

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

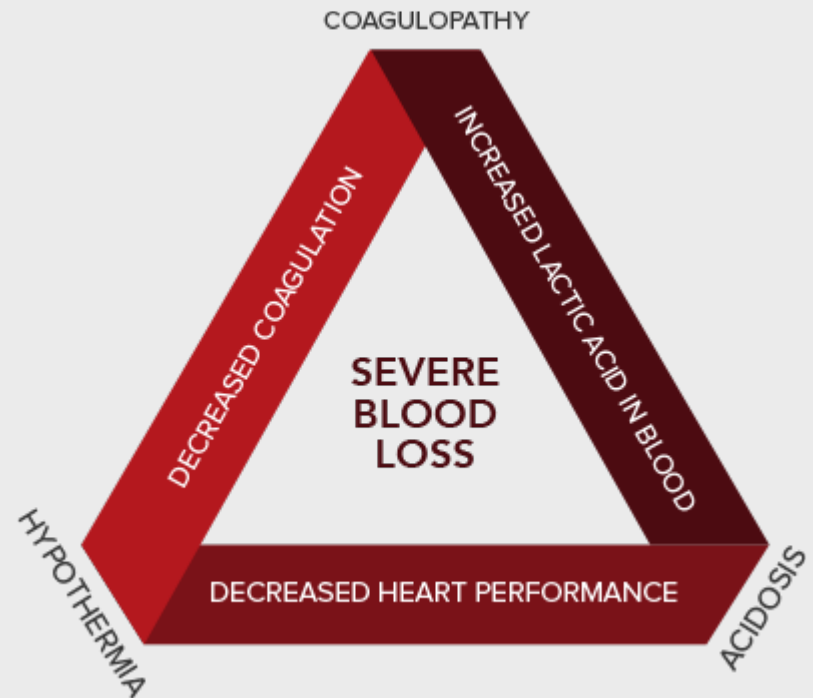
ISS	
1-8	Minor
9-15	Moderate
16-24	Serious
25-49	Severe
50-74	Critical
75	Maximum

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!!!

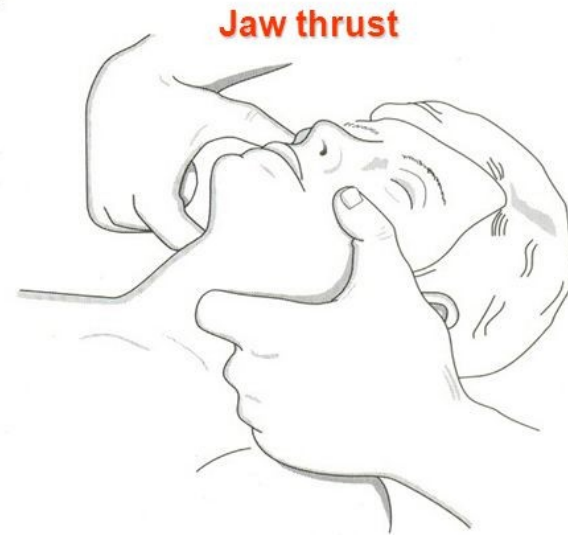
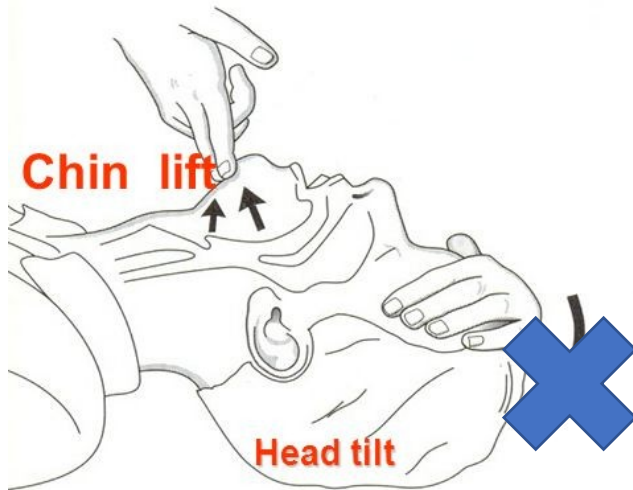
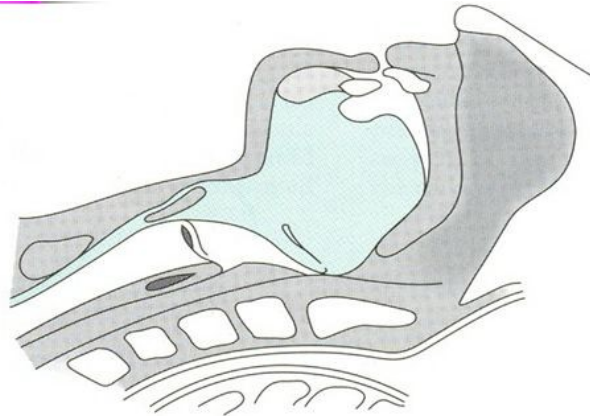
- Succion, airways, SGD, OTI, NTI, surgery

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

- GCS 8 nad less... intubate!

Manual maneuvers

**CPR...
AIRWAY**



Airway management No1.

