Pediatrics
OSCE

V 3.0

BY
Mohammed Nawaiseh

Acknowledgements

First and foremost, i would to thank allah for his never-ending grace,mercy and provision.

Nobody has been more important to me in the pursuit of this project than the members of my family. I would like to thank my parents, whose love, guidance,support and encouragement are with me in whatever I pursue. They are the ultimate role models.

I would like to express my very great appreciation to my Batch “**Doctor 2013**”

Thanks also to anyone I've forgotten who was instrumental in this project, especially those who contributed to this work in any way over the years.

Introduction

In this book, history & physical examination for the most important chief complaints and OSCE stations will be provided in a simple organized way,along with summary of investigations and management of the case.

Remember that you can use this book for taking history in your rounds , which will help you master history taking and gain confidence.

There are two general approaches for taking history in this book which will cover 80% of the cases , the first one is the “SOCRATES” approach which is mainly for Pain and similar complains, the second one is the “review of system” approach which is mainly for general cases that require scanning all the body to look for the problem . Other approaches will be used for other few cases .

Physical examination for pediatrics is the same as for adults with few add ons to suit the intended age category for the examination .

Theoretical information that will help in the diagnosis will be provided after each case.Acronyms will be used extensively in this book, and will be supplied in the next page. Past papers will be added to the end of the book.

When taking history , always ask the questions in same order as that will help recall the information and make you more organized which is very important the exam .

Please read the acronyms section and general approach to hx before you start studying; to get the most out of this book with ease.

Resources

1. Illustrated Textbook of Paediatrics (5th Ed) by Tom Lissauer, Will Carroll-Elsevier (2017)
2. Macleod’s clinical examination 13th edition
3. Peds-OSCE-and-Notes-corrected → old dosseyeh
4. Summary of examination, Done by: Hamzeh Naghawi
5. http://learn.pediatrics.ubc.ca/
6. developmental milestones →Dr.omar abu sharia’
7. Newborn Examination → Dr.haitham al khatib

Acronyms & Abbreviation

Hx	History		ROS	Review of Systems
PE	Physical Examination		NVD	Normal Vaginal delivery
PP	Patient Profile		CS	C-section
CC	Chief complaints		wt	weight
HPI	History of present illness		ht	height
PMH	Past Medical History		HC	Head circumference
PSH	Past Surgical History		NICU	neonatal intensive care unit
DH	Drug History		#	number
FH	Family History		FNW	Fever,night sweats, weight loss
SH	Social History		N\V	Nausea and Vomiting
MSS	Musculo skeletal system		D\C	Diarrhea and constipation
CNS	Central nervous system		RR	Respiratory rate
US	Urinary system		V\S	Vital signs
RS	Respiratory system		HR	Heart rate
CVS	Cardiovascular system		BP	Blood pressure
GI	Gastrointestinal system		BMI	Body mass index
Tx	Treatment		Temp	temperature
Bx	Biopsy		HA	headache
Dx	Diagnosis		IPPH	Introduction,permission, privacy, hand hygiene
Ddx	Differential Diagnosis		UA	Urine analysis
FTT	Failure to thrive		BWT	Birth Weight

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General approach to hx

1. PP
2. CC
3. HPI
    a. History of time (DOT.PC)
        i. D → duration
        ii. O → Onset → sudden or gradual
        iii. T → Timing
        iv. P → progression → increase or decrease or constant
        v. C → course → intermittent or continuous
    b. SOCRATES OR ROS or other special approach
    c. Other special questions (related to the case)
    d. Recent (recent events that may have association with the case)
        i. Recent sick contact
        ii. Recent animal contact
        iii. Recent travel
        iv. Recent drug intake
        v. Recent Contaminated food or water
        vi. Recent infection
4. Prenatal hx → events during pregnancy
    a. Infection or illness or drugs during pregnancy
    b. alcohol/smoking during pregnancy
5. Natal and neonatal hx
    a. Gestational age → term or preterm
    b. Mode of delivery → Normal vaginal delivery (NVD) or C-section (CS)
    c. Complications during delivery
    d. Birth weight
    e. NICU → neonatal intensive care unit
6. Developmental hx
7. PMH
    a. Previous similar episodes
8. PSH
9. DH
10. FH
    a. Similar episodes in other family members
    b. Related diseases in the family
    c. consanguinity
11. SH
    a. Residency (lives with parents or other)
    b. parent's (alive,married or divorced)
    c. Parents occupation and educational level
    d. Number of Sister and brothers

ROS “Review of Systems”

- In the ROS approach all the systems will be asked about, always ask those questions in the same order which will help you to recall the information faster and will prevent you from forgetting important questions.
- Occasionally, some systems has nothing to do with the chief complaints, so you may omit these questions depending on the case .
- When the child is unable to talk he might not express some complaints such as pain,nausea and others. So you may omit these questions in this case.
- In case of weird hard case in the exam you might ask the ROS and get at least half of the marks.

1. General
    a. FNW → Fever, chills or rigors ,night sweats , weight loss
    b. Pale or tired
2. Skin →
    a. Rash, hair loss, nail abnormalities.
    b. Purpura and petechiae .Easy bruisability
3. Fat → increased or decreased weight
4. MSS → muscle pain , joint pain or swelling ,bone pain or swelling
5. CNS
    a. Headache,Photophobia,nuchal rigidity
    b. Irritability, Lethargy ,Drowsiness,sleepy, Hypoactivity
    c. Poor feeding/vomiting
    d. Hypotonia
    e. Loss of consciousness, Seizures
6. Eyes
    a. colors→ Redness ,pale,yellow
    b. Periorbital edema
7. Endocrine
    a. Faltering growth → inability to gain wt
    b. polyuria, polydipsia, polyphagia
8. Ears
    a. Ear rubbing ,ear pain
9. Nose
    a. Runny nose
10. Mouth
    a. Poor feeding \ anorexia (decreased appetite)
    b. Mouth sores,mucositis
    c. Throat pain
    d. crying
11. RS
    a. Cough , SOB, hemoptysis, chest pain
12. GI
    a. N**V** ,D**C** ,abdominal pain

b. Change in stool color ,blood or mucus in stool
c. Melena (black tarry stool) and hematemesis
d. Steatorrhea (bulky ,difficult to flush, pale and oily appearance and foul-smelling).
e. perianal mucositis or sinuses or fistula.

13. US
    a. Dysuria, frequency and urgency
    b. change in urine color or amount or characteristic
        i. Decreased urine output or polyurea
        ii. Haematuria → red or brown
        iii. Frothy urine
        iv. Offensive/cloudy urine
        v. stones
    c. Loin pain or abdominal pain
    d. Enuresis → primary (from birth) or secondary (there is previous period of continence)

General Pediatrics

Fever

This is the hx for fever which includes the hx of meningitis\encephalitis, pneumonia & UTI.which all present with Fever.

PP

Name, age, gender

CC

Fever (increased temperature), duration ?

HPI

1. Fever
    a. Hx of time (PC,DOT)
        i. **D**uration, sudden or gradual **O**nset
        ii. **T**iming → at night or day or in the morning,specific time
        iii. **C**ourse → continuous or intermittent →+ duration of afebrile periods
        iv. **P**rogression → increase or decrease or constant
    b. Documented or not → How much?,highest temp ?
    c. Site of measurement
        i. Axillary, anal ,mouth
    d. Decreased by cold compression or cold shower or paracetamol “antipyretics” or by decreasing the clothes and getting out ?
2. ROS
    a. General
        i. FNW → **F**ever “chills or rigors” ,**n**ight sweats , **w**eight loss
        ii. Pale and tired
    b. Skin
        i. Rash → ask about site, palpable or not , blanch with pressure
        ii. Purpura and petechiae ,easy bruisability
    c. MSS
        i. joint pain or swelling , bone pain
    d. CNS
        i. Headache,Photophobia,nuchal rigidity → meningitis in older child*
        ii. Irritability, Lethargy ,Drowsiness,sleepy, Hypoactivity → meningitis in infants*
        iii. Poor feeding/vomiting
        iv. Hypotonia
        v. Loss of consciousness, Seizures → more in Encephalitis
    e. Eyes
        i. colors→ Redness (infection or irritation) ,pale (anemia) ,yellow “jaundice”
        ii. Periorbital edema
    f. Endocrine

i. Faltering growth → inability to gain wt

g. Ears
   i. Ear rubbing ,ear pain*

h. Nose
   i. Runny nose

i. Mouth
   i. Poor feeding \ anorexia (decreased appetite)
   ii. Mouth sores,mucositis
   iii. Throat pain
   iv. crying

j. RS
   i. Cough , SOB, hemoptysis, chest pain or neck pain ,rapid breathing

k. GI
   i. N***V** ,D**C** ,abdominal pain*
      1. If there is abdominal pain → SOCRATES
   ii. Change in stool color ,blood or mucus in stool
   iii. Melena (black tarry stool) and hematemesis
   iv. perianal mucositis

l. US
   i. Dysuria, frequency and urgency → UTI in older child*
   ii. change in urine color or amount or characteristic
      1. Decreased urine output or polyurea
      2. Haematuria → red or brown
         a. If yes → All over the course of urine flow or at the end or start of the flow
      3. Frothy urine
      4. Offensive/cloudy urine
      5. stones
   iii. Loin pain or abdominal pain → if yes , ask the SOCRATES
   iv. Enuresis → primary (from birth) or secondary (there is previous period of continence) سلس بولي ,اسأل اذا الولد او البنت بمسك البول او اذا يتبول لاإرادي
   v. Infrequent voiding → as cause not as a symptom
   vi. Ask about , how the genitalia are washed after voiding ? Wiping from back to front in girls.? Toilet training ?
   vii. If male → Uncircumcised male ?
   viii. Atypical UTI
      1. poor urine flow
      2. abdominal or bladder mass
      3. Ask about plastic catheters

3. Recent
   a. Recent sick contact → in family or school (any sick children)
   b. Recent animals contact
   c. Recent poorly cooked food or fast food or contaminated water ingestion
   d. Recent travel
   e. Recent or Recurrent infection
4. PMH and PSH

    a. Previous similar episodes → + how many times ?
    b. Malignancy , blood disorder (hemophilia or thrombocytopenia)
    c. Immunocompromised
        i. immunodeficiency
        ii. receiving chemotherapy or immunosuppressive medication
        iii. post-autosplenectomy in sickle cell disease
        iv. splenectomy or nephrotic syndrome
    d. Previous similar infection or recurrent UTI or other infections
        i. How much , did he\she was admitted to hospital
        ii. Prophylactic antibiotics was given ?
        iii. TB
    e. Recent upper respiratory tract infection.
    f. Central line
    g. Cystic fibrosis
    h. Congenital renal anomalies
    i. Hearing anomalies
    j. HTN and CKD
5. DH and allergies
    a. Prophylactic antibiotics
    b. immunization
    c. Painkiller,paracetamol
6. FH
    a. Similar condition with father or mother when were children
    b. Structural kidney diseases → Vesicoureteric reflux
    c. Other recent sick family member
7. SH
    a. Smoking and alcohol in the house
    b. Residency

Physical Examination :

1. General
    a. Well or sick ?
    b. Level of Consciousness
    c. Irritability ,Lethargy
    d. Color ? → pale, mottled, or cyanosed
    e. Rash
    f. mouth sores
2. Vital signs
    a. RR, HR ,BP, Temp,capillary refill → look for signs of shock and fever
        i. Tachypnoea → pneumonia
    b.
3. CNS
    a. Focal neurological signs
    b. Brudzinski/Kernig signs ?

    c. Neck stiffness (not always present in infants)
    d. Raised intracranial pressure - reduced conscious level, abnormal pupillary responses, abnormal posturing, Cushing's triad (bradycardia, hypertension, abnormal pattern of breathing)
    e. Late signs – papilloedema (rare), bulging fontanelle in infants, opisthotonus (hyperextension of head and back)
4. RS → air entry , Ears and throat ,Always examine tympanic membranes in febrile children,Erythema or exudate on the tonsils? ,chest recession, abnormal auscultation.
    a. In pneumonia → Look for tachypnoea, nasal flaring and chest indrawing.
    b. In pneumonia → There may be end-inspiratory coarse crackles over the affected area but the classic signs of consolidation with dullness on percussion, decreased breath sounds and bronchial breathing over the affected area are often absent in young children. Oxygen saturation may be decreased.
5. CVS → S1,S2 ? any added sounds
6. GI
    a. Inspection
    b. Palpation
    c. Percussion
    d. auscultation
7. UGS → costovertebral angle tenderness

Investigation

 # Septic screen

1. Blood
    a. Blood culture
    b. CBC with differential
    c. Acute phase reactant, e.g. C-reactive protein, ESR
2. Urine sample
    a. Urine analysis
        i. dipstick testing
            1. Nitrite stick testing → for bacteria in urine
            2. Leucocyte esterase stick → for white blood cells
            3. Glucose ,protein , blood
        ii. Urine culture and microscopy
            1. Clean catch → >10^5 CFU of a single organism per millilitre
            2. Catheter sample or suprapubic aspirate → Any bacterial growth of a single organism per millilitre
    - Consider if indicated:
1. Chest X-ray → RS infection
2. Lumbar puncture (unless contraindicated) → CNS infection
3. Specific bacterial and viral investigation
    a. Rapid antigen screen on blood/CSF/urine
    b. Meningococcal and pneumococcal (PCR) on blood/CSF samples
    c. PCR for viruses in CSF (especially herpes simplex virus and enteroviruses).

Contraindications to lumbar puncture:

1. Cardiorespiratory instability
2. Focal neurological signs
3. Signs of raised intracranial pressure, e.g. coma, high BP, low heart rate or papilloedema
4. Coagulopathy, Thrombocytopenia
5. Local infection at the site of LP
6. If it causes undue delay in starting antibiotics

Investigation For UTI

1. Urine analysis
    a. dipstick testing
        i. Nitrite stick testing → for bacteria in urine
        ii. Leucocyte esterase stick → for white blood cells
        iii. Glucose ,protein , blood
    b. Urine culture and microscopy
        i. Clean catch → >10^5 CFU of a single organism per millilitre
        ii. catheter sample or suprapubic aspirate → Any bacterial growth of a single organism per millilitre
2. Imaging
    a. US → for urinary system
    b. DMSA → after 3 months of UTI , for scarring
    c. MCUG

Management For UTI

1. Treatment
    a. < 3 months of age
        i. intravenous antibiotic therapy (e.g. co-amoxiclav) for at least 5–7 days then→ oral prophylaxis
    b. > 3 months and children with acute pyelonephritis/upper UTI (bacteriuria and fever ≥38° C or bacteriuria and loin pain/tenderness even if fever is <38° C)
        i. oral antibiotics (e.g. trimethoprim for 7 days); or
        ii. Intravenous antibiotics, e.g. co-amoxiclav, for 2–4 days followed by oral antibiotics for a total of 7–10 days.
    c. Children with cystitis/lower UTI (dysuria but no systemic symptoms or signs)
        i. Oral antibiotics such as trimethoprim or nitrofurantoin for 3 days.
2. Prevention
    a. High fluid intake → Regular voiding, double micturition
    b. Prevent or treat constipation
    c. circumcision in boys
    d. anti-VUR surgery in severe VUR
    e. Good perineal hygiene
    f. Lactobacillus acidophilus → probiotic
    g. Advise to check urine culture if develops clinical features suggestive of nonspecific illness
    h. If renal scarring or reflux on investigation, or develops recurrent UTIs:

i. Consider low-dose antibiotic prophylaxis → Trimethoprim (2 mg/kg at night) or nitrofurantoin or cephalexin
ii. Monitor blood pressure, proteinuria, renal growth and function

Investigation For Meningitis\Encephalitis

1. Blood:
    a. CBC with differential
    b. electrolytes and Urea
    c. blood culture
    d. Blood glucose and blood gas (for acidosis)
2. KFT,LFT
3. Coagulation screen, C-reactive protein
4. Culture of blood, throat swab, urine, stool for bacteria
5. Rapid antigen test for meningitis organisms (can be done on blood, CSF, or urine)
6. Samples for viral PCRs (e.g. throat swab, nasopharyngeal aspirate, conjunctival swab, stool sample)
7. Lumbar puncture for CSF unless contraindicated
8. PCR of blood and CSF for possible organisms
9. Consider CT/MRI brain scan and EEG

If TB suspected: chest X-ray, Mantoux test and/or interferon-gamma release assay, gastric aspirates or sputum for microscopy and culture (and PCR if available)

Management For Meningitis\Encephalitis

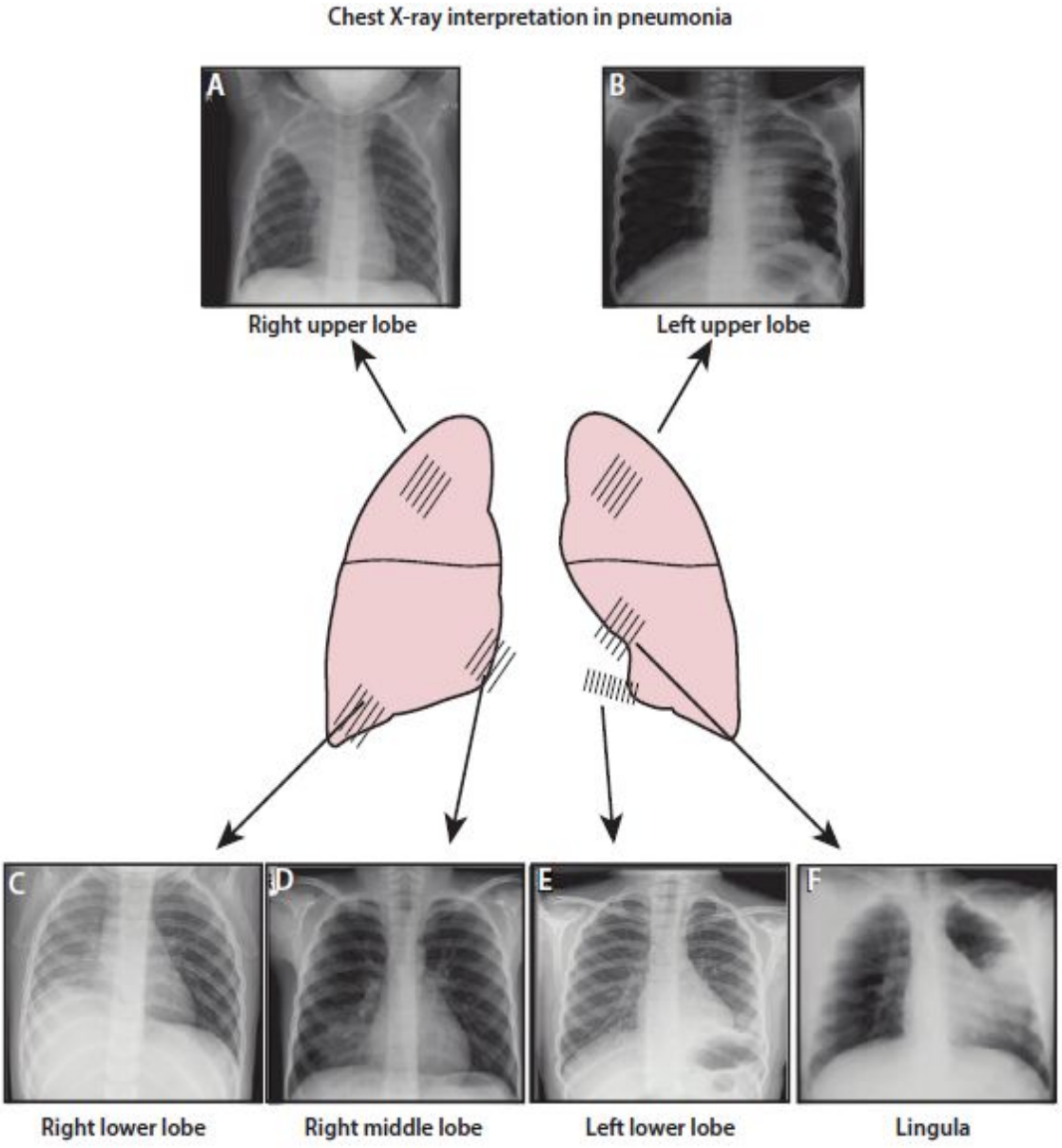
1. Antibiotics
    a. cefotaxime (<1 month)
    b. ceftriaxone (>1 month).
    c. vancomycin is added to cover G +ve
    d. In infants under 1 month of age, ampicillin is added to cover Listeria infection.
    e. Acyclovir→ (HSV) encephalitis
    f. Intramuscular benzylpenicillin immediately → any fever + purpuric rash
    g. ceftriaxone/vancomycin (just in case of strep-resistance)
2. Antipyretic
    a. paracetamol or ibuprofen

Investigation For pneumonia

1. Chest X-ray (Fig. 17.18, look below) may confirm the diagnosis but cannot reliably differentiate between bacterial and viral pneumonia.
2. Nasopharyngeal aspirate
3. Blood tests, including full blood count and acute-phase reactants are generally unhelpful in differentiating between a viral and bacterial cause.

