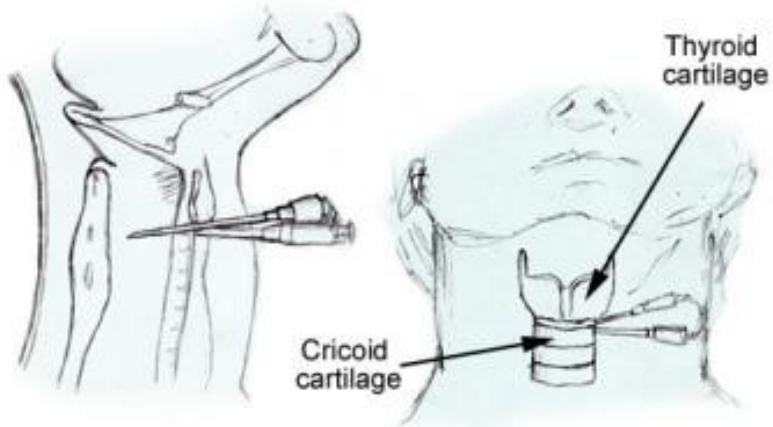
## Airway management No.2 – endotracheal intubation



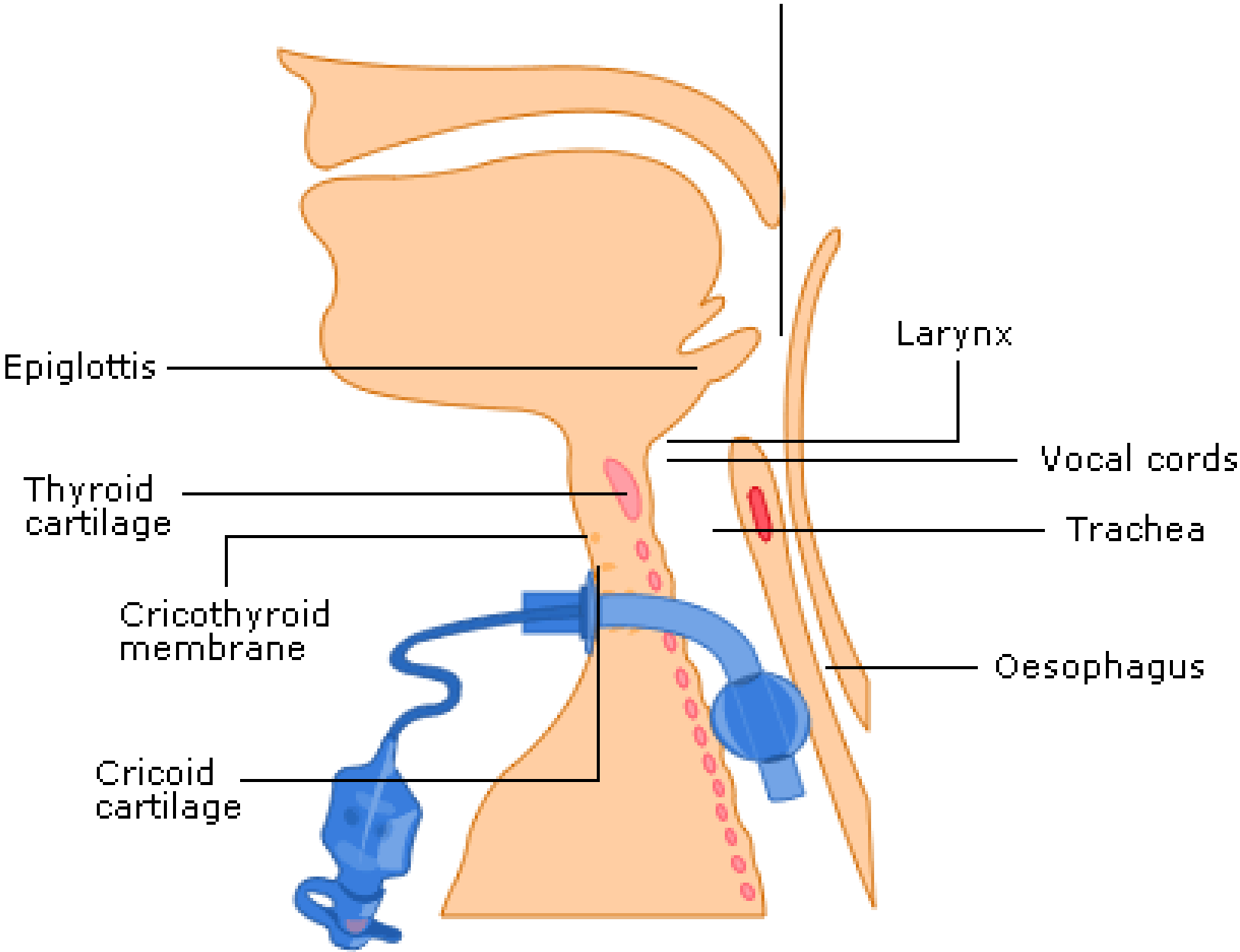
If everything else fails....



