‘The Golden ~~Hour~~ *Opportunity*’

Trauma Workshop

Dr Lucy Richards

Overview

- What is the golden hour? Why is it golden? Why is it an hour?
- What is the sensitivity and specificity of focused abdominal sonography for trauma compared with CT scan, diagnostic peritoneal lavage or examination?
- How can shock be classified and graded

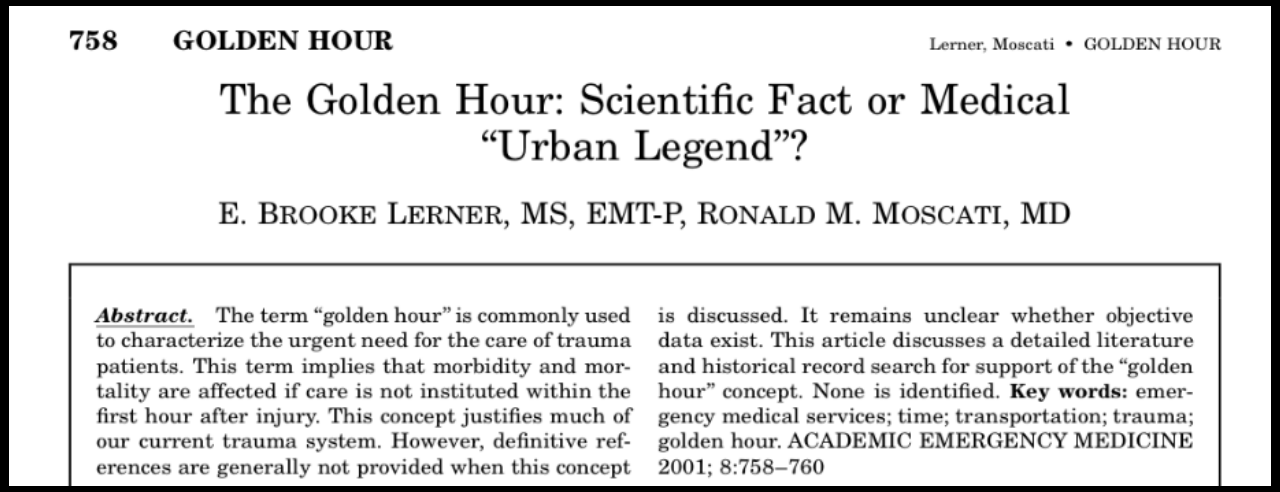
The Golden Hour

"There is a golden hour between life and death. If you are critically injured you have ess than 60 minutes to survive. You might not die right then; it may be three days or two weeks later – but some-thing has happened in your body that is irreparable"

R Adams Cowley MD

Professor Thoracic Surgery

The golden hour



758 GOLDEN HOUR Lerner, Moscati • GOLDEN HOUR

The Golden Hour: Scientific Fact or Medical "Urban Legend"?

E. BROOKE LERNER, MS, EMT-P, RONALD M. MOSCATI, MD

Abstract. The term "golden hour" is commonly used to characterize the urgent need for the care of trauma patients. This term implies that morbidity and mortality are affected if care is not instituted within the first hour after injury. This concept justifies much of our current trauma system. However, definitive references are generally not provided when this concept is discussed. It remains unclear whether objective data exist. This article discusses a detailed literature and historical record search for support of the "golden hour" concept. None is identified. **Key words:** emergency medical services; time; transportation; trauma; golden hour. ACADEMIC EMERGENCY MEDICINE 2001; 8:758–760

- **"The term implies that morbidity and mortality are affected if care is not instituted within the first hour after injury"**
- **"Our search into the background of this term yielded little scientific evidence to support it"**

Lerner EB &, Moscati RM. The golden hour: Scientific fact or medical "urban legend". 1991. Academic Emergency Medicine. 2001:8;758-760

Does pre-hospital time affect mortality?