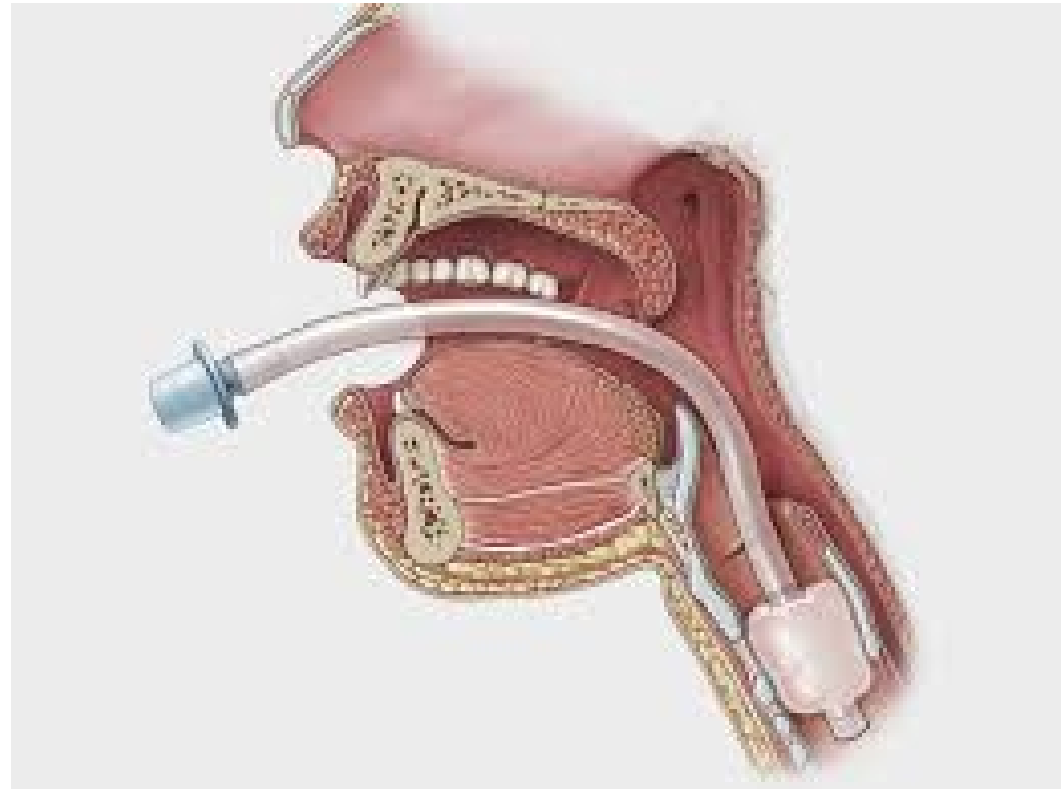
Airway - nasal, oral

Combitube

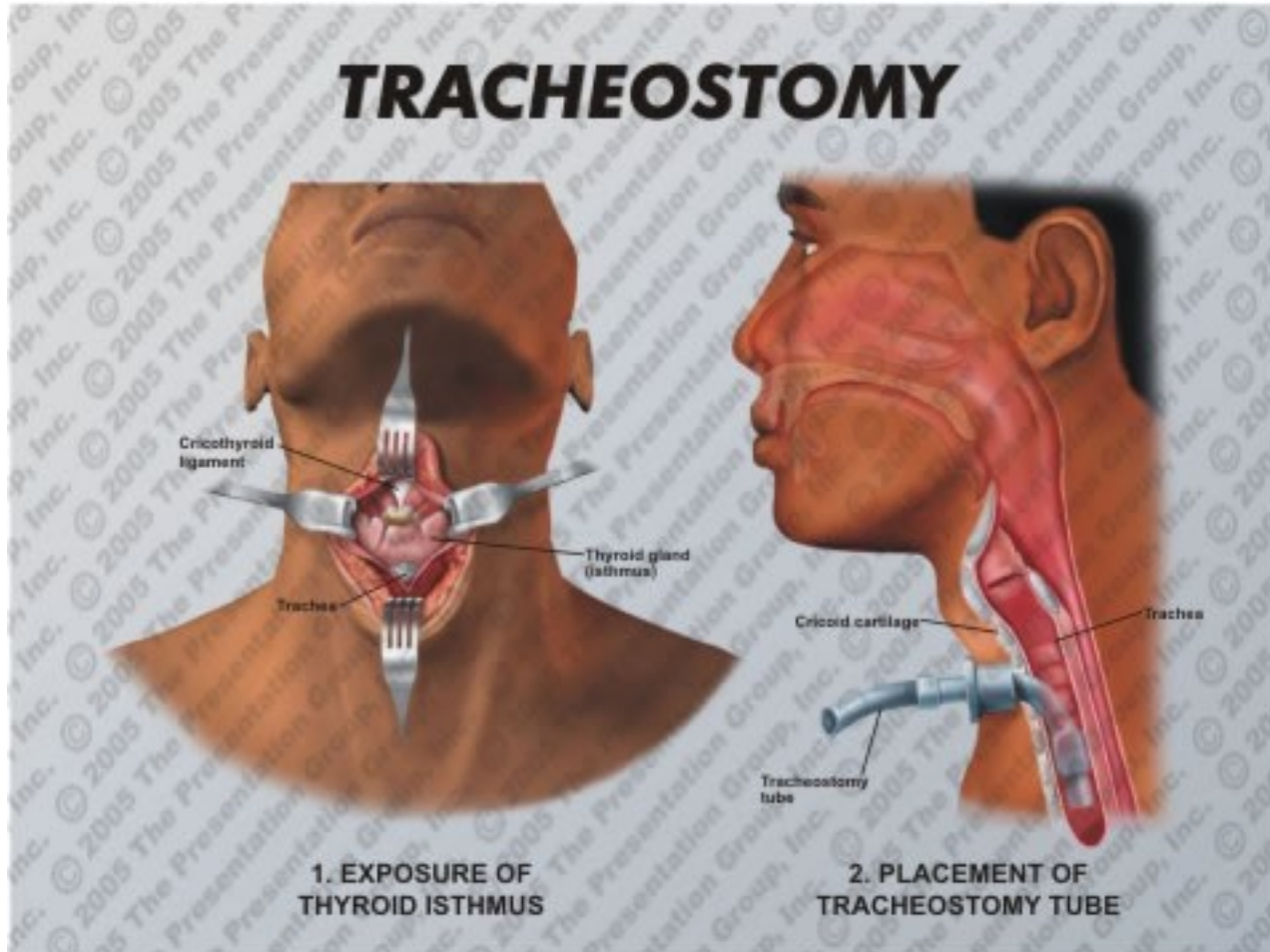
Laryngeal mask



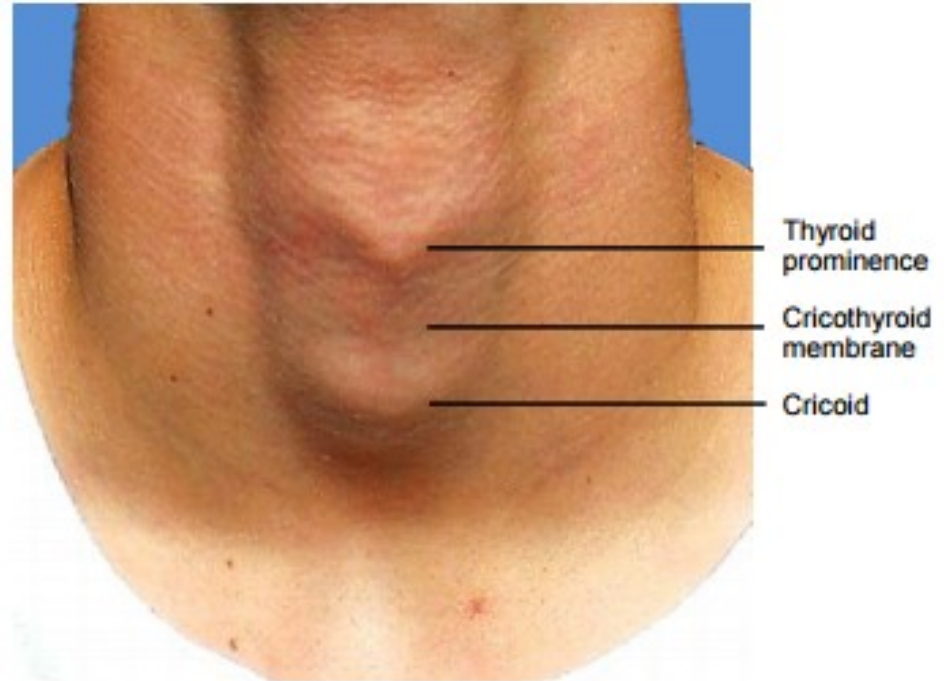
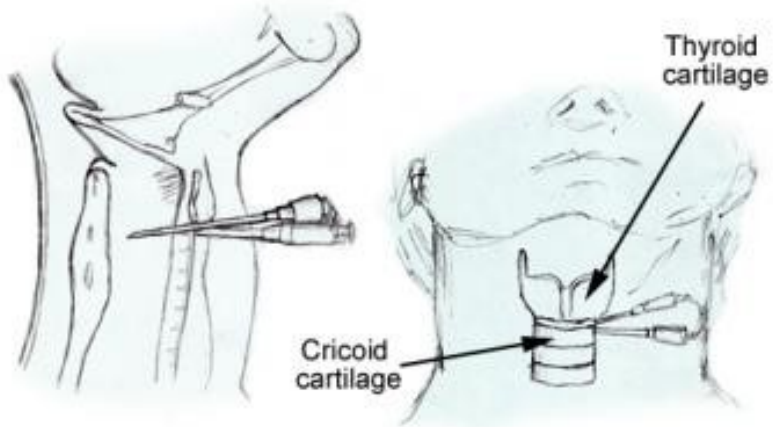
Airway management No.2 – endotracheal intubation

