



# Update in trauma life support



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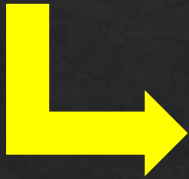
Emergency department

Khon Kaen Hospital

# initial assessment



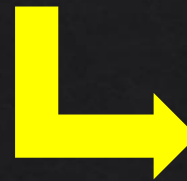
Primary survey with  
simultaneous  
resuscitation



Adjuncts to the  
primary survey  
with resuscitation



Secondary survey



Definitive  
care

Re-evaluation

# High energy mechanism



## ◇ Fall

- Adult > 20 ft (6m) (ตึก 2 ชั้น)
- Children > 10 ft (3m) (2-3 เท่าของความสูง)

## ◇ Motor crash

- Intrusion : roof > 12 inches (30 cm.), Occupant > 18 inches (45 cm.)
- Ejection
- Death in same passenger compartment

## ◇ Auto VS Pedestrian > 20 mph (32 kph)

## ◇ MC crash > 20 mph (32 kph)



# Primary survey with simultaneous resuscitation



- ◇ **A**irway maintenance with restriction of cervical spine motion
- ◇ **B**reathing and ventilation
- ◇ **C**irculation with hemorrhage control
- ◇ **D**isability (assessment of neurologic status)
- ◇ **E**xposure/Environmental control



# Airway maintenance with restriction of cervical spine motion



- ◈ Facial burn
- ◈ Maxillofacial Trauma
- ◈ Neck Trauma
- ◈ Laryngeal Trauma

Airway obstruction

# Airway maintenance with restriction of cervical spine motion



## Signs of airway obstruction

- Secretion or blood per mouth/nose
- Inspection for foreign bodies
- Stridor
- facial, mandibular, or tracheal/laryngeal fractures

Able to communicate verbally → patent

# Airway maintenance with restriction of cervical spine motion



## Objective sign of airways obstruction

- Look : agitation, skin color, retraction of use of accessory respiratory muscles
- Listen : noisy breathing , snoring, stridor ,hoarseness of voice
- Feel : location of trachea



# Airway maintenance with restriction of cervical spine motion



## Airway management

- Open airway : chin lift, jaw thrust
- Suction, clear airway/FB , O2 (Mask c bag > 10LPM)
- Unconscious , no gag patient → Oropharyngeal airway/Nasopharyngeal airway
- Obvious airway compromise → definite airway (orotracheal/nasotracheal tube, surgical airway)
- **C spine protection** ตลอดเวลา



# Airway maintenance with restriction of cervical spine motion

## Drug-Assisted Intubation

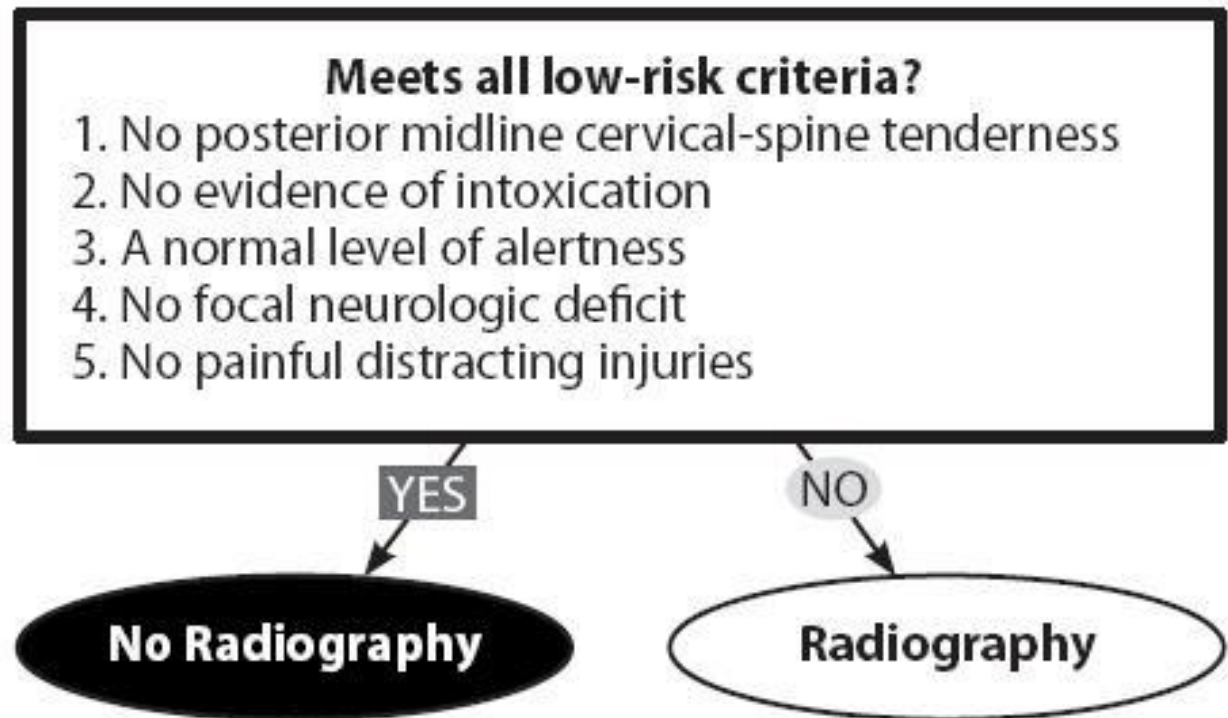
- ◇ induction drug >> etomidate 0.3 mg/kg or sedative
- ◇ Paralytic drug >> succinylcholine 1 to 2 mg/kg i.v. (usual dose is 100 mg)