Emergency Medical Services Intervals and Survival in Trauma: Assessment of the "Golden Hour" in a North American Prospective Cohort

Presented as an abstract at the Society for Academic Emergency Medicine Annual Meeting, May 2008, Washington, DC.

Craig D. Newgard, MD, MPH, Robert H. Schmicker, MS, Jerris R. Hedges, MD, MS, MMM, John P. Trickett, BScN, Daniel P. Davis, MD, Eileen M. Bulger, MD, Tom P. Aufderheide, MD, Joseph P. Minei, MD, J. Steven Hata, MD, FCCP, MSc, K. Dean Gubler, DO, MPH, Todd B. Brown, MD, MSPH, Jean-Denis Yelle, MD, Berit Bardarson, RN, Graham Nichol, MD, MPH, Resuscitation Outcomes Consortium Investigators

2656 patients accross 10 sites in North America. SBP <90, RR <10 >29, GCS <12 or advanced airway intervention.

"No significant association between time and mortality for any EMS interval."

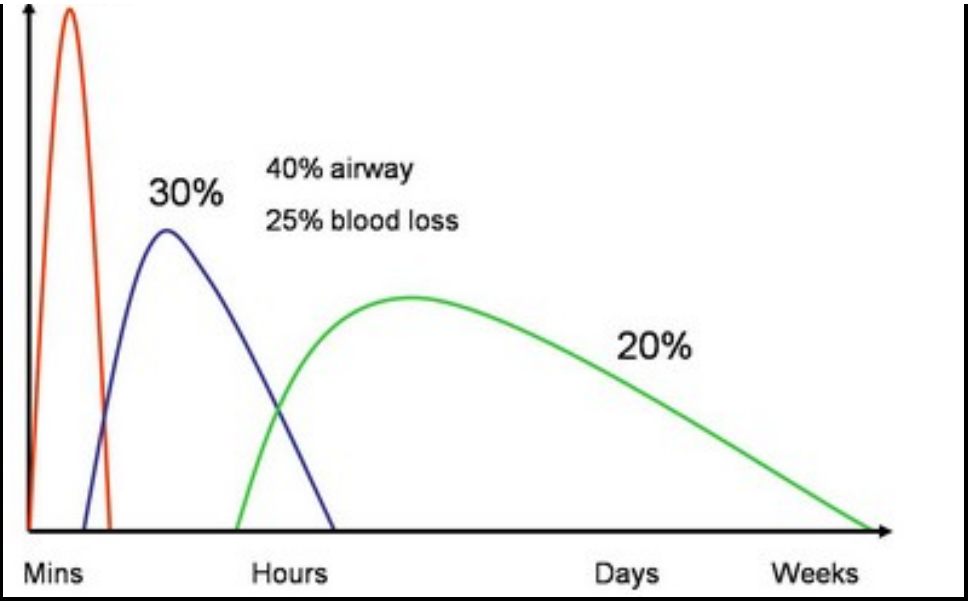
Newgard et al. (2008) Emergency Medical Services Intervals and Survival in Trauma: Assessment of the "Golden Hour" in a Northern American

Trimodal distribution of death

Table 1

Trunkey's 1983 classification of immediate, early, and late trauma deaths*

Deaths	Timing†	Location	Cause	Interventions‡
Immediate	Minutes	Scene	Nonsurvivable injuries	Injury prevention
Early	Hours	Hospital	Severe injuries, potentially survivable with optimal care	Improved access to trauma care
Late	Weeks	Hospital	Multiple organ failure, sepsis	Improved resuscitation/critical care



Trimodal distribution of death

Demetriades et al (2005) Trauma Deaths in a Mature Urban Trauma System: Is "Trimodal" Distribution a Valid Concept?