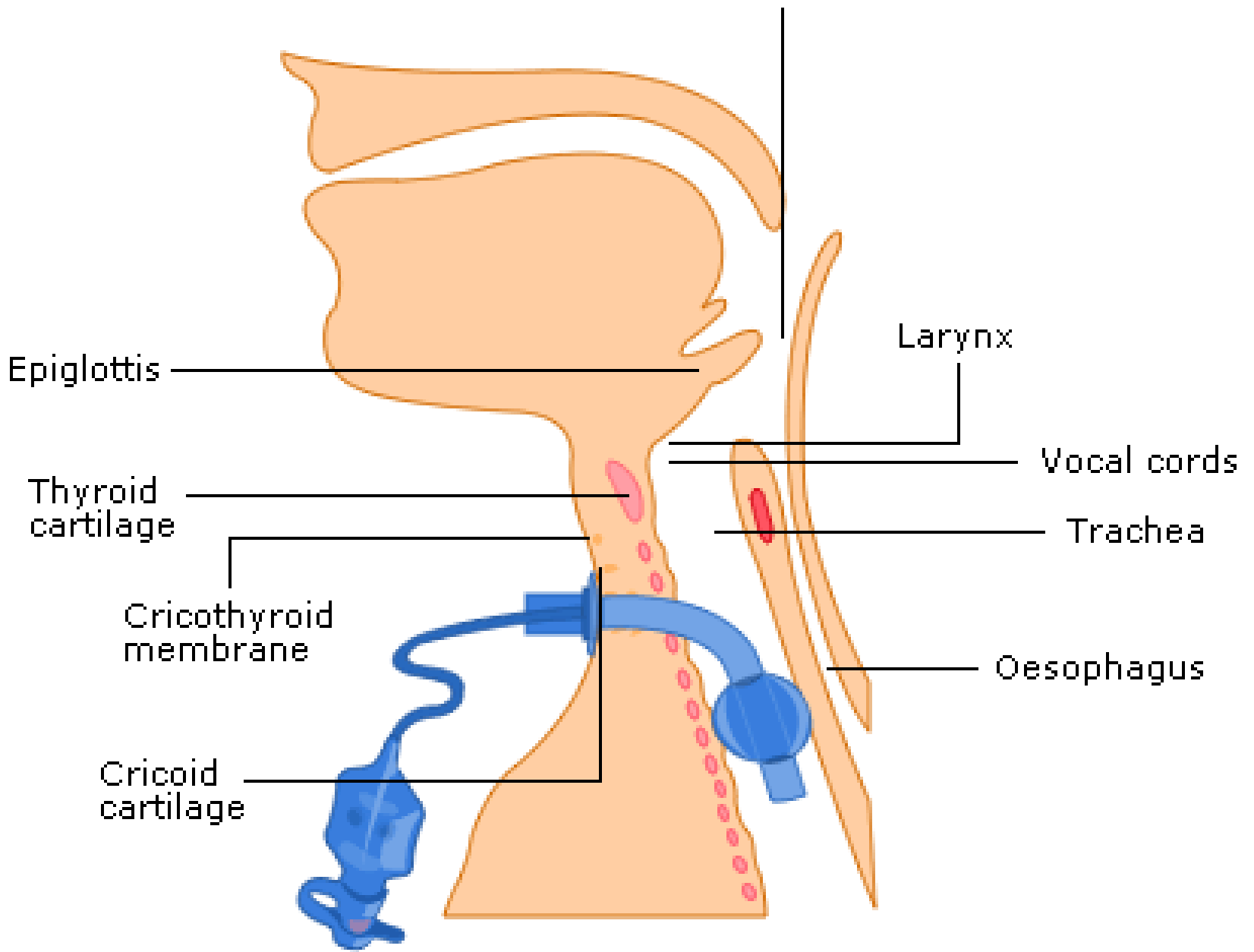


If everything else fails....



But cricothyreotomy is faster!!!

