Pediatric Pearls

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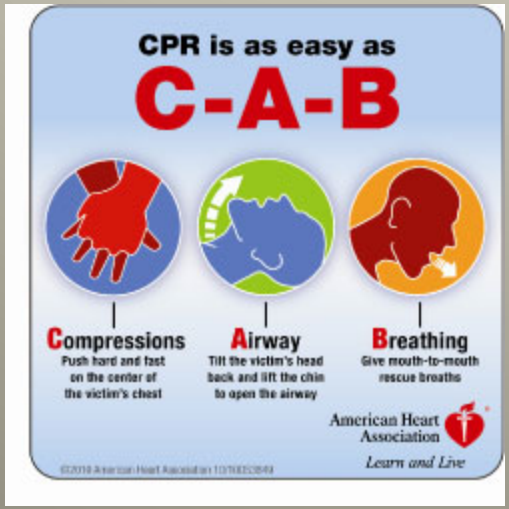
Assumptions

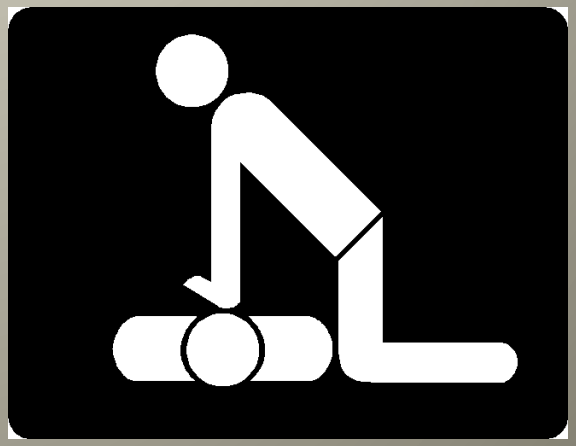
- Limited experience
- Limited resources
- Limited time

<Core Interventions>

First things First

- Know yourself
- Know your resources
- Know your epidemiology
- ABC's





Overview

- Shock
- Burns
- Trauma
- Poisons

First Things First (ABC)

- Airway
- Breathing
- Circulation
- Neuro-cognitive
  - Adults
  - Children
  - Infants

INTRODUCING

Double-Day Junior...

BECAUSE CHILDREN ARE LITTLE ADULTS

Children are just little adults?

- Minute ventilation
- Frank Starling curve
- Blood Pressure
- Renal Capacity
- Blood volume
- Urine output
- Capacity to adapt

Case 1

- 18 MO Male brought by his 10 year old sister
- The boy is a thin semi-conscious & pale child with no obvious signs of trauma
- VS: 103.2, HR 100, BP 80/30, RR 16

Vitals Normal?

Vitals Normal…..for this patient?

