Pediatrics Shelf Review

Tim Philip

Practice Questions

A 1-month old male is brought to the clinic by his mother for vomiting for the past 6 days. He has not been able to keep any food down since this time, the vomit appears “formula-colored,” and he is immediately hungry after vomiting. Which of the following is the best next step in management?

A. Reassurance
B. Abdominal X-ray
C. Abdominal ultrasound
D. Surgery
E. Upper GI study

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A. Reassurance
B. Administer IV 0.9% saline
C. Administer IV 3% saline
D. Administer 0.45% saline
E. Surgery

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E. Surgery

Explanation

Isotonic fluids: ALWAYS the right answer for volume resuscitation

- 0.9% normal saline
- Lactated Ringer's

Hypotonic fluids: useful for free water deficit (severe hypernatremia, prevention of osmotic demyelination)

- Dextrose 5% in free water
- 0.45% saline

Hypertonic fluids: hyponatremia when symptomatic or sodium <120

- 3% saline

Practice Questions

A 1-minute old newborn female is evaluated shortly after birth. Her extremities appear blue, her pulse is 113 BPM, she grimaces upon nasal suctioning, actively moves all four extremities, and cries loudly. Which of the following is her APGAR score at 1-minute?

A. 6
B. 7
C. 8
D. 9
E. 10

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APGAR Evaluation of newborn infants

SIGN	0	1	2
Heart rate	Absent	Below 100	Over 100
Respiratory effort	Absent	Slow, irregular	Good, crying
Muscle tone	Limp	Some flexion	Active motion
Reflex*	No response	Grimace	Cough or sneeze
Color	Blue, Pale	Body pink, Extremities blue	Completely pink

➢7 to 10 is normal ➢ 4 to 6 is moderately depressed ➢ 0 to 3 needs immediate resuscitation

https://commons.wikimedia.org/wiki/File:APGAR_score.jpg

*Response to catheter in nostrils

Practice Questions

A newborn male born to a mother with known diabetes presents with blue discoloration of his skin. Physical exam reveals a single S2 sound, a blowing holosystolic murmur, and the heart appears to have an “egg on a string” appearance on chest X-ray. Which of the following is the most likely diagnosis?

A. Tetralogy of Fallot
B. Tricuspid atresia
C. Transposition of the great vessels
D. Truncus arteriosus
E. Total anomalous pulmonary venous return

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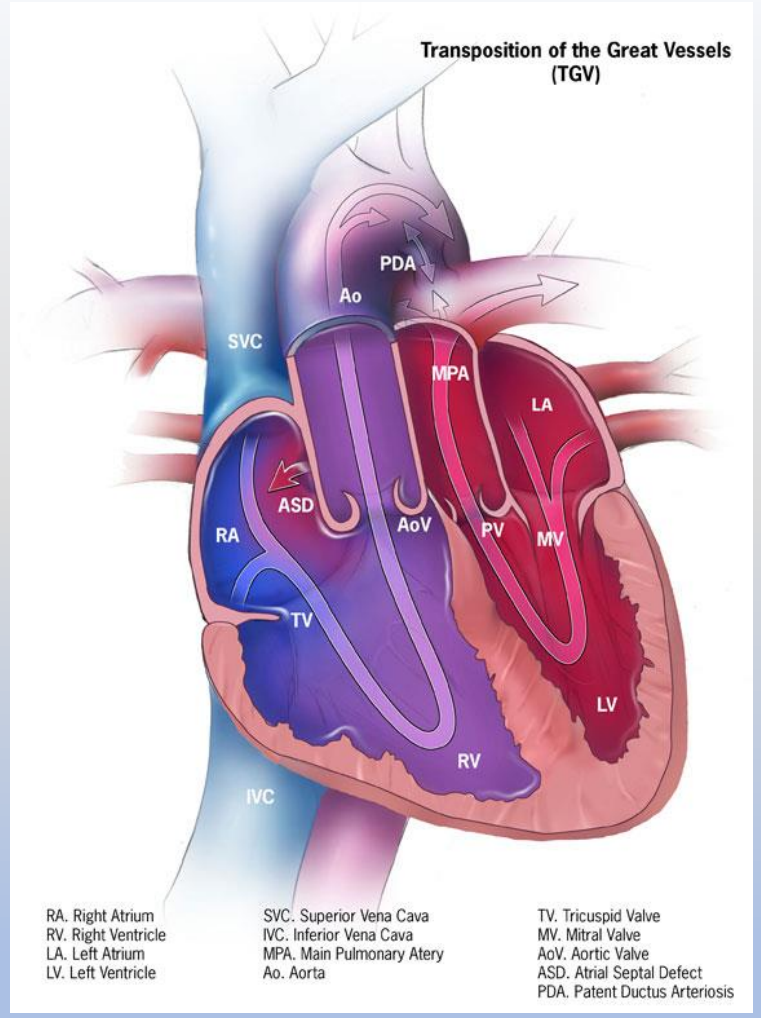
High Yield Cyanotic CHDs

- TGV:
  - Caused by failure of **aorticopulmonary septum spiraling**
  - Right heart -> aorta -> systemic circulation (sends hypoxic blood back to body); Left heart -> sends oxygenated blood back to lungs; requires a shunt (PFO, ASD, VSD, PDA), associated with **maternal diabetes**
  - **"Egg on a string" appearance**
- Truncus arteriosus:
  - Failure of **aorticopulmonary septation**
  - Associated with **DiGeorge syndrome** (22q11 deletion)
- Tetralogy of Fallot:
  - Anterosuperior displacement of **infundibular septum**
  - Leads to P.R.O.V. abnormalities (Pulmonic stenosis, RVH, overriding aorta, VSD)
  - Associated with **DiGeorge syndrome**