- 4152 trauma deaths examined:
  - Trimodal distribution 50.2% first 1hr, Second peak 1-6hrs (18.3%), Late >1wk (7%)
  - Death from penetrating trauma and head trauma did not follow the trimodal distribution

Pang et al (2007) Is the trimodal pattern of death after trauma a dated concept in the 21st century? Trauma deaths in Auckland 2004

- 186 deaths
- Trimodal distribution of deaths not demonstrated. Most pre-hospital with a gradual decrease thereafter

Bimodal distrubtion

- Gunst et al (2010) Changing epidemiology of trauma deaths leads to a bimodal distribution
  - Fist peak at scene (61%), Second peak <4hrs (29%), late >4hrs (10%)

" We hypothesize that the development of trauma systems has improved prehospital care, early resuscitation and critical care leading to alterations in this pattern"

"Near elimination of the late peak likely represents advancements in resuscitation and critical care that have reduced organ failure."

The Golden *Opportunity*

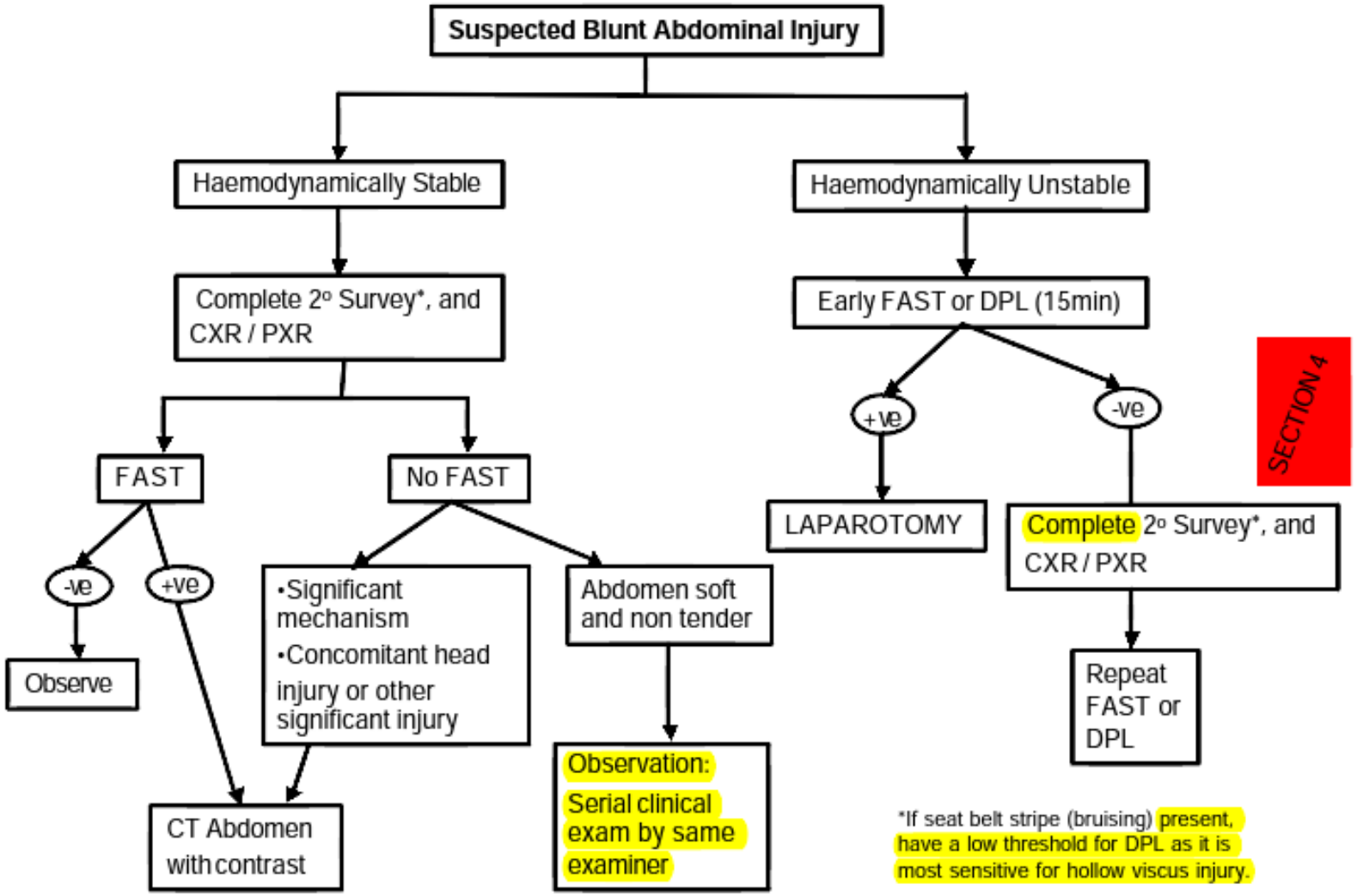
"The concept of the ‘golden hour’ is important; a 1-2-hour period during which all opportunities need to be taken to discover injuries that may cause death within minutes and then to discover injuries that may cause death within hours"

