Pediatric for 4Th stage

CVS & Respiratory

Index

- 1- History of Respiratory & CVS
- 2- General examination
- 3- Respiratory examination
- 4- Examination of CVS
- 5- Important topics

http://www.muhadharaty.com/lecture/1689

Part:1

Pediatric

History of respiratory & CVS

Pediatric history related to respiratory system

#Ask about

- Cough, sputum, Cyanosis, Shortness of breath, Noisy breathing
- Sneezing, Expectoration, Hemoptysis, Post-tussive, Nasal discharge
- Chest pain, Chest tightness (respiratory and cardiac problems)
- Fever, Abdominal distention, Abdominal movement
- Daily activity, Difficulty in feeding, Crying

#Cough

- Source \rightarrow carina // center \rightarrow medulla oblongata
- Onset (sudden, gradual)
- Duration:
 - < 2 weeks → acute (bronchiolitis, pneumonia, asthma)</p>
 - 2 weeks 2 months → acute prolonged cough (pertussis, chronic sinusitis)
 - > 2 months → chronic (foreign body, GERD, Tracheo-esophageal fistula, cystic fibrosis, bronchiectasis, mucociliary dyskinesia)
- Continuous or intractable
- Wet or dry?
 - If productive (with sputum) ask about: color, amount, consistency, contains blood or clot
 - \circ If productive: mostly lower respiratory tract problem // dry: upper problem
- Character:
 - o Group, LaryngeoTracheoBronchitis → barking
 - Pertussis → paroxysmal post-tussive vomiting
 - o Bronchiolitis, asthma → wheezing
- Timing:
 - Nocturnal → allergy, asthma
 - \circ Midnight \rightarrow sinusitis
 - Early morning → Bronchiectasis, COPD, chronic bronchitis, adenoid, smoking
 - Exercise → asthma
 - All over the day → allergy, foreign body
- Associated symptoms:
 - \circ Feeding \rightarrow may suggest Tracheo-esophageal fistula
 - Suffocation, Apnea, Fever, Dyspnea

#Cyanosis

- Bluish discoloration of skin and mucus membrane
- Central or peripheral (lips, tip of tongue, peripheries)
- Respiratory causes: T.B, respiratory distress syndrome, asthma, pneumonia, pneumothorax, bronchiectasis, lung abscess, cystic fibrosis, asbestosis, familial (10%)
- Acute cyanosis: pneumonia (respond to O2)
- Chronic cyanosis: Tetralogy of Fallot (not respond to O2)
- Signs of chronic cyanosis: finger clubbing, polycythemia (due to chronic hypoxia), gingival hyperplasia

#Shortness of breath

- Onset
- Duration
- Day/night
- Feeding activity sleeping
- Fever
- Bluish discoloration
- Aggravating and relieving factors

#Fever

- High grade fever (in bacterial infection) or low grade fever (in viral infection)
- At day time or night
- Intermittent or continuous
- Associated with sweating, chills, shivering, rigors
- DDx: T.B, pneumonia, dehydration, SIADH, others (CNS infection and UTI)

#Noisy breathing

- At which level?
- Nose \rightarrow snoring "inspiratory", adenoid hypertrophy, common in pediatric
- **Epiglottis** → Grunting "expiratory", sign of respiratory distress
- Grunting:
 - Pulmonary:
 - Effusion, pneumothorax
 - Dramatic response to O2 for 10 minutes
 - Extra-pulmonary:
 - Cardiac: e.g. acute heart failure
 - Metabolic acidosis: e.g. gastroenteritis, diarrhea, diabetic ketoacidosis, salicylate
 - Severe blood loss: anemia
 - Expiratory phase due to respiratory failure

- Larynx → Strider "inspiratory", e.g. croup
- Trachea and major bronchus → Crepitation (by stethoscope), Rattling (by ear)
 "Inspiratory and expiratory" causes:
 - $\circ~$ Bronchiolitis: viral (RSV), less than 1 year, peak at 6 months
 - Pneumonia: more than 1 year, inflammation of lower respiratory tract
- Minor bronchioles → wheezing "mainly expiratory", causes: bronchiolitis, asthma, heart failure, pulmonary edema

#Relation of other systems to respiratory system:

- GIT → chest infection + frequent bowel motion = adenovirus
- GUS → chest infection + UTI = adenovirus
- CNS → chest infection + meningitis = adenovirus / Fit due to hypoxia (anxious or lethargic)
- Skin → respiratory infection + rash = meals or as complication of poliovirus vaccine

#Past medical history:

• The most important problem that affect the neonate and that 100% ends with asthma is → Broncho-pulmonary dysplasia

#Feeding:

• Unfortified milk \rightarrow may lead to rickets – iron deficiency anemia // cow milk allergy

#Family history:

Usually 4 types of atopy

- Allergic conjunctivitis
- Allergic rhinitis (annual or seasonal)
- Asthma
- Allergic dermatitis (Eczema)

#Social history:

- Type of heating \rightarrow trigger gas irritant for asthma patient
- Animal contact \rightarrow irritant for child and asthma patient
- Ventilation \rightarrow factory near house, fresh air from trees
- Type of house cleaning

#Effects of feeding on respiratory problems:

- 1st common \rightarrow aspiration pneumonia
- 2nd common → Tracheo-esophageal fistula
- 3rd common → cow milk protein allergy (dyspnea, skin rashes, diarrhea, microscopically bleeding or rectal bleeding)

Respiratory distress:

- Mild: flaring of ala nasi and tachypnea
- Moderate: use of accessory muscles
- <u>Severe</u>: Grunting
- More severe: all of above + cyanosis + conscious level (irritability)
- Other signs:
 - Cyanosed face
 - Tachypnea (increased O2 wash \rightarrow alkalosis \rightarrow retention of CO2 \rightarrow acidosis)
 - Asymmetrical movement of the chest
 - o Recession (suprasternal, supraclavicular, intercostal, subcostal)
 - o Harrison's sulcus → permanent indentation of chest wall along the costal margins where diaphragm inserts, due to chronic dyspnea in asthma, COPD, bronchiolitis obliterans, heart diseases, also occur in rickets
 - \circ Tracheal Tag \rightarrow pulling of thyroid cartilage towards the sternal notch in inspiration
- Associated symptoms:
 - Nasal discharge (rhinorrhea)
 - Sneezing
 - o Otalgia
 - Ear discharge (otorrhea)
 - o Dysphagia
 - Chest pain (if child can explain)
 - Pulsus paradoxus → fall in systolic BP > 15 mmHg during inspiration
- Ask about: activity, sleeping pattern, feeding
- General information:
 - $\circ~$ RDS is a condition that need admission postnatally and its effect is long-lived
 - Surfactant formation starts at 28 weeks and complete at 37 weeks
 - o For maturity of lung of the baby → dexamethasone is replaced by betamethasone (one injection/ 24 hours before delivery)
 - Causes of respiratory distress:
 - Reparatory: pneumonia, bronchiolitis, bronchitis, asthma, plural effusion, pneumothorax → relieved by O2
 - Cardiac → not respond to O2
 - Metabolic: diabetic ketoacidosis, acute renal failure, dehydration
 - Neurological, drugs (opioids), severe anemia
- <u>Differential diagnosis</u> of chronic cough + respiratory distress syndrome:
 - Infections → Pertussis (most common), TB
 - Asthma, Bronchiectasis
 - Sinusitis, Foreign body
 - Bronchiolitis, obliteration
 - Congenital anomaly

Part:2

Pediatric

General examination

General examination related to respiratory system

#General:

- Introduce yourself
- Name-age-sex-occupation of the patient
- Alert or not (Old child \rightarrow oriented// young child \rightarrow alert)
- Condition of patient: well, depressed, crying, comfortable, no abnormal posture,
- Build → obese (steroids), thin (TB, asthma, bronchiectasis, cystic fibrosis), macrosomia (occur in baby for mother with gestational diabetes)
- Environment (cannula, I.V fluid, catheter)
- Congenital anomalies
- Color of the child: Polycythemia, dusky color, jaundice, pale (physiological anemia, breast milk not contain high amount of iron, premature baby)
- Rapid assessment of dehydration (fontanels, eyes, skin turgor, drinking, urine output)
- Rapid assessment of malnutrition (Subcutaneous fat of abdomen and thigh and buttock, wrinkling, old face baby)
- Respiratory problems (Dyspnea, Tachypnea, wheezing)
- Anemia ightarrow conjunctiva, mucus membrane, nail bed, palmer creases
- Face: mangolian face, site of ear, eye distance
- Mouth: cyanosis, dental carries, mouth breathing, gum hypertrophy (in CHD)
- Nose: nasal discharge, nasal obstruction
- Ear: otitis media
- Neck: tonsils, thyroid, lymphadenopathy (generalized lymphadenopathy → 3 groups of lymph nodes involvement
- Hand: drumstick clubbing, cyanosis, pallor, koilonychia, leukonychia
- Leg: bilateral edema, cyanosis, sacral edema common in children
- Peripheral cyanosis in neonate → could be acrocyanosis, due to cold, should disappear after warming up
- Joneway lesions \rightarrow rheumatic fever "red macules in the palm"

#Finger clubbing:

Grading of clubbing:
 I: obliteration of angle between nail and nail bed (fluctuation test: +Ve)
 II: Parrot beak
 III: Drum stick

IV: Hypertrophic osteroarthropathy

- Causes:
 - pulmonary: TB, Cystic fibrosis, bronchiectasis, lung abscess, bronchogenic carcinoma
 - Cardiac: congenital heart disease, infective endocarditis, Tetralogy of Fallot (severe drum stick), fibrosing arteritis
 - Idiopathic Familial

#Cyanosis:

- It is bluish discoloration of skin and mucus membrane due to increased deoxygenated hemoglobin > 5 g/dl it is not hypoxia (associated with CO2)
- Acro-cyanosis: peripheral (hands), normally occur in neonate, newborn, cold
- Cardiac cyanosis: central (involves tongue), In central cyanosis there should be peripheral cyanosis with it
- **5T** cyanosis:
 - **TOF**: tetralogy of Fallot
 - TGA: transposition of great arteries \rightarrow D(dextro)type/L(incompetent with life)type
 - o Total anomalies pulmonary venous return
 - Tricuspid atresia
 - Truncus arteriosus
 - Also: Ebstein's anomaly, pulmonary atresia or stenosis

Cyanosis: From birth it is mostly →TGA

Cyanosis: 3-6 months later → TOF

Cyanosis: Associated with H.F \rightarrow TGA

Cyanosis: Not associated with H.F \rightarrow TOF

#Vital signs:

1- Temperature:

- Tympanic membrane (more common)
- Oral
- Axillary (+0.5)
- Rectal (-0.5)
- One degree increase lead to 10 beat increase in the heart rate

2- Pulse rate:

- Rate
 - Tachycardia: Fever, shock, drugs (salbutamol), sinus tachycardia, anemia, thyrotoxicosis
 - Bradycardia: sick sinus syndrome, athletes, cretinism, drugs (propanol), sleeping, heart block, heart failure
- Rhythm:
 - Regular regular
 - Regular irregular (ectopic)
 - o Completely irregular
 - o Radio-femoral delay: post ductal coarctation of aorta
 - Radio-radial delay: pre ductal coarctation of aorta
 - Brachio-femoral delay
- Character:
 - Jet of pulse: e.g. big and thrusting pulse
 - Watson's water hammer pulse
 - Gallop rhythm: can be assessed by palpation, we find S1, S2, S3, tachycardia
 DDx: heart failure and valvular heart disease
- Volume: small volume, normal volume, large volume
- Pulsus paradoxus: decrease in systolic blood pressure >15 mmHg with inspiration, occur in asthma and acute pericarditis
- Non-cardiac causes of large volume pulse:
 - o Thyrotoxicosis
 - o Severe anemia
 - o Stress
- Cardiac causes of small volume:
 - o Aortic stenosis
 - Coarctation of aorta
 - Pericardial effusion
 - o Cardiac tamponade
- Causes of radial pulse absence:
 - o Arteriovenous fistula
 - TAR: Thrombocytopenia-absent radius syndrome → Thrombocytopenia, absence of radial artery, congenital absence of radius bone
- Tachycardia + small volume → in shock or diarrhea
- Water hummer (collapsing pulse) → large volume, dorsum of hand
- Differential cyanosis: cyanosis present in foot, but not hand → coarctation of aorta
- By ending of pulse examination: 80 bpm, regular, normal character, good volume, no radio-femoral delay, normal peripheral pulsation

Post ductal coarctation:

Bluish discoloration of the lower limbs but not the upper limbs and head

3- Blood pressure:

- 5 methods:
 - Auscultation: cuff = 2/3 of arm circumference
 - Palpitory method: only systolic
 - Flushing → pale → red
 - o Osmometry
 - o Doppler
 - There is special chart for blood pressure:

Age in years + 90

Age in years + 60

Example: 4 years child \rightarrow BP = 4+90/4+60 = 94/64 mmHg

4- Respiratory rate:

- At least for 1 min (because of irregular respiration in childhood)
- 1-2 months → 60/ min
- 2 months 1 year → 50/ min
- > 3 years → 20-30/ min
- Periodic breathing: occurs when the breath pause for up to 10 seconds at time, there may be several such pauses close together, followed by series of rapid shallow breaths, then breathing returns to normal. This is common condition in premature babies in first few weeks of life. Even healthy full term babies sometimes spells periodic breathing, usually after sleeping deeply. Home care: supine position, avoid soft pillows and smoking, never snake your baby to breath → brain injury.

Periodic breathing	Apnea
Breathing stops up to 10 seconds	Stops more than 20 seconds
No	Infant may become limp
No cyanosis	Cyanosis
No change in heart rate	Decrease heart rate

5- Anthropometric measurements

- OFC \rightarrow microcephaly, macrocephaly
- Wight \rightarrow underweight, overweight
- Height \rightarrow short stature, long stature
- In acute illness → weight is most affected anthropometric measure
- In chronic illness → length is most affected anthropometric measure
- TB and bronchiectasis → decrease weight
- Asthma → increase weight (due to steroids use) and cause short stature

Part:3

Pediatric

Respiratory examination

1- Setting:

- Full exposure of the chest
- Good light
- Take permission
- In children < 2 years old → the examination includes inspection and auscultation only

Hyperoxia test: (give 100% O2)

- Used to differentiate between cardiac and respiratory causes of cyanosis
- Response (absence of cyanosis after O2) \rightarrow pulmonary
- No response (persistent of cvanosis after O2) \rightarrow cardiac (R to L shunt)

2- Inspection:

- Shape of the chest:
 - o Hyper-inflated chest: in bronchiolitis, asthma, emphysema
 - o Barrel chest: anterio-posterior diameter = transverse diameter → normally in young baby
 - o Pectus excavatum (Funnel chest)
 - Pectus carinatum (Pigeon chest)
- Symmetry of the chest
- Movement with respiration, and respiratory rate
- Type of respiration: abdominal, thoraco-abdominal, periodic respiration // abdominal breathing is normal in small children
- Space between 2 nipples
- Scars:
 - On left or right side of the chest → Thoracotomy
 - On sternum → cardiac surgery
- Abnormalities:
 - o Polymastia
 - Absence of pectorals (Poland syndrome)
 - Absence of sternum
 - Absence of intercostal muscles (or wasted) → starvation
 - o Hemangioma
 - o Rachitic rosary: in rickets patient, bead like knobs in the costochondral joint
 - Visible pulsation

 Posterior inspection for: kyphosis, scoliosis → respiratory compression → decreased lung volume → right sided heart failure // kyphoscoliosis in COPD and heart failure

3- Palpation:

- Areas:
 - Anteriorly \rightarrow clavicle (above) + 3 areas (ICS)
 - Laterally → 2 areas (in axillary region)
 - \circ Posteriorly \rightarrow supra-clavicular, inter-scapular, infra-scapular
- Palpation for any mass or tenderness
- Trachea:
 - use one finger (unlike adult) → Put index finger in the suprasternal notch
 - o normally centrally located and slightly deviated to the right
 - If you suspect deviation of the trachea → palpate the apex beat (could be deviated)
 - Fibrosis, consolidation, collapse → pull
 - Pneumothorax, hemothorax, plural effusion, emphysema → push
 - Only trachea deviated \rightarrow upper lobe lesion, neck mass (L.N, Tumor)
 - \circ Only heart deviated \rightarrow left ventricular hypertrophy, dextrocardia
- Apex beat:
 - Under 7 years: normally at 4th ICS at mid-clavicular line
 - Above 7 years: normally at 5th ICS lateral to mid-clavicular line
 - Shifting of apex beat (cardiac or respiratory cause) → plural effusion, pneumonia, pneumothorax, cardiomegaly (toward axilla)
- Chest expansion: by tape measure below the nipple (use tape measure < 4 years // use hands > 4 years) normally 1-3 cm → bilateral
- Vocal fremitus:
 - Need cooperative child, you could know it from crying in young baby
 - Decreased in: emphysema, plural effusion, pneumothorax, collapse
 - Increased in: consolidation
 - o Done at 7 areas
 - Mitral area
 - Tricuspid area
 - Suprasternal area
 - Left upper and lower sternal border
 - Right upper and lower sternal border

4- Percussion:

- Dull, Resonant, Hyper-resonant \rightarrow normally resonance
- Site of percussion:
 - \circ Anterior wall \rightarrow one apical over clavicle, three anterior chest wall in ICS
 - \circ Lateral wall \rightarrow two at mid-axillary line

- \circ Posterior wall \rightarrow one apical, one interscapular, one subscapular
- Start from supraclavicular area and same regions of auscultation
- Supra-clavicular (apex of lung) important \rightarrow most common site of T.B \rightarrow increase O2
- Percuss direct on clavicles 2nd space anterior and posterior
- Dull areas: cardiac (3,5,6 ICS) liver (7th ICS)
- Resonance → normal
- Hyper-resonance → pneumothorax, emphysema
- Dull → consolidation, fibrosis, tumor
- Stony dull → plural effusion

5- Auscultation:

- Areas: Mammary region (supra-mammary, mammary, infra-mammary) Axillary region (superior, inferior) and same sites of percussion
- First check the nose patency
- Air entry or not? Unilateral or bilateral? Type of respiration? Breathing sounds?
- First: expose patient, warm stethoscope, ensure that nostrils are patent
- Silent chest:
 - No air entry all over the chest
 - o In status asthmaticus, in severe eczema (or emphysema), in pleural effusion
- Bronchial breathing: found normally over trachea, over main bronchus, in neonate // abnormally hear over lung in pneumonia
- Added sounds: wheezes (rhonchi), crepitation (rales, crackles), plural rub
- Plural Friction rub:
 - Occur at the end of inspiratory phase when pleura become in contact with chest wall
 - Causes: pleurisy, pleural effusion
 - \circ friction rub with respiration ightarrow pneumonia
- Neonatal stridor:
 - High pitched (harsh), inspiratory, biphasic (in foreign body), upper respiratory problem (partial obstruction of large airways)
 - Infectious strider: viral , bacterial (epiglottitis, croup)
 - Non-infectious strider: hypocalcemia, edema, allergy to penicillin, foreign body
 - In congenital laryngeomalacia, laryngeal foreign body, infection (like croup), angioedema, hypocalcemia (stridor, convulsion, spasm)
 - If cyanosis occur with stridor → emergency
 - \circ Most common cause in pediatric is ightarrow laryngeomalacia
- Wheezing:
 - Musical, medium pitched or low pitched transmission of air through narrow spaces (partially obstructed airway)
 - In pediatric = small diameter bronchi → mainly expiratory / severe → diffuse expiratory and inspiratory

- Differential diagnosis: heart failure (cardiac asthma), pneumonia, foreign body, infection
- Localized rhonchi: foreign body
- o Generalized rhonchi: asthma, bronchiolitis
- Most common cause of wheezing: bronchiolitis (<1 year), asthma (>4 year)
- Crepitation:
 - High pitched sound (inspiratory)
 - Produced by mucus filled alveoli which fill during inspiration and collapse on expiration
 - Fine: inspiratory, occur in pulmonary edema (heart failure), pneumonia, foreign body
 - Course: inspiratory and expiatory, occur in fibrosis, asthma, bronchiolitis
- Vocal resonance:
 - o Heard by stethoscope at same sites of percussion while the patient say 44
 - Increase in: consolidation
 - Decrease in: plural effusion, collapse

Part:4

Pediatric

Examination of CVS

#Cardiac examination

1- Settings:

- Take permission
- Hand washing
- Good light support
- Patient in sitting or semi-supine position
- Exposure form the neck to the umbilicus

2- Inspection:

- General look for:
 - Signs of cyanosis or distress
 - Continuous O2 administration
 - Medication types
 - How many pillows below the head of the patient
 - Jaundice, hydration status
- Any thoracic cage abnormality like Precordium bulging:
 - o Unilateral bulge: pneumothorax, plural effusion
 - o Bilateral bulge: massive collapse
- Scars: indicates open heart surgery
 - Axillary \rightarrow coarctation of aorta
 - Femoral → catheterization
 - Scapular → PDA
 - Radial → A-V shunt
 - Middle sternotomy → GABG, aortic valve replacement
 - Infra-clavicular scar → Pacemaker
 - Sub-mammary → mitral valvotomy
- Visible pulsations: at apex, aortic, tricuspid, left side of sternum, epigastric, carotid
- Bulged beat \rightarrow cardiomegaly
- Apical pulse:
 - \circ Apex beat ightarrow outermost, lowermost
 - If you don't find the pulsation → look at the axilla (left side), if you still don't find the pulsation → see the right side (dextrocardia)
 - Causes of absent apex beat: obesity, thick chest wall, pericardial effusion, dextro
- Other pulsations: hyperactive dancing pericardium in severe left to right shunt in patient with VSD

 Note: Telangiectasia: distributed blood vessels in face and thorax, disappear at pressure, Ataxia telangiectasia syndrome // doesn't disappear on pressure → spider navi

3- Palpation:

- Apex beat:
 - Apex beat + character: example → apex beat is palpable at 5th ICS mid-clavicular line with normal character
 - Under 7 years: normally at 4th ICS at mid-clavicular line
 - Above 7 years: normally at 5th ICS lateral to mid-clavicular line
- Thrill (by palmer surface of 4 fingers) → suprasternal thrill → coarctation of aorta
- Heave → parasternal or epigastric (right ventricular hypertrophy) apical (left ventricular hypertrophy)
- 4- Percussion: only in plural effusion or pericardial tamponade

5- Auscultation:

- 4 regions in auscultation:
 - Mitral (Apex) area → 4th left ICS in mid-clavicular line or 5th ICS in older child
 - Aortic area \rightarrow 2nd ICS right to the sternum
 - Pulmonary area \rightarrow 2nd ICS left to the sternum
 - Tricuspid area → left sternal border in 4^{th} ICS or 5^{th} ICS in older child
- Finding: S1, S2, Added sounds (S3, S4, ejection click), Murmur
- 1^{st} heart sound (S1) \rightarrow Mitral area (normal, soft, loud)
- 2nd heart sound (S2) → Pulmonary area (normal, splitting, loud, single)
- Mitral (apex) area auscultation abnormalities:
 - o S1, S3, S4
 - Mitral regurgitation
 - Pan-systolic murmur (presented in first month of life) → may be normal in infants
 < 7 weeks but always pathological in infants > 7 weeks
 - Mitral stenosis: most common cause of opening snap
- Aortic area auscultation abnormalities:
 - $\circ~$ Aortic stenosis \rightarrow head at apex and all over chest and can radiate to neck
 - Coarctation of aorta (also heard from the back)
 - o Innocent murmur
 - Ejection systolic murmur (early aortic diastolic murmur) due to aortic regurgitation and also radiated to pulmonary area
- Pulmonary area auscultation abnormalities:
 - Pulmonary stenosis
 - Pulmonary innocent murmur
 - Pulmonary hypertension
 - Atrial septal defect (ASD)

