Neonatal Emergencies

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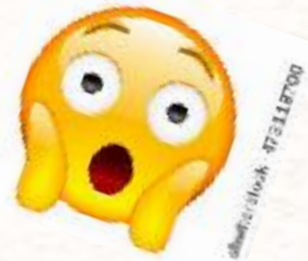
Hypoglycemia

- Definition: Variable definitions but generally any baby who experiences lack of glucose delivery or availability which is inadequate to meet their glucose demand.
  - Goal is to treat a blood glucose that is < 40-50 mg/dL
  - Treat with glucose gel or IV glucose?
- Who's at risk?
  - **Preterm or Late Preterm**
  - **SGA or LGA**
  - **Infants of Diabetic Mothers/Mothers that received certain meds during pregnancy**
    - Terbutaline, Glyburide, Betablockers, HCTZ, Tricyclics
  - **Infants that have abnormal clinical findings** i.e. Perinatal depression, respiratory distress, shock
  - **Most likely: any newborn that EMS would be transporting**



Signs and Symptoms

General	Neurologic	Cardiorespiratory
Abnormal cry (weak, high)	Tremors	**Tachypnea**
Poor feeding	**Jitteriness**	**Apnea**
Hypothermia	**Irritability**	Cyanosis
Diaphoresis	**Hypotonia**	
	Lethargy	
	Seizures	

Why?..... 3 reasons:

#1 Inadequate Glycogen Stores OR ↓Glucose Production

- Preterm infants
- Late Preterm infants
- SGA

2 Hyperinsulinemia

- Infant of Diabetic Mother
  - –HbA1c
  - –Insulin as a “growth hormone”
- LGA

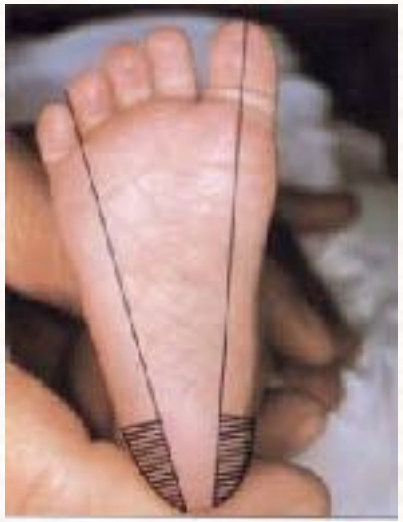
#3 Increased Utilization of Glucose

- All sick infants
  - Preterm
  - SGA
  - Infection
  - Shock
  - Respiratory and Cardiac Disease
  - Hypothermia
  - Hypoxia

Glucose Gel or IV Glucose?

- Any newborn that is ill-appearing, should **not** receive glucose gel!
- Whole blood glucose testing can be >10% lower than plasma glucose values. Also, if levels are low this can make whole testing values even less accurate.
- **Glucose Gel**
  - infants 35 weeks
- **IV Glucose**

  D10W IV bolus 2ml/kg (OR: D5W IV bolus 4ml/kg)
  - To make: 1:4 concentration of D50: NS/SW
  - Follow up with glucometer check per protocol ~ 15 minutes



- **IV**
  - 24G catheters usual choice for neonates
  - Sites: scalp, arms, feet & hands

- **IO**
  - Jamshidi
  - EZ IO: Pink or Blue?
  - Tibia or Femur Site?

- **Umbilical Vein**
  - Emergent need: insert catheter 2-4cm until blood return
  - Clean IT, Tie IT, Cut IT, Insert IT, Secure & Use IT

Temperature Instability

- Highest Risk:
  - Preterm infants
  - Small for Gestational Age infants (SGA)
  - Infants with prolonged resuscitation
  - Acutely ill infants
  - Infants with open skin defects i.e. abdomen, chest, bladder, spine

Temperature Instability

- Maintenance of a normal body temperature is a priority for all newborns
- An infant's body temperature can drop as quickly as 0.2- 1˚ C *per minute*
- Hypothermia is preventable
- **"Cold-Stress"**
  - Babies respond by:
    - **Peripheral vasoconstriction** (arms and legs)
    - **Increased muscle flexion and activity** (to decrease surface area; generate heat by moving)
    - **Metabolism of brown fat** (increases heat production)