D-Transposition of great vessels



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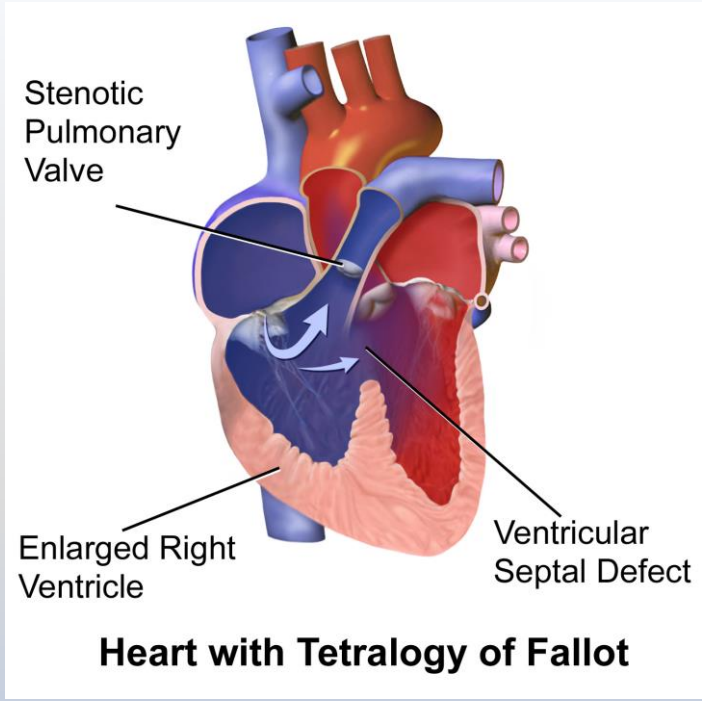
Tetralogy of Fallot



https://commons.wikimedia.org/wiki/File:Tetralogy_of_Fallot_Part_1.png

Bonus question:
Why does the VSD murmur decrease in intensity over the first few weeks of life in TOF?

Answer: **Decreasing pulmonary vascular resistance**
(in-utero: fluid in lungs -> high pressure; newborn breathes air -> lowers pressure)

Practice Questions

An 18-year-old male presents to the ED after an episode of sudden onset weakness in his left arm while at basketball practice. He has no significant medical history. On exam, 2/5 strength is noted in his left arm compared to 5/5 on the right. Which of the following is the most likely cause?

A. Atrial septal defect
B. Ventricular septal defect
C. Patent foramen ovale
D. Coarctation of the aorta
E. Patent ductus arteriosus

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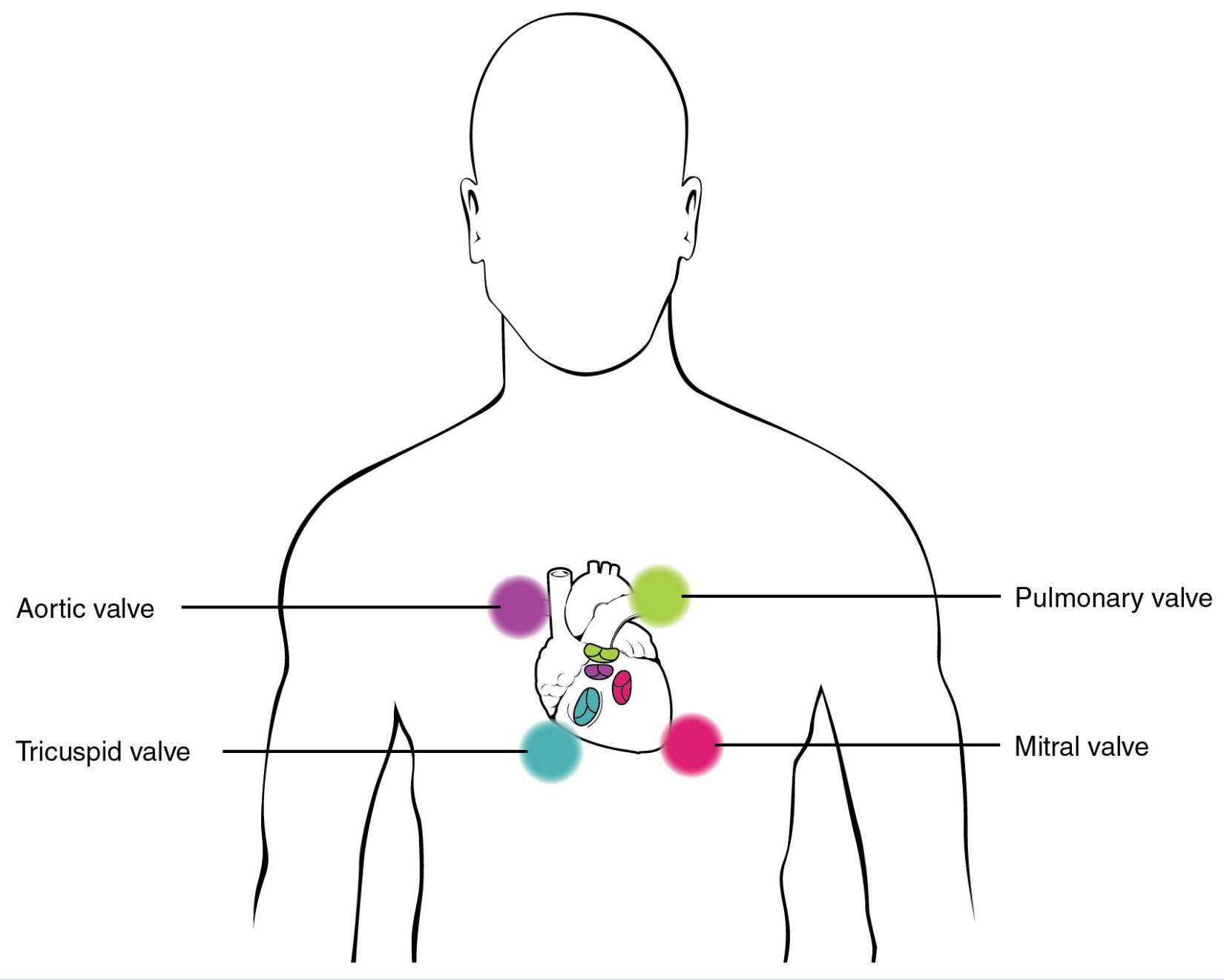
High Yield non-cyanotic CHDs

- PFO:
  - Present in 25-30% of the population but usually asymptomatic
  - In a young person with **no family history** and **ischemic stroke** on an NBME: think patent foramen ovale (if family history present, consider inherited disorders e.g.; Factor V leiden)
- VSD:
  - Most common congenital heart defect
  - Physical exam: “holosystolic murmur at the left lower sternal border”
  - Quieter murmur = Larger defect (the more narrow the opening, the more turbulent the flow is: $N_R = \rho dv/\eta$ ($v = Q/A$, $A = pi*\text{^}2$), *thus* diameter is **inversely** associated with turbulence)
  - **Always** get an ECHO on an NBME exam if a VSD is heard
- ASD:
  - Physical exam: “wide, fixed splitting of S2”
  - May have accessory, distractor murmur; if you hear wide, fixed split S2, almost guaranteed its ASD



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Practice Questions

- A 2-year-old boy presents to your office with a 3 day history of right ear pain. His mother reports him having a fever over this time. On physical exam, you notice he constantly pulls at his ear. Upon otoscopy, the only abnormality is a tense tympanic membrane that does not move in response to insufflation. Which of the following is the most likely diagnosis?

