Bleeding and Shock

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Circulatory System

- Composed of heart, blood vessels and blood
- **A closed system**
- Pumps oxygenated blood and nutrients to body tissues
- Delivers waste products to waste organs
- Supply and Demand
Circulatory System

Arteries

- Carry blood away from the heart
- Usually carries oxygenated blood
- Has thick muscular walls
  - Can change its diameter
  - To selectively distribute 5 – 6 liters of blood to parts of the body that really require about 9 liters
- Under relatively high pressure
- Eventually, become Arterioles
Veins

- Carry blood to the heart
- Usually carries deoxygenated blood, CO₂ and other waste products
- Large veins (e.g. in legs) can hold large volumes of blood
- Contains one way valves
  - To prevent backflow
- Under very small pressure
- Eventually become Venules

Capillaries

- Where gas, nutrient and waste exchange occurs
- One cell thick
  - To facilitate the diffusion of gasses, nutrients and waste products
Cardiac Circulation -- 1

Superior vena cava (deoxygenated blood from head and upper body)

Pulmonary artery (blood to right lung)

Right atrium

Interior vena cava (deoxygenated blood from lower body)

Right ventricle

Pulmonary artery (blood to left lung)

Cardiac Circulation -- 2

Oxygenated blood to head and upper body

Aorta

Pulmonary veins (oxygenated blood from left lung)

Left atrium

Left ventricle

Pulmonary veins (oxygenated blood from right lung)

Oxygenated blood to lower body
Blood

- **Approximately 5-6 liters in the adult body**
- Composed of:
  - Red Blood Cells
    - Erythrocytes
    - Carry Oxygen "on" Hemoglobin
  - White Blood Cells
    - Leukocytes
    - Fight Infection
  - Platelets
    - Assist in clotting
  - Plasma
    - Mostly Water

Blood Cells

![Blood Cells Image](image-url)
Functions of Blood

- Transportation of gasses
  - Oxygen
  - Carbon Dioxide
  - Other gasses in small amounts

- Nutrition
  - Transport nutrients to the tissues

Gasses & Nutrients
Functions of Blood -- 2

- Excretion
  - Transport waste to waste eliminating organs
- Protection
  - White Blood Cells fight infection
- Regulation of bodily functions

Regulation of Bodily Functions

- Hormones
  - From one place in the body to another
  - E.g. Adrenalin in a “flight/fright” situation
- Chemicals
  - E.g. Medications
- Temperature
  - E.g. On a hot day, blood vessels dilate near the skin's surface → Allows the blood to cool and circulate cooler blood to the rest of the body
Important Terms!

- **Perfusion**
  - Adequate delivery of O\(_2\) and nutrients to body tissues

- **Shock/ Hypoperfusion**
  - Inadequate tissue perfusion

- **Hemorrhage**
  - Bleeding of any kind from any place in the body

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Perfusion

![Perfusion Diagram]

- Artery
- Arterioles
- Capillaries
- Organ or tissue
- Venules
- Vein
Causes of “Shock”

- **Key principle:** When the circulatory system fails, it fails in one or a combination of the following:
  - The pump
    - A heart problem
      - Cardiogenic shock
  - Leaks
    - Hemorrhage
  - Pipes
    - Blood vessels that become too wide
      - Sepsis
      - Anaphylaxis

Types of Hemorrhages

- Arterial
  - Pulsating bright red flow
- Venous
  - Steady dark red flow
- Capillary
  - Slow and oozing
Types of Bleeds

External Bleeding

- Determine severity based on age and estimated blood loss
- One liter in an adult considered serious
- Weight dependent in children
- “Relatively” easy to control
External Bleeding -- Treatment

Other Techniques
- Tourniquet
  - Never release in the field
  - Mark the time applied on forehead
    - E.g. “TK/ 9:00PM”
- If it involves a fracture, apply a “splint”
- MAST/PASG

Tourniquet – Bad technique!
MAST/PASG – not used

- Medical AntiShock Trousers
- Pneumatic AntiShock Garment

**Indications:**
- Shock with Systolic BP < 50
- Pelvic injury with S/S of shock

**Contraindications:**
- Absolute Contraindication
  - Patient in Acute Pulmonary Edema
- Relative Contraindications
  - Pregnancy (inflate legs only)
  - Impaled object
  - Open Chest Wound

- **NEVER DEFLATE IN THE FIELD!**

Internal Bleeding

- **Not outwardly visible**
  - BIG PROBLEM!