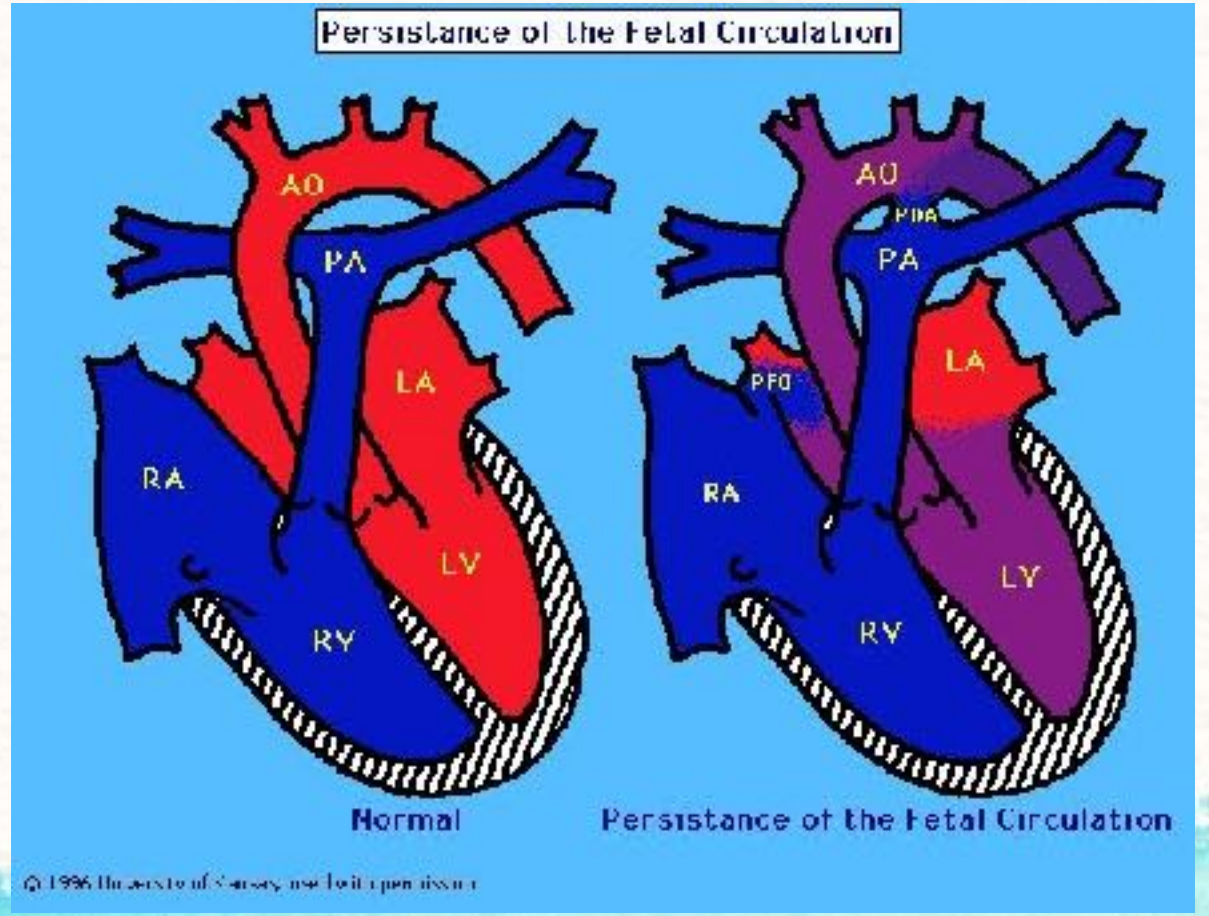
    - **For these responses to be effective, the metabolic rate must increase which increases the use of oxygen and glucose!**

Norepinephrine: the downward spiral for neonates!