- Ventricular septal defect (VSD)
- Ejection click systolic murmur in pulmonary area
- Tricuspid area auscultation abnormalities:
 - $\circ~$ Tricuspid regurgitation \rightarrow radiate laterally to mitral area
 - Pan-systolic murmur
 - \circ Tricuspid stenosis \rightarrow rare condition cause opening snap

<u>5- Murmur:</u>

- Abnormal musical heart sound due to abnormal valve or abnormal (turbulent) blood flow through normal valve
- Rolle the patient left lateral → bring the heart to the chest wall then sitting → hear back and ask the patient to take inspiration and expiration → Murmurs related to the back (PDA, Aortic regurgitation, coarctation of aorta)
- Murmurs:
 - Types (systolic-diastolic)
 - Time (ejection systolic, pan systolic, early diastolic, late diastolic)
 - o Site, Intensity, Radiation, Grade, Character
 - Relation to respiration: murmur of right side (higher during inspiration like aortic stenosis) murmur of left side (higher during expiration like pulmonary stenosis)
 - Propagation (radiation of pulse)
 - Pitch of sound (harsh, soft, high)
 - Change with position: mitral (left side), aortic (forward)
- Murmur grades:
 - o G1: fairly heard
 - o G2: heard without difficulty
 - o G3: there is thrill
 - G4: loud murmur
 - o G5: heard without stethoscope
- Types of murmurs:
 - Innocent murmur → only systolic, murmur that change or disappear with position change, change with inspiration and expiration, change in hype-dynamic condition, diminished with liver decompression
 - Ejection click → in aortic stenosis
 - Opening snap → in mitral stenosis / in early diastolic phase with left ventricular contraction and stenosed valve (soft sound)
- Pan-systolic murmur:
 - \circ Ventricular septal defect \rightarrow radiate all over the precordium
 - Mitral regurgitation (apex) \rightarrow radiate to the axilla
 - \circ Tricuspid regurgitation (left lower sternal border) ightarrow no radiation
 - Coarctation of aorta → radiate to the back

		Ejection systolic murmur	Pulmonary stenosis
			Aortic stenosis
			Atrial septal defect ASD
	Systolic	Pan- systolic murmur	Mitral regurgitation
			Tricuspid regurgitation
Murmur			Ventricular septal defect VSD
	Systolic + diastolic	Machinery murmur	Patent ductus arteriosus PDA
		Early diastolic murmur	Pulmonary regurgitation
Dias	Diastolic		Aortic regurgitation
		Mid-diastolic murmur	Mitral stenosis
			Tricuspid stenosis

#Diagnosis of VSD by examination

1-Inspection:

- Hyperactive precordium (dancing precordium)
- In large VSD > 5 mm → there is Harrison sulcus, deviated apex beat, dancing, bulging precordium
- Shifting apex beat
- 2- Palpation:
 - Shifted apex beat
 - Epigastric thrill
 - Apical heave
- 3- Auscultation:
 - S1: normal
 - S2: not splitting, strong, fixed
 - Murmur: more harsh, less loud in large VSD // less harsh, more loud in small VSD
- Large VSD → > 5 mm → treated surgically, if there is heart failure we afraid of complications like pulmonary hypertension and cardiac arrhythmias
- Small VSD → < 3 mm → close spontaneously 40% in the first year and 60% in the followed 4 years

#Congenital heart disease (CHD)

1- History presentation of CHD:

- Acute: cyanosis, dyspnea, cardiogenic shock
- Chronic: chest pain, fatigability, sweating
- 2- Types:
 - Cyanotic (15%): 6T
 - Tetralogy of Fallot (TOF) → 65%
 - o Transposition of great vessels (arteries) TGA
 - o Total anomalous pulmonary venous return
 - o Truncus arteriosus
 - Tricuspid atresia
 - The pulmonary atresia or stenosis
 - Acyanotic (85%) → 90% VSD

3- Patent ductus arteriosus (PDA)

- Lead to Machinery murmur (systolic and diastolic)
- Normally ductus arteriosus is opened in the 1st week and then closed
- If not closed → treated medically then surgically
- Prostaglandins: the opening of PDA is maintained by it, thus given in TGA until surgery performed, while indomethacin closes it thus given in PDA

4- Atrial septal defect (ASD)

- Functioning foramen ovale is closed at 1 week to 1 month
- If not closed \rightarrow lead to shunt with pulmonary stenosis usually
- After 6 months present as ejection systolic murmur and accidentally discovered
- ASD: usually asymptomatic with excellent prognosis
- Clinical features of ASD: 1st and 2nd degree heart failure, arrhythmia, acyanotic
- Osteum primum → may present at 3 months
- Secondum type of ASD → can't be seen before 6 months, and my presented at 30 years as arrhythmia and heart failure, hypertension, tachycardia
- 5- Ventricular septal defect (VSD)
 - Presented at 1^{st} month \rightarrow complex heart lesion + VSD
 - Presented up to 3 months \rightarrow pan-systolic murmur of VSD
 - Recurrent admission to hospital because of Congenital heart defect indicated large VSD

6- Tetralogy of Fallot (TOF)

Presented up to 9 months → during activity (as feeding)

- Pink TOF → when pulmonary cyanosis is not severe enough to cause bluish discoloration, presented during 2-3 months due to feeding
- May present at one year with right ventricular hypertrophy (boot shaped heart)
- Surgical treatment is preferred but may treated medically
- Decrease lung vascularity → Tetralogy of Fallot TOF (Don't **DROP** the baby)
 - Defect (VSD)
 - Right ventricular hypertrophy
 - Overriding aorta (aorta over interventricular septum)
 - Pulmonary stenosis
- Pulmonary stenosis determines the severity of Tetralogy of Fallot
- Clinical features:
 - Central cyanosis (1-2 months after birth) usually aggravated by sulking and crying
 - Hyper-cyanotic spells: deep cyanosis aggravated by crying, infection, iron deficiency anemia, followed by weakness, sleep, convulsion, unconscious
 - Finger clubbing (before 1-2 years)
- Signs:
 - Left parasternal pulsation due to right ventricular hypertrophy
 - Systolic thrill at 2nd left intercostal parasternal spaces
 - Single S2 and loud at pulmonary area
 - Ejection (mid systolic) murmur: usually heard over pulmonary area due to pulmonary stenosis
 - Heart failure is unusual
- 7- Left to right shunt \rightarrow clinical features:
 - Frequent chest infection
 - Cardiomegaly
 - Left axis dilation
 - Pericardial bulge
 - No cyanosis or clubbing
 - Easy fatigability and sweating
 - Chest lead on left ventricle
 - Plethoric lung in chest x-ray (increase lung vascularity) → occur in Patent ductus arteriosus PDA, Transposition of the Great Arteries TGA
- 8- Right to left shunt \rightarrow clinical features:
 - Polycythemia
 - Cyanosis
 - Clubbing
 - With or without cardiomegaly
 - Oligemic lung

- 9- Congenital heart conditions without shunt:
 - Patent ductus arteriosus
 - Aortic stenosis and regurgitation
 - Pulmonary stenosis and regurgitation

10- How to differentiate between congenital/ aortic problem:

- Time of appearance of clinical features
- Failure to thrive (FTT)
- Easy fatigability
- Psychological problem

Notes:

- Right ventricular hypertrophy (on palpation):
 - Apex don't shift
 - Thrusting (diffuse pulsation)
 - o Heave
 - \circ May find murmur
- Left ventricular hypertrophy (inside the chest):
 - o Apex has shifted to the axilla
- Both right and left ventricular hypertrophy:
 - Precordium bulging
 - o Diffuse pulsation
 - o Shifting apex beat
- Ejection click + innocent murmur found in:
 - o Aortic stenosis
 - Pulmonary stenosis
 - Pulmonary hypertension
 - o Atrial septal defect
- Ejection click is not found in:
 - o Coarctation of aorta
 - Aortic regurgitation
- Cyanosis stat from the beginning in:
 - \circ Mitral condition
 - Tricuspid condition
 - o Transposition of great vessels
- Sever pulmonary atresia and TGA without VSD \rightarrow 1st day, 1st hour, severe cyanosis
- 2-3 months → nearly most cyanotic heart diseases

