Minutes Really Do Count: Direct-to-OR Resuscitation in Practice

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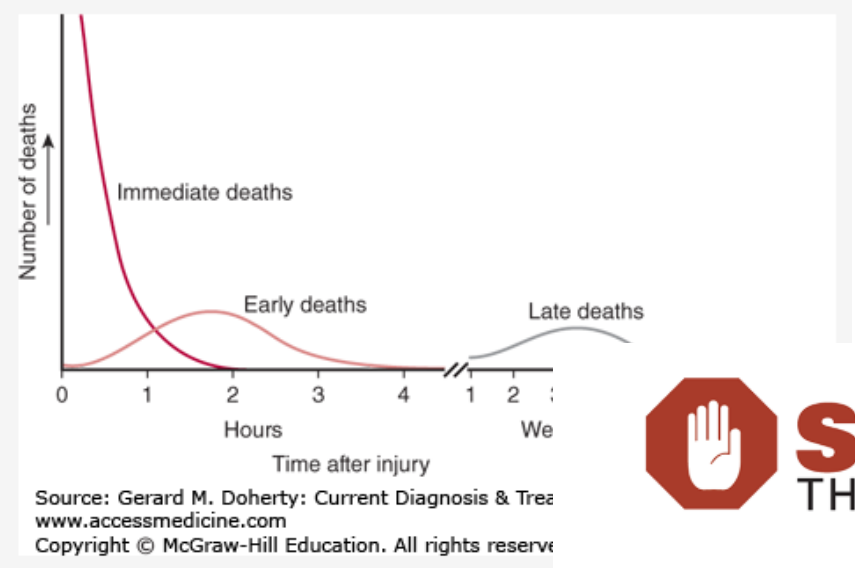
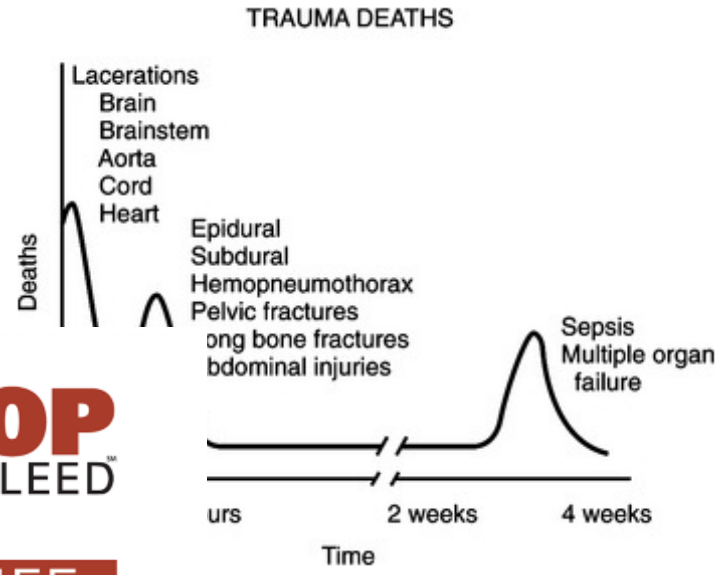
- Why do trauma patients die?
- What is it?
- When to do it
- Why do it?
- Case examples

Time matters

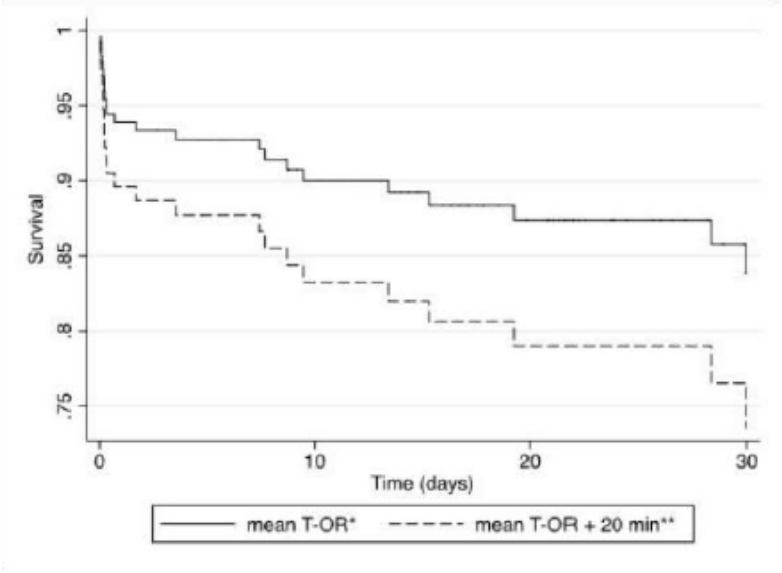
- "There is a golden hour between life and death. If you are critically injured you have less than 60 minutes to survive…" – R. Adams Cowley