- Temperature regulation is controlled by hypothalamus
- When peripheral/core sensors detect cold stress: message to hypothalamus
- This **releases norepinephrine**
- **Peripheral vasoconstriction**: If prolonged, tissue perfusion and oxygenation are impaired → Anaerobic metabolism → lactic acid increases & pH decreases → Acidosis →Acidosis contributes to pulmonary vasoconstriction → **right-to-left shunting** → hypoxemia
- **Increased metabolic rate**
- **Increased oxygen & glucose consumption**

Right-to-Left **shunting** at the ductus arteriosus

- **Norepinephrine** causes peripheral AND pulmonary vasoconstriction.
- **Hypoxemia** also causes pulmonary vasoconstriction and contributes to right-to-left shunting at the ductus and/or foramen ovale

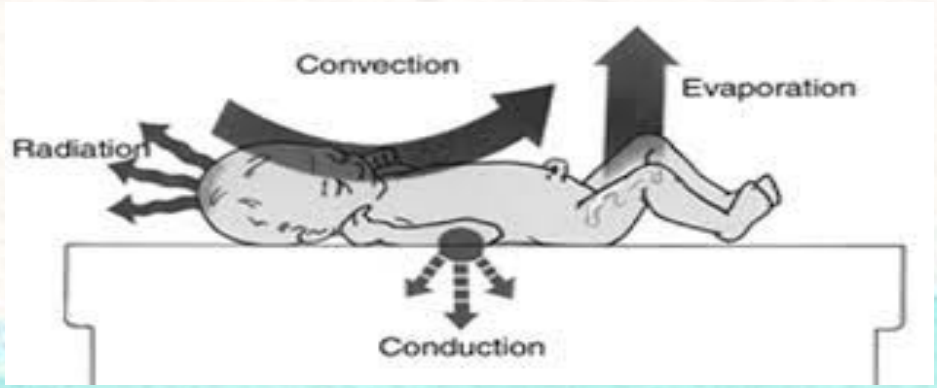


Continued Cold Stress….

- **Hypoglycemia** from ↑ glucose utilization and of ↓glycogen stores
  - –Glucose is primary energy source for the brain: may see ↓ LOC, ↓ respirations
- **Impaired coagulation**
  - –Could contribute to Intraventricular or Pulmonary hemorrhage
- **Impaired surfactant production**
  - –Worsening respiratory distress

How to avoid heat loss

- Body temperature is lost by conduction, convection, evaporation & radiation
- Remove wet towels from infant (evaporative)
- Hats and blankets (conductive & radiation)
- Increase heat in the ambulance (convective & evaporative)
- Warmed IV fluids → chemical thermal mattress (conductive)
- Place premature infants in plastic bag from toes to shoulders (convective & evaporative)
- Skin to skin with mom, if able
- O2 "blow-by" is cold!



Temperature goals: 36.5 – 37.5˚C OR 97.7 – 99.5˚F

Airway Management

- Respiratory Distress: RR, WOB, Cyanosis, O2 Sats, O2 requirements & Neuro

Mild	Moderate	Severe
*Rapid respiratory rate >60 bpm *With or without supplemental O2 needs *With or without s/s distress i.e. flaring	*cyanotic in RA *s/s of distress: grunting & retracting	*Struggling to breath bradypnea/gasping→ apnea *Cannot maintain saturations despite supplemental O2 *s/s of exhaustion: hypotonia decreased response to stimulation

- **Flaring**: a sign of air hunger as the baby attempts to decrease airway resistance and increase airway diameter by flaring the nostrils
- **Grunting**: the baby's attempt to increase FRC (functional residual capacity) or lung volume when there is a collapse of alveoli. The baby partially closes his vocal cords to try to trap air in the lungs when exhaling. Grunting "splints open" the small airways. * Be mindful of grunting in older infants*
- **Retracting**: occurs with inspiration and is an inward movement of the chest wall as the baby tries to increase TV (tidal volume) or the amount of air that is breathed in and out with each breath. Mild to Severe and in several locations.
  - Suprasternal, Subcostal, Substernal and Intercostal