- > 3 months → supra-ventricular tachycardia, Intra-uterine event that mimic condition of CHD and causes heart failure (give intrauterine adenosine during pregnancy)
- > 2-3 years → Rheumatic fever (rheumatic carditis), aortic stenosis and mitral regurgitation
- Infective endocarditis → rare in children because of insidious progression (diagnosed by culture only)
- Patient with myocarditis have → enlarged heart, muffled S1 and S2, low voltage
- Any lesion in the right side of the heart increase with inspiration and in the left side of the heart increase with expiration
- If baby diagnosed as one of these anomalies or other, mention that at the beginning of history with time.
- Infective endocarditis risk for lifelong → 2%
- all chronic heart diseases do not interfere with patient activity except aortic stenosis in which patient is exhausted with any activity
- In osteom secundum ASD and PDA of 6 mm → close after 2 weeks → if not, it need surgical correction
- squint \rightarrow CVA
- bad hygiene of mouth → endocarditis
- Congenital heart defect ((1- CVA < 4 years // 2- Abscess > 4 years)) associated with CNS history
- History of heart failure in 2 months old baby is: feeding difficulty + sweating
- Investigations in CVS: CXR, Echo, ECG, Catheterization
- ASD → there is fixed splitting S2 and functional pulmonary stenosis with it.
- Murmur in aorta:
 - $\circ~$ Aortic stenosis: hear everywhere in the chest, occur suddenly
 - Coarctation of the aorta: hear better in the back, not suddenly, there is difference in the upper and lower limb
- Non-pathological murmur:
 - Functional murmur → in fever, thyrotoxicosis, anemia, increased metabolic rate
 - \circ Innocent murmur \rightarrow characteristics (10S)
 - S1 = systolic
 - S2 = small area
 - S3 = short duration
 - S4 = Symptoms free
 - S5 = signs free
 - S6 = severity G1 or G2
 - S7 = study (investigations) like ECG, Echo, CXR => are normal
 - S8 = sternal depression
 - S9 = sitting standing variation
 - S10 = smooth

Part:5

Pediatric

Important Topics

#Presentation of respiratory system

- Super-acute:
 - o Short attack within minutes
 - May be due to: aspiration, poisoning with CO or Kerosin, Foreign body inhalation
- Acute:
 - \circ Within hours
 - May be due to acute respiratory infection (upper or lower as in strider, croup, bronchial asthma)
- Sub-acute:
 - Within several weeks
 - May be due to pertussis, TB
- Chronic:
 - May be due to T.B, COPD, Bronchiectasis, Asthma

<u>#Asthma</u>

#General information

- Asthma is disease of small and large airways, but mostly of small airways
- Definition: it is recurrent episodes of dyspnea respond to bronchodilators and there is family history
- Chronic inflammatory airway disorder, characterized by:
 - Airway obstruction: that is reversible either spontaneously or by medications
 - Airway hypersensitivity to variety of stimuli (most commonly in children are viral infections)
- Recurrent disorder, characterized by:
 - Chest tightness
 - o Wheezing
 - o Breathlessness
 - \circ Cough
- Deferential diagnosis:
 - \circ 1st attack ightarrow pneumonia, heart failure, bronchiolitis
 - \circ 2nd attack \rightarrow allergic bronchitis
 - \circ 3rd attack \rightarrow asthma
- Epidemiology :
 - o Most common health problem in children

- 80% of them have symptoms < 5 years
- High in African American than white
- Asthma needs acute (rescue) treatment and chronic management (if asthma not treated sufficiently → complicated as fibrosing alveolitis)

#Etiology Not well understood

- Family history: Genetic factor (chromosome 15)
- Environmental factors (viral infection)
- Atopy (atopic dermatitis) or type I hypersensitivity reaction (Exposure to allergens or chemicals)
- Increase risk in (Low Body Weigh < 2.5 Kg) and (Meconium aspiration)
- Diet: protective → Chinese food // aggravative → egg- banana fish Cow's milk

#Environmental risk factors

- <u>Perinatal asthma</u>: male, maternal smoking, passive neonatal illness, Low body weight, meconium aspiration
- <u>Early childhood</u>: Lower respiratory tract infection (adenovirus, pneumonia, bronchiolitis), Food allergy, Low socio-economic status, Exposure to household mites
- <u>Later childhood</u>: diet, air pollution, mites and pets

#Why common at night?

- Anatomically: diameter of bronchioles at night less than at day
- Exposure to antigens at bed and pillows
- Decrease secretion of cortisol

Q: Why immunosuppressive agents not very effective in treatment of asthma in pediatric age? Because most common triggers in children is viral infection

#Pathophysiology



#Models of inflammatory response leading to asthma

Phase I

- Sensitization of immune system
- Repeated exposure to allergen
- Production of IgE by immune system \rightarrow bronchospasm
- Treatment: bronchodilators
- Lasts 6 hours

Phase II

- immediate hypersensitivity to subsequent exposure
- IgE recognize and binds to allergen → inflammatory mediators released by immune cells (eg: histamine)
- Histamine: smooth muscles contraction, increase secretion of mucus from airway tract glands, fluid leakage (edema) in airway wall
- Treatment: corticosteroids
- Lasts 24 hours

#Types

- Intermittent:
 - More than 2 attacks (at day)/ month and 1 or more attacks (at night)/ month
 - Treatment: No daily treatment (only on demand inhaler or nebulizer)
- Mild persistent:
 - More than 2 attacks (at day)/ month and more than 2 attacks (at night)/ month
 - Treatment: low dose of steroid inhaler
- Moderate persistent:
 - Daily attack mostly / month and more than 4 attacks (at night)/ month
 - Treatment: low or moderate dose corticosteroids + aminophylline or bronchodilator
- Severe persistent:
 - More daily attacks and frequent attacks at night
 - Treatment: low dose of oral corticosteroids or long acting beta agonist (LABA)

Note \rightarrow Mild: low dose inhaler, Moderate: systemic steroids, Severe: high dose corticosteroids

Note \rightarrow With frequent monitoring and ask about school performance

#Clinical manifestations

• History:

- 1- Mucus plug
- 2- Airway edema
- 3- Bronchospasm
- 4- Airway remodeling

Bronchiolitis has same pathophysiology except: airway remodeling

- Wheezing, cough, chest tightness, breathlessness
- Worsening at night
- Provoking factors, relieving factors
- Risk factors: allergic rhinitis, atopy, family history
- Documented airway obstruction: PEF (peak expiratory flow) or spirometry (FEV,VC) {>5years}
- Demonstration of reversibility of obstruction and symptoms: by giving bronchodilators → improved? → asthma
- Exercise test

#Differential diagnosis

- Bronchiolitis
- Bronchitis
- Pneumonia
- Cystic fibrosis
- Tracheal stenosis
- Laryngeal stenosis
- Laryngeal webs
- Uvula disease
- Lymphadenopathy
- Foreign body
- Pulmonary embolism
- Viral infection
- GERD
- Congestive heart failure
- Pulmonary eosinophilia

#Lung Function Test

- 1- Spirometry:
 - Air flow limitation: low FEV1 \rightarrow FEV1/FVC < 0.8
 - Response to bronchodilators: B2 agonist > 12% of FEV1
 - Exercise challenge : worsening in FEV1 > 15%
- 2- Peak expiratory flow meter: the difference between morning and night is > 20%
- 3- Exercise test:
 - Stop treatment for 24-72 hours
 - At early morning and dry weather
 - Exercise for 15 minutes
 - First 6 hours accompanied by bronchodilators due to cholinergic stimulation
 - Before-After exercise worsening: FEV1 > 15% → diagnostic

Asthma	Allergy
Recurrence	May but less
Response to bronchodilator	No
Eosinophilia	No
+ve family history	No

Asthma	Bronchiolitis
Recurrent attacks	1 st attack
Positive family history	Negative family history
Respond to bronchodilators	Not respond
Older children	Small children
Over all year	Winter and early spring
Eosinophilia	No

