



Management of the Trauma Patient

Hieu Ton-That, MD, FACS
Loyola University Medical Center
Division of Burns, Trauma and Surgical
Critical Care

Trauma in the United States

- 2.7 million hospital admissions per year
- Leading cause of death for ages 1-44 years
- 100,000 deaths per year from traumatic injuries
 - Half die before they reach medical care
- Hemorrhage is second-leading cause of death in trauma

Figure 6A: Number of Incidents by Age

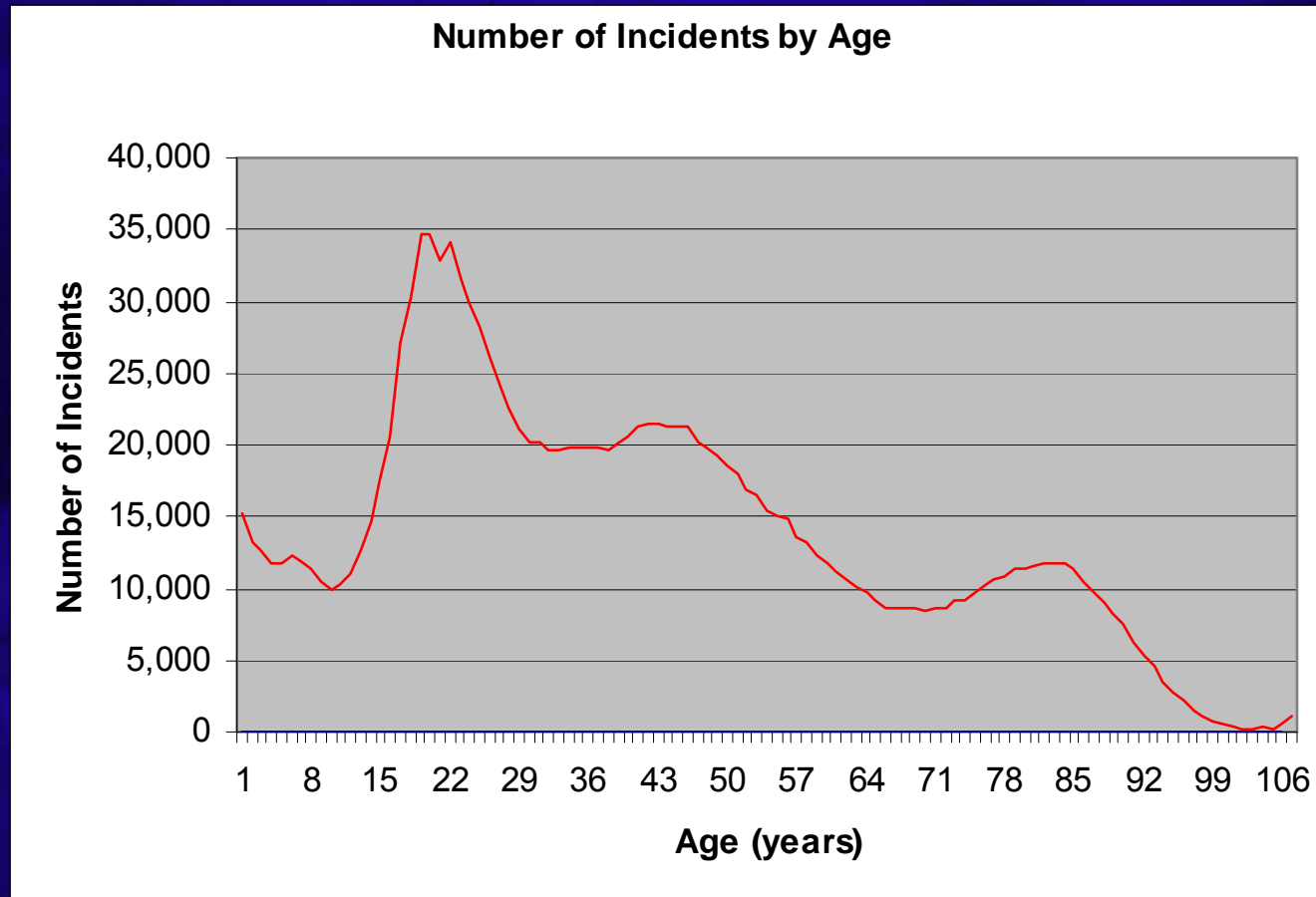


Figure 7A: Number of Incidents by Age and Gender