Airway

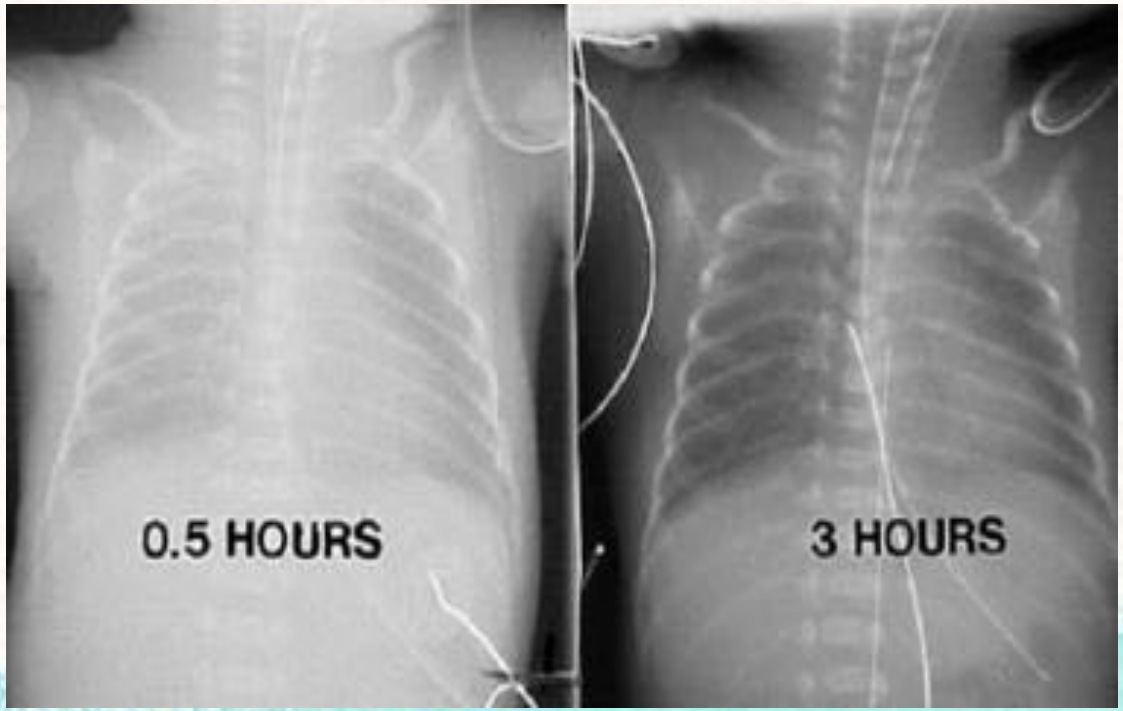
- PPV via BVM or ETT/LMA
- 40-60 bpm
- 20 cmH2O for PIP (Peak Inspiratory Pressure) on the manometer OR just enough pressure to move the chest
- Bilateral breath sounds and + EtCO2
- Adequate ventilation = stable HR and oxygen saturation

Transient Tachypnea of the Newborn (TTNB)

- Affects term or late preterm infants
- One of the most common causes of respiratory distress in the newborn period
- Onset within first few hours of birth
- Usually from failure to absorb fetal lung fluid
- Risk factors: precipitous delivery, preterm, or cesarean section
- Mild to moderate distress with low oxygen requirements

Respiratory Distress Syndrome (RDS)

- Most commonly seen in preterm infants
- Immature lungs with a surfactant *insufficiency*
- Infants of Diabetic Mothers (even at term gestation) may have RDS due to a *delayed* surfactant production
- Onset is usually at time of birth
- Administration of Surfactant via ETT



Shock

- For the cells of the body to survive, oxygen is necessary. When tissue perfusion and oxygen delivery to the vital organs becomes inadequate: Shock. Two phases of shock are *compensated* and *uncompensated*
  - **Compensated shock**: shunting to vital organs, but the non-vital organs suffer to maintain a central blood pressure. Eventually, if not treated, the baby will become hypotensive afterall, and now is in uncompensated shock
  - **Hypotension in a neonate is a late sign** of cardiac decompensation.

