Blunt Cardiac Injury: Who, How, and What?

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Goals

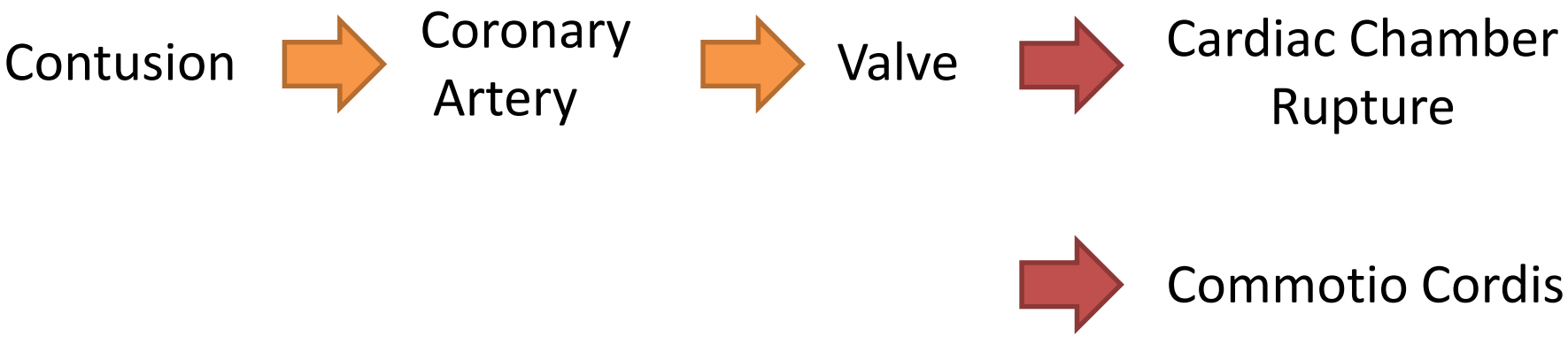
- Understand the broad spectrum of blunt cardiac injury
- Recognize which populations are at risk
- Understand current screening guidelines
- Identify which patients need immediate treatment

The 3 Questions….

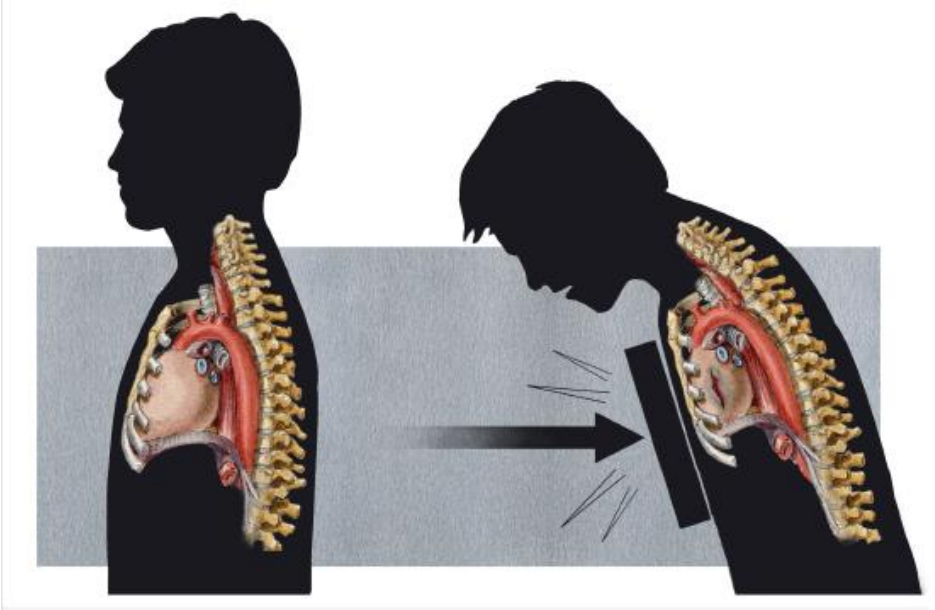
- **Whom** do you screen?
- **How** do you screen?
- **What do you do** when you screen positive?