"No need for further clinical guesswork 2 hours after pt arrival"

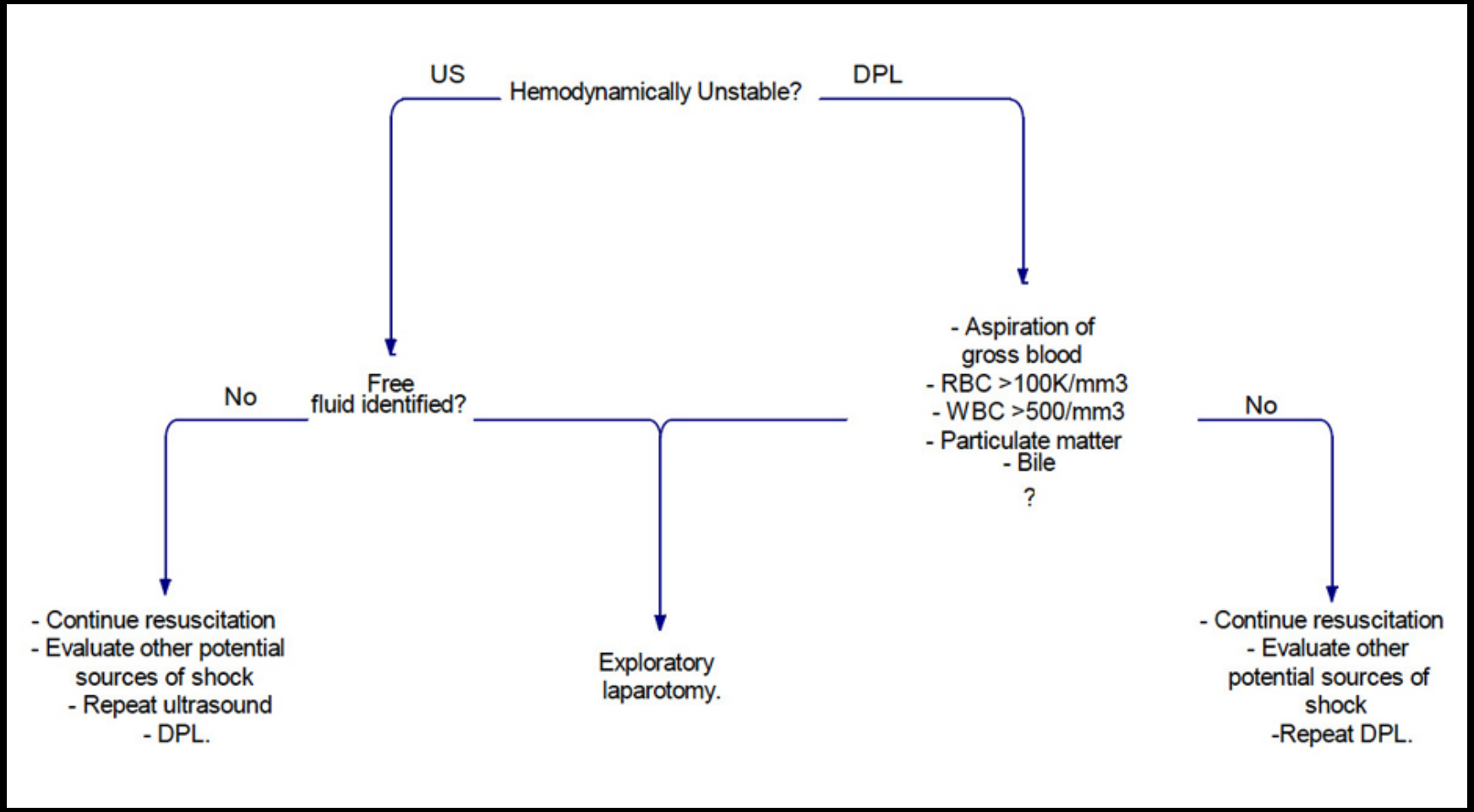
- http://surgwiki.com/wiki/Principles_of_trauma_management#ch45-fig1