Shock….not Shock

Shock Types

- Hypovolemic
- Septic
- Distributive
- Cardiogenic
- Obstructive

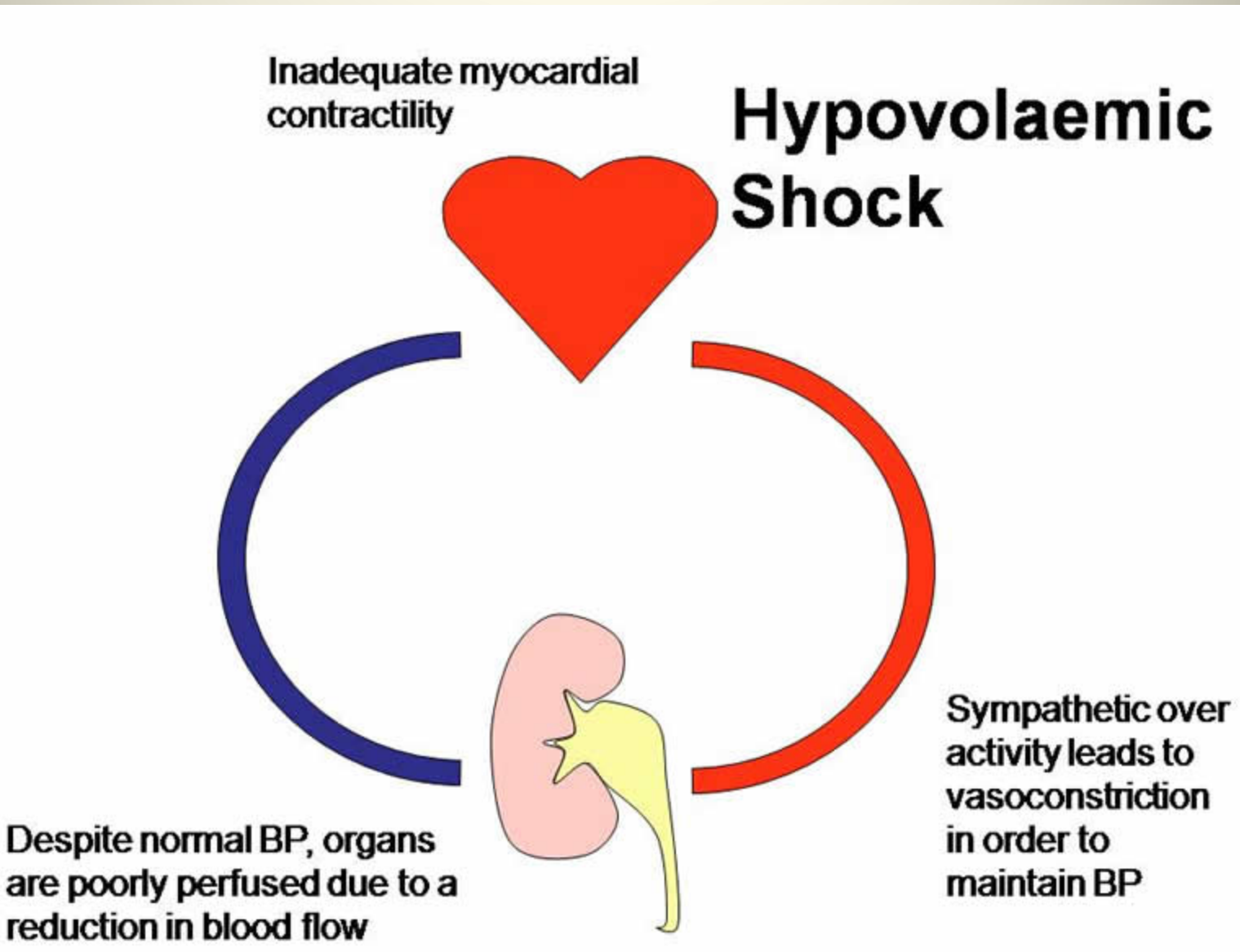
Hypovolemic shock

- Hypovolemic shock absolute deficiency of intravascular blood volume.
- *It is a leading cause of pediatric mortality in the United States and worldwide*
- Causes:
  - Intravascular volume loss - Eg, from gastroenteritis, burns, heat stroke,…..
  - Interstitial loss - Eg, from burns, sepsis, nephrotic syndrome, intestinal obstruction, ascites (3rd Spacing)
  - Hemorrhage - Eg, from trauma, surgery, gastrointestinal (GI) bleeding……

Blood Loss

- Class 1: 10%-15%
- Class 2: 15%-30%
- Class 3: 30%-40%
- Class 4 >40%

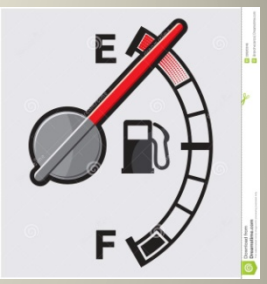
- 20 lb at 1 year add 5 lb/year
- 10 kg at 1 year add 2kg/year
- 70-80ml/kg


Inadequate myocardial contractility
Hypovolaemic Shock
Sympathetic over activity leads to vasoconstriction in order to maintain BP
Despite normal BP, organs are poorly perfused due to a reduction in blood flow

Hypovolemic shock
Etiology

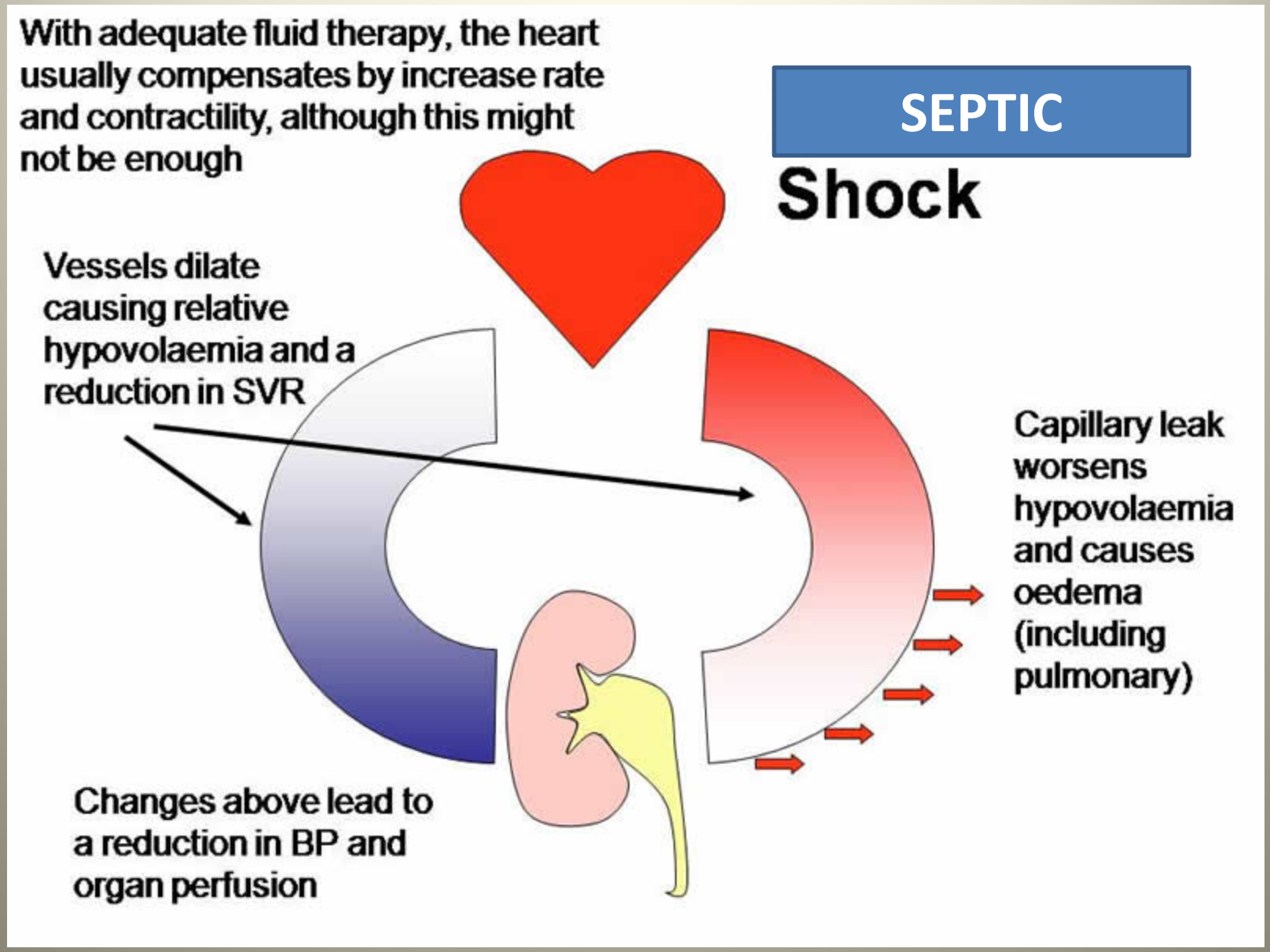
- ***Gastroenteritis***
- *Trauma*
- *Third spacing*
  - Etiologies include burns, sepsis, and other systemic inflammatory diseases. (later stages)