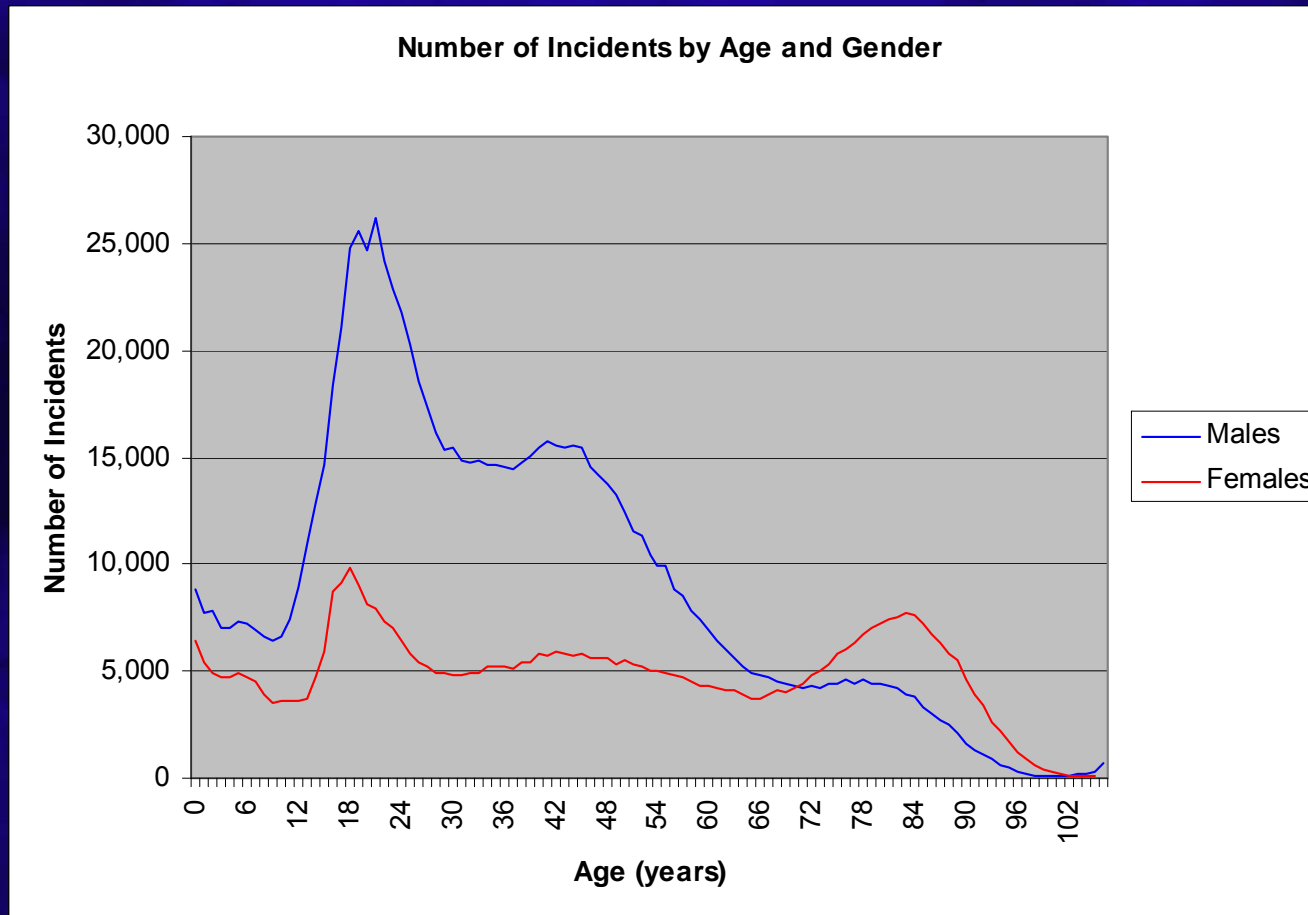


Figure 8A: Case Fatality Rate by Age

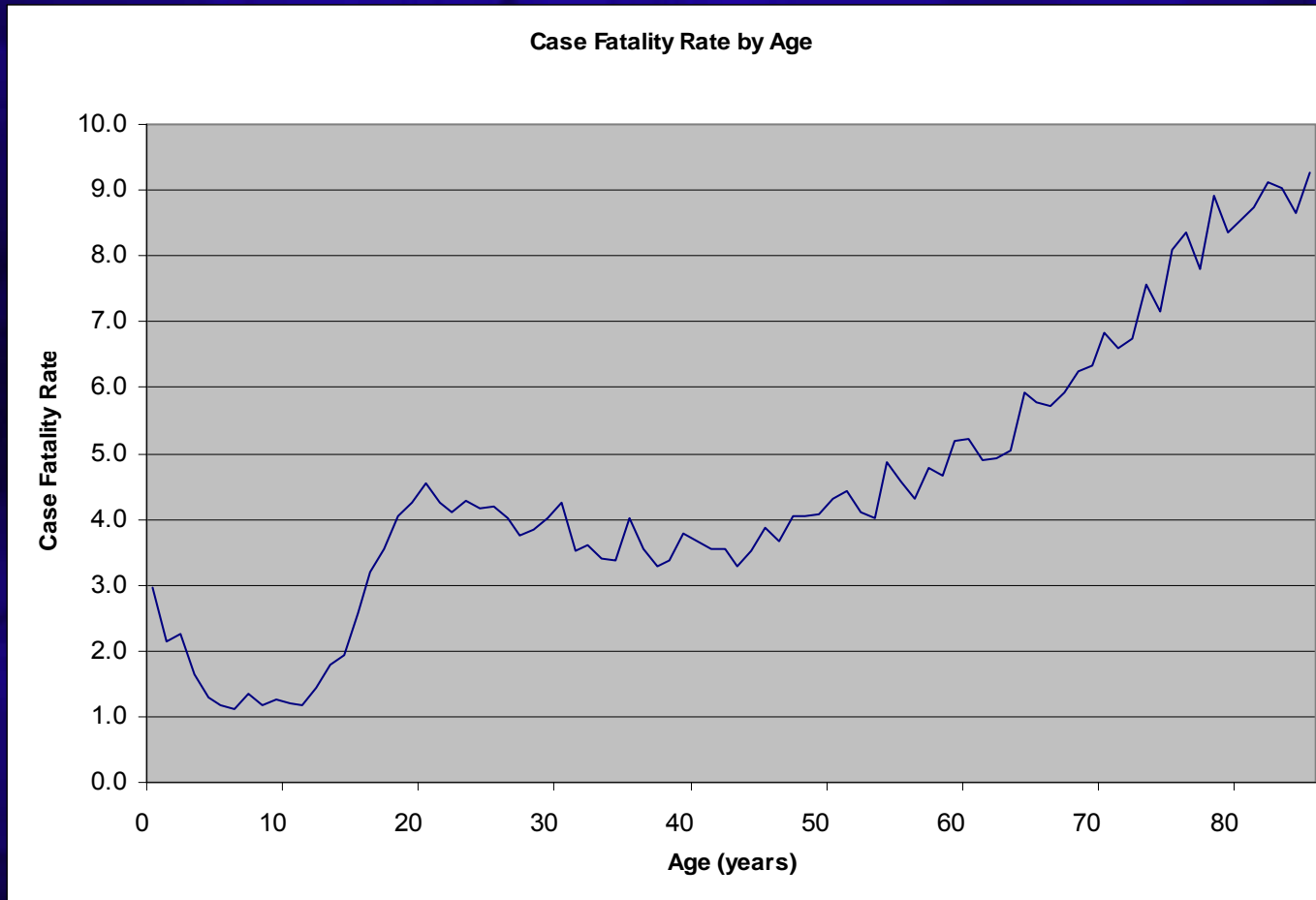
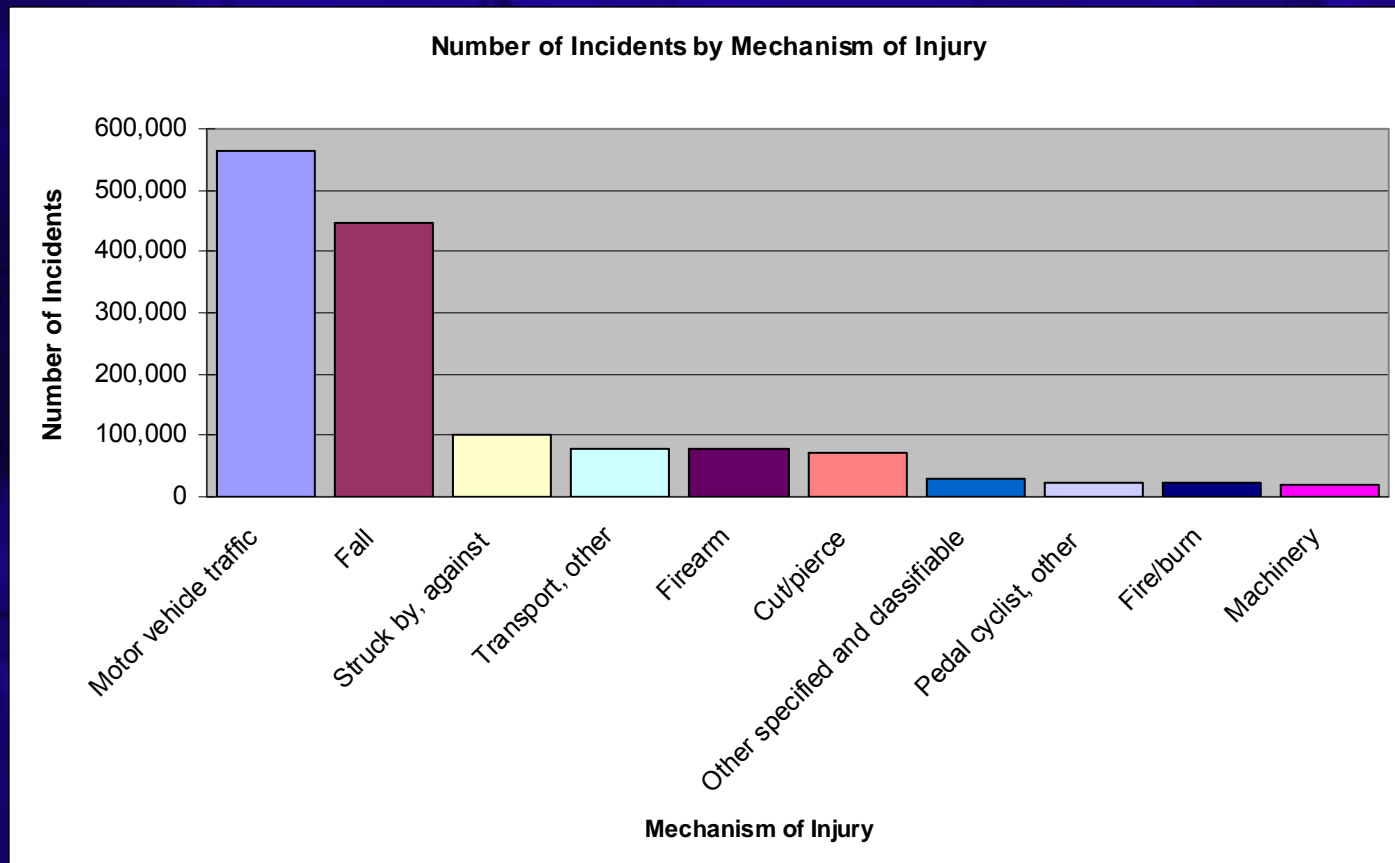


