Advanced Trauma Life Support (ATLS)

Department of thoracic and cardiovascular surgery

Trauma center, Dankook University Hospital

Associate professor, Sung Wook Chang. MD. PhD.

No conflict of interest

GOLDEN HOUR

중증외상센터 골든아워

중증외상센터 : 골든 아워 웹툰

스토리 > 화요웹툰 | ★★★★★ 10.0

글 한산이가 | 그림 홍비치라

내용 살 수 있는 환자들이 죽어 가고 있다.

연재정보 네이버 만화 | 연재중

전체보기 첫회보기

Golden hour

Golden hour

First peak

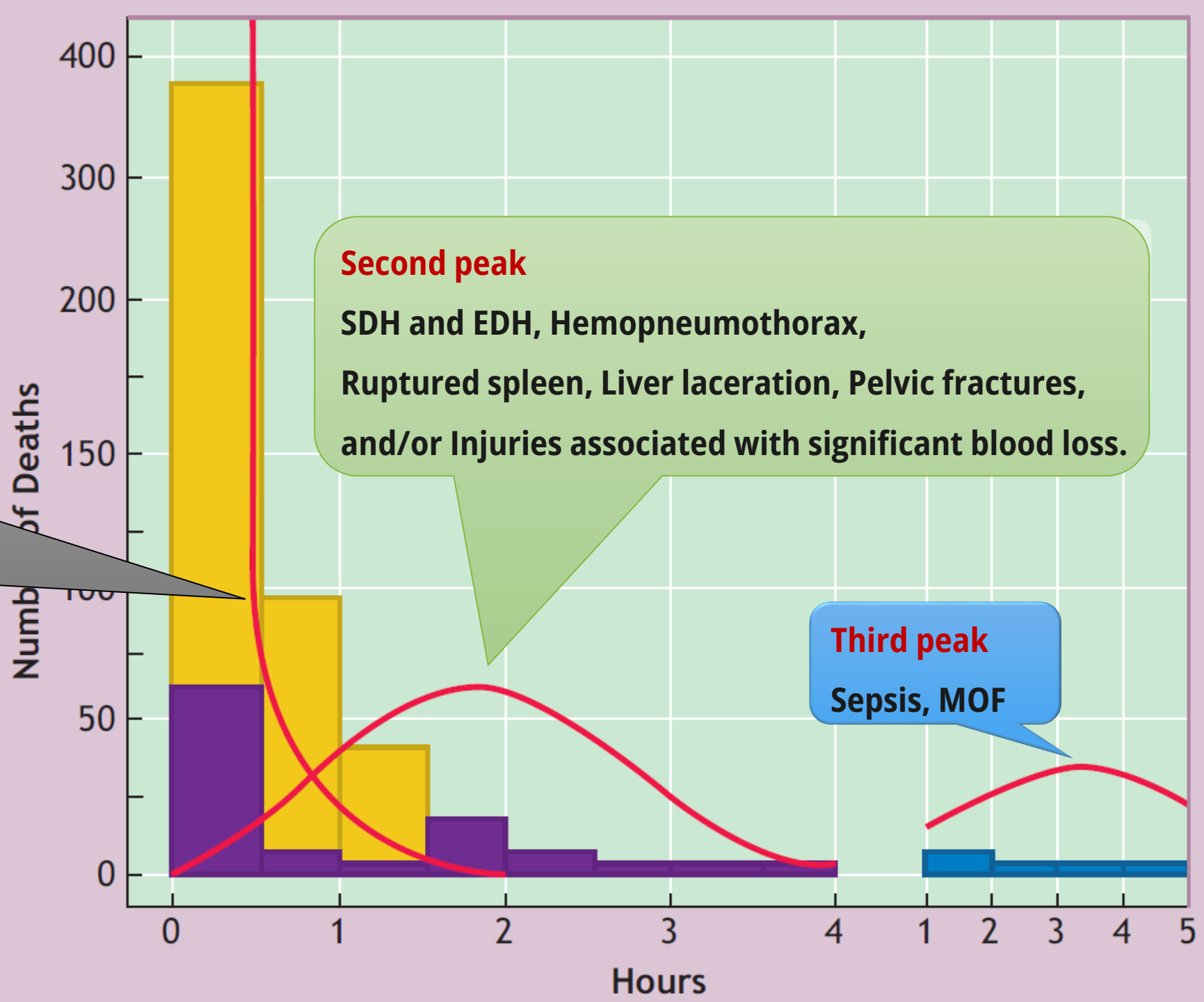
Severe brain,

High spinal cord injury,

Rupture of the heart,

Aorta, Large blood vessels

TRIMODAL DEATH DISTRIBUTION



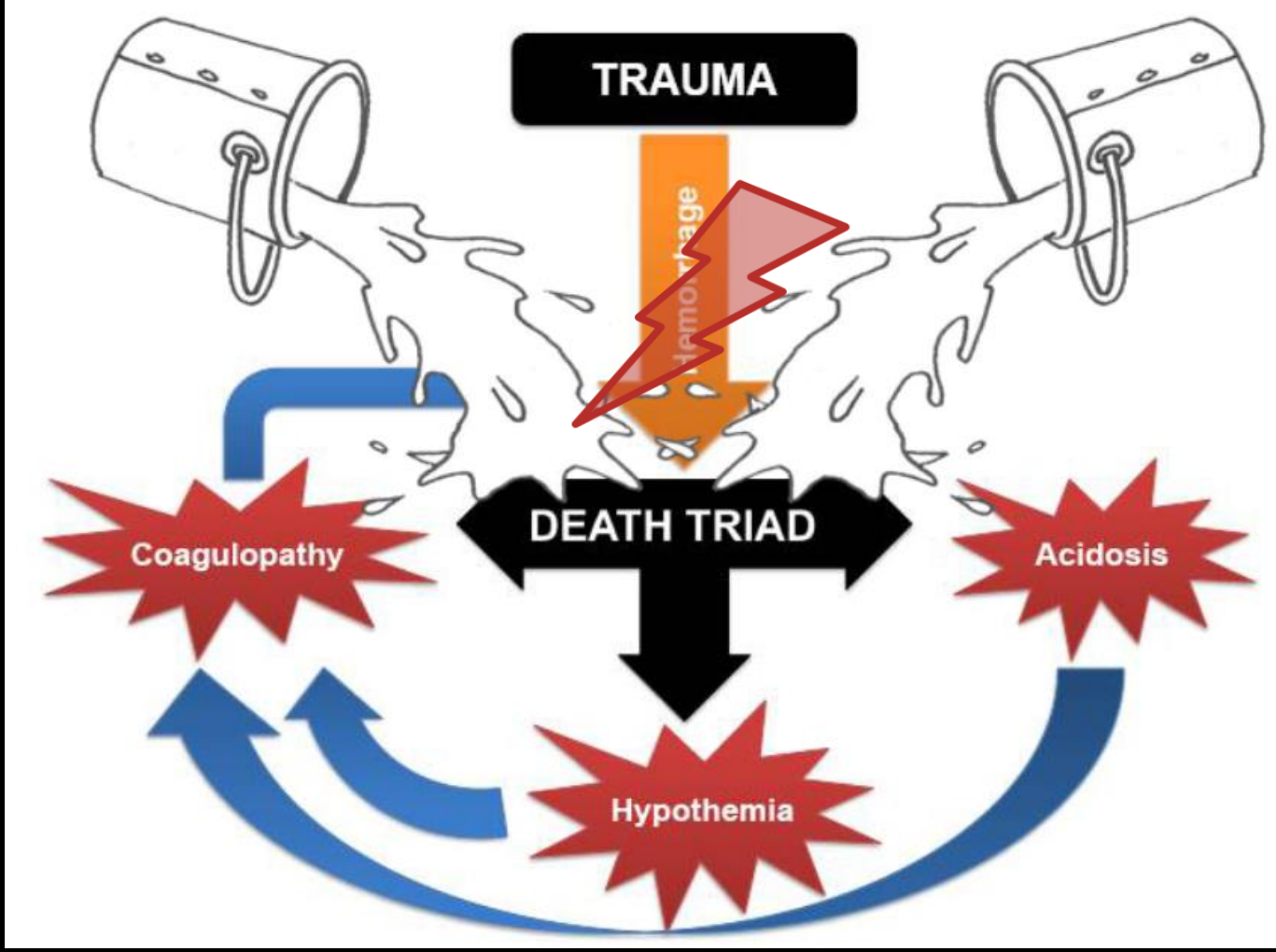
Deadly Trauma Triad

- Hypothermia
- Coagulopathy
- Acidosis

❖ Prevent a trauma death

➔ Precise patient assessment

& Damage Control Resuscitation



ASSESSMENT AND TREATMENT FOR TRAUMA PATIENT

- Advance planning for the arrival of trauma patients
- Patients are assessed, and their treatment priorities are established, based on their injuries, vital signs, and the injury mechanisms.
- Primary survey with simultaneous resuscitation of vital functions
- More detailed secondary survey