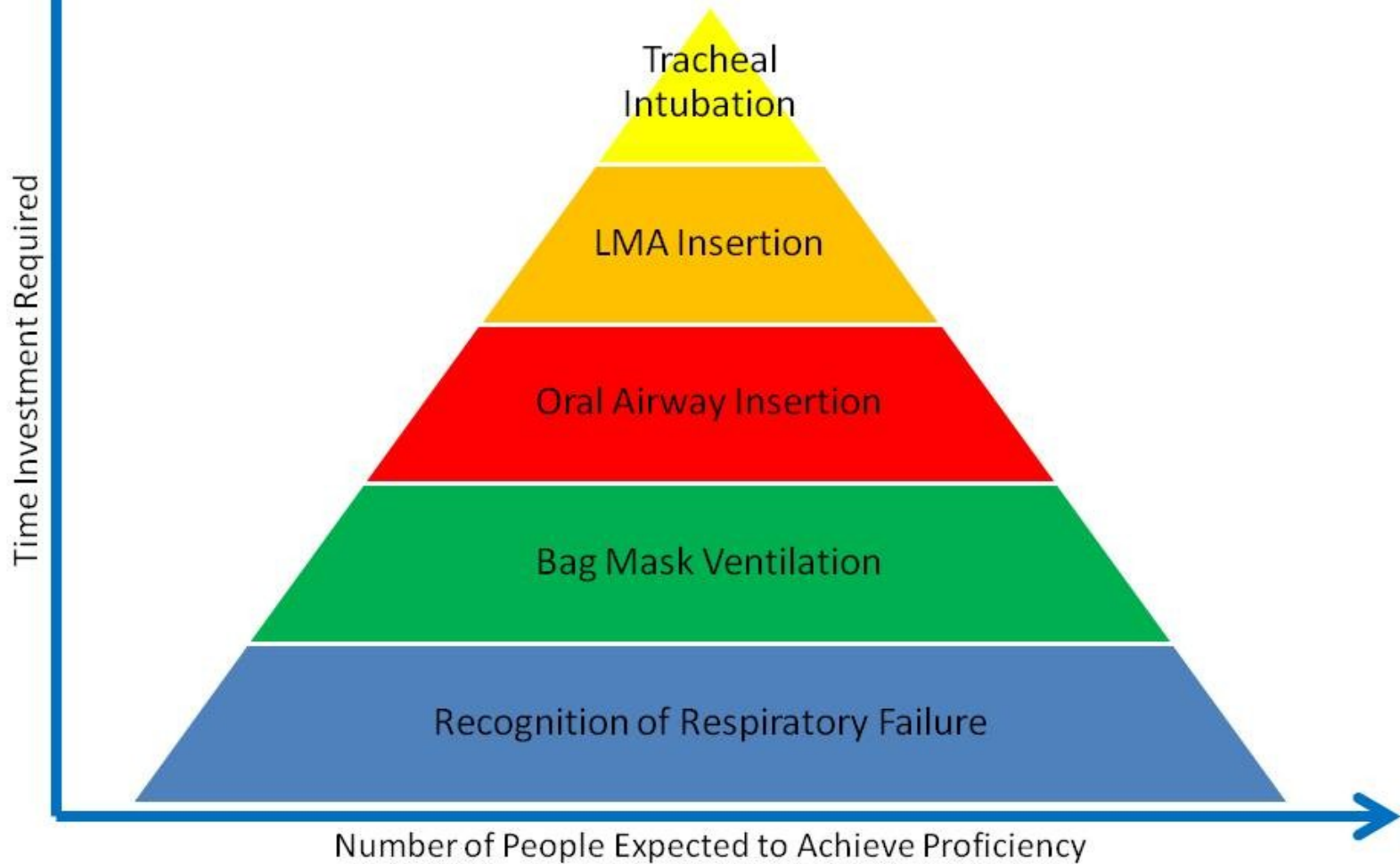


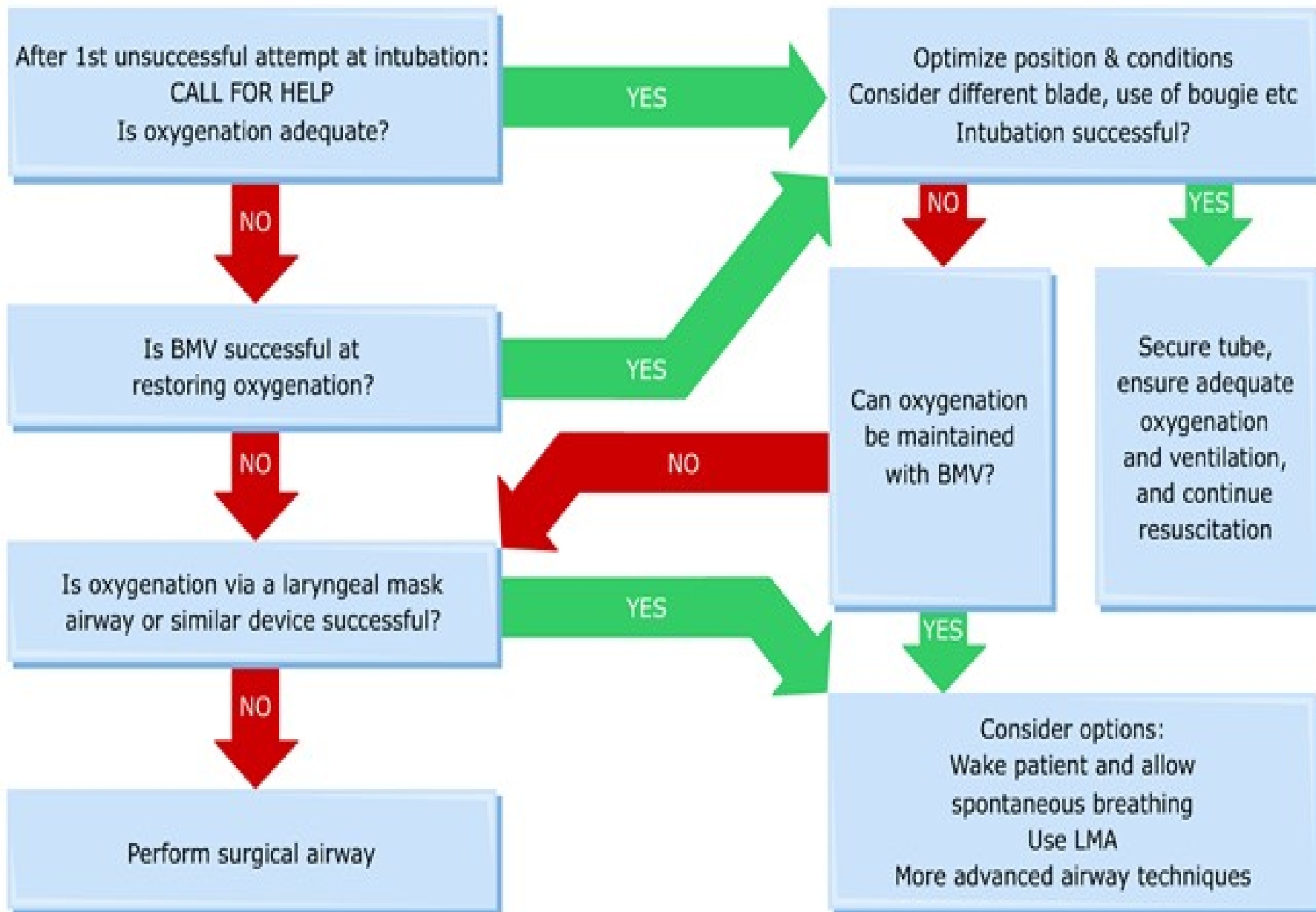


Cricothyreotomy emergency kit



Airway Skills Pyramid





C-spine control





Ideal C spine protection