Figure 10A: Number of Incidents by Mechanism of Injury



Primary Survey

- Advanced Trauma Life Support
- Assess and address life threatening injuries in order
- “ABCDE of trauma”
 - Airway
 - Breathing
 - Circulation
 - Neurologic “deficit”
 - Exposure of patient

Airway

- Identify airway obstruction
- Maintain cervical spine immobilization
- May require definitive airway
 - Orotracheal intubation
 - Blind nasotracheal intubation
 - Cricothyroidotomy
 - Tracheotomy

Breathing

- Identify life threatening deficits in breathing mechanism
 - Simple pneumothorax
 - Tension pneumothorax
 - Massive hemothorax
 - Open pneumothorax (“sucking chest wound”)
 - Flail chest



Circulation

- Or, identification of shock

Definition of shock – *inadequate organ perfusion*

- Causes of shock
 - Hemorrhage/hypovolemia
 - Compressive
 - Cardiogenic
 - Neurogenic
 - Sepsis

| | Class I | Class II | Class III | Class IV |
|-------------------------|------------------|----------------|-----------------------|-----------------------|
| Blood Loss mL | Up to 750 | 750-1500 | 1500-2000 | >2000 |
| Blood Loss % | Up to 15% | 15-30% | 30-40% | >40% |
| Pulse rate | <100 | >100 | >120 | >140 |
| Systolic blood pressure | Normal | Normal | Decreased | Decreased |
| Pulse pressure | Normal | Decreased | Decreased | Decreased |
| Respiratory rate | 14-20 | 20-30 | 30-40 | >35 |
| Urine output | >30 | 20-30 | 5-15 | Negligible |
| Mental status | Slightly anxious | Mildly anxious | Anxious, confused | Confused, lethargic |
| Fluid (3:1 rule) | Crystalloid | Crystalloid | Crystalloid and blood | Crystalloid and blood |

Circulation

- Treatment of shock
- Direct pressure on external bleeding
- Initial 2 liter bolus of crystalloid fluid
 - Responders
 - Non-responders
 - Transient responders
- Definitive management for ongoing hemorrhage

Neurologic “deficit”

- Rapid assessment of neurologic status to identify life-threatening injury
 - Pupil size and response
 - Mental status (Glasgow coma scale)
 - Motor and sensory exam

Glasgow Coma Scale

- 3 – 15 point scale to assess mental status only
- Best observed response
- Modified scale for children
- $GCS \leq 8$ is a “coma” and requires intubation for airway protection

Eye opening

- » None = 1
- » To painful stimuli only = 2
- » To voice only = 3
- » Spontaneously open = 4

Verbal response

- » None = 1
- » Incomprehensible sounds = 2
- » Incomprehensible words = 3
- » Confused = 4
- » Oriented = 5

Motor response

- » None = 1
- » Decerebrate (extension) posturing = 2
- » Decorticate (flexion) posturing = 3
- » Withdraws to pain = 4
- » Localizes pain = 5
- » Follows commands = 6