# Airway maintenance with restriction of cervical spine motion



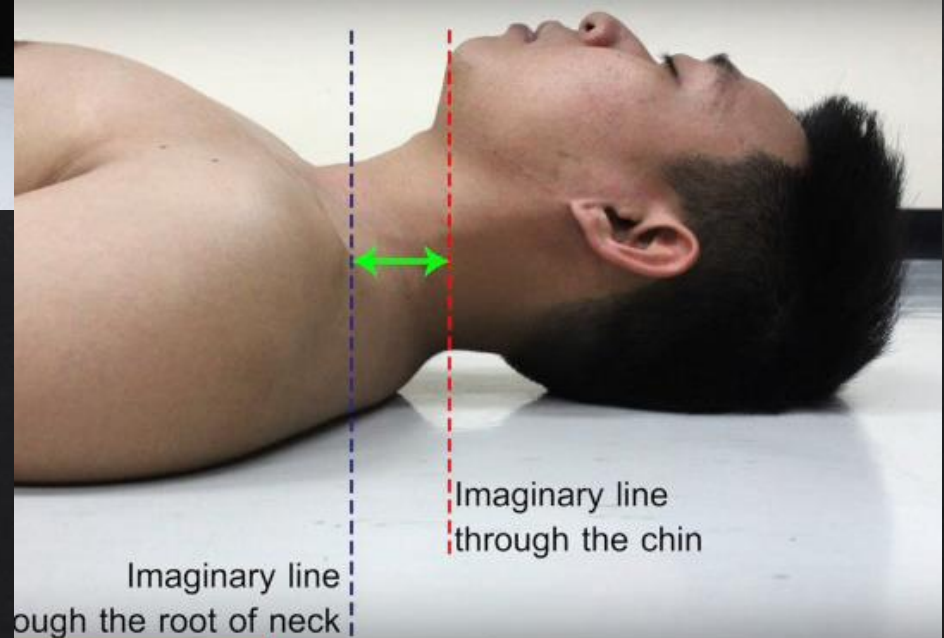
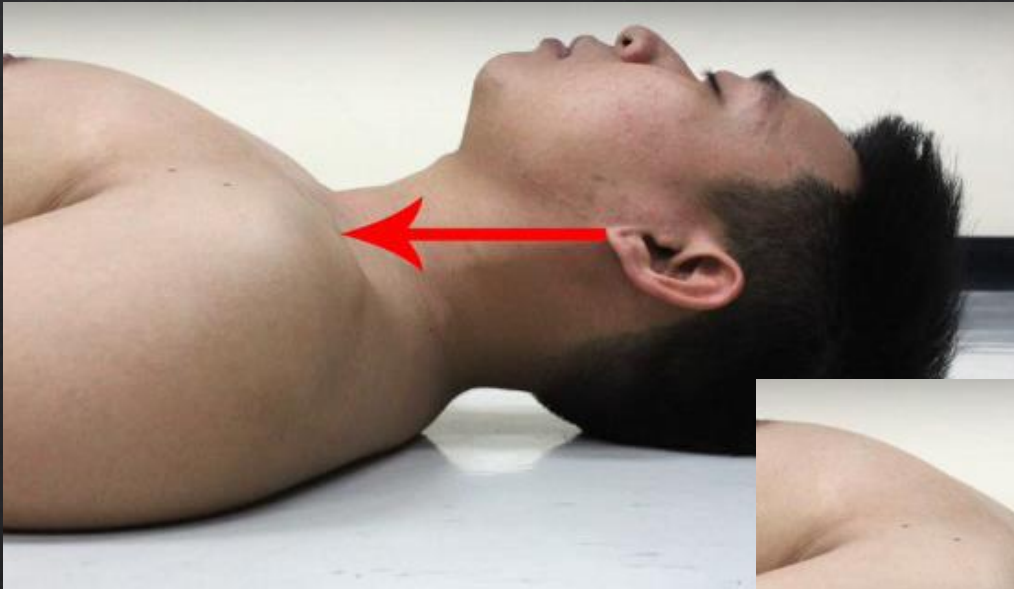
Restriction of  
cervical spine  
motion