Management For pneumonia

- Most affected children can be managed at home
- but indications for admission include
    - oxygen saturation <92%,
    - recurrent apnoea,
    - grunting and/or an inability to maintain adequate fluid/feed intake.
- General supportive care should include oxygen for hypoxia and analgesia if there is Pain.
- Intravenous fluids should be given if necessary to correct dehydration and maintain adequate hydration and sodium balance.
- Physiotherapy has no proven role
- Antibiotics (determined by the child's age and the severity of illness)
    - Newborns → broad spectrum intravenous antibiotics.
    - Older infants → oral amoxicillin, with broader spectrum antibiotics such as co-amoxiclav reserved for complicated or unresponsive pneumonia.
    - children over 5 years of age → either amoxicillin or an oral macrolide such as erythromycin is the treatment of choice.
    - There is no advantage in giving intravenous rather than oral treatment in mild/moderate pneumonia.
- If there is parapneumonic effusions (empyema on X-ray + persistent fever despite 48 hours of antibiotics) → drainage with ultrasound guidance



A. Consolidation of the right upper lobe with loss of volume of this lobe. The horizontal fissure has been shifted upwards.
B. Left upper lobe consolidation.
C. Right lower lobe consolidation with volume loss on the right. The heart silhouette is clearly seen but the right hemidiaphragm is raised and partially obscured.
D. A normal right hemidiaphragm but partial loss of the right heart border typical of right middle lobe consolidation.
E. Left lower lobe consolidation - the diaphragm is not clearly seen behind the cardiac silhouette.
F. Lingular consolidation with obvious loss of the left heart border.

Figure 17.18 A guide to the radiological appearances of pneumonia in different lobes of the lung. The diagram shows the horizontal fissures and shading illustrates the key finding in each lobar consolidation.

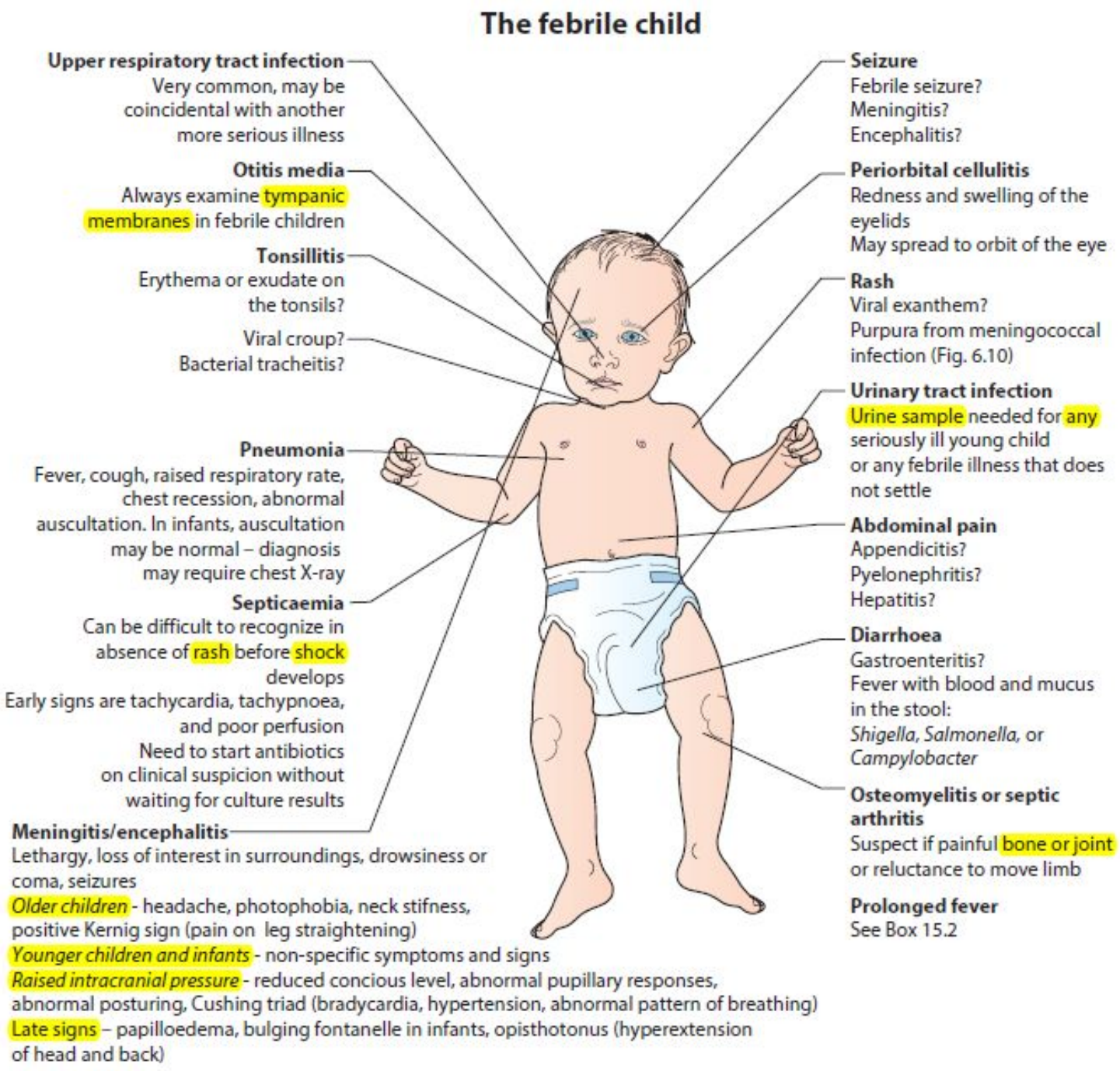


Figure 15.3 Diagnostic clues to evaluating the febrile child.

- Rash or purpura → meningococcal infection
- Dysuria alone is usually due to cystitis, or vulvitis in girls or balanitis in uncircumcised boys.
- UTI may involve the kidneys (pyelonephritis), when it is usually associated with fever and systemic involvement, or may be due to cystitis, when there may be no fever.
- Abdominal pain or loin pain + dysuria + hematuria +fever→ UTI
- Fever + HA+Photophobia,nuchal rigidity → meningitis
- Fever + Irritability, Lethargy ,Drowsiness,sleepy, Hypoactivity → meningitis

- Fever +Loss of consciousness, Seizures → Encephalitis
- Fever + chills and rigors + dyspnea → pneumonia
- Fever + vomiting and diarrhea → Gastroenteritis
- Fever + ear rubbing → otitis media
- Fever + bone pain → osteomyelitis
- Fever + joint pain → septic or reactive arthritis
- Dysuria alone is usually due to cystitis, or vulvitis in girls or balanitis in uncircumcised boys.
- UTI may involve the kidneys (pyelonephritis), when it is usually associated with fever and systemic involvement, or may be due to cystitis, when there may be no fever.
- all febrile neonates(<4 wks) should be:
    - Admitted
    - Given empirical IV antibiotics
    - Evaluated with a full sepsis work-up
- Most common infections in neonates (< 4 weeks) are caused by:
    - Gram –ve bacteria
    - Group B strep
- Choice of ABx should cover these groups. Therefore, start the patient on:
    - Ampicillin + cefotaxime
    - Ampicillin + gentamicin
- Indications for Admission:
    - If WBC >15,000 or < 5000, OR
    - Urine culture is +ve, OR
    - CXR is positive
    - Invasive diarrhea
    - Premature
    - Prior antibiotic treatment

The most common pathogens causing pneumonia vary according to the child's age:

- Newborn – organisms from the mother's genital tract, particularly group B streptococcus, but also Gram-negative enterococci and bacilli.
- Infants and young children – respiratory viruses,particularly RSV, are most common, but bacterial infections include Streptococcus pneumoniae or H. influenzae. Bordetella pertussis and Chlamydia trachomatis can also cause pneumonia at this age.An infrequent but serious cause is Staphylococcus aureus.
- Children over 5 years – Mycoplasma pneumoniae,Streptococcus pneumoniae, and Chlamydia pneumoniae are the main causes.
- At all ages Mycobacterium tuberculosis should be considered.

-In pneumonia , Fever, cough and rapid breathing are the most common presenting symptoms. Localized chest, abdominal, or neck pain is a feature of pleural irritation and suggests bacterial infection.

Skin Rash

PP → Name,age,gender

CC → Rash, Exanthem, Enanthem. , duration طفح جلدي او حبوب حمراء

HPI

1. Rash (SOCRATES)
    a. Site → where it started and to where it spread ?
        i. Nails and hair
        ii. Face , mouth, tongue, tonsils
        iii. Neck ,trunk, buttoks
        iv. Arms ,legs, sole and palms
    b. Onset → hx of time (PC,DOT)
        i. **O**nset → sudden or gradual
        ii. **D**uration → how long does each lesion last?
        iii. **T**iming → increase with sun, hot bath, exercise or Relieving factors – (e.g. **s**teroid cream)?
        iv. **P**rogression → At first? With progression ?
            1. S→ size, site, shape → flat or raised , solid or filled with fluid
            2. C→ Color
        v. **C**ourse → (Intermittent or continuous)
    c. Character
        i. S→ size, site, shape → flat or raised , solid or filled with fluid
        ii. C→ Color
        iii. Discharge or bleeding
        iv. Painful or itching
        v. Desquamation (peeling) ?
2. ROS
    a. General
        i. FNW → **F**ever (before, or during, or after; change in rash in relation to temperature?), **N**ight sweats , **W**t loss
        ii. Malaise or lethargy or anorexia, fatigue
    b. MSS
        i. Arthralgia or joint swelling, myalgia
        ii. Photosensitivity
    c. CNS
        i. seizure or HA or MR “mental retardation”
    d. Eyes
        i. Redness → conjunctivitis
    e. Ears → painful
    f. Nose → runny nose or sneezing
    g. Mouth → ulcers or dysphagia , tonsil pain
    h. Neck → lymphadenopathy
    i. RS → cough , wheeze, SOB → URTI

    j. CVS → chest pain
    k. GI
        i. N\V ,D\C, abdominal pain
    l. US
        i. Red urine , frothy urine
3. Recent
    a. Recent Sick contact → school or kindergarten or family member
    b. Recent animal contact → pets in the house
    c. Recent poorly cooked food or fast food or contaminated water
    d. Recent travel
    e. Recent or Recurrent infection
4. PMH
    a. Previous infections? E.g. chickenpox
    b. Recent URTI
    c. eczema, asthma, nasal polyps → ربو او زوائد لحمية
    d. Skin disease, rheumatologic disease, malignancy
    e. Neurological (neurofibromatosis, tuberous sclerosis)
5. DH ,allergy and vaccination
    a. Penicillin or other Abx
    b. Topical drugs, Lotions and creams
    c. Allergy to drug or food or vaccination
6. Family History:
    a. Sick contacts, similar lesions
    b. Atopy, eczema, asthma
    c. Food or vaccine allergy
    d. Malignancy
    e. Rheumatologic disease
    f. Immunodeficiency
    g. Bleeding disorder

PE

1. IPPH → Introduction,permission, privacy, hand hygiene
2. Genreral
    a. Well or sick
    b. Conscious oriented
    c. Lethargy or irritable
    d. Not in pain or distress
3. V\S → RR,HR,BP, Temp, capillary refill
4. Growth parameters
    a. Ht, wt, HC
5. Skin → rash
    a. S→ size, site, shape → flat or raised , solid or filled with fluid
        i. Nails and hair
        ii. Face , mouth, tongue, tonsils ,palate

iii. Neck ,trunk, buttoks
iv. Arms ,legs, sole and palms

b. C→ Color
c. Discharge or bleeding
d. Blanch or not , palpable or not

6. Eyes
    a. Redness
7. Lymphadenopathy
8. RS,CVS ,CNS exam → according to the Hx
9. GI
    a. Liver and spleen → hepatosplenomegaly

Investigations:

1. Blood
    a. CBC
    b. ESR, CRP → inflammation of arthritis and SLE
    c. ASO → strep B
    d. PT, PTT → bleeding disorders
    e. ANA, C3, C4, RF → arthritis and SLE
2. Infection
    a. Serology (measles, rubella)
    b. PCR
3. UA, urine culture
4. Echo
5. Skin bx

1. Blanching rash , rash spread pattern (head → trunk → extremities) ill child ,Koplik's spots opposite lower molar teeth (white spots), stenson line beneath the eye → measles
2. Vesicular , Lesions in different stages: papules, vesicles, crusting → Chickenpox
3. Like measles but well looking,posterior lymphadenopathy,Forschheimer spots on soft palate → rubella
4. slapped cheeks ,Lacy reticular rash → Erythema infectiosum (fifth disease)
5. High fever for 3-4 days, Followed by seizures,Generalized rash (trunk to extremities, face spared) → Roseola infantum or exanthem
6. Tonsils and pharynx membrane , strawberry tongue,sandpaper-like, erythematous, blanching rash and desquamation → Scarlet fever
7. Erythema marginatum – transient macular with central clearing on extensor surfaces → Acute rheumatic fever
8. Kawasaki
    - <4 years old
    - Fever >5 days
    - Bilateral conjunctival redness,red lips

- Injected pharynx or “strawberry tongue”
- Erythema of palms or soles
- Edema of hands or feet
- Cardiac complication
- periungual desquamation
- Cervical lymphadenopathy

9. Inflammatory Bowel Disease → Erythema Nodosum, Pyoderma Gangrenosum
10. SLE
    - Butterfly or discoid rash \ photosensitivity
    - Arthritis
    - Seizure and psychosis
    - Mouth ulcers
    - CBC → anemia , leukopenia, neutropenia
    - ANA , (anti DNA, anti rho ,anti sm , antiphospholipid)
    - Proteinuria → lupus Nephritis

Failure to Thrive

PP

Name,age,gender

CC

FTT ,duration

1. ما بطول
2. ما بنصح
3. مش عاجبني
4. بفرق عن اخوانه
5. نفس قياس الملابس من كم سنة

HPI

1. Hx of time (PC.DOT)
    a. Onset → from birth (primary,premature or prenatal ,IUGR) or postnatal (2nd)
    b. Duration
    c. Progression
        i. Increase,constant ,worsen
        ii. Growth Delay, or Growth Arrest?
2. Nutritional hx (feeding hx)
    a. Infant (Breastfed or bottle-fed? , Exclusive breast-feeding or mix ?)
        i. Breast-feeding
            1. Freq → how much a day
            2. Duration → per session
            3. Lactation problems→ Poor suckling? ,Refusal
            4. Feeling of breast emptying , sleep after suckling
            5. Parental dietary beliefs
        ii. Bottle-feeding
            1. Freq → how much a day
            2. Duration → per session
            3. Amount → per ml
            4. Type of formula , method of formula Preparation
            5. Refusal
            6. Parental dietary beliefs
        iii. Weaning started? (If yes → Quality? Quantity?, age of Weaning)
    b. Child
        i. Freq → how much a day
        ii. Duration → per session
        iii. Quantity and Quality of food ? → milk intake, protein intake
        iv. Appetite → normal or decreased

v. Does the child feed himself?
vi. Timing → Where does he eat (if while watching TV → distraction)?
vii. Who observes the child while he eats?
viii. Excessive snacks and juice ?
ix. Parental dietary beliefs

3. ROS
    a. General
        i. FNW → fever ,night sweats,weight loss
        ii. Recurrent infection → CNS, RS , otitis media, throat pain,GI,US
    b. Fat
        i. Wt loss ? how much ? duration?
    c. Muscle
        i. Muscle wasting, **buttock wasting**
    d. Bone
        i. Ht or length
    e. CNS
        i. **Irritable** ,lethargic , activity (decreased, nl or increased)
        ii. Seizure , LOC
        iii. Mental retardation or delayed development
    f. Mouth
        i. Appetite, and food intake
        ii. oral ulcers , dysphagia or odynophagia
    g. Endocrine
        i. Hypothyroid
            1. Dry skin, hypoactivity, goiter, constipation , menorrhagia, cold sensitivity
        ii. DM or DI
            1. Polyuria and polydipsia or polyphagia
    h. RS
        i. Cough , SOB, wheeze
    i. CVS
        i. Chest pain ,cyanosis
        ii. Hemato → anemia → SOB and pale
    j. GI
        i. N\V ,D\C, abdominal pain
        ii. **abdominal distension**
        iii. Stool → color or consistency or odor change ⇒ abnormal stools
            1. Melena (black tarry stool) or steatorrhea (yellow pale offensive stool)
    k. US
        i. Dysuria ,frequency,urgency
        ii. Hematuria or frothy urine
        iii. Urine output

4. Prenatal History
    a. Maternal “disease, nutrition, infection) during preg
    b. Smoking, alcohol, drugs during pregnancy

5. Natal History

    a. Gestational Age (premature)→ birth weight, length, head circumference
        i. preterm or intrauterine growth restriction
    b. Mode of delivery (natural vaginal birth or cesarean section)
    c. Any complication during delivery (e.g., asphyxia)
    d. Neonatal intensive care unit (NICU) admission
6. PMH
    a. CNS → CP ,MR
    b. RS → asthma and CF
    c. CVS → Congenital heart disease and anemia
    d. GI → celiac , GERD , pyloric stenosis
    e. US → CKD
    f. Recurrent infection
7. DH and Immunization
8. FH
    a. Similar condition in siblings, short stature, or developmental delay
9. SH
    a. Residency, own or rent house ,
    b. Occupation and insurance
    c. divorced parents ,single parent

PE

1. Generel
    a. Well or ill
    b. Conscious oriented
    c. Not in pain , not in distress
    d. Color → Pallor, cyanosis, jaundice
    e. Bad odors, Dirty clothes
    f. activity, dysmorphic features, short stature,
    g. signs & symptoms of injury or abuse
2. VS
    a. RR,HR,BP,Temp,capillary refill
3. Growth parameters
    a. Wt, ht or length, HC ,BMI ,fontanels
4. MSS
    a. Muscle wasting , short stature, koilonychia
    b. signs & symptoms of injury or abuse
        i. Ecchymosis , fracture
5. CNS
    a. Hypotonia , Conscious oriented
6. Face → dysmorphic features , periorbital edema , flat occiput
7. Mouth
    a. Ulcers, cleft lip and palate, angular stomatitis
    b. dental caries
8. Neck
    a. Thyroid → goiter

9. RS and CVS → if you suspect from the hx
10. GI → distension, organomegaly, mass

Investigations:

1. Blood
    a. CBC with diff
    b. Ferritin → IDA
    c. TFT, KFT and electrolytes
    d. Anti tissue transglutaminase and IgA → celiac
2. Urine analysis, urine culture
3. Stool culture, stool for ova and parasites
4. Sweat chloride test → CF
5. Infection
    a. HIV ,TB, hepatitis
6. Bone age (left wrist and hand x-ray)
7. Mid-parental height (for short stature)

#FTT: Often diagnosed by weight that:

1. Falls or remains < 3rd percentile for age;
2. Decreases, crossing two major percentile lines on the growth chart over time; OR
3. Is less than 80% of the median weight for the height of the child.

