

Polytrauma with Massive Transfusion

Section 1: Case Summary

Scenario Title:	Polytrauma with Massive Transfusion
Keywords:	Trauma. Massive Transfusion.
	A 35 year old man crashes his motorcycle on the highway and is brought in by EHS. He is hemodynamically unstable. In the ED the patient has a primary survey and initial resuscitation with activation of trauma team, OR, General/Trauma Surgery. He requires activation of massive transfusion protocol. After intubation and placement of chest tube in the ED the patient is transferred to the OR for trauma laparotomy and continued transfusion / resuscitation.

Goals and Objectives	
Educational Goal:	Preparation of ED team for massive transfusion protocol in unstable trauma patient
Objectives: (Medical and CRM)	<ul style="list-style-type: none">• Initial stabilization and management of severely injured trauma patient• Review of implementing a Major Hemorrhage Protocol, identifying barriers and successes from physician, nursing, laboratory, RT and technical/IT perspectives.• Clear handover and transfers of care between teams
EPAs Assessed:	

Learners, Setting and Personnel			
Target Learners:	<input type="checkbox"/> Junior Learners	<input type="checkbox"/> Senior Learners	<input checked="" type="checkbox"/> Staff
	<input checked="" type="checkbox"/> Physicians	<input checked="" type="checkbox"/> Nurses	<input checked="" type="checkbox"/> RTs
	<input type="checkbox"/> Other Learners: IMIT, Porters, Lab staff.		
Location:	<input type="checkbox"/> Sim Lab	<input checked="" type="checkbox"/> In Situ – ER	<input type="checkbox"/> Other:
Recommended Number of Facilitators:	Instructors: 1		
	Confederates: Paramedics PRN		
	Sim Techs: 1		

Scenario Development	
Date of Development:	February 2020
Scenario Developer(s):	Drew Delany and Sarah Hall
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Last Revision Date:	March 2020
Revised By:	Drew Delany
Version Number:	4 – abbreviated to ER only



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Section 2A: Initial Patient Information

A. Patient Chart					
Patient Name: Tanner Roark		Age: 35		Gender: Male	
Weight: 80kg					
Presenting complaint: Motorcycle Crash					
Temp: 35.2C		HR: 128		BP: 85/55	
RR: 30		O ₂ Sat: 91% NRB		FiO ₂ : 100%	
Cap glucose: 6.5			GCS: 8 (E2 V2 M4)		
<p>Triage note:</p> <p>Pre-arrival – Patient will be here in 3 minutes being brought in by EHS.</p> <p>Patient was riding a motorcycle and lost control on the highway.</p> <p>Decreased LOC at scene with hypotension.</p> <p>EHS Report – Patient found lying prone 50 feet from his motorcycle on the highway.</p> <p>IV access established.</p> <p>BP has been steadily declining since initial assessment 20 minutes ago on scene.</p> <p>Still wearing his helmet. C-spine precautions placed. Protective clothing cut off in ambulance.</p> <p>Right arm is obviously deformed. Right ankle is obviously deformed.</p> <p>Decreased air entry to left chest.</p>					
Allergies: NKDA					
Past Medical History:			Current Medications:		
Healthy			None		
1 previous visit for ankle sprain 3 years ago.					

Section 2B: Extra Patient Information

A. Further History	
Family has been notified and will come in as soon as possible.	
No other vehicles involved. No other patients.	
B. Physical Exam	
Cardio: Tachycardic. Normal heart sounds.	Neuro: Altered. GCS 8. Moaning. PERLA. Responds to pain in all 4. Back: Abrasions. Groans to palpate thoracic and lumbar spine.
Resp: Tachypneic. Decreased breath sounds on left. Equal chest rise. Crepitus and pain to palpate left chest.	Head & Neck: C-spine precautions in place. Small amount of blood from left nare. No other signs of facial/head trauma.
Abdo: Soft. Tender. Non-distended.	MSK/skin: Right forearm and right ankle obviously deformed. Abrasions and lacerations to left arm, knees, right hip.
Other: EFAST : Left hemothorax. No pneumothorax. No pericardial effusion. Hyperdynamic heart. Free fluid in abdomen and pelvis.	