## Figure 11. National Emergency X-Radiography Utilization Study (NEXUS) Criteria





# Airway maintenance with restriction of cervical spine motion



# Airway maintenance with restriction of cervical spine motion



# Airway maintenance with restriction of cervical spine motion







# Breathing and ventilation

Auscultation, Visual inspection and palpation, Percussion

## Detect

- ✓ Tension pneumothorax
- ✓ Tracheobronchial tree injury
- ✓ Open pneumothorax
- “sucking wound”
- ✓ Massive hemothorax
- ✓ Cardiac tamponade

Oxygen mask with bag

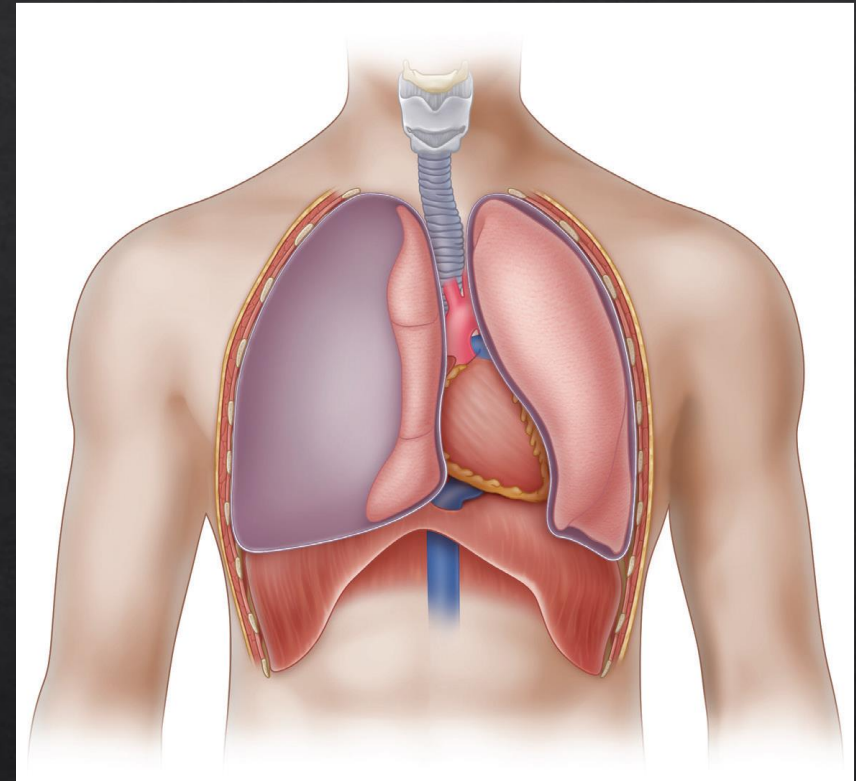
3 side dressing

Needle thoracostomy

Intercostal drainage

# Tension Pneumothorax

- Chest pain , Air hunger
- Tachypnea , Respiratory distress
- Tachycardia
- Hypotension
- Tracheal deviation away from the side of the injury
- Unilateral absence of breath sounds
- Neck vein distention
- Cyanosis (late manifestation)



Oxygen mask  
with bag



Needle  
thoracostomy



Intercostal  
drainage

# Tracheobronchial tree injury

- Injury to the trachea or a major bronchus
- Most of patients die at scene
- Tension pneumothorax or tension pneumopericardium