ATLS

- The initiation of definitive care
- Damage control surgery on thoracic injury

DCR

BLS

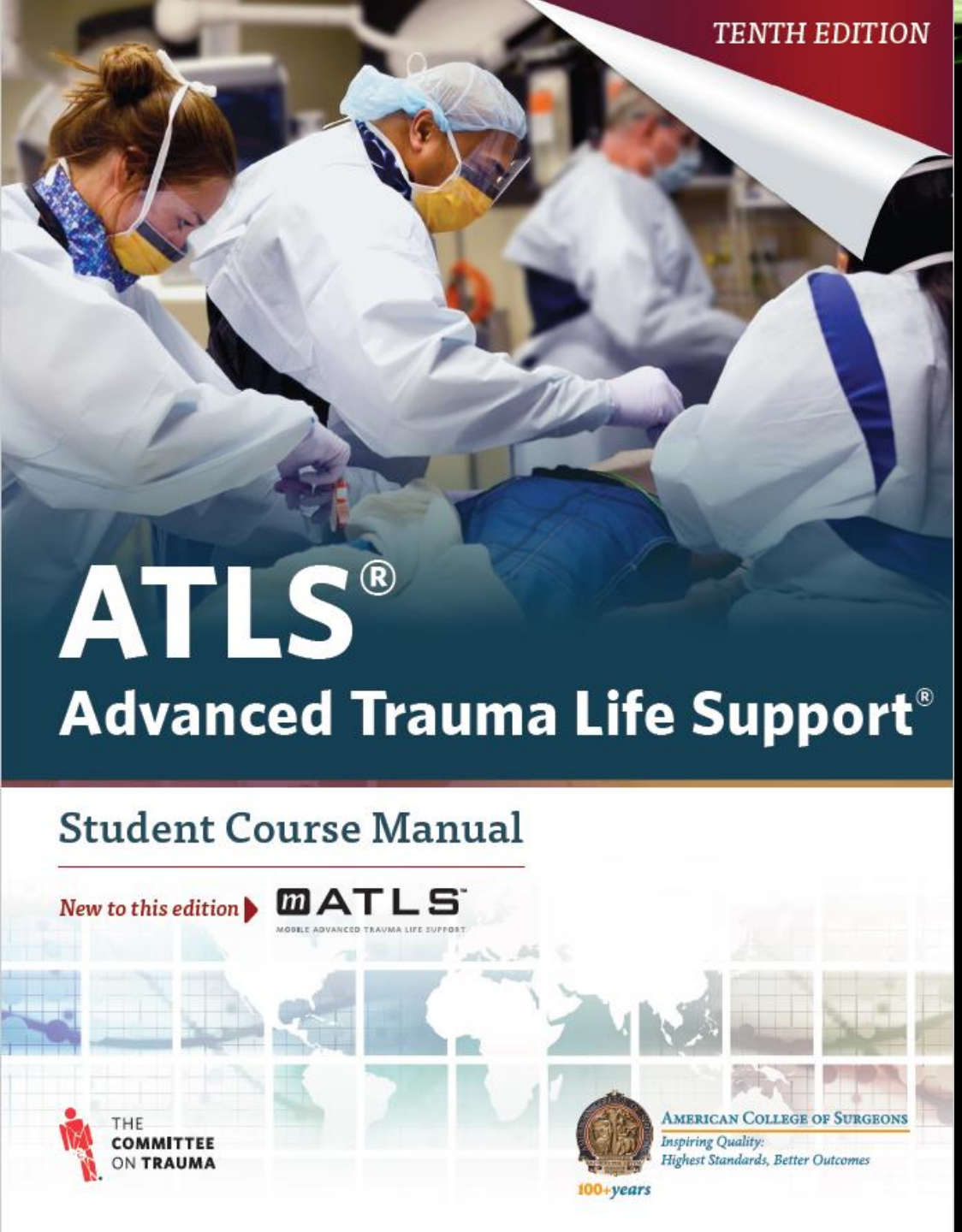
Basic Life Support

ACLS

Advanced Cardiovascular Life Support

ATLS

ADVANCED TRAUMA LIFE SUPPORT



ATLS

- First, In 1978
- 1980, American College of Surgeons

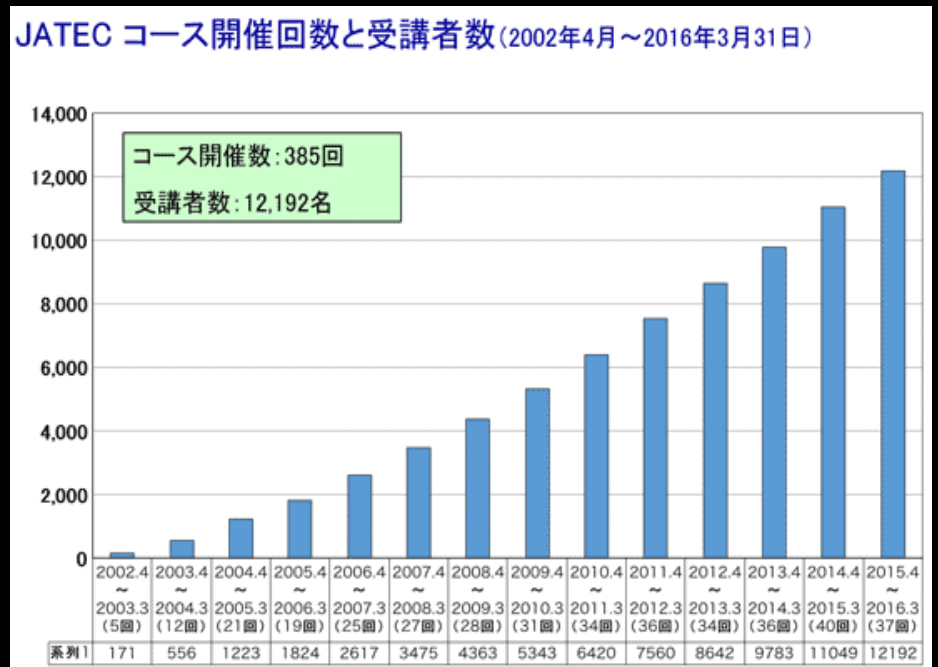
➔ ATLS has been accepted, 78 countries

- Standard protocol for injured patient
- In England:

➔ Advanced for multidisciplinary approach

JATEC

- 일본 구급의학회 및 외상학회
- **First course, in 2002, Now, over 20,000 doctors**
- **Residents: associated with trauma care**



IN SOUTH KOREA

- **BLS, ACLS ➔** 병원 인증평가
- **KTAT (Korean Trauma Assessment and Treatment)**

  ➔ 대한응급의학회 **+** 대한외상학회 **+** 대한외상소생협회
- **First, 2011, Total 52 times (2023.05)**
- **Obligation for only trauma surgeon, not residents**
- **Emergency medicine and military medicine**
- **Primary and secondary survey ➔ Management for trauma patient**

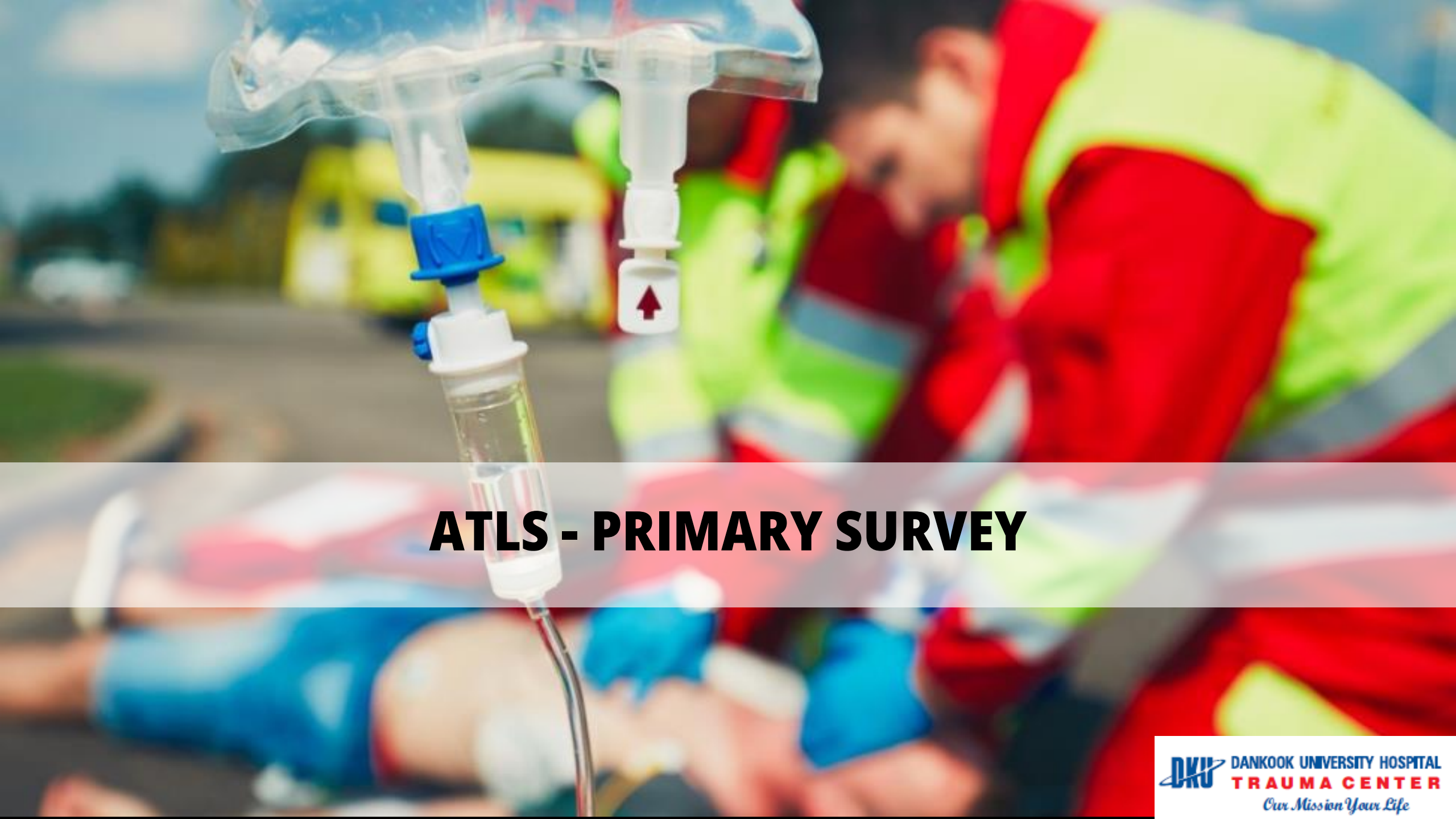
1일차

Time	Title	Option
08:30-09:00	Registration	Secretariat
09:00-09:10	KTAT 소개	President of KART
09:10-09:50	[Lecture] 일차평가 및 이차평가 쇽의 처치와 수액 요법	Director
09:50-10:00	Coffee break	
10:00-12:00	Skill session workshop	
10:00-10:30	ROOM 1: Airway (surgical airway)	Instructor
10:30-11:00	ROOM2 2: Chest tube insert, Needle decompression	
11:00-11:30	ROOM 3: FAST	
11:30-12:00	ROOM 4: Pericardiocentesis and IO	
12:00-13:00	Lunch	
13:00-15:00	영상 판독 Workshop	
13:00-13:30	외상 환자 두부 영상 판독	Instructor
13:30-14:00	외상 환자 흉부 영상 판독	
14:00-14:30	외상 환자 복부 영상 판독	
14:30-15:00	외상 환자 골반 영상 판독	
15:00-15:10	Coffee break	
15:10-17:30	일차평가 및 이차평가 Simulation	
15:10-15:30	일차평가 및 이차평가 시연	Instructor
15:30-16:30	일차평가 Case 1, 2	
16:30-17:30	이차평가 Case 1, 2	
17:30-17:40	질의응답	Director

2일차

Time	Title	Option
09:00-11:00	모의실험 (기본 + 심화) Simulation	
09:00-09:20	Case 1	Instructor
09:20-09:40	Case 2	
09:40-10:00	Case 3	
10:00-10:20	Case 4	
10:20-10:40	Case 5	
10:40-11:00	Case 6	
11:00-12:00	Lunch	
12:00-13:30	Simulation Exam	
12:00-12:20	ER1	Instructor
12:20-12:40	ER2	
12:40-13:00	ER3	
13:00-13:20	ER4	
13:20-13:40	ER5	
13:40-14:00	ER6	
14:00-14:10	Coffee break	
14:10-14:40	Post Test	Director
14:40-15:00	Closing	Director

* 2일 차 교육 과정 시간은 시뮬레이션 시험 특성상 변동될 가능성이 있습니다.



ATLS - PRIMARY SURVEY

DANKOOK UNIVERSITY HOSPITAL
TRAUMA CENTER
Our Mission Your Life

WHEN TREATING INJURED PATIENTS

- Preparation
- Triage
- Primary survey (ABCDEs) with immediate resuscitation of patients with life-threatening injuries
- Adjuncts to the primary survey and resuscitation
- Consideration of the need for patient transfer

WHEN TREATING INJURED PATIENTS

- Secondary survey (head-to-toe evaluation and patient history)
- Adjuncts to the secondary survey
- Continued post-resuscitation monitoring and reevaluation
- Definitive care

PREPARATION

■ **FIGURE 1-1 Prehospital Phase.** During the prehospital phase, personnel emphasize airway maintenance, control of external bleeding and shock, immobilization of the patient, and immediate transport to the closest appropriate facility, preferably a verified trauma center.

■ **FIGURE 1-3** Trauma team members are trained to use standard precautions, including face mask, eye protection, water-impervious gown, and gloves, when coming into contact with body fluids.

the Good Doctor season one 6 disc set

Doctor Shaun Murphy, a young surgeon with autism and savant syndrome, relocates from a quiet country life to join a prestigious hospital surgical unit. Alone in the world and unable to personally connect with those around him, Shaun uses his extraordinary medical gifts to save lives and challenge the skepticism of his colleagues.

