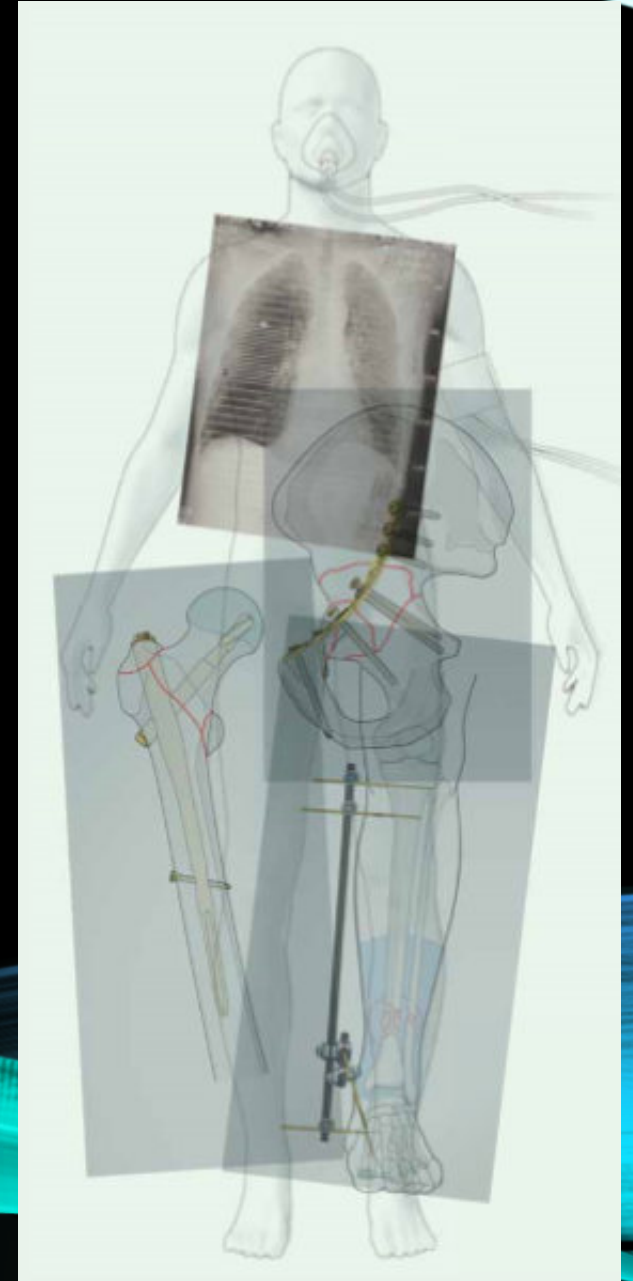


CURRENT CONCEPT POLYTRAUMA MANAGEMENT: Damage Control Orthopedics

dr. Rakhmad Aditya Hernawan, SpOT





POLYTRAUMA PATIENT

More than 2 organ system injuries

Injury Severity Score (ISS) > 17

Threatening remote vital organ, even not damaged by the injury itself

Polytrauma \neq Multiple Fracture \rightarrow multi-discipline approach (Trauma Team)



EPIDEMIOLOGY

- World wide No.1 killer amongst the younger age group (15-45 yrs).
- Third most common cause of death in all age group.
- Mostly occur out of hospital

Injury Severity Scoring (ISS)

