

Treatment of the Polytrauma Patient

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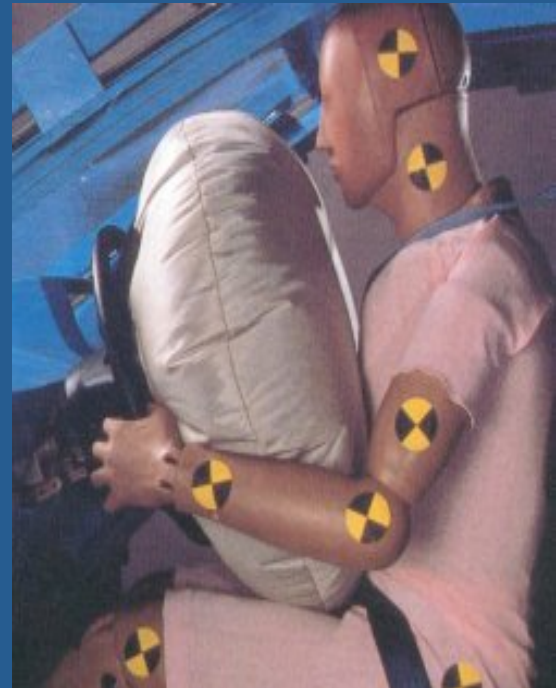
Trauma in the US

- Leading cause of death in < 45 age group
- **\$75 billion loss** in income due to death and disability annually
- 12% of hospital beds occupied by trauma patient



Trauma Epidemiology

- Number of polytrauma patients increasing
 - Air bags-
polytrauma
patients surviving



Trauma Centers

- Studies demonstrate a 30-40% preventable death rate due to inadequate trauma systems
 - West, Trunkey: Arch Surgery, 1979
 - Mortality – 73% to 9%
 - West, Cales: Arch Surgery, 1983
 - Mortality – 71% to 9%
 - Baker, et al: J Trauma, 1987
 - Bypass nearest hospital got to trauma center

Protocol for Management

- **Biffl et al**, Evolution of a multidisciplinary clinical pathway for the management of unstable patients with pelvic fractures. JT, 2001

5 elements:

- Immediate trauma surgeon availability (+ Ortho!)
- Early simultaneous blood and coagulation products
- Prompt diagnosis & treatment of life threatening injuries
- Stabilization of the pelvic girdle
- Timely pelvic angiography and embolization

Changes:

- Patients more severely injured (52% vs 35% SBP < 90)
- DPL phased out for U/S
- Pelvic binders and C-clamps replaced traditional ex fix

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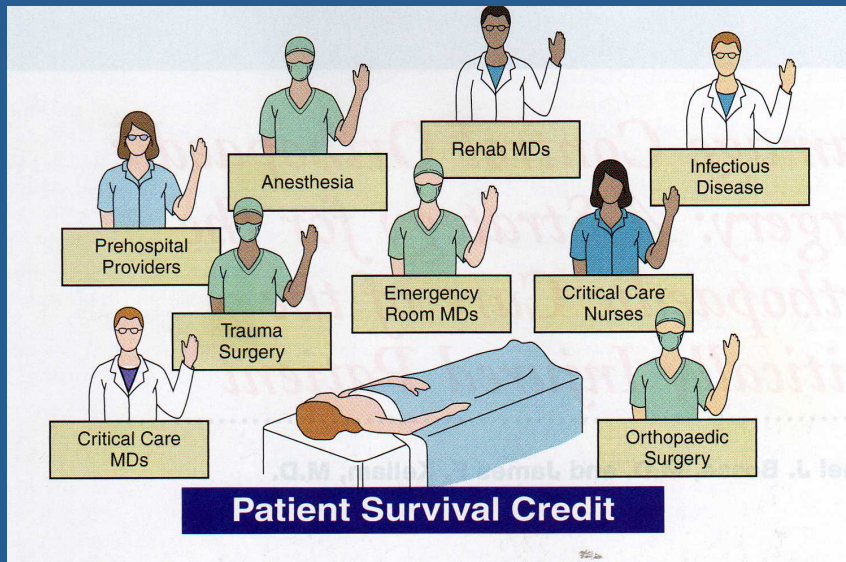
Mortality decreased	from 31% to 15%
Exsanguination death	from 9% to 1%
MOF	from 12% to 1%
Death (<24 hours)	from 16% to 5%

The evolution of a multidisciplinary clinical pathway, coordinating the resources of a level 1 trauma center and directed by joint decision making between trauma surgeons and orthopedic traumatologists, has resulted in improved patient survival. The primary benefits appear to be in reducing early deaths from exsanguination and late deaths from multiple organ failure.