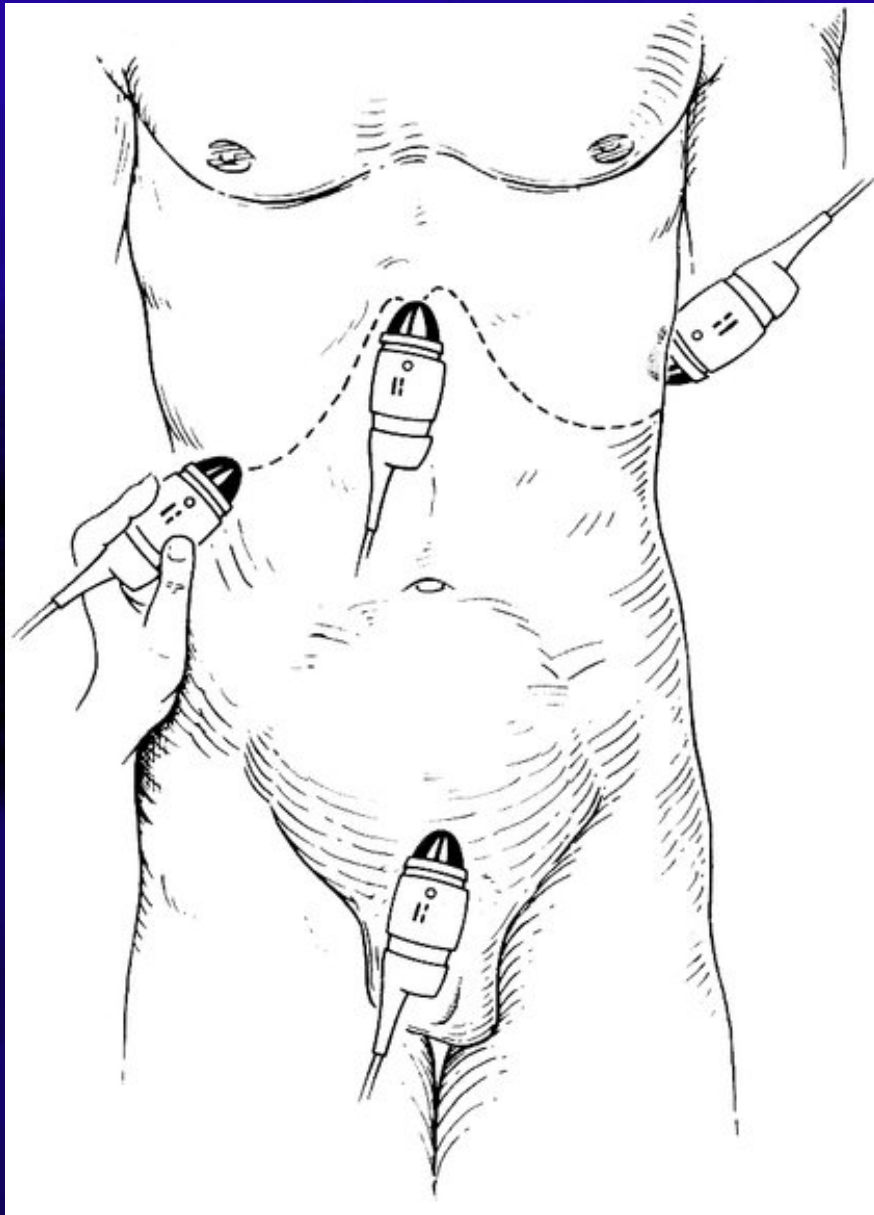
Exposure

Head to toe examination of the patient for injury

- Pitfalls
 - Maintenance of spine precautions
 - Prevention of heat loss
 - Under cervical collar
 - Back and flanks

Adjuncts to the Primary Survey

- Exams during or after primary survey to aid in identifying life-threatening injuries
 - Chest x-ray
 - Pelvis x-ray
 - Focused abdominal sonogram for trauma (FAST)
 - Diagnostic peritoneal lavage (DPL)



Secondary Survey and Definitive Treatment

- The secondary survey is a complete head to toe evaluation of the patient
- Adjuncts to the secondary survey include CT's, plain radiographs, blood tests
- Treatment plans, especially for multiple injuries, based on clinical status and specific injuries