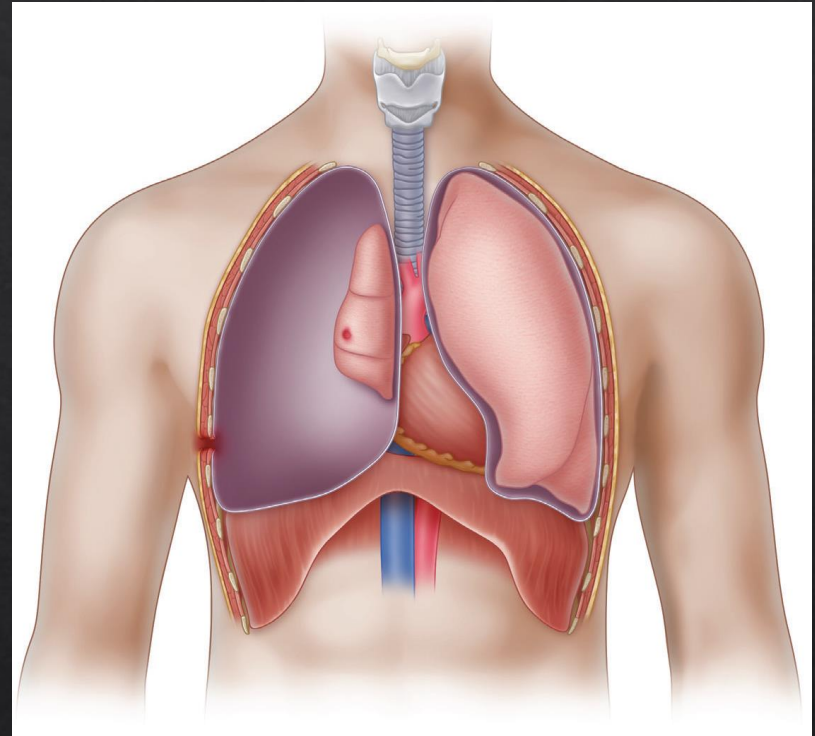
# Open pneumothorax “sucking wound”



- Large injuries to the chest wall (> 2/3 diameter of trachea)

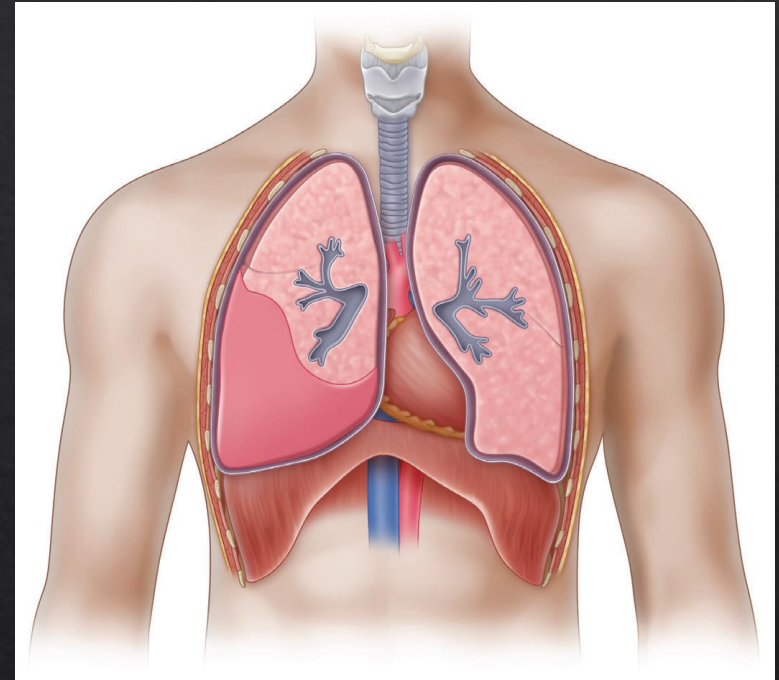


Intercostal  
drainage



# Massive hemothorax

- ◇ Rapid accumulation of more than 1500 mL of blood
- ◇ One-third or more of the patient's blood volume
- ◇ Continuing blood loss 200 mL/hr for 2 to 4 hours



Intercostal  
drainage

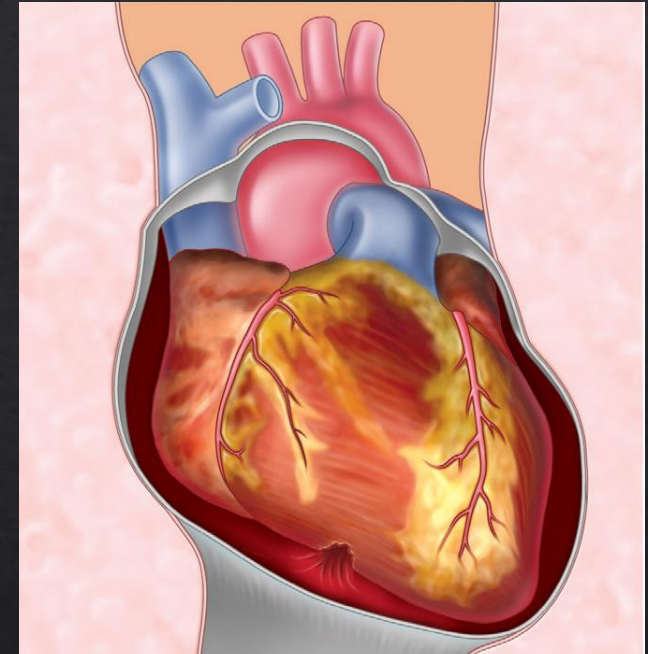


Immediate surgical  
consultation

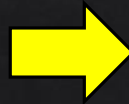
# Cardiac tamponade

- ◆ The classic clinical triad
  - ◆ Muffled heart sounds
  - ◆ Hypotension
  - ◆ Distended veins