Abbreviated Injury Scale



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

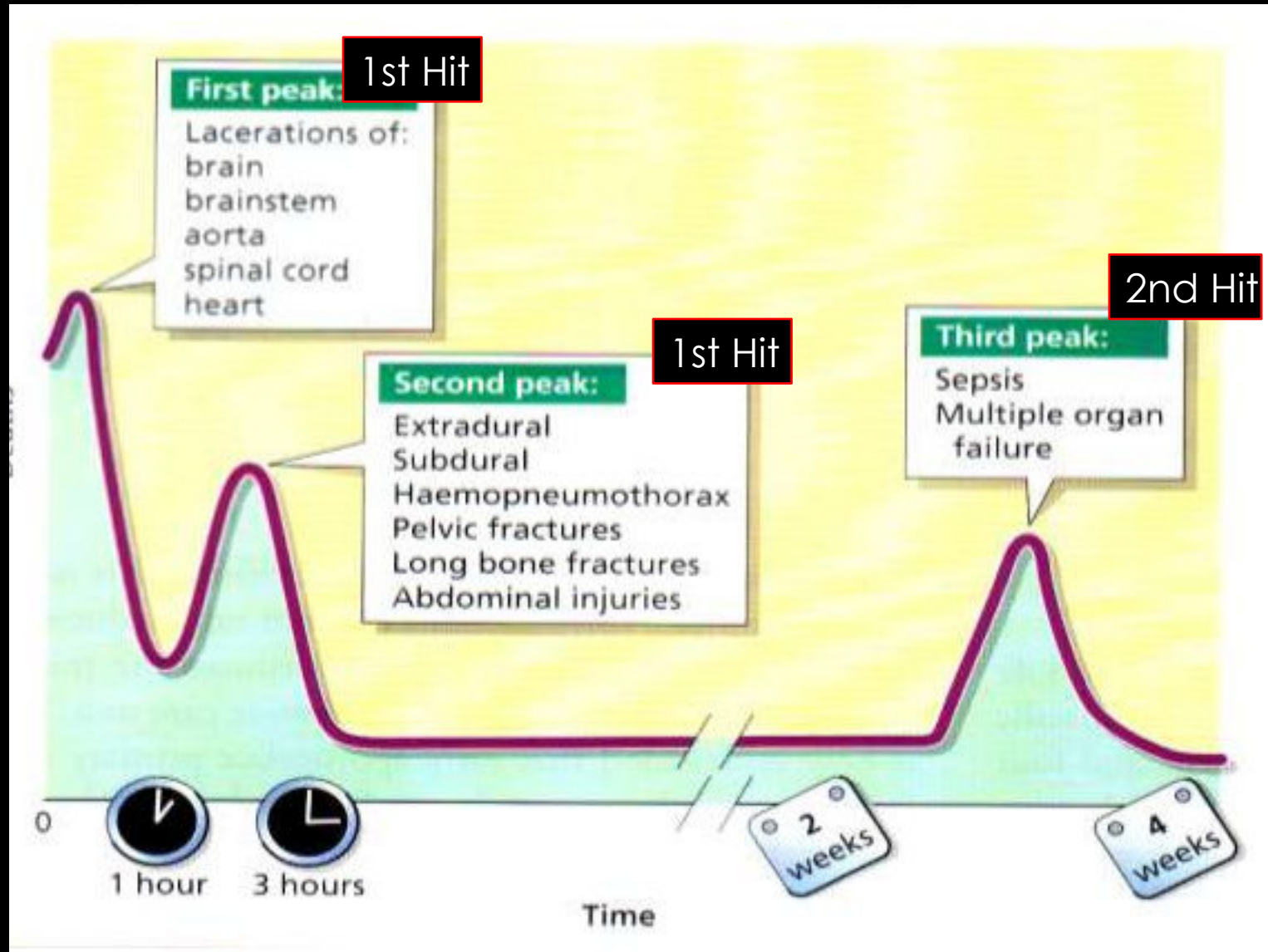


Region	Injury Description	AIS	Square Top Three
Head & Neck	Cerebral Contusion	3	9
Face	No Injury	0	
Chest	Flail Chest	4	16
Abdomen	Minor Contusion of Liver	2	
	Complex Rupture Spleen	5	25
Extremity	Fractured femur	3	
External	No Injury	0	
Injury Severity Score:			50

POLYTRAUMA AND ISS

- ISS developed by Bah et al in 1974
- Important in assessing the effectiveness of medical care
- ISS below 25 : mortality rate minimal
- **ISS above 25 : linear increase in death**
- ISS 50 : mortality 50%
- **ISS 70 : mortality close to 100%**
- Highest ISS is 75