Shock

- Respiratory ↑ RR > 60bpm Apnea Gasping
- Color Cyanosis Desaturations Pale white skin
- Heart Rate Bradycardia < 100 bpm or Tachycardia > 180 bpm
- Pulses Weak peripheral pulses √ brachial & femoral
- Peripheral perfusion Prolonged capillary refill time > 3 sec

  cool & mottled skin

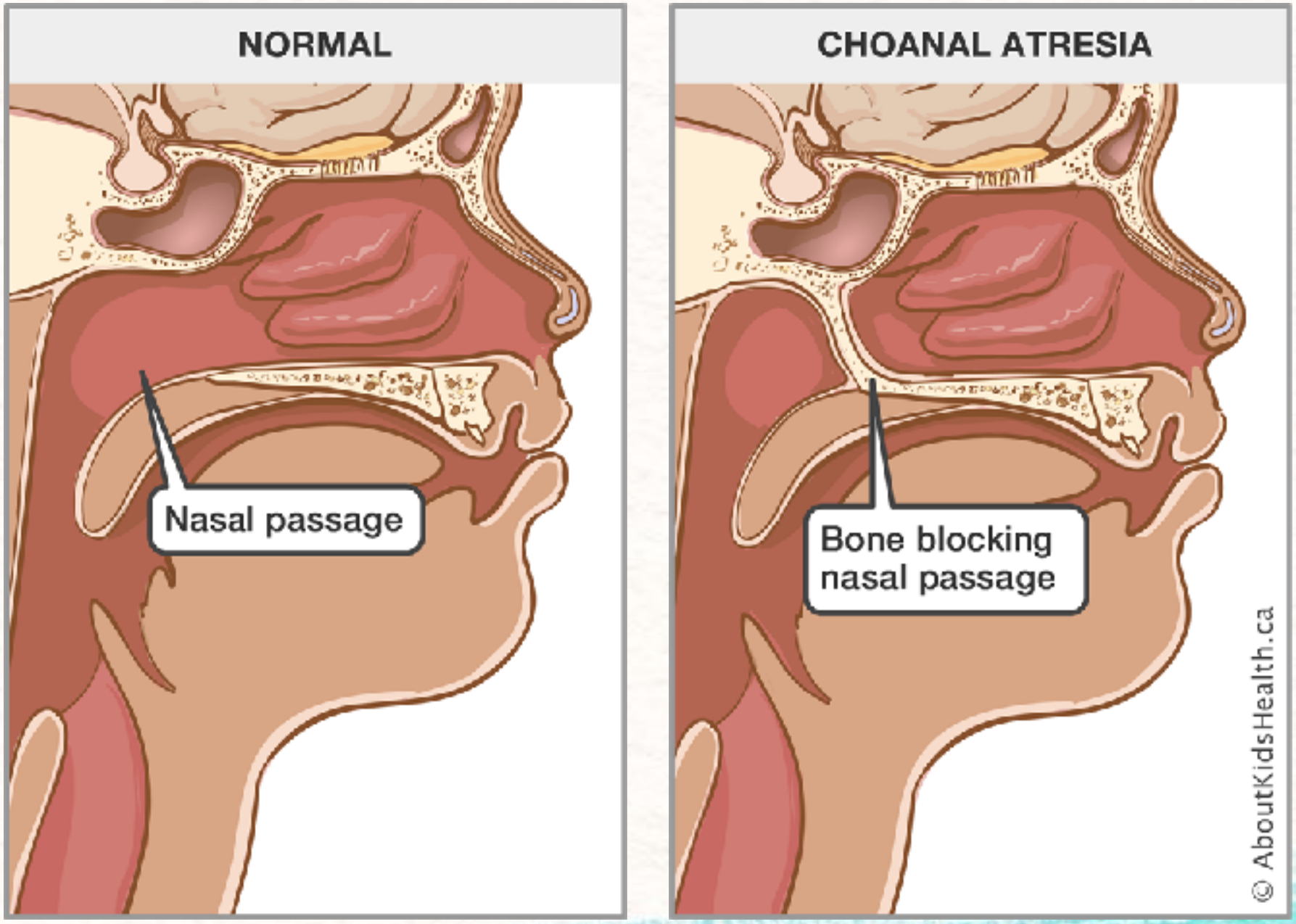
Capillary refill time (CRT)