Resuscitation

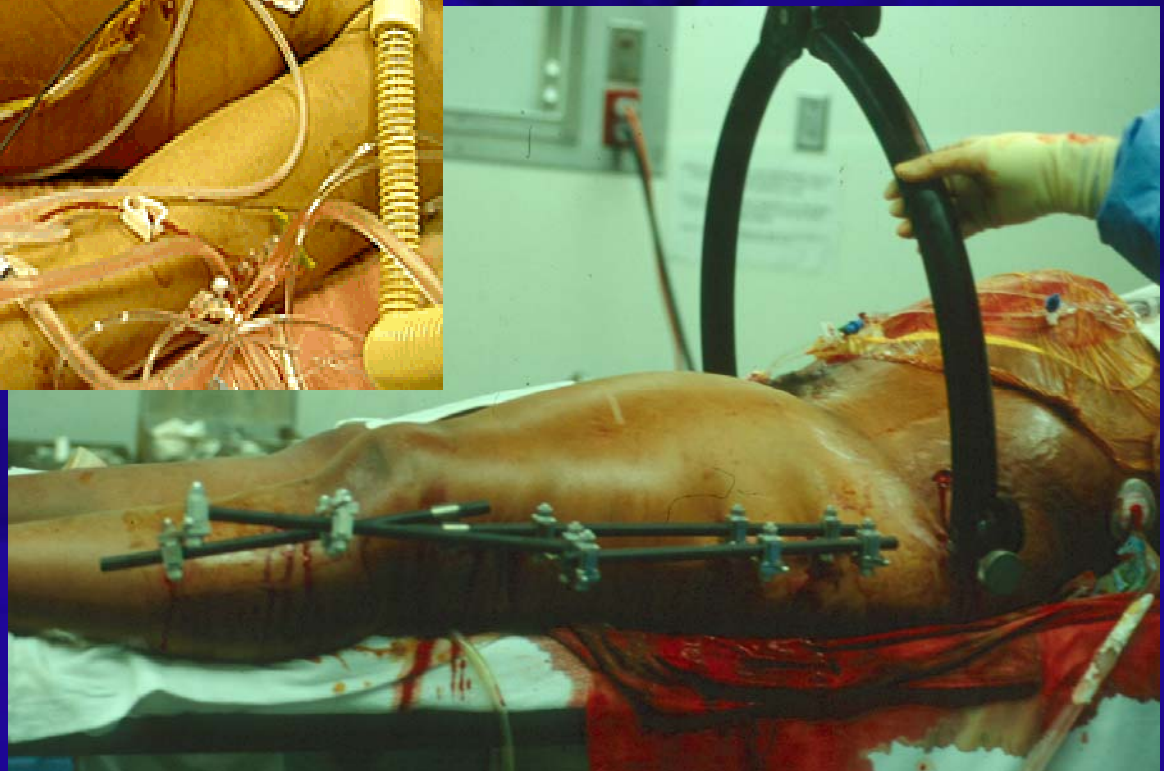
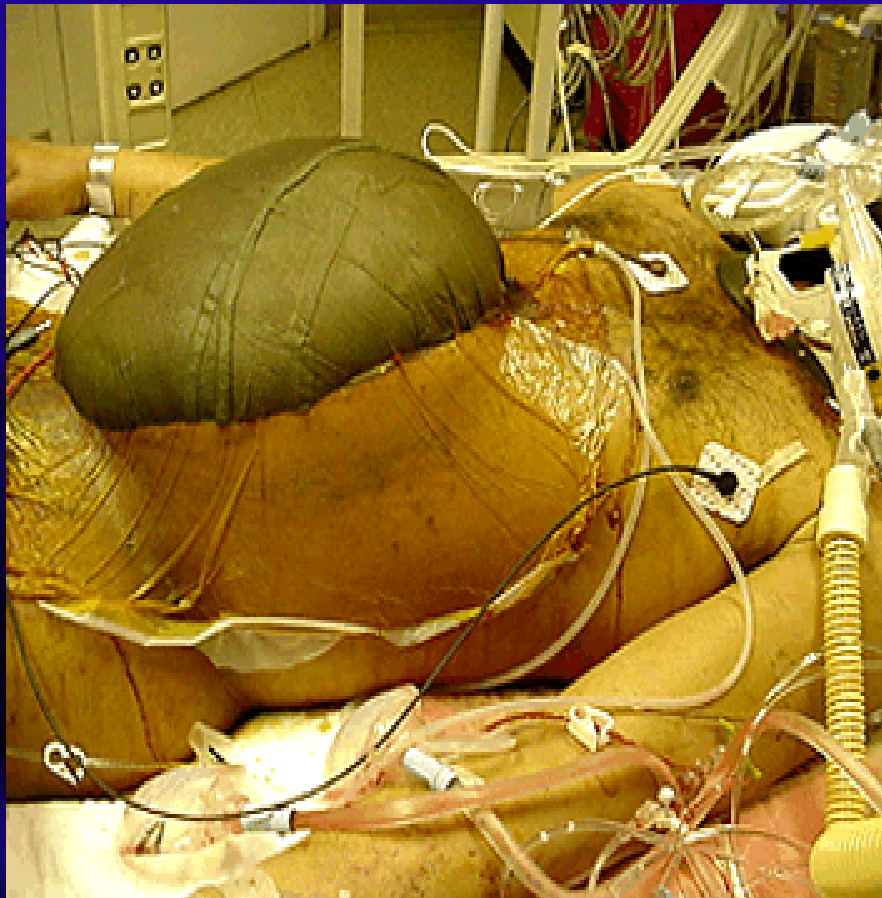
- Restoring organ perfusion
- How much is enough? What are the *endpoints of resuscitation*?
 - Heart rate, blood pressure, urine output
 - May lead to “compensated shock”
 - Organ-specific indicators of perfusion
 - ie gastric tonometry
 - Global indicators of perfusion
 - Lactic acid, base deficit
 - Cardiac output, oxygen delivery, oxygen consumption
 - Mixed venous O₂ saturation (SvO₂)

Lactic acid and base deficit

- Initial BD and serum LA are reliable indicators of the need for ongoing resuscitation
- Time to normalization of LA and BD are predictive of MSOF and mortality