- Give bronchodilators: if there's improvement > $15\% \rightarrow$ diagnostic
- Needs cooperative child (5 years old or more)
- 4- Other tests:
 - Eosinophils
 - Allergic test 'Chest x-ray
 - Diffusing capacity
 - Broncho provocation (give patient histamine → bronchospasm → risk of status asthmaticus)
 - Blood gases:
 - Hypoxia + hypocapnia
 - Hypoxia + normal capnia
 - Hypoxia + hypercapnia

#Reliving factors of asthma

- Reduce activity
- Give bronchodilators
- Give Antibiotics
- Avoid allergens

#Notes:

- Criteria of asthma → dry cough (respond to bronchodilators), positive family history, no strider, presence of wheezing or rhonchi
- FVC normal in asthma \rightarrow so FEV1/FVC decreases
- In fibrosis → FVC decreased, FEV1 decreased, normal FEV1/FVC
- PEFM (peak expiratory flow meter):
 - Green → Asthma in good control
 - Yellow → Liable to develop asthma
 - \circ Red \rightarrow patient has asthma
- Rhonchi:
 - \circ Mild asthma \rightarrow expiratory rhonchi
 - \circ Moderate asthma \rightarrow expiratory and inspiratory rhonchi
 - Severe asthma \rightarrow silent chest

#Acute respiratory infection

- Patient come with cough or dyspnea
- Acute → < 30 days (4 weeks)
- Age \rightarrow < 5 years
- Assessment:
 - Ask \rightarrow fever, feeding, fit, sleeping disturbance

- \circ Look \rightarrow respiratory rate, chest indrawing, malnutrition
- Listen \rightarrow strider, wheezing
- Respiratory rate:
 - o < 2 moths (60/min), 2 moths 1 year (50/min), 1 year 5 year (40/min)</p>
 - Periodic respiration because of immature brain center
- Chest indrawing:
 - o Intermittent lower chest movement due to acute dyspnea
 - Movement of chest inward during fetus breathing in (inspiration)
 - Occur in acute illness
- Sulci → permanent indrawing of lower chest (most lower ribs) due to chronic dyspnea occur in rickets, COPD
- Sub-costal recess \rightarrow one line of indrawing of muscles below the ribs immediately
- Malnutrition:
 - \circ Wasting \rightarrow loss of muscle bilk (thigh and buttocks)
 - Thinning → loss of subcutaneous fat (skin of thigh)
 - Strider: harsh noise due to upper respiratory tract obstruction, either inspiratory or biphasic (in severe obstruction) never be expiratory alone
 - Wheeze: musical sound due to lower respiratory tract obstruction, either expiratory or biphasic and never be inspiratory alone
 - Categories from 2 months 5 years
 - Category 1:
 - When patient come with cough or dyspnea with any of dangerous sign of the following:
 - Fit
 - Sleeping disturbance
 - Feeding disturbance
 - Strider in calm child (and wheezing)
 - Malnutrition
 - Diagnosis: very severe illness
 - \circ Treatment: 1st dose antibiotic ightarrow refer urgently to hospital
 - Category 2:
 - Patient come with cough or dyspnea with no dangerous sign but tachypnea or chest indrawing
 - Diagnosis: sever pneumonia
 - \circ Treatment: 1st dose antibiotic ightarrow refer urgently to hospital
 - Category 3:
 - Patient come with cough or dyspnea with tachypnea only
 - o Diagnosis: pneumonia
 - Treatment: oral antibiotic (5days) then reassess after that then return within 2 days if no response
 - Category 4:

- Patient come with cough or dyspnea with nothing
- Diagnosis: coryza (cold + cough)
- Treatment: at home → clear nose + keep child warm + enhance breast feeding + give soft home remedies
- Categories from 0 2 months
- Category 1 and category 2 like above
- Category 2:
 - o Patient come with cough or dyspnea with nothing
 - o Diagnosis: coryza
 - Treatment: at home → clear nose + keep child warm + enhance breast feeding
- Types of drugs used:
 - Oral antibiotics: Trimethoprim sulfamethoxazole
 - o Injection antibiotics: Penicillin Benzathine Ampicillin + Amoxicillin
 - \circ For wheezing we use \rightarrow oral salbutamol
 - For fever we use → paracetamol (oral)

<u>#Pneumonia</u>

- It is disease of parenchyma (once parenchyma affected → sleeping feeding activity not well)
- Pneumonia → inflammation with consolidation // pneumonitis → inflammation without consolidation
- Causes:
 - Newborn (0-30 days): Streptococcus pneumonia, Listeria monocytogens, E.coli, Klebsiella pneumonia
 - Infants and toddlers: mostly viral → RSV, para-influenza virus
 - Pre-school (5 years): Mycoplasma pneumonia
 - Other causes: osteomyelitis (hematological spread), foreign body, aspiration, viral, hematological spread (leukemia)
- Organisms:
 - Pneumococcus pneumonia → most common
 - \circ Staphylococcus pneumonia ightarrow most serious, lead to lung abscess and sepsis
 - Streptococcus pneumonia
 - Para-influenza virus
 - Mycoplasma pneumonia → atypical pneumonia, peri-school age, afebrile paroxysmal, spasmodic, not toxic, Investigations (CXR → lobar pneumonia / Serology → +ve agglutination test), treated by erythromycin
 - Viral → low grade fever/ mild toxicity/ CBP lymphocytosis/
 - o Bacterial → high grade fever/ high toxicity/ CBP neutrophilia, increased ESR & CRP
- Types of pneumonia:
 - Lobar pneumonia → bacterial, one lobe, unilateral in chest x-ray, bronchial breathing, increased vocal resonance

- Interstitial pneumonia (acute bronchiolitis) →viral, granular, pattern
- Broncho-pneumonia → small foci of consolidation along distribution of bronchioles, bilateral, fine crepitation, expiratory wheezing, multiple small patches on chest xray, Causes:
 - Viral → mild fever, high paroxysmal cough, involve the bronchi (granular interstitial small foci), lymphocytosis, negative culture of blood
 - Bacterial → toxic, less episodes of mild cough, lobar CXR, leukocytosis, increased ESR, increased protein, positive culture of blood
- Indications of hospitalized patient in pneumonia:
 - Age: < 6 months
 - o Immune compromised
 - Vomiting and dehydration
 - Patient with chronic disease
 - Congenital heart diseases CHD
 - Non-competent / not educated parents
- Recurrent pneumonia:
 - 2 attacks of pneumonia/6 months or 3/1 year, with complete resolution between attacks
 - Causes:
 - Cardiovascular \rightarrow CHD
 - pulmonary → kartagener syndrome (dextrocardia and immotile cilia), Tracheoesophageal fistula, GERD, hernealocele, cystic fibrosis, bronchiectasis
 - Immunodeficiency
 - Others: croup, asthma
 - Recurrent lobar pneumonia at same site → DDx: foreign body
- Stages of pneumonia:
 - Congestion
 - o Red hepatization
 - Gray hepatization
 - Resolution (crepitation)
- Signs and symptoms of consolidated lung (like in lobar pneumonia)
 - Decease air entry and bronchial breath
 - o Dull percussion
 - Decrease chest expansion
 - Increase vocal fremitus
 - Increase vocal resonance (while decease vocal fremitus and resonance in plural effusion → e.g. atelectasis)
- Neonatal pneumonia usually bacterial → mostly staphylococcus
- Aspiration pneumonia → bad feeding practice (especially in neonate), at right apical area

- Pneumonia always with fever except in: immunocompromised patient or atypical pneumonia caused by mycoplasma
- Mycoplasma pneumonia:
 - School aged children
 - Causes lobar pneumonia
 - Diagnosis: cold agglutinin
 - Complications of M.Pneumonia:
 - Erythema multiforme
 - Steven-Jensen syndrome (sloughing of skin)
 - Hemolytic anemia (may produce jaundice)
- Management of pneumonia:
 - IV fluid if there is vomiting because it causes dehydration
 - Oxygen due to hypoxia
 - Antibiotics mostly macrolides or antiviral or anti-TB
 - o Chest drainage if there is para-pneumonic effusion
 - o Steroids
- Indication for hospital admission in pneumonia:
 - Signs of respiratory distress
 - Less than 6 months
 - Fever, vomiting, chronic disease
 - Poor response to oral treatment
 - Poor family situation
- Complications of pneumonia:
 - Para-pneumonic effusion
 - o Respiratory failure
 - o Myocarditis
 - o Paralytic ileus
 - Meningisum (neck rigidity without other features of meningitis)