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Section 3: Technical Requirements/Room Vision

A. Patient
<input checked="" type="checkbox"/> Mannequin (<i>specify type and whether infant/child/adult</i>)
<input type="checkbox"/> Standardized Patient
<input checked="" type="checkbox"/> Task Trainer (chest tube trainer)
<input type="checkbox"/> Hybrid
B. Special Equipment Required
Chest Tube trainer. Level One ("Rapid Ranger") for massive transfusion – if available
C. Required Medications
Usual trauma meds (Ketamine, Roc, TXA, Analgesia, Antiemetics, TXA, IVF, etc) Simulated blood products.
D. Moulage
Abrasions, lacerations and dried blood. C-Collar in place Tensor or "Sam Splint" on right wrist and right ankle
E. Monitors at Case Onset
<input type="checkbox"/> Patient on monitor with vitals displayed <input checked="" type="checkbox"/> Patient not yet on monitor
F. Patient Reactions and Exam
A-Patent. Midline trachea. Nothing in mouth. B-Decreased breath sounds to left chest. Moan with palpation of chest. C-Hemodynamically unstable. D-Eyes closed (opens to pain). GCS 8 E- Abrasions and lacerations visible. Moans to palpation of T + L spine.

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Section 4: Confederates and Standardized Patients

Confederate and Standardized Patient Roles and Scripts	
Paramedics (2)	<i>Not necessary but can be added for fidelity</i> Will bring patient in on their stretcher. Will provide report to ER team.
Wife	<i>Not necessary but can be added for fidelity</i> Comes in during ER component of case. Provides some medical history. Can be used to increase fidelity or potentially be a distraction and require a provider to manage her distress.



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Section 5 - Part 1: Scenario Progression - ER Setting

ER Trauma Room				
Patient State/Vitals	Patient Status	Learner Actions, Modifiers & Triggers to Move to Next State		Facilitator Notes
1. Baseline State Rhythm: Sinus tach HR: 128 BP: 85/55 RR: 30 O ₂ SAT: 91% NRB T: 35.2°C GCS: 8 (E2 V2 M4) Gluc 6.5	Moaning patient.	<u>Expected Learner Actions</u> <input type="checkbox"/> Receive EHS Report <input type="checkbox"/> Transfer safely to ER stretcher <input type="checkbox"/> Remove clothing <input type="checkbox"/> Place on monitors <input type="checkbox"/> Obtain more IV access or IO <input type="checkbox"/> Primary Survey <input type="checkbox"/> EFAST – (identify free fluid in abdomen, left hemo-pneumothorax) <input type="checkbox"/>	<u>Triggers</u> For progression to next state -Should progress to next stage within 3 minutes	
2. Initial Management Rhythm: Sinus tach HR: 128 BP: 80/50 RR: 30 O ₂ SAT: 91% NRB GCS: 8 (E2 V2 M4)	Patient quiet after analgesia	<u>Expected Learner Actions</u> <input type="checkbox"/> Call for blood STAT <input type="checkbox"/> Initiate MHP <input type="checkbox"/> Call TTL, OR, General Surgery <input type="checkbox"/> Analgesia, TXA <input type="checkbox"/> Portable CXR, PXR <input type="checkbox"/> Analgesia, TXA <input type="checkbox"/> Trauma labs <input type="checkbox"/> Identify / communicate priorities to team.	<u>Modifiers</u> - If no blood called for STAT or no MHP requested within 5 minutes patients BP drops to 60/P and confederate identifies concerns	
3. Procedures Rhythm: Sinus tach HR: 120 BP: 75/40 RR: 30 O ₂ SAT: 91% NRB GCS: 8 (E2 V2 M4)		<u>Expected Learner Actions</u> <input type="checkbox"/> MD to prepare / insert left chest tube <input type="checkbox"/> MD to prepare to intubate patient <input type="checkbox"/> 2 units of uncrossed blood arrives <input type="checkbox"/> Post intubation sedation/analgesia <input type="checkbox"/> Warm patient / Bair Hugger	<u>Modifiers</u> - If no chest tube or blood then patient has PEA arrest and will not have ROSC until this is done <u>Triggers</u> -Once intubated and left chest tube in-situ Trauma/GenSurg arrives	
4. Handover HR: 110 BP: 95/50 RR: 15 O ₂ SAT: 95% intubated GCS: 3 T		<u>Expected Learner Actions</u> <input type="checkbox"/> Provide summary to Surgeon <input type="checkbox"/> Discussion about stability for CT vs direct to OR <input type="checkbox"/> Continue MHP <input type="checkbox"/> Quickly reduce / splint wrist and ankle <input type="checkbox"/> Initial Labs available <input type="checkbox"/> Phone call with Hematopathology	<u>Modifiers</u> - Chest tube puts out 650cc blood, slowing <u>Triggers</u> - Surgery accepts care and will take to OR	