18 episodes

1. BURNT FOOD
2. MOUNT RUSHMORE
3. OLIVER
4. PIPES
5. POINT 3 PERCENT
6. NOT FAKE
7. 22 STEPS
8. APPLE
9. INTANGIBLES
10. SACRIFICE
11. ISLANDS part 1
12. ISLANDS part 2
13. SEVEN REASONS
14. SHE
15. HEARTFELT
16. PAIN
17. SMILE
18. MORE

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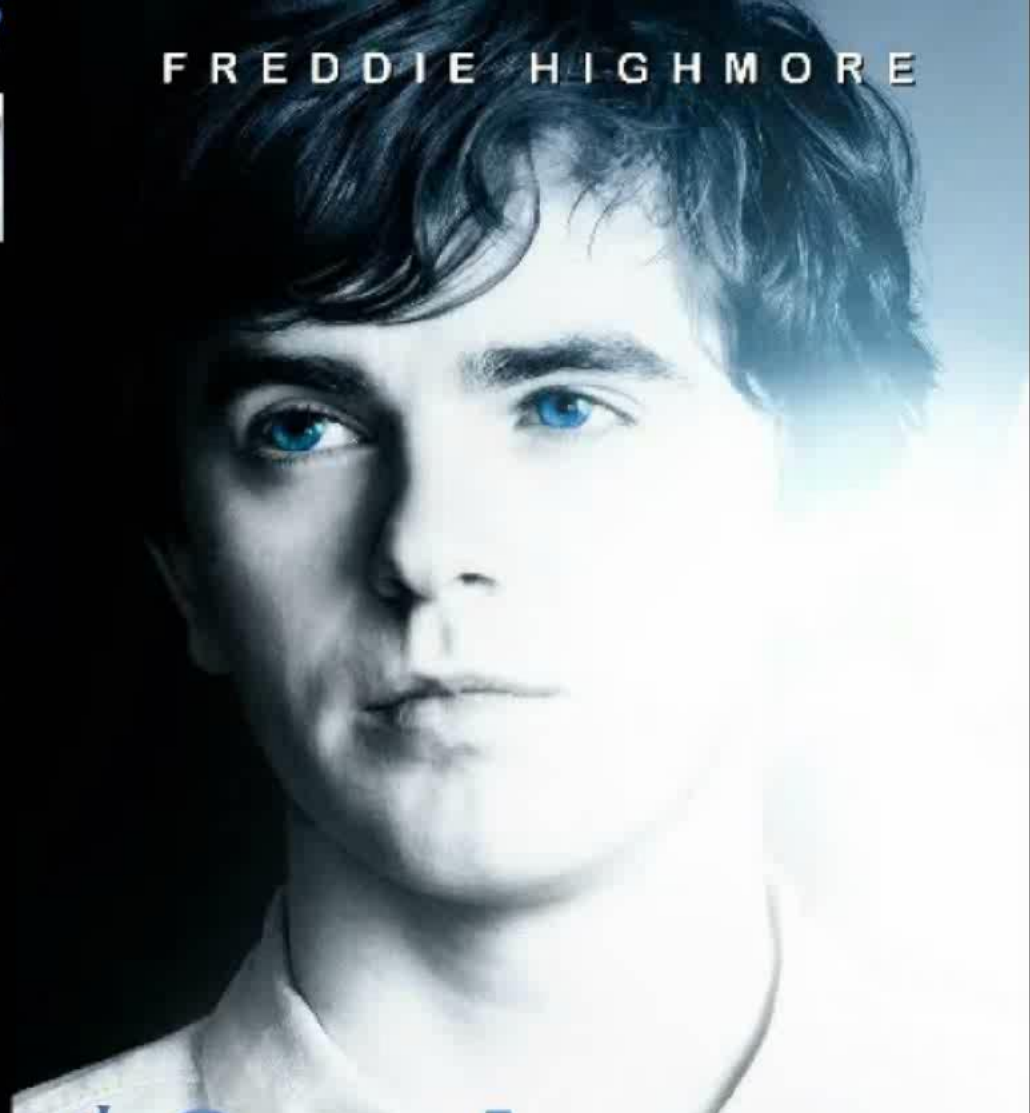
DVD VIDEO

the Good Doctor season one

abc

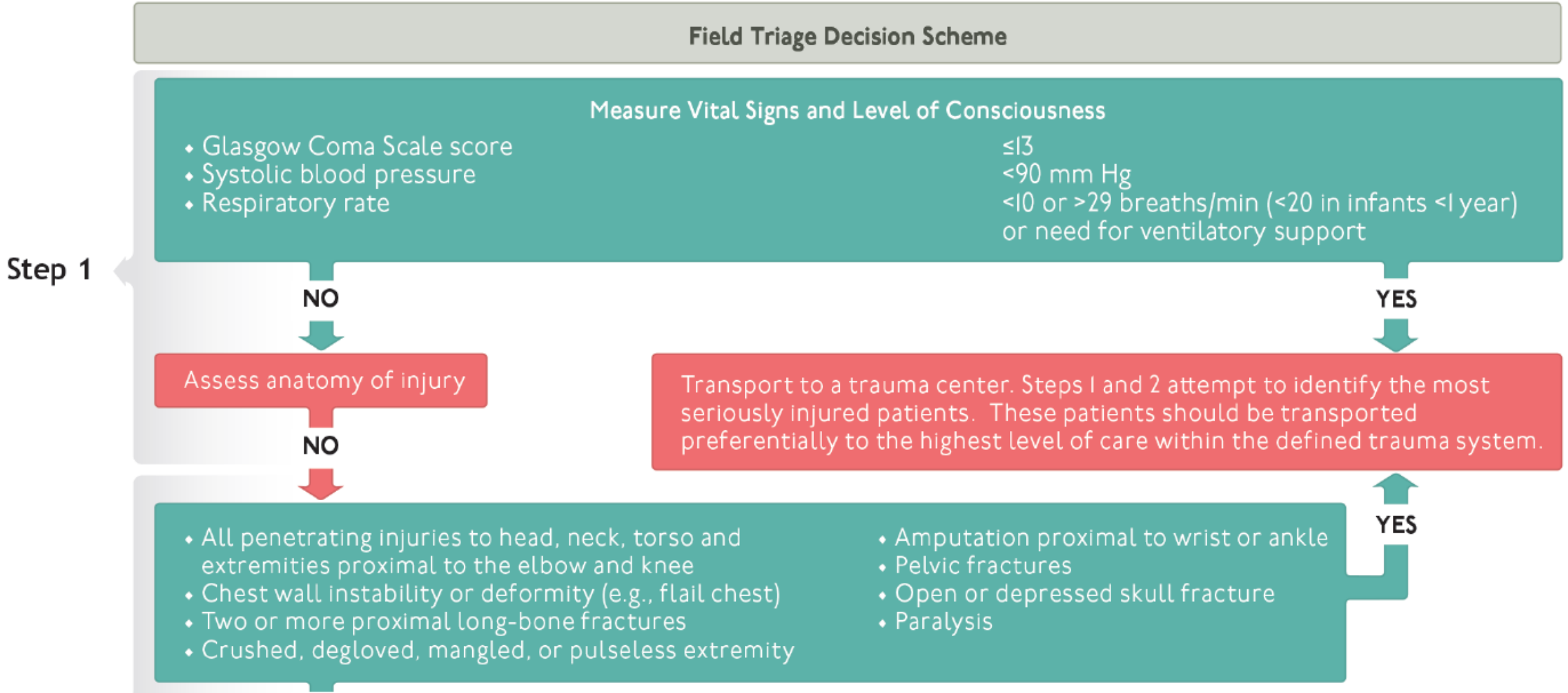
SONY PICTURES

FREDDIE HIGHMORE



the Good Doctor season one

TRIAGE


Field Triage Decision Scheme
Step 1
Measure Vital Signs and Level of Consciousness
• Glasgow Coma Scale score ≤13
• Systolic blood pressure <90 mm Hg
• Respiratory rate <10 or >29 breaths/min (<20 in infants <1 year) or need for ventilatory support
NO
YES
Assess anatomy of injury
Transport to a trauma center. Steps 1 and 2 attempt to identify the most seriously injured patients. These patients should be transported preferentially to the highest level of care within the defined trauma system.
NO
YES
• All penetrating injuries to head, neck, torso and extremities proximal to the elbow and knee
• Chest wall instability or deformity (e.g., flail chest)
• Two or more proximal long-bone fractures
• Crushed, degloved, mangled, or pulseless extremity
• Amputation proximal to wrist or ankle
• Pelvic fractures
• Open or depressed skull fracture
• Paralysis

- Chest wall instability or deformity (e.g., flail chest)
- Two or more proximal long-bone fractures
- Crushed, degloved, mangled, or pulseless extremity

- Open or depressed skull fracture
- Paralysis

Step 2

NO

Assess mechanism of injury and evidence of high-energy impact

Transport to a trauma center; depending upon the defined trauma system, does not need to be the highest level trauma center.

YES

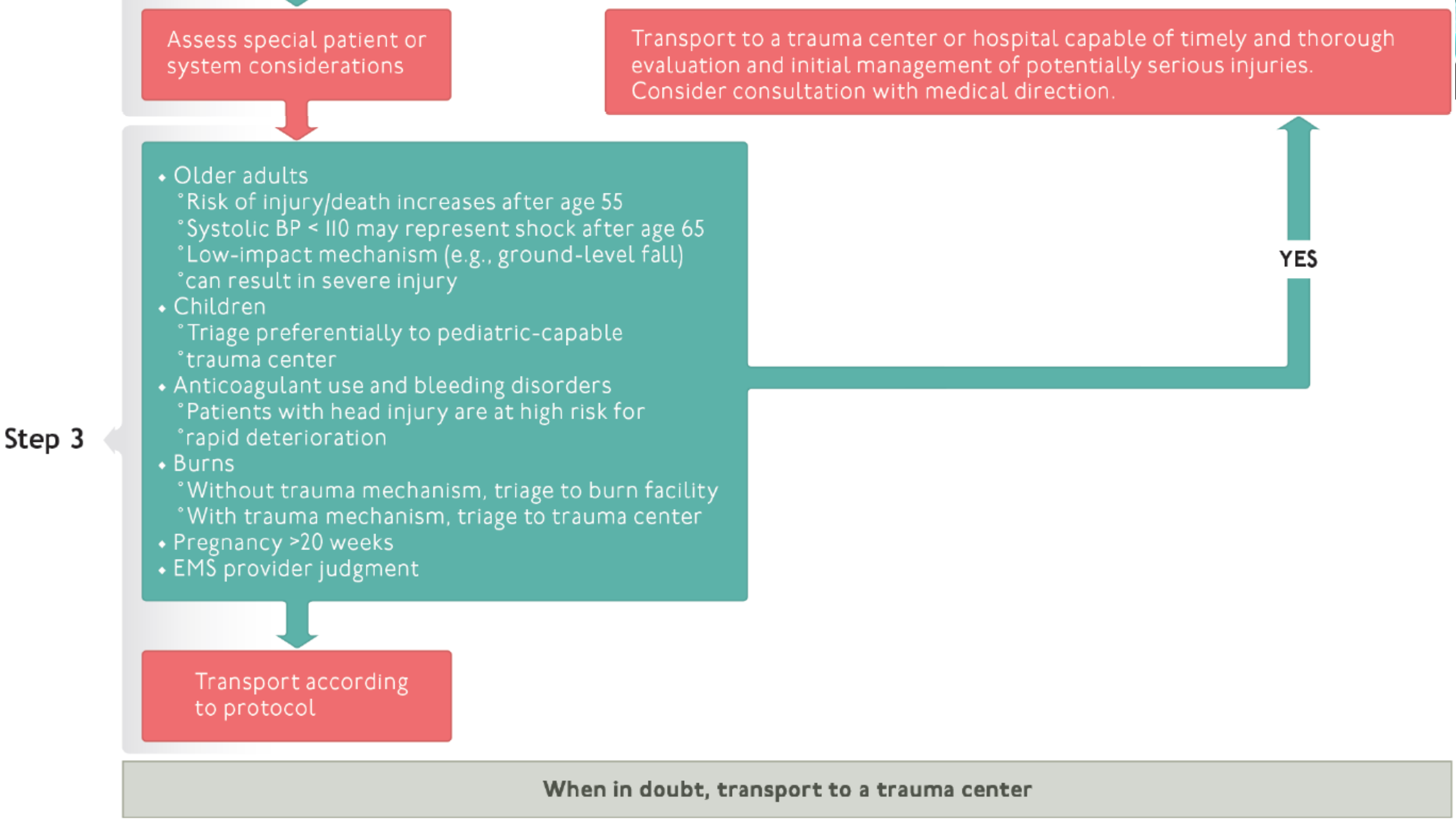
Step 3

- Falls
  - Adults > 20 feet or 6 meters (2 stories)
  - Children > 10 feet or 3 meters (2-3 x height of child)
- High-risk motor vehicle crash
  - Intrusion, including roof: > 12 inches (30 cm) occupant side;
  - > 18 inches (45 cm) any side
  - Ejection (partial or complete) from vehicle
  - Death in same passenger compartment
  - Vehicle telemetry data consistent with high risk of injury
- Auto vs. pedestrian/bicyclist thrown, run over, or with significant (> 20 mph; 32 kph) impact
- Motorcycle crash >20 mph

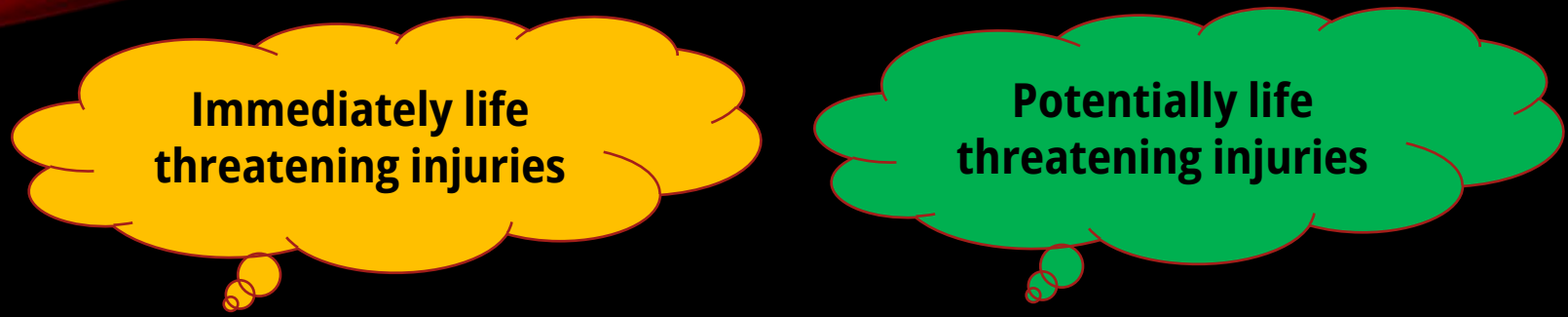
NO

Assess special patient or system considerations

Transport to a trauma center or hospital capable of timely and thorough evaluation and initial management of potentially serious injuries. Consider consultation with medical direction.