# But cricothyreotomy is faster!!!



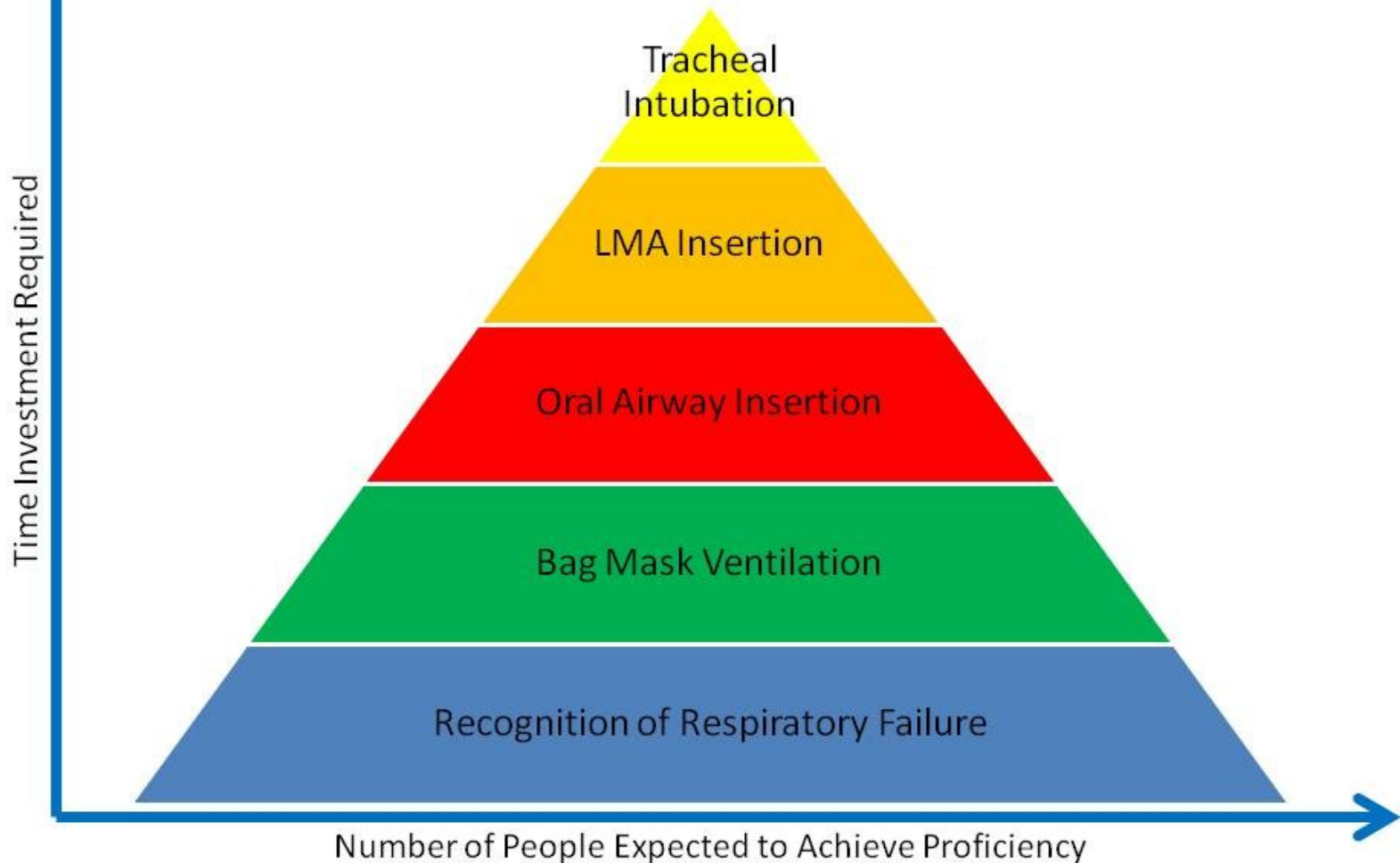


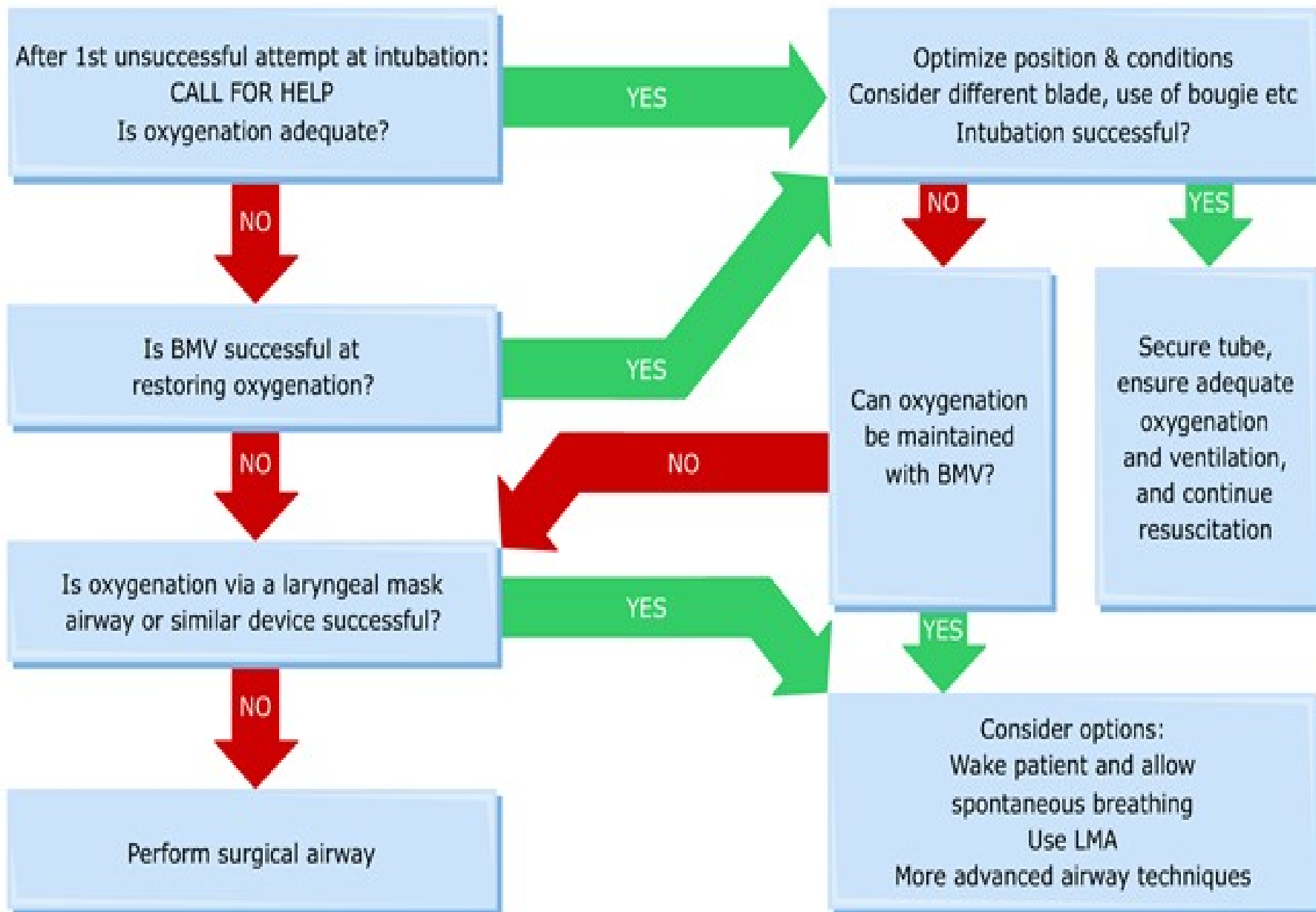


# Cricothyrotomy emergency kit



# Airway Skills Pyramid





# C-spine control

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Ideal C spine protection

# Spine board, Vacuum SB

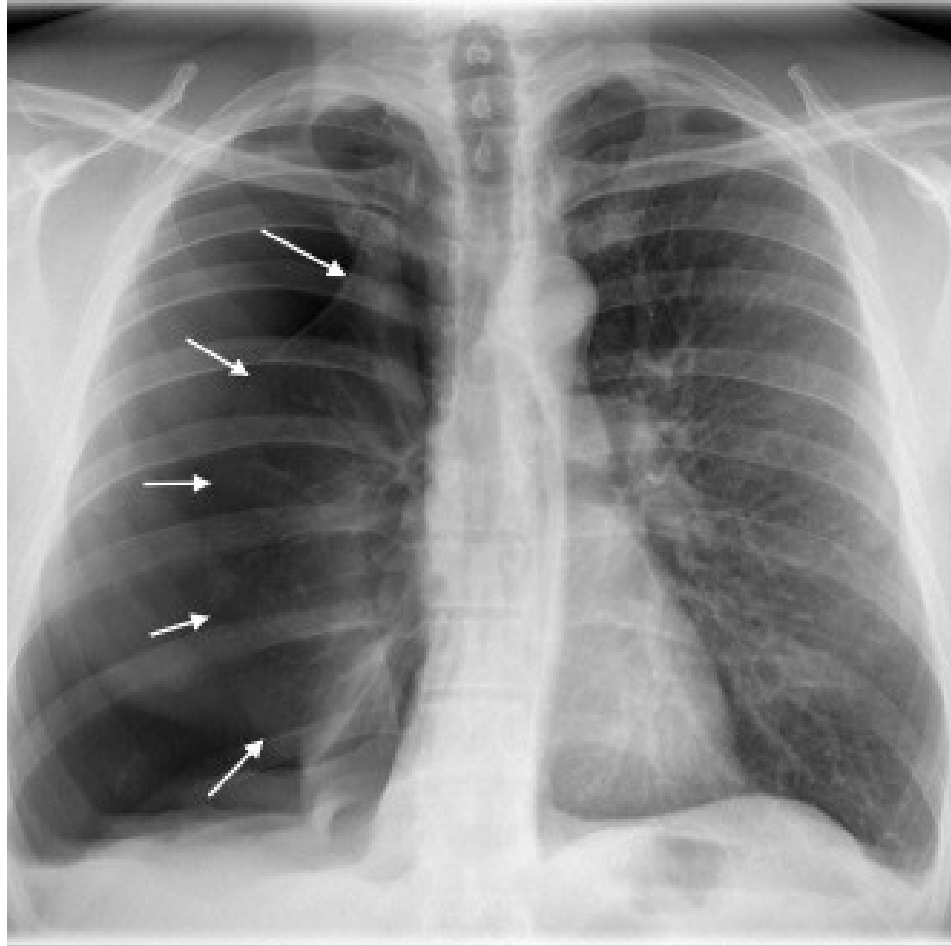


# Breathing

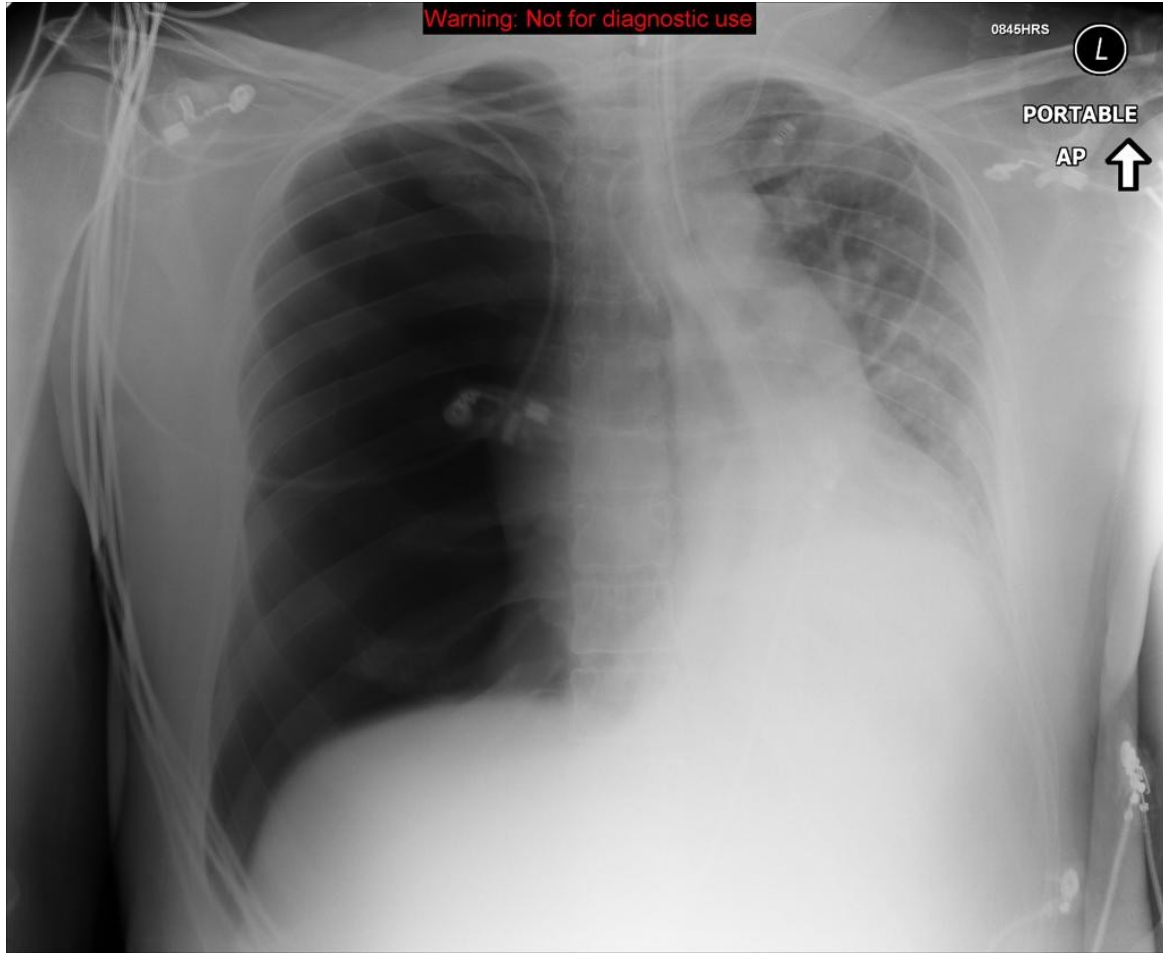
- PNO, hemotorax