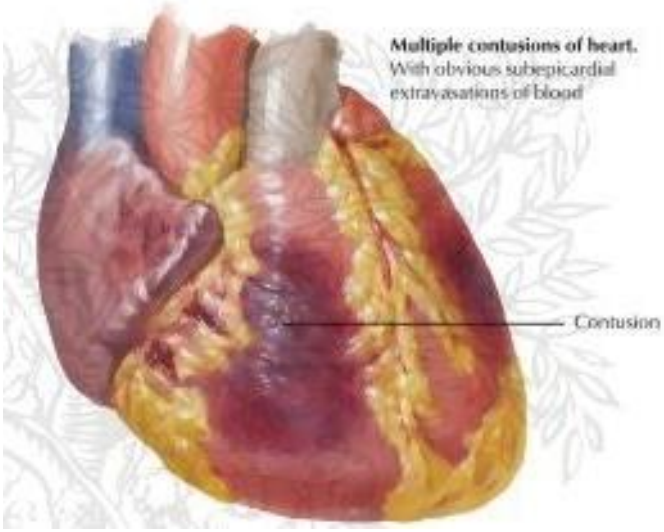
Blunt Cardiac Injury

- Spectrum of injury



Injury Location

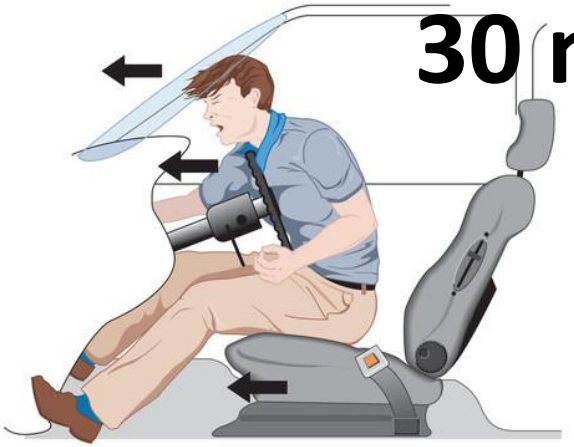




- Truisms:
  - Right heart > Left heart
  - Valves: aortic > mitral > tricuspid > pulmonary
  - Atrial rupture > ventricle rupture

Whom do you screen?

- Mechanism
  - Motor Vehicle Crash
  - Pedestrian vs auto
  - Fall
  - Direct impact



How do you screen?

- EKG
- Biomarkers
- ECHO?
- ~~CT/MRI?~~
- ~~Nuclear medicine scan?~~

EKG Findings in BCI

- NPV 95%
- ~~Right sided EKG?~~

Non-specific abnormalities
Pericarditis-like ST segment elevation or PTa depression
Prolonged QT interval
Myocardial injury
New Q wave
ST-T segment elevation or depression
Conduction disorders
Right bundle branch block
Fascicular block
AV nodal conduction disorders (1, 2, and 3 degree AV block)
Arrhythmias
Sinus tachycardia
Atrial and ventricular extrasystoles
Atrial fibrillation
Ventricular tachycardia
Ventricular fibrillation
Sinus bradycardia
Atrial tachycardia

Sybrandy, KC., et al. Heart. 2003 May; 89 (5) 485-489.

Biomarkers

- ~~CK/MB~~
- Troponin T
- Troponin I
  - More specific for dx of BCI than TnT
  - When combined with EKG, PPV 100%

Salim A., et al *J Trauma*. 2001;50:237-243.

EAST Guidelines 2012

- Level 1
  - Admission EKG
- Level 2
  - New EKG abnormality should be monitored
  - Normal EKG and troponin I rules out BCI
  - Hemodynamic instability or persistent new arrhythmia should have ECHO
  - Sternal fracture alone does not warrant workup
  - CK-MB not useful
  - Nuclear medicine scans not generally useful

Clancy, K., et al. J Trauma. 2012; 73 (5) S301-S306.