BLUNT ABDOMINAL TRAUMA

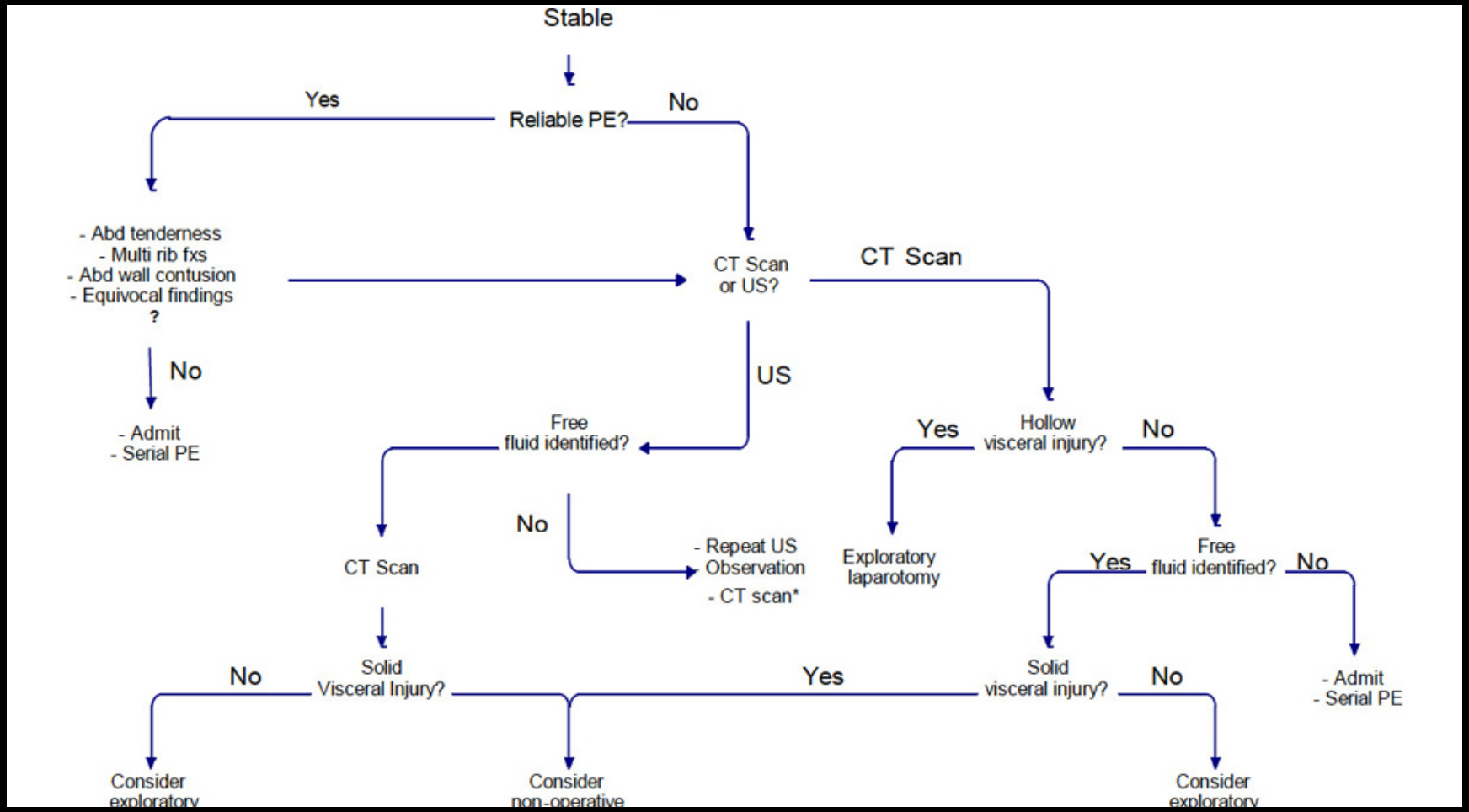
Assessing and managing blunt abdominal trauma