- Fractured sternum, ribs, scapula, collar bone
- Diaphragmatic rupture
- Flair chest
- aspiration

**Deliver oxygen via BMV!!!**









Warning: Not for diagnostic use

0845HRS

L

PORTABLE

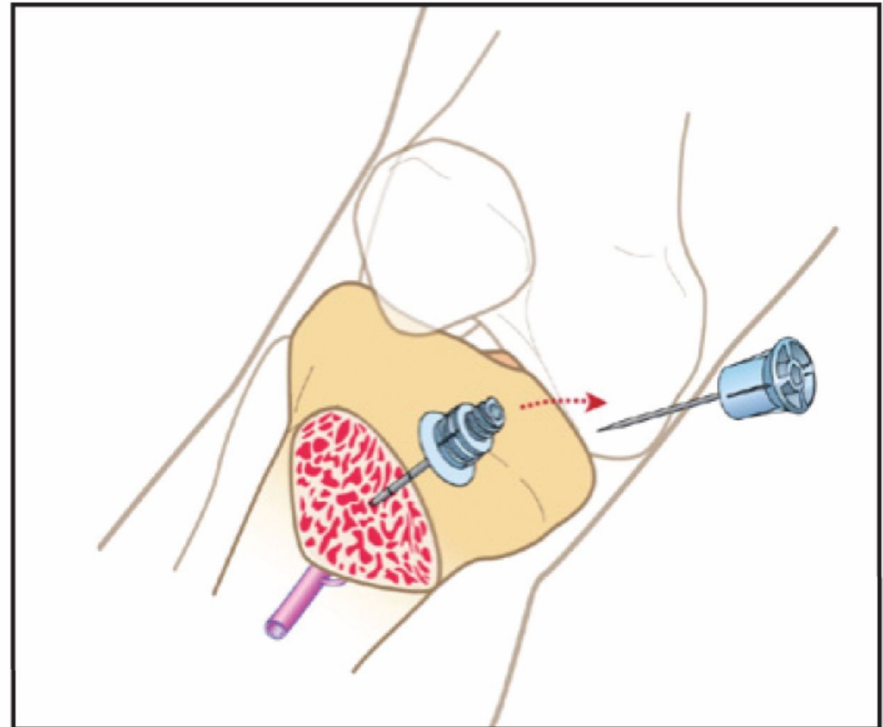
AP



# Circulation

- Identify & stop bleeding
  - „Blood on the floor, 4 places more!“
- Replacement of intravascular volume
- 1st - crystalloids, blood derivatives, colloids??. vasopressors
- Blood replacement protocol (4EBR:4FFP:1TRO + 1Exacyl+4g Fibrinogen)
- Permissive hypotension

- Minimum 2 strong IV caths!!!
- Intraosseal entry – tibia, ankle, humerus
- Urinary output – GOAL - 1ml/kg/hour
- 



# Disability

- GCS, pupils, liquorrhea, battle sign, racoon eyes
- Agitation, confussion, pain, emotional reaction
- Drugs, alcohol, medication
  
- Pain management after ABCD!!!!