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Appendix A: Laboratory Results

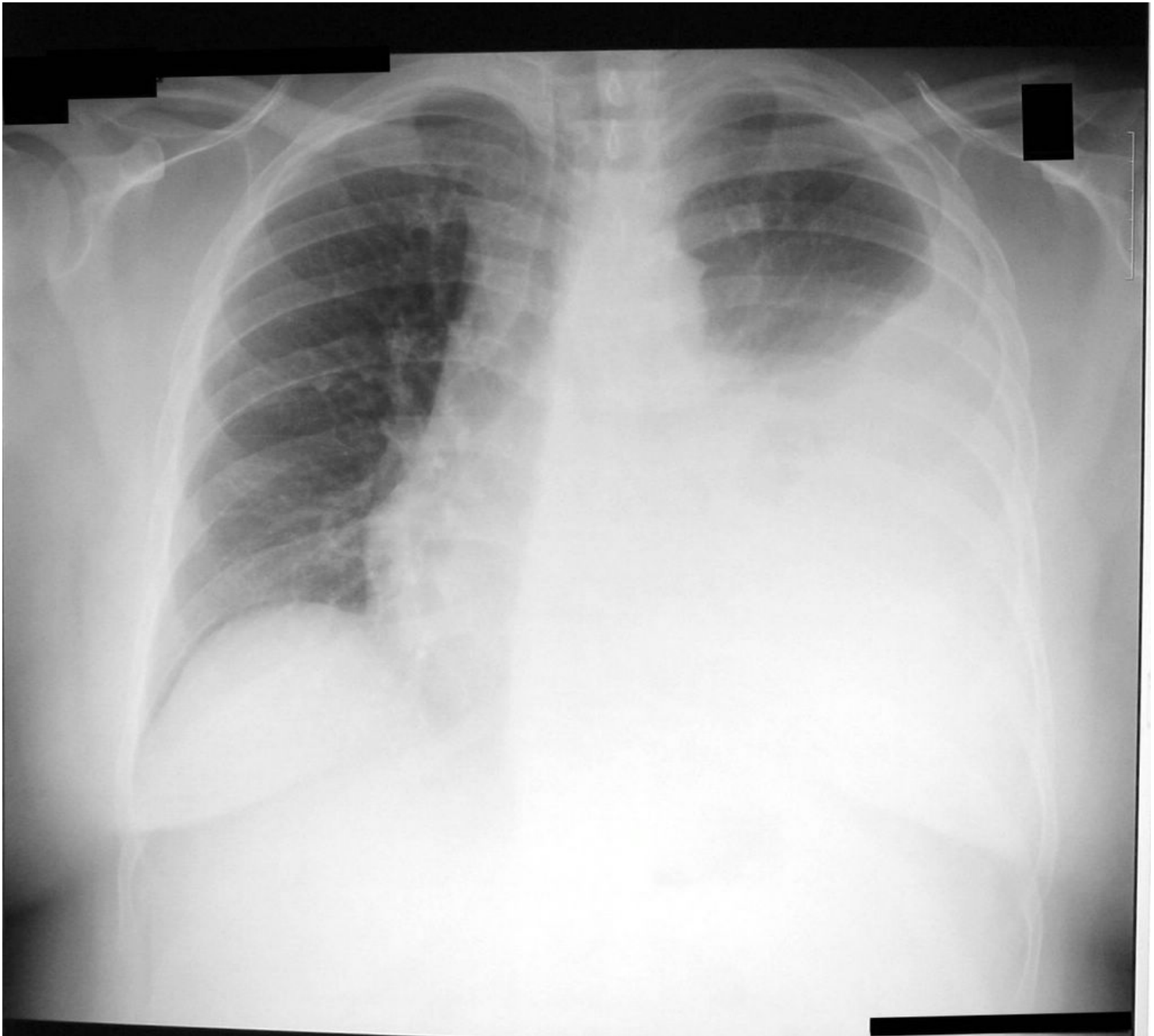
Lab 1 (ED)