Assess special patient or system considerations
Transport to a trauma center or hospital capable of timely and thorough evaluation and initial management of potentially serious injuries. Consider consultation with medical direction.
YES
• Older adults
° Risk of injury/death increases after age 55
° Systolic BP < 110 may represent shock after age 65
° Low-impact mechanism (e.g., ground-level fall)
° can result in severe injury
• Children
° Triage preferentially to pediatric-capable
° trauma center
• Anticoagulant use and bleeding disorders
° Patients with head injury are at high risk for
° rapid deterioration
• Burns
° Without trauma mechanism, triage to burn facility
° With trauma mechanism, triage to trauma center
• Pregnancy >20 weeks
• EMS provider judgment
Step 3
Transport according to protocol
When in doubt, transport to a trauma center

INITIAL ASSESSMENT AND MANAGEMENT



The primary and secondary surveys are **repeated frequently** to identify any change in the patient's status that indicates the need for additional intervention.

PRINCIPLE

The patient's **vital functions** must be assessed **quickly and efficiently**. Management consists of a rapid primary survey with **simultaneous resuscitation** of vital functions, a more detailed secondary survey, and the initiation of definitive care

QUESTION 1, ON TRAUMA BAY

- 50/M, Driver TA
- On Scene: SOL (+), Upon arrival: SOL (-)
- CPR time: (7) minutes
- Next step ??? What should you do for patient on trauma bay?

- Signs of Life

- Respiratory or Motor effort
- Electrical activity
- Pupillary activity

JUST 10 SECONDS (ABCD)

Clinicians can quickly assess A, B, C, and D in a trauma patient by identifying themselves, asking the patient for his or her name, and asking what happened.

- **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 AND CERVICAL IMMOBILIZATION

- Airway maintenance

  - suctioning to clear accur

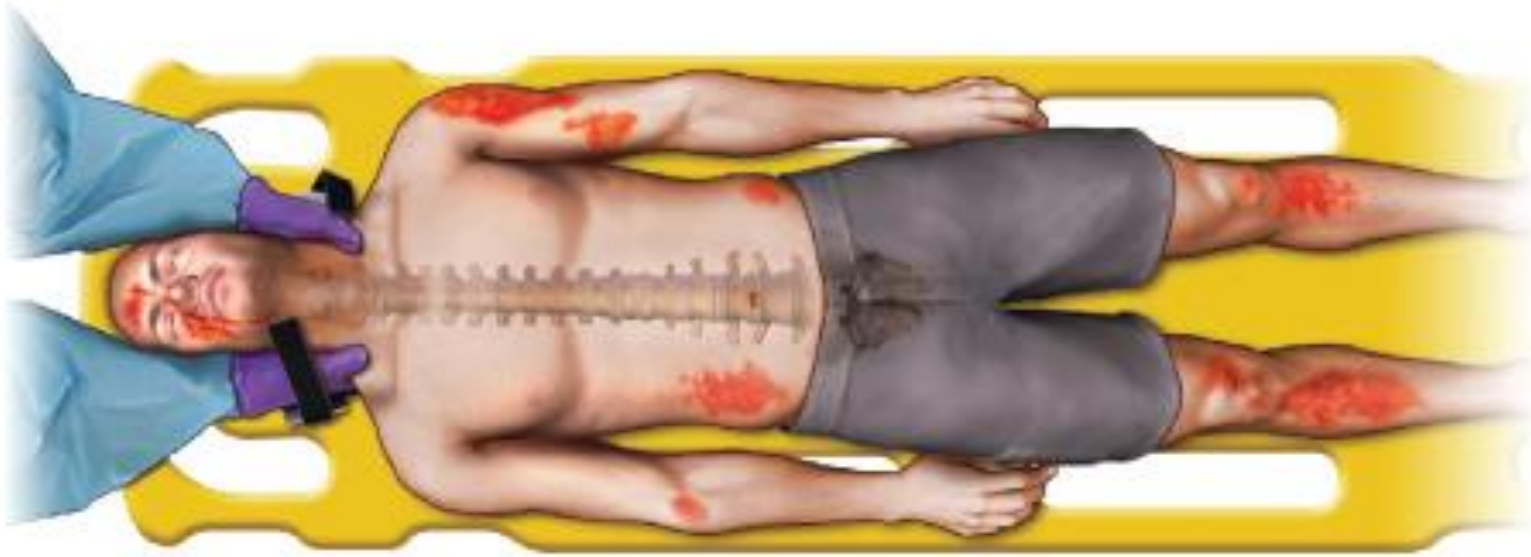
  - GCS ≤ 8 : placement of a

  ➔ establish a definitive a

- While assessing and man

  ➔ prevent excessive mov

  - if intubation cannot be a



■ FIGURE 1-4 Cervical spine motion restriction technique. When the cervical collar is removed, a member of the trauma team manually stabilizes the patient's head and neck.

TEMPORARILY RELEASING THE CERVICAL COLLAR

BREATHING AND VENTILATION

- Auscultation/ Visual inspection/ Palpation/ Percussion
- Expose the patient's neck and chest → Assess jugular venous distention, position of the trachea, and chest wall excursion
- **Detect injuries**: Tension pneumothorax/ Massive hemothorax/ Open pneumothorax/ Trachea injury/ Flail chest c severe lung contusion/ Tamponade
- **A simple pneumothorax → A tension pneumothorax**

  - potentially aggravated by intubation, positive pressure ventilation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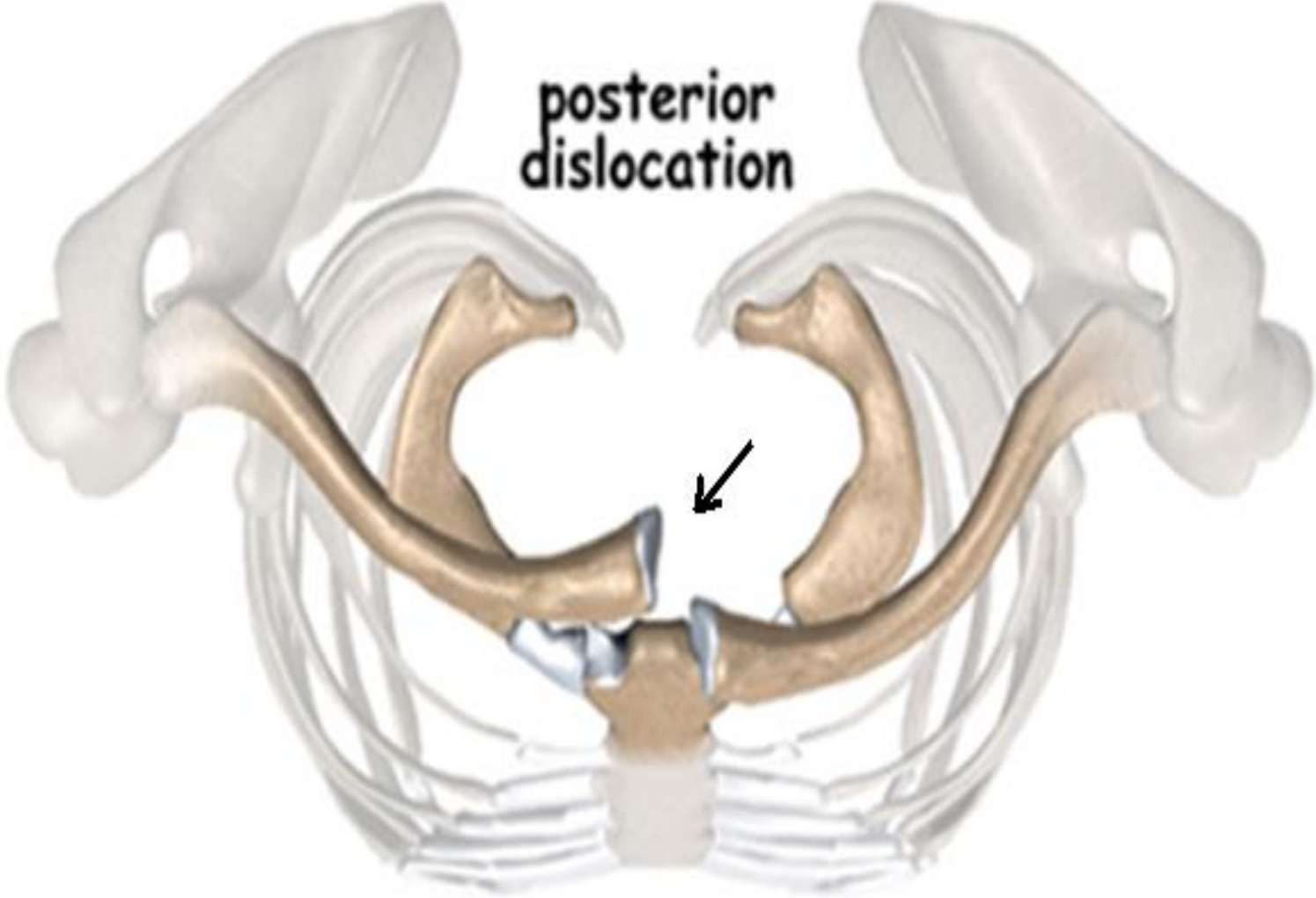
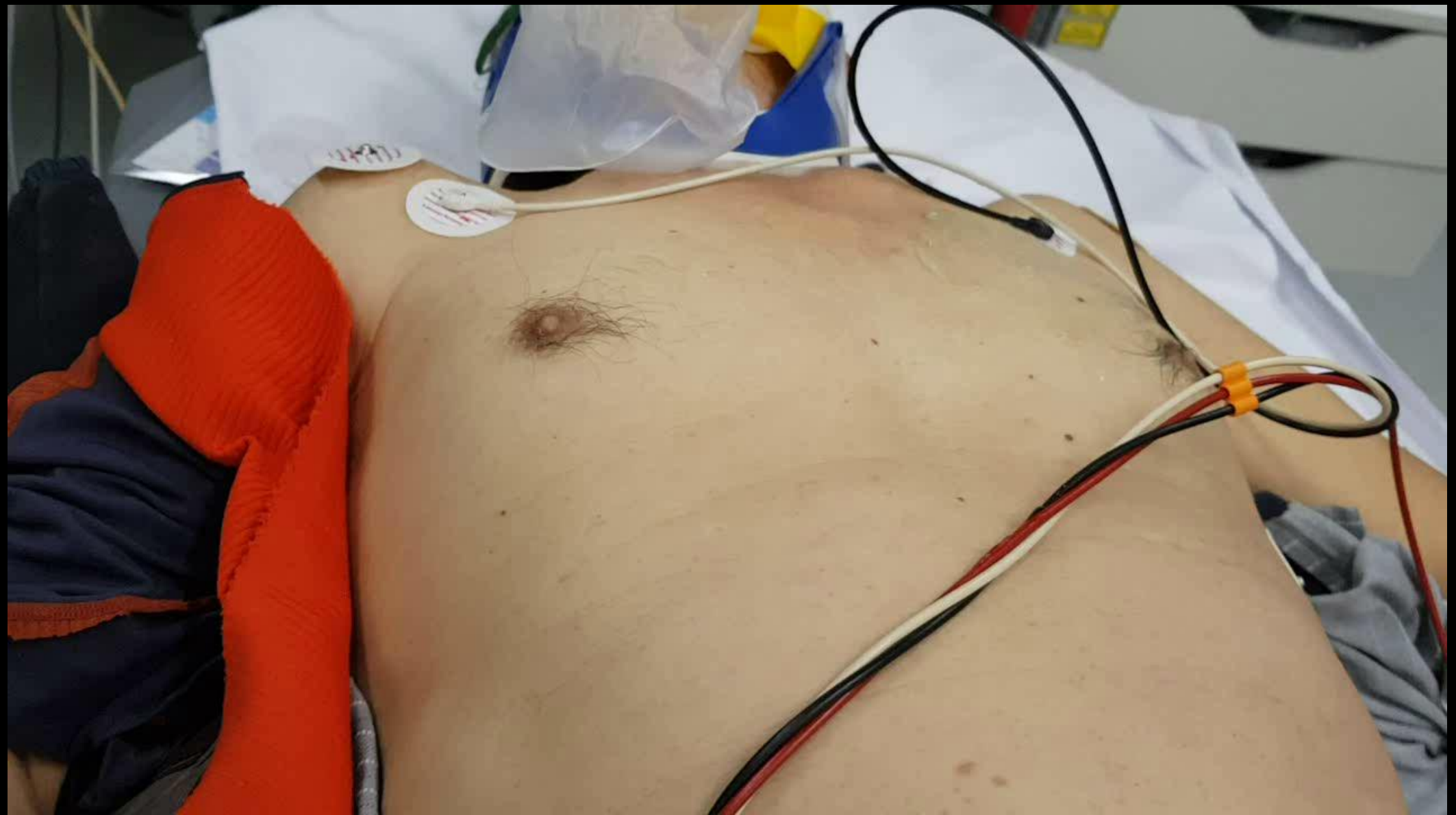
OPEN PNEUMOTHORAX