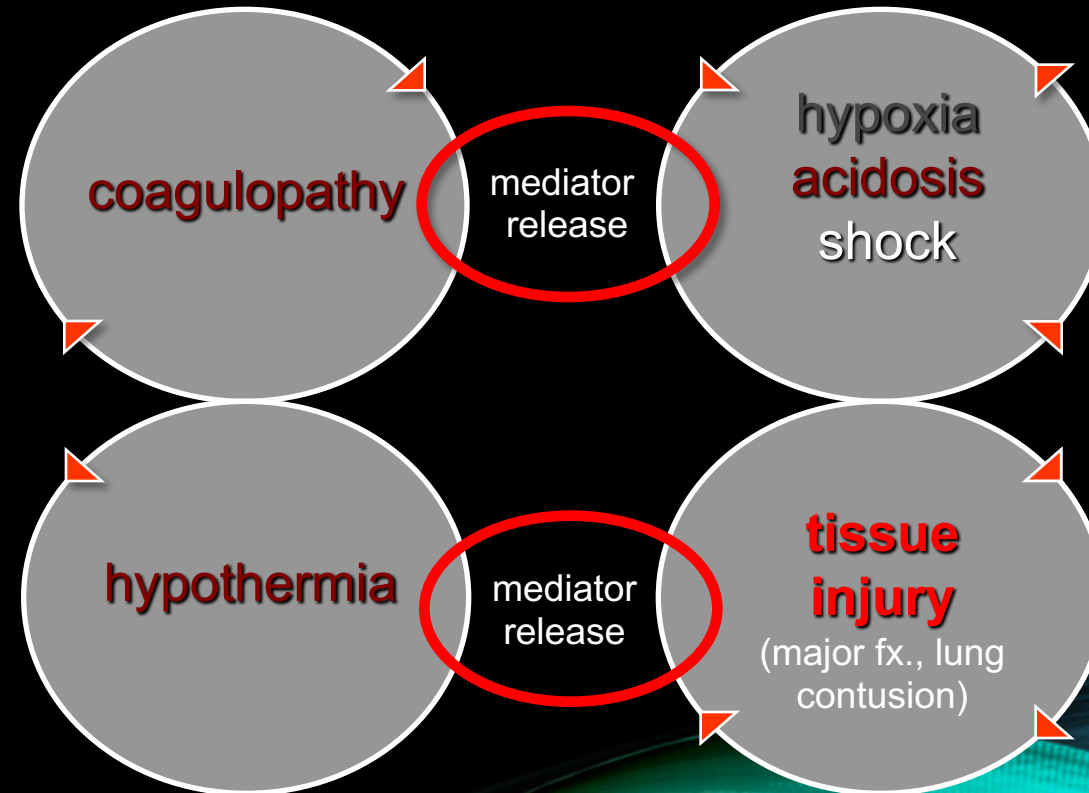
TRIMODAL DISTRIBUTION OF DEATH



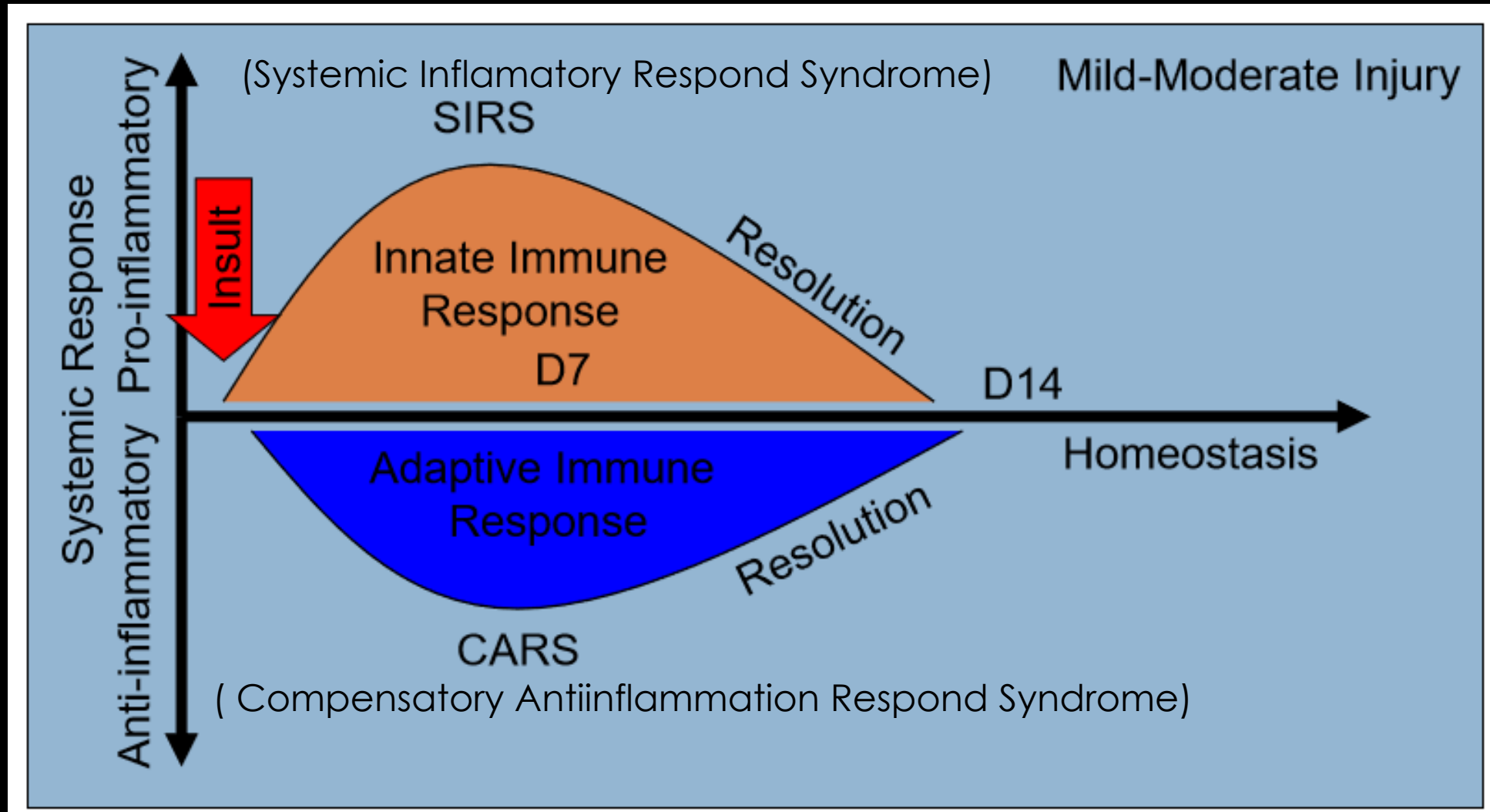
(Saiboon I. 2012)