Time matters

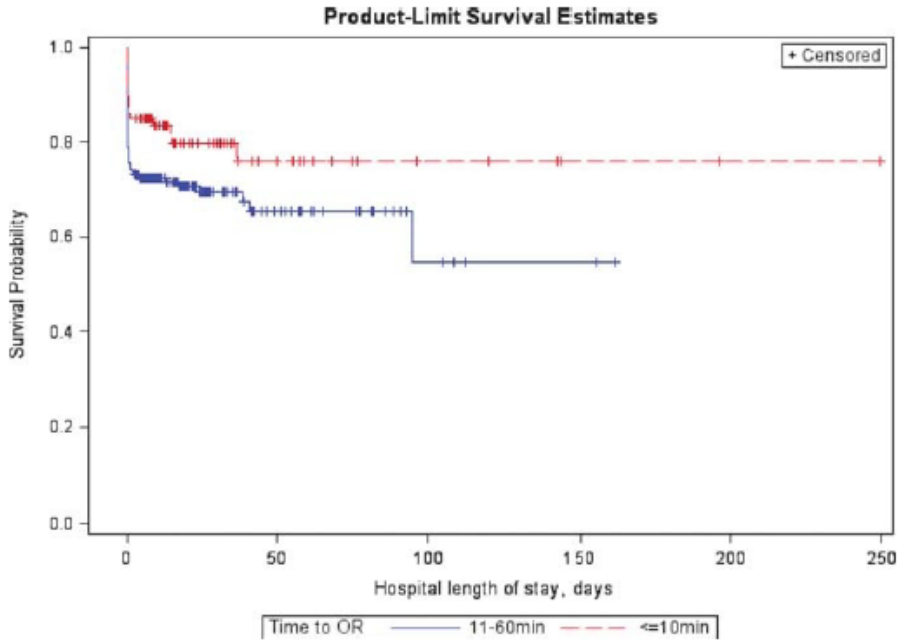
- Increased time to OR in FAST positive patients decreased survival in a PROMMTT subgroup analysis
- Each 10 min delay in time to OR increased hazard ratio by ~1.5



J Trauma Acute Care Surg. 2013 July ; 75(1 0 1): S48–S52. doi:10.1097/TA.0b013e31828fa54e.

Time matters

- Ryder Trauma Center
  - > Evaluated hypotensive patients with a torso GSW



  - > "Golden 10 minutes"

(J Trauma Acute Care Surg. 2016;81: 685–691 DOI: 10.1097/TA.0000000000001198

What is Direct to OR

- Utilization of the Trauma OR as the resuscitation area for receiving the newly arrived trauma patient
- The Trauma OR contains all of the equipment kept in a standard Trauma bay AND of a OR for trauma
- Patients are not charged OR time until an OR pack is opened
- Generally reserved for the sickest of trauma patients & have a high likelihood of an immediate operation

LEMC Trauma Activation criteria

- Two levels of activation
  - > Level 2
    - Physiologic:
      - GCS 9-14
      - Blunt traumatic impact with numbness and tingling
    - Mechanism
      - Fall from height: > 20 ft (adult) or > 10 ft (peds)
      - Elderly fall on blood thinners
      - Auto vs. pedestrian/bike thrown, run over or with significant (> 10 mph) impact
      - MC/ATV/Bike crash > 20 mph
      - High risk auto crash: 1. Intrusion, including roof, >12 inches occupant site, >18 inches any site
        - » Partial or complete ejection
        - » Rollover
        - » Death in the same vehicle
        - » Reported speed > 45 mph