STRIDOR, MARKED CHANGE OF VOICE

- Driver TA



LT. FLAIL CHEST C PARADOXICAL MOVEMENT



CIRCULATION WITH HEMORRHAGIC CONTROL

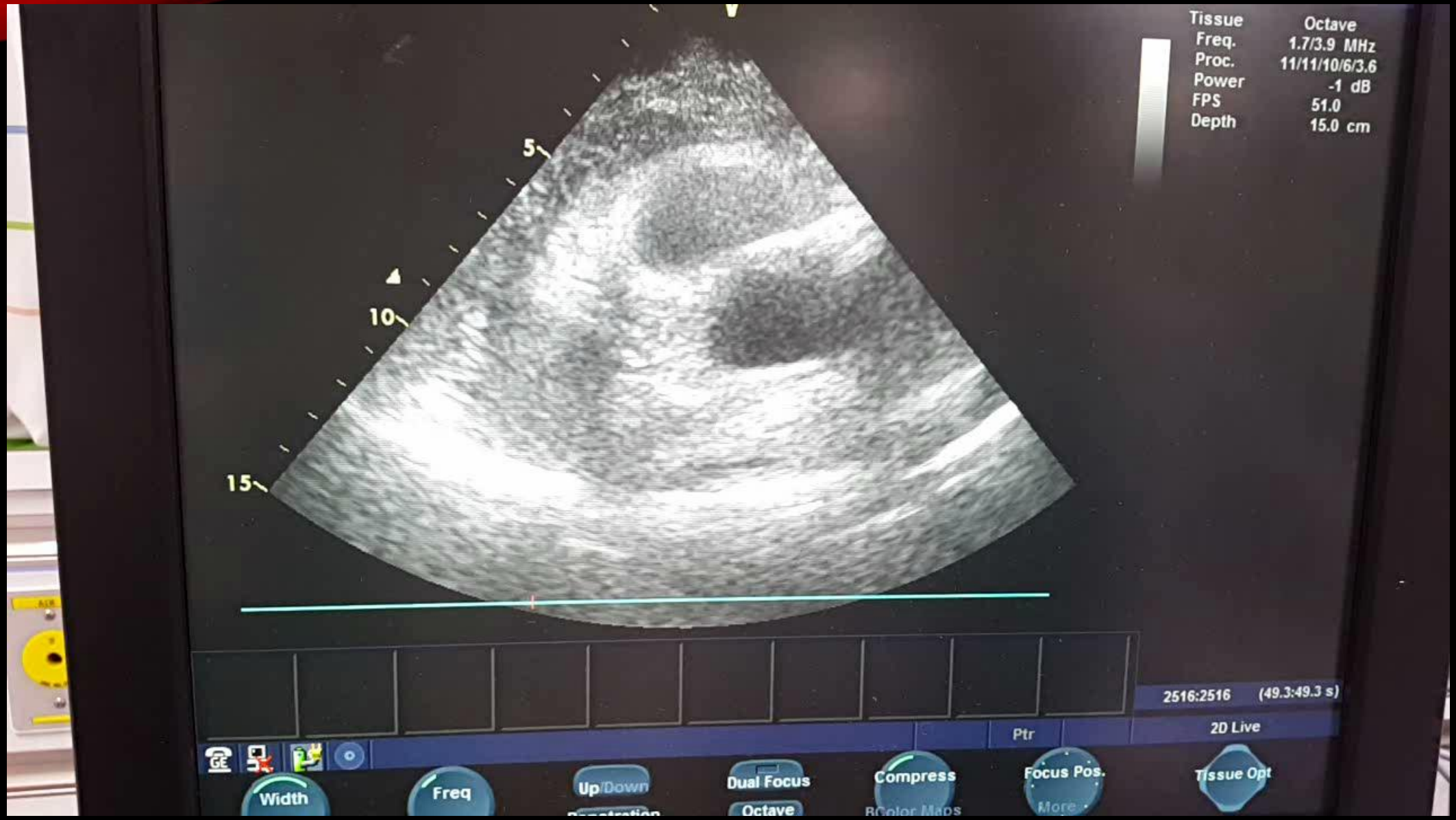
- Once **tension pneumothorax has been excluded** as a cause of shock,

➔ consider that hypotension is due to **blood loss** until proven otherwise

- **Blood volume and cardiac output**: level of consciousness, skin, pulse etc
- **Bleeding**: Direct manual pressure, tour
  application of a pelvic stabilizing devic
  tranexamic acid(within 3 hours of inju
- All IV solutions should be **warmed, a bo**

➔ unresponsive to initial crystalloid th

CARDIAC TAMPONADE



DISABILITY (NEUROLOGIC EVALUATION)

- Patient's level of consciousness and pupillary size and reaction
- GCS
- **Drug or alcohol intoxication** can accompany **traumatic brain injury**
- **Prevention of secondary brain injury** by maintaining adequate oxygenation and perfusion
- Patients with evidence of brain injury

➔ neurosurgeon contact, not available -> transfer

EXPOSURE AND ENVIRONMENTAL CONTROL

- **Completely undress** the patient, usually by cutting off
- After completing the assessment, cover the patient with **warm blankets**
- **Hypothermia** is a potentially lethal complication in injured patients
- A high-flow fluid warmer to heat crystalloid fluids to **39°C** is recommended.
- **A microwave** can be used to warm crystalloid fluids, but it should never be used to warm blood products.

DURING THE PRIMARY SURVEY

- ECG monitoring
- Pulse oximetry
- Ventilatory rate, capnography, and arterial blood gases
- Urinary and gastric catheters
- Trauma series (X-ray; Chest AP, Pelvis AP, C-spine lateral)
- FAST (focused assessment with sonography for trauma). Extended FAST
- Surgical consultation/ patient transfer (not to delay transfer)

DURING THE PRIMARY SURVEY

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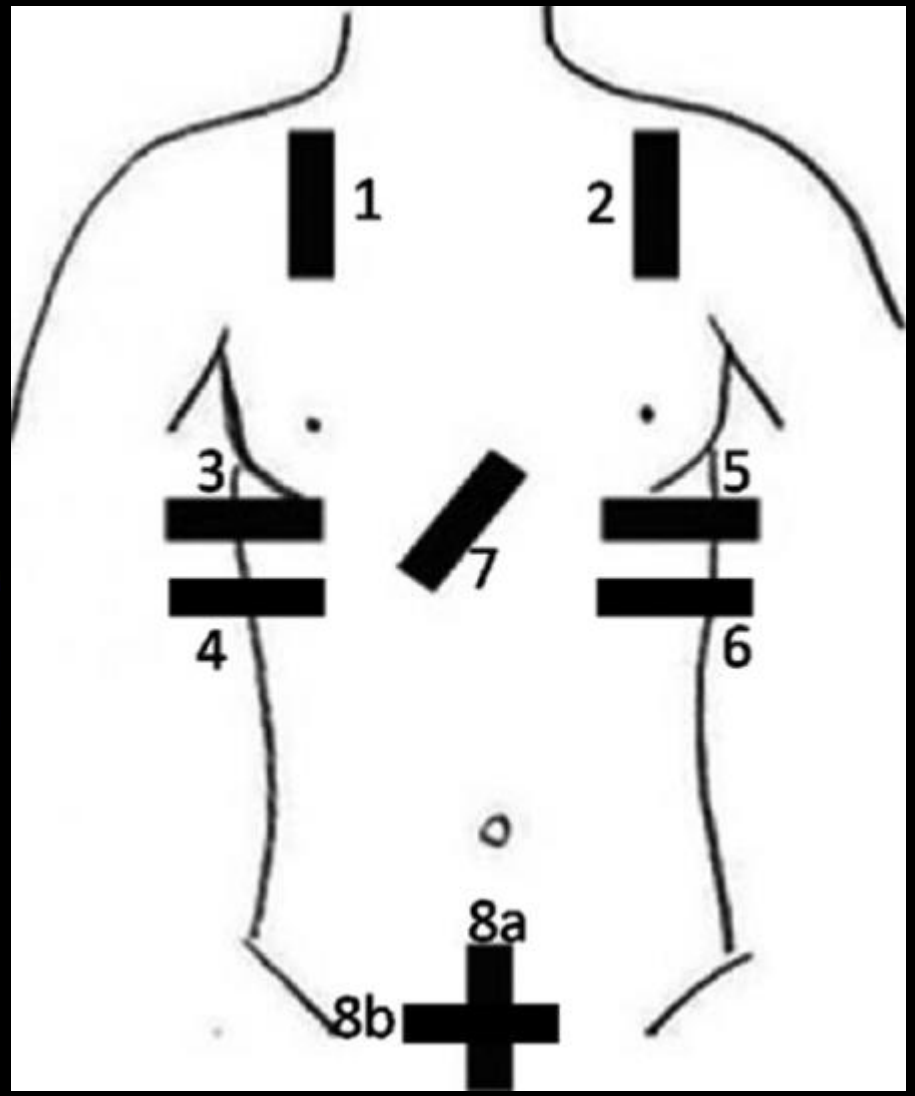
- FAST (focused assessment with sonography for trauma). Extended FAST
- Surgical consultation/ patient transfer (not to delay transfer)

FAST (FOCUSED ASSESSMENT WITH SONOGRAPHY FOR TRAUMA)

- A rapid bedside ultrasound examination
- Screening test for blood around
  - Heart (Pericardial effusion)
  - Abdominal organs (Hemoperitoneum)
    : Morison's pouch, splenorenal recess, pelvic cavity
- Extended FAST (E-FAST)
  - Examination of both lungs (pneumothorax, hemothorax)