Polytrauma **Triad** of Death

Four Factors in vicious cycles



INTERPLAY OF CARS AND SIRS (2ND HIT)



OLD AND NEW CONCEPT OF MANAGEMENT

- 1960 → **Delayed Surgery**
 - To sick to operate
- 1980 → **ETC (Early Total Care)**
 - To sick not to operate
 - All injuries operated in 1st day
 - Extended operative procedures during early phase of Polytrauma were associated adverse outcome
 - Patients with ISS>17 (borderline patients) are at high risk of complications
- 1990 → **DCO (Damage Control Orthopedics)**
 - Immediate temporary fracture fixation and secondary definitive management

What means by damage control ?

To enhance the capacity of a ship to absorb damage and ...“



What means by damage control ?



- „ ... and maintain mission integrity...”
- „ It does not mean complete repair”

MANAGEMENT PRIORITIES

- *Life salvage*
- *Limb salvage*
- *Salvage of total function if possible*

ADVANTAGES OF DCO

- Effective approach
- Lower mortality
- Lower blood loss
- Shorter operation time

MANAGEMENT OF ORTHOPAEDIC TRAUMA IN POLYTRAUMA

Four different distinguished periods:

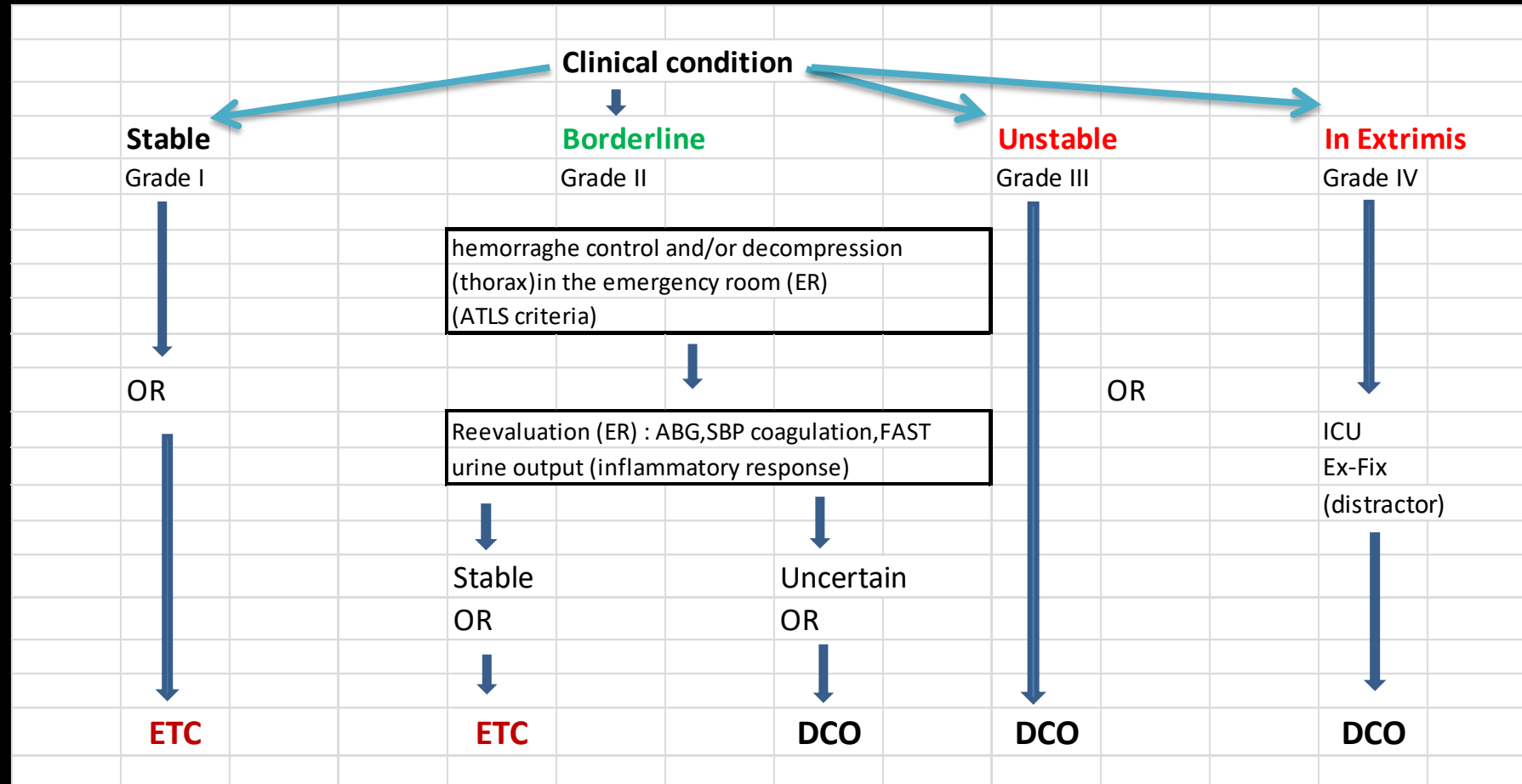
1.
 - Acute or resuscitation period (0-3 hours)
Life saving procedures
2.
 - Primary or stabilization period (3-24 hours)
Day 1 Surgery
3.
