

Resuscitation and Transfer of the Major Trauma Patient



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Objectives

- What is the resuscitation goal?
- Point of departure – ATLS
- Common pitfall in the ABCDEs
- Evolving concepts in trauma resus
 - ◆ Permissive hypotension
 - ◆ Damage control, staged resuscitation
 - ◆ Massive transfusion and the 1:1:1 ratio
- Transferring trauma patients in BC

Resuscitation Goals

Death Following Injury

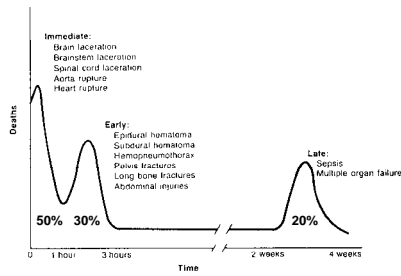


Figure 1-3 Causes of Trauma Death. Source: Adapted from "Trauma" by DD Trunkey in Scientific American (1983:249-31). Copyright © 1983 by Scientific American, Inc. All rights reserved.

Death Following Injury

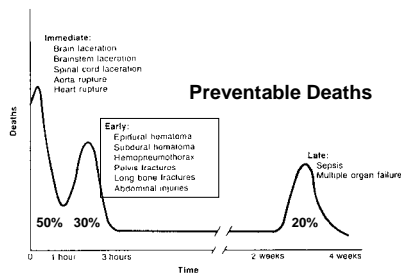


Figure 1-3 Causes of Trauma Death. Source: Adapted from "Trauma" by DD Trunkey in Scientific American (1983:249-31). Copyright © 1983 by Scientific American, Inc. All rights reserved.

Goals of Resuscitation

- Support, correct (?) physiology
- Manage life threatening problems
- Complete a diagnostic work up
- Definitive interventions
- Fully restore physiology

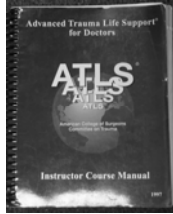
Point of Departure: ATLS

■ Primary survey, adjuncts and resuscitation

- ◆ Rapid identification of immediately life threatening problems with initiation of resuscitative interventions based on priority sequence (ABCDE).

■ Secondary survey, adjuncts and definitive care

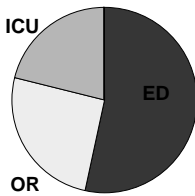
- ◆ Thorough diagnostic evaluation, identification of injuries and prioritization of subsequent interventions



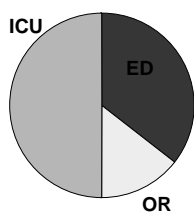
Pitfalls, Errors and Preventable Death

Pitfalls: Errors in Trauma Care

Errors (1032)

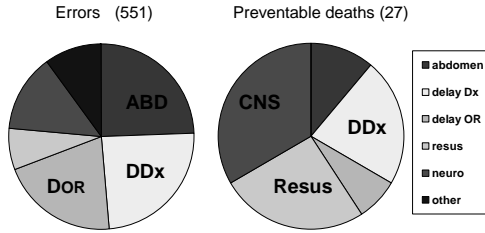


Preventable Deaths (76)



Hoyt et al. 1992

Pitfalls: Resuscitation Phase Errors



Hoyt et al. 1992

Organizational Pitfalls: Trauma Team Activation (TTA)

- TTA protocol
- Do you have one?
- Does it work?
- Is it audited?
- TTA threshold?
- Who's called?
- Surgeon response?



Primary Survey Pitfalls: Airway

- Abnormal LOC
 - ◆ Drunk or SDH?
- Penetrating wounds
 - ◆ Airway looks OK now
- Difficult airway
 - ◆ Adequate skills/tools?



Primary Survey Pitfalls: Breathing

- Flail chest / Pulm contusion
- C spine # with deficit
- Elderly with rib #
- Analgesia: friend or foe
- SaO₂ vs. ABG

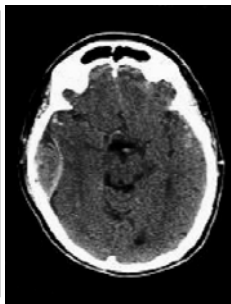


Primary Survey Pitfalls: Circulation

- Hard to get handle on
- Remember: “ Hemodynamic stability is the condition patient is in just before he crumps”.
- Assume there is bleeding, look for it & stop it
 - ◆ ABG, CXR, PXR, U/S
- Unstable but can't find bleeding?
- Elderly hypotensive – hypovolemic/cardiac?
- Hypotensive, bleeding patient – resus goal?