e-FAST



intravenous fluid



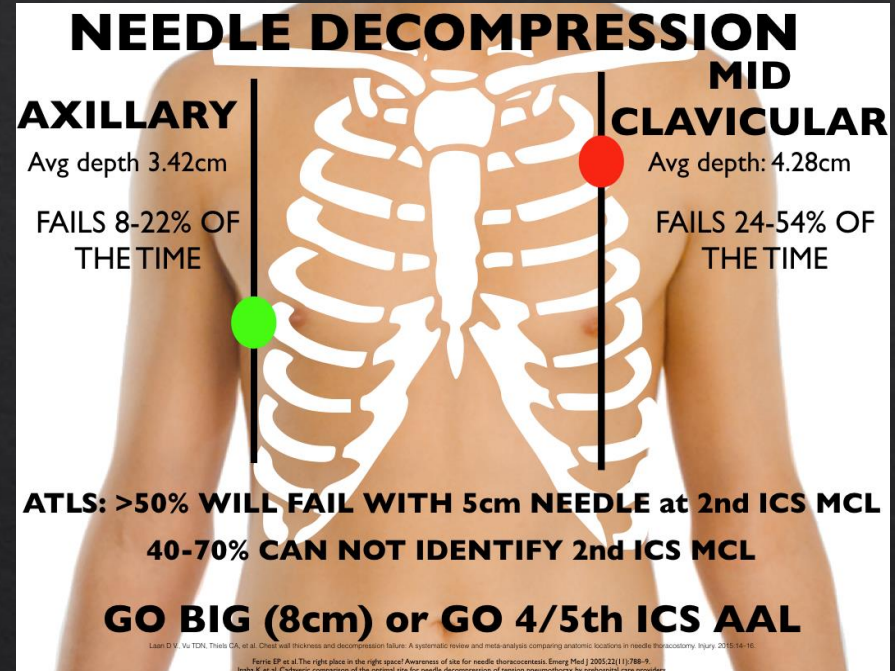
Emergency thoracotomy  
as soon as possible

pericardiocentesis



# Needle thoracostomy

- ◆ Large over-the-needle catheter
- ◆ 2<sup>nd</sup> ICS midclavicular line
- ◆ 5<sup>th</sup> ICS anterior to midaxillary line



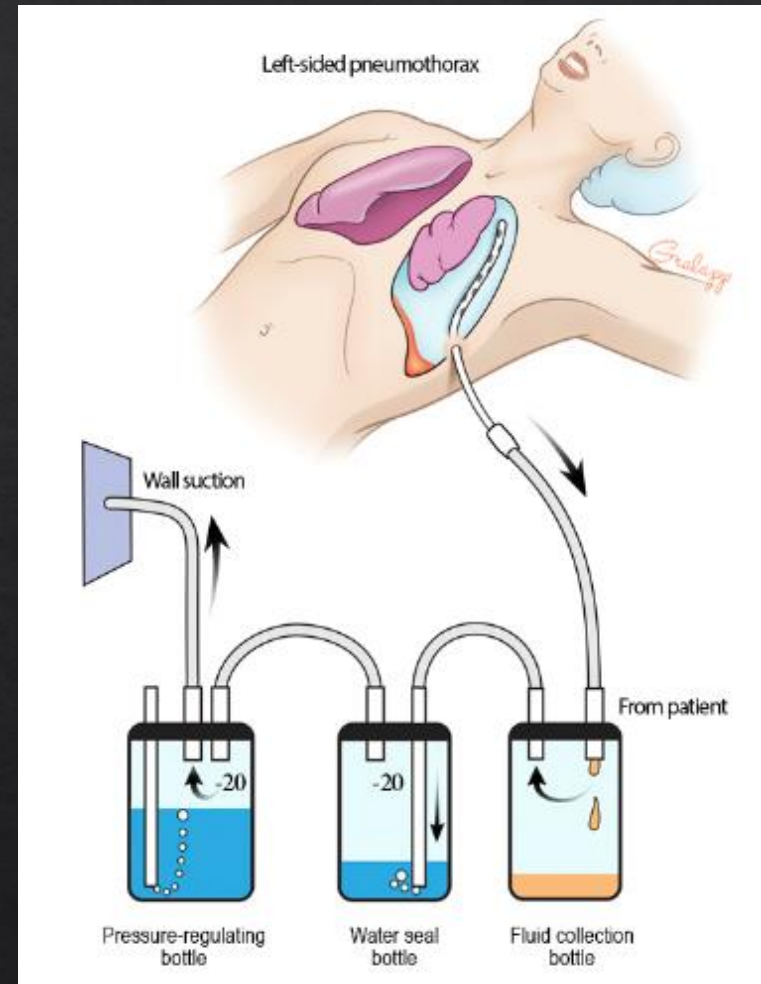
# Finger Decompression



# Intercostal drainage (ICD)



Chest tube  
(28-32 French)