EAST guidelines



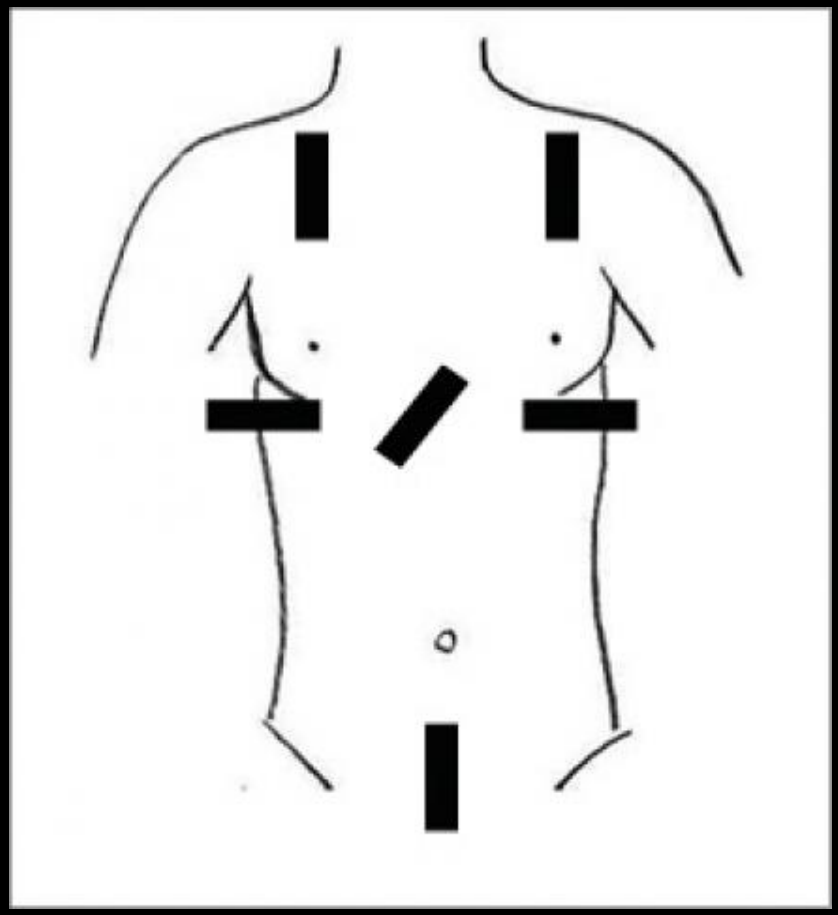
EAST guidelines



E-FAST

Extended Focused Assessment with Sonography in Trauma

1. Subcostal pericardium
2. Coronal Morrison's Pouch
3. Coronal Spleno-renal angle
4. Pelvis
5. Right and left pleural spaces



E-FAST

Pros:

- **Rapid (3-4mins)**
- **Repeatable**
- **non-invasive**
- **Can be performed concurrent to resuscitation**

Cons:

- Operator dependent
- Early scans can be falsely negative (min 200mls fluid)
- Cannot determine:
  - Source, nature of free fluid
  - Presence/level of organ damage
  - Presence of retro-peritoneal injury