A. Otitis media
B. Otitis externa
C. Otitis media with effusion
D. Cerumen impaction
E. Tympanic membrane hemorrhage

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- A 2-year-old boy presents to your office with a 3 day history of right ear pain. His mother reports him having a **fever** over this time. On physical exam, you notice he **constantly pulls at his ear**. Upon otoscopy, the only abnormality is a **tense** tympanic membrane that **does not move in response to insufflation**. Which of the following is the most likely diagnosis?

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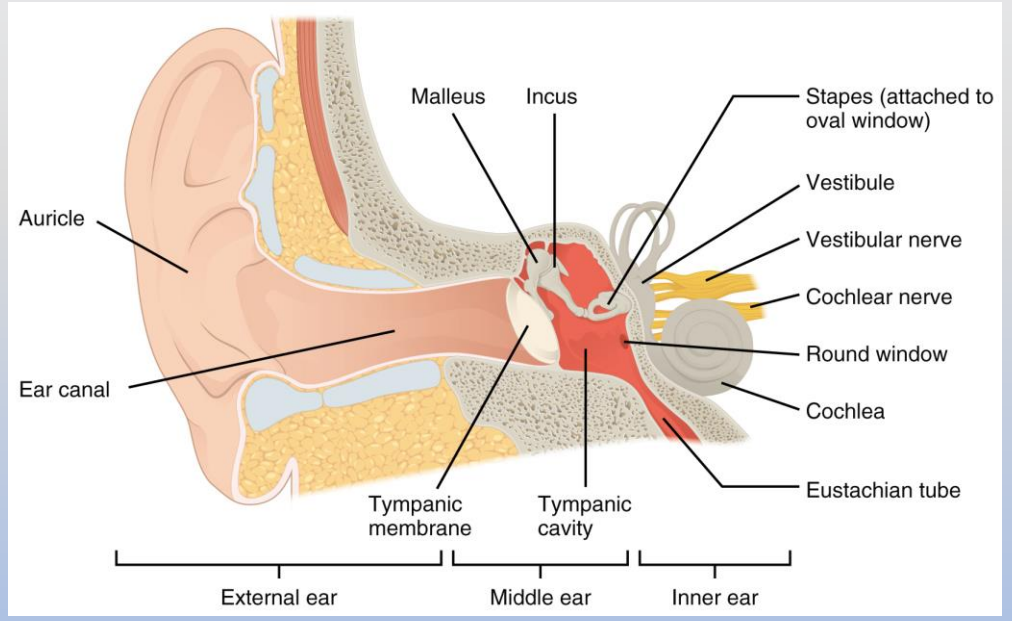
Differential Diagnosis

- Acute otitis media: Red, inflamed TM, **no movement on insufflation** (diagnostic), **pulls on pinna** (pulling relieves middle ear pressure)
  - When to treat with amoxicillin?
  - < 6 months old
  - > 6 months old **plus** high fever (102.2F), severe pain, or bilateral disease
- Otitis media with effusion: (AKA serous otitis media): **fluid** seen on tympanic membrane, may have history of **recurrent** otitis media, **no** acute inflammation present, may lead to conductive hearing loss
- Otitis externa: Inflamed **ear canal** ("externa"-l ear), **normal** tympanic membrane, history of **inciting event** (swimming, earbuds, trauma)



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Differential Diagnosis

- Bilious emesis

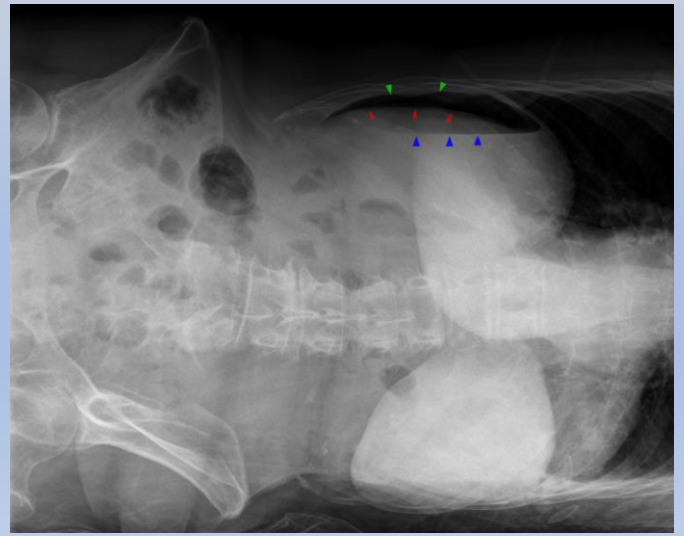
Bilious Emesis

- Hirschsprung disease
- Meconium ileus (95% of cases caused by cystic fibrosis)
- Malrotation with volvulus
- Duodenal atresia
- Jejunal atresia

What is the next best step to differentiate between these conditions?