Septic Shock



- Sepsis may be defined as a systemic inflammatory response triggered by the presence of infectious agents or their toxins.[4]

- - Inflammatory agents
  - Cytokines
  - Endotoxins
  - NO Synthase
  - And others leading to:
    - Coagulation cascade
    - Complement activation
    - Bradykinins
    - Vascular leaking
    - Decreased Cardiac Output
    - Disseminated Intravascular Coagulation (DIC)
    - Multiple system organ failure


SEPTIC
Shock
With adequate fluid therapy, the heart usually compensates by increase rate and contractility, although this might not be enough
Vessels dilate causing relative hypovolaemia and a reduction in SVR
Capillary leak worsens hypovolaemia and causes oedema (including pulmonary)
Changes above lead to a reduction in BP and organ perfusion

Shock Types (Review)

- Hypovolemic
- Septic
- *Distributive
- *Cardiogenic

Shock TX

- Irrespective of type or etiology…
  - Are you safe?
  - AB:
    - Establish/Stabilize the Airway/Breathing
    - 100% supplemental O2, maximum flow
    - Intubation?
      - Bag/ventilation pearls
        - » Gentle bagging (listen, watch, observe)
  - C:
    - "Large" bore IV x 2
      - Where?
      - What?
      - How much?
      - How Fast?
- Caveats

Acute Shock TX

"Large" bore IV x 2

<u>Where?</u>

- **Where you can…**

<u>What?</u>

- **NS or Lactated Ringers**

<u>How Much?</u>

- **20ml/kg**

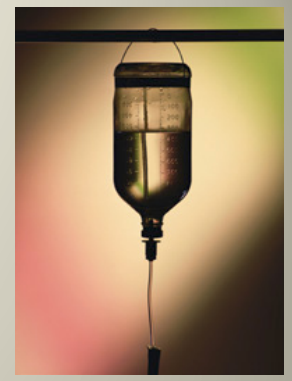
<u>How Fast?</u>

- **5 min or less**
- **Evaluate**
- **Repeat x 2**

Shock TX

- Life after ABC
  - Got Sepsis?
    - Empiric antibiotics (see lectures)
- Multidisciplinary management when possible
- Hold / Observation
  - Monitor Vital Signs
  - Urine output
  - Weight
  - Finger stick (glucose/blood smear)

Shock TX (fine tuning)



- **Dextrose**
  - Neonates and infants have limited glycogen stores
  - Dose: 0.5-1g/kg IV as a continuous infusion over