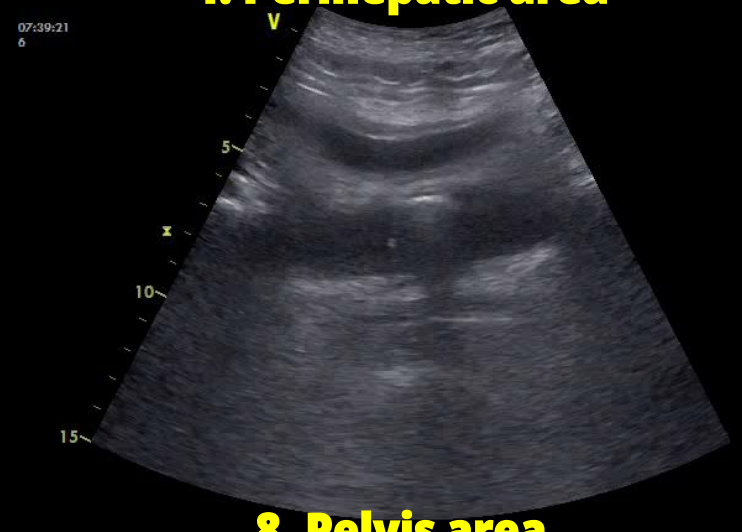
E-FAST

4. Perihepatic area

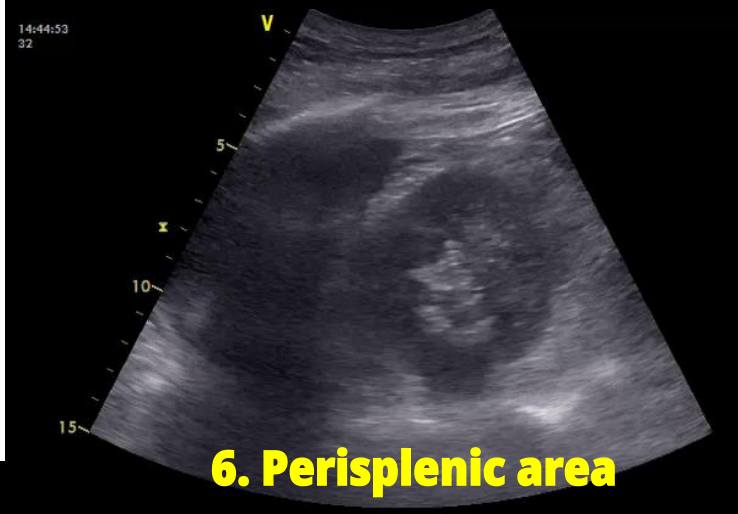


1.2. Lung area

7. Pericardial area



8. Pelvis area



6. Perisplenic area

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- Next step ??? What should you do for patient on trauma bay?

- Signs of Life
  - Respiratory or Motor effort
  - Electrical activity
  - Pupillary activity

During the primary survey, life-threatening conditions are identified and treated in a prioritized sequence

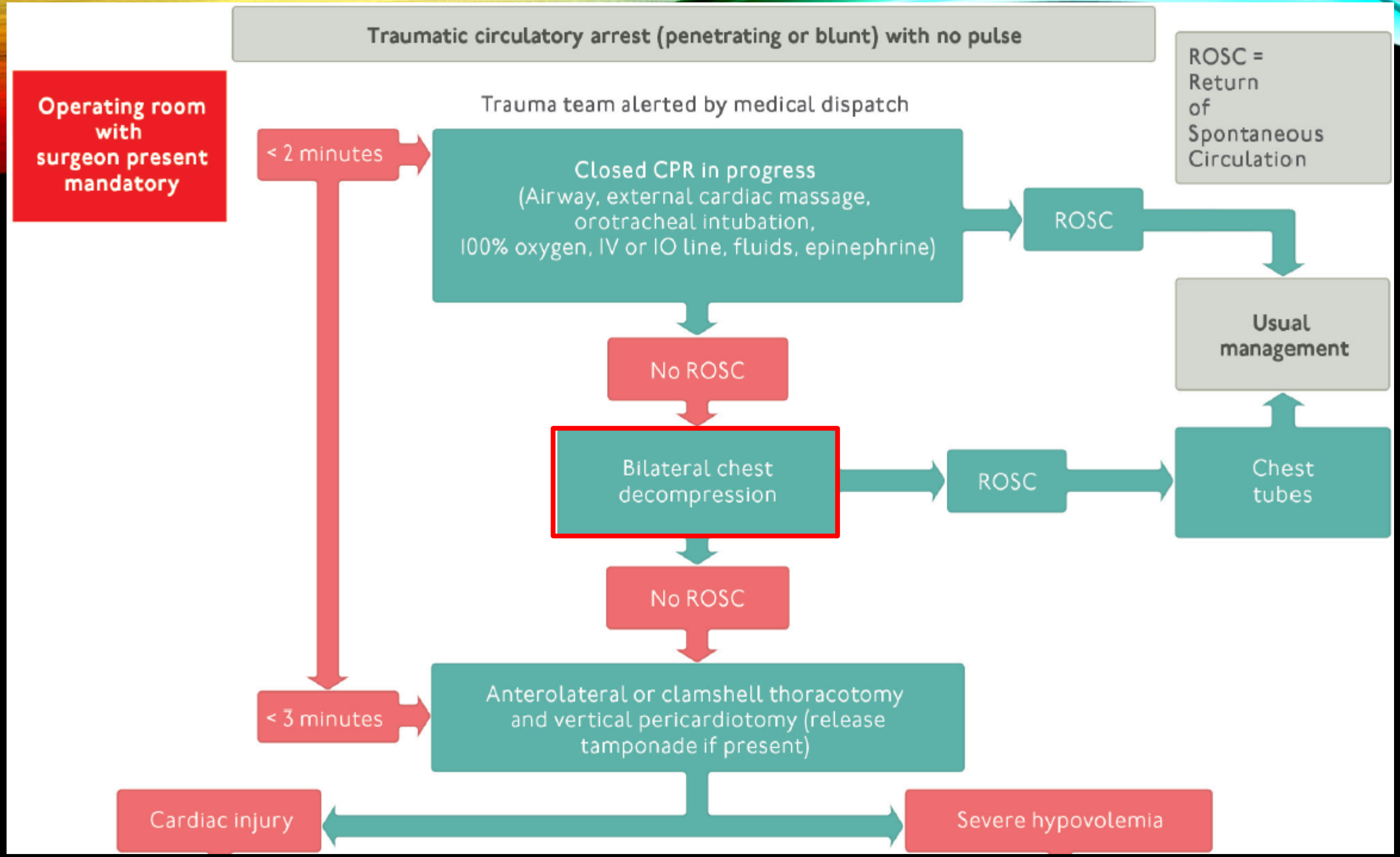
QUESTION 1, ON TRAUMA BAY

- 50/M, Driver TA
- On Scene: SOL (+), Upon arrival: SOL (-)
- CPR time: (7) minutes
- FAST: Hemopericardium (+)

  Hemoperitoneum (-)
- V/S: Not checkable
- Next step ??? What should you do for patient on trauma bay

- Signs of Life

- Respiratory or Motor effort
- Electrical activity
- Pupillary activity


Traumatic circulatory arrest (penetrating or blunt) with no pulse
ROSC = Return of Spontaneous Circulation
Operating room with surgeon present mandatory
Trauma team alerted by medical dispatch
< 2 minutes
Closed CPR in progress
(Airway, external cardiac massage, orotracheal intubation, 100% oxygen, IV or IO line, fluids, epinephrine)
ROSC
Usual management
No ROSC
Bilateral chest decompression
ROSC
Chest tubes
No ROSC
< 3 minutes
Anterolateral or clamshell thoracotomy and vertical pericardiotomy (release tamponade if present)
Cardiac injury
Severe hypovolemia

BILATERAL CHEST DECOMPRESSION

- In TRAUMA patient, What is the critical point during CPR?
- WHAT

  IS THE MOST IMPORTANT PROCEDURE DURING CHEST COMPRESSION

BILATERAL CHEST DECOMPRESSION

- In TRAUMA patient, What is t
- CHEST DECOMPRESSION

  IS THE MOST IMPORTANT PR

- Field thoracostomy

Resuscitation (2007) 75, 276–285

Outcome in 757 severely injured patients with traumatic cardiorespiratory arrest☆

Stefan Huber-Wagner[a,*], Rolf Lefering[b], Mike Qvick[a], Michael V. Kay[a]
Thomas Paffrath[b], Wolf Mutschler[a], Karl-Georg Kanz[a],

Working Group on Polytrauma of the German Trauma Society (DGU)[1]

Conclusions: Prehospital chest tube insertion was found to be a strong predictor for survival. On-scene chest decompression of TCRA patients is recommended in case of the decision to start with ECC. Based on our data, resuscitation after severe trauma seems to be more justified than the current guidelines state.

BILATERAL CHEST DECOMPRESSION

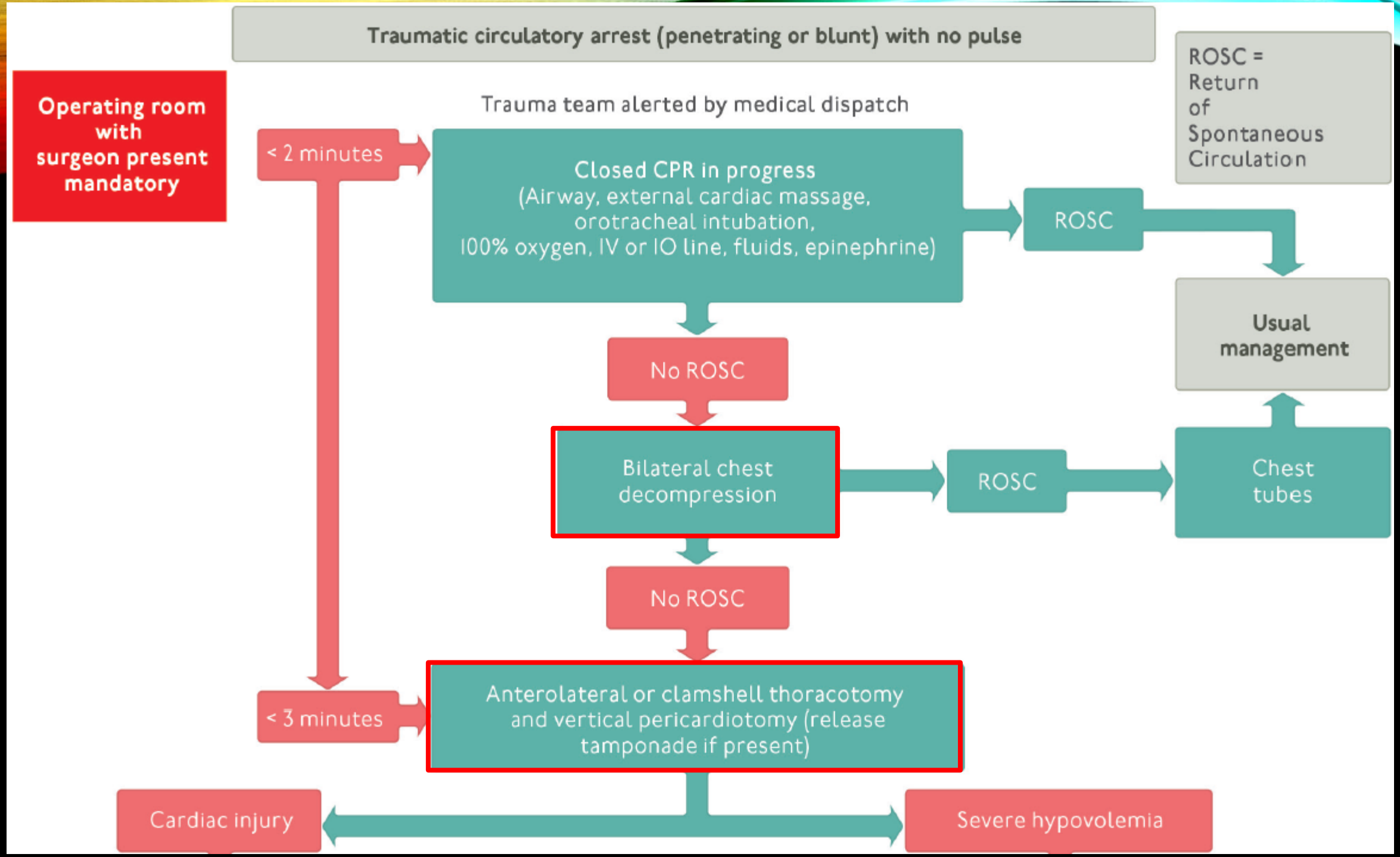
- In TRAUMA patient, What is the critical point during CPR?
- CHEST DECOMPRESSION