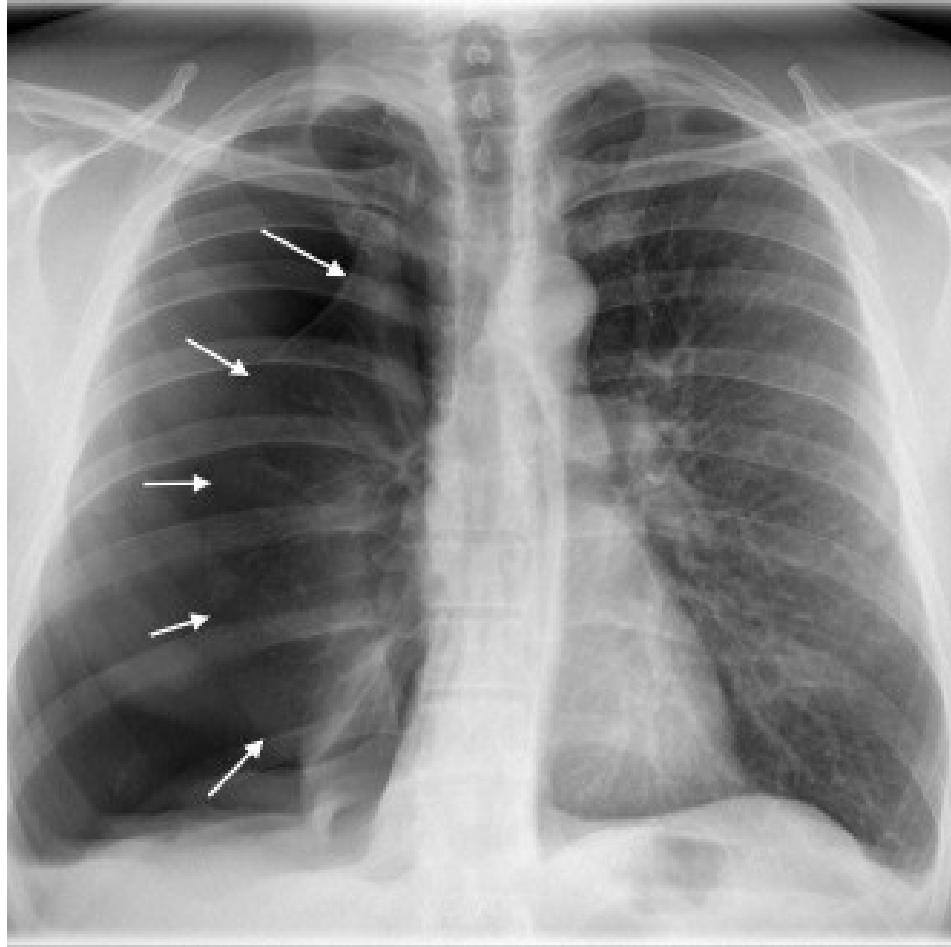
Spine board, Vacuum SB



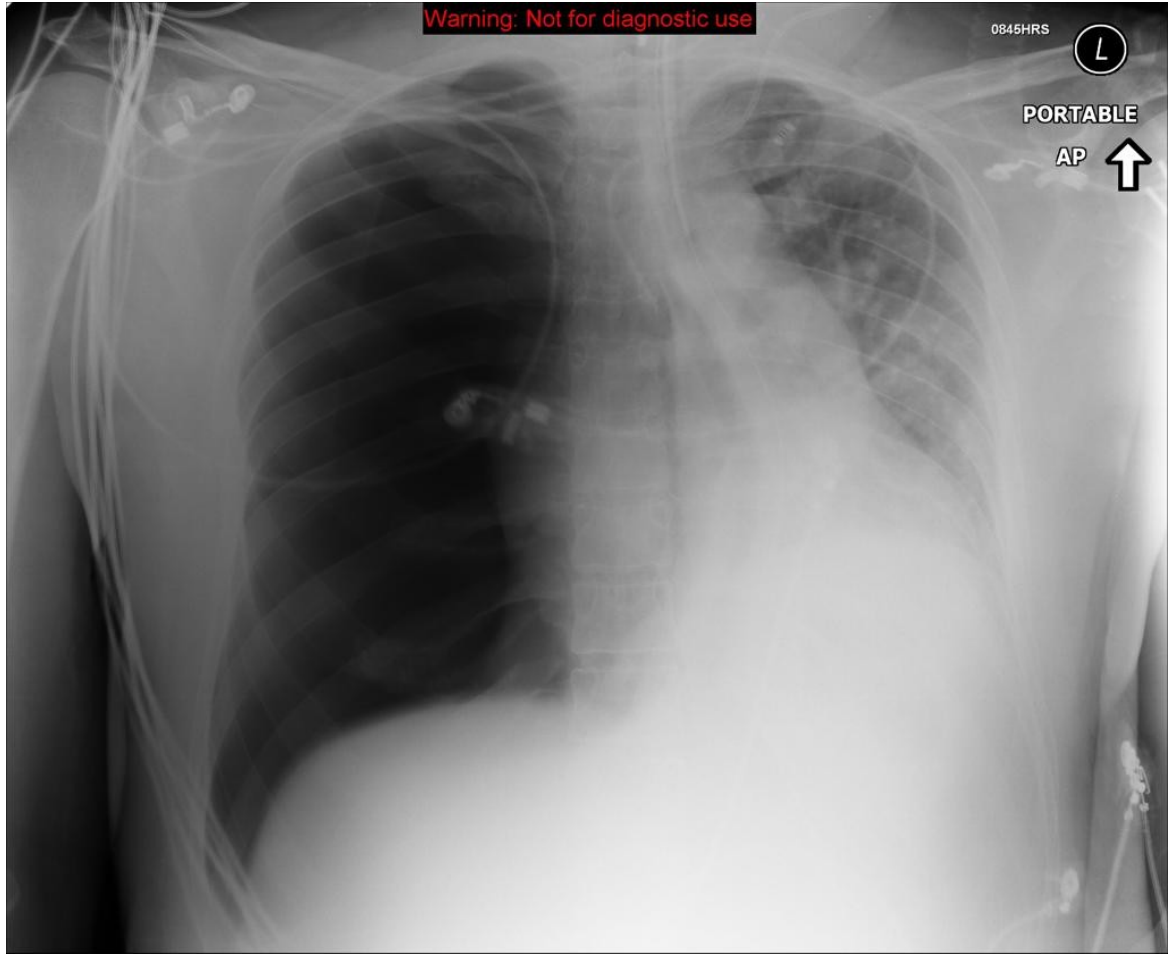
Breathing

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

Deliver oxygen via BMV!!!