Goal of a Trauma service

- IMPROVE OUTCOME (quality of life)
- Outcome = Anatomic injury + Physiologic Injury + Patient reserve
- Physiologic injury
 - Adequate resuscitation before definitive treatment
- Anatomic (orthopedic injury)
 - Appropriate timely treatment of fractures
 - Early mobilization
 - Decrease risk of infection

Trauma Team Approach



- Improved outcomes
 - Acute
 - In hospital
 - After D/C

Skeletal trauma 4th ed.

Trauma Mortality

- Early phase - immediate death
 - severe brain injury, disruption of great vessels, cardiac disruption
- Second phase - minutes to hours
 - subdural, epidural hematomas, hemopneumothoraces, severe abdominal injuries, multiple extremity injuries (bleeding)
- Third phase - delayed
 - multisystem organ failure
 - sepsis

- Where do you start?

ABC' S

Primary Survey

Airway with c-spine protection

Breathing and ventilation

Circulation with hemorrhage control

Disability: Neuro status

Exposure / **E**nvironmental control

Quick Assessment

What is a quick, simple way to assess a patient in 10 seconds?

Quick Assessment

What is a quick, simple way to assess a patient in 10 seconds?

- Ask the patient his or her name
- Ask the patient what happened

Appropriate Response Confirms

A Patent airway

B Sufficient air reserve to permit speech

C Sufficient perfusion

D Clear sensorium

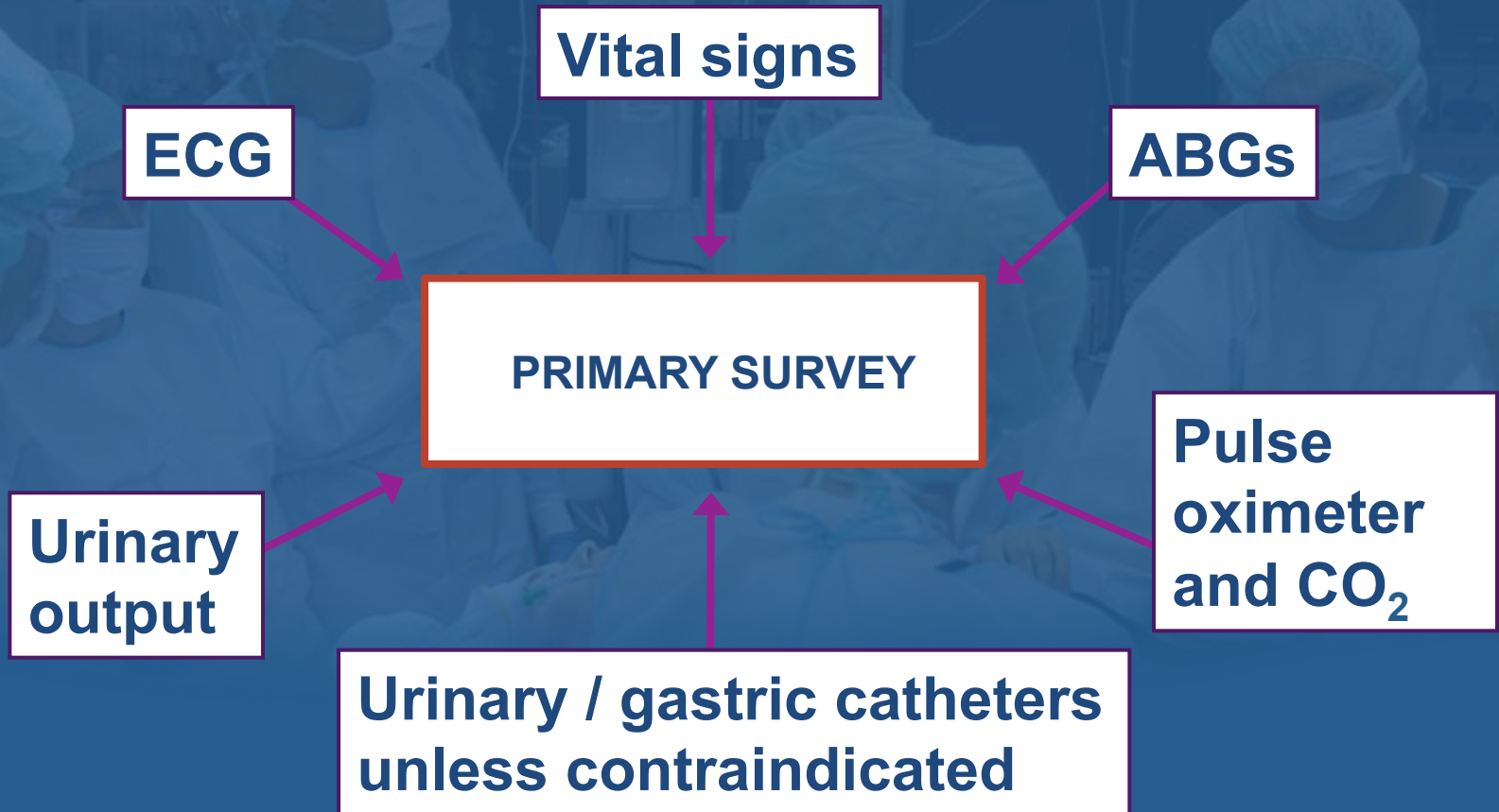
What is the role of the orthopedic surgeon?