 - Secondary or regeneration period (day 4-7)
4.
 - Tertiary or rehabilitation period (beyond day 8)

CLINICAL PARAMETERS OF FOUR CLINICAL GRADES

	Parameter	Stable (grade I)	Borderline (grade II)	Unstable (grade III)	In extremis (grade IV)
Shock	BP (mmHg)	≥100	80–100	60–90	<50–60
	Blood units (2 h)	0–2	2–8	5–15	>15
	Lactate levels	Normal range	Approx 2.5	>2.5	Severe acidosis
	Base deficit (mmol/L)	Normal range	No data	No data	>6–18
	ATLS classification	I	II-III	III-IV	IV
	UO (mL/h)	>150	50–150	<100	<50
Coagulation	Platelet count (μg/mL)	>110000	90000–110000	<70000–90000	<70000
	Factor II and V (%)	90–100	70–80	50–70	<50
	Fibrinogen (g/dL)	>1	Approx 1	<1	DIC
	D-Dimer	Normal range	Abnormal	Abnormal	DIC
Temperature		>35°C	33–35°C	30–32°C	30°C or less
Soft tissue injuries	Lung function, PaO ₂ /FiO ₂	>350	300	200–300	<200
	Chest trauma scores, AIS	AIS I or II	AIS ≥ 2	AIS ≥ 2	AIS ≥ 3
	TSS	O	I-II	II-III	IV
	Abdominal trauma (moore)	≤II	≤III	III	≥III
	Pelvic trauma (AO classification)	A	B or C	C	C (crush, rollover with abd trauma)
	Extremities	AIS I or II	AIS II-III	AIS III-IV	Crush, rollover, extremities

Abbreviations: BP: blood pressure, ATLS: advanced trauma life support, UO: urine output, TTS: thoracic trauma score, AIS: abbreviated injury scale, DIC: disseminated intravascular coagulation.