Recall, however, that:

1. 3% of the population naturally falls below the 3rd percentile. These children typically have short stature or constitutional delay of growth that usually are proportional (normal weight for height).
2. In the first few years of life, large fluctuations in percentile position can occur in normal children. Changes in weight should be assessed in relation to height (length) and head circumference.

#Allowances must be made for prematurity:

1. Head circumference corrections → until 18 months of age.
2. Weight corrections → until 24 months of age,
3. Height corrections→ until 40 months of age, and

In FTT, malnutrition initially results in

1. wasting (deficiency in weight gain).
2. Stunting (deficiency in linear growth) generally occurs after months of malnutrition, and head circumference is spared except with chronic, severe malnutrition.
   In pt with FTT condition weight is affected firstly, then, height, then HC

FTT that is **symmetric** (proportional weight, height/length, and head circumference) suggests:

1. Long-standing malnutrition,
2. Chromosomal abnormalities,
3. Congenital infection, or
4. Teratogenic exposures

Clues to **adequate feeding** (esp. if breast milk)

o Duration (10-15 mins on each one) o Feeling of emptying the breast
o Sleeping after suckling o Adding wt. o Urination, passing stool

FTT divided into: (DDx)

1. Non-organic → Iatrogenic/Sociopsychological → In the P/E, look for:
    a. Sings
        i. Bad odor
        ii. Dirty clothes
        iii. Muscle wasting
        iv. Flat occiput
    b. Poverty, poor feeding techniques, improper formula
    c. Emotional: neglect, violence, deprivation,abuse
    d. Social factors: divorce, alcohol
2. Organic
    a. CNS
        i. CP ,MR,hypotonia, neuromuscular disease
    b. Endocrine
        i. Hypothyroidism
    c. RS
        i. CF
    d. CVS
        i. Heart failure, Congenital heart disease
        ii. Hemato → Iron deficiency, sickle cell disease
    e. GI
        i. Malabsorption
            1. Celiac disease: presents at 6 months (age of weaning), NOT before
            2. Cystic Fibrosis: patient is usually short + thin
        ii. GERD, pyloric stenosis
    f. US → Renal failure
    g. Infections
        i. HIV, TB, parasitic infection, hepatitis
    h. Congenital/Anatomic
        i. Genetic syndromes → Prader-Willi Syndrome: patient is usually short + obese
        ii. congenital immunodeficiency
        iii. cleft lip, cleft palate

Growth Parameters

1. Wt
    a. Normal birth wt → 2.5-4.2 → 3.5 kg
    b. Doubling at 5 months
    c. Tripling at 1 year
2. Ht (length)
    a. Normal birth ht → 45-55 → 50 cm
    b. Increase 15 cm at 1st 6 months → 65 cm
    c. Increase 10 cm at 2nd 6 months → 75 cm
    d. Doubling at 4 years
3. HC
    a. Normal birth HC→ 37 cm
    b. Increase 7 cm at 1st 6 months → 42 cm
    c. Increase 5 cm at 2nd 6 months → 47 cm
4. Pre-term correction , until
    a. For HC: **18** months old
    b. For wt: **24** months old
    c. For ht: **40** months old
5. Fontanels
    a. Anterior
        i. 2-3 cm
        ii. Closes at 9-18 months
    b. Posterior
        i. Absent or .5 cm
        ii. Closes at 4-5 months
6. Teething
    a. Eruption → 6-7 months \ Delayed if it starts at 13 months
    b. Complete decidual teeth: 20 at 2.5 yrs (30 months)
    c. 1st to appear: lower central incisors → upper central incisors→ lateral incisors

Immunization History

- Background and Definitions:
  - Immunity:
    - Active immunity → body makes AB, life-long immunity
    - Passive immunity → giving Ig, immunity lasts for months
  - Active vaccines:
    - Live-attenuated: influenza, oral polio (OPV), MMR, varicella, BCG
    - Killed: injectable polio vaccine (IPV)
    - Parts of the microorganism: HBV, HiB, DTP, pneumococcal
- DTP: diphtheria, tetanus, pertussis
  - DT & dT
    - Given when it's contraindicated to give pertussis vaccine :
      - Progressive,Reaction
      - High grade fever
      - Encephalopathy
  - DT → high dose, < 7 yrs
  - dT:
    - Given when DT is contraindicated
    - = ½ the dose
    - Given if patient > 7 yrs
  - Whole limb erythema is not a contraindication, but we give acellular pertussis (aP)

#HBV → for adults 0-1-6, validity 10-20 yrs

- BCG:
  - First month or first contact, Intradermal
- Immunization History:
  - Up to age or not
  - Which protocol : e.g. جامعة,صحة,قطاع خاص
  - Age of each vaccine, route of administration
    - IV, IM ,subcutaneous , oral
  - Extra-vaccines
  - Complication
    - anaphylaxis, allergy
    - Fever
    - Dissemination in immunocompromised
    - Lymph node enlargement
    - Ulceration
    - Osteomyelitis

Vaccination schedule : preschool -Jordan

Age	Vaccine
1 st contact	BCG
2 months	DaPT1 + IPV1 +Hib1 + HepB1
3 months	DaPT2 + IPV2 +Hib2 + HepB2 + OPV
4 months	DaPT3 + IPV3 +Hib3 + HepB3 + OPV
9 months	Measles + OPV
12 months	MMR1
18 months	DPT booster 1 +MMR2+OPV booster 1

School Immunization Schedule

- School children who were completely vaccinated
  - الصف الأول → OPV +DT + checked for MMR (2 doses)
  - الصف العاشر → DT + checked for MMR (2 doses)
- Validate the primary vaccination (preschool program)
- Vaccinate the unvaccinated children according to national program

- BCG مطعوم السل أو مرض التدرن
- IPV مطعوم شلل الأطفال المقتول :Inactivated polio vaccine
- OPV مطعوم شلل الأطفال الفموي :Oral polio virus vaccines
- MMR: measles, mumps, and rubella (German measles):اللقاح الثلاثي:لقاح الحصبة والنكاف والحصبة الألمانية
- DaPT1 + Hib1 + HepB1 (المطعوم الخماسي)
- HiB :Haemophilus influenzae type B vaccine:لقاح المستدمية النزلية من النوع ب
- DPT : diphtheria, pertussis (whooping cough), and tetanus.مطعوم الخانوق ، والسعال الديكي والكزاز, the component with lower case "a" is acellular.
  TD vaccine, which lacks the pertussis component.
- **Hepatitis B vaccine:hepB** مطعوم الكبد الوبائي
- Booster: الجرعة المدعمة
- Tetanus vaccine, tetanus toxoid (TT)

Developmental Milestones

- There are 4 groups of Developmental Milestones that should be examined to determine the age of the child → fine motor, gross motor , social , language
- Start with the hearing tests (ears) then eyes then fine motor (hands) then gross motor then social then language.
- In each category ,If the pt is infant start from the first to 1 year.if he /she is a child start from the 1st year.
- The age of the baby is determined by the stage that is previous to the stage that the baby can't do.
- In each category , specify the predicted age. Then specify the age depending on all categories.

Developmental Milestones approach

1. Ears
    a. Make sound behind the baby's ears without him\her seeing you
        i. Newborns Startles to loud noises
        ii. At 6-7 months → moves head toward the loud noise
2. Eyes
    a. Look directly at the baby's eye if he\she
        i. Fixate but does not follow → < 1 month
        ii. Fixate and follow (less than 180 degrees) → between 1 and 2 months
        iii. Fixate and follow (more than 180 degrees) → > 2 months
3. Fine motor → hands
    a. Give the baby a pen (or something else) to grab
        i. If he\she reaches but didn't grabbed → < 4 months
            1. Moves eyes only toward the object → 1 month
            2. Moves hands toward the object → 2 months
            3. Moves body toward the object → 3 months
        ii. If he\she reaches and grabs → > 4months
            1. Hands in midline → 4months
            2. If he\she brings objects to mouth → 5 months
            3. If he\she transfers object from hand to hand → 7 months
        iii. Cover the object under the sheets, if he\she reaches and uncover the hidden objects → 10 months
        iv. Pencil grasp (give him\her a pencil and notice the grasp)
            1. 9 months →starts to develop
            2. 12 months → well developed
        v. Ask him\her to release the object
            1. Releases objects on command → 1 year
        vi. Ask about eating with spoon
            1. eats with spoon **with** missing →1.5 years بوكل و بوسخ حاله
            2. eats with spoon **without** missing → 2 years بوكل بدون ما يوسخ حاله
        vii. Ask to draw (**copy**) horizontal line then circle then square, then triangle
            1. Scribbling → 1.5 year
            2. Vertical line → 2 years
            3. circle → 3 years

4. Square → 4 years
5. Triangle → 5 years

viii. Other milestones
1. Hands closed → < 3 months
2. Opens hands spontaneously (hands open >90% of time), reaches & misses → 3 months
3. Drinks from a cup, turns pages of a book → 1 year
4. ties shoes → 5 years

4. Gross motor
   a. Start from head lag → prone position (ع بطنه) → Ventral Suspension (احمل المريض بايديك وبطنه لتحت) → Supine (ع ظهره) → Sitting → Standing → Walking
   b. Head lag → start from the supine position then hold both of the baby's arms and pull him\her to setting position and notice his\her head
      i. No head lag → > 4 months → skip the Ventral Suspension part
      ii. There is marked head lag → <3 months
      iii. Head lag partially compensated with bobbing → 3 months
   c. Prone position
      i. Moves head side to side, flexed body → At birth
      ii. lifts chin up → 1 month
      iii. lifts head 15^{o} → 2 months
      iv. lifts head & chest with arms extended & outstretched → 3 months
      v. Rolls over from prone to supine → 6 months
      vi. Rolls over from supine to prone→ 7 months
      vii. Creeps → 8 months بزحف وبطنه على الأرض
      viii. Crawls → 9 months بزحف وبطنه مرفوع عن الارض
   d. Ventral Suspension
      i. Head **below** plane of the body → 1 month
      ii. Head **with** plane of the body → 2 months
      iii. Head **above** plane of the body → 3 months
   e. From supine position make the baby sits
      i. sits **with** truncal support → 5 months
      ii. sits **with** pelvic support →7 months
      iii. sits **without** support, **rounded** back →8 months
      iv. sits **without** support, **straight** back →9 months
   f. Standing and Walking
      i. Cruises around furniture → 10 months بوقف بالاستناد على الاثاث
      ii. stands alone, walks with hand held or alone unsteadily → 1 year بوقف لحاله +بمشي مشية غير متزنة
      iii. walks alone well, crawls upstairs → 15 months بمشي باتزان وبطلع الدرج زحف
      iv. Runs stiffly, climbs upstairs with one hand held → 1.5 year بركض بصعوبة مثل البطريق وبطلع الدرج بمساعدة شخص اخر
      v. runs well, goes upstairs & downstairs one step at a time, jumps → 2 years بركض +بطلع الدرج درجة درجة+بقفز
      vi. goes upstairs alternating → 2.5 years بطلع الدرج مثل الكبار
      vii. stands momentarily on one foot → 3 years بوقف على رجل وحدة
      viii. Hops → 4 years بقفز على رجل وحدة

ix. Skips → 5 years https://www.youtube.com/watch?v=x3agbhyL-Ao

5. Social
    a. Social smile to anyone → 2 months
    b. Social smile to known people → 3 months
    c. laughs out loud → 4 months
    d. shows likes & dislikes, enjoys mirror → 7 months
    e. plays peek-a-poo → 9 months
    f. waves bye-bye → 10 months
    g. plays simple ball game → 1 year
    h. Hugs → 15 months
    i. Kisses + plays alone→ 1.5 year
    j. listens to stories → 2 years
    k. plays with others + washes hands → 3 years
    l. goes to toilet alone → 4 years
    m. dresses & undresses → 5 years
6. Language
    a. Cooing → 2 months
    b. Sounds (ba, ma, da) → 7months
    c. mama, dada (not specifically) → 9 months
    d. mama, dada (specifically) → 1 year
    e. Says 6 words, **responds** to name → 15 months
    f. 10 words, tells body parts when pointed to → 1.5 year
    g. (2-3)-word sentence → 2 years
    h. **knows** full name → 2.5 years
    i. counts **3** objects , knows age & sex → **3** years
    j. counts **4** objects → **4** years
    k. counts **10** objects, **prints** name →**5** years

Central nervous system

Headache

PP→ Name ,age
CC→ Headache “H\A” +duration ?

HPI:

1. SOCRATES :
    a. Site: “uni or bi” lateral ? , symmetrical , frontal ,temporal , behind the eye ?
    b. Onset +PC DOT +Frequency: gradual or sudden ,progression (increase or decrease or constant) and course (time & state of pt btw each attack), duration ,
    At morning ,at night , wake pt from sleep,
    After or during stress ? ,late nights or early rises ?
    c. Character : pressure ,band ,throbbing
    d. Radiation : to neck or scalp ?
    e. Associated :
        i. FNW → fever,night sweats,wt loss
        ii. autonomic disturbance :N\V , abdominal pain ,facial flushing,conjunctival injection, lacrimation and nasal discharge or congestion.
        iii. Horner’s syndrome: miosis partial ptosis,apparent anhidrosis , with or without enophthalmos (inset eyeball).
        iv. Aura (visual, sensory, or motor) :
            1. Visual :hemianopia (loss of half the visual field) or scotoma (small areas of visual loss) ,fortification spectra(seeing zigzag lines).
            2. unilateral sensory or motor symptoms (e.g. hemiplegic migraine).
        v. Photophobia and phonophobia + nuchal rigidity
        vi. Nausea and vomiting (morning or persistent)
        vii. Recent change in behavior or personality or educational performance
    f. Exacerbating and relieving factors+ triggers : food”chocolate,cheese , caffeine” ,sounds , light , stress “emotional or social problem at home or at school”,relaxation , menstruation , head or neck trauma”, alcohol or drug abuse or analgesia overuse. Increase with lying down or straining or coughing
2. Other medical condition that can cause “or associated with “ H\A
    a. Visual acuity – refractive errors \Visual field defects – craniopharyngioma \ Squint
    b. Sinus tenderness – for sinusitis
    c. Pain on chewing – temporomandibular joint malocclusion
    d. Blood pressure – for hypertension
    e. Growth failure
    f. Torticollis
    g. Ataxia

-migraine lasts more than 4 hours
Tx → Rescue treatments:

- Rescue treatments
    - Analgesia – paracetamol and (NSAIDs)

- Antiemetics – prochlorperazine or cyclizine
- Triptans (serotonin (5-HT1) agonists), e.g. sumatriptan. “nasal preparation”
- physical treatments such as cold compresses, warm pads, topical forehead balms.

- Prophylactic treatments
  - sodium channel blockers – topiramate or valproate
  - beta-blockers – propranolol; contraindicated in asthma
  - tricyclics: pizotifen (5-HT2 antagonist) or amitriptyline –
  - acupuncture.
- Psychosocial support

Summary

Headaches

Headaches history

Premonitory symptoms, aura, character, position, radiation, frequency, duration, triggers, relieving and exacerbating factors?
Special consideration:
Triggers – stress, relaxation, food, menstruation?
Emotional or behavioural problems at home or school?
Vision checked – refractive error?
Head trauma?
Alcohol, solvent, or drug abuse?
Analgesia over-use?

Investigations

Only consider these if Red Flag features

Headache type

Tension-type headache – constriction band.
Migraine without aura – bilateral or unilateral, pulsatile, gastrointestinal disturbance, e.g. nausea, vomiting, abdominal pain, photophobia. Lies in quiet, dark place. Relieved by sleep
Migraine with aura – preceded by aura (visual, sensory or motor), premonitory symptoms
Mixed-type headaches – common

Red flag symptoms – space-occupying lesion

Headache – worse lying down or with coughing and straining
Headache – wakes up child (different from headache on awakening, not uncommon in migraine)
Associated confusion, and/or morning or persistent nausea or vomiting
Recent change in personality, behaviour or educational performance

Red flag physical signs – space-occupying lesion

- Growth failure
- Visual field defects – craniopharyngioma
- Squint
- Cranial nerve abnormality
- Torticollis
- Abnormal coordination – for cerebellar lesions
- Gait – upper motor neurone or cerebellar signs
- Fundi – papilloedema
- Bradycardia
- Cranial bruits – arteriovenous malformation

Other physical signs

Visual acuity – for refractive errors
Sinus tenderness – for sinusitis
Pain on chewing – temporomandibular joint malocclusion
Blood pressure – for hypertension

Epilepsy

PP → name , age

CC→ convulsions,duration ?

-ask for eyewitness

HPI

1. Hx of time (PC,DOT)
    a. Onset
    b. Duration of each attack,frequency
    c. Timing → at night or at day, at the morning, sleep deprived,stress,flashing lights
    d. Progression
    e. Course
2. Type (partial or generalized)
    a. Partial → aura and convulsion in part of body
        i. loss of consciousness (complex) or no loss of consciousness (simple)
        ii. If there is aura (visual,auditory,olfactory hallucination ;headache ;dizziness;deja vu ;jamevu)
        iii. Specify the the site where the convulsion started at
    b. Generalized → all the body convulsion ,epileptic cry
        i. myoclonic,absence,tonic , atonic ,tonic clonic
3. Is there a fever ?
4. Preictal phase → is there an aura or happen without warning
5. During the attack→ ask about urine and bowel incontinence , tongue bite
6. postictal phase → confusion ,headache ,mood disturbance ,amnesia and duration of postictal phase
7. PMH,PSH
    a. Previous episodes
    b. ask about birth injury,childhood fever and diseases (meningitis)
8. drug history
9. family history
10. social ;smoking and alcohol in the family

PE

-Cranial nerves :

1)3rd 4th 6th nerve --diplopia or blurred vision

2)7th facial nerve → Frontalis ,orbicularis oris and oculi ,buccinator ,platysma

3)vagus and glossopharyngeal→ Palate deviation,speech

4)hypoglossal→ Tongue deviation,fasciculation, Ask to move tongue from side to side inside and out

Inspection of tongue bites

-Motor ;

Inspection of injury ,asymmetry,abnormal movement

Palpation of bulk

Power of UL and LL

Reflexes

Co-ordination; nystagmus ,finger to nose ,dysdiadochokinesia ,Romberg test

---

Normal neurological examination does not rule out epilepsy

-Complex partial:(partial+loss of consciousness) → Resistant to tx ,adult ,long aura

-Absence:(generalized) → Not Resistant to tx ,child ,no aura

-Febrile seizures

- Affect 3% of children; have a genetic predisposition. → ask about family hx
- Occur between 6 months and 6 years of age.
- Are usually brief, generalised tonic-clonic seizures occurring with a rapid rise in fever.
- If a bacterial infection, especially meningitis, is present, it needs to be identified and treated.
- If simple – does not affect intellectual performance or risk of developing epilepsy.
- If complex, 4–12% risk of subsequent epilepsy.