#Common clod (Nasophyrangitis)

- Rhinorrhea (watery discharge from nose) if greenish \rightarrow give antibiotics
- Low grade fever (High fever suggests complications such as: sinusitis, otitis media)
- Simple infrequent cough
- No disturbance of sleeping
- Post nasal drip \rightarrow cough
- Not need hospital admission
- Doing well (activity + feeding + sleeping)

<u> #Pharyngitis (Oropharyngitis)</u>

• Include Tonsillitis

- Most common microorganism → Group A beta-hemolytic streptococci
- Dysphagia but no dyspnea
- Fever, sore throat, vomiting, abdominal pain, mouth breather, adenoid, malaise
- Not well
- Why abdominal may develop in tonsillitis? due to involvement of mesenteric lymph nodes
- Tonsillectomy not resolve (Rheumatic fever) problem due to involvement of pharynx, so prophylaxis of rheumatic fever is antibiotics not tonsillectomy

#Laryngitis

- Mostly viral, mild in bacterial
- High pitched sound (teacher, singer) \rightarrow dysphonia, aphonia (management \rightarrow rest)
- Cough: stellate cough
- Irritating
- Cold exposure
- Low grade fever
- No malaise
- Affect old age

#Laryngeo-Tracheo-Bronchitis

- Viral → benign // bacterial → serious and emergency
- Viral:
 - Mostly para-influenza, 1-3 years of age, low grade fever, no dyspnea, moderate activity
 - Barking cough (caw sound) → due to dryness of the area (no moister due to: croup, foreign body) at late night increase dryness so increase severity
 - Dramatic response to hot path vaporation and hot soup
 - Note: strider sound with inspiration sign of upper respiratory tract problem
- Bacterial :
 - Haemophilus influenza → most common cause
 - Specific dangerous site → epiglottis → suffocation
 - Barking cough, stride, fever, dyspnea, cyanosis, open mouth, extended neck, dysphonia, even aphonia, drooling of saliva
 - You shouldn't exam mouth especially tongue depressor
 - At causality unit: cannula, I.V fluid, antibiotics, tracheostomy

#Croup

- Affect infants, in winter,
- Barking cough + well activity + stridor at night + low grade fever
- Para-influenza virus, Respiratory syncytial virus

- Haemophilus influenza, Diphtheria, Staph.aureus, Strept.pneumoniae
- Complications of RSV: acute respiratory distress syndrome, bronchiolitis obliterans, congestive heart failure, myocarditis, chronic lung disease
- Management of croup: epinephrine, mist therapy, steroids (dexamethasone 0.4 mg/kg/day to decrease edema)

<u>#Epiglottitis</u>

- Toxic and dangerous and patient not well
- Nasal discharge (within 6 hours)
- Fever, extended neck, drooling saliva, air hunger, barking cough, suffocation, dyspnea
- Under general anesthesia in surgical room for investigation
- In chest x-ray → thumb printing
- Acute epiglottitis may be caused by H.influenza
- Epiglottitis and foreign body (cause sudden strider) are emergency conditions
- Need hospital admission → oxygen + IV line (fluid and antibiotics) + assessment of circulation, monitor of urine output + not use tongue depressor + ay need tracheostomy

<u>#Otitis media</u>

- High grade fever
- Unexplained crying
- Rubbing ear

<u>#Sinusitis</u>

- High grade fever
- Nasal discharge is purulent > 10 days

<u> #Pertussis</u>

- It is infection of the respiratory system caused by bordetella pertussis
- Signs and symptoms:
 - Common cold: running nose, sneezing, mild cough, low grade fever
 - After 1-2 weeks: the dry irritating cough evolves into coughing spells (the child may return red or purple) then the child make a characteristic whooping sound when breathing in or may vomit (post-tussive) // cyanosis // reddish discoloration
 - Between spells the child usually feels well
- At first patient come with burst gum cough then continuous cough then cyanosis then whooping cough
- Paroxysmal cough > 5-6 times accompanied by post-tussive emesis, repeated episodes, if more than 8 times → DDx: pertussis

- Not all patients come with whooping cough especially young babies, because it requires strong contraction
- Baby come with immature respiration → so can't produce enough force to produce whooping
- Pertussis → at any age from birth or at 2 months or 4 months age due to its relation with cellular immunity
- Definitive diagnosis: culture, atypical lymphocytosis
- Treatment: antibiotics for 2 weeks, mist therapy, rest

<u>#Bronchitis</u>

- Acute bronchitis \rightarrow usually viral in origin // bacterial occur in infants & malnourished
- Not common in pediatrics, but small trees (bronchiolitis) is common {in adult بالعكس} because length of tree shorter in pediatrics
- Common especially < 2 years winter viral
- All lower respiratory infection \rightarrow dyspnea
- Mostly it is precede by nasopharyngitis
- Cough: firstly dry then productive
- Fever, spasm, looks like asthmatic patient, recurrent episodes
- Signs: rhonchi and moist crepitation
- It is not associated with respiratory distress

<u>#Bronchiolitis</u>

- 0 month 2 years (usually 2-6 months)
- Viral causes \rightarrow RSV, adenovirus, para-influenza virus
- During winter and early spring
- Diagnosis: wheezy cough, acute respiratory distress in infant around 6 months old
- Clinical features: begins with high grade fever and nasal discharge and then with cough and severe dyspnea, patient not well, no barking cough, no strider
- Auscultation: Fine crepitation, expiratory wheezing, decreased air entry
- Bronchiolitis may lead to decease urine output due to dehydration with yellow color (Tachypnea, poor feeding, fever, SIADH)
- In bronchiolitis: after first diagnostic CXR for evaluation of the child we use oximetry and respiratory rate instead of CXR
- Q: how to differentiate between bacterial Broncho-pneumonia and bronchiolitis? by leukocytosis and C-reactive protein in pneumonia
- To differentiate between bronchiolitis and heart failure:
 - o Murmur
 - Enlarged left or right ventricle (apex beat)
 - On abdominal examination → if palpable liver: do liver span because bronchiolitis may push liver downward or hepatomegaly due to heart failure

- Management: steroids (no benefit), beta-agonist (no benefit), albuterol, only O2 therapy improves the condition
- Serious condition called → bronchiolitis obliterans
- Viral cause → low grade fever less toxic ESR & CRP normal normal X-ray Elevated lymphocytes
- Bacterial cause → High grade fever more toxic ESR & CRP elevated patchy consolidation in X-ray elevated neutrophils and leukocytosis

Important conditions to know:

- Laryngeomalacia → short neck, the patient come with stridor due to congenital atrophy of the larynx
- Tracheo-esophageal fistula → the patient come with history of respiratory tract infection
- Cystic fibrosis → the patient come with repeated chest infection and diarrhea → because patient can't spit up sputum and cause chest infection
- Meconium ileus → abdominal distention due to cystic fibrosis

#Diagnosis of:

- Left side heart failure:
 - Percussion: normal
 - Vocal fremitus: Normal (resonant)
 - Breath sound: normal
 - Added sounds: crepitation, wheeze
- Plural effusion:
 - Percussion: stony dull
 - Vocal fremitus: decreased (diminished)
 - o Breath sound: decrease in site of effusion
 - Added sounds: no
- Pneumonia (consolidation):
 - Percussion: dull
 - Vocal fremitus: increased
 - Breath sound: bronchial
 - Added sounds: rales
- Emphysema (COPD in late stage):
 - Percussion: hyper-resonant
 - Vocal fremitus: decreased
 - Breath sound: decrease vesicular breathing
 - Added sounds: no
- Pneumothorax:
 - Percussion: hyper-resonant

- Vocal fremitus: absent
- Breath sound: absent
- Added sounds: no
- Atelectasis (obstruction):
 - Percussion: dull
 - Vocal fremitus: decreased or absent
 - Breath sound: decreased or absent
 - Added sounds: no