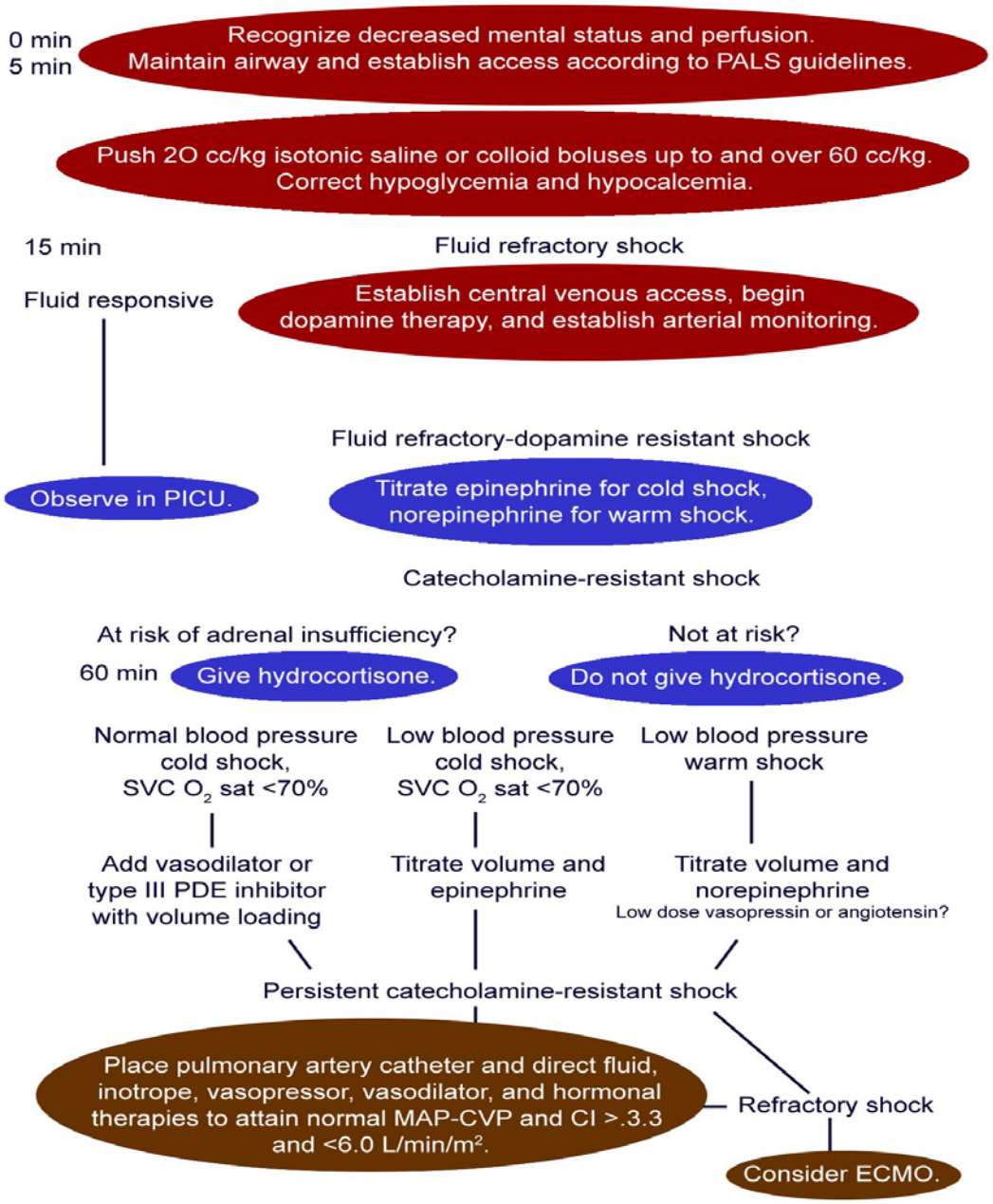
- **Electrolyte and Calcium Stabilization**
  - Calcium regulation altered during shock and the treatment of shock
  - Dose: Calcium gluconate 10-20mg/kg Max rate: 100mg/min
  - Dose: 10% Calcium chloride 10-20mg/kg (0.1-0.2ml/kg) Max rate: 100mg/min