<p><u>CBC</u></p> <p>WBC 19 Hgb 59 Plt 118</p> <p><u>Chemistry</u></p> <p>Na138 K3.0 Cl112 HCO2 18 Urea 9 Cr 100 Glucose 6</p> <p><u>Extended Lytes</u></p> <p>Ca2.0 Mg1.8</p> <p><u>ABG</u></p> <p>pH 7.20 pCO₂ 48 pO₂ 160 HCO₃ 18 Lactate 4</p>	<p><u>Cardiac/Coags</u></p> <p>HS Trop <3 INR 1.4 aPTT 38 Fibrinogen 1.5 (1.5-3 g/L)</p> <p><u>Biliary</u></p> <p>AST 189 (14-20 U/L) ALT 198 (10 - 55U/L) GGT 150 (0-50 U/L) Alk Phos 189 (25-100 U/L) Bili 20 (1.7- 20.5 mcm/L) Albumin 20 (38 -53 g/L)</p> <p><u>Urine Toxiology Screen (qualitative)</u></p> <p>Amphetamines – Neg Cocaine – Neg Marijuana (THC) – Neg Benzodiazepines – Neg EDDP (Methadone Metabolite) – Neg Morphine – Neg Buprenorphine – Neg Fentanyl – Neg</p> <p><u>Toxicology (blood)</u></p> <p>EtOH Neg Acetaminophen level Neg</p>
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Appendix B: ECGs, X-rays, Ultrasounds and Pictures



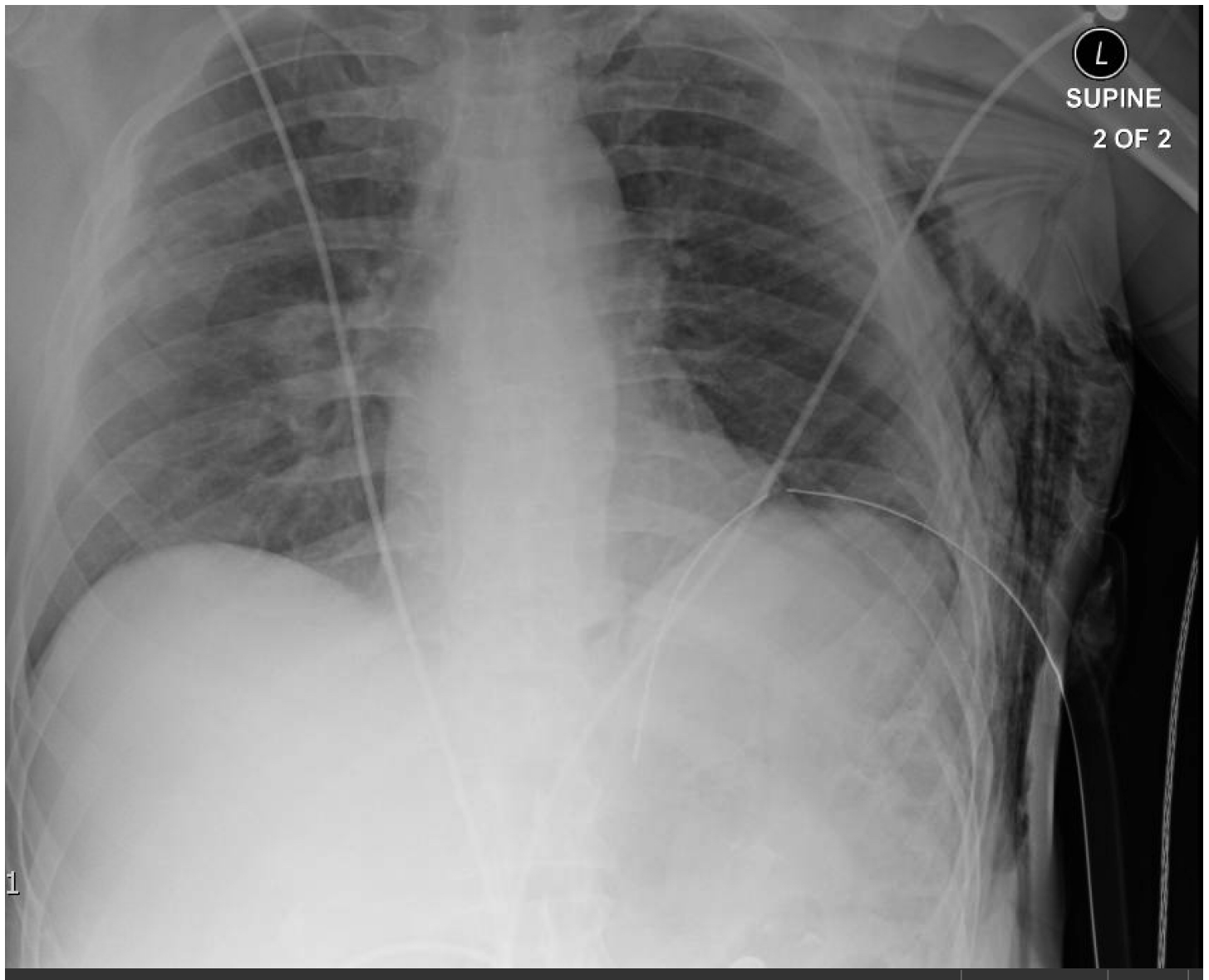
https://upload.wikimedia.org/wikipedia/commons/5/57/Left-sided_Pleural_Effusion.jpg