# Traumatic Circulatory Arrest



## CPR

Airway , external cardiac massage ,  
ETT , 100%oxygen , IV or IO ,  
fluids , Adrenaline



Bilateral chest  
decompression



Chest tube



# Circulation with hemorrhage control



- ◈ Hemorrhagic Shock
- ◈ Non-hemorrhagic Shock
  - ◈ Cardiogenic shock
  - ◈ Cardiac tamponade
  - ◈ Tension pneumothorax
  - ◈ Neurogenic shock
  - ◈ Septic shock

# Circulation with hemorrhage control



- Identify external hemorrhage and control bleeding

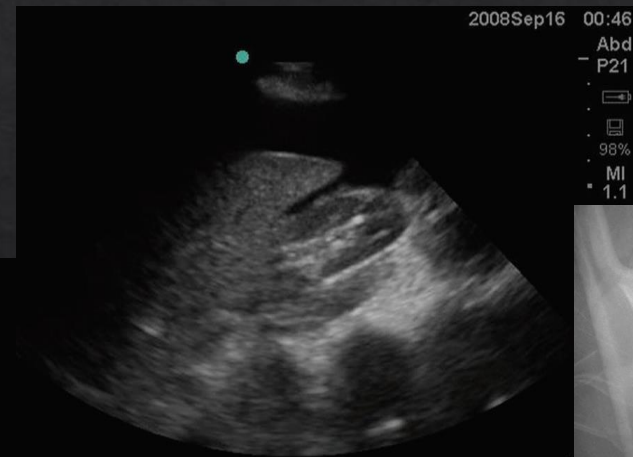
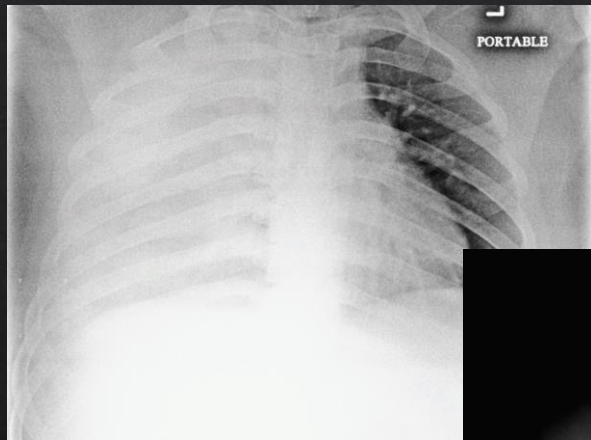




# Circulation with hemorrhage control



- Internal bleeding : chest, abdomen, retroperitoneal, pelvis, long bone





# Circulation with hemorrhage control



Fracture	Blood Loss (mL)
Single rib	125
Radius or ulna	250–500
Humerus	750
Tibia or fibula	500–1000
Femur	1000–2000
Pelvis	Massive



# Hemorrhagic Shock



**TABLE 3-1 SIGNS AND SYMPTOMS OF HEMORRHAGE BY CLASS**

PARAMETER	CLASS I	CLASS II (MILD)	CLASS III (MODERATE)	CLASS IV (SEVERE)
Approximate blood loss	<15%	15–30%	31–40%	>40%
Heart rate	↔	↔/↑	↑	↑/↑↑
Blood pressure	↔	↔	↔/↓	↓
Pulse pressure	↔	↓	↓	↓
Respiratory rate	↔	↔	↔/↑	↑
Urine output	↔	↔	↓	↓↓
Glasgow Coma Scale score	↔	↔	↓	↓
Base deficit <sup>a</sup>	0 to -2 mEq/L	-2 to -6 mEq/L	-6 to -10 mEq/L	-10 mEq/L or less
Need for blood products	Monitor	Possible	Yes	Massive Transfusion Protocol

# Vascular access



- ◆ Two large caliber 18-gauge
- ◆ Intraosseous (IO)