Shock

- Treatment Goals
  - Restoring intravascular volume and supporting perfusion, oxygenation and ventilation is extremely important when infants are in shock.
  - **Oxygen delivery to the tissues must improve to reverse the effects of shock!**
  - Identify the cause to treat
    - Hypovolemia
    - Tamponade
    - Electrolyte disturbances
    - Hypoglycemia
    - Hypoxemia
    - Arrythmias

Choanal Atresia

- Congenital narrowing of the back of the nasal cavity causing difficulty breathing
- Relatively rare (1:7,000)
- More often in girls
- Often associated with other developmental abnormalities
- Can be bilateral or unilateral
  - Pass a 5/6Fr catheter down each nares to confirm
- **Bilateral defect** will need oral intubation until surgical repair
- **Unilateral defect** may/or may not need intubation in the initial newborn period
  - Supplemental O2 & Saline or HHFNC prn


NORMAL
Nasal passage
CHOANAL ATRESIA
Bone blocking nasal passage
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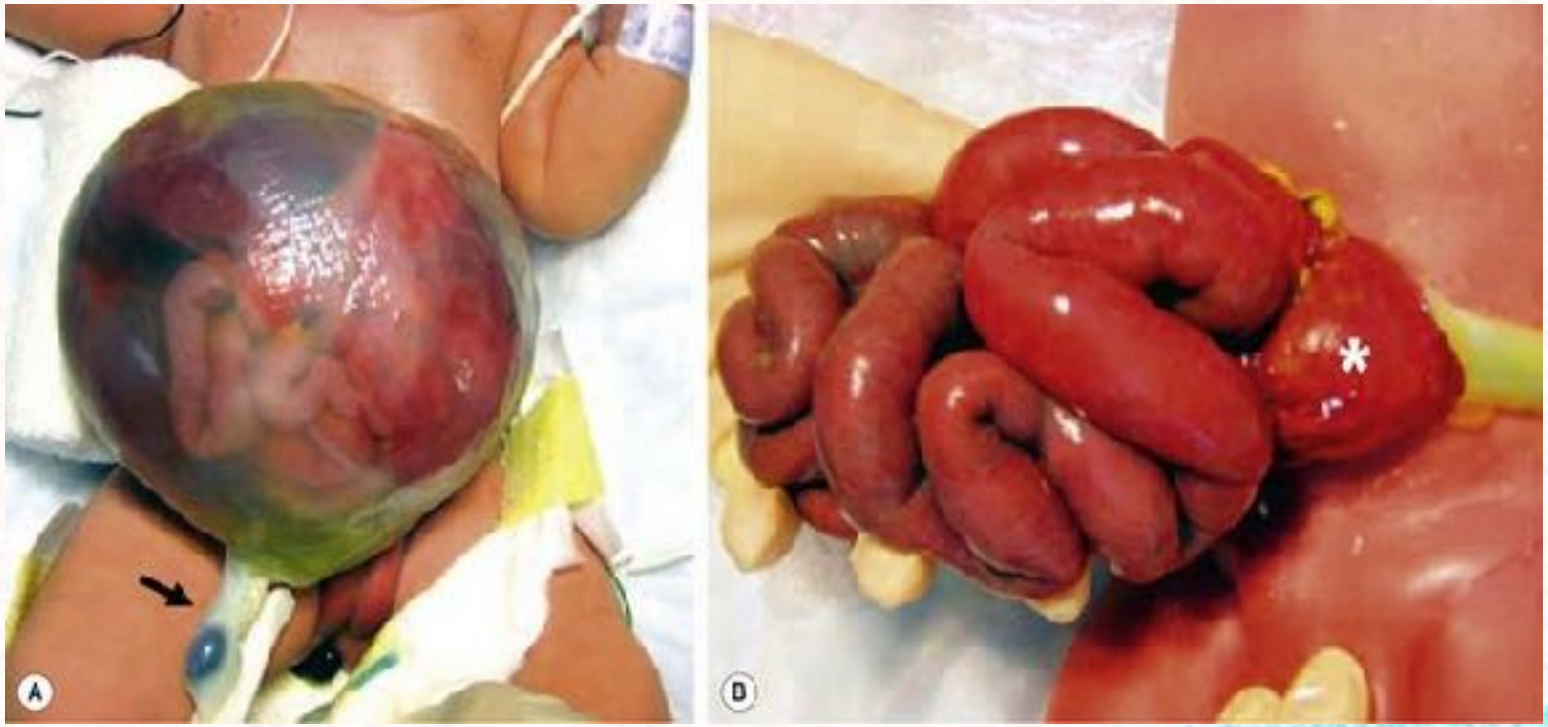
Kō-ā-nul a-tree-shia