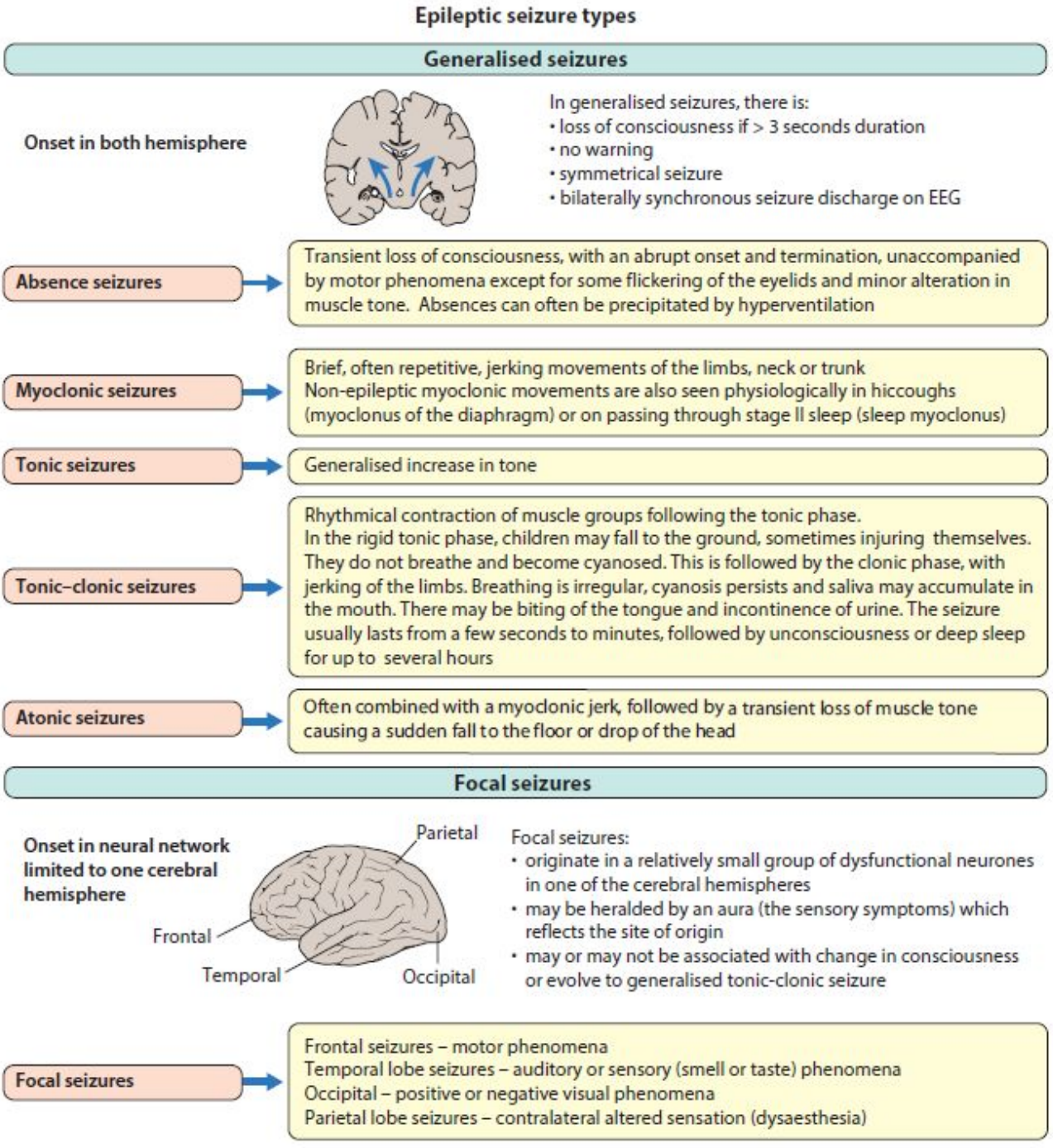


Figure 29.2 Epileptic seizure types.

Diagnosis of epilepsy →detailed history from the child and eyewitnesses, substantiated by a video if available,Clinical examination should include checking for skin markers for a neurocutaneous syndrome or neurological abnormalities

Investigation

1. ECG → to exclude convulsive syncope due to an arrhythmia,
2. EEG (electroencephalogram) → standard interictal EEG,or sleep or sleep-deprived record,or 24 hour ambulatory EEG or a 5-day video-telemetry EEG or video EEG

3. Brain imaging
    a. Structural. MRI and CT brain scans
    b. Functional.
        i. PET (positron emission tomography)
        ii. SPECT (single photon emission computed tomography)

Management

1. Antiepileptic drug therapy → Monotherapy is given if possible and chosen for the least potential adverse effects.
2. If intractable epilepsies
    a. Ketogenic (low-carb, fat-based) diets
    b. Vagal nerve stimulation
    c. Epilepsy surgery.
        i. temporal lobectomy
        ii. Hemispherotomy
        iii. Focal resections

Respiratory system

Asthma

PP:Name, age,gender
CC:Dyspnea ,cough with sputum ,wheeze + duration ?

HPI:

1. Hx of time (PC.DOT)
    a. Onset (sudden or gradual)
    b. Duration
    c. Timing (at rest**exertion** ,at **night** vs at **early morning**,reversible by inhalers,wakes pt from sleep ? ,**Seasonal variation**)
    d. **C**ourse (continuous,intermittent) + frequency + Interval symptoms(symptoms between acute exacerbations
    e. **Progression** (progressive,constant,worsening)
2. ROS
    a. General → FNW
    b. RS
        i. Cough (dry or productive)
            1. Sputum (Color,amount ,smell ,taste, solid materials)
            2. Hemoptysis
        ii. Wheezing (expiration) ,Stridor (inspiration)
        iii. SOB → Cyanosis
        iv. chest tightness
        v. hoarseness of voice
        vi. URTI → Runny nose , Nasal congestion,Sneezing,throat pain , ear rubbing ,eye redness,skin rash,diarrhea
    c. CVS
        i. Chest pain (Socrates)
        ii. Palpitation (sOCrATES)
            1. Onset ,character (regular or irregular) ,A,T (at night ,rest ,exertion) ,Exacerbated and relieving factors ,Severity
        iii. LL edema (bi or uni , painful?,hotness?)
    d. Psychogenic :
            1. Lightheadedness,dizziness ,
            2. tingling in fingers and around the mouth
            3. chest tightness
    e. GI → **N\V** ,D\C ,**abdominal pain** ,Heartburn ,Post-tussive vomiting(pertussis)
    f. CNS → HA
3. Recent
    a. Recent sick contact or animal contact
    b. Recent travel
    c. Recent trauma
    d. Recent infection →Viral infections → irritates airway
4. Exacerbating factors:

a. Asthma Exacerbating factors
    i. Smoke, perfumes, fumes → عطور ودخان
    ii. Cold air or exercise
    iii. Drugs → NSAID " aspirin"
    iv. Animals "pets and birds" or plants
    v. viral triggers
    vi. grass and tree pollens → غبرة
b. Anxiety
c. **Orthopnea**→ Lying flat
d. **PND** → Awakes pt from sleep→ if after 2-3 hours ,
    i. if with cough and wheezes ,often at 3-5 am→ **asthma**
    ii. Worse at waking up and relieve by coughing sputum→ COPD
e. **Platypnea**→ Sitting up
f. **Trepopnea** → Lying on one side
g. **Exercise-induced asthma** (continues to worsen for 5–10 minutes after stopping activity.)

5. Relieving factors:
    a. improving at weekends or holidays → occupational asthma
    b. Drugs (nebulizers , inhalers)
6. Severity:
    a. are they able to talk in full sentences? exercise intolerance? school attendance, activity, sleep ?
7. PMH
    a. **Previous episodes**
    b. Eczema , allergic rhinitis
    c. pneumonia ,TB \ sinusitis,influenza\
    d. GERD
    e. Visits to the ER in the last 2 months or o Hospitalizations
8. DH
    a. Reliever → inhalers or steroids → Compliance ?
    b. Exacerbating → NSAID and aspirin, Beta blockers ,Diuretics, **Antibiotics**
    c. Allergies
9. FH
    a. **Respiratory disease? –** asthma ,Eczema , allergic rhinitis / atopy / cystic fibrosis
    b. consanguinity
10. SH
    a. Occupation of parents
    b. Residency
    c. Hobbies – Bird fancier
    d. How much school has been missed due to asthma?

PE

Respiratory examination:

- General :
    - Well or ill ?
    - Distress or in pain
    - Conscious ,oriented
    - Color → pale ,cyanosis or jaundice
    - Thin,cachectic
    - Dyspnea and coughing (dry cough in asthma)
    - Growth should be plotted (normal growth unless extremely severe)
    - Evidence of eczema should be sought

- V\S :RR,HR,BP,pulse oxy,Temp,wt
    - tachypnea,tachycardia,hypotension,wt loss
- Hands:
    - Peripheral cyanosis
    - Flapping tremor
    - **No clubbing in asthma**
- Face:
    - Central cyanosis
    - Pursed lip,Nasal flaring, nasal mucosa for allergic rhinitis
    - prolonged expiration
- Chest:
    - Inspection:
        - Hyperinflation , 'barrel' chest,Harrison's sulci
        - Use of accessory muscles
        - Inward movement of lower ribs on inspiration (low flat diaphragm)
        - Retraction → Intercostal indrawing during inspiration
        - Grunting → a forced expiration against a closed glottis
    - Palpation:
        - Reduced cricosternal distance
        - Cardiac apex not palpable
    - Percussion:
        - Resonant
        - Loss of cardiac dullness on percussion
    - Auscultation:
        - Auscultation Reduced breath sounds ± wheeze
- Examine for LL edema ,sacral edema

Investigations:

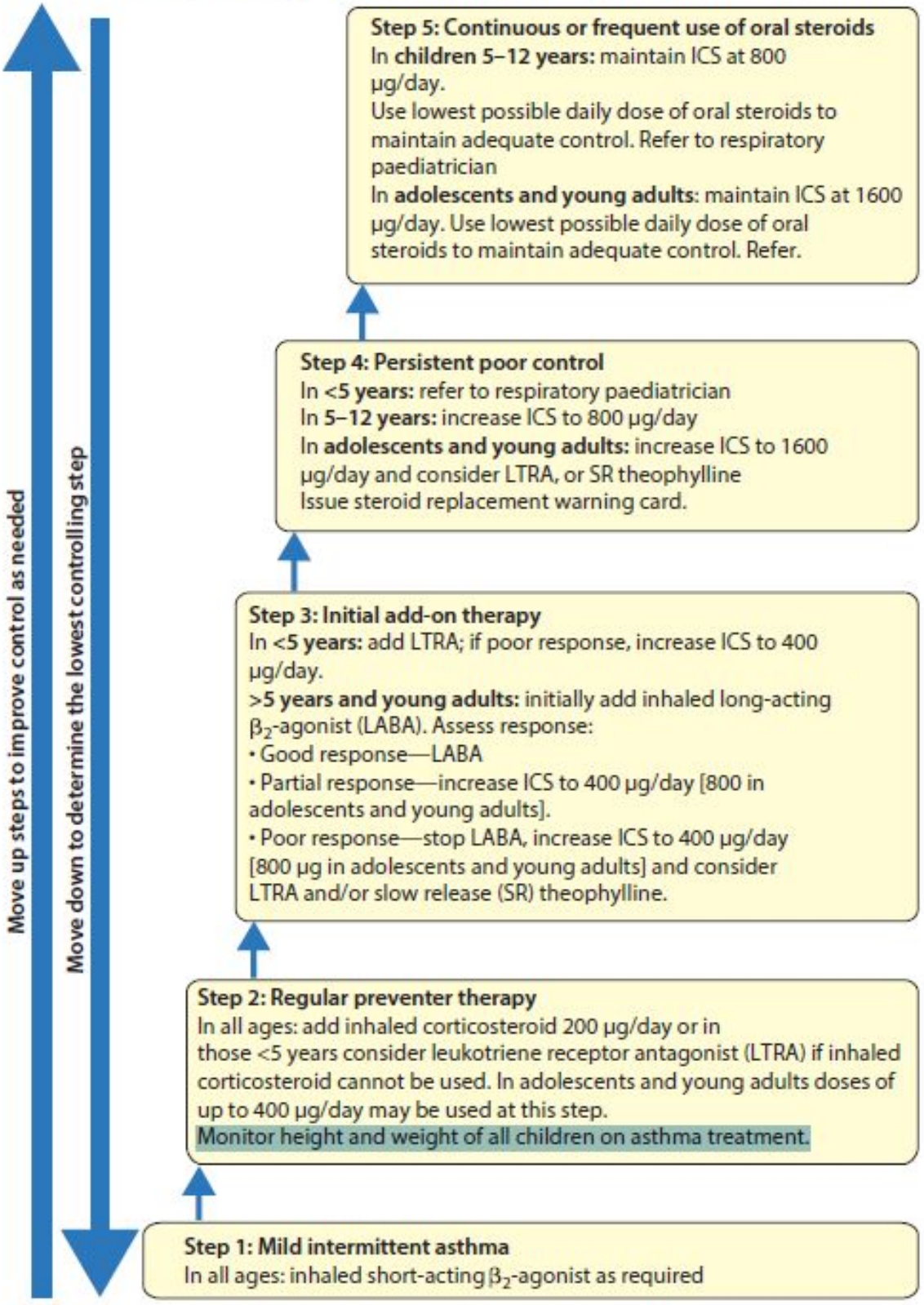
1. General
    a. CBC,Pulse oximetry
    b. CXR

    c. Allergy Skin Testing
2. α1-antitrypsin level
3. PFT → Peak flow meter ,Spirometry,Lung volume measurements,Exercise test

Management

1. To recognize if asthma is **controlled** or not → rules of two
    a. Have asthma symptoms or take your quick-relief inhaler more than Two times a week?
    b. Awaken at night with asthma symptoms more than Two times a month?
    c. Refill your quick-relief inhaler more than Two times a year?
    d. Measure your peak flow at less than than Two times 10 (20%) with asthma symptoms?
2. **Prevention** of the attack by avoiding known triggering factors
3. Management of the attack
    a. Rescue:
        i. Bronchodilators (short acting B- agonist) → Salbutamol
        ii. Anticholinergics → Ipratropium bromide
        iii. Epinephrine
        iv. Xanthine derivatives
        v. Mg sulfate
    b. Control (preventers)
        i. Steroids (main) → Inhaled corticosteroids,Prednisolone (oral,alternate days)
        ii. long acting B- agonist (LABAs) (add on >5 years) → Salmeterol
        iii. Montelukast (leukotriene receptor antagonist) (add on <5 years)
        iv. Theophylline → not often used in children
    c. Immunotherapy→ Omalizumab might be used in very severe cases. (Isotope switching of IgE into IgG)
    d. All are given by inhalation, except prednisolone, leukotriene modulators and theophylline preparations, which are by mouth, and omalizumab, which is by subcutaneous injection.
    e. Monitor height and weight of all children on asthma treatment.

A stepwise approach to the treatment of chronic asthma



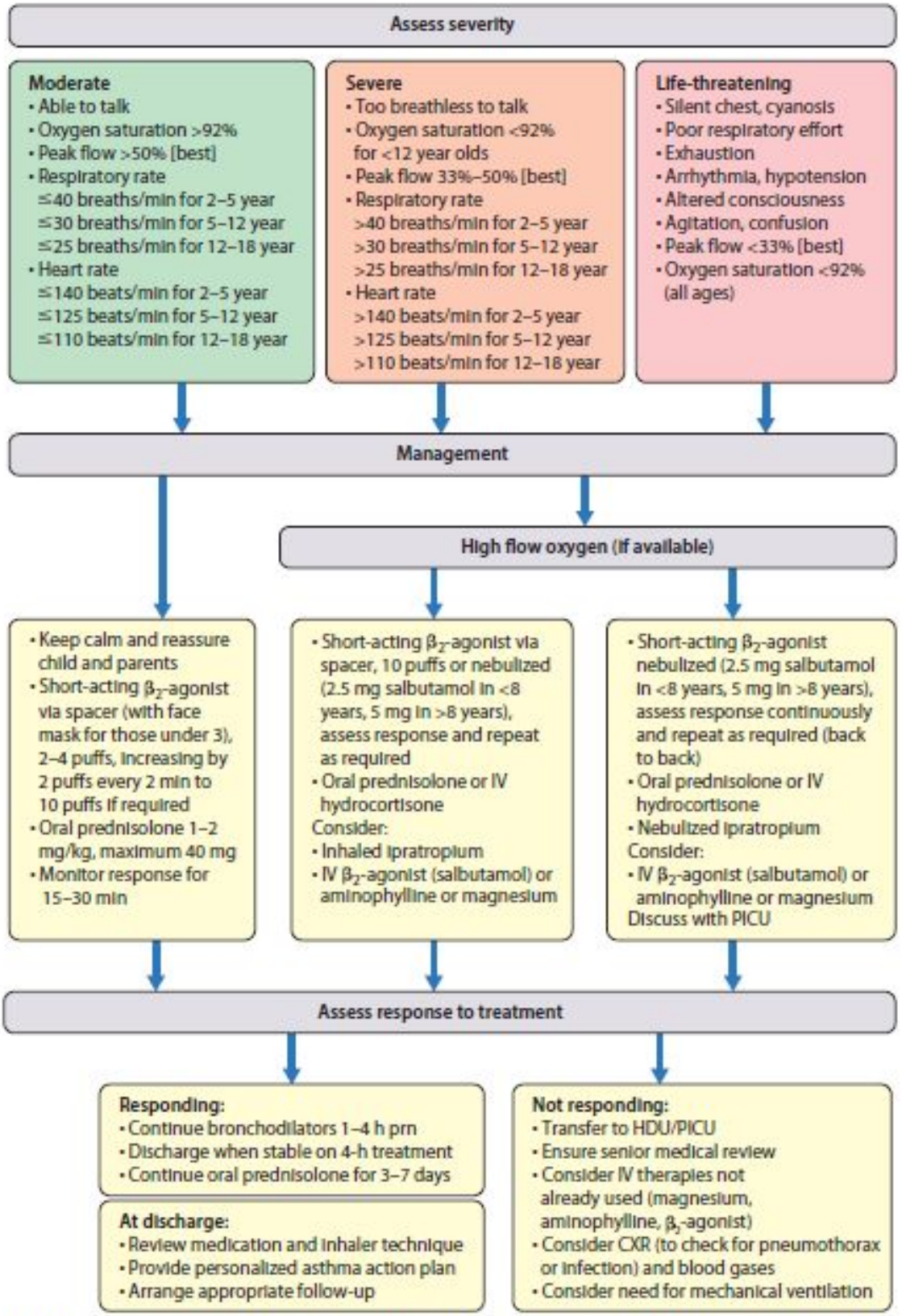


Figure 17.12 Assessment and management of acute asthma. (Adapted and modified from British Thoracic Society and Scottish Intercollegiate Guidelines Network (2016) with permission.)

Assessment of the child with acute asthma

Determine the severity of the attack (see Fig. 17.12):
- Mild
- Moderate
- Severe
- Life-threatening

This is determined by clinical features shown.