- **Caveat**

Shock TX

- **Controversial**
  - **Bicarbonate**
  - **Corticosteroids**

- **Local medicines (culture)**
  - **Philippines story**

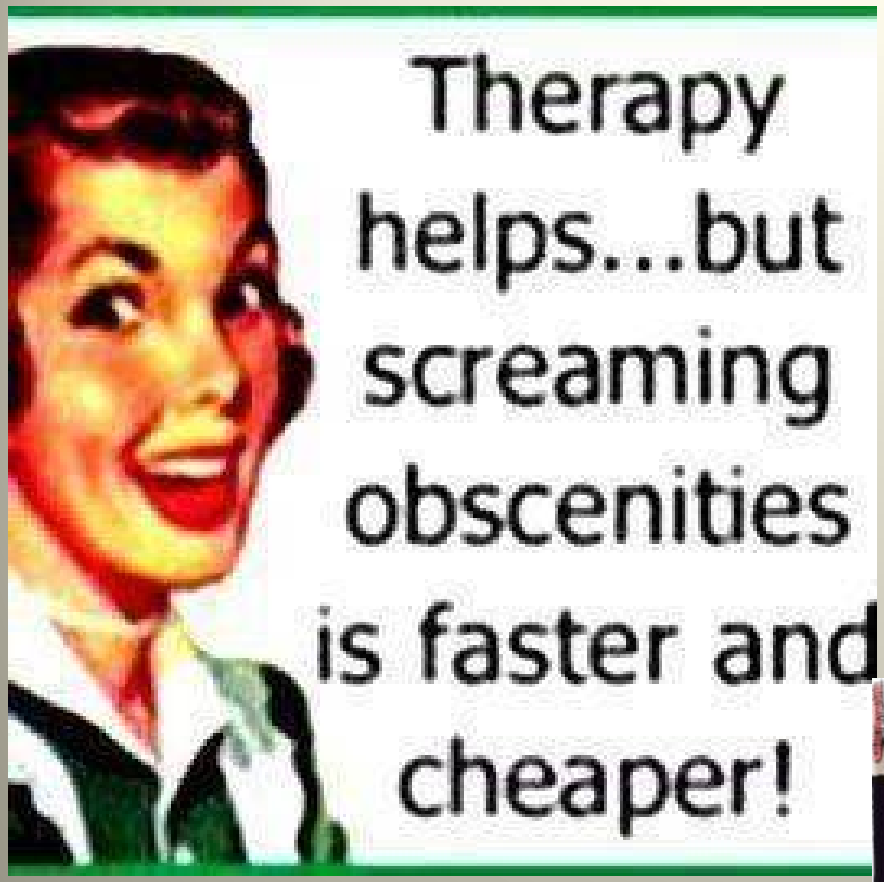

0 min
5 min
Recognize decreased mental status and perfusion.
Maintain airway and establish access according to PALS guidelines.
Push 2O cc/kg isotonic saline or colloid boluses up to and over 60 cc/kg.
Correct hypoglycemia and hypocalcemia.
15 min
Fluid refractory shock
Fluid responsive
Establish central venous access, begin dopamine therapy, and establish arterial monitoring.
Fluid refractory-dopamine resistant shock
Observe in PICU.
Titrate epinephrine for cold shock, norepinephrine for warm shock.
Catecholamine-resistant shock
At risk of adrenal insufficiency?
Not at risk?
60 min
Give hydrocortisone.
Do not give hydrocortisone.
Normal blood pressure cold shock, SVC O_2 sat <70%
Low blood pressure cold shock, SVC O_2 sat <70%
Low blood pressure warm shock
Add vasodilator or type III PDE inhibitor with volume loading
Titrate volume and epinephrine
Titrate volume and norepinephrine
Low dose vasopressin or angiotensin?
Persistent catecholamine-resistant shock
Place pulmonary artery catheter and direct fluid, inotrope, vasopressor, vasodilator, and hormonal therapies to attain normal MAP-CVP and CI >.3.3 and <6.0 L/min/m².
Refractory shock
Consider ECMO.

Shock (Summary)

- Protect yourself
- Evaluate the patient
- Intervene
  - ABC
    - Fluids
  - Antibiotics
  - Sugar (if needed)
- Observe/Transport

Case 2 (Hospital)

- 1 YO ME M presents with yelling parents speaking Arabic.
- The boy is also crying, appears disoriented
- You note: dirty kid, messy face, no blood, no deformities
- At the same time a group of 5 soldiers involved in an accident arrive to the hospital, you are left with the patient, the parents, and 1 medic


Therapy helps...but screaming obscenities is faster and cheaper!

IRS TAX PREP OFFICE
DEAR, I FORGOT... WHERE WAS I SUPPOSED TO GO TODAY?
Colonoscopy OFFICE
JOE HELLER

What else do you want to know?

Others affected suddenly

Breathing: difficulty breathing, chest tightness

Secretions: drooling, airway secretions, sweating

Eyes: tearing, miosis, blurred vision

Rhinorrhea: excessive runny nose

Voiding: involuntary urination/defecation

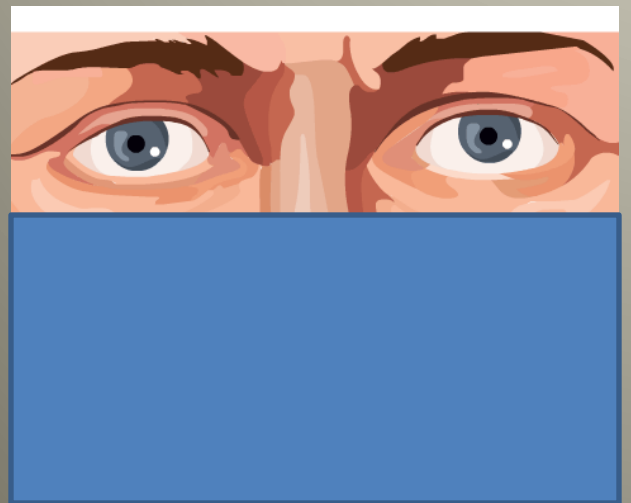
Arrhythmia: tachycardia, bradycardia

Nausea: stomach cramps, vomiting

Twitching: muscle twitching, convulsions

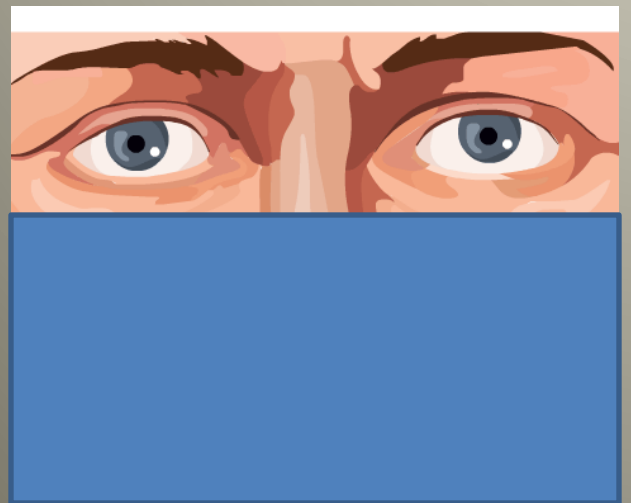
Poisoning

- Causes of **Miosis** (COPS)
- Cholinergics, clonidine
- Organophosphates, Opiates
- Phencyclidine, phenothiazine, pilocarpine
- Sedatives (barbiturates)



Poisoning

- DUMBELS:
  - Diarrhea, Urination, Miosis, Bronchospasm, Emesis, Lacrimation, Salivation
- Atropine (TX)
- Pralidoxime (2-PAM) (TX)
- Benzodiazepines (TX)



Poisoning

- Causes of **<u>Mydriasis</u>** (AAAS)
- Anticholinergic (atropine)
- Antihistamines
- Antidepressants (cyclic)
- Sympathomimetics (amphetamine, cocaine, LSD)