  IS THE MOST IMPORTANT PRO

- Field thoracostomy

Finger Thoracostomy

by Cliff Reid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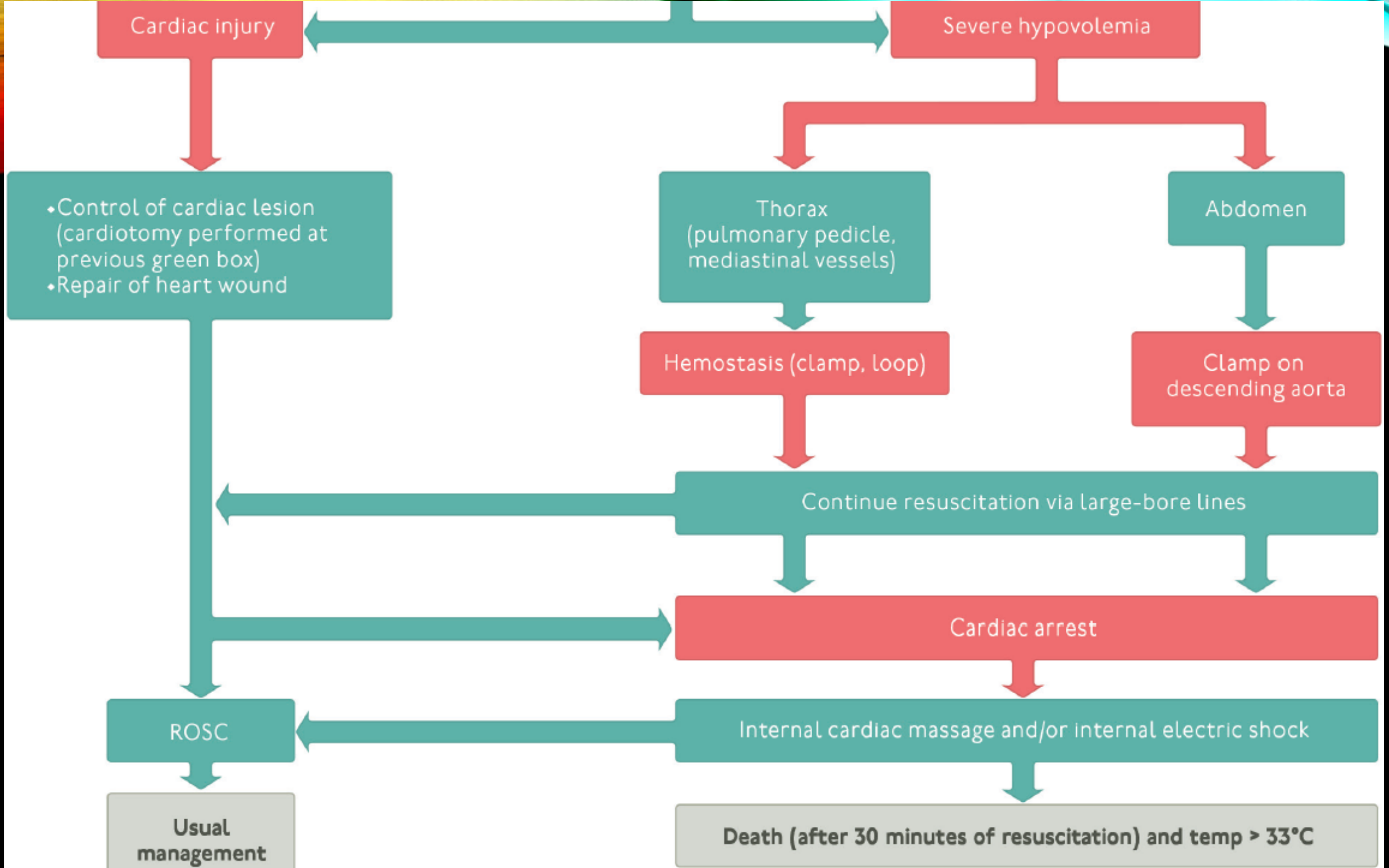
Cardiac injury
Severe hypovolemia
•Control of cardiac lesion (cardiotomy performed at previous green box)
•Repair of heart wound
Thorax (pulmonary pedicle, mediastinal vessels)
Abdomen
Hemostasis (clamp, loop)
Clamp on descending aorta
Continue resuscitation via large-bore lines
Cardiac arrest
ROSC
Internal cardiac massage and/or internal electric shock
Usual management
Death (after 30 minutes of resuscitation) and temp > 33°C

ATLS - SECONDARY SURVEY

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TRAUMA CENTER
Our Mission Your Life

SECONDARY SURVEY

- **Head-to-toe evaluation**
- **Complete history**
- **Physical examination**
- **Each region of the body**
- **The potential for missing an injury or failing**

TABLE 1-1 MECHANISMS OF INJURY AND SUSPECTED INJURY PATTERNS

MECHANISM OF INJURY	SUSPECTED INJURY PATTERNS	MECHANISM OF INJURY	SUSPECTED INJURY PATTERNS
BLUNT INJURY			
Frontal impact, automobile collision • Bent steering wheel • Knee imprint, dashboard • Bull's-eye fracture, windscreen	• Cervical spine fracture • Anterior flail chest • Myocardial contusion • Pneumothorax • Traumatic aortic disruption • Fractured spleen or liver • Posterior fracture/dislocation of hip and/or knee • Head injury • Facial fractures	**Rear impact, automobile collision**	• Cervical spine injury • Head injury • Soft tissue injury to neck
		Ejection from vehicle	• Ejection from the vehicle precludes meaningful prediction of injury patterns, but places patient at greater risk for virtually all injury mechanisms.
Side impact, automobile collision	• Contralateral neck sprain • Head injury • Cervical spine fracture • Lateral flail chest • Pneumothorax • Traumatic aortic disruption • Diaphragmatic rupture • Fractured spleen/liver and/or kidney, depending on side of impact • Fractured pelvis or acetabulum	**Motor vehicle impact with pedestrian**	• Head injury • Traumatic aortic disruption • Abdominal visceral injuries • Fractured lower extremities/pelvis
		Fall from height	• Head injury • Axial spine injury • Abdominal visceral injuries • Fractured pelvis or acetabulum • Bilateral lower extremity fractures (including calcaneal fractures)

HISTORY

- **History of the mechanism of injury (MOI)**

TABLE 1-1 MECHANISMS OF INJURY AND SUSPECTED INJURY PATTERNS

MECHANISM OF INJURY	SUSPECTED INJURY PATTERNS
PENETRATING INJURY	
Stab wounds	
• Anterior chest	• Cardiac tamponade if within "box" • Hemothorax • Pneumothorax • Hemopneumothorax
• Left thoraco-abdominal	• Left diaphragm injury/spleen injury/hemopneumothorax
• Abdomen	• Abdominal visceral injury possible if peritoneal penetration
Gunshot wounds (GSW)	
• Truncal	• High likelihood of injury • Trajectory from GSW/retained projectiles help predict injury
• Extremity	• Neurovascular injury • Fractures • Compartment syndrome

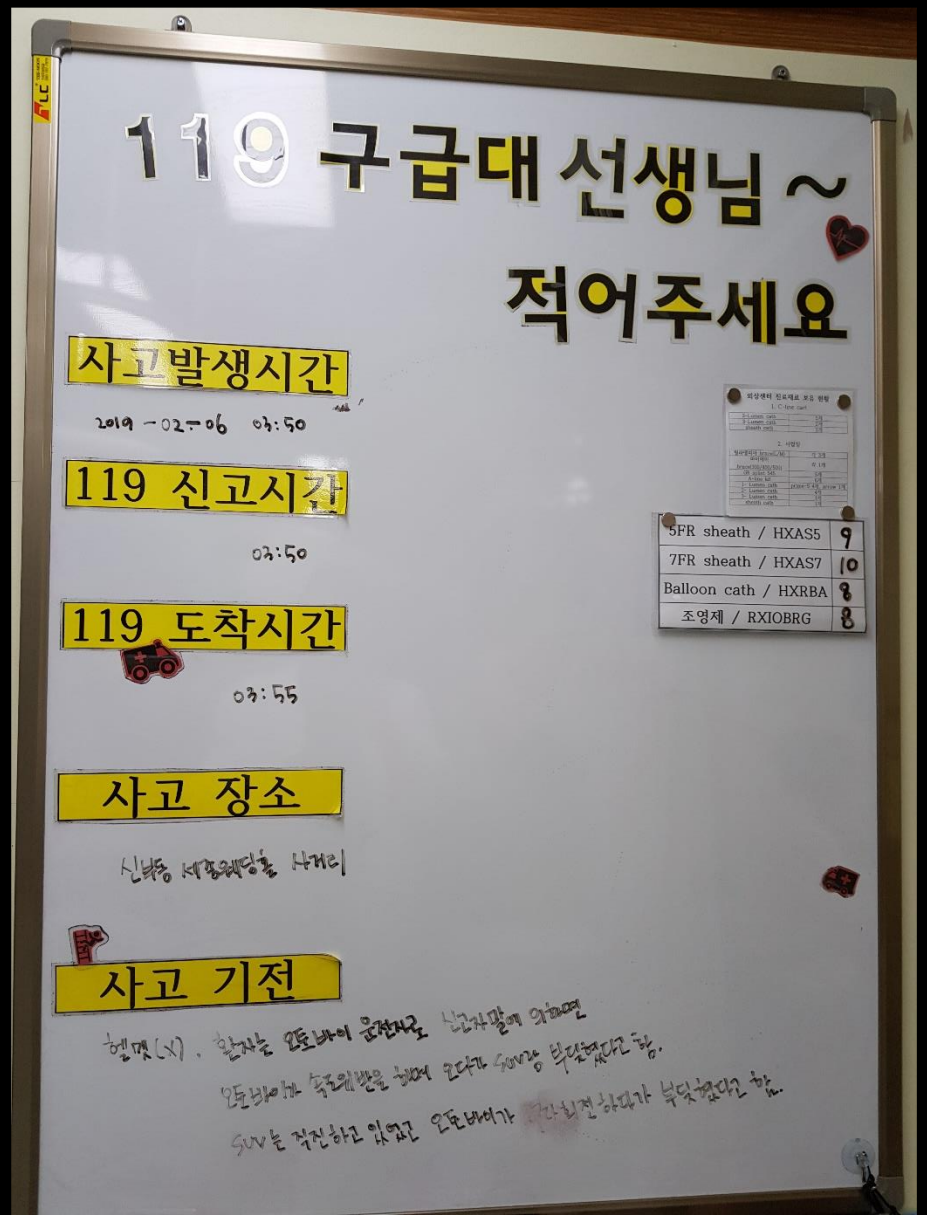
MECHANISM OF INJURY	SUSPECTED INJURY PATTERNS
THERMAL INJURY	
Thermal burns	• Circumferential eschar on extremity or chest • Occult trauma (mechanism of burn/means of escape)
Electrical burns	• Cardiac arrhythmias • Myonecrosis/compartment syndrome
Inhalational burns	• Carbon monoxide poisoning • Upper airway swelling • Pulmonary edema