# Battle's sign & Raccoon eyes



# Exposure, environment

- Undress your patient for secondary survey
- Warming up your patient
  - Blanket, IV fluids
- LOCK ROLL !!!
- 3-4 persons





# Garther all the informations possible!!!

- Allergies
- Mechanism
- Medication
- Injury found and suspected
- Previous medical history
- Signs, symptoms
- Last meal
- Treatment initiated
- Events related to injury

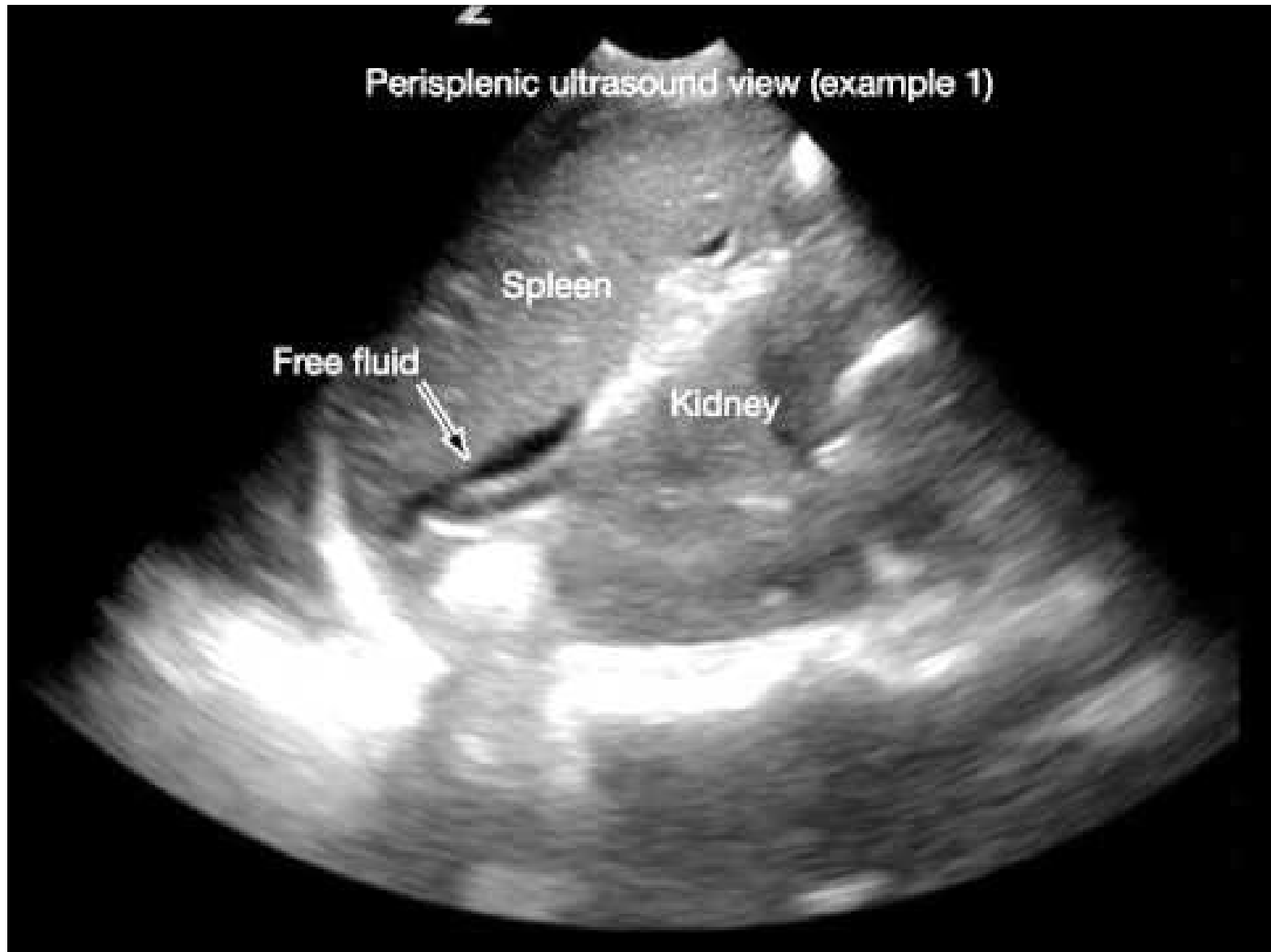
# Lab

- Hb, Leu, Tro, Ery, coagulation, ROTEM - bed side
- Basic biochem.
- Blood group type, EBR, ČMP reserve
- Toxicology?
- Alcohol level in blood (legal issues)

# FAST

- Focused assessment sonography for trauma
- Quick orientation- free fluid, no details required
- Repetitive, non-invasive, bed side
- Both hemithoraces, abdominal cavity, pelvis
- +/- pericardial sack

Perisplenic ultrasound view (example 1)



Spleen

Free fluid

Kidney

# X- ray

- Chest X-ray
- pelvis
- According to today's protocol not needed
- Replaceable by clinical examination
- Majority of patients get CT scan
- Bones – NOOO!!! Time for that!!!



# CT polytrauma protocol

- Only for hemodynamic stable and secured patient!!!!
- Golden standart
- Nativ, IV. contrast - art., ven. phase
- Alergies?? (AMPLE)
- Radiologist at the place!!!

# Decision making:

- Stabile ... FAST negativ. .... CT... next...
- Stabilní...FAST pozitiv ...still stabile...CT... next...
- Non-stabile... FAST pozitiv.... surgery
- Non-stabile.... FAST negativ. ....???