Diagnostic Peritoneal Lavage (DPL)

Diagnostic Peritoneal Lavage (DPL)

- Introduced by Root (1965)
- Rapid accurate method to identify intra-abdo haemorrhage
- Most sensitive in hollow viscous injury + mesenteric injury
- Accuracy 92-98%, but significant false positive rate (esp in pelvic fractures).
- Largely replaced by FAST + CT

Computed Tomography (CT)

Computed Tomography (CT)

- Requires a co-operative, HD stable patient
- Needs availability of radiographers/ radiologists to interpret scans
- Sens 92-97.6%, Specificity 98.7%
- Poor predictor of mesenteric injuries and may miss hollow viscous injuries.
- Detects comcomitant injuries such as renal injury

At a glance....

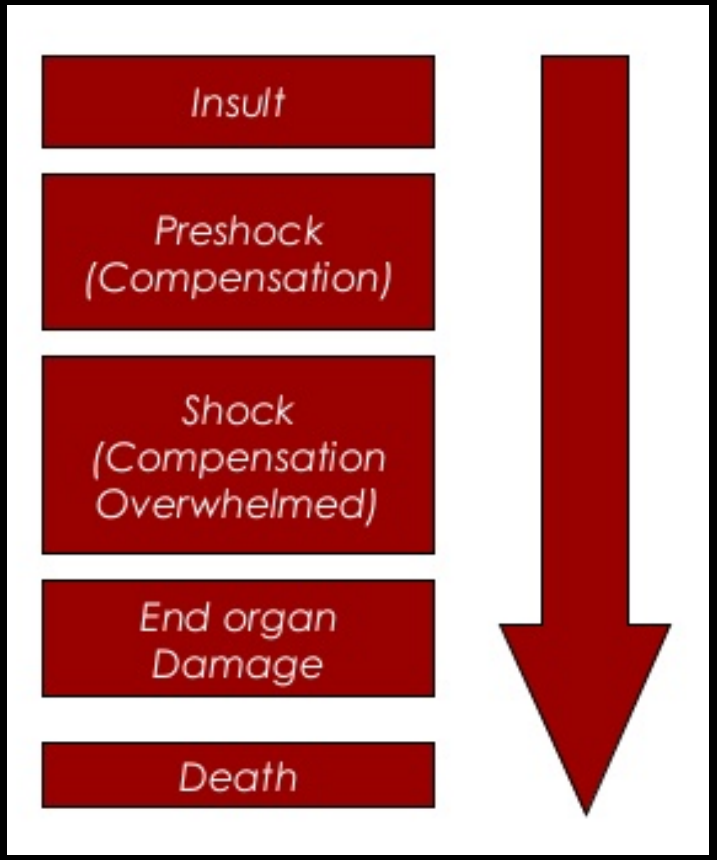
DPL	FAST	CT
10-15mins	2-4 mins, repeatable	Variable time
Inexpensive, mobile, detects bowl injury	Non-invasive, rapid, mobile, inexpensive Additionally looks at lung/ heart	Non-invasive, highly accurate, fixed
Invasive, misses retroperitoneal and diaphragm injuries. Needs a lab to interpret results. Skills shortage	Not good in obese, intra-abdo air, pelvic fractures. User dependent	Misses diaphragm, small bowel and pancreatic injuries. Exposes to radiatiion, expensive
Accuracy 92-98%	Sens 73-88% Spec 98%	Sens 92-97% Spec 98.7%

SHOCK

Shock

Inadequate tissue perfusion

- insufficient delivery of metabolites (eg O2) to sustain aerobic metabolism in cells
- switch to less efficient anaerobic metabolism, producing lactate