- Airway
- Breathing
- CIRCULATION
 - Pelvis
 - Pressure on bleeding wounds
- Disability
 - Spinal Cord
- Exposure
 - Identifying open wounds

Resuscitation

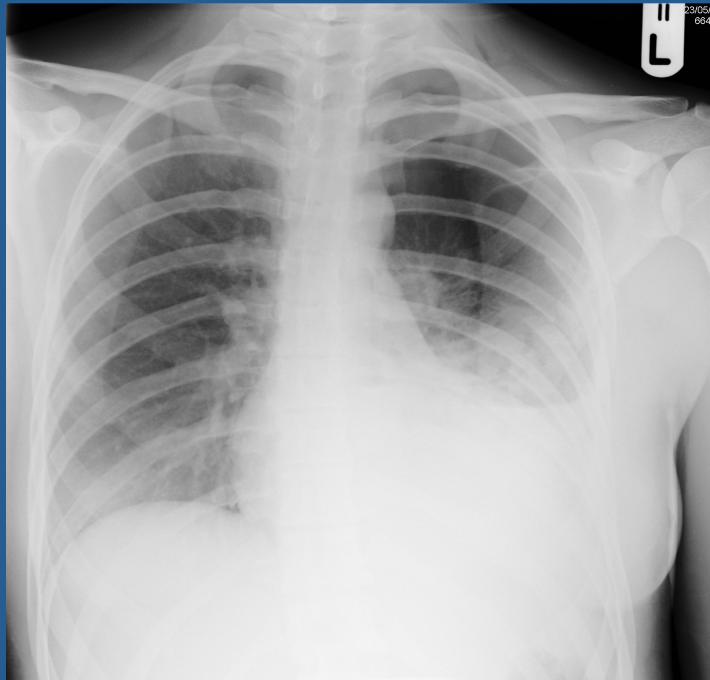
- Protect and secure airway
- Ventilate and oxygenate
- Stop the bleeding!
- Crystalloid / blood resuscitation
- Protect from hypothermia

Adjuncts to Primary Survey



Adjuncts to Primary Survey

Diagnostic Tools



Adjuncts to Primary Survey

Diagnostic Tools

- FAST
- DPL



Definition of Shock

What is shock?

Definition of Shock

What is shock?

Shock is an abnormality of the circulatory system that results in inadequate organ perfusion and tissue oxygenation.

Definition of Shock

Generalized State of Hypoperfusion

- Inadequate oxygen delivery
- Catecholamines and other responses
- Anaerobic metabolism
- Cellular dysfunction
- Cell death

Recognition of Shock

Is the patient in shock?

Recognition of Shock

Is the patient in shock?