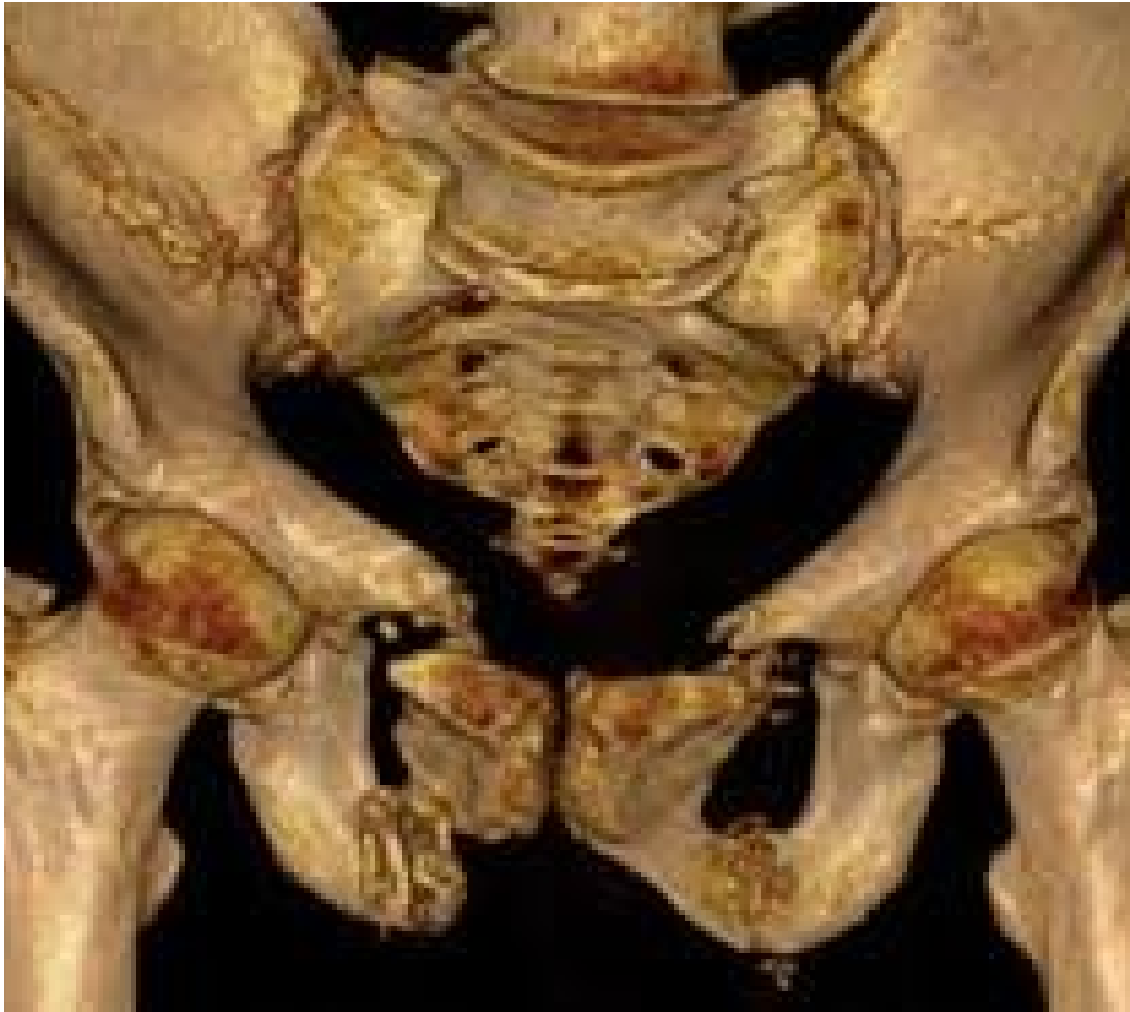
# Urgent life-saving procedures

1. ABC
2. tension pneumothorax
3. heart tamponade
4. Massive PNO, hemothorax
5. stabilisation of long bone/hip fractures
6. urgent laparotomy for major bleeding ??
- 7.