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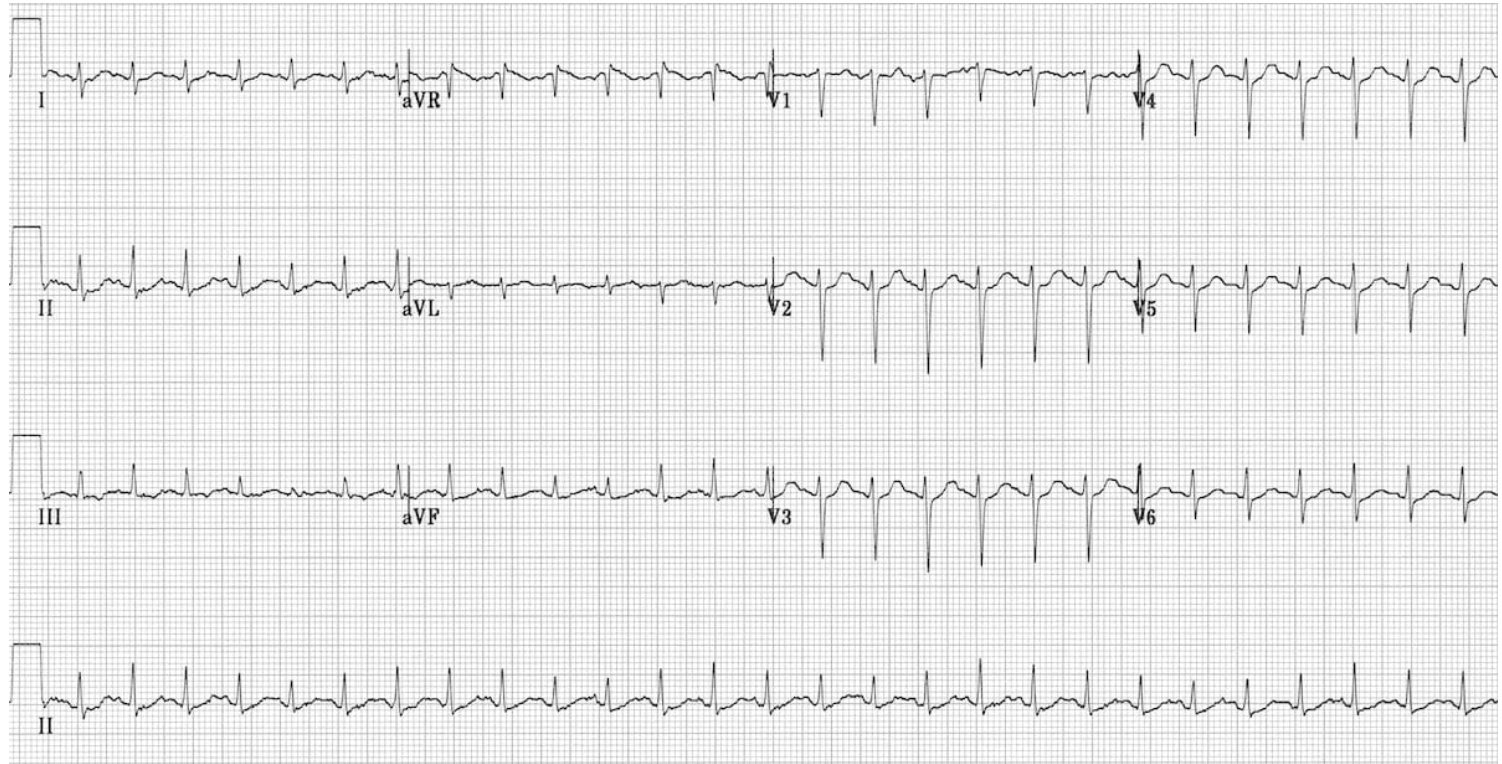
<https://radiopaedia.org/cases/normal-pelvis-x-ray-ap>