EAST Guidelines 2012

- Level 3
  - Troponin I should be measured routinely and if elevated, the patient should be admitted
  - CT/MRI can be used to differentiate BCI from acute MI

EKG **Abnormal** Troponin **Abnormal**	EKG **Normal** Troponin **Abnormal**
EKG **Abnormal** Troponin **Normal**	EKG **Normal** Troponin **Normal**

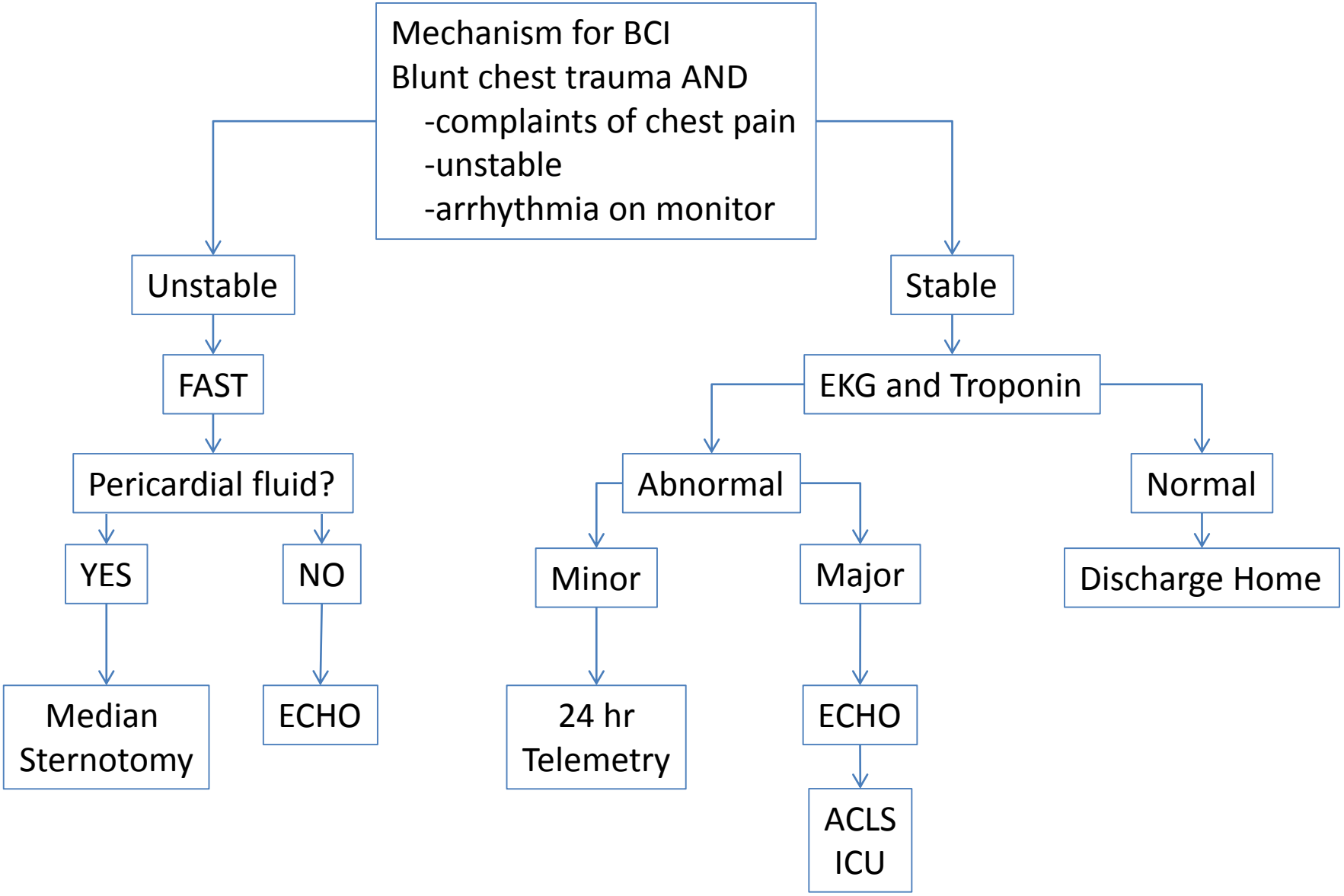
OBSERVATION/ADMISSION

DISCHARGE

Treatment Options

- Arrhythmia
- Cardiac dysfunction
- Acute coronary syndrome
  - Catheterization/stenting
  - CABG
  - Avoid thrombolytics
- Valve/septum/wall rupture
  - Emergent surgical intervention

Screening Algorithm



The Case:

- 24 yo M high speed MVC – ran into brick wall, significant front end damage
- Unrestrained driver, found lying in front seat
- Initial BP on the scene 42/24 HR 65
- GCS 14
- Moving all extremities
- Obvious open right ankle fracture

The Case:

- Boarded and collared
- O2 via non-rebreather mask
- EKG performed
- IV access – 16g ante-cubital
- Bolus IVF – wide open

[redacted]

Cook County Stroger-ERTRUM ROUTINE RECORD

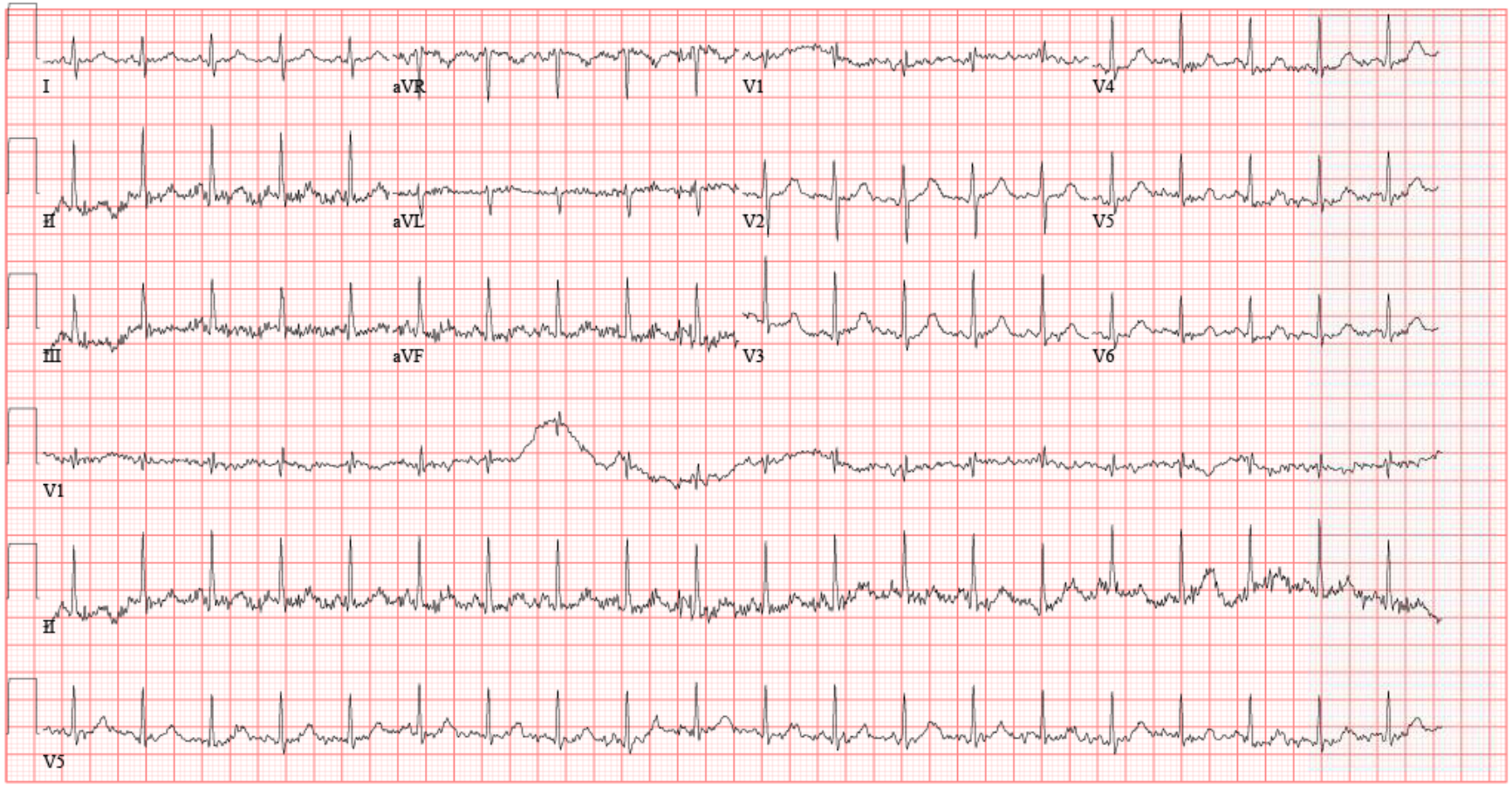
[redacted]