LEMC Trauma Activation criteria

- Level 1
  - Level 2 criteria plus:
    - Anticipation of airway management
    - Shock
    - Low GCS
    - Penetrating head injury/open skull fracture
    - Suspected SCI
    - Concern for chest wall instability/deformation, acute abdomen or pelvic hemorrhage
    - Severe extremity injury (eg mangled, crushed, amputations, tourniquet use)
    - Bilateral femur fractures
    - Patients received/receiving transfusion of blood or blood products
    - ED Providers, ED/Trauma RN, Trauma PA or Trauma Surgeon Discretion

LEMC Trauma Activation criteria

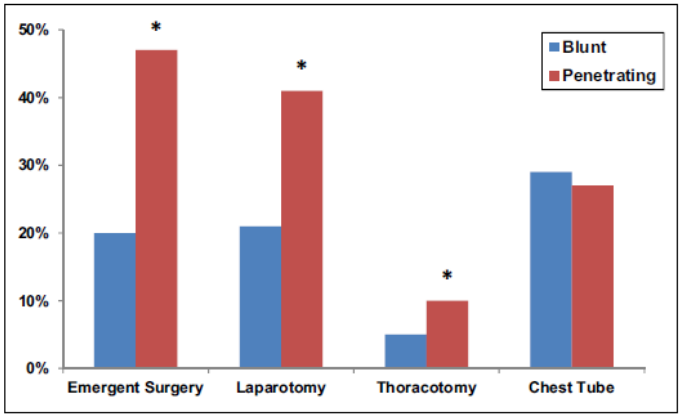
- Level 1/Direct to OR
  - Level 1 criteria plus:
  - Cardiopulmonary Arrest
  - Anticipated need for surgical airway
  - Profound shock (Adult: SBP<80; pediatric SBP<60)
  - Arterial or vascular injury to neck
  - Evisceration of abdominal contents
  - Penetrating injury or impaled object to the neck or torso
  - EMS, flight, or provider request

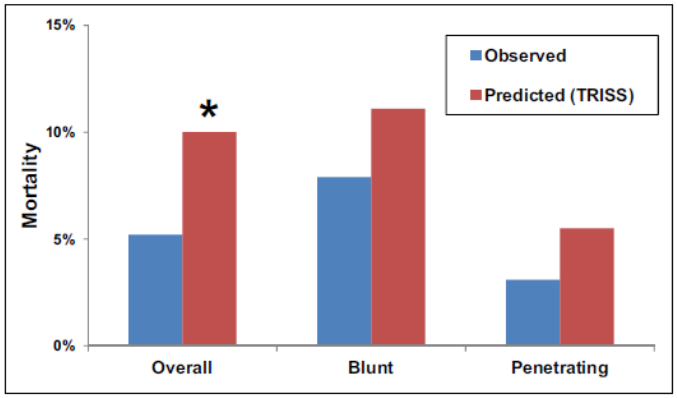
Who responds at LEMC?

- Level 2:
  - > Trauma Surgeon
  - > ED physician
  - > Trauma resident(s)
  - > Trauma PA(s)
  - > Trauma RN (2-3)
  - > RT
  - > XR tech
  - > OR nurse (if avail)
- Level 1:
  - > Trauma Surgeon
  - > Trauma Anesthesiologist
  - > Trauma resident(s)
  - > Trauma PA(s)
  - > Trauma RN (2-3)
  - > RT
  - > XR tech
  - > OR nurse
  - > OR scrub tech

Why use Direct to OR

- Improved survival
- Over 10y (2000-2009)
  - > 1407 pts
    - 68% required an operation
    - 33% required an immediate operation





Comparison of actual mortality rates with predicted mortality based on TRISS methodology). *$P < .05$.

Am J Surg 2012; doi:10.1016/j.amjsurg.2012.06.001

Pediatric Direct to OR

- Reviewed all DOR peds pts at LEMC 2009-2016

TABLE 4. Emergent Procedural Interventions (n = 82)

Interventions	n (%)
Laparotomy	14 (18%)
Thoracotomy	6 (8%)
Craniotomy	10 (13%)
Neck exploration	6 (8%)
Wound exploration/repair	28 (35%)
Vascular repair	8 (10%)
Tube thoracostomy	15 (19%)
Central venous access	17 (22%)
Intracranial pressure monitor	5 (6%)