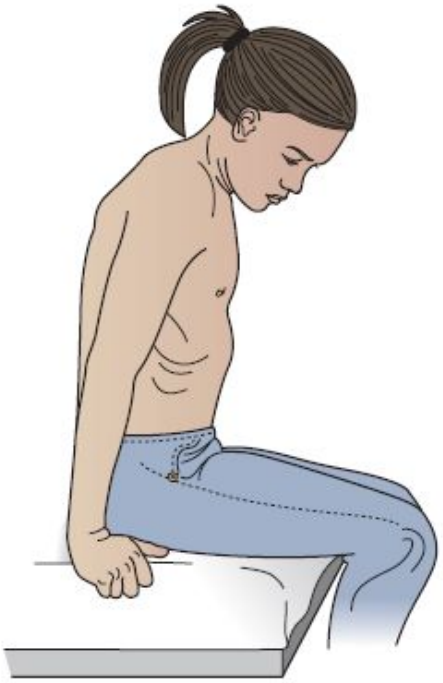
Too breathless to talk – severe

Increased work of breathing
Check respiratory rate:
- Tachypnoea – varies with age; poor guide to severity

Chest recession:
- Moderate – some intercostal recession
- Severe – use of accessory neck muscles
- Life-threatening – poor respiratory effort

Auscultation:
- Wheeze
- Silent chest – poor air entry from poor expiratory effort or exhaustion in life-threatening

Cardiovascular:
- Tachycardia – varies with age; better guide to severity than respiratory rate but affected by β_2-agonists
- Arrythmia, hypotension – life-threatening



Altered consciousness, agitation or confusion – in life-threatening
Exhaustion – life-threatening

Tongue:
- Cyanosis in life-threatening

Peak flow (% predicted or best or usual measurement):
- Moderate >50%
- Severe 33–50%
- Life-threatening <33%

O_2 saturation:
- Moderate ≥92%
- Severe or life-threatening <92%

Is there a trigger for the attack?:
- URTI or other viral illness
- Allergen, e.g. animal dander
- Exercise
- Cold air

Causes of acute breathlessness in the older child:
- **Asthma**
- **Pneumonia or lower respiratory tract infection**
- **Foreign body**
- **Anaphylaxis**
- **Pneumothorax or pleural effusion**
- **Metabolic acidosis – diabetic ketoacidosis, inborn error of metabolism, lactic acidosis**
- **Severe anaemia**
- **Heart failure**
- **Panic attacks (hyperventilation)**

Cough

HPI

1. Hx of time (PC.DOT)
    a. Onset (sudden or gradual)
    b. Duration
    c. Timing (at rest**exertion** ,at **night** vs at morning,reversible by inhalers,wakes pt from sleep ? ,**Seasonal variation**)
    d. **C**ourse (continuous,intermittent)
    e. **Progression** (progressive,constant,worsening)
2. ROS
    a. General → FNW , FTT
    b. Skin → rash
    c. MSS → myalgia
    d. CNS → HA , lethargy
    e. Face → facial tenderness (change with posture),postnasal drip → سوائل الأنف بتنزل على الحلق
    f. RS
        i. Cough (dry or productive)
            1. Character: barking, whooping, bovine, brassy, harsh نباحي,ديكي,بقري,خشن وناشف,صرير
            2. Sputum (Color,amount ,smell ,taste, solid materials)
            3. Hemoptysis
        ii. Wheezing (expiration) ,Stridor (inspiration)
        iii. SOB → Cyanosis
        iv. chest tightness
        v. hoarseness of voice
        vi. URTI → Runny nose , Nasal congestion,Sneezing,throat pain , ear rubbing ,eye redness,skin rash,diarrhea
    g. CVS
        i. Chest pain (Socrates)
        ii. Palpitation (sOCrATES)
            1. Onset ,character (regular or irregular) ,A,T (at night ,rest ,exertion) ,Exacerbated and relieving factors ,Severity
        iii. LL edema (bi or uni , painful?,hottness?)
    h. Psychogenic :
            1. Lightheadedness,dizziness ,
            2. tingling in fingers and around the mouth
            3. chest tightness
    i. GI →
        i. **N\V** ,D\C ,**abdominal pain** ,
        ii. Heartburn
        iii. Post-tussive vomiting(pertussis),drooling of saliva
        iv. steatorrhea

3. Recent
    a. Recent sick contact or animal contact
    b. Recent travel
    c. Recent trauma
    d. Recent infection →Viral infections → irritates airway
    e. Recent Choking or Aspiration
4. Exacerbating factors:
    a. Asthma Exacerbating factors
        i. Smoke, perfumes, fumes → عطور ودخان
        ii. Cold air or exercise
        iii. Drugs → NSAID " aspirin"
        iv. Animals "pets and birds" or plants
        v. grass and tree pollens → غبرة
    b. Anxiety
    c. Cough with lying flat → GERD
    d. **Exercise-induced asthma** (continues to worsen for 5–10 minutes after stopping activity.)
5. Relieving factors:
    a. improving at weekends or holidays → occupational asthma
    b. Drugs (nebulizers , inhalers)
6. Severity:
    a. are they able to talk in full sentences? exercise intolerance? school attendance, activity, sleep ?
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    a. **Previous episodes**
    b. Eczema , allergic rhinitis
    c. Food allergy
    d. CF
    e. pneumonia ,TB \ sinusitis,influenza\
    f. GERD
    g. Visits to the ER in the last 2 months or o Hospitalizations
8. Prenatal hx
    a. oligohydramnios → قلة سوائل في الرحم → BPD
9. Natal and birth
    a. GA , CS vs natural, NICU and ventilation
    b. Problems → Meconium ileus or plug, RDS,Diaphragmatic hernia, BPD → مشاكل بعد الولادة
10. DH
    a. Reliever → inhalers or steroids → Compliance ?
    b. Exacerbating → NSAID and aspirin, Beta blockers ,Diuretics, **Antibiotics**
    c. Allergies
11. FH
    a. **Respiratory disease? –** asthma ,Eczema , allergic rhinitis / atopy / cystic fibrosis
    b. consanguinity
12. SH

a. Occupation of parents
b. Residency
c. Hobbies – Bird fancier

PE

Respiratory examination:

- General :
  - Well or ill ?
  - Distress or in pain
  - Conscious ,oriented
  - Color → pale ,cyanosed or jaundice
  - Irritable, crying, lethargic
  - Dyspnea and coughing
  - Wheezing or stridor or grunting

- V\S :RR,HR,BP,pulse oxy,Temp,capillary refill
  - tachypnea,tachycardia,hypotension,wt loss
- Growth parameters: ht,wt ,HC → FTT (ID, CF)
- Hands:
  - Peripheral cyanosis
  - Flapping tremor
  - No clubbing in asthma
- Face:
  - Central cyanosis
  - Pursed lip,Nasal flaring
  - prolonged expiration
  - Eye redness or ear rubbing
  - nasal polyps, pharyngitis
- Neck → cervical & supraclavicular lymphadenopathy
- Chest:
  - Inspection:
    - Hyperinflation , ‘barrel’ chest
    - Use of accessory muscles
    - Inward movement of lower ribs on inspiration (low flat diaphragm)
    - Retraction → Intercostal indrawing during inspiration
    - Grunting → a forced expiration against a closed glottis
  - Palpation:
    - Reduced cricosternal distance
    - Cardiac apex not palpable
  - Percussion:
    - Resonant
    - Loss of cardiac dullness on percussion
  - Auscultation:
    - Auscultation Reduced breath sounds ± wheeze
- Abdomen

- Distention, hepatosplenomegaly: CF
- Tenderness: pneumonia

- Examine for LL edema ,sacral edema

Investigations:

- Blood
  - CBC → infection
  - ESR, CRP → inflammation
  - ABGs
  - IgE levels → asthma
- CXR → infection or pneumothorax
  - Steeple → croup → tx → o2 and salbutamol (b2 agonist)
  - Thumb → epiglottitis → tx →intubation and vanco+ceftriaxone
- PFT → Spirometry
- Bronchoscopy → foreign body (dx and tx)
- Methacholine challenge test, Allergy skin testing → asthma
- Sweat chloride test → CF
- Sputum or throat culture
- PPD → TB

theory
-Ddx

1. Foreign Body: history of choking, sudden onset of symptoms
2. Viral URTI : Fever, malaise, myalgia, headache, rhinorrhea, nasal congestion, conjunctivitis, sore throat, sneezing, diarrhea, skin rash
   a. Following specific respiratory infections (e.g. pertussis, respiratory syncytial virus, Mycoplasma)
   b.
3. Pneumonia: Fever, cough and rapid breathing are the most common presenting symptoms,preceded by a URTI. abdominal pain, vomiting, skin rash, conjunctivitis (adenovirus, chlamydia) ,Persistent lobar collapse following pneumonia
   a. most sensitive clinical sign of pneumonia in children is increased respiratory rate
   b. end-inspiratory coarse crackles over the affected area but the classic signs of consolidation with dullness on percussion, decreased breath sounds and bronchial breathing over the affected area are often absent in young children. Oxygen saturation may be decreased
   c. Dx → CXR
   d. Tx
      i. Newborns → broad spectrum intravenous antibiotics.
      ii. <5 Most older infants→ oral amoxicillin,
         1. co-amoxiclav reserved for complicated or unresponsive pneumonia.
      iii. > 5 years of age, either amoxicillin or an oral macrolide such as erythromycin is the treatment of choice.

4. Sinusitis: facial tenderness, headache, postnasal drip
5. Croup"Laryngotracheobronchitis": fever, Harsh cough,Inspiratory stridor,retractions
   Neck x-ray will show STEEPLE SIGN
6. Epiglottitis: high fever, stridor, sore throat, drooling of saliva, air hunger
7. TB: Fever, weight loss, hemoptysis, night sweats
8. GERD: heartburn
9. CF: diarrhea, steatorrhea, failure to thrive, dermatitis
10. Pertussis
    a. Caused by Bordetella pertussis.
    b. Paroxysmal cough followed by inspiratory whoop and vomiting; in infants, apnoea rather than whoop, which is potentially dangerous.
    c. Diagnosis: culture of organism on pernasal swab, marked lymphocytosis on blood film
11. Asthma
12. Cigarette smoking (active or passive

recurrent cough:

1. Asthma
2. CF
3. GERD
4. PND (post nasal drip: sinusitis, allergic rhinitis)

#A cough that lasts more than 8 weeks or one that has not improved after 3–4 weeks should be considered persistent in the absence of recurrent URTI.

Wheezing:

1. RS
    a. Bronchiolitis:
        i. 1st year of life
        ii. Tx → o2+b2 agonist+RSV vaccine: Palivizumab
    b. Asthma:
        i. Presents in older children
        ii. NO fever except if trigger of attack was RTI
        iii. +ve family history
    c. CF:
        i. Poor growth
        ii. Chronic diarrhea
        iii. +ve family history
    d. Foreign body aspiration:
        i. Focal area on radiography that doesn't inflate or deflate
    e. Exacerbation of chronic lung disease
    f. Viral or bacterial pneumonia, or other LRT disease
2. CVS → Cardiogenic asthma
    a. Presence of pulmonary congestions secondary to LHT
    b. wheezing, coughing or shortness of breath due to congestive heart failure.
3. GI → Gastroesophageal Reflux
    a. Chronic/recurrent wheezing
    b. frequent vomiting

c. heartburn

#CF “Cystic fibrosis”

- CF transmembrane conductance regulator (CFTR). located on chromosome 7.
- most frequent mutation (about 78%) in the UK is ΔF508
- Pathophysiology
    - **airways** → reduction in the airway surface liquid layer and consequent impaired ciliary function and retention of mucopurulent secretions.
    - Chronic endobronchial infection→ Pseudomonas aeruginosa.(P. aeruginosa has mucoid coat and loves salty environment)
    - Recurrent **infection**.
    - **intestine**, thick viscid meconium→ meconium ileus
    - **pancreatic** ducts → blocked by thick secretions → pancreatic enzyme deficiency and malabsorption.
    - Abnormal function of the **sweat glands** results in excessive concentrations of sodium and chloride in the sweat.
- Clinical features of cystic fibrosis
    - Newborn
        - Diagnosed through newborn screening
        - Meconium ileus → vomiting, abdominal distension, and failure to pass meconium in the first few days of life
    - Infancy
        - Prolonged neonatal jaundice
        - Growth faltering
        - Recurrent chest infections
        - Malabsorption, steatorrhoea
    - Young child
        - Bronchiectasis
        - Rectal prolapse
        - Nasal polyp
        - Sinusitis
    - Older child and adolescent
        - Allergic bronchopulmonary aspergillosis
        - Diabetes mellitus
        - Cirrhosis and portal hypertension
        - Distal intestinal obstruction (meconium ileus equivalent)
        - Pneumothorax or recurrent haemoptysis
        - Sterility in males
- General:
    - Short, thin, pale
    - Growth failure,Delayed puberty,Amenorrhea
    - Peripheral edema → protein malabsorption
- Respiratory:
    - Recurrent chest infections
    - Cough ,Sputum production (color, amount, viscosity)
    - Wheeze, SOB

- GI:
    - Steatorrhea (fatty, foul-smelling, floating)
    - Vomiting
    - Diarrhea
    - Abdominal pain
    - GERD
    - Jaundice
    - Hyperglycemia
- Neonatal History:
    - Meconium ileus or plug
    - Rectal prolapse
    - Prolonged neonatal jaundice
- Family History:
    - CF
    - Male infertility
    - Meconium ileus or plug

- The child has a persistent, 'wet' cough, productive of purulent sputum
- Sweat – salty may lead to dehydration in hot weather → HypoChloremic, hypoNatremic, HypoKalemic dehydration
- Pancreatic exocrine insufficiency (lipase, amylase, and proteases) → maldigestion and malabsorption. Untreated, this leads to faltering growth with frequent large, pale, and greasy stools (steatorrhoea). Pancreatic insufficiency can be diagnosed by demonstrating low faecal elastase.
- Cystic fibrosis should be considered in any child with recurrent infections, loose stools or faltering growth
- PE
    - General
        - Jaundice, Pale, Cyanosis
        - Resp. distress
    - Growth parameters: FTT
    - Vital signs
    - Hands: cyanosis, Finger clubbing
    - ENT: nasal polyps, sinusitis
    - GI exam
        - Scar from operation for meconium ileus as neonate
    - RS exam
        - hyperinflation of the chest due to air trapping, coarse inspiratory crepitations, and/or expiratory wheeze.
        - Harrison's sulcus
        - Central venous line
- Dx
    - sweat test → chloride conc. In sweat is markedly elevated (Cl 60–125 mmol/L in CF, 10–40 mmol/L in normal children
        - False Positive
            - Hypothyroidism,Adrenal insufficiency,

            - Poor technique/inadequate sweat collection
            - Dehydration
        - False Negative
            - Edema
            - Poor technique/inadequate sweat collection
            - Atypical cystic fibrosis (unusual gene mutations—uncommon)
    - Gene testing
    - nasal potential difference testing
    - Stool elastase
    - Antenatally by U/S polyhydramnios, echogenic bowel, obstruction
    - newborn screening (usually immunoreactive trypsinogen) or FH
    - On CT: we see railway sign of bronchiectasis
- Tx
    - Physiotherapy → chest percussion and postural drainage. Older patients perform controlled deep breathing exercises
    - continuous prophylactic oral antibiotics (usually flucloxacillin),
    - Nebulised antipseudomonal antibiotics and DNase
    - Pancreatic insufficiency→ oral enteric-coated pancreatic replacement therapy taken with all meals and snacks
    - high-calorie diet , 150% of normal. To achieve this, overnight feeding via a gastrostomy is increasingly used.
    - fat-soluble vitamin supplements

Stridor

CC:harsh, musical sound صفير

HPI

1. Hx of time (PC.DOT)
    a. Onset (sudden or gradual)
    b. Duration
    c. Timing (at rest**exertion** ,at **night** vs at morning,reversible by inhalers,wakes pt from sleep ? ,**Seasonal variation**)
    d. **C**ourse (continuous,intermittent)
    e. **Progression** (progressive,constant,worsening)
2. Severity
    a. characteristics of the stridor (none, only on crying, at rest, or biphasic)
    b. the degree of chest retraction (none, only on crying, at rest).
3. ROS
    a. General → FNW , FTT
    b. Skin → rash
    c. MSS → myalgia
    d. CNS → HA , lethargy,reduced level of consciousness
    e. Face → facial tenderness (change with posture),postnasal drip → سوائل الأنف بتنزل على الحلق
    f. RS
        i. Central cyanosis
        ii. Drooling of saliva
        iii. Cough (dry or productive)
            1. Character: barking, whooping, bovine, brassy, harsh نباحي,ديكي,بقري,خشن وناشف,صرير
            2. Sputum (Color,amount ,smell ,taste, solid materials)
            3. Hemoptysis
        iv. Wheezing (expiration) ,Stridor (inspiration)
        v. SOB and increased RR→ Cyanosis
        vi. chest tightness
        vii. hoarseness of voice
        viii. URTI → Runny nose , Nasal congestion,Sneezing,throat pain , ear rubbing ,eye redness,skin rash,diarrhea
    g. CVS
        i. Chest pain (Socrates)
        ii. Palpitation (sOCrATES)
            1. Onset ,character (regular or irregular) ,A,T (at night ,rest ,exertion) ,Exacerbated and relieving factors ,Severity
        iii. LL edema (bi or uni , painful?,hotness?)
    h. Psychogenic :

1. Lightheadedness,dizziness ,
2. tingling in fingers and around the mouth
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i. GI →
   i. **N\V** ,D\C ,**abdominal pain** ,
   ii. Heartburn
   iii. Post-tussive vomiting(pertussis),drooling of saliva
   iv. steatorrhea

4. Recent
   a. Recent sick contact or animal contact
   b. Recent travel
   c. Recent trauma
   d. Recent infection →Viral infections → irritates airway
   e. Recent Choking or Aspiration
5. Exacerbating factors:
   a. Asthma Exacerbating factors
      i. Smoke, perfumes, fumes → عطور ودخان
      ii. Cold air or exercise
      iii. Drugs → NSAID " aspirin"
      iv. Animals "pets and birds" or plants
      v. grass and tree pollens → غبرة

   b. Anxiety
   c. Cough with lying flat → GERD
   d. **Exercise-induced asthma** (continues to worsen for 5–10 minutes after stopping activity.)
6. Relieving factors:
   a. improving at weekends or holidays → occupational asthma
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   a. are they able to talk in full sentences? exercise intolerance? school attendance, activity, sleep ?
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   a. **Previous episodes**
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   c. Food allergy
   d. CF
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   f. GERD
   g. Visits to the ER in the last 2 months or o Hospitalizations
9. Prenatal hx
   a. oligohydramnios → قلة سوائل في الرحم → BPD
10. Natal and birth
    a. GA , CS vs natural, NICU and ventilation
    b. Problems → Meconium ileus or plug, RDS,Diaphragmatic hernia, BPD → مشاكل بعد الولادة

11. DH
    a. Reliever → inhalers or steroids → Compliance ?
    b. Exacerbating → NSAID and aspirin, Beta blockers ,Diuretics, **Antibiotics**
    c. Allergies
12. FH
    a. **Respiratory disease? –** asthma ,Eczema , allergic rhinitis / atopy / cystic fibrosis
    b. consanguinity
13. SH
    a. Occupation of parents
    b. Residency

Theory

- Stridor is a harsh, musical sound due to partial obstruction of the lower portion of the upper airway including the upper trachea and the larynx.
- most common cause is laryngeal and tracheal infection,
- severity of upper airways obstruction is best assessed clinically by characteristics of the stridor (none, only on crying, at rest, or biphasic) and the degree of chest retraction (none, only on crying, at rest).
- Central cyanosis, drooling or reduced level of consciousness suggest impending complete airway obstruction

Box 17.1 Differential diagnosis of acute stridor (upper airway obstruction)

Common causes

Viral laryngotracheobronchitis ('croup')

Rare causes

Epiglottitis
Bacterial tracheitis
Laryngeal or oesophageal foreign body
Allergic laryngeal angioedema (seen in anaphylaxis and recurrent croup)
Inhalation of smoke and hot fumes in fires
Trauma to the throat
Retropharyngeal abscess
Hypocalcaemia
Severe lymph node swelling (tuberculosis, infectious mononucleosis, malignancy)
Measles
Diphtheria
Psychological – vocal cord dysfunction

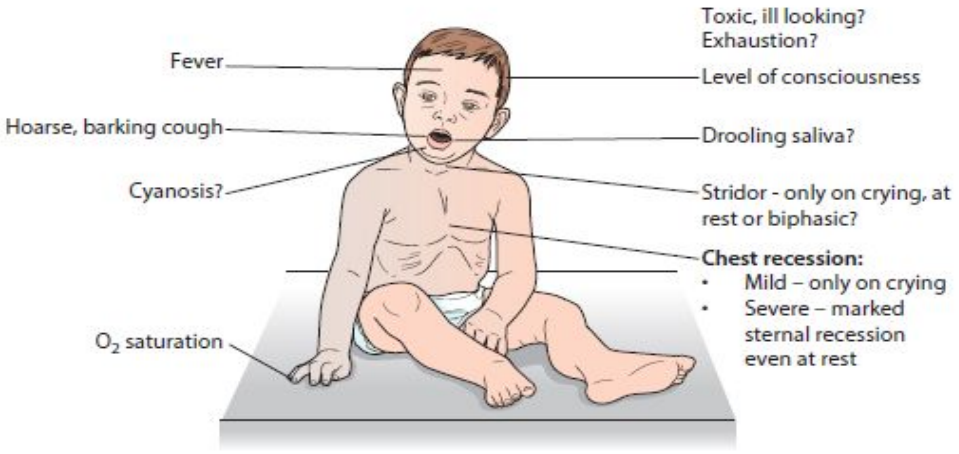
Table 17.1 Clinical features of croup (viral laryngotracheitis) and epiglottitis