- ◆ Basic lab, UPT
- ◆ G/M

# Initial fluid therapy



- ◇ Warmed isotonic fluid (39 C)
- ◇ Adults : 1 liter
- ◇ Pediatric : 20 mL/kg



# Initial fluid therapy



**TABLE 3-2 RESPONSES TO INITIAL FLUID RESUSCITATION<sup>a</sup>**

	<b>RAPID RESPONSE</b>	<b>TRANSIENT RESPONSE</b>	<b>MINIMAL OR NO RESPONSE</b>
Vital signs	Return to normal	Transient improvement, recurrence of decreased blood pressure and increased heart rate	Remain abnormal
Estimated blood loss	Minimal (<15 % )	Moderate and ongoing (15%–40%)	Severe (>40%)
Need for blood	Low	Moderate to high	Immediate
Blood preparation	Type and crossmatch	Type-specific	Emergency blood release
Need for operative intervention	Possibly	Likely	Highly likely
Early presence of surgeon	Yes	Yes	Yes

<sup>a</sup> Isotonic crystalloid solution, up to 1000 mL in adults; 20 mL/kg in children

# Initial fluid therapy



“In penetrating trauma with hemorrhage, delaying aggressive fluid resuscitation until definitive control of hemorrhage”

“controlled resuscitation”

“balanced resuscitation”

“hypotensive resuscitation”

“permissive hypotension”

# Circulation with hemorrhage control



## ◆ Massive transfusion :

: Require > 10 units of pRBCs within the first 24 hours

: More than 4 units in 1 hour

## ◆ Shock class IV



Massive transfusion protocol  
= PRC:Plasma:Platlet = 1:1:1



# Circulation with hemorrhage control



- ◇ Thromboelastography (TEG)
- ◇ Rotational thromboelastometry (ROTEM)



- ◇ Tranexamic acid within 3 hours of injury
  - ◇ dose 1 g drip over 10 mins then 1 g q 8 hours

# Circulation with hemorrhage control



## Special considerations

- ◆ Advanced age
- ◆ Athletes
- ◆ Pregnancy
- ◆ Medications
- ◆ Hypothermia

# Disability



◇ AVPU Method : Alert, Response to Verbal Stimuli,  
Response to Pain, Unresponsive

◇ Glasgow Coma Score (GCS)

- Mild : GCS 13-15
- Moderate : GCS 9-12
- Severe : GCS 3-8

◇ Pupil size



# Disability



**TABLE 6-2 GLASGOW COMA SCALE (GCS)**

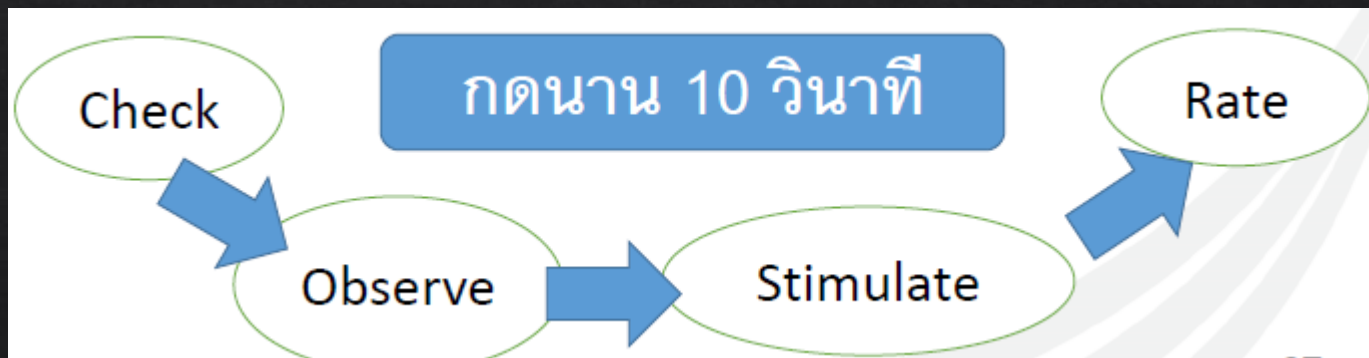
ORIGINAL SCALE	REVISED SCALE	SCORE
Eye Opening (E)	Eye Opening (E)	
Spontaneous	Spontaneous	4
To speech	To sound	3
To pain	To pressure	2
None	None	1
	Non-testable	NT
Verbal Response (V)	Verbal Response (V)	
Oriented	Oriented	5
Confused conversation	Confused	4
Inappropriate words	Words	3
Incomprehensible sounds	Sounds	2
None	None	1
	Non-testable	NT
Best Motor Response (M)	Best Motor Response (M)	
Obeys commands	Obeys commands	6
Localizes pain	Localizing	5
Flexion withdrawal to pain	Normal flexion	4
Abnormal flexion (decorticate)	Abnormal flexion	3
Extension (decerebrate)	Extension	2
None (flaccid)	None	1
	Non-testable	NT

# Disability



ตำแหน่งที่กระตุ้นเพื่อประเมิน GCS แนะนำดังนี้

- กดที่ปลายนิ้ว **fingertip pressure**
- หยิกที่กล้ามเนื้อ ทราปิเซียส **trapezius pinch**
- กดที่รอยบากหัวตา **supraorbital notch**