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https://jetem.org/chest_trauma/subcutaneous-emphysema-cxr-2-post-left-chest-tube-1-jetem-2018/

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<https://litfl.com/sinus-tachycardia-ecg-library/>

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***Final Report ***

XR Chest AP 1 view

Reason For Exam

Trauma

REPORT

There is a large left side hemothorax with associated left 5th and 6th rib fractures.

There is a small left apical pneumothorax.

The mediastinum is midline. The right lung is well-aerated. No right rib fractures definitively identified.

Findings will be related to the ER physician.

Clinical Correlation suggested.

***Final Report ***

XR Pelvis

Reason For Exam

Trauma

REPORT

The boney pelvis is intact.

No fracture identified.

***Final Report ***

XR Chest AP 1 view

Reason For Exam

Trauma

REPORT

There is now a left sided chest tube in place with interval improvement in hemothorax.

There is subcutaneous emphysema possibly secondary to left sided pneumothorax or chest tube insertion.

The mediastinum is midline. The right lung is well-aerated. No right rib fractures definitively identified.

CT Chest recommended.

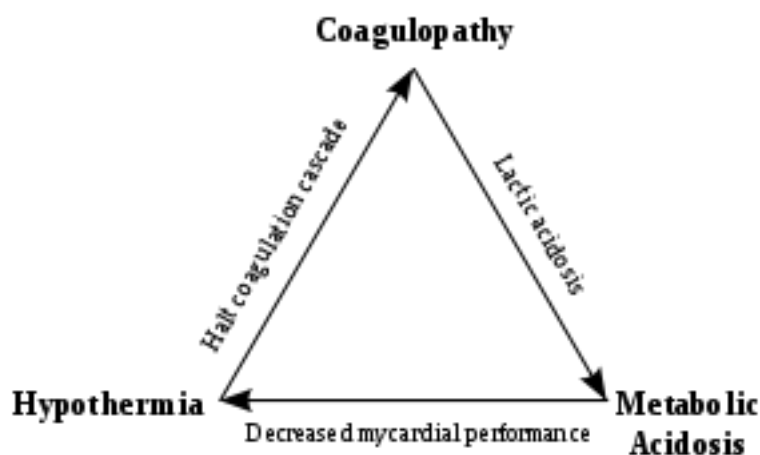
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Appendix C: Facilitator Cheat Sheet & Debriefing Tips

The **trauma triad of death** is a medical term describing the combination of [hypothermia](#), [acidosis](#) and [coagulopathy](#).^[1] This combination is commonly seen in patients who have sustained severe [traumatic injuries](#) and results in a significant rise in the [mortality rate](#).^[2] Commonly, when someone presents with these signs, [damage control surgery](#) is employed to reverse the effects.

The three conditions share a complex relationship; each factor can compound the others, resulting in high mortality if this [positive feedback](#) loop continues uninterrupted.

Severe [bleeding](#) in trauma diminishes [oxygen delivery](#), and may lead to [hypothermia](#). This in turn can halt the [coagulation cascade](#), preventing [blood from clotting](#). In the absence of blood-bound oxygen and nutrients ([hypoperfusion](#)), the body's cells burn glucose [anaerobically](#) for energy, causing the release of [lactic acid](#), [ketone bodies](#), and other [acidic](#) compounds into the blood stream, which lower the blood's [pH](#), leading to [metabolic acidosis](#). Such an increase in acidity damages the tissues and organs of the body and can reduce [myocardial performance](#), further reducing the oxygen delivery.