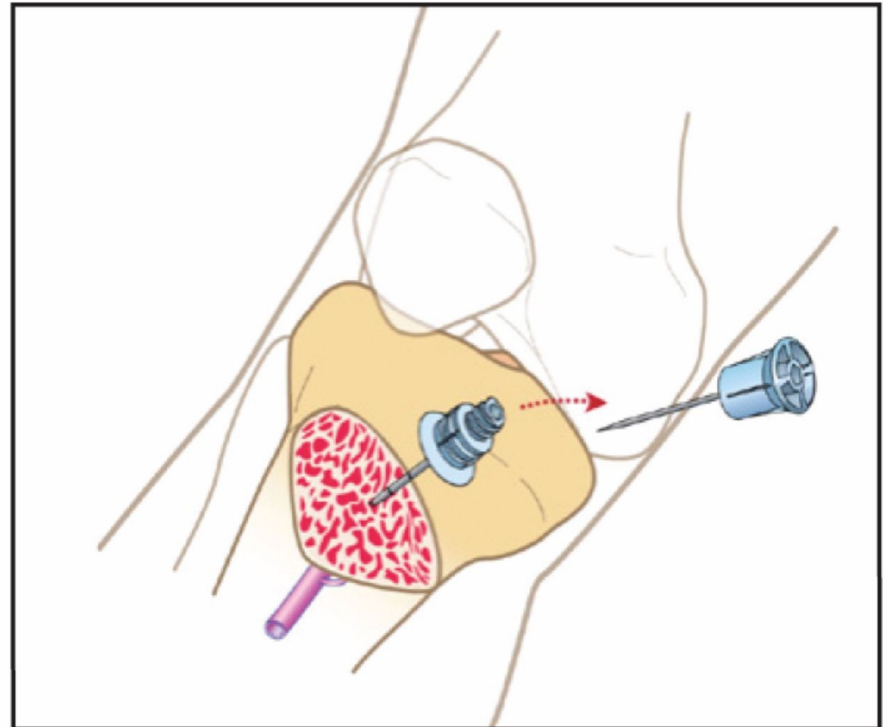




Circulation

- 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

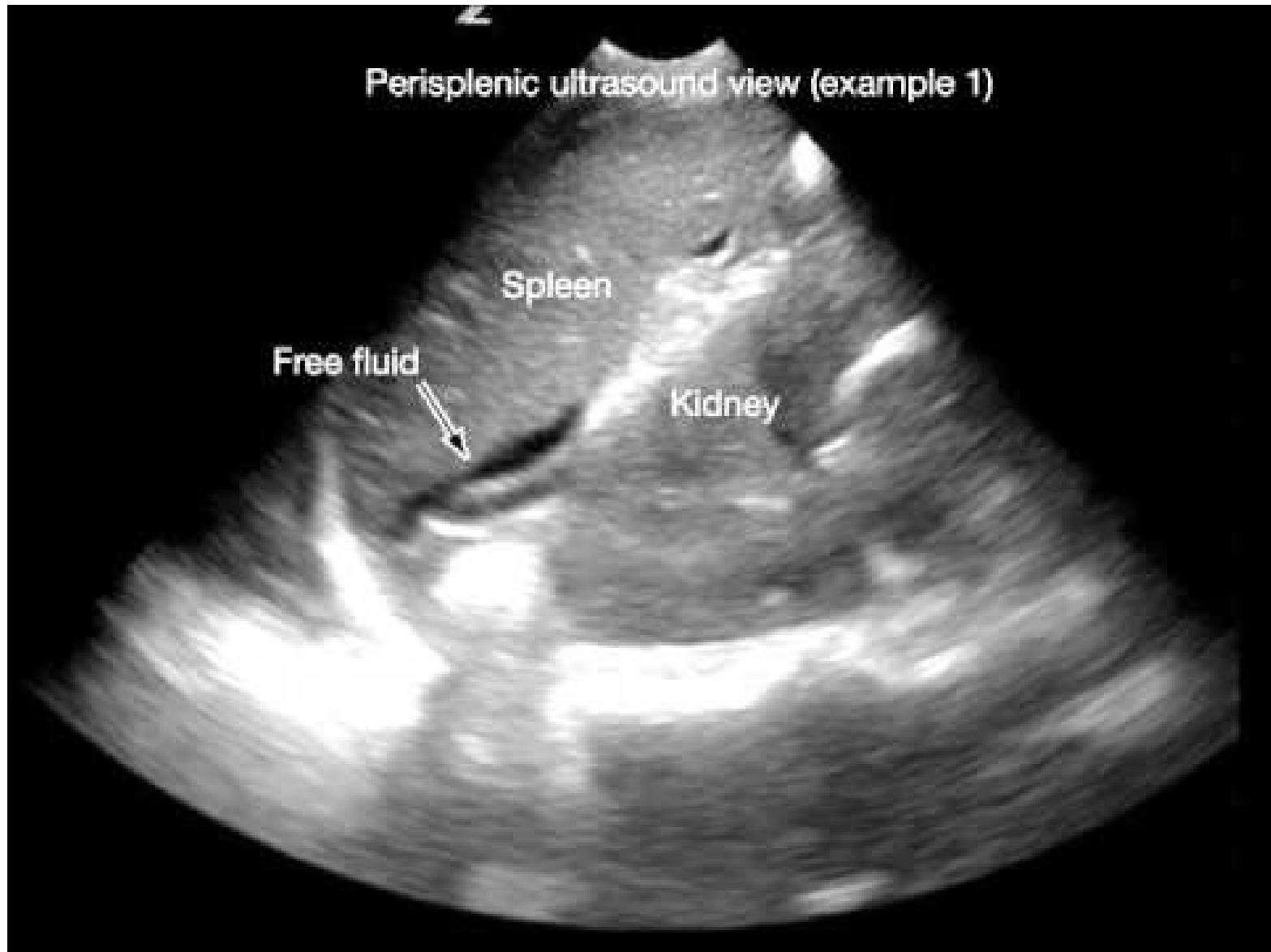
Lab

- 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.???