Shock

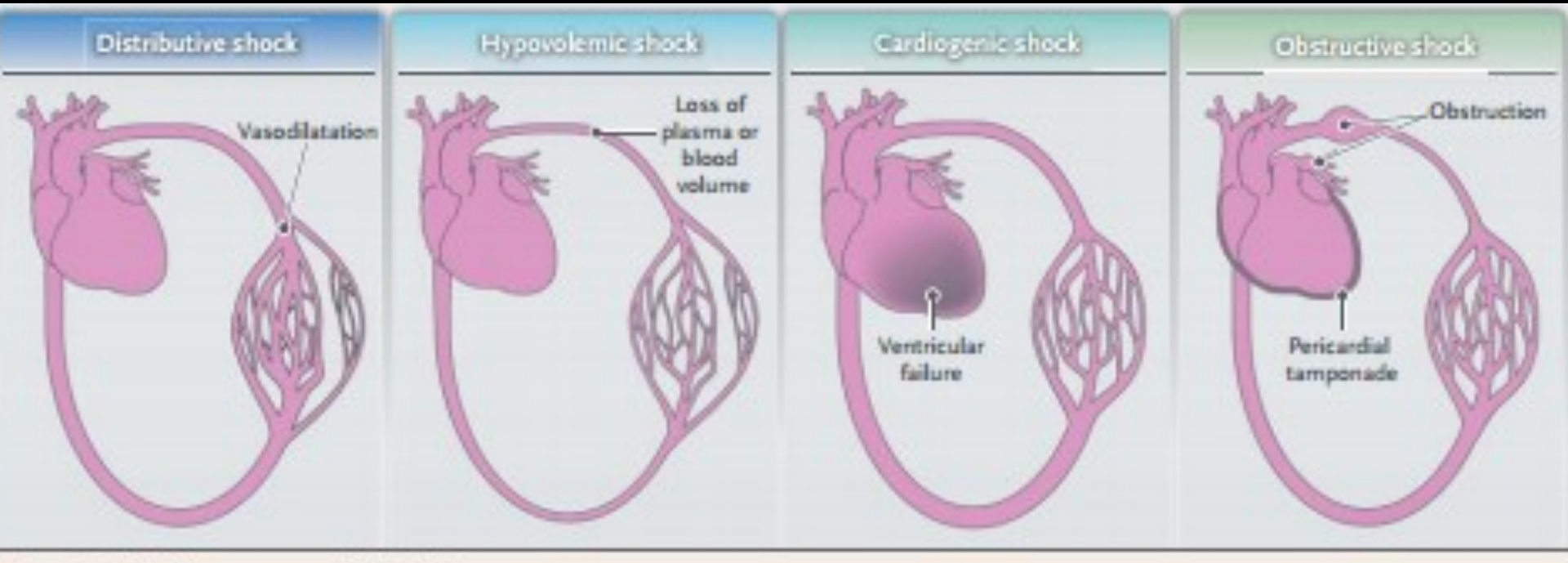
Manifests as:

Haemodynamic disturbance

- SNS stimulation – tachycardia, vasoconstriction, increased ventricular contractility

Organ dysfunction

- renal impairment, ischaemic hepatitis, GIT necrosis


Distributive shock
Vasodilatation
Hypovolemic shock
Loss of plasma or blood volume
Cardiogenic shock
Ventricular failure
Obstructive shock
Obstruction
Pericardial tamponade

Classes of Haemorrhagic shock

Class of haemorrhagic shock				
	I	II	III	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 (per minute)	< 100	100–120	120–140	> 140
Blood pressure	Normal	Normal	Decreased	Decreased
Pulse pressure (mm Hg)	Normal or increased	Decreased	Decreased	Decreased
Respiratory rate (per minute)	14–20	20–30	30–40	> 35
Urine output (mL/hour)	> 30	20–30	5–15	Negligible
Central nervous system/ mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, lethargic

Principles of management

- Assess:
  - ABCDEs (ATLS principles)
  - Find causes, haemorrhage control
- Management:
  - Simultaneous to assessment
  - IV access, volume replacement
  - Resuscitate with blood early (MTP if necessary)
  - Optimise coagulation
- Reassess:
  - Monitor haemodynamics, Check urine output