

AIR GOES IN AND OUT,  
BLOOD GOES ROUND AND  
ROUND

Any variation on this is a bad thing . . .

# HEMORRHAGIC SHOCK IN TRAUMA

Kevin Pearl, M.D., M.S.

*Clinical Assistant Professor of Emergency Medicine, University of Maryland  
Emergency Medicine*

*Associate Medical Director, Talbot County Dept. of Emergency Services*

David Timms, B.S., NRP

*Captain, Talbot County Dept. of Emergency Services*

# Shock = Hypoperfusion

- ▣ Inadequate bloodflow to tissues
  - Inadequate oxygen delivery
  - Inadequate delivery of energy sources
  - Inadequate removal of carbon dioxide
  - Inadequate removal of toxins & byproducts
- ▣ In trauma, most often hemorrhagic shock
  - Not enough blood volume
  - May also be referred to as hypovolemic shock

# Where did it go?

- ▣ “On the floor plus four more”
  - On the floor
  - In the chest cavity
  - In the abdomen
  - In the pelvis
  - In the thighs

0/15/30/40



# Stages of Hemorrhagic Shock

	Stage I	Stage II	Stage III	Stage IV
% lost	0-15%	15-30%	30-40%	> 40%
Vol. lost	< 750 mL	750-1500 mL	1500-2000 mL	> 2000 mL
HR	< 100	100-120	120-140	> 140
BP	Normal	Normal	Decreased	Decreased
Mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, lethargic

American College of Surgeons Committee on Trauma. ATLS Student Course Manual, Eighth edition. Table 3-1, pp61. Chicago, IL. 2008.



Needs  
Bloodflow



# Stage I

- ▣  $< 750$  mL blood loss ( $< 15\%$ )
- ▣ Pulse  $< 100$
- ▣ Normal blood pressure
- ▣ Respirations 14-20
- ▣ Mental status normal, may be anxious
- ▣ Well compensated via venous contraction



## Stage II

- ▣ 750 – 1500 mL blood loss (15-30%)
- ▣ Pulse 100-120
- ▣ Normal blood pressure
- ▣ Respirations 20-30
- ▣ Mental status normal, or anxious
- ▣ Compensation through increase in heart rate and cardiac contractility