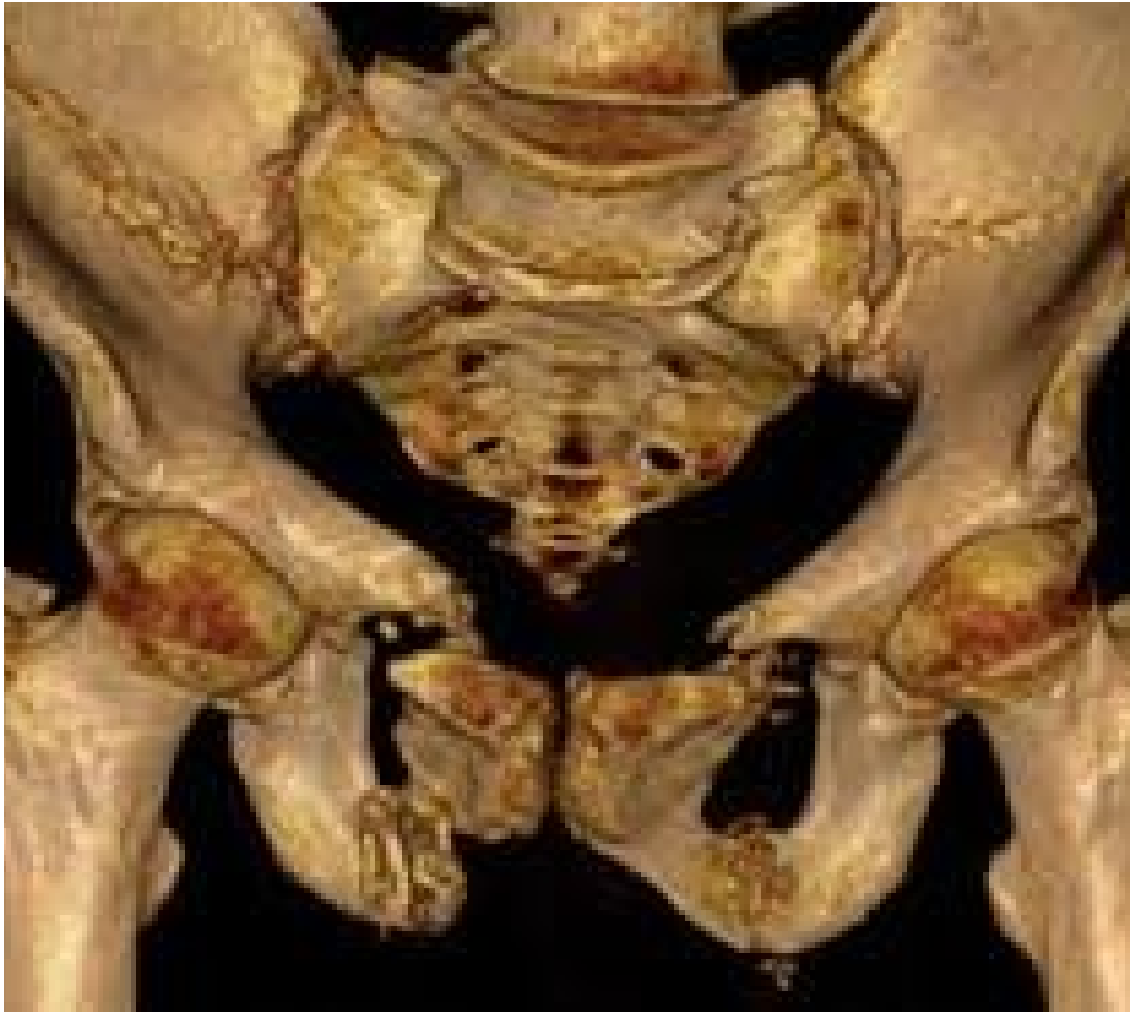
Urgent life-saving procedures

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.