Poisoning

- Causes of **Diaphoretic** skin (SOAP)
- Sympathomimetics
- Organophospates
- Aspirin (salicylates)
- PCP (Phencyclidine)

Poisoning

- Causes of **RED** skin
  - Carbon Monoxide*
  - Boric acid

- Causes of **BLUE** skin
  - Cyanosis*
  - Methemoglobinemia

Poison Treatment

- Activated Charcoal (EXCEPTIONS)
- CHEMICAL CamP

-Caustics
-Hydrocarbons
-Electrolytes
-Metals
-Iron

-Cyanide
-Alcohols
-Lithium
-Camphor
-Phosphorus

Poison Treatment

- Gastric Lavage
  - (contraindications: caustic, hydrocarbon, sharp items
- Whole Bowel Irrigation (WBI)
- Cathartics (adjunct therapy)
- Ipecac

Poison (Summary)

- Protect yourself
- Evaluate the patient
- Intervene
  - ABC
    - Fluids
  - Antidotes
    - Medication
    - Activated Charcoal
    - Irrigation
- Observe/Transport

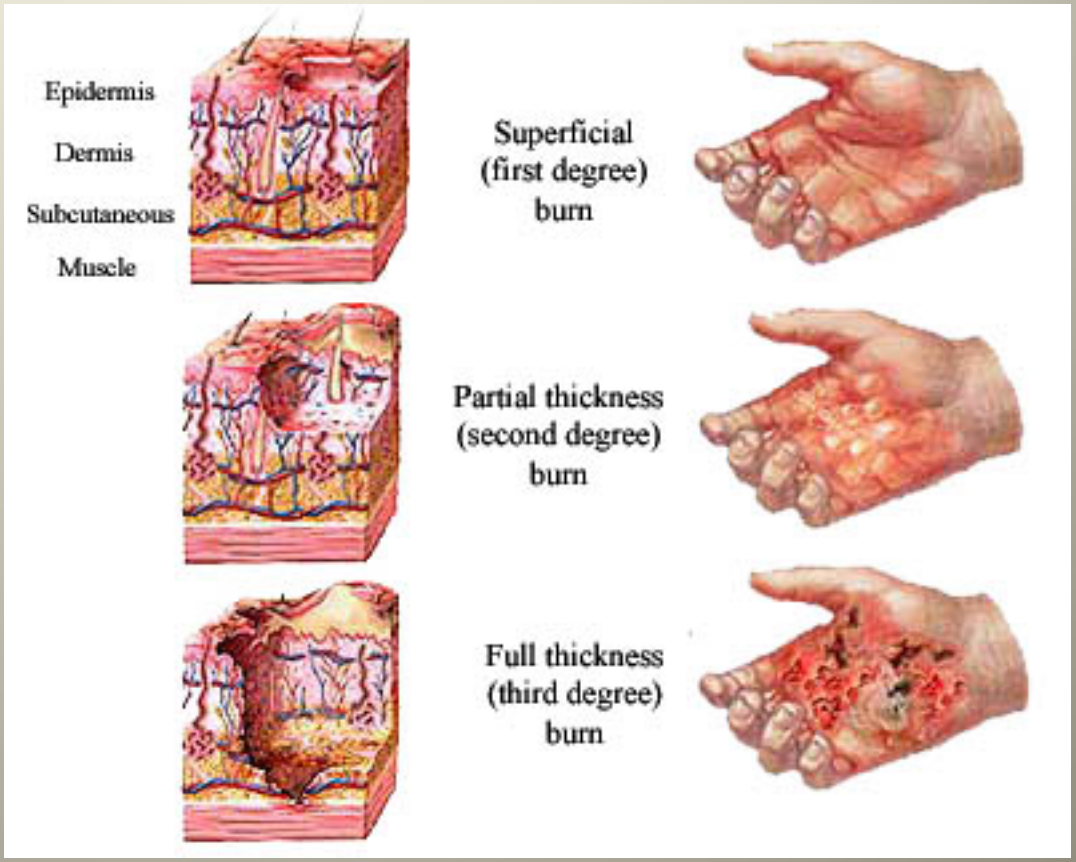
Case 3

-6 YOF helping her mother cook dinner accidently falls into the cooking fire

- You note:
  - Extensive burns on the right & left hands
  - Extensive burns on the right arm, shoulder and upper back
  - Mild burns on the right side of the face and tip of the nose

Burn Definition

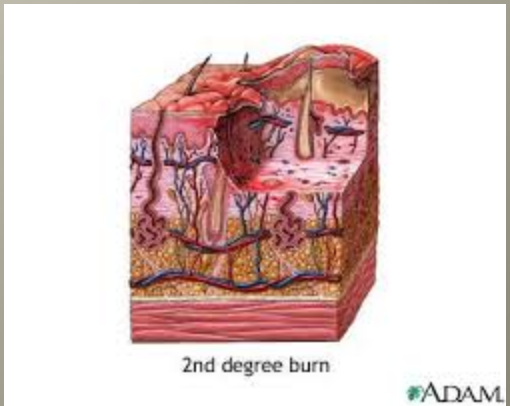
- First Degree
- Second Degree
- Third Degree



First Degree

Burn Care 2nd degree

- Clean with soap and water (daily)
- Leave blisters intact
- Remove jewelry
- Consider antibiotic ointment (silvadene or bacitracin)
- Pain control
- Tdap vaccination if needed
- Dressing change daily
- Re-evaluation (2-3 days)