<u>#Drugs:</u>

- Vancomycin → most frequent antibiotics used to treat patient with chest infection → given as slow drip (over 1 hour) because it may cause cardiogenic shock
- Nebulizer:
 - Nebulizer administration after 2 months (not before 2 months) because smooth muscles of bronchioles are not well developed and also the receptors of bronchodilator is not mature
 - Nebulizer → distilled water is replaced by normal saline because the tonicity of the later is similar to that of the blood
 - Ventolin (Salbutamol) 1 ml contains 5 mg → we give 0.15 mg/kg → lf 10 kg baby we give 10 x 0.15 = 1/5 mg/kg → thus give about 1/2 cc for 10 kg
- Steroid harmful in adenovirus \rightarrow oblitrance bronchiolitis

Notes:

- Upper respiratory tract (nasal cavity, pharynx, larynx) Lower respiratory tract (Trachea, bronchi, Lungs)
- Clinical features of: Upper respiratory tract (Rhinorrhea, Barking cough, Normal feeding, Normal activity) Lower respiratory tract (Irritable, significant dyspnea, significant cough, poor feeding)
- Nasopharynx → (nasopharyngitis, tonsillitis, pharyngitis)(no dyspnea, no cyanosis)
- Lymphoma (common malignancy in children) → clinically: abdominal mass, dyspnea, wheezing (compression), CXR (mediastinal widening)
- NTD: affects lower limbs and bladder sphincter at lower level and affect phrenic nerve (c3,4,5) at upper level
- Cystic fibrosis: lethal inherited (autosomal recessive) disease, affect exocrine glands, 90% respiratory tract, also affect the pancreas and multiple organs.
- Vesicular breathing is bronchial, but due to septae it will change, thus in consolidation and congestion bronchial not heard
- Tachypnea part of dyspnea, but dyspnea not synonymous with tachypnea
- Neonatal sepsis → Group b beta-hemolytic streptococci, listeria, E.coli

- Group A beta-hemolytic streptococci → lead to scarlet fever (red skin rah sore throat-fever), tonsillitis, rheumatic fever
- alpha-hemolytic streptococci \rightarrow in oral cavity lead to infective endocarditis
- Examine membrane cover the tonsils or pharynx:
 - Diphtheria → gray toxic fever membrane cover the whole nasopharynx tonsils even may include soft and hard palates, difficult to be removed – when remove cause blood oozing, diphtheria could lead to myocarditis
 - Beta-hemolytic streptococci → covers pillers and tonsils, gray to red, easily removed, doesn't reach the hard palate
 - o Infectious mononucleosis
- Staphylococcus (fist 2 months) / Mycoplasma pneumonia (in school age)
- Fever: viral (sudden, less severe) bacterial (gradual, more severe)
- Chronic cough > 1 months → trachitis
- Toxic infant + drooling saliva → epiglottis
- Pneumonia + severe cough with sudden deterioration may indicate → pneumothorax
- How can we know the patient's condition is stable? assessment of vital signs (especially respiratory rate), skin color, feeding, urine output // if not stable and become worse suggest abscess development (developing of sepsis) indicators of infection (patient in shock, with high fever, tachypnea, increase O2 demand, poor oxygenation, decreased mentality and stability) → do investigations (see cytokines, leukocytopenia suggest overwhelming infection)
- While measles for example → After 6 months due to its relation with humoral immunity from mother
- Congenital rubella → microcephaly + cardiac disease
- Viral infection (with adenovirus) → sticky eyes, conjunctivitis, dry cough, febrile, frequent bowel motion, chest infection / treatment by cold exposure to relieve spasm and inflammation
- The only virus that cause fever after dyspnea \rightarrow adenovirus
- Nasal discharge without cough, without fever \rightarrow common cold
- Watery nasal discharge \rightarrow green thick (nasopharyngitis)
- Fever + nasal discharge + pain \rightarrow pharyngitis
- Fever + dysphonia → laryngitis
- Chest x-ray → vertebrae adjacent to costocondrial junction are the only visible, when all vertebral column is shown → bad exposure
- Over inflated chest: flat diaphragm or more than 8 ribs on CXR
- Congenital diaphragmatic hernia on left side more common due to site of liver
- Diaphragmatic hernia: cyanosis, dyspnea, scaphoid abdomen
- Cow milk may cause: diarrhea, allergy (wheezing, rhonchi)
- Acute tracheitis caused by S.aureus
- Children < 1 month → may have hypothermia

- Edema may occur because RSV may cause inappropriate secretion of ADH
- How would you know that the infant have sputum with cough? usually if there is sputum, you can see that with vomiting
- Causes of irritability associated with breathlessness? dehydration, hypoxia
- Infectious mononucleosis: it is viral infection caused by EBV and causes suppurative pharyngitis (rare below 2 years) called glandular fever, may involve trochlear lymph nodes.
- Ampicillin and amoxicillin may cause skin rashes
- Q: when the child swallow organic particle or inorganic one, which of them is more dangerous? organic substance is more dangerous because the body immune response rapidly develop (more rapid than inorganic particle)
- DDx of cough + fit \rightarrow febrile convulsion, hypoxia, severe dyspnea \rightarrow caused by rotavirus
- CVS relation with environmental cold \rightarrow peripheral cyanosis (acrocyanosis)
- Respiratory problem + deceased urine output: SIADH, asthma, cystic fibrosis, dilution hyponatremia
- Neonate with heart failure have neither ankle edema nor raised JVP → because of small neck
- Rule of 60 in neonate: 60 breath/min, 160 mmHg, cardiothoracic ratio is 60%, PCV = 60%
- White sputum seen in: viral infection, asthma, other types of allergy
- Infantile colicky \rightarrow occurs in first 3 months because of overfeeding
- Poor ventilation and crowding \rightarrow TB and other communicable diseases
- The optimal interval between feedings is about 2-3 hours, because gastric emptying in pediatrics lasts about 2-3 hours
- Normal oxygen saturation is from 94 to 100 % ((SpO2))
- Signs of poor circulation → increase heart rate, cyanosis, pale face, cold skin, decrease in the BP and temperature and urine output and capillary refill and O2 saturation
- In pediatrics there is no tracheitis alone, in adult yes
- Dyspnea occur in asthma, pneumonia, bronchiolitis
- High grade fever with shivering → pus anywhere / UTI
- Low grade fever with sweating and rigor → rickettsia / TB
- Traveler fever \rightarrow flu like illness
- Persistent fever \rightarrow chronic infection
- BCG → look for scar
- Breath holding attack → benign condition, psychological cause, baby not cry, become cyanosed, disappear after the age of 5 years
- Down's syndrome → congenital heart disease and recurrent pneumonia
- Hypocalcaemia → strider, convulsions, carpopedial spasm
- Wheezing chest + GIT problems:
 - Seen in parenteral infection (rotavirus), cystic fibrosis, cow's milk allergy (cause eosinophilia because it is IgE mediated allergy)

- Clinical features: failure to thrive, dyspnea, wheezy chest, diarrhea, colicky abdominal pain, abdominal distention
- Diagnosis of hypertrophy without ECG:
 - PMI = point of maximal impulse = apex beat → normally in the mitral area but not necessarily be in mitral area
 - Left ventricular hypertrophy → if we feel apex beat displaced downward → the cause mostly is congestive HF
 - Right ventricular hypertrophy → if we feel apex beat displaced upward → the cause mostly is TOF
- Diagnosis of pneumonia without X-ray:
 - Hear bronchial breathing with added sound, but bronchial breathing without added sound is plural effusion
- Hyper-dynamic circulation → PDA, Aortic regurgitation, HF, thyrotoxicosis, anemia
- Dilated cardiomyopathy → 30% return normal, 30% have restrictive myocarditis, 30% will die.
- Most common causes of H.F in children: VSD, PDA, ebstein anomaly, common AV channel (in Down's syndrome)
- Timing table in heart diseases in pediatric:
 - o 12 hours → all cyanotic CHD like TGA and tricuspid atresia (presented as tricuspid stenosis)
 - 1 2 weeks → PDA discovered as Heart failure
 - 8 12 weeks → VSD
 - 6 months → Secondum ASD
 - \circ 6 9 months \rightarrow TOF