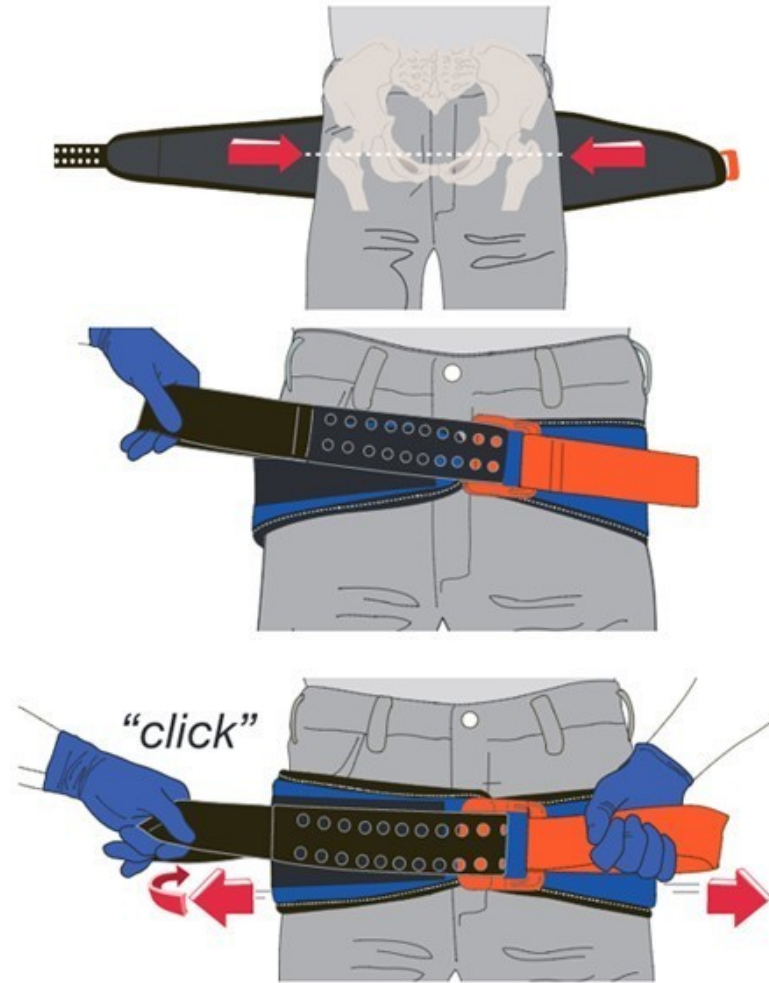
Skeletal extension

reduces bleeding, reduces pain, stabilizes fracture

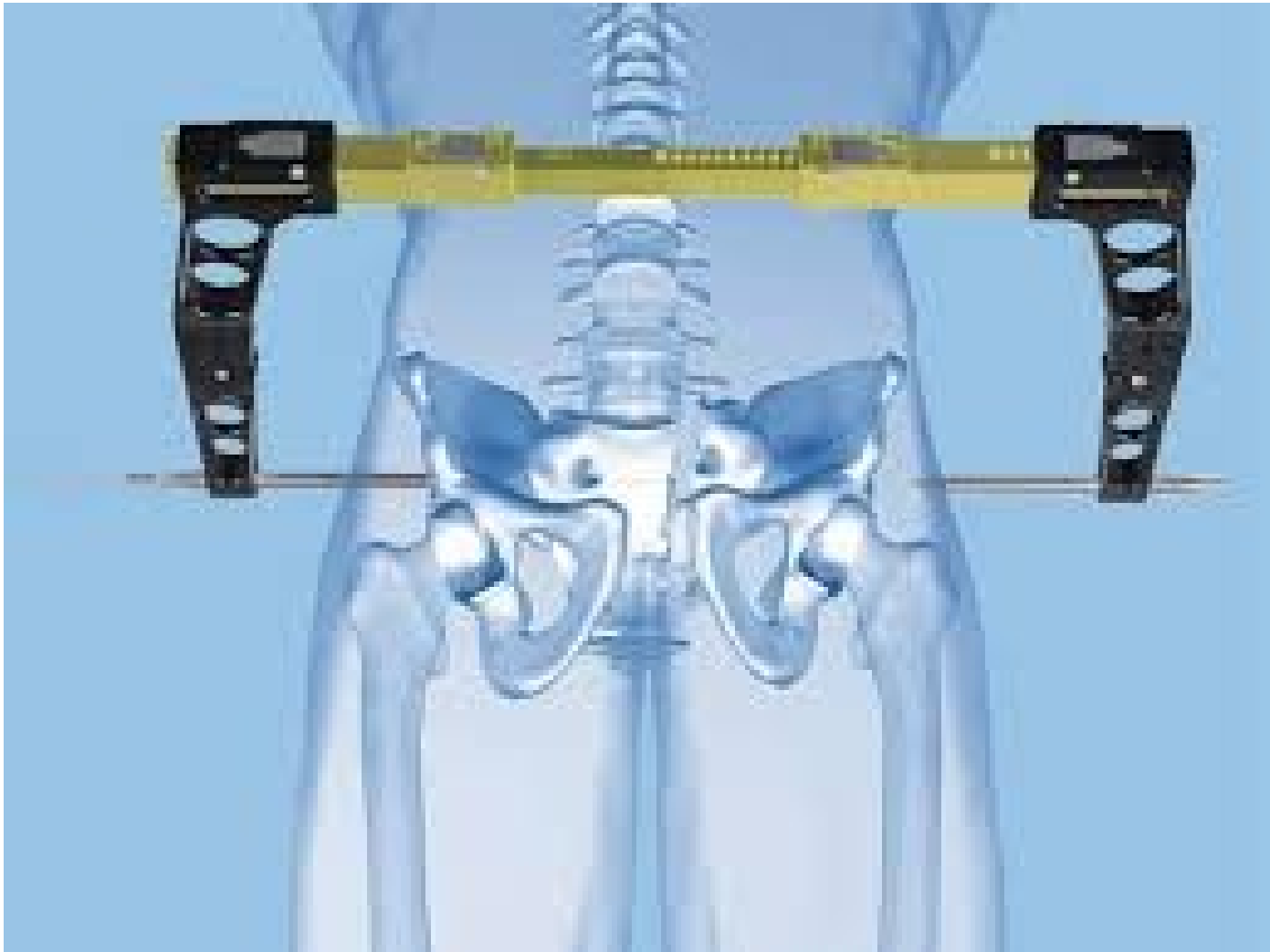




Pelvic binder



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)

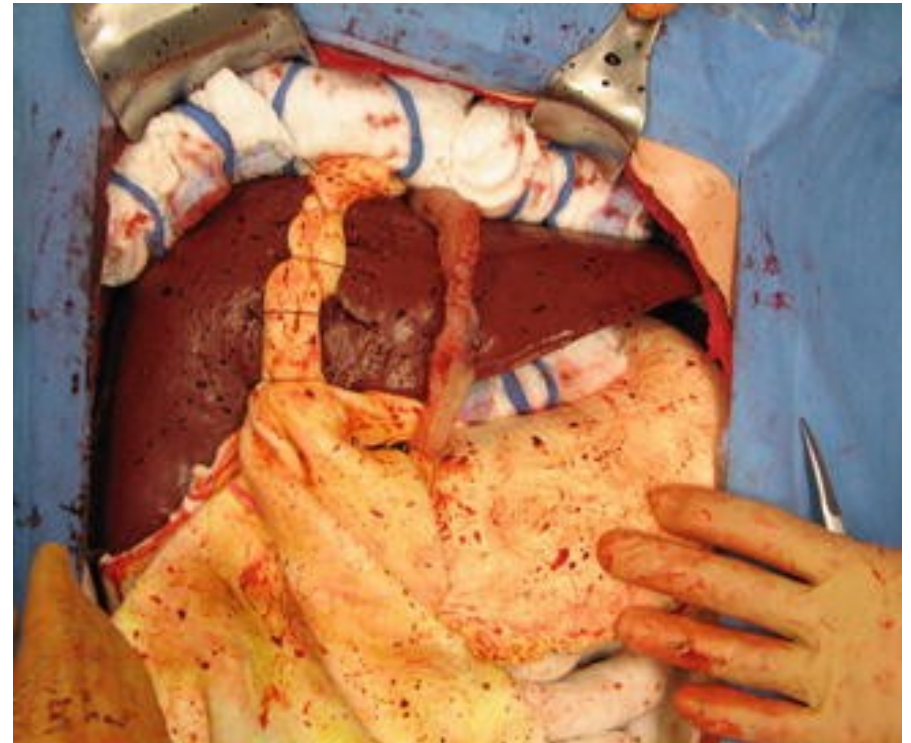
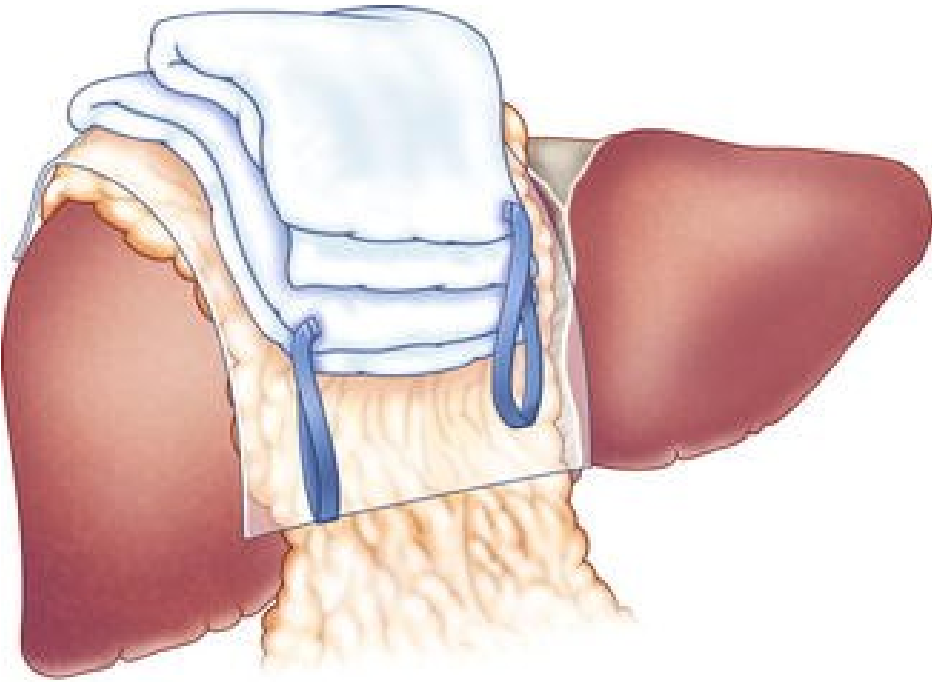
Why should I take care of fractures? It is not life-threatening, right?

Estimated Blood Loss

Bone	Approximate internal blood loss (mL)
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“