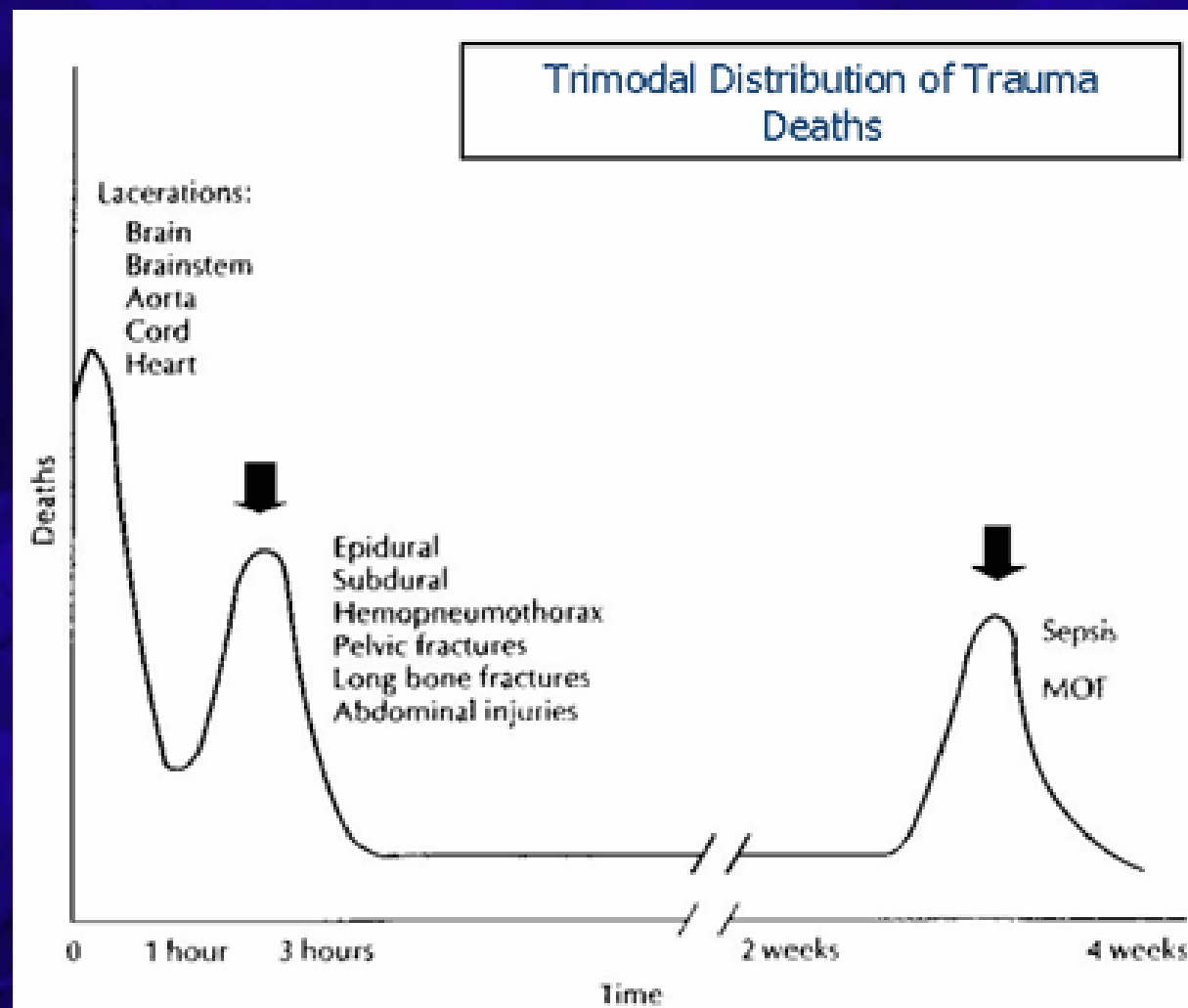
Damage-control laparotomy

- A shift from definitive management of abdominal injuries to stabilizing the patient for resuscitation
- Goals
 - Stop bleeding
 - Control contamination
 - Temporary abdominal closure





Critical care and rehabilitation





Questions?