Alteration in level of consciousness, anxiety

Cold, diaphoretic skin

Tachycardia

Tachypnea, shallow respirations

Hypotension

Decreased urinary output

Cause of Shock

What is the cause of shock?

Cause of Shock

What is the cause of shock?

Hypovolemic

vs

Nonhemorrhagic

Blood loss

Fluid loss

Tension pneumothorax

Cardiac tamponade

Cardiogenic

Neurogenic

Septic

Cause of Shock

What is the cause of shock?

In the vast majority of trauma patients, shock is due to *blood loss*.

Shock Assessment

Methods of Locating Bleeding

Physical examination

Diagnostic adjuncts to
primary survey

Chest X-ray

Pelvic X-ray

FAST / DPL



Interventions

What can I do about shock?

Interventions

What can I do about shock?



Interventions

What can I do about shock?

Balanced resuscitation

Accepting a lower-than-normal
blood pressure

Packed red blood cells, FFP,
platelets

Not a substitute for definitive
surgical control of bleeding



Too much may be
as bad as too little.

Patient Response

What is the patient's response?

Patient Response

What is the patient's response?

Identify improved organ function

Skin: warm, capillary refill

Renal: increased urinary output

Vital signs

CNS: improved level of consciousness

Patient Response

What is the patient's response?

Related to volume or persistence of hemorrhage

Rapid responder

Transient responder

Nonresponder



Class I Hemorrhage

750 mL Blood Volume Loss (15%)

Slightly anxious

Normal blood pressure

Heart rate < 100 / min

Respirations 14-20 / min

Urinary output 30 mL / hour

Crystalloid

Class II Hemorrhage

750-1500 mL Blood Volume Loss (15-30%)

Anxious

Normal blood pressure

Heart rate > 100 / min

Decreased pulse pressure

Respirations 20-30 / min

Urinary output 20-30 mL / hour

Crystalloid

Class III Hemorrhage

1500-2000 mL Blood Volume Loss (30-40%)

Confused, anxious

Decreased blood pressure

Heart rate > 120 / min

Decreased pulse pressure

Respirations 30-40 / min

Urinary output 5-15 mL / hour

**Crystalloid,
blood
components,
definitive control
of bleeding**

Class IV Hemorrhage

> 2000 mL Blood Volume Loss (> 40%)

Confused, lethargic

Hypotension

Heart rate > 140 / min

Decreased pulse pressure

Respirations > 35 / min

Urinary output negligible

**Blood components,
definitive control of
bleeding**

Patient is hemodynamically unstable



Bleeding cancellous bone

Venous bleeding

Arterial bleeding

Hemorrhage Control pelvis

- Pelvic Containment

- *Sheet*

- *Pelvic Binder*

- *External Fixation*

Bleeding bone
Venous bleeding

- Angiography

Arterial bleeding

- Pelvic Packing

Pelvic Fractures

Hemodynamically Abnormal Patients



Primary Survey

What are my priorities and management principles?

Primary Survey

What are my priorities and management principles?

During the Primary Survey

Stop the bleeding!
(pressure - tourniquet)

Splint the extremity



Primary Survey

Rationale for Splinting

Prevents further blood loss
and injury

Can restore or maintain
perfusion

Relieves pain

Important during evaluation

Do not delay



Secondary Survey

Look

Deformity

Wound(s)

Listen

Doppler
signals

Bruit

Feel

Crepitus

Skin flaps

Neurologic deficit

Pulses

Tenderness

Secondary Survey

Early Concerns

Vascular compromise

Open fractures

Compartment syndrome



Secondary Survey

Assess and Manage Vascular Compromise

- Reduce fracture(s)
- Splint fracture(s)
- Assess by doppler
 - Ankle / brachial index

Secondary Survey

Managing Open Fractures

- Apply appropriate splint
- Cleanse/debride (now or later)
- Consider time factor
- Antibiotic / tetanus status



Secondary Survey

X-Ray Studies

- What x-rays do I need?
 - Any suspected area
 - One joint above and below
- When do I obtain them?
 - Patient is hemodynamically normal



Orthopaedic Urgencies/ Emergencies

- Open fractures
- Dislocations
- Compartment syndromes
- Cauda equina syndrome
- Extremities with neurological or vascular compromise



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Summary

- Dynamic Process
- Must work as a team
- Be available to assess and provide quality care