NDC 61570-131-50
SILVADENE® CREAM 1%
(Silver sulfadiazine)
50 grams
℞ Only
Monarch Pharmaceuticals®

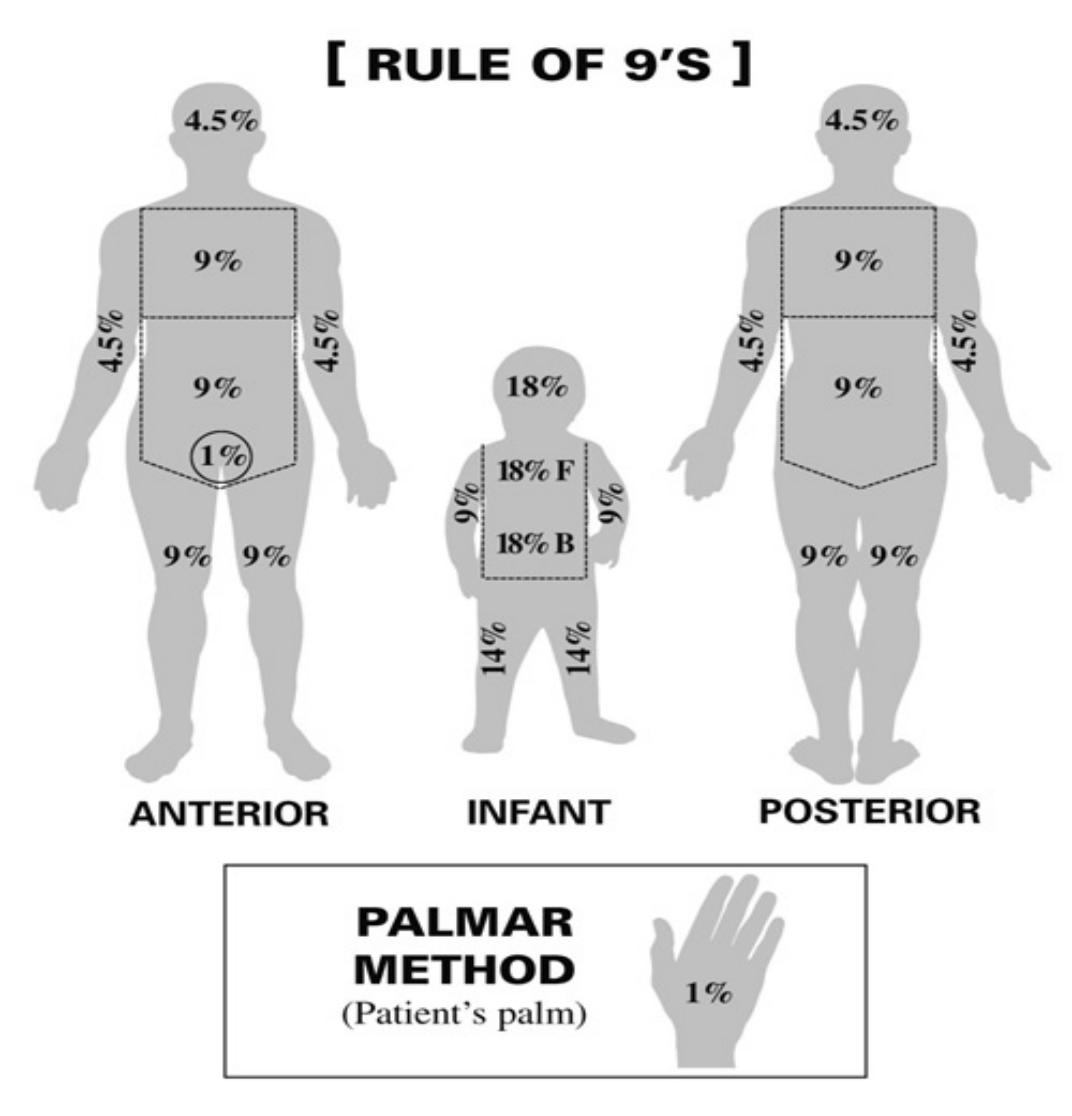
VS

rougera
BACITRACIN
OPHTHALMIC
OINTMENT USP
STERILE
℞ only
USUAL DOSAGE: 3 appli-
CONTAINS: 500 units
of Bacitracin per gram,
White Petrolatum,
Mineral Oil.
NET WT 3.5 g (1/8 Oz)
KEEP TIGHTLY
M93 1108

Burn Care 3rd degree

- IVF (NS or Ringers Lactate) for burns > 15%
- Parkland
  - 4ml/kg/% total burn first 24 hours
  - 50% in first 8 hours
  - 50% over next 16 hours
  - ADD maintenance
  - <20kg (consider 5% dextrose)
  - Refer if possible