	Croup	Epiglottitis
Onset	Over days	Over hours
Preceding coryza	Yes	No
Cough	Severe, barking	Absent or slight
Able to drink	Yes	No
Drooling saliva	No	Yes
Appearance	Unwell	Toxic, very ill
Fever	<38.5°C	>38.5°C
Stridor	Harsh, rasping	Soft, whispering
Voice, cry	Hoarse	Muffled, reluctant to speak

Summary

The child with stridor

Clinical features to assess



Clinical conditions

Croup:
- Mostly viral
- 6 months to 6 years of age
- Harsh, loud stridor
- Coryza and mild fever, hoarse voice, barking cough

Epiglottitis:
- Caused by *H. influenzae* type b, rare since Hib immunization
- Mostly aged 1–6 years
- Acute, life-threatening illness
- High fever, ill, toxic-looking
- Painful throat, unable to swallow saliva, which drools down the chin

Bacterial tracheitis:
- High fever, toxic
- Loud, harsh stridor

Inhaled foreign body:
- Choking on peanut or toy or object in mouth
- Sudden onset of cough or respiratory distress

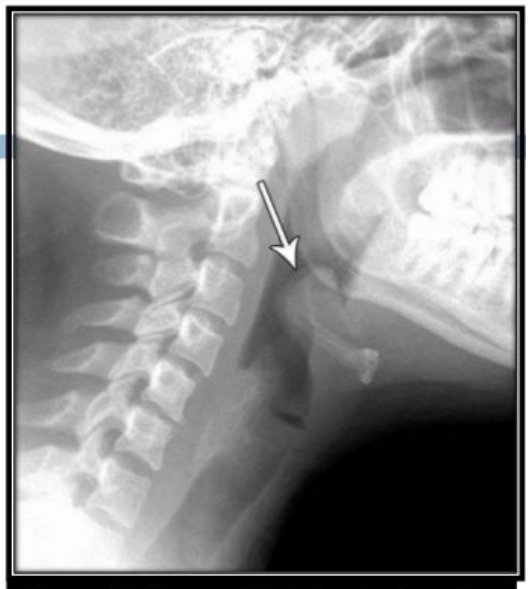
Chronic stridor:
- Recurrent or continuous stridor since birth or early infancy from laryngomalacia, congenital airway abnormality, or external compression, e.g. vascular ring

Other rare causes:
- See Box 17.1

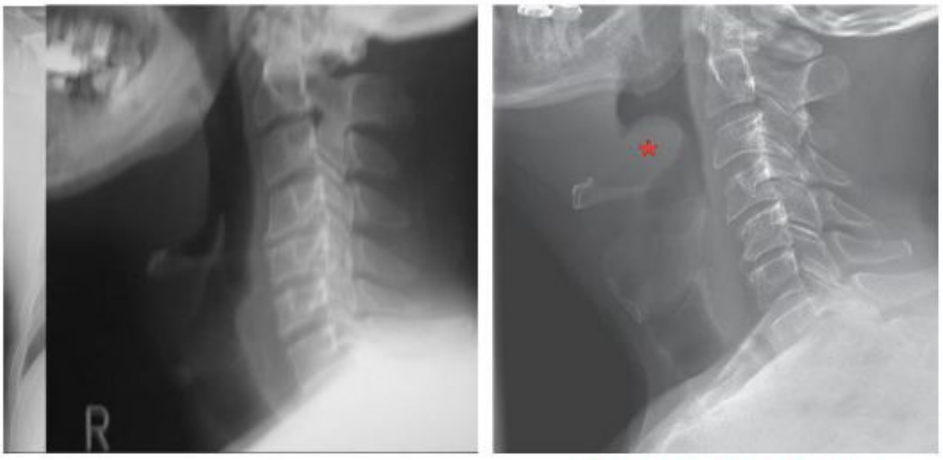
Basic management of acute upper airways obstruction is:
• reduce anxiety
• observe carefully for signs of hypoxia or deterioration – agitation or fatigue or drowsiness or cyanosis. Provide oxygen if required and tolerated
• do not examine the throat with a spatula! It may precipitate upper airway obstruction
• oral, nebulized or intravenous steroids are beneficial in croup and have similar speed of onset (90–120 min)
• if severe, administer nebulized epinephrine (adrenaline) and contact an anaesthetist
• if respiratory failure develops from increasing airways obstruction, exhaustion or secretions blocking the airway, urgent tracheal intubation is required.

X ray findings

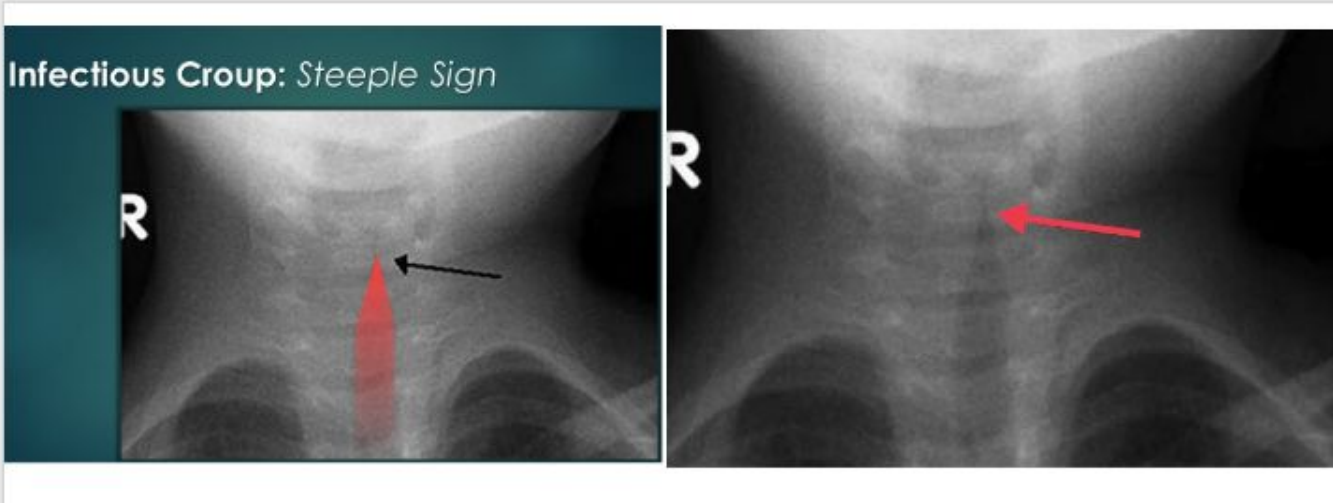
- Lateral soft tissue X Ray of Neck Shows **swollen epiglottis** i.e **Thumb sign**



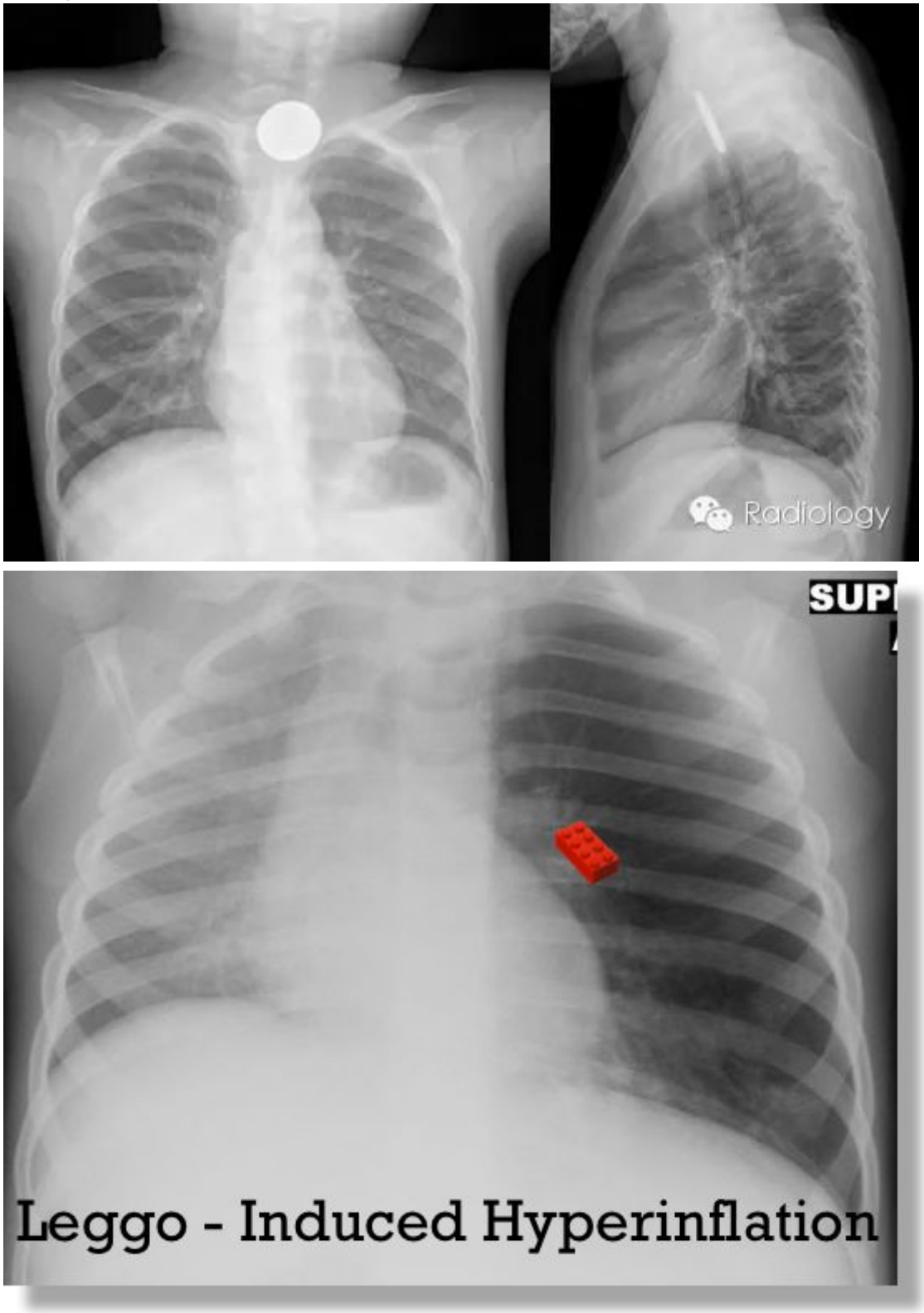
Lateral X Ray of Epiglottis showing Swollen Epiglottis.this is also Known as Thumb sign



Thumb sign



foreign body aspiration



Cardiovascular System

Syncope

PP → name and age
CC :loss of consciousness,fainting' or 'passing out'.Funny turn or blackout.
-ask for a witness

HPI:

1. **Triggers** :
    a. exercise (during or after) vs rest
    b. posture(sitting ,standing? Or prolonged standing ,coughing?,micturition?, eating?)
    c. Medication
    d. emotion"fear, anxiety or pain"
    e. Pt situation before attack :
        i. **external pressure to neck** (e.g. during neck movement or if a tight collar is worn,shaving)
        ii. **Hypovolemia** : Bleeding or hot weather or diarrhoea, vomiting, burn
        iii. ask if trigger consistently causes syncope
2. **Premonitory symptoms** "**Prodrome,presyncope"** :
    - Chest pain,Palpitation, Lightheadedness,
    - Breathlessness,
    - Nausea,Sweating,
    - Confusion,Hyperexcitability,
    - **'Aura**;strange light, an unpleasant smell, or confusing thoughts or experiences'.visual disturbances and a ringing in the ears (tinnitus)
    - **Color change**:
        Pallor → systemic hypotension, in syncope.
        blue colour (cyanosis) → in seizure
3. During :
    a. **Duration**
    b. Convulsions,tongue biting,urinary & faecal incontinence → more with seizure
4. After
    a. Speed of recovery(rapid or slow) ,confusion,headache,focal neurological signs ?,nausea ,vomiting
5. **ROS**
    a. CVS→ chest pain,palpitation ,peripheral edema.
    b. RS → dyspnea → orthopnea,PND
6. **PMH**;
    a. Previous episodes
    b. Recurrent syncope (more than two to three times)
    c. General → DM,HTN
    d. cardiac diseases → ,valvular disease ,pacemaker or defibrillator .
    e. **autonomic neuropathy**→
        i. **secondary;**diabetes, uraemia, spinal cord lesions
7. PSH;previous cardiac diseases,

8. **DH**;
    a. antihypertensives ex → diuretics (if excessive)
    b. Insulin → hypoglycemia
    c. antidepressants, and alcohol → in adolescence
    d. barbiturates, tricyclic antidepressants, and phenothiazines.
    e. cocaine, alcohol, marijuana, inhalants and opiates
9. FH**;sudden death**,cardiac disease,DM

- Syncope is defined as a sudden, brief loss of consciousness associated with loss of postural tone from which there is spontaneous recovery.
- Features suggestive of a cardiac cause are:
    - symptoms on exercise – potentially dangerous
    - family history of sudden unexplained death
    - palpitations.
- differentiate syncope from Dizziness "lightheadedness" or vertigo "feeling off balance"
- **Transient,** self-limiting, i.e. no intervention is needed for the patient to fully recover. This therefore excludes events such as cardiac arrest and hypoglycaemic coma which do not normally involve spontaneous recovery.
- Seizures are followed by a postictal fatigue lasting hours, in contrast syncope is usually followed by near immediate complete recovery with no lasting effects.
- Patients with seizures do not exhibit pallor, may have abnormal movements, usually take more than 5 minutes to recover and are often confused.
- Common conditions of syncope:
    - **Vasovagal syncope** – is by far the most common cause of syncope among children. Also known as neurocardiogenic, reflex or the common faint, it typically involves a precipitating event and a prodrome. Precipitating events can include standing or stress (physical or emotional) and even swallowing, hair grooming and micturition. The typical prodrome consists of light headedness, dizziness, nausea, visual changes, pallor and diaphoresis. The mechanism for the common faint involves an exaggerated reflex response in vasomotor tone and heart rate.
    - **Breath holding spells** – are most common in children aged 6 to 24 months. The cause is usually due to an emotional insult such as pain, anger or fear and the child may be cyanotic or pallid. If it is cyanotic, the breath holding begins and cyanosis develops and to loss of consciousness follows. If it is pallid spell, loss of consciousness will occur before breath holding. Breath holding spells usually follow a benign course and are expected to stop by the age of 5. The child may develop vasovagal syncope at a later age.
    - **Orthostatic hypotension** – occurs when there is a sudden reduction in blood pressure greater than 20/10 mmHg as a result of postural change such as moving quickly from sitting to standing. Dizziness and lightheadedness result. Volume depletion, anemia, and medications can exaggerate this response.
    - **Toxic exposure** – Exposure to toxins can result in decreased cardiac output or loss of consciousness caused by numerous toxins such as barbiturates, tricyclic antidepressants, and phenothiazines. Drugs such as cocaine, alcohol, marijuana, inhalants and opiates can also play a role in toxic exposure leading to syncope some of which can be life threatening
- Life threatening conditions of syncope
    - Primary Electrical Disturbances
    - Long QT syndrome
    - Preexcitation syndrome
    - Congenital short QT syndrome

    - Coronary artery anomalies
    - Valvar aortic stenosis
    - Dilated cardiomyopathy
    - Pulmonary hypertension
    - Acute myocarditis
- Other conditions:
    - Hypoglycemia
    - Arrhythmia
    - Bradycardia
    - Supraventricular tachycardia
- Differential Diagnosis
    - Seizures – Characterized by a loss of consciousness and postural tone. Seizures will sustain for longer than syncopic episodes and involve aura, prolonged tonic clonic activity, and/or the presence of a postictal phase.
    - Migraine syndromes – Can be similar to syncope in regards to loss of consciousness, ataxia, or vertigo. Differences can be distinguished because loss of consciousness concerning migraine syndromes is longer. Further, individuals with migraine syndromes experience neurologic symptoms, headaches and nausea.
    - Hysteria/conversion disorder
    - Hyperventilation – Correlated with emotional stress,
    - Choking
- Investigations
    - ECG, glucoometer, CBC (to look for anemia), and urine beta-HCG in a young post-menarchal female
    - Echocardiogram
    - Holter monitor → ambulatory electrocardiography device

APPROACH TO CARDIAC HISTORY TAKING

Source → http://learn.pediatrics.ubc.ca/body-systems/cardiology/approach-to-cardiac-history-taking/

- BASIC ANATOMY AND PHYSIOLOGY
    a. Understanding the fetal circulation and the circulatory shunts can also form a framework for approaching congenital heart diseases. The foramen ovale shunts blood from the right atrium to the left atrium. A patent foramen ovale presents as an atrial septal defect, resulting in a left-to-right shunt of blood. The ductus arteriosus shunts blood from lungs to the aorta. A patent ductus arteriosus also leads to a left-to-right shunt and pulmonary hypertension. A prolonged left-to-right shunt can significantly increase pressure in the right side of the heart, leading to a reverse right-to-left shunt known as Eisenmenger's syndrome.

table 1: congenital heart conditions

Heart Conditions			
Septal	**Valvular**	**Vascular**	**Ventricular**
Atrial septal defect (ASD)	Aortic valve stenosis (ie. Bicuspid)	Truncus arteriosus	Tetralogy of Fallot
Atrioventricular septal defect	Ebstein's anomaly	Coarctation of aorta	Hypoplastic left heart syndrome
Ventricular septal defect (VSD)	Pulmonary valve stenosis	Transposition of the great arteries	
	Pulmonary atresia	Patent ductus arteriosus (PDA)	
	Tricuspid atresia	Total anomalous pulmonary venous return	

- Questions to ask "HISTORICAL INVESTIGATION"
    a. Ask about **pregnancy history** and **prenatal testing**:
        - Medications,
        - gestational diabetes mellitus, maternal systemic lupus erythematosus,
        - exposure to infectious (ie. Rubella, Coxsackie virus).
        - Also ask about prenatal ultrasounds which often identify structural heart disease before birth
    b. Ask about **perinatal history** and **birth defects**: this includes premature rupture of membranes, fever, sedatives or anesthetics, antibiotics, cyanosis at birth, gestational age and APGAR score, asphyxia, hypertension, pneumonia, and any birth defects (ie. heart-related or not) diagnosed at birth
    c. Ask about **family history** of congenital or childhood heart disease, or sudden death
    d. If the child has a **murmur**, inquire about the initial detection and diagnosis of the murmur (Relevant findings: valve regurgitation murmur detected in the first 6 hours

after birth (ie. tricuspid or mitral), shunt lesions also diagnosed as pulmonary resistance drops – usually first 12-24 hours (ie. ASD, VSD, PDA, pulmonary stenosis, Tetralogy of Fallot).