Bilious Emesis

- Abdominal X-ray is <u>almost</u> always the next best step
- When to proceed to surgery (AKA exploratory laparotomy)?
    - Hemodynamic instability such as BP < 90/60 (it will be obvious in the question)
    - **Peritoneal signs** (can be difficult to distinguish in children: rigid abdomen, rebound tenderness, guarding)
    - **Free air** under the diaphragm on X-ray
    - Inconsolable or unconscious



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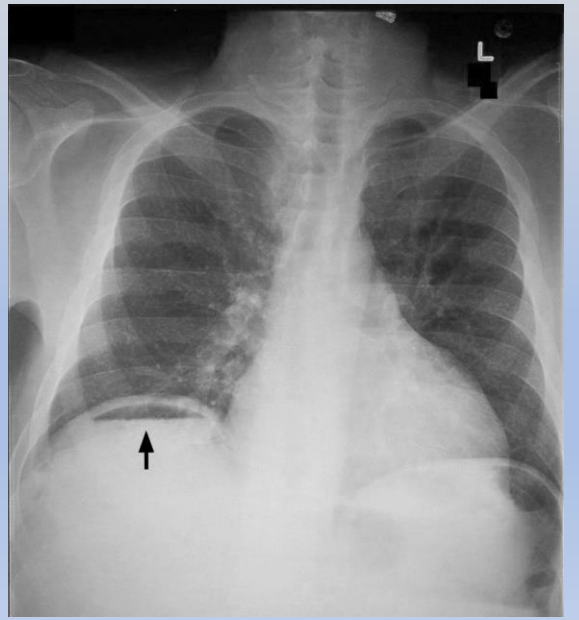
<u>FREE AIR = SURGERY, SURGERY, SURGERY, SURGERY!</u>



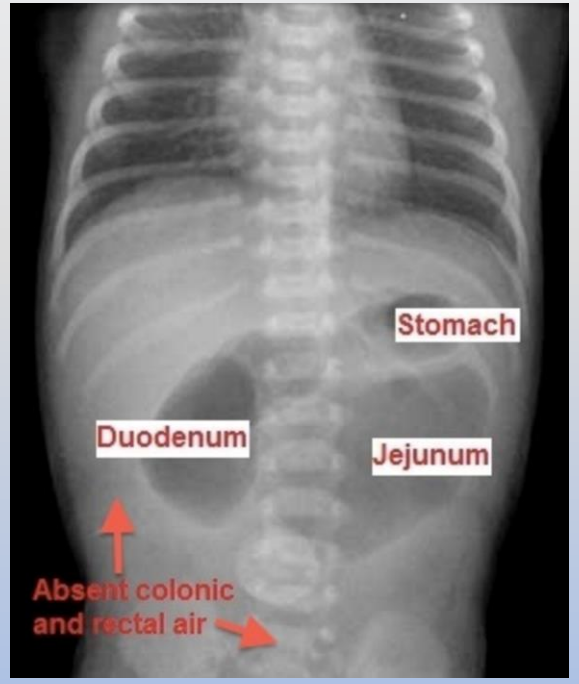
https://commons.wikimedia.org/wiki/File:Pneumoperitoneum_modification.jpg

Bilious Emesis

- If stable & not in need of surgery, what X-ray findings would be present?

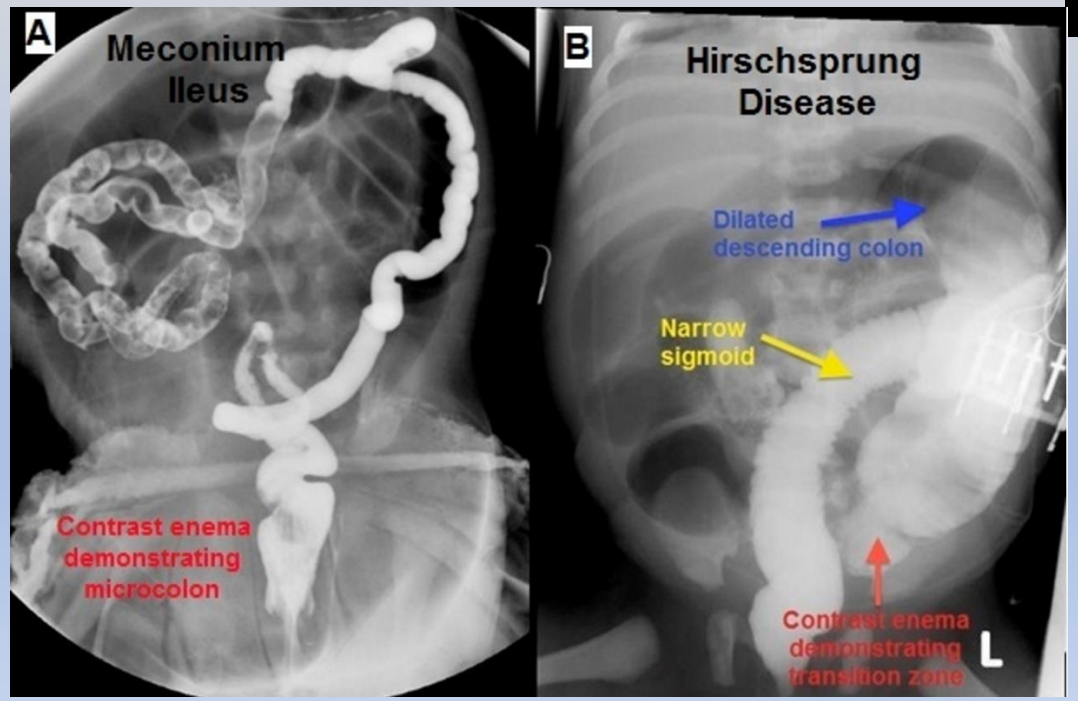
- Dilated bowel or “dilated loops of bowel” = **Hirschsprung** vs. **Meconium ileus**
  - **Barium contrast enema** is the next step -> differentiates the two
    - **Hirschsprung** will show “transition” zone of the rectum
    - **Meconium ileus** will show “microcolon” as the inspissated stool in cystic fibrosis obstructs the lumen
- X-ray normal? possible **Malrotation with volvulus**
  - **Upper GI contrast** series is the next step -> will enhance malrotated bowel
- Double bubble sign = **Duodenal atresia**
- Triple bubble sign = **Jejunal atresia**

