The Primary Survey

Clay Cothren Burlew, MD FACS
Outlining the ABCs

• Why do we need such an approach?
• The Golden Hour
• ABCs – The Specifics
  – preventable deaths
  – problem recognition
  – management
• Take Home Points
Why the ABCs?

• Annual trauma costs exceed $400 billion

• Trauma = leading cause of death for age 1-44 yrs

• Inconsistent delivery of care prior to 1980
  → ATLS course initiated
Why the ABCs?

- **Goals of the ATLS Course**
  - appropriate and timely care
  - algorithm based
  - focus on the first hour
  - train practitioners who do not daily care for trauma patients
Trauma Deaths

Trimodal distribution of trauma deaths.

Sauaia et al., *J Trauma* 1994
Trauma Deaths

Trimodal distribution of trauma deaths.

Sauaia et al., J Trauma 1994
Trauma Deaths

Trimodal distribution of trauma deaths.

Sauaia et al., *J Trauma* 1994
Trauma Deaths: Prevention

• **Immediate (1\textsuperscript{st} peak)**
  – injury prevention
  – rapid prehospital transport

• **Early (2\textsuperscript{nd} peak)**
  – rapid assessment
  – prompt resuscitation

  \{ \text{“Golden Hour”} \}

• **Late (3\textsuperscript{rd} peak)**
  – ICU care
The Golden Hour

- Treat the greatest threat to life first
- Treat despite lack of a definitive diagnosis
- Treat despite incomplete history
The Golden Hour

- **A** = Airway with c-spine protection
- **B** = Breathing
- **C** = Circulation, stop the bleeding
- **D** = Disability/Neuro status
- **E** = Exposure and Environment
The Golden Hour

• **ABCDE – Primary Survey**
  – sequential yet actually simultaneous
  – includes resuscitation efforts
  – normalization of vital signs

• **Secondary Survey**
  – AMPLE history
  – head-to-toe and x-rays
Starting with the ABCs

A = Airway
Airway: Preventable Deaths

- Failure to recognize need
- Inability to establish
- Incorrectly placed airway
- Displacement
- Failure to ventilate
- Aspiration
Airway: Problem Recognition

• **Objective Signs – Airway Obstruction:**
  - agitation, cyanosis = hypoxia
  - obtundation = hypercarbia
  - abnormal sounds
  - tracheal location
  - external trauma
Airway: Problem Recognition

- Altered Levels of Consciousness
  - closed head injury
  - intoxication

- Maxillofacial Trauma
  - hemorrhage
  - dislodged teeth
  - mandible fx
Airway: Problem Recognition

- Penetrating Neck Trauma
  - laceration of trachea
  - hemorrhage with tracheal deviation/obstruction
  - patient may initially maintain airway
  - prophylactic intubation?
Airway: Problem Recognition

- **Blunt Neck Trauma**
  - hemorrhage with tracheal deviation/obstruction
  - disruption of the larynx
    - hoarseness
    - subcutaneous emphysema
    - palpable fracture
  - prophylactic intubation?
Airway: Problem Recognition

Clothes-line Injury to the Neck
Airway: Management

A always includes C-spine in-line immobilization!

assume this therefore, do this
Airway: Management

• Airway Maintenance Techniques:
  – chin lift
  – jaw thrust
  – oral airway
  – nasal trumpet

• Definitive Airway:
  – orotracheal or nasotracheal intubation
  – surgical airway
Airway: Cricothyroidotomy

Vertical skin incision – make it longer than you think you need....
Airway: Cricothyroidotomy

Can use the trach hook to stabilize.

Incise the cricothyroid membrane.
Airway: Cricothyroidotomy

Place a 6-0 endotracheal tube.

< 11yo, cric is contraindicated – do a trach.
Airway: Take Home Points

- Suspect impending airway obstruction
- C-spine immobilization
- Provide definitive airway
- Check patency, tube position
- Intubation unsuccessful → surgical airway

Address life threatening injuries!
Starting with the ABCs

B = Breathing
Breathing: Preventable Deaths

- **Assess** = “Look - Listen - Feel”

- **Address:**
  - Tension PTX
  - Open PTX
  - Flail chest
  - Massive hemothorax
    (really part of C)
Breathing: Problem Recognition

• **Objective Signs – Inadequate Ventilation:**
  - asymmetric chest rise
  - labored breathing
  - absent breath sounds
  - tachypnea
  - pulse oximeter
    (indirect measure)
Breathing: Problem Recognition

- Tension PTX:
  - “one-way-valve” air leak
  - blunt or penetrating mechanism
  - absent breath sounds

- CLINICAL DIAGNOSIS
  - immediate decompression
Breathing: Problem Recognition

- **Open PTX:**
  - defect of chest wall
  - air passes preferentially through defect
  - hypoxia & hypercarbia
  - occlusive dressing on 3 sides until CT placed
Breathing: Problem Recognition

• Flail Chest:
  – segment without bony continuity
  – asymmetric movement
  – crepitus

  – pulmonary contusion
  → hypoxia
The patient’s hemodynamic status dictates imaging and management.
Breathing: Management

- Chest tube, chest tube, chest tube
- Occlusive dressing
- Ventilatory support
- Thoracotomy?
Breathing: Take Home Points

- Look, listen, feel
- Adequate airway ≠ adequate ventilation
- HD status determines imaging
- Tension PTX = clinical dx

Address life threatening injuries!
Starting with the ABCs

C = Circulation
Circulation: Preventable Deaths

- Hypotension = Hemorrhage

- Assess:
  - level of consciousness
  - pulse / skin color

- Address:
  - external bleeding
  - massive hemothorax
  - cardiac tamponade
  - massive hemoperitoneum
  - unstable pelvic fracture
## Circulation: Classes of Shock