e. Ask about the **growth and development** of the child: height and weight gain can be affected by poor cardiac function, pulmonary edema, or a left-to-right shunt. Large shunts, particularly ventricular shunting, become symptomatic in 2 to 8 weeks as pulmonary resistance drops, and presents with tachypnea, diaphoresis, and feeding difficulties.
f. If the child is **cyanotic**, determine a cardiac, pulmonary, central nervous system, or hematologic basis for the condition by asking about
    - onset, course and duration.
    - Tetralogy of Fallot can present as cyanotic spells, or squatting in older infants.
    - Transient cyanosis can also be a normal finding in infants.
g. Ask about **Endurance and exercise tolerance**: this screens for cardiac diseases involving obstructive lesions such as aortic or pulmonic stenosis
h. Ask about **chest pain**: this can screen for left ventricular outflow obstruction, aortic dissection, pericarditis, myocarditis, and arrhythmias
    - SOCRATES
        - Associated Symptoms → Fever, dyspnea, vomiting, headache or pain in another region, lightheadedness, syncope, palpitations
i. Ask about **syncopal episodes**: this can suggest right or left obstructive heart disease, pulmonary hypertension, and arrhythmia (such as prolonged QT).
j. Ask about related symptoms to **low cardiac output,** including dizziness, blurring of vision, oliguria, easy fatigability, and cold extremities
k. Ask about **palpitations**: this can suggest sinus tachycardia, supraventricular tachycardia, ventricular tachycardia, and other irregular rhythms (prolonged arrhythmia can cause dizziness or episodes of syncope)
l. Ask about symptoms of **Right- and Left-sided Heart Failure**: left-sided heart failure may be due to left-sided obstructive disease (ie. aortic stenosis, coarctation of the aorta). Right-sided heart failure may be due to right-sided obstructive disease (ie. pulmonic stenosis)(See Table 3)

table 3: signs and symptoms of right-and left-sided heart failure

Right-sided Heart Failure	Left-sided Heart Failure
Systemic venous congestion	Pulmonary venous congestion
Hepatosplenomegaly	Tachypnea
Edema	Respiratory distress (retractions)
Ascites	Wheezing (cardiac asthma)
Pleural effusion	Nasal flaring or grunting
Jugular venous distension	Crackles and pulmonary edema
Shared Signs and Symptoms of Congestive Heart Failure	
Tachycardia	Fatigue and low energy
Pallor	Cool extremities
Sweating	Feeding difficulties
Failure to thrive	Hepatic and/or renal failure
Dizziness, syncope	Altered consciousness

- differential diagnosis based on cardiac history

Medical Condition	Relevant Findings on Cardiac History
Aortic valve stenosis	Often asymptomatic; heart failure in severe stenosis, along with chest pain, lightheadedness, syncope with exercise
Atrial septal defect	Often asymptomatic; heart failure in large defect, along with shortness of breath, easy fatigability, poor growth
Atrioventricular septal defect	Cyanosis (right-to-left shunt), heart failure, sweating, tiring while feeding, poor growth, weight loss
Coarctation of aorta	Heart failure, signs of ischemia to organs and extremities
Ebstein's anomaly	Often asymptomatic; cyanosis (right-to-left shunt), heart races (due to supraventricular tachycardia), irregular beats and palpitations, easy fatigability, shortness of breath
Hypoplastic left heart syndrome	Cyanosis (right-to-left shunt), respiratory distress, lethargy, poor feeding, leads to shock, seizures, renal & liver failure

Interrupted aortic arch with ventricular septal defect	Weakness, fatigue, poor feeding, rapid breathing, fast heart rate, leads to shock, pale, mottled, and cool
Patent ductus arteriosus	Fast or increased work of breathing, respiratory infections, easy fatigability, poor growth, asymptomatic if small PDA
Pulmonary valve stenosis	Often asymptomatic; cyanosis (right-to-left shunt), easy fatigability and shortness of breath with exertion
Pulmonary atresia	Rapid breathing, difficulty breathing, irritability, lethargy, pale/cool/clammy skin, cyanosis
Tetralogy of Fallot	Cyanosis (right-to-left shunt), rapid breathing, **tet spell** (cyanosis usually accompanying a crying fit)
Total anomalous pulmonary venous return	Severe cyanosis at birth, respiratory distress, rapid breathing, grunting and retraction of rib cage muscles
Transposition of the great arteries	Cyanosis as ductus arteriosus closes, rapid breathing, 'comfortably tachypneic', congestive heart failure
Tricuspid atresia	Cyanosis at birth or as ductus arteriosus closes, fast breathing and heart rate, poor feeding, difficulty breathing (pulmonary edema), heart failure, sweating, poor growth
Truncus arteriosus	Cyanosis in first week of life, heart failure, rapid breathing, shortness of breath, wheezing, grunting, noisy breathing, nasal flaring, retractions, restlessness, hepatomegaly (due to congestion), poor feeding, swelling
Ventricular septal defect	Heart failure, poor growth and failure to thrive

- Physical exam
    a. Inspection: look for cyanosis
    b. Percussion: percuss lungs for consolidation or fluid
    c. Palpation: palpate for thrills, right ventricular heave, displaced apical beat
    d. Auscultation: auscultate for heart sounds, splitting, and murmurs
- Investigations
    a. echocardiogram, electrocardiogram, exercise stress test, and chest x-ray

physical exam findings and complications for congenital heart diseases

Medical Condition	Physical Exam Findings, Complications
Aortic valve stenosis	Murmur; **lightheadedness, fainting spells, or sudden death during strenuous activities**
Atrial septal defect	Murmur, S2 splitting; **poor growth**
Atrioventricular septal defect	Murmur, cyanosis; **congestive heart failure and poor growth**
Coarctation of aorta	Difference in pulse between upper and lower extremities, hypertension in upper extremities, **congestive heart failure**
Ebstein's anomaly	Murmur, cyanosis; **heart failure**
Hypoplastic left heart syndrome	Cyanosis, weak pulses in extremities; **shock with seizures, renal and liver failure, and heart failure**
Patent ductus arteriosus	Murmur; **heart failure, endocarditis**
Pulmonary valve stenosis	Murmur, cyanosis; **right ventricular failure, sudden death**
Pulmonary atresia	Cyanosis, possible murmur; **cyanosis**
Tetralogy of Fallot	Murmur, cyanosis; **severe cyanosis and unresponsive**
Total anomalous pulmonary venous return	Murmur, cyanosis; **severe cyanosis and hemodynamic instability**
Transposition of the great arteries	Cyanosis; **congestive heart failure, 90% die in first year if unrepaired**
Tricuspid atresia	Cyanosis; **congestive heart failure, fast heart rate, sweating with feeds, poor weight gain**
Truncus arteriosus	Cyanosis; **congestive heart failure in first two weeks**
Ventricular septal defect	Murmur; **congestive heart failure and poor growth**

CONGESTIVE HEART FAILURE IN CHILDREN

Source →http://learn.pediatrics.ubc.ca/body-systems/cardiology/congestive-heart-failure-in-children/
Presentation:

- All patients who develop HF from congenital heart lesions do so by 6 months of age. Patients who acquire HF from acquired conditions may do so at any age.
- Infants with heart failure often presents with non-specific signs, including irritability, diaphoresis with feeds, failure to thrive.
- Older Children with HF may present with more classic features such as fatigue, exercise intolerance, breathlessness, and/or evidence of pulmonary congestion

Questions to Ask

- Infants: (asking the parents)
    - How are they feeding? Does the baby “tire out”, or have to rest in the middle of feeding? Does the baby change colour during feeds?
    - Is the baby growing?
    - Any episodes of blueness around the lips or face?
- Children
    - Do you feel short of breath when exercising? Can you keep up with other children? Can you run or play as much as before?
    - Do you feel short of breath when lying down?
    - Do your hands and/or feet feel constantly cold?
    - Do you often feel sweaty?
    - To parents: Have you noticed a change in their activity level? Are they keeping up with other kids? Any episodes of blueness? Noticed any facial puffiness? (facial edema) Do they seem tired?

Physical Examination

- Vital signs:
    - Tachycardia (>160 beats per minute in the neonate; >120 beats per minute in the older infant)
    - Tachypnea (>60 breaths per minute in the neonate; >40 breaths per minute in the older infant)
    - Blood pressure. Do 4 limb blood pressures if aortic coarctation is suspected.
    - Oxygen saturation is present in cyanotic congenital heart diseases.
- Growth parameters, especially weight – poor weight gain is a key indication of poorly compensated heart failure.
- General appearance:
    - Perspiration, Dysmorphic features (often associated with syndromes), cyanosis, increased work of breathing
- Cardiovascular Exam:
    - Pulses – feel for brachial, femoral, and pedal pulses. Pulses may be bounding or weak, depending on the underlying cause and the significance of the heart failure. There may also be a delay between the brachial and femoral pulses, in the case of coarctation

    - Capillary refill time
    - JVP – Useful in children older than 5-6 years old, although it may be difficult to obtain. In infants and younger children, right sided congestion tend to present as hepatomegaly and facial edema.
    - Precordial exam:
        - Palpate for thrills and right and left sided heaves
        - Listen for S1, S2. Abnormal S1 S2 may be a clue to valvular disease. A loud P2 is in strong indication of pulmonary overload.
        - Listen for gallop rhythms (S3, S4) and murmurs
        - Infants with cardiomyopathy often present with a quiet precordium
- Respiratory Exam:
    - Signs of increased work of breathing, including tachypnea, indrawing, tracheal tugging.
    - Auscultation, listening for signs of pulmonary edema

Laboratory Investigations:

- **Chest X-ray**: very commonly demonstrates cardiomegaly.
- **Electrocardiogram**:although not useful in assessing HF, may give diagnostic hints for the underlying disorder through demonstrating ventricular enlargement, artrial enlargement, ST changes associated with myocarditis / pericarditis, and arrhythmias.
- **Urine test**: In chronic heart failure, proteinuria and high specific gravity of urine are common.
- **Blood test**: An increase in blood urea nitrogen and creatinine levels may be present, as renal function decreased due to decreased perfusion. **CBC** , differential may give clues to anemia and infection causing or complicating HF. **Brain natriuretic peptide (BNP)** may be used in some cases to track heart failure.
- **Echocardiogram**:very important → atrial and ventricular size, systolic and diastolic function, valve anatomy and function, and intra-cardiac shunts.
- Endomyocardial **biopsy**→ myocarditis
- Thyroid, Renal and Hepatic function tests

● Heart failure

- Symptoms
    - Breathlessness (particularly on feeding or exertion)
    - Sweating
    - Poor feeding
    - Recurrent chest infections.
- Signs
    - Poor weight gain or faltering growth
    - Tachypnoea
    - Tachycardia
    - Heart murmur, gallop rhythm
    - Enlarged heart
    - Hepatomegaly
    - Cool peripheries.
- Signs of right heart failure (ankle oedema, sacral oedema, and ascites)

- In the first week of life, heart failure usually results from left heart obstruction, e.g. coarctation of the aorta.
- After the first week of life, progressive heart failure is most likely due to a left-to-right shunt

Box 18.2 Causes of heart failure

1 Neonates – obstructed (duct-dependent) systemic circulation

- Hypoplastic left heart syndrome
- Critical aortic valve stenosis
- Severe coarctation of the aorta
- Interruption of the aortic arch

2 Infants (high pulmonary blood flow)

- Ventricular septal defect
- Atrioventricular septal defect
- Large persistent ductus arteriosus

3 Older children and adolescents (right or left heart failure)

- Eisenmenger syndrome (right heart failure only)
- Rheumatic heart disease
- Cardiomyopathy.

Cyanosis

Source → http://learn.pediatrics.ubc.ca/body-systems/cardiology/approach-to-cyanotic-congenital-heart-disease-in-the-newborn/

APPROACH TO CYANOTIC CONGENITAL HEART DISEASE IN THE NEWBORN

History Taking: Key Symptoms

- Cyanosis
  - Timing and location (peripheral or central) of cyanosis
  - Refractory cyanosis if fails to improve with oxygen therapy
- Fainting or cyanotic spells
  - Cyanosis occurring with exertion, emotions, and/or bearing down
- Exercise Intolerance
  - Dyspnea and/or diaphoresis on minor exertion, or palpitations with exertion
- Gestational History and Family History
  - Prenatal screening → many genetic syndromes are associated with congenital cardiac malformations
  - Maternal illness: diabetes, rubella, teratogenic medications.
  - Family history of congenital cardiac disease

Physical Examination

- Inspection
  - Dysmorphic features of genetic/congenital malformations (ie. Down's syndrome is associated with endocardial cushion defects, Turner's syndrome associated with coarctation of aorta)
  - Look for the signs of peripheral (nail beds) and central (mucous membranes) cyanosis
  - Differential cyanosis (oxygen saturation in lower limbs < upper limbs)
- Cardiac Examination
  - Heart rate, pulse oximetry, palpate central and peripheral pulses and/or measure blood pressure in upper and lower extremities
  - Palpate for loud heart sounds, parasternal heave, apical impulse and thrill.
  - Auscultate for abnormal (ie. single or widely split S2) and extra heart sounds and murmurs (Grade, timing, location, radiation, intensity and maneuvers)
  - Signs of heart failure: parasternal heave and palpable P2 (pulmonary hypertension), elevated JVP, hepatomegaly, and peripheral edema (right-sided failure), displaced apical impulse (enlarged LV)
- Respiratory Examination
  - signs of respiratory distress like tachypnea, dyspnea (ie. accessory muscles, paradoxic diaphragm) and hypoventilation
  - asymmetric diaphragmatic expansion, and in older children percussion for consolidation, pleural effusions, and pneumothorax
  - Auscultate for air entry, listen for rales/crackles (consistent with effusions and/or consolidation)

- Congestive heart failure: Poor air entry and dullness to percussion at the bases (pleural effusion), along with basal rales/crackles (pulmonary edema)

Investigations

1. Electrocardiogram (ECG)
2. Chest X-ray (CXR

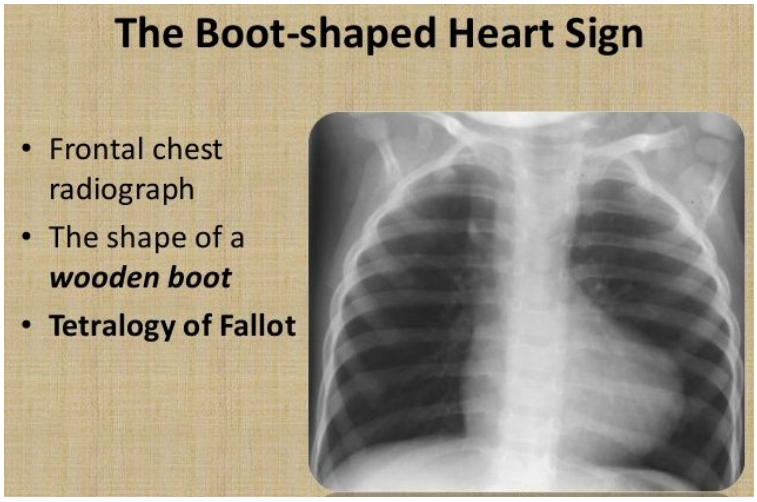
"*Egg-shaped*" heart transposition of great arteries	"*Boot-shaped*" heart in Tetralogy of Fallot
"*Snowman*" in total anomalous pulmonary venous return	Extreme cardiomegaly can occur in Ebstein's anomaly

3. Hyperoxia Test:
    a. Hyperoxia test is performed to demonstrate the response of the neonate's arterial PaO2 to 100% oxygen. Typically, if the cause for cyanosis is non-cardiac, the arterial PaO2 will increase to ≥ 100 mmHg on exposer to 100% oxygen. However, if there is a cardiac cause for cyanosis, the PaO2 will remain below 100mmHg.
4. Pre-ductal and Post-ductal Pulse Oximetry:
    a. Pulse oximetry from the upper (pre-ductal) and lower/umbilical (post-ductal) arteries can help identify a right-to-left shunt occurring through the ductus arteriosus.
5. Transthoracic Echocardiogram (TTE)
6. cardiac catheterization and cardiac magnetic resonance

Table 18.2 Types of presentation with congenital heart disease

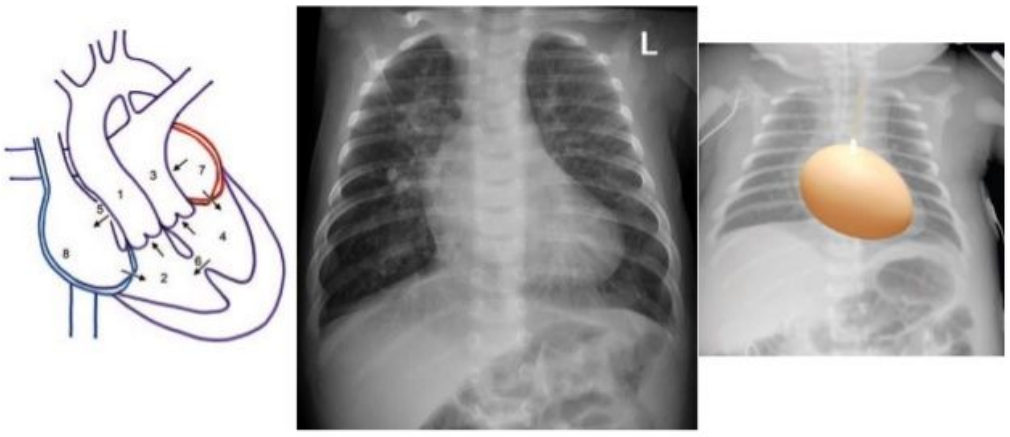
Type of lesion	Left-to-right shunt	Right-to-left shunt	Common mixing	Well children with obstruction	Sick neonates with obstruction
Symptoms	Breathless or asymptomatic	Blue	Breathless and blue	Asymptomatic	Collapsed with shock
Examples	ASD VSD PDA	Tetralogy of Fallot TGA	AVSD Complex congenital heart disease	AS PS Adult-type CoA	Coarctation HLHS

AS, aortic stenosis; ASD, atrial septal defect; AVSD, atrioventricular; CoA, coarctation of the aorta; HLHS, hypoplastic left heart syndrome; PDA, patent ductus arteriosus; PS, pulmonary stenosis; TGA, transposition of the great arteries; VSD, ventricular septal defect.



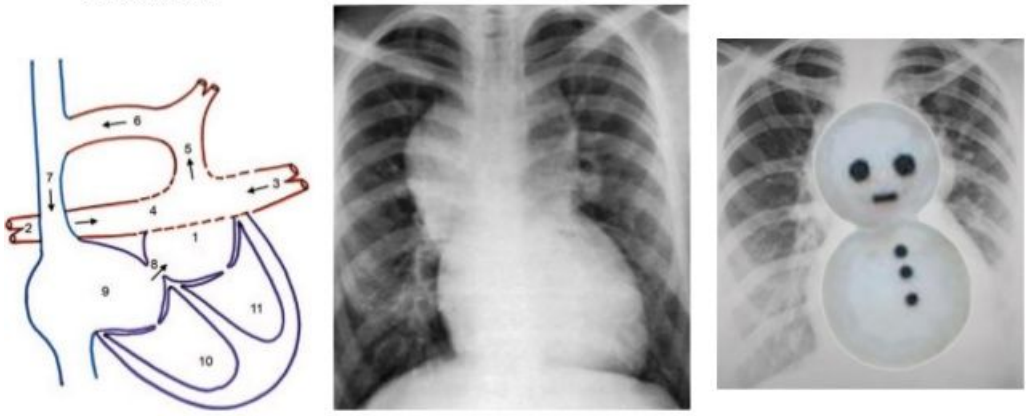
Transposition of great vessels

EGG ON STRING SIGN



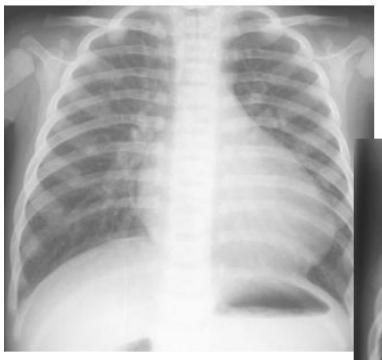
Total Anomalous Pulmonary Venous Return

SNOWMAN SIGN

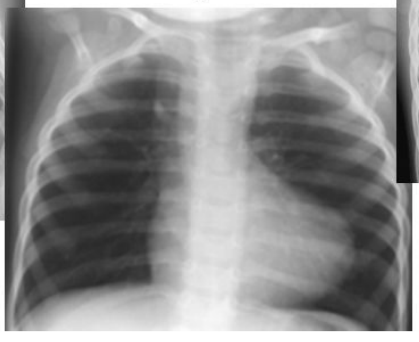


Cardiac silhouette

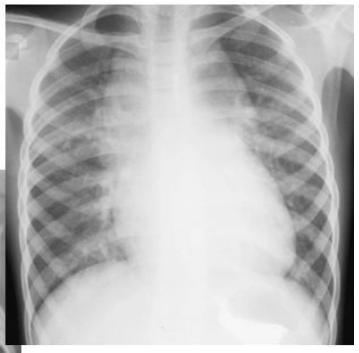
Egg on a string = TGA



Boot shaped = ToF



Snowman = TAPVR



Rheumatic fever

Clinical features
After a latent interval of 2–6 weeks following a pharyngeal or skin infection, polyarthritis, mild fever and malaise develop.