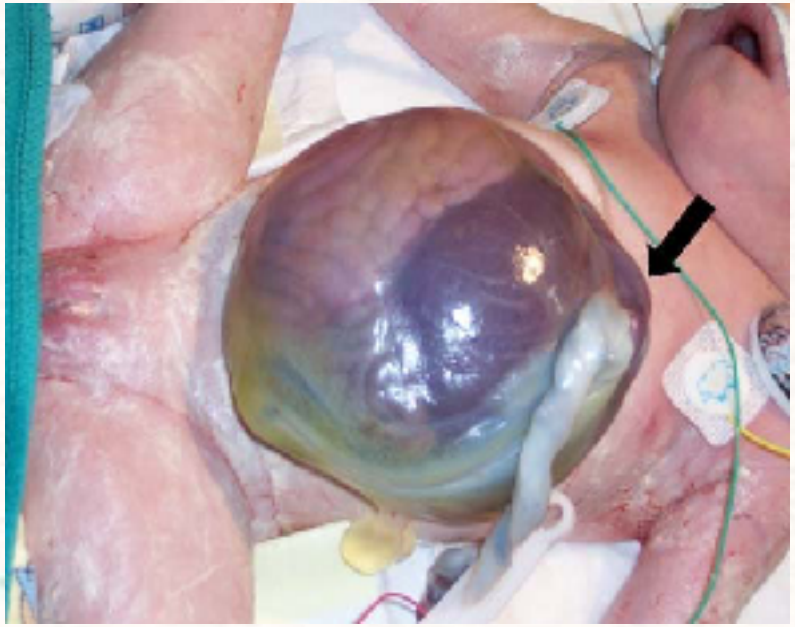
Abdominal Wall Defects

- Recent study released by CDC
- Short TD, Stallings EB, Isenburg, J. et al. **Gastroschisis Trends and Ecologic Link to Opioid Prescription Rates.** United States, 2006-2015. MMWR MorbMortal Wkly Rep 2019;68:31-36. DOI: http://dx.doi.org/10.15585/mmwr.mm6802a2



Abdominal Wall Defects

- Congenital defect that allows the stomach, intestines or other organs to protrude through an opening in the abdomen: at the umbilical area.
- Two main types: Omphalocele and Gastroschisis