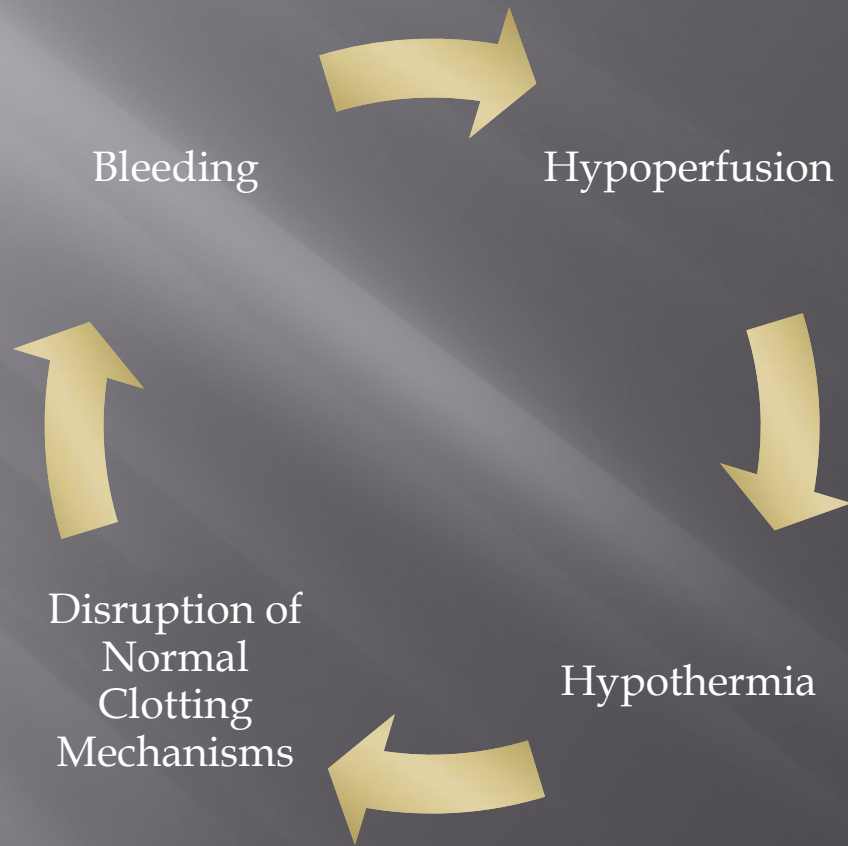
## Stage III

- ▣ 1500-2000 mL blood loss (30-40%)
- ▣ Pulse 120-140
- ▣ Decreased blood pressure
- ▣ Respirations 30-40
- ▣ Mental status decreased, confused
- ▣ Compensation failing, shunting blood away from non-critical organ systems

## Stage IV

- ▣  $> 2000$  mL blood loss ( $> 40\%$ )
- ▣ Pulse  $> 140$
- ▣ Blood pressure markedly decreased
- ▣ Respirations  $> 35$
- ▣ Mental status decreased, lethargic or unconscious
- ▣ Decompensated

# Spiral of Death



# Basic Life Support



# Source control

- ▣ Direct pressure (external bleeding)
- ▣ Tourniquets (extremities)
- ▣ Pelvic stabilizer (pelvic internal bleeding)
- ▣ Surgical Control!
  - Route to trauma center



# Prevent hypothermia

- ▣ After exposing the patient, cover them back up!
- ▣ Get the patient off the ground
- ▣ Warm ambulance



# Maximize oxygen delivery

- ▣ Administer oxygen
- ▣ Good airway management skills





# Advanced Life Support



# Good BLS!!!!

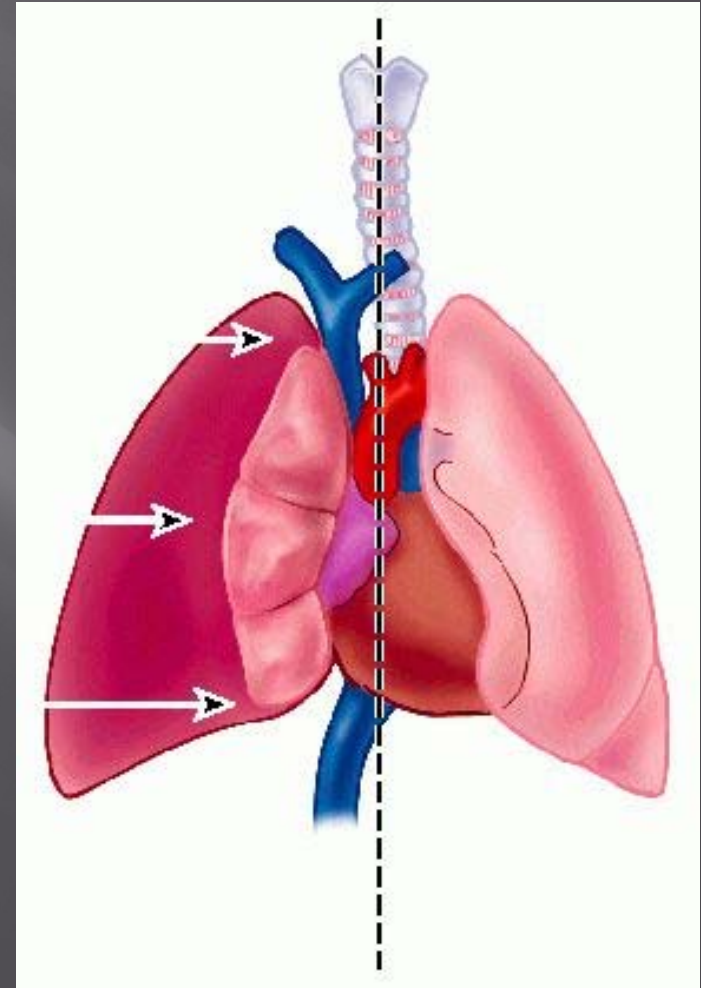
- ▣ Source control as above
- ▣ Prevention of hypothermia
- ▣ Airway management (including ALS tools)
- ▣ Appropriate destination