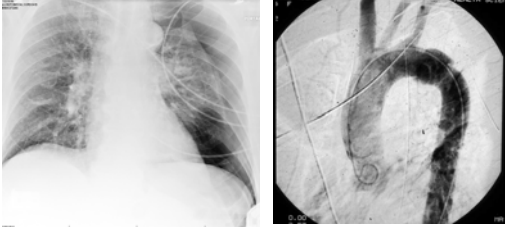
Primary Survey Pitfalls: Disability

- GCS is 14-15 until just before EDH reaches critical size / herniation.
- “I'll get the CT / transfer if he deteriorates”
- Common cause of preventable death.



Secondary Survey Pitfalls Chest

▪CXR: Is it really wide? Are they at risk for this?



Secondary Survey Pitfalls: Abdomen

"Soft, non tender"



Belt stripe



Prioritizing Definitive Care

•What first?



**Pitfalls Definitive Care :
Prioritizing**

- Doing too much
 - ◆ Keep yourself and team on tight timeline
 - ◆ Essential interventions only
 - ◆ Damage control mindset
- Waiting too long
 - ◆ Call early, Autolaunch?
- Doing in wrong order

**Evolving Concepts in
Resuscitation**

Trauma Transfer

Rural Facility (T=0.40)

69 yo male, motor cycle crash into ditch

Primary Survey:

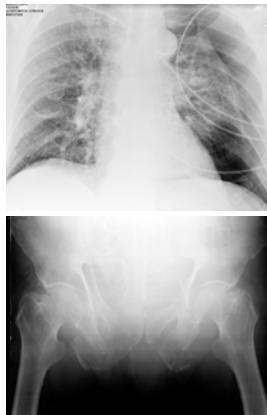
- A. Talking, seems OK
- B. RR = 26, tender & decreased AE on left
- C. BP = 80/P, HR = 128
- D. GCS 15, PERL
- E. Unstable, tender pelvis

Adjuncts:

CXR -

PXR -

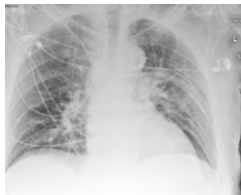
Foley - Gross Hematuria



Resuscitation:

Standard ATLS response

- A. OK
- B. O2 by mask,
L chest tube
SaO2 monitor



- C. 2LB IVs, 2L saline, cardiac monitor, ABG?
- D. OK
- E. Collar, trans-saver, pelvis?

Resuscitation:
Transient Responder, Now What?

- Where's the bleeding? How do you find it, stop it?
- How are you going to approach this resuscitation?
 - ◆ What are your resuscitation end points?
 - Normal or adequate physiology
 - ◆ What are you going to use to get there?
 - ◆ How will you maintain it?
 - ◆ What are your resources? Can you get more?
- Who, where, when, how are you going to get help?

Where's the bleeding?

- PE: pelvis

- Adjuncts:
 - ◆ CXR: no htx
 - ◆ PXR: # evident, likely source
 - ◆ U/S: no FF

What are you going to do
about it?

- Can you stop it?
- Can you mitigate it?
- How?

What are you going to do?

- Can you stop it?- no
- Can you mitigate it?- yes
- How?
 - ◆ Wrap pelvis in sheet
 - ◆ Tie legs together
 - ◆ Maintain euthermia
 - ◆ Maintain normal coagulation



Approach to resuscitation

- End points
- Available resources
- Products/ratios
- Preparation for transfer

Concept: Permissive hypotension

- Concept and application:
 - ◆ Adequate vs. normal physiology
 - ◆ Shock with uncontrolled hemorrhage
- Rationale:
 - ◆ ↓ Blood loss, coagulopathy, & hypothermia
- Evidence:
 - ◆ Clinical: modest, penetrating injury (Bicknell)
 - ◆ Laboratory: yes - uncontrolled hemorrhage
- Common sense test?

Concept: 1:1:1 Ratio resus

- Concept:
 - ◆ MT requires equal # of PRBC, FFP & Plts
- Rationale:
 - ◆ Whole blood lost – whole blood needed
 - ◆ Coagulopathy of major trauma
 - ◆ Lab driven protocols create lethal delays
- Evidence
 - ◆ Lots of clinical papers, quality not so great
- Common sense test?