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blood Loss</strong></td>
<td>&lt; 750 cc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>% Volume</strong></td>
<td></td>
<td>&lt; 15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pulse</strong></td>
<td></td>
<td>&lt; 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BP</strong></td>
<td></td>
<td></td>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>
# Circulation: Classes of Shock

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Loss</td>
<td>&lt; 750 cc</td>
<td>750 - 1500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Volume</td>
<td>&lt; 15%</td>
<td>15 - 30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse</td>
<td>&lt; 100</td>
<td>&gt; 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BP</td>
<td>Normal</td>
<td>Normal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Circulation: Classes of Shock

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blood Loss</strong></td>
<td>&lt; 750 cc</td>
<td>750 - 1500</td>
<td>1500 - 2000</td>
<td></td>
</tr>
<tr>
<td><strong>% Volume</strong></td>
<td>&lt; 15%</td>
<td>15 - 30%</td>
<td>30 - 40%</td>
<td></td>
</tr>
<tr>
<td><strong>Pulse</strong></td>
<td>&lt; 100</td>
<td>&gt; 100</td>
<td>&gt; 120</td>
<td></td>
</tr>
<tr>
<td><strong>BP</strong></td>
<td>Normal</td>
<td>Normal</td>
<td></td>
<td>↓</td>
</tr>
</tbody>
</table>
### Circulation: Classes of Shock

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Loss</td>
<td>&lt; 750 cc</td>
<td>750 - 1500</td>
<td>1500 - 2000</td>
<td>&gt; 2000</td>
</tr>
<tr>
<td>% Volume</td>
<td>&lt; 15%</td>
<td>15 - 30%</td>
<td>30 - 40%</td>
<td>&gt; 40%</td>
</tr>
<tr>
<td>Pulse</td>
<td>&lt; 100</td>
<td>&gt; 100</td>
<td>&gt; 120</td>
<td>&gt; 140</td>
</tr>
<tr>
<td>BP</td>
<td>Normal</td>
<td>Normal</td>
<td>↓</td>
<td>↓</td>
</tr>
</tbody>
</table>
Circulation: Causes of Shock

- **Hypovolemic = Hemorrhage:**
  - 5 spaces = scalp/street, chest, abdomen, pelvis, long-bones

- **Fractures:**
  - rib = 100-200 cc
  - tibia = 300-500 cc
  - femur = 800-1200 cc
  - pelvis = 1500 cc and up
Circulation: Causes of Shock

- **Cardiogenic:**
  - tension PTX
  - cardiac tamponade or contusion
  - air embolism
  - primary cardiac disease

- **Neurogenic:**
  - spinal cord injury

- Septic
Circulation: Problem Recognition

- **External Hemorrhage:**
  - apply direct manual pressure
  - don’t indiscriminately use clamps
  - tourniquet if amputation
Circulation: Problem Recognition

- **Massive Hemothorax:**
  - 1500 cc blood
  - 1/3 blood volume in a child
  - blunt trauma → rib fx, intercostal artery, lung lac
  - penetrating trauma → systemic or hilar vessels
Circulation: Problem Recognition

• **Cardiac Tamponade:**
  – *penetrating = most common*
  – *diagnosis:*
    • Beck’s triad = uncommon
    • CVP line
    • Ultrasound
  – *pericardiocentesis*
Circulation: Problem Recognition

- **Massive Hemoperitoneum:**
  - consider mechanism
    - X-rays if penetrating
  - FAST is often diagnostic
  - DPA if patient remains unstable, FAST –
  - Emergent OR
Circulation: Problem Recognition

- **Unstable Pelvic Fracture:**
  - exam/film PLUS shock
  - R/O associated injuries
  - “sheet” the pelvis
  - If transfusing blood consider intervention: IR vs. OR
Circulation: Pitfalls

- Elderly – limited reserve
- Children – abundant reserve, decompensate late
- Athletes – “relative” tachycardia
- Drugs – Rx and illegal
Circulation: Management

• **IV access:**
  - 2 large-bore peripheral IVs
  - central line
  - saphenous vein cut down
  - IO needle

• **2 liter bolus**
Circulation: Management

- Tube thoracostomy
- Pericardiocentesis
Circulation: Management

- “Wrap the pelvis” to close down volume

wrapped in ED  C-clamp  external fixator
Circulation: Management

THE OR
Circulation: Management

- **ED Thoracotomy:**
  - penetrating torso < 15 min CPR
  - penetrating non-torso < 5 min CPR
  - blunt < 10 min CPR
Circulation: Management

• Hilar Injuries:
  – satinsky clamp
  – hilar twist
  – digital compression
Cardiac Injuries:
  - pledget repair RV
  - staple repair LV if linear wound
  - suture repair LV
  - avoid ligating a coronary
Circulation: Management

- **Cross-clamp aorta:**
  - after pericardium
  - do first if penetrating neck/extremity injury
• Don’t forget:
  – proper hand position for cardiac massage
  – internal cardioversion paddles
  – intracardiac epi
Circulation: Take Home Points

- Hypotension = hemorrhage
- Class III shock before ↓ BP
- 5 spaces for blood loss
- IV access is key!

Address life threatening injuries!
ABCs: Take Home Points

• Systematic evaluation

• Address life threatening injuries
  – airway obstruction
  – tension/open PTX
  – massive hemoperitoneum
  – cardiac tamponade
  – external hemorrhage
  – massive hemothorax
  – unstable pelvis

• Resuscitation without specific diagnosis

• Following this, proceed with 2° survey
The Primary Survey