Area

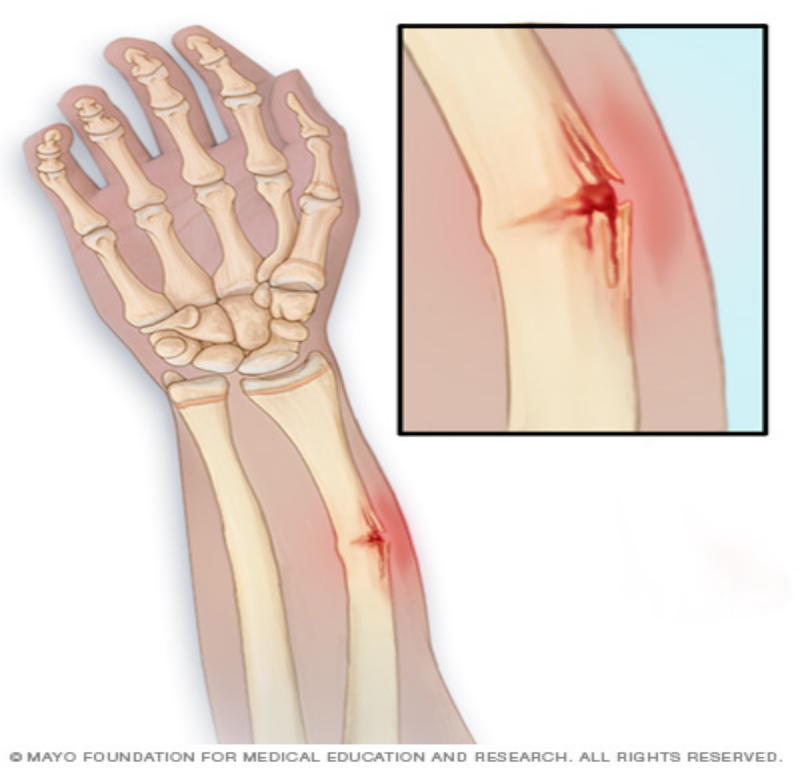

[RULE OF 9'S]
4.5%
9%
9%
1%
4.5%
4.5%
9%
9%
ANTERIOR
18%
18% F
18% B
9%
9%
14%
14%
INFANT
4.5%
9%
9%
4.5%
4.5%
9%
9%
POSTERIOR
PALMAR
METHOD
(Patient's palm)
1%

Case 4

- 14 YOF walking on the wall of his compound falls from 4 feet and lands in smoldering trash pit
- You note:
  - Swelling, redness, deformity of the right radius and ulna

Fractures

- Greenstick Fracture: common
  - Immobilization (with little or no deformity)



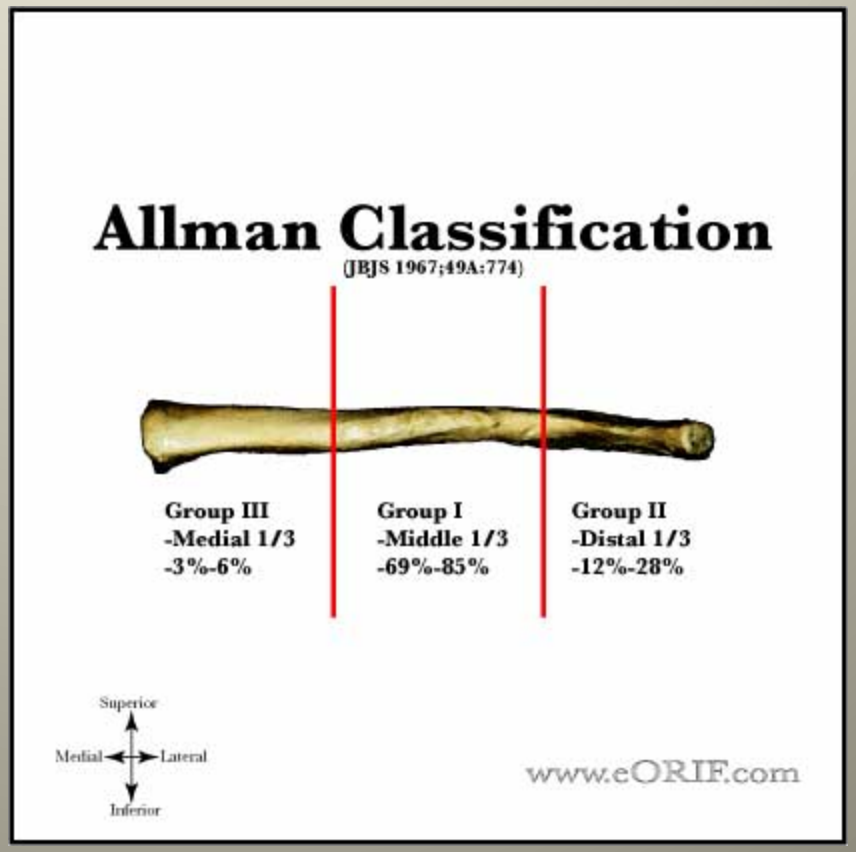
Fractures

Buckle Fracture: common

- Immobilization

Fractures

- Clavicle Fracture: common
  - Immobilization



Trauma Treatment (Acute)

- Immobilize the affected area
- Wound pressure
- Place IV access
- Transport if possible
- Imaging
- Repeat Exams (important)

Corneal Abrasions

- Pain, tearing, photophobia, decreased vision
  - Slit lamp exam if at all possible
  - NO semi pressure patch
  - Look for foreign body
  - NSAID eye drops
  - Referral if possible
  - Pain management

LAC Gems

- NO topical skin adhesives on the scalp
- NO LET (lidocaine, epi, tetracaine) on fingers, toes, nose, ears, or penis
- NO shaving eyebrows
- Eyelid lacerations = ophthalmologist
- Clenched fist hand lac = high risk of infection