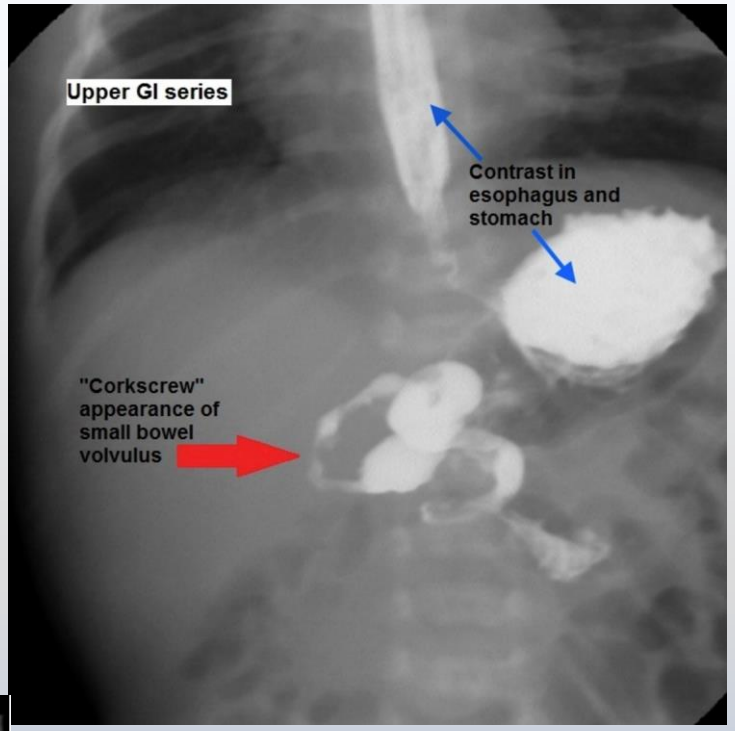
Bilious Emesis



Triple Bubble = Jejunal atresia

Double Bubble = Duodenal atresia





"Corkscrew" or "Misplaced" ligament of Treitz = Malrotation + volvulus

Differential Diagnosis

- Sore throat

Sore throat

- GAS pharyngitis
  - If **2+** CENTOR criteria
    - **C**ough absent
    - **E**xudates on tonsils
    - **N**odes (**anterior** lymphadenopathy)
    - **T** > 38 C
    - < 14 (+1 point) **OR** > 44 (-1 point)
  - 1st step: Rapid strep test -> if (+) treat with penicillin > amoxicillin
  - 2nd step: If (-), perform throat culture, if (+) treat with penicillin > amoxicillin
    - Don't need throat culture in adults
- Scarlet fever
  - Triad: **Tonsillitis** + strawberry **tongue** + "morbilliform" **rash**
  - **Treat the same uncomplicated GAS pharyngitis** (penicillin for treatment)
- Kawasaki disease
  - CRASH and BURN
  - Conjunctivitis, rash, adenopathy, strawberry tongue, hand and foot erythema + fever for 5 days
  - **4** of the above findings + 5 days of fever on an NBME exam is almost always how they test this
  - Treatment = aspirin + IVIG
- Infectious Mononucleosis
  - Older (teenagers usually)
  - **Posterior** lymphadenopathy
  - **Abdominal** pain (from splenomegaly)
  - **Rash** if given amoxicillin

Complicated “sore throat”

- Peritonsillar abscess
- Retropharyngeal abscess
- Epiglottitis
- Laryngotracheitis
- Bacterial tracheitis

Complicated “sore throat”

- Fever, lock jaw (trismus), ear pain, **uvular deviation**
- Anterior LAD, **unable to move neck**
- Fever, dysphagia, **drooling**
- “Harsh” cough, **inspiratory stridor**
- Treatment for “croup” **doesn’t work**