Damage control surgery (DCS) is a technique of surgery used to care for critically ill patients. The leading cause of death among trauma patients remains uncontrolled hemorrhage and accounts for approximately 30–40% of trauma-related deaths.^[1] This technique places emphasis on preventing the "[lethal triad](#)", rather than correcting the [anatomy](#).^{[2][3]} Damage control surgery is meant to save lives. A multi-disciplinary group of individuals is required: nurses, respiratory therapist, surgical-medicine intensivists, blood bank personnel and others. While this lifesaving method has significantly decreased the morbidity and mortality of critically ill patients, complications can result. This procedure is generally indicated when a person sustains a severe injury that impairs the ability to maintain [homeostasis](#) due to severe [hemorrhage](#) leading to [metabolic acidosis](#), [hypothermia](#), and increased [coagulopathy](#).^[4] The approach would provide a limited surgical intervention to control hemorrhage and contamination. This subsequently lets clinicians focus on reversing the physiologic insult prior to completing a definitive repair. While the temptation to perform a definitive operation exists, surgeons should avoid this practice because of the deleterious effects on patients can result them succumbing to the physiologic effects of the injury, despite the anatomical correction.

[World J Emerg Surg.](#) 2017; 12: 40.

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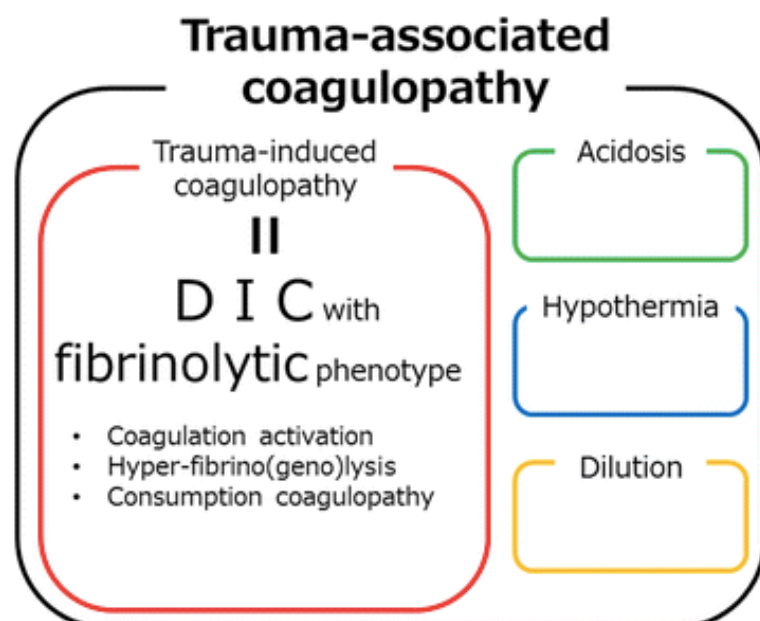
Disseminated intravascular coagulation (DIC) is characterized by systemic activation of blood coagulation, which results in generation and deposition of fibrin, leading to microvascular thrombi in various organs and contributing to multiple organ dysfunction syndrome (MODS).^[1, 2] Consumption of clotting factors and platelets in DIC can result in life-threatening hemorrhage.^[3]

Derangement of the fibrinolytic system further contributes to intravascular clot formation, but in some cases, accelerated fibrinolysis may cause severe bleeding. Hence, a patient with DIC can present with a simultaneously occurring thrombotic and bleeding problem, which obviously complicates the proper treatment.

The subcommittee on DIC of the International Society on Thrombosis and Haemostasis has suggested the following definition for DIC: "An acquired syndrome characterized by the intravascular activation of coagulation with loss of localization arising from different causes. It can originate from and cause damage to the microvasculature, which if sufficiently severe, can produce organ dysfunction."^[4]

DIC is estimated to be present in as many as 1% of hospitalized patients.^[5] DIC is not itself a specific illness; rather, it is a complication or an effect of the progression of other illnesses. It is always secondary to an underlying disorder and is associated with a number of clinical conditions, generally involving activation of systemic inflammation.

Fig. 1



Trauma-associated coagulopathy and trauma-induced coagulopathy. Trauma-associated coagulopathy is caused by multiple factors and includes trauma-induced coagulopathy, which is caused by trauma itself.

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References

1. Pathophysiology of trauma-induced coagulopathy: disseminated intravascular coagulation with the fibrinolytic phenotype [Mineji Hayakawa](#) *Journal of Intensive Care* volume 5, Article number: 14 (2017)