- Severity
  - Varies
  - Large blood losses in short time periods
  - Can occur with fractures of large bones
    - E.g. Pelvis, femur

- **YOU CAN'T FIX IT!**
Internal Bleeding -- Causes

- Blunt trauma
  - Especially to abdominal organs
- Gunshot wounds
- Stab wounds
- Impaled objects
- Medical causes
  - E.g. “GI bleeds”

Recognition of internal bleeds

- Often, it’s only recognized by signs & symptoms
  - Mechanism of Injury (“MOI”)
  - Bruising/pain/swelling over affected areas
  - Body orifice bleeding
  - Tender/rigid/distended abdomen
  - Coffee grounds or BRB “emesis”
  - BRB per rectum
  - S/S of shock
Types of shock

- Hypovolemic
  - Hemorrhagic
  - Metabolic
- Cardiogenic
- Neurogenic ("Spinal shock")
- Septic
- Psychogenic
  - The “simple” faint
  - “Syncope”

A Question

*How important is it to “diagnose” the type of shock?*
Hypovolemic

- Blood losses (hemorrhagic)
- Fluid losses (metabolic)
  - Vomiting
  - Diarrhea
  - Sweating

Cardiogenic Shock

- Caused by the heart’s inability to pump sufficiently to meet body needs
- Often follows a “large” MI
  - Within hours or days
- Poor outcomes - despite the best treatment
Neurogenic Shock

- Caused by an injured spinal cord
- Body loses the ability to “constrict” blood vessels
  - Allows BP to drop
- Loss of “communication” with nerves controlling skin condition
- **Hallmark:** Warm, dry skin in a patient with S/S of shock

Septic Shock

- Caused by a generalized body infection
- Usually, follows some “local” infection
  - E.g. pneumonia, UTI in elderly
- Body loses the ability to “constrict” blood vessels
  - Allows BP to drop
Severity of shock

If undetected and/or untreated, can QUICKLY lead to organ failure and death!

Stages of Shock

- Compensated
  - HR and RR are elevated
    - Trying to maintain perfusion
  - Normal BP is maintained
  - Cool, pale and clammy skin
  - Body is fighting to “compensate”
Stages of Shock

- Decompensated
  - The hallmark: Falling BP
  - Body can not maintain perfusion
  - Body is losing the fight

Stages of Shock

- Irreversible
  - Cell damage and organ death is occurring
  - Body has *lost* the fight
  - Death almost a certainty
**S/S of Shock**

- Altered Mental Status ("AMS")
  - Agitation (an “early sign”)
  - Lethargy → Unconsciousness
- Cool, pale, sweaty ("diaphoretic") skin
- **Tachycardia**
  - An early sign
  - Body tries to maintain cardiac output

**More S/S of Shock**

- **Tachypnea**
  - Early sign
  - Body tries to maintain $O_2$ saturation
  - Poor/delayed “capillary refill”
- **Hypotension**
  - *A LATE SIGN!*
  - *DO NOT RELY ON IT AS AN INDICATOR OF SHOCK!*
Treatment Priorities

- Rapid transport!
- “Golden Hour”
  - From incident to operating room
  - Patient needs a “date with a surgeon”!
- Platinum ten minutes
  - On scene time
  - Additional stabilization and treatment during transport to the hospital

Shock -- Treatments

- ABC’s
  - Close attention to airway maintenance especially in patients losing consciousness and in facial/oral trauma patients
- High concentration O₂
- “Shock position” (Trendelenberg)
- (PASG/MAST if indicated)
Shock -- Treatments

- **Rapid transport!**
  - Splint and further assessment and treatment enroute
- Prevent the loss of body heat
  - Shock patients lose control of temperature
- **Consider ALS**
  - Call for ALS ASAP!

Shock -- Treatments

- Reassure patient!
  - “PFA”
  - More than just being nice!
  - Medical reasons
- **Continuous reassessment**
  - Patients can rapidly deteriorate
  - Be prepared to treat