➢Peritonsillar abscess

➢Retropharyngeal abscess

➢Epiglottitis

➢Laryngotracheitis

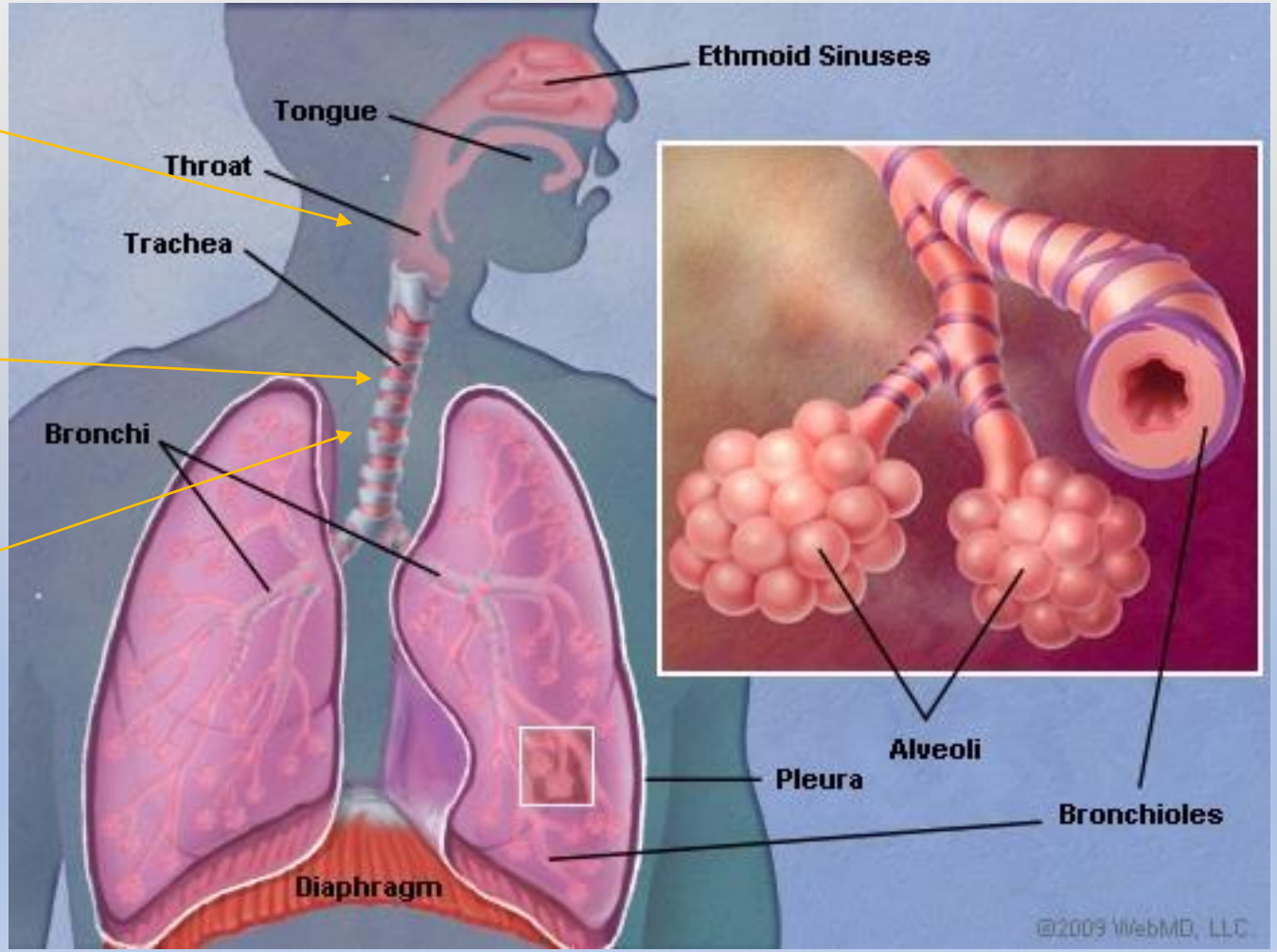
➢Bacterial tracheitis

Differential Diagnosis

- Chronic stridor

Chronic stridor

- Laryngomalacia
  - **Inspiratory**
  - Improves with **prone** position
- Vascular ring
  - **Biphasic** (inspiratory and expiratory)
  - Improves with **neck extension**
- Tracheomalacia
  - **Expiratory**
  - History of prolonged (> 2 weeks) intubation



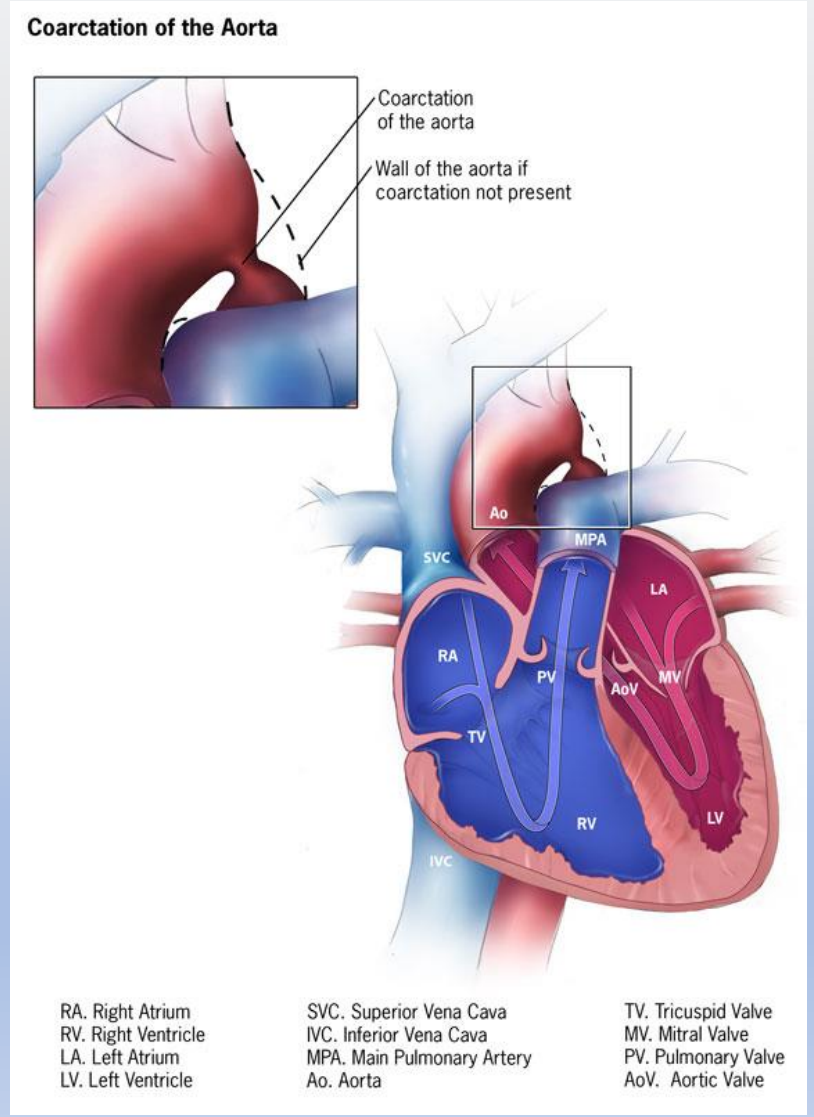
https://commons.wikimedia.org/wiki/File:Lungs_Anatomy.jpg

“Marfanoid habitus”

- Homocystinuria vs. Marfan vs. MEN2B
  - Similarities: “Marfanoid habitus”, joint hyperextensibility, skin laxity
  - Differences:
    - Homocystinuria: **thrombosis**, **downward** lens dislocation, **megaloblastic anemia**, **fair skin**
    - Marfan syndrome: **valvular/heart** problems (aortic dissection, aortic regurgitation, mitral valve prolapse), **upward** lens dislocation (Marfans looks toward mars)
    - MEN2B: **pheochromocytoma**, **medullary** thyroid carcinoma, **mucosal neuromas**

Different upper and lower extremity pressures/perfusion

- Coarctation of the aorta vs. Persistent pulmonary hypertension
  - Coarctation: upper and lower extremity differential **pressures**, rib notching, lower extremity claudication
  - PPHTN: history of respiratory distress, upper and lower extremity differential **cyanosis**, prominent S2



https://commons.wikimedia.org/wiki/File:Coarctationlayoutv2-575px.jpg

Differential Diagnosis

- Neonatal respiratory distress

Neonatal Respiratory Distress

- NRDS
- Meconium aspiration syndrome
- Transient tachypnea of the newborn

Neonatal respiratory distress syndrome

- Cause: prematurity -> insufficient surfactant -> alveoli collapse
- Physical exam: respiratory distress, **grunting**, **nasal flaring**
- X-ray findings: **ground glass** appearance (collapsed alveoli) + **air bronchograms** (bronchi still intact)
- Other: **pre-term** (<37 weeks)
- Treatment: positive pressure ventilation, may need intubation (follow pediatric ACLS algorithm)