Vent. rate	121	BPM	Sinus tachycardia with short PR
PR interval	80	ms	Otherwise normal ECG
QRS duration	66	ms	Confirmed by Yadav, Neha (1002) on 11/18/2016 1:34:30 PM
QT/QTc	332/471	ms	
P-R-T axes	45 80	20	

Technician: A.SMITH
Test ind:CD:45922782

Referred by:

Confirmed By: Neha Yadav



25mm/s 10mm/mV 100Hz 7.1.1 12SL 241 CID: 177

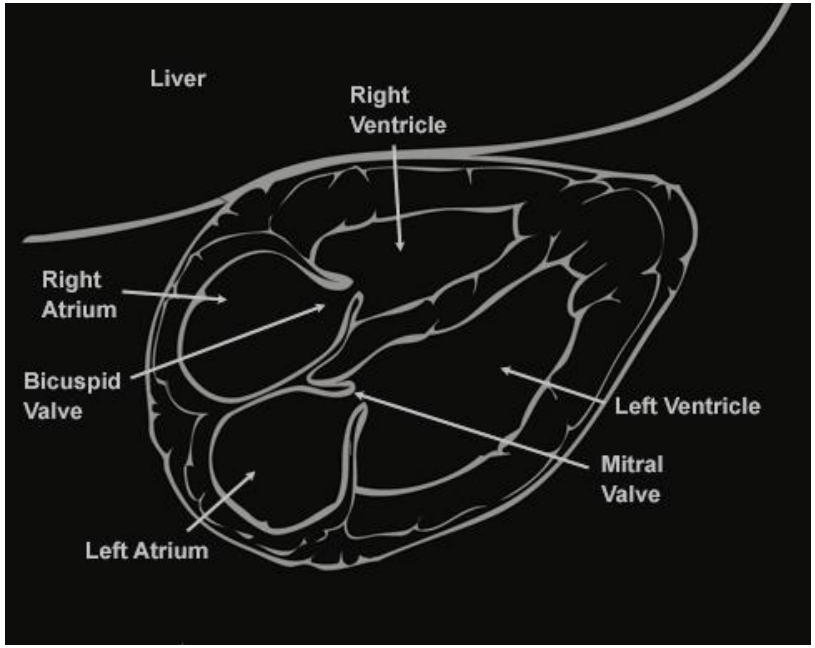
EID:1002 EDT: 13:34 18-NOV-2016 ORDER: 735806299 ACCOUNT: 778500645

Upon Arrival to Cook County Trauma:

- SBP 70s to low 100s
- HR 120
- GCS 15
- Spine not cleared due to distracting injury

- Airway - talking
- Breathing – bilateral breath sounds
- Circulation
  - Not so good….
  - Patient appears to be in shock

video


Liver
Right Ventricle
Right Atrium
Bicuspid Valve
Left Ventricle
Mitral Valve
Left Atrium

video

Blunt Cardiac Rupture

ORIGINAL ARTICLE

Blunt Cardiac Rupture: A 5-Year NTDB Analysis

Pedro G. R. Teixeira, MD, Kenji Inaba, MD, Didem Oncel, MD, Joseph DuBose, MD, Linda Chan, PhD, Peter Rhee, MD, MPH, Ali Salim, MD, Timothy Browder, MD, Carlos Brown, MD, and Demetrios Demetriades, MD

- Most die in the field
- Of those who survive to the hospital: **90% mortality**
- Mortality of patients reaching OR: **68% mortality**
- Presence of vital signs on arrival and rapid diagnosis are key to survival

Patient Follow up:

- Post op went to TICU
- POD#1 returned to OR with Orthopedics for repair of ankle fracture
- Extubated
- All chest tubes removed on POD#5
- Discharge home POD#8

Summary

- Blunt cardiac injury ranges from clinically irrelevant EKG changes to catastrophic structural disruption
- Need a high index of suspicion
- Screen with EKG and troponin
- If positive, need at least 24hr telemetry
- The most severe injuries require immediate surgical intervention!