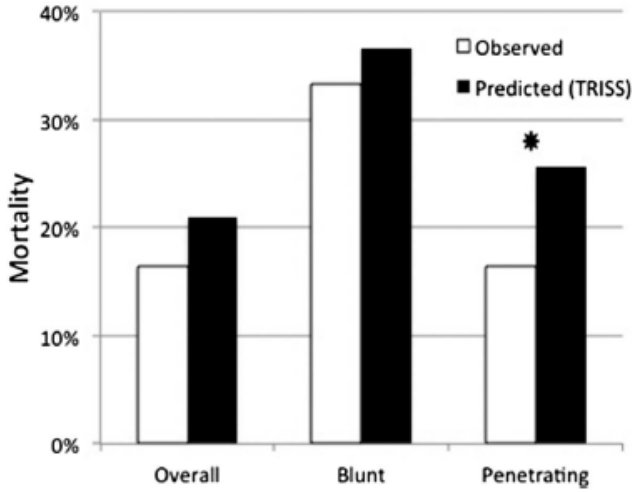


Figure 1. Observed vs expected mortality by mechanism (*$p < 0.01$).

TABLE 5. Total Hospital Charges for Most Severely Injured Patients* by Initial Resuscitation Protocol

	DOR		ED Resuscitation		
	n	Cost Median (Range)	n	Cost Median (Range)	*p*
All patients	19	US $77,390 (US $32,873–349,628)	113	US $120,279 (US $25,683–4,472,640)	0.20
Survived	7	US $77,390 (US $43,156–25,683)	90	US $139,027 (US $25,683–4,472,640)	0.50
Died	12	US $71,279 (US $32,873–138,046)	23	US $94,202 (US $31,465–479,947)	0.18
LOS ≤1 d	7	US $56,036 (US $32,873–180,243)	15	US $57,689 (US $25,683–120,279)	0.85

* As defined by ISS > 15, TRISS < 0.8.

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Recent Legacy Emanuel Experience

- 2023
  - > 4183 trauma activations
    - 190 Direct to OR
    - 52 underwent an operation within the first 60 minutes
      - 24 GSW
      - 22 stabbed
      - 6 MVC
      - 7 chest tube only
      - 2 skin lac repair only