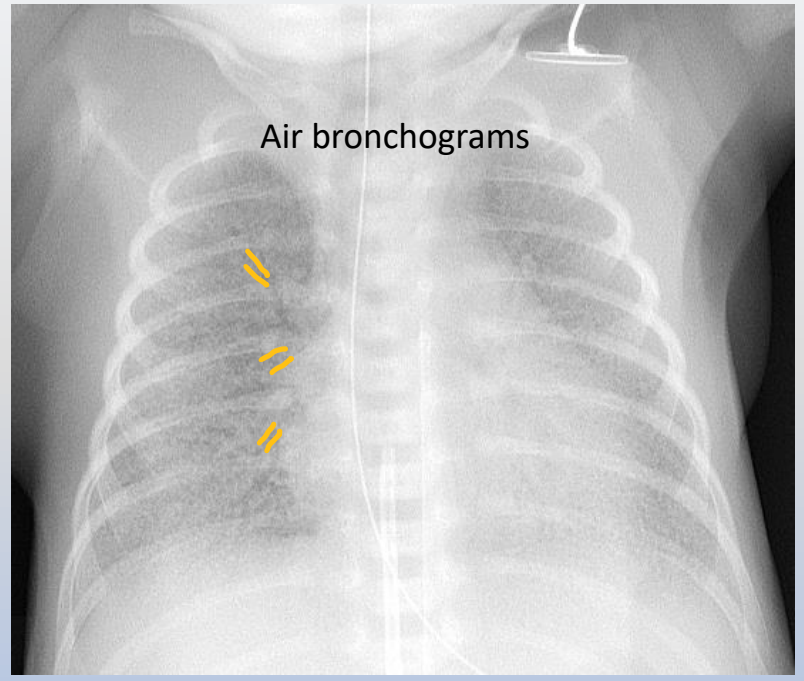
Transient tachypnea of the newborn

- Cause: rapid expulsion -> inability to exhale pulmonary fluid
- Physical exam: brief tachypnea, resolves by **day 2**
- X-ray findings: perihilar **streaking** + **fluid** in fissures
- Other: look for **C-section** or **rapid** vaginal delivery
- Treatment: Supportive

Meconium aspiration syndrome

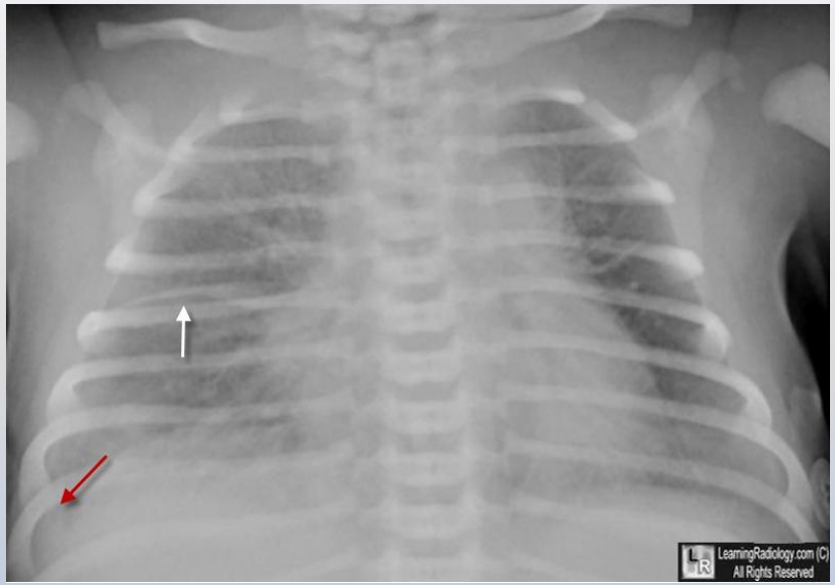
- Cause: post-term fetus -> more likely infant has passed meconium -> risk to aspirate
- Physical exam: **Green** colored amniotic fluid
- X-ray findings: **Patchy** consolidation (pockets of inhaled meconium)
- Other: look for **post-term** (40+ weeks gestation)
- Treatment: Intubation + suction beneath trachea

Neonatal respiratory distress syndrome



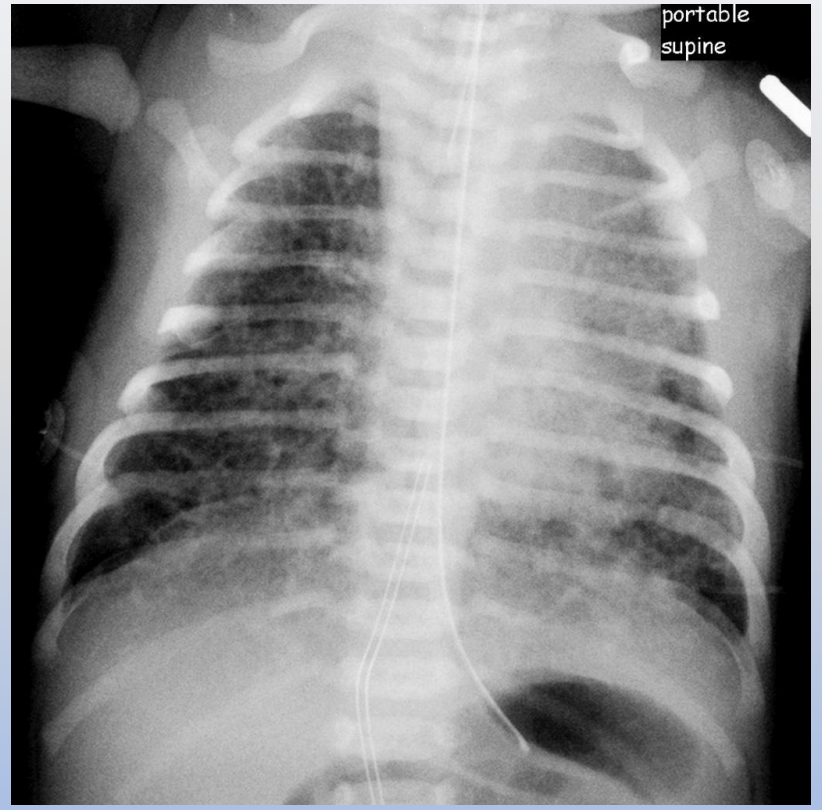
https://commons.wikimedia.org/wiki/File:X-ray_of_infant_respiratory_distress_syndrome_(IRDS).png

Transient tachypnea of the newborn



http://learningradiology.com/notes/chestnotes/ttnccorrect.html

Meconium aspiration syndrome



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Differential Diagnosis

- Hip pain

Hip Pain

- Transient (toxic) synovitis
- SCFE
- Legg-Calve-Perthes Disease
- Septic arthritis