HISTORY

- **History of the mechanism of injury (MOI)**

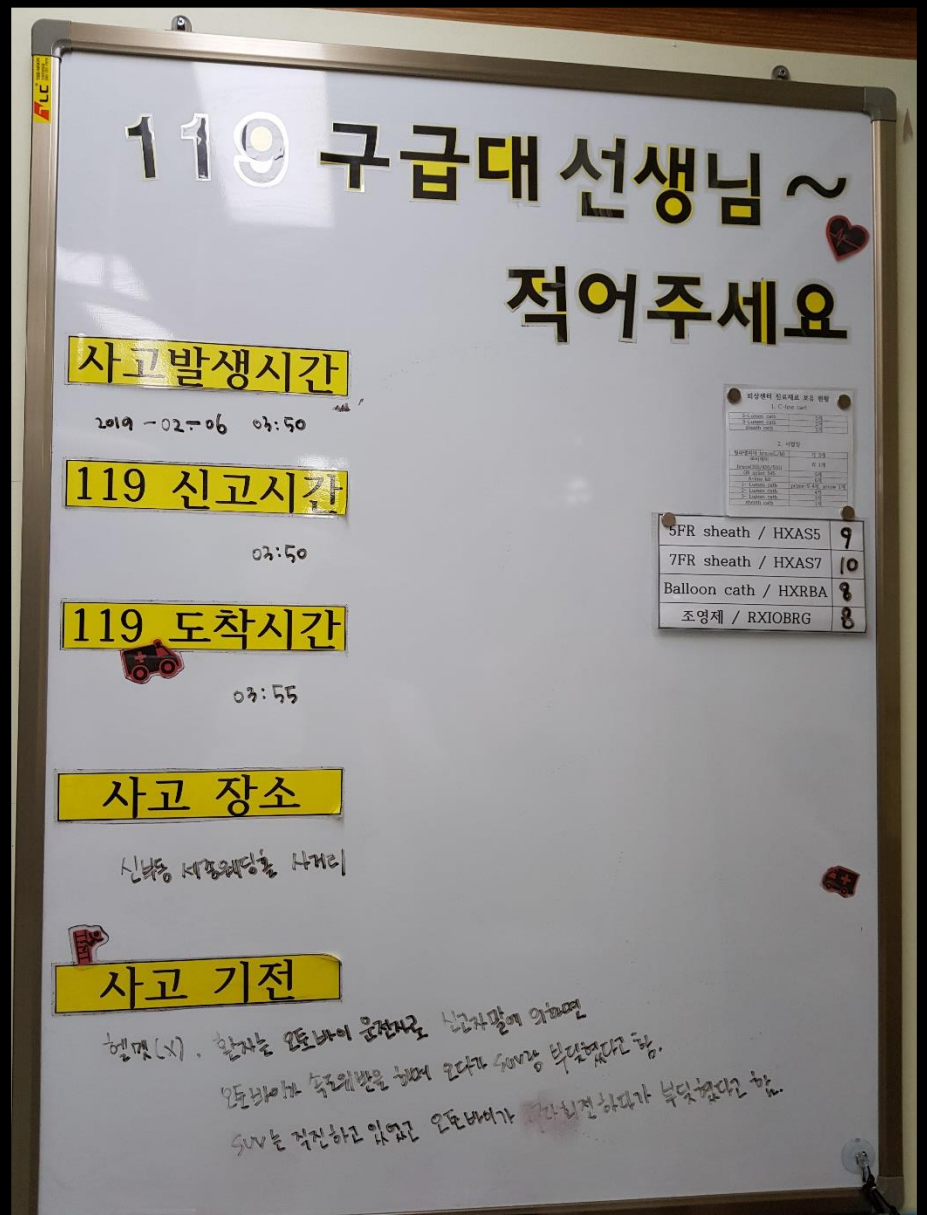
HISTORY

- Include a history of MOI



AMPLE HISTORY

- Include a history of MOI
- **A** llergies
- **M** edications currently used
- **P** ast illnesses/Pregnancy
- **L** ast meal
- **E** vents/**E**nvironment related to the injury



HEAD

- Visual acuity, ocular entrapment
- Pupillary size
- Hemorrhage of the conjunctiva and/or fundi
- Penetrating injury
- Contact lenses (remove before edema occurs), dislocation of the lens
- Maxillofacial structures

CERVICAL SPINE AND NECK

- Patients with maxillofacial or head trauma: possible a cervical spine injury

  → Cervical spine motion must be restricted.

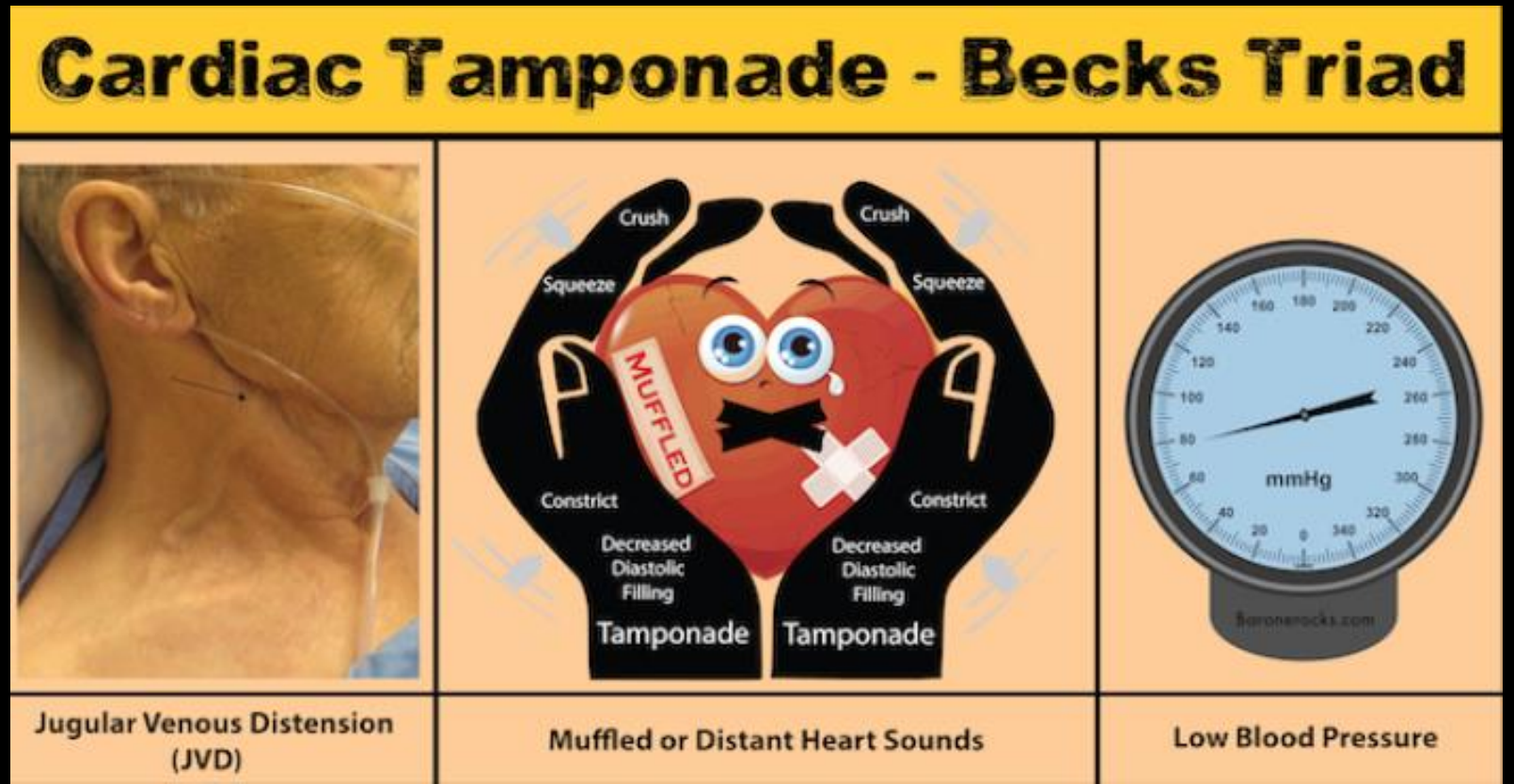
- The absence of neurologic deficit ≠ No cervical spine injury
- Active arterial bleeding, an expanding hematoma, arterial bruit, or airway compromise → usually operative evaluation.
- Protective helmet → protection of a potentially unstable cervical spine
- Unexplained paralysis of an upper extremity → a cervical nerve root injury

CHEST

- Inspection, palpation, auscultation and percussion of the chest
- **Cardiac tamponade vs. Tension pneumothorax** vs. Massive hemothorax

- Hypovolemia

➔ No neck vein distention



CHEST

- Inspection, palpation, auscultation and percussion of the chest
- Cardiac tamponade vs. **Tension pneumothorax vs. Massive hemothorax**

TABLE 4-1 DIFFERENTIATING TENSION PNEUMOTHORAX AND MASSIVE HEMOTHORAX

CONDITION	PHYSICAL SIGNS				
	BREATH SOUNDS	PERCUSSION	TRACHEAL POSITION	NECK VEINS	CHEST MOVEMENT
Tension pneumothorax	Decreased or absent	Hyperresonant	Deviated away	Distended	Expanded immobile
Massive hemothorax	Decreased	Dull	Midline	Collapsed	Mobile

ABDOMEN, PELVIS, PERINEUM, RECTUM, AND VAGINA

- Early involvement of a surgeon is essential
- Pelvic fractures: ecchymosis over the iliac wings, pubis, labia, or scrotum.
- Pain on palpation of the pelvic ring is an important finding.
- Perineum and pelvis ➔ Urethral injury
- A rectal examination

  ➔ integrity of the rectal wall, and quality
- Vaginal examination in patients with a ris

PITFALL	PREVENTION
Pelvic fractures can produce large blood loss.	• Placement of a pelvic binder or sheet can limit blood loss from pelvic fractures. • Do not repeatedly or vigorously manipulate the pelvis in patients with fractures, as clots can become dislodged and increase blood loss.

MUSKULOSKELETAL AND NEUROLOGICAL SYSTEM

PITFALL	PREVENTION
Compartment syndrome can develop.	• Maintain a high level of suspicion and recognize injuries with a high risk of development of compartment syndrome (e.g., long bone fractures, crush injuries, prolonged ischemia, and circumferential thermal injuries).

ADJUNCTS TO THE SECONDARY SURVEY

- Additional x-ray examinations of the spine and extremities
- CT scans of the head, chest, abdomen, and spine
- Contrast urography and angiography
- Transesophageal ultrasound
- Bronchoscopy
- Esophagoscopy
- Other diagnostic procedures

REEVALUATION

Trauma patients must be reevaluated constantly to ensure that new findings are not overlooked and to discover any deterioration in previously noted findings

As initial life-threatening injuries are managed,

but other life-threatening problems may....


Wii
TRAUMA TEAM
SIX DOCTORS... SIX SPECIALTIES...
SIX MÉDECINS... SIX SPÉCIALITÉS...
Not even the dead hold secrets from her.
Même les morts ne peuvent lui cacher quoi que ce soit.
Dr. Naomi Kimishima
Forensics
Autopsies
Dr. Hank Freebird
Orthopedics
Orthopédie
A true hero who seeks an end to pain and injustice.
Un véritable héros qui cherche à mettre fin aux souffrances et à l'injustice.
Keen intellect and insight, but a bitter heart.
Un individu intelligent et perspicace, mais doté d'un cœur de pierre.
Dr. Gabriel Cunningham
Diagnosis
Diagnostics
CR-S01
Surgery
Chirurgie
A brilliant surgeon seeking redemption.
Un brillant chirurgien en mal de rédemption.
Born with power and grace, but still seeking independence.
Une personne à la fois forte et gracieuse, mais toujours à la recherche d'indépendance.
Dr. Maria Torres
First Response
Premiers soins
Dr. Tomoe Tachibana
Endoscopy
Endoscopie
The first to react – or overreact – to any situation.
La première personne à intervenir, ou à paniquer, pour toutes les situations.
ATLUS
IMPORTANT
TEEN
ADOLESCENTS
Blood/Sang
Language/Langage
Suggestive Themes/Thèmes suggestifs
Use of Tobacco/Usage de tabac
Violence/Violence
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OUR MISSION IS ---- ----

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그래도 끝까지 포기하지마

NEVER EVER GIVE UP!

THANK YOU FOR YOUR ATTENTION

Sung Wook Chang @ DKUH

E-mail: changsw3@naver.com

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