ALGORITHM TRAUMA MANAGEMENT

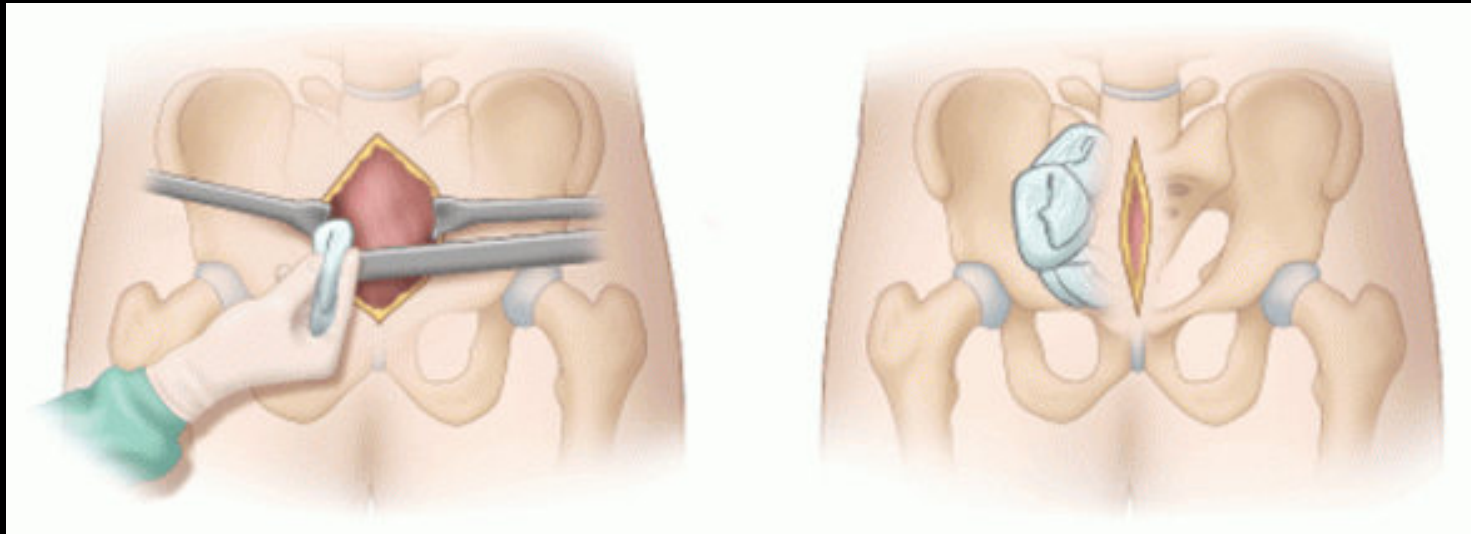
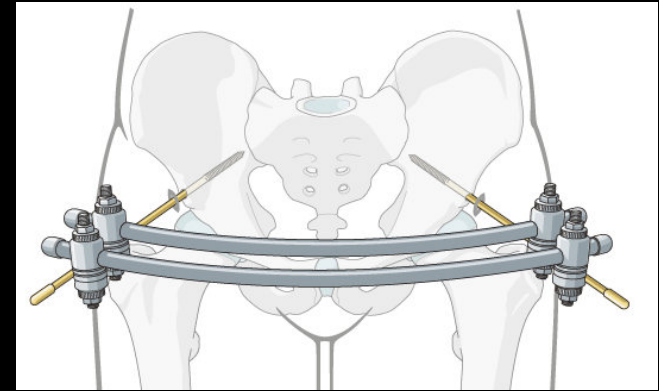


TIMING AND PRIORITIES OF SURGERY

Timing	Physiological Status	Surgical Intervention
Day 1	Normal response to resuscitation	Early Total Care
Day 1	Partial response to resuscitation	Damage Control Surgery
Day 1	No response to resuscitation	Life-saving surgery
Day 2-5	Hyperinflammation	'Second-look' only
Day 6-10	Window of opportunity	Definitive surgery
Day 12-21	Immunosuppression	No surgery
Week 3+	Recovery	2 ^o reconstructive surgery

DAMAGE CONTROL ORTHOPAEDICS

- Upper extremities → Splint or sling
- Lower extremities → Splint, external fixation or traction
- Pelvic fracture → Pelvic packing and or external fixation



REPORTED INCIDENCE OF ARDS IN POLYTRAUMA PATIENTS

Treatment	ARDS incidence reported	ARDS incidence reported
---	ETC era	DCO era
IM nailing	32.8%	15.2%
Ext-fix than IM nailing	16.2%	7.9%

(Meek R et al. AO Dialogue 2006)

SUMMARY

- Polytrauma patients are No.1 killer for young ages
- New concept of triage (grading), and management
- Early Total Care (ETC) still used for stable patient
- Damage Control Orthopedics (DCO) as first procedure for life, limb saving and salvage total function if possible
- Timing of surgery determined by patient's condition and determine the outcome

THANK YOU