# Intravenous Fluids

- ▣ Will replace lost volume, HOWEVER
  - Will not stop the leak
  - Will not carry oxygen
  - Will not help blood clot
- ▣ Start 2 large bore IVs
- ▣ Administer no more than 2 liters without consult

# Assess for Alternate Causes of Shock

- ▣ Tension Pneumothorax
- ▣ Cardiac Tamponade
- ▣ Blunt Cardiac Injury



# Pediatrics



# Pediatric Trauma

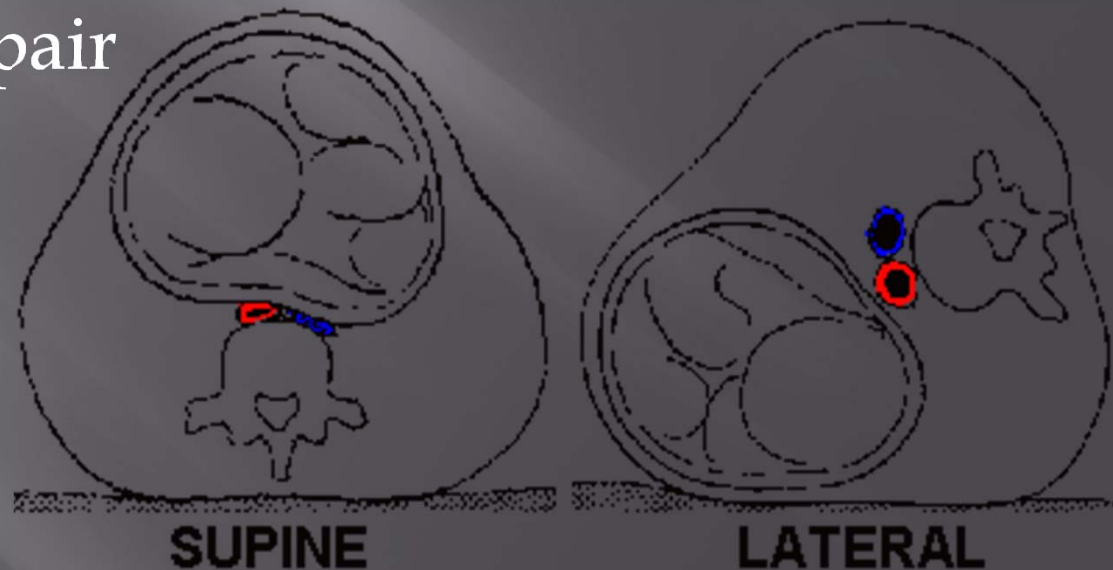
	Mild Blood Loss (< 30%)	Moderate Blood Loss (30-45%)	Severe Blood Loss (> 45%)
Heart Rate	Increased	Markedly increased	Severely increased, followed by bradycardia
Blood Pressure	Normal (90 + age x 2)	Low normal (70 + age x 2)	Low < (70 + age x 2)
Mental Status	Anxious, irritable, confused	Lethargic	Comatose
Skin	Cool, mottled, prolonged cap refill	Cyanotic, markedly prolonged cap refill	Pale and cold

# Pregnancy



# Trauma in Pregnancy

- ▣ Be aware of normal physiologic changes
  - Anemia
  - Increased cardiac output
- ▣ Placenta as a source of bleeding
- ▣ Uterus can impair venous return





# Geriatrics



# Geriatric Trauma

- ▣ Decreased cardiac reserve
- ▣ Increased tissue susceptibility
- ▣ Presence of comorbidities
- ▣ Decreased bone strength
- ▣ More likely to be on medications
  - Beta-blockers/Calcium channel-blockers
  - Blood thinners

QUESTIONS?

# Resources

- ▣ American College of Surgeons Committee on Trauma. ATLS Student Course Manual, Eighth Edition. Chicago, IL. 2008.
- ▣ Judith E Tintinalli. Tintinalli's Emergency Medicine. McGraw-Hill. 2011.