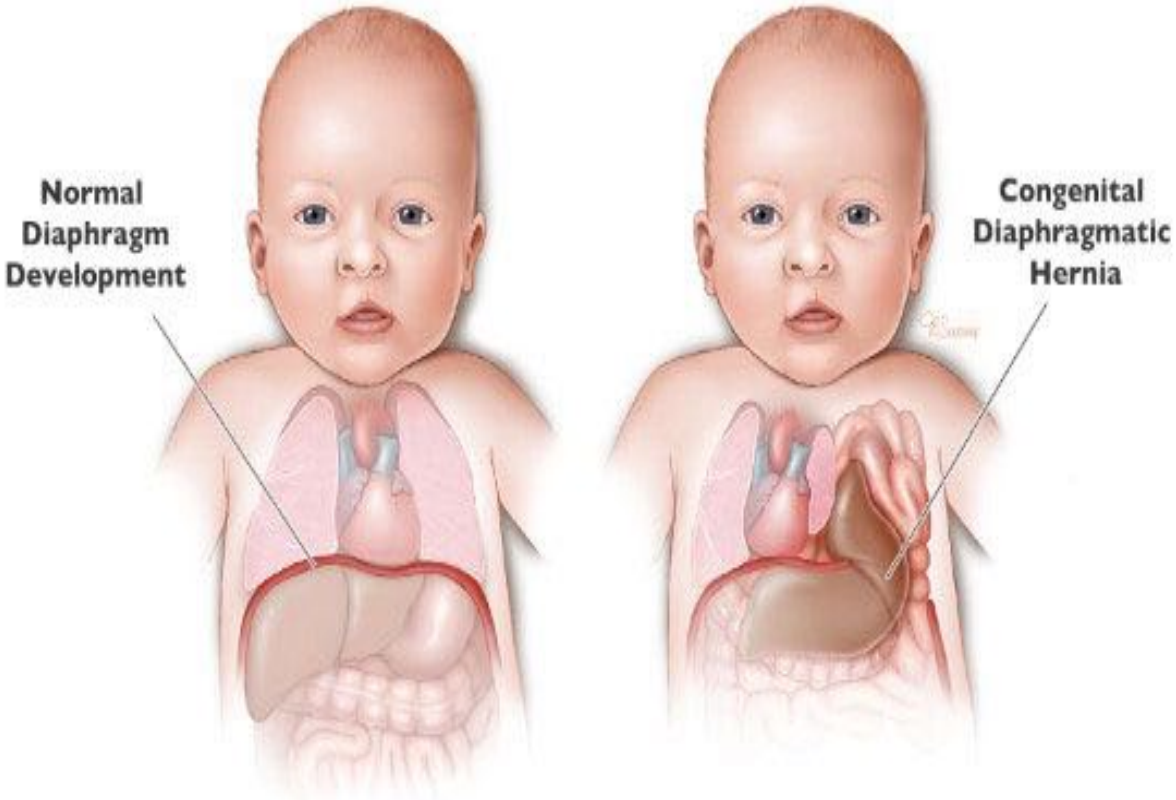


Abdominal Wall Defects

- Stabilization for pre-hospital providers
  - Goals: Maintenance of body temperature & prevention of heat loss, maintaining viability of the exposed viscera and bowel decompression.
  - Respiratory: avoid BVM it will worsen bowel distention
  - Cardiovascular: Treat hypotension with 10ml/kg NS boluses + vasopressor prn
  - GI: Place NG (Replogle) to low continuous suction
  - Care of the defect:
    - Wrap defect in saline soaked gauze and wrap in plastic bag
    - Place infant side-lying to increase blood flow

Congenital Diaphragmatic Hernia

- Respi**ratory distress at birth**: cyanotic with ↓ breath sounds on affected side (usually the left). **The abdomen will appear sunken** as the stomach/intestine are up in the chest.
- Immediately upon suspecting a CDH, stop giving PPV with BVM and intubate
- Insert an OG/NG tube and frequently remove air from the stomach
- IV/IO access to support cardiovascular status


Normal
Diaphragm
Development
Congenital
Diaphragmatic
Hernia
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NRP and PALS… What's the difference?

- **NRP**: Management of the neonate at or immediately following delivery
  - Neonate is defined as 0-28 days
  - Usually if problem is respiratory in origin the use of NRP guidelines is observed
- P**ALS**: Management of pediatric advanced life support
  - More fluid volume
  - More medications

Once you are out of the delivery room environment you may consider the etiology behind the need for resuscitation:

*if respiratory in etiology, then NRP with focus on ventilation is appropriate

*if cardiac i.e. arrythmia, then PALS is more appropriate

NRP VS. PALS

- If the arrest is a 50-day old, 24-week gestation infant with chronic lung disease- then mostly respiratory in origin then NRP makes sense
- If the arrest a 2 week old with complex cardiac disease – most likely cardiac in origin- then PALS algorithm makes the most sense

Questions?

Thank you ☺️