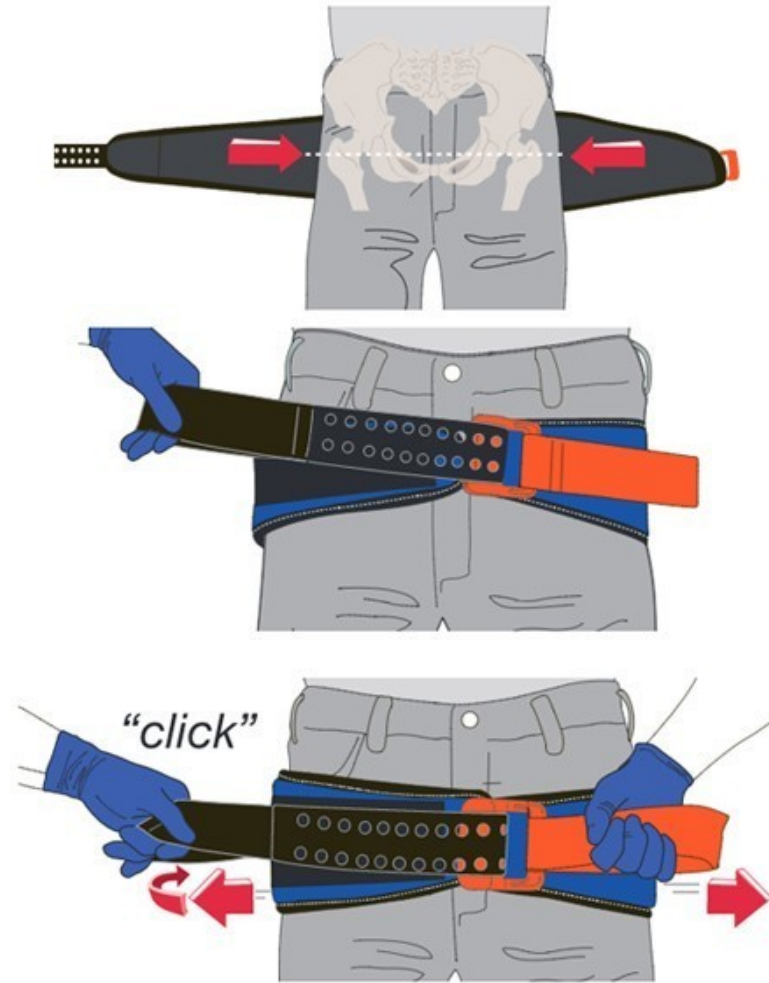
# Skeletal extension

reduces bleeding, reduces pain, stabilizes fracture

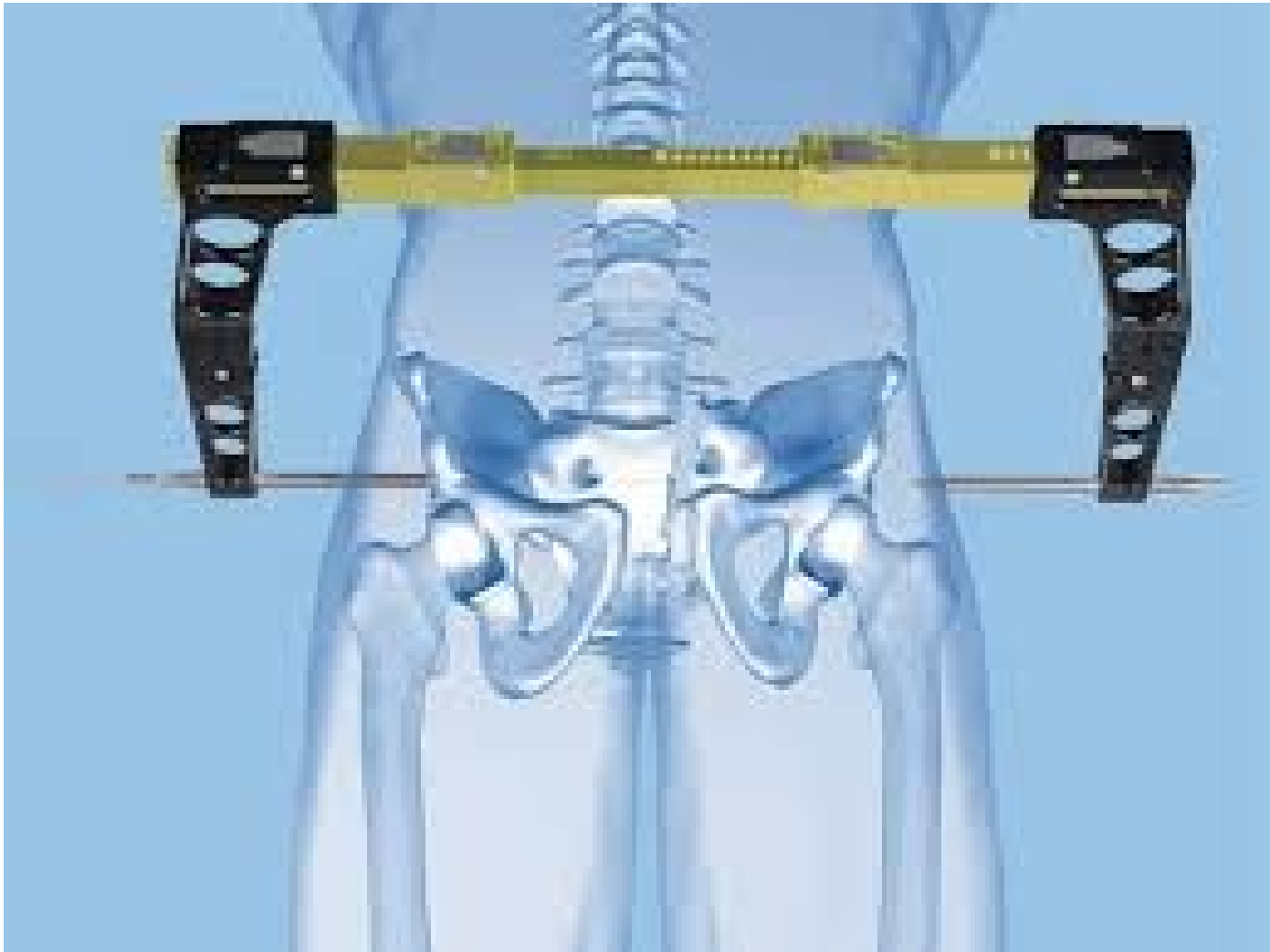




# Pelvic binder



# Pelvic C- clamp



# Damage control surgery

- „Easy“ and fast life-saving surgical procedures
- Not reconstructions!!!
- „golden hour“ rule, „Life before limb“ policy
- Identifying priorities:
- Stop bleeding (ektomy, tamponade, packing)
- Decontamination (resections, staplers)
- Fracture stabilisation (external fixation)