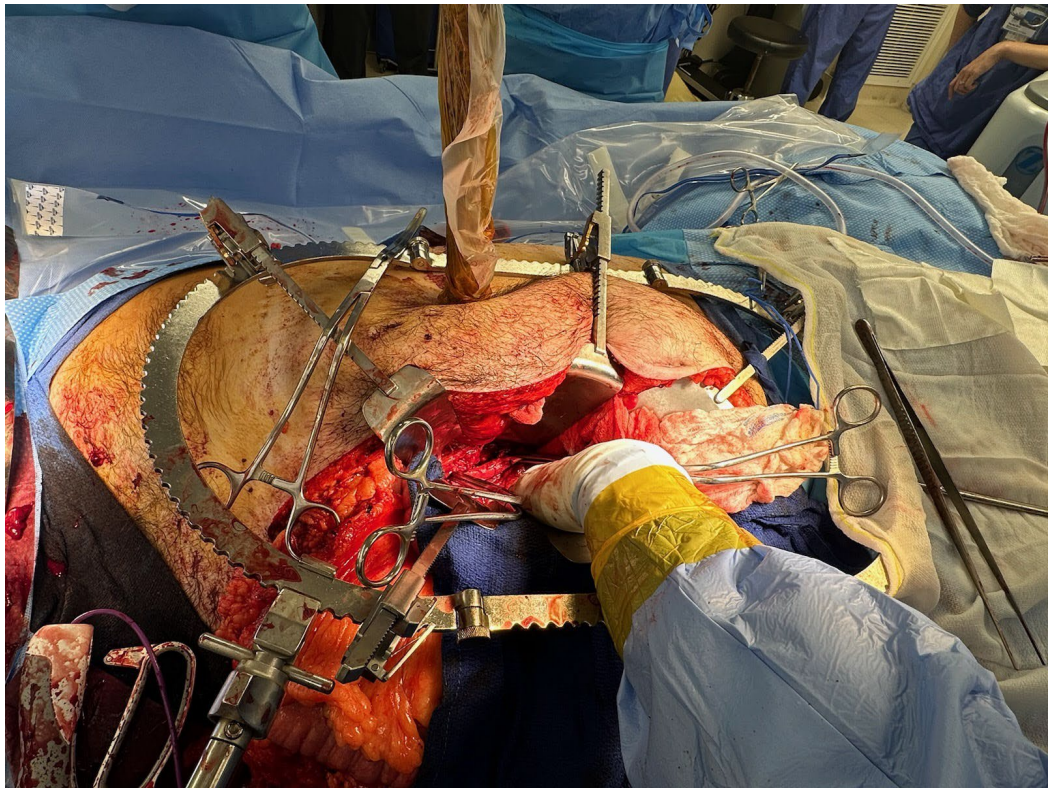
Direct to OR: Pros/Cons

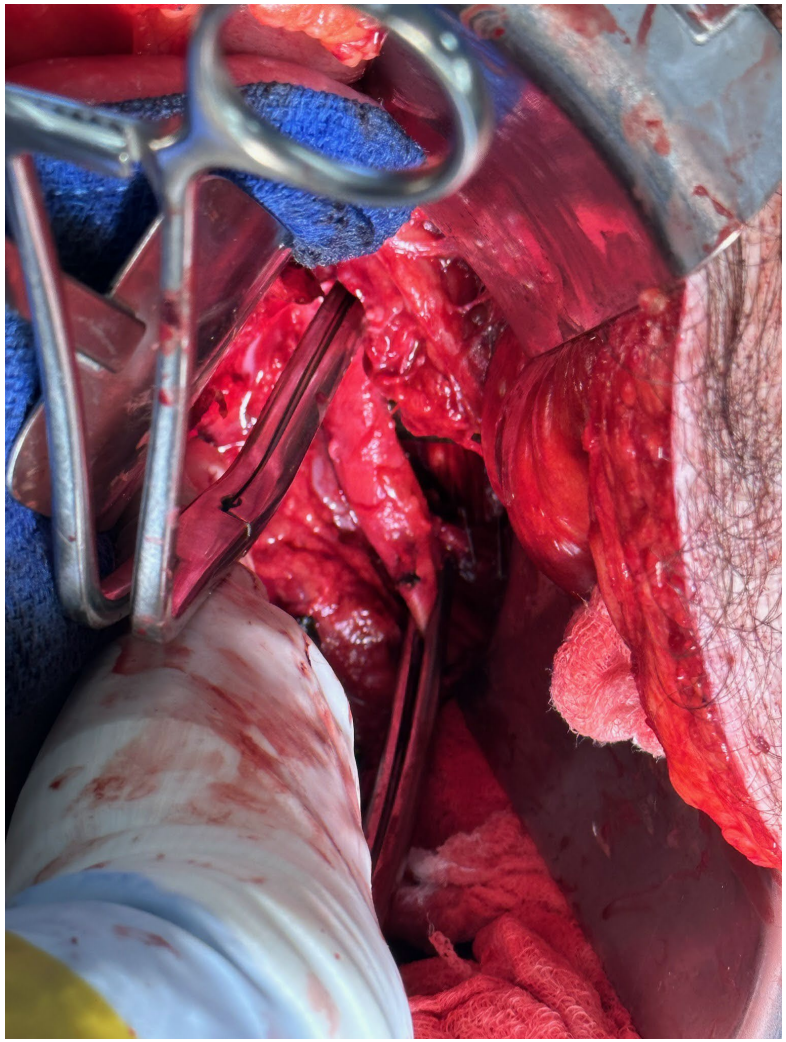
- Pro:
  - All procedural equipment is present
  - No need to travel from the ER to the OR
  - Provides the OR team “constant” practice for a sick trauma patient
  - Does not appear to have added charges to a patient’s care

- Con:
  - Maybe “overkill” for 2/3 of our patients who met DOR criteria
  - Utilizes a relatively scarce resource

Case Example

- 40M impaled in the abdomen by a pry bar
- Brought directly from the field as a Level 1 Direct to OR Trauma Entry






15
LIEUTENANT
PARAMEDIC
LIEUTENANT
EMT

Injuries:

- Hernia x 3 (abdominal, omental, lumbar)
- Colon injury x 2 (transverse & splenic flexure)
- Left renal artery & renal ischemia
- Aortic injury with thrombus
- Left femoral art thrombosis with leg ischemia
- IVC intimal injury with thromboembolism
- Left gonadal art/vein transection
- Left lymphatic trunk transection
- B/L Lumbar sensory and autonomic nerve injuries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Thank you!