Concept: Damage control

- Concept: Staged approach to resuscitation
- Phase 1. Initial resus, active hemorrhage (ED)
- Phase 2. Hemorrhage control (OR/Angio)
- Phase 3. Physiological restoration (ICU)
- Phase 4. Definitive care (OR)
- Phase 5. Reconstruction, closure (OR)

Putting the resuscitation together

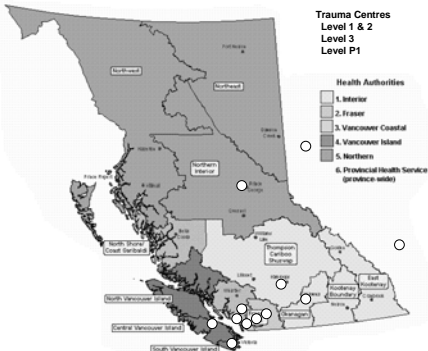
- Mindset:
 - ◆ Damage control (Phase 1)
- Resuscitation Goal:
 - ◆ Adequate physiology
- Resuscitation Plan:
 - ◆ Limited use of crystalloid
 - ◆ Liberal use of blood products incl. FFP/Plts
 - ◆ Maintain euthermia, transfer quickly (Phase 2)

Transferring Trauma Patients in BC

Transferring Trauma

- Who?
- Where?
- When?
- How?

Where? - Trauma Centres in BC



Transferring Trauma

- Who? -
- Where? - To a trauma centre
- When? - ASAP
- How to initiate?
- How to transport (air/ground, ALS/BLS)?
- How to support?

Transferring Trauma - Hows

- How to initiate?
 - ◆ Most Health Authorities use BC Bedline
 - ◆ Single call: 1 866 233 2337
 - ◆ Conference call with receiving centre/MD/Dispatch
- How to transport?
 - ◆ Decided on distances and available resources
- How to support?
 - ◆ Joint decision of referring/receiving MDs and BCAS-transport advisor

**Postscript:
Arrival Report**
(T=5.20)



- A. Size 8 ETT
- B. Difficult to ventilate
 - 60% FiO2, SaO2 >95%
 - Distended abdomen, pelvic wrap removed
- C. Hemodynamically unstable
 - All 8 units prbc + 4 u FFP given
 - 20L crystalloid
 - Nor epinephrine at 20mcg

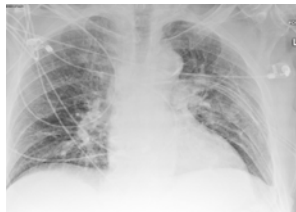
**Postscript:
ED Arrival: Primary Survey**

- A. Intubated ETT size 8
 - B. PCV, 35/5, 400, 60%
 - C. 120, 65/50. 34.8°
 - D. GCS 3 (Rocuronium)
 - E. L chest tube, 250cc
- Tense abdomen, anuric
Pelvic #, wrap off
Big guy (90kg)
Old guy (69y, high mileage)



Postscript: Primary Adjuncts

CXR:



FAST: +

ABG: 7.00, 64, 179, 15, -16
Hb/Platelets: 79 / 62
INR/PTT: 1.9 / 65

Decision Time

- What's killing him?
- Do we know?
- What tests needed if any?
- What interventions needed?
- What to do first?

Certainties, Probabilities, & Possibilities

- Hypovolemic shock
- Hypothermic
- Coagulopathic
- Pelvic # with probable pelvic bleeding
- Prob. abdominal compartment syndrome
- Possible intra-abdominal bleed
- Possible evolving CHI

What & where next?

- CT for diagnostic
- OR for ACS and ? bleeding
- Angio for bleeding



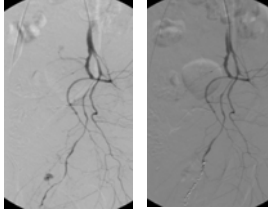


Action Taken (T=6.35h)

- Patient to OR for Laparotomy (Phase 2)
 - ◆ 2L clear fluid
 - ◆ No abdominal visceral injury
 - ◆ Pelvic hematoma (large but contained)
 - ◆ Bladder dome intact with palpable Foley
 - ◆ Happy anaesthetist – why?
- Angio team called in

Next Steps

- Temporary closure
- Transfer to Angio
- Embolisation



- Transfer to ICU
- 7.18/48/118/17/-11
- (T=8.30h)

Resuscitation Summary

- ATLS is our common language and common point of departure
- New concepts in trauma resuscitation need to be integrated
 - ◆ Permissive hypotension
 - ◆ Ratio approach to MT
 - ◆ Damage control mindset

Transfer Summary

- Know your limitations and back up
- Know your trauma centres
- Activate early (Autolaunch)
- Use BC Bedline