Hip Pain

- Transient (toxic) synovitis: recent **viral** infection; **normal** physical exam, labs, and X-ray
  - Treatment: rest + NSAIDs
- SCFE: **obese** or **tall** adolescent (10-16 years old), may have **knee** pain (weight shifts load to knee causing wear), flexion of the hip causes **external** rotation
  - Treatment: surgical pinning
- Legg-Calve-Perthes disease: **younger** (4-10 years old) child, limited **internal rotation** and **abduction** (both cause femur-acetabulum space to narrow)
- Septic arthritis: systemically **ill**; **fever**, elevated **WBC** count, inability to bear weight, elevated ESR/CRP
  - Treatment: arthrocentesis + IV antibiotics

Legg-Calve-Perthes disease

https://commons.wikimedia.org/wiki/File:LCPdisease2015.png

SCFE

https://sml.snl.no/epifysiolyse

Differential Diagnoses

- Bloody stool

Bloody Stool

- Milk allergic proctoenterocolitis
- Meckel's diverticulum

Pain**less**

- Constipation
- Intussusception

Pain**ful**

Bloody Stool

- Milk allergic proctoenterocolitis: history of **eczema**, mildly fussy but consolable, **painless** hematochezia + **loose** stool
  - Treatment: for breast
- Meckel's diverticulum:
  - rule of "2's": ~2 years old, 2x more common in **males**, 2 feet from ileocecal valve, 2 inches long
  - Painless **hematochezia** or **melena**
- Constipation: history of **straining**, **hard** or pellet-like stools, +/- anal fissure (usually very painful)
- Intussusception: **painful**, **intermittent episodes** of painful bloody stool, in-between they are seen "playing normally", **sausage** shaped mass in RLQ or RUQ, **currant jelly** (thick, bloody consistency) stool

Differential Diagnoses

- Delayed passage of meconium (> 48 hours)

Delayed Passage of Meconium

- Meconium ileus:
  - **Normal** tone, **thick, inspissated** meconium
  - Imaging: dilated small bowel, “microcolon” (bowel obstructs at **ileum**)
- Hirschsprung disease:
  - **Increased** rectal tone, **normal** meconium consistency, “squirt” sign
  - Imaging: Narrow point at rectosigmoid -> everything proximal is **dilated**
- Hypothyroidism (very rare)
  - Consider if: **hypotonia**, **jaundice**, **dry skin**, etc.

Genetic Syndromes

- Slanted epicanthal folds, single palmar crease, sandal toe (gap between 1st and 2nd toe), Brushfield spots on iris
  Trisomy 21
- Happy demeanor, seizures, gap between teeth, intellectual disability
  Angelman (15q11-13 **maternal** deletion)
- History of hypotonia as infant, obesity, short stature, behavioral problems
  Prader-Willi (15q11-13 **paternal** deletion)
- Friendliness with strangers, “elfin” face, supravalvular aortic stenosis
  Williams syndrome (7q deletion)
- High pitched cry, microcephaly
  Cri-du-chat (5p deletion)
- Midline defects (cleft lip, aplasia cutis of scalp), polydactyly, holoprosencephaly
  Patau (Trisomy 13)
- “Prominent occiput,” clenched & overlapping fingers, micrognathia or retrognathia
  Edward’s (Trisomy 18)

More Syndromes

- Narrow epicanthal folds, smooth philtrum, thin upper vermilion border
  Fetal alcohol syndrome
- Omphalocele, large tongue, right arm and leg enlargement, Wilms tumor
  Beckwith-Wiedemann syndrome
- Choanal atresia, heart defects, ear anomalies
  CHARGE syndrome
- Tracheoesophageal fistula, anal abnormalities, scoliosis
  VACTERL
- Hypotonia, jaundice, umbilical hernia, large tongue
  Congenital hypothyroidism
- Self-aggression, crystals found in diaper, poor tone
  Lesch-Nyhan syndrome
- Long head, large ears, intellectual disability
  Fragile X syndrome
- Nephrotic syndrome, genitourinary abnormalities, Wilms tumor
  Denys-Drash syndrome

Congenital Infections

- Hearing loss, microcephaly, periventricular calcifications
  Congenital CMV
- Hydrocephalus, chorioretinitis, diffuse intracranial calcifications
  Toxoplasma
- Skin scars, cataracts, limb hypoplasia
  Varicella
- Jaundice, cataracts, deafness, “continuous” murmur
  Rubella
- Rhinorrhea, skin rash, teeth and bone abnormalities
  Syphilis
- Hydrops fetalis
  Parvovirus B-19 (other causes of hydrops include alpha thalassemia & CMV)
- Neonatal sepsis, widespread abscesses
  Listeria
- Encephalitis, sepsis, vesicular skin lesions
  Herpes simplex

Rapid Review Murmurs

- Harsh, holosystolic murmur at lower left sternal border
  - VSD
- Wide, fixed split S2 + soft systolic murmur
  - ASD
- Continuous murmur in interscapular region
  - Coarctation
- Continuous “machine-like” murmur in infraclavicular region
  - PDA
- Continuous murmur in right infraclavicular region, disappears with compression of internal jugular vein
  - Central venous hum (turbulent flow in IJV, disappears also with neck turning: both compress jugular veins -> reduce flow)
- Holosystolic murmur at lower sternal border + systolic murmur at upper left sternal border in a patient with Trisomy 21
  - Common AV canal (endocardial cushion defect seen in Down syndrome)
- Systolic murmur at lower left sternal border, increased intensity with Valsalva
  - Hypertrophic cardiomyopathy

Immunodeficiencies

- Recurrent Staph, Serratia, Pseudomonas infections, family history of males with recurrent infections
  Chronic granulomatous disease
- Recurrent infections, peripheral neuropathy, pale skin, large inclusions within neutrophils
  Chediak-Higashi
- History of delayed umbilical cord separation (> 21 days), recurrent skin infections with no pus, extremely high blood neutrophil count
  Leukocyte adhesion deficiency
- Recurrent infections, red & itchy rash on the skin, petechiae and thrombocytopenia
  Wiskott-Aldrich
- Recurrent giardia, strep. pneumoniae, and H. influenzae infections
  X-linked agammaglobulinemia
- History of sinus infections as a child, rapid anaphylaxis after a blood transfusion
  Selective IgA deficiency
- Failure to thrive, recurrent viral and fungal infections, no lymph nodes present
  SCID
- Recurrent viral and fungal infections, diffuse lymphadenopathy, similar history in mother
  Congenital HIV infection (lymph nodes can help differentiate SCID from HIV!)

Questions?