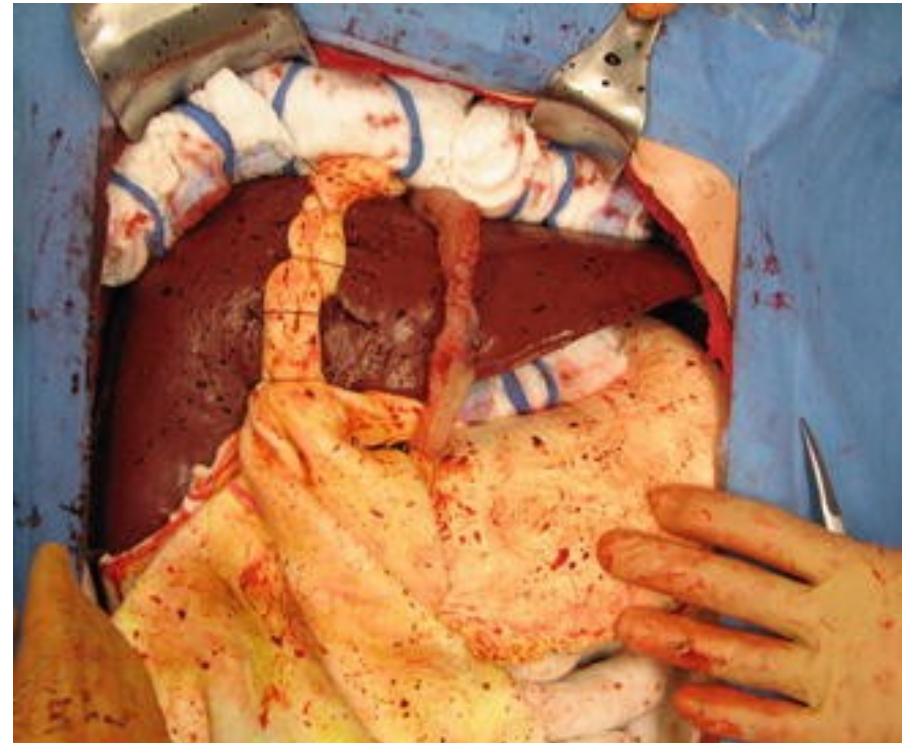
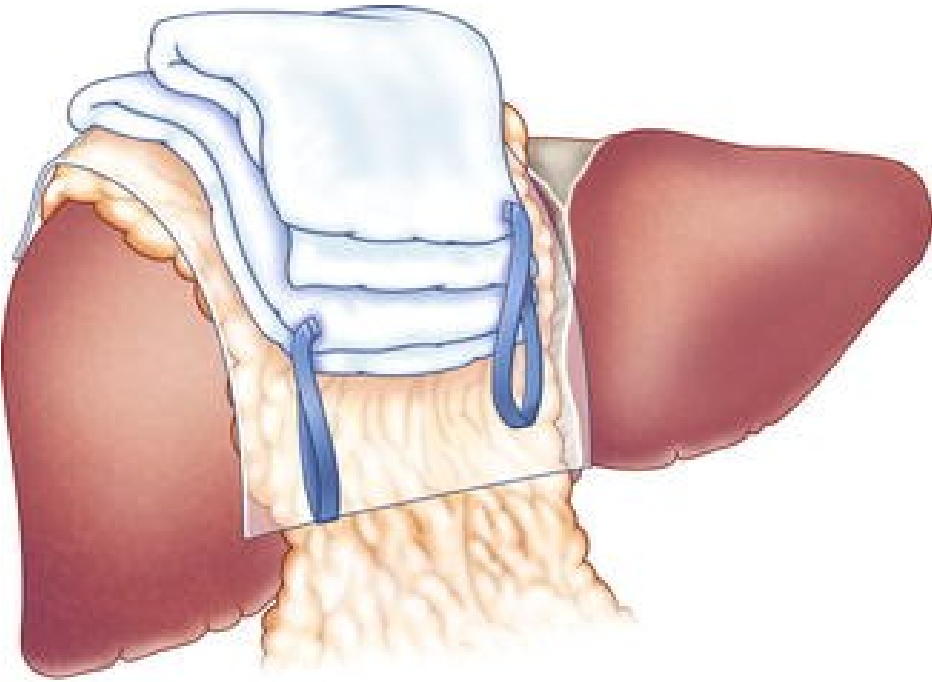
# Why should I take care of fractures? It is not life-threatening, right?

## Estimated Blood Loss

<b>Bone</b>	<b>Approximate internal blood loss (mL)</b>
Rib	125
Radius or ulna	250–500
Humerus	500–750
Tibia or fibula	500–1000
Femur	1000–2000
Pelvis	1000–massive



# Packing/tamponade





## External fixator - Pelvis





# Damage control

## Resuscitation / surgery / orthopedics

- DCR: Analgosedation, OTI + ventilation, volume therapy (TU, FFP, crystalloids/colloids)
- DCS: time-limited (max 90´)
  - Control of **bleeding, contamination**
- DCO: Stabilization of long bone fractures (pelvic fractures) - **external fixator**
- 
- **return to operating room** after stabilisation on ICU
- 
-

# Death following polytrauma (Trimodal distribution curve)

1. **Immediate death** (on scene) - 50-60%
  - Lethal injuries
2. **Early death** - 30%
  - Within hours after admission (max. 24 hours)
  - **Potentially reversible** (disruption of airways, blood loss)
3. **Late death** - 10-20%
  - days to weeks after injury
  - ARDS, sepsis, MOF, PE
  - **Potentially reversible**

# Take home message

- Mechanism of injury – suspected trauma
- Triage signs, scoring systems
- Multiplex approach, centralization
- ATLS principles – ABCDE
- O2 delivery to vital tissues
- Damage control surgery

# Disaster Management

- Needs of patients overextend or overwhelm the resources needed to care for them
- Emergency preparedness
- Anticipation and readiness
- 
- Multiple casualty incidents
- Mass casualty events

# Terms and terminology

- Acute care, acute care specialists – Emergency medical services
- „Hot zone“ - SaR, „Warm zone“ – area of operations, external perimeter
- Casualty collection point
- Decontamination corridor (CBRNE, HazMat)
- Operation center, Incident command
- Surge capability – extra assets that can be actually deployed

## Hospital incident command system /Americas/ Emergo train systém /Europe, Australasia/

- Operation center, Incident command- horizontal and vertical relations
- Emergency responders
- Triage
- Personal protective equipment
- Ways of transport, delivering material help, evacuation of victims and casualties
-



# Phases

- The need (ATLS, B-ATLS...)
- The approach - to do the greatest good for the greatest numbers
- Disaster management
  1. **Preparation** /community, hospital, departmental, personal/
  2. **Mitigation** /emergency op. Centers, HICSm ETS/, SAR,WZ,CCP, EP, transport/
  3. **Response** /pre-hospital care, in-hospital care/
  4. **Recovery**

# Decontamination!!!

- PPE
- HazMat technicians
- Primary vs- secondary
- 
- „Dilution is the solution to pollution“