# Disability



## Mild TBI (GCS 13-15)

Moderate risk for brain injury on CT:

- ♦ Loss of consciousness (more than 5 minutes)
- ♦ Amnesia before impact (more than 30 minutes)
- ♦ Dangerous mechanism (e.g., pedestrian struck by motor vehicle, occupant ejected from motor vehicle, fall from height more than 3 feet or five stairs)

High risk for neurosurgical intervention:

- ♦ GCS score less than 15 at 2 hours after injury
- ♦ Suspected open or depressed skull fracture
- ♦ Any sign of basilar skull fracture (e.g., hemotympanum, raccoon eyes, CSF otorrhea or rhinorrhea, Battle's sign)
- ♦ Vomiting (more than two episodes)
- ♦ Age more than 65 years
- ♦ Anticoagulant use\*



# Disability



## Moderate TBI (GCS 9-12)

- ◆ Initial examination
- ◆ CT head in all cases
- ◆ Admit or transfer to facility capable of definitive neurosurgical care

# Disability

## Severe TBI (GCS 3-8)

### Assessment and management

- ♦ ABCDEs
- ♦ Primary survey and resuscitation
- ♦ Secondary survey and AMPLE history
- ♦ Admit or transfer to a facility capable of definitive neurosurgical care
- ♦ Therapeutic agents (usually administered after consultation with neurosurgeon)
  - Mannitol
  - Avoid hyperventilation in the first 24 hours unless signs of herniation
  - Hypertonic saline
- ♦ Neurologic reevaluation:
- ♦ GCS
  - Eye opening
  - Motor response
  - Verbal response
- ♦ Pupillary light response
- ♦ Focal neurologic exam

CT scan

# Disability



## Severe TBI (GCS 3-8)

- ◆ Maintain systolic blood pressure
  - ◆  $\geq 100$  mm Hg for patients 50 to 69 years
  - ◆  $\geq 110$  mm Hg or higher for patients 15 to 49 years or older than 70 years
- ◆ Decrease mortality and improve outcomes

CATEGORY	PARAMETER	NORMAL VALUES
Clinical Parameters	Systolic BP	$\geq 100$ mm Hg
	Temperature	36–38°C
Laboratory Parameters	Glucose	80–180 mg/dL
	Hemoglobin	$\geq 7$ g/dL
	International normalized ratio (INR)	$\leq 1.4$
	Na	135–145 meq/dL
	PaO <sub>2</sub>	$\geq 100$ mm Hg
	PaCO <sub>2</sub>	35–45 mm Hg
	pH	7.35–7.45
	Platelets	$\geq 75 \times 10^3/\text{mm}^3$



# Exposure Environmental control



◇ ถอดให้หมด เพื่อตรวจหาการบาดเจ็บทุกส่วนของร่างกาย โดยเฉพาะหลัง และ perineum

◇ Keep warm

- Warm blanket
- Warm IV fluid (39 C)



# Adjuncts to the primary survey with resuscitation



- ◇ EKG
- ◇ Pulse Oximetry
- ◇ Ventilatory Rate, Capnography
- ◇ ABG
- ◇ Urinary and Gastric Catheters
- ◇ X-ray Examinations (PCXR, PPelvic)
- ◇ Diagnostic Studies (eFAST, DPL)

# Secondary survey



AMPLE

Head to toe evaluation







# Definitive care

## Interhospital transfer to definitive care

- ◆ Mechanism (and time) of injury
- ◆ Injuries found and suspected
- ◆ Symptoms and Signs
- ◆ Treatment initiated

# Spinal trauma

◇ Spinal immobilization เปลี่ยนเป็น  
Restriction of spinal motion





# BURN

**TABLE 9-1 BURN RESUSCITATION FLUID RATES AND TARGET URINE OUTPUT BY BURN TYPE AND AGE**

CATEGORY OF BURN	AGE AND WEIGHT	ADJUSTED FLUID RATES	URINE OUTPUT
Flame or Scald	Adults and older children ( $\geq 14$ years old)	2 ml LR x kg x % TBSA	0.5 ml/kg/hr 30–50 ml/hr
	Children ( $< 14$ years old)	3 ml LR x kg x % TBSA	1 ml/kg/hr
	Infants and young children ( $\leq 30$ kg)	3 ml LR x kg x % TBSA  Plus a sugar-containing solution at maintenance rate	1 ml/kg/hr
Electrical Injury	All ages	4 ml LR x kg x % TBSA until urine clears	1–1.5 ml/kg/hr until urine clears

LR, lactated Ringer's solution; TBSA, total body surface area





Thank  
You