CC:polyarthritis, mild fever and malaise

HPI

1. Ask about recent pharyngeal or skin infection
2. Chest pain, palpitation
3. Joint pain, redness, swelling → location and ask if Migratory
4. Involuntary movements and emotional lability ?
5. Skin rash or nodules→ location , shape , color

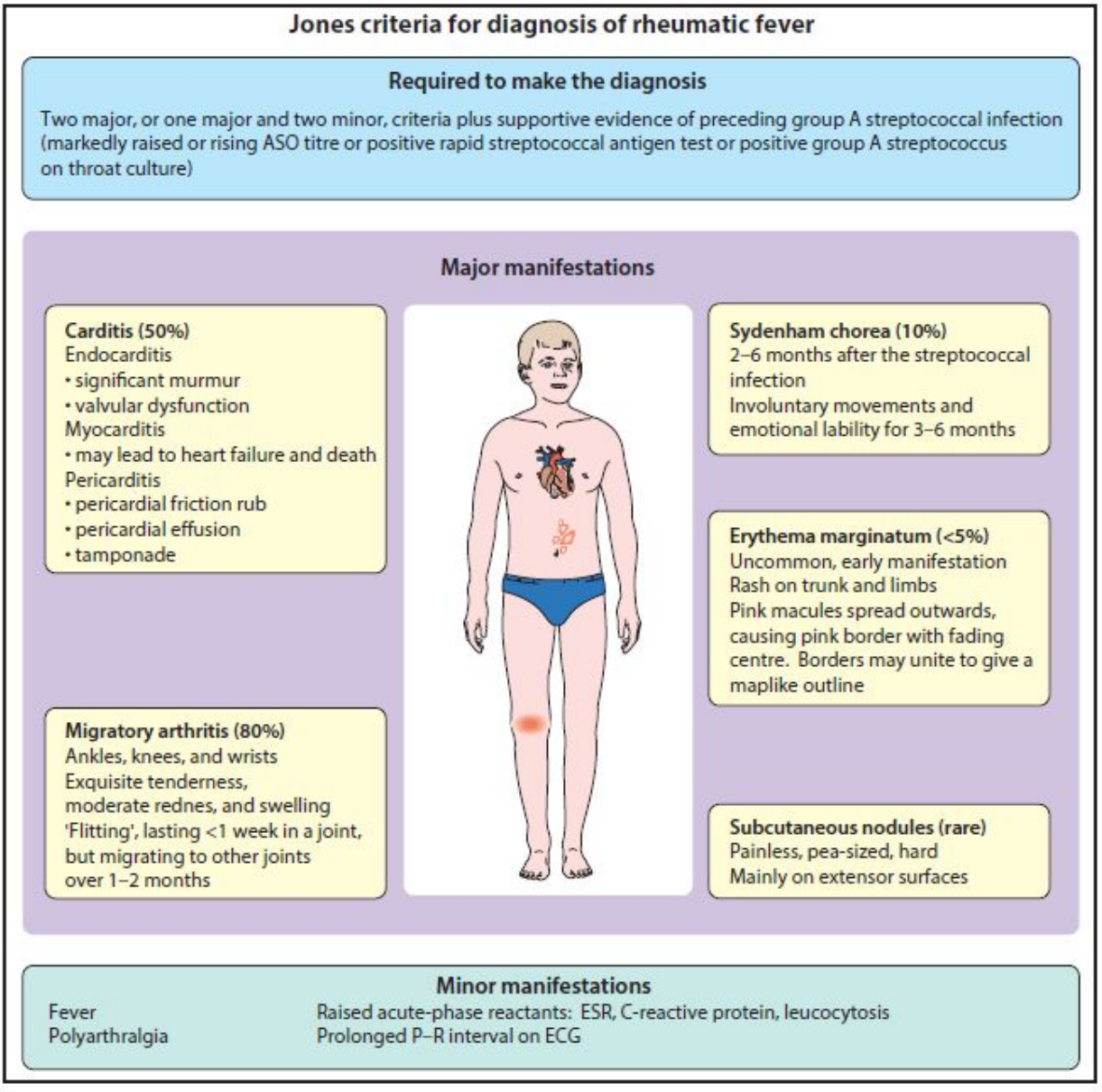


Figure 18.20 Jones criteria for diagnosis of rheumatic fever.

-Acute rheumatic fever is a short-lived, multisystem autoimmune response to a preceding infection with group A β-haemolytic streptococcus. The disease mainly affects children aged 5–15 years. It progresses to chronic rheumatic heart disease in up to 80% of cases

-Chronic rheumatic heart disease → most common form of long-term damage is mitral stenosis.this may occur as early as the second decade of life, but usually symptoms do not develop until early adult life

-Management of Acute rheumatic fever

1. Bed rest
2. And anti-inflammatory agents → Aspirin
3. If the fever and inflammation do not resolve rapidly, corticosteroids may be required.
4. Symptomatic heart failure is treated with
    a. diuretics and angiotensin-converting enzyme inhibitors,
5. pericardial effusions will require pericardiocentesis.
6. Anti-streptococcal antibiotics may be given if there is any evidence of persisting infection
7. Prophylaxis of recurrence
    a. Monthly injections of benzathine penicillin
    b. Or penicillin “if penicilin sensitive give Oral erythromycin “ can be given orally every day, but less effective and less compliance

Infective endocarditis

All children of any age with congenital heart disease (except secundum ASD), including neonates, are at risk of infective endocarditis. The risk is highest when there is a turbulent jet of blood, as with a VSD, coarctation of the aorta and PDA or if prosthetic material has been inserted at surgery. It may be difficult to diagnose, but should be suspected in any child or adult with a sustained fever, malaise, raised erythrocyte sedimentation rate, unexplained anaemia or haematuria.

Clinical signs

1. Fever
2. Anaemia and pallor
3. Splinter haemorrhages in nailbed
4. Clubbing (late)
5. Necrotic skin lesions
6. Changing cardiac signs
7. Splenomegaly
8. Neurological signs from cerebral infarction
9. Retinal infarcts
10. Arthritis/arthralgia
11. Haematuria (microscopic).

Diagnosis

1. Multiple blood cultures should be taken before antibiotics are started
2. cross-sectional echocardiography → vegetations
3. Acute-phase reactants → raised

Management

1. Tx
    a. high-dose penicillin in combination with an aminoglycoside
    b. surgical removal→ If infected prosthetic material, e.g. prosthetic valves, VSD patches or shunts
2. Prophylaxis
    a. good dental hygiene in all children with congenital heart disease
    b. avoidance of body piercing and tattoos.
    c. Antibiotic prophylaxis is no longer recommended

Gastrointestinal system

Jaundice

CC:

Jaundice or dark urine + pale stool +pruritus , duration

HPI

1. Hx of time (PC,DOT)
    a. From birth or after that ? Gestational age of the infant (term or preterm)?
    b. From 1st day or 3-5 days or 10-14 days ?
    c. Where was it noticed (head, eyes, arms or legs)? By who?
2. ROS
    a. General
        i. FNW
        ii. Pale or jaundice
        iii. iLL child or well \ lethargy ,poor feeding, irritable \ dehydrated
    b. GI
        i. N\V,D**C**,abdominal pain
        ii. Abdominal distension or masses
        iii. dark urine + pale stool +pruritus
        iv. Odynophagia and dysphagia (in older children)
        v. Vomiting blood or melena
        vi. Steatorrhea
    c. CNS
        i. Seizure, hypotonia,tremor, or increased muscle tone (arched back: opisthotonos)
        ii. poor school performance,behavioral or personality changes,depression
    d. Endocrine
        i. Hypothyroid
            1. Dry skin, decreased activity,increased wt,decreased appetite
            2. features of coarse facies
            3. Cold intolerance
            4. Menorrhagia
        ii. FTT → inability to gain wt
    e. RS
        i. Cough ,SOB,wheeze
        ii. URTI
            1. sneeze ,runny nose,nasal congestion
            2. Red eye, ear rubbing
    f. US
        i. Dysuria,hematuria,freq,urgency,Flank pain,
3. Exacerbating factors
    a. Certain drugs → antibiotics, anti seizure, paracetamol,sulphonamides and diazepam,
    b. Feeding → fava beans , mushroom ,breast milk
    c. Recent infection

4. Recent
    a. Infection ,travel, sick contact
5. PMH or FH of (+ PSH) :
    a. Recent infection , Hypothyroid, Prolonged neonatal jaundice
    b. CF, Liver disease
    c. Death of a sibling, abortions
    d. Hemolytic anemia ,G6PD
    e. Heart disease
    f. Galactosemia
    g. PSH for biliary problems
6. Prenatal hx
    a. Infection → TORCH
    b. Disease → Hepatitis
    c. Blood transfusion → blood group , ask about the mother ,father and infant type of blood
7. Natal and birth
    a. GA → term or not
    b. NVD or CS → complication → Forceps or **vacuum** use → cephalohematoma
    c. NICU
    d. Twins
    e. Transfusion
8. Feeding History:
    a. Formula or breast feeding or solids
    b. Amount, frequency ?
    c. Weaning?
    d. New food items, fava beans, mushrooms, etc.?

Investigations:

1. Blood
    a. CBC with diff + retic count
    b. Blood film → for Spherocytosis
    c. ESR,CRP
    d. TFT → hypothyroidism
    e. LFT → bilirubin (total,direct and indirect) , ammonia
        i. Direct >20% or (>25 µmol/L) → conjugated/Direct Hyperbilirubinemia
    f. Hemato
        i. Coomb's test, G6PD enzyme,PT, PTT, coag factors
2. Serum alpha 1-antitrypsin level and phenotyping
3. Serum bile acids (disorders of bile acid synthesis or transport)
4. Urine succinylacetone (tyrosinemia)
5. Sweat chloride test (Cystic Fibrosis)
6. Galactose-1-phosphate in urine → Galactosaemia
7. Imaging → abdominal US and CT → liver and biliary system → look for gall bladder
8. cholangiogram (ERCP (endoscopic retrograde cholangiopancreatography),
9. Liver bx

Treatment

1. Reassurance → physiological and breast milk
2. Phototherapy
3. exchange transfusion
4. Surgery → biliary atresia
5. Supplementation with fat-soluble vitamins (EDAK)
6. Formula containing medium chain fatty acid
7. Good amount of calories, iron, zinc
8. Phenobarbital (↓itching), URSA

if jaundice appears <24 hours old – likely to be haemolysis (Rhesus or ABO incompatibility, G6PD deficiency ,Spherocytosis, pyruvate kinase deficiency)and potentially serious
-ask about the mother , father, baby type of blood , high risk pt:

1. O-ve mother and O+ve infant → rhesus hemolytic disease
2. type O mother and type A or B infant→ ABO incompatibility

#Physiological jaundice in newborns is common but 90% will have resolved by 2 weeks (3 weeks if preterm).
Prolonged (or persistent) neonatal jaundice “Jaundice in babies >2 weeks old (3 weeks if preterm) ” requires prompt investigation to distinguish unconjugated (resolves spontaneously) from conjugated which indicates liver disease

#unconjugated indirect bilirubin can cross the BBB→ kernicterus (unconjugated bilirubin in the basal ganglia and brainstem nuclei hypotonia, seizures, opisthotonos, delayed motor skills, choreoathetosis, sensorineural hearing loss are features of kernicterus.
Peaks at 3-4 days in term, < 12 mg/dL, At 5-7 days in preterm, < 15mg/dl
Note: physiological jaundice may be higher in breast-milk fed infants than formula-fed infants
#Breast Milk Jaundice

- Late onset (10-14 days), Prolonged jaundice (months)
- If breast feeding is interrupted for 48 hrs bilirubin level falls
- Baby is sick sometimes
- Familial

NOTE:
o **Breast milk** jaundice occurs due to a glucuronidase present in some breast milk. Infants become jaundice in week 2 of life. Diagnosis and treatment is by interruption of breastfeeding . Although the bilirubin may rise again, it will not rise to the previous level. The baby may then be safely breastfed. Problem resolves by 2-3 months.
o **Breast feeding or "lack of breastfeeding"** jaundice means that a baby is not nursing well and so not getting many calories. This is frequent in first-time breastfeeding mother. The infant may become dehydrated. However, it is lack of calories that causes the jaundice. The treatment is to obtain a lactation consultation and rehydrate the baby.

- Prolonged Jaundice:

> 2 wks in term, > 3 wks in preterm
90% of them are not pathological → breast milk jaundice

In pathological jaundice, bilirubin rise rate:
o > 5mg/dl/day or > 0.5mg/dl/hr
Work up for possible pathologic hyperbilirubinemia when:
o It appears on the first day of life
o Bilirubin rises >5 mg/dl/day
o Bilirubin > 13 mg/dl in term infant
o Direct bilirubin > 2 mg/dl at any time

Neonatal Jaundice

	Physiological jaundice	Pathological jaundice
Appearance of Clinical Jaundice	2-3 days	First 24 hrs of age
Rate of rise of bilirubin	< 5mg/dl/day	> 5 mg/dl/day
Peak Concentration of total Bilirubin	Term <12 mg/dl Preterm <15 mg/dl	Term >12 mg/dl Preterm >15 mg/dl
Clinical Jaundice Resolution	By 2 weeks (term) By 3 weeks (preterm)	Not resolved by 2 weeks (term) Not resolved by 3 weeks (preterm)
After Resolution	Doesn't reappear after it has resolved	Appears after it has been resolved

Table 11.2 Causes of neonatal jaundice

Jaundice starting at <24 h of age	Haemolytic disorders: Rhesus incompatibility ABO incompatibility G6PD deficiency Spherocytosis, pyruvate kinase deficiency Congenital infection	**Jaundice at >2 weeks of age**	Unconjugated: Physiological or breast milk jaundice Infection (particularly urinary tract) Hypothyroidism Haemolytic anaemia, e.g. G6PD deficiency High gastrointestinal obstruction, e.g. pyloric stenosis Conjugated (>25 μmol/l): Bile duct obstruction Neonatal hepatitis
Jaundice at 24 h to 2 weeks of age	Physiological jaundice Breast milk jaundice Infection, e.g. urinary tract infection Haemolysis, e.g. G6PD deficiency, ABO incompatibility Bruising Polycythaemia Crigler–Najjar syndrome		

Diarrhea & Vomiting

PP → Name, age
CC→ Diarrhea &\or Vomiting , duration ?

HPI:

1. Diarrhea ; Hx of time → DOT.PC
    a. Duration (< or > 10 days) → acute<2wks or chronic>2wks ,onset ?
    b. Timing → at morning (before and after breakfast ,at night ,related to meals? ,does diarrhea decrease with fasting,related to milk feeding?)
    c. Progression and course → intermittent or constant , increase or decrease in intensity
    d. Freq ? (how much do pt defecate per day and compare it with the past)
    e. Is there any episodes of constipation
    f. sleep disturbed by diarrhoea?
2. Stool characteristics (color ,smell,shape,amount ,consistency)
    a. Color (red ,bloody, pale ,tarry shiny black “melena” , matt black , normal color
        i. blood, mucus or pus ?
    b. amount (how many times diapers is changed per day, is there is an increase in comparison to past)
    c. consistency → Loose or watery or ,unformed or semisolid, normal consistency
    d. Smell
    e. Float
    f. Hard to flush
3. Vomiting
    a. Hx of time:DOT.PC
        i. Onset,duration
        ii. Timing
            1. related to mealtimes, early morning or late evening?
            2. Preceded by nausea **or occurring without warning?
            3. Time after food or milk ingestion ?
        iii. Progression ,course → intermittent or constant , increase or decrease in intensity
    b. Vomitus
        i. Projectile (forceful ejection) or non-forceful
            1. If non forceful → Posseting or regurgitation
                a. If small amount → Posseting
                b. If larger, more frequent amount → regurgitation
        ii. Color :Bilious , blood , mucus
        iii. Is there undigested food
4. Wt loss
    a. How much ,duration
    b. planned or unplanned
    c. Psychiatric illness*→ anorexia nervosa, bulimia ,alcoholism

5. Infection
    i. FNW → **fever** ,chills ,rigors ,temp (documented or not and how much , axillary or oral or anal+ hx of time PC DOT (progression, course, duration, onset, timing) + does the pt look well and active during afebrile periods) **N**ight sweats , **W**eight loss
    ii. Cough
    iii. Dysuria** or crying during urination
    iv. Malaise ,crying , sleepy
    v. Sexual activity *, Drug misuse*
    b. Hx of malignancy
    c. Recent
        i. Recent sick contact or animal contact
        ii. Recent travel
        iii. Recent poorly cooked food or fast food or contaminated water ingestion
6. Rash
    a. Site (number of lesions , spreading).
    b. PC DOT (progression (in/decrease or constant) and course (Intermittent or continuous) , duration , onset , timing) ,character
    c. Precipitating factors
    d. Relieving factors – (e.g. steroid cream)?
    e. Contact history – has the patient been in contact with an infectious skin problem (e.g. chickenpox)?
    f. Sun exposure
    g. Previous episodes
    h. Associated:
        i. Pain
        ii. Itch
        iii. Bleeding
        iv. Discharge (pus)
        v. Blistering

7. Abdominal pain ** → socrates
8. Other symptoms
    a. Respiratory symptoms → Cough,SOB, Runny nose
    b. Change in urine color ,amount ,smell
    c. Dysuria
    d. Headache**
    e. Photophobia and phonophobia
    f. Ear rubbing
    g. Eye discharge or redness
9. GI ROS
    a. Oral ulcers
    b. Dysphagia,odynophagia **
    c. dyspepsia and heartburn**
    d. N\V ,D\C , **abdominal pain**
    e. FNW → fever ,night sweats , weight loss

f. Hematemesis ,rectal bleeding,melena
g. Malabsorption symptoms
    i. Abdominal distension, borborygmi, cramps and undigested food in the stool
    ii. Malaise, lethargy, peripheral neuropathy and symptoms of (vitamin or mineral def.)
h. Anal symptoms
    i. Anal pain on defecation **.
    ii. Straining
    iii. Tenesmus;Sensation of incomplete evacuation**
    iv. Urgency
    v. Incontinence
i. Arthralgia?

*= (in adolescence)
** = ask only if child is able to talk

Natal hx and birth hx:

- NVD or CS or breach
- BWT

Postnatal hx

- NICU

Nutritional hx :

Nutritional hx (feeding hx)

d. Infant (Breastfed or bottle-fed? , Exclusive breast-feeding or mix ?)
    i. Breast-feeding
        1. Freq → how much a day
        2. Duration → per session
        3. Lactation problems→ Poor suckling? ,Refusal
        4. Weaning started? (If yes → Quality? Quantity?)
        5. Feeling of breast emptying , sleep after suckling
        6. Parental dietary beliefs
    ii. Bottle-feeding
        1. Freq → how much a day
        2. Duration → per session
        3. Amount → per ml
        4. Type of formula , method of formula Preparation
        5. Refusal
        6. Parental dietary beliefs
e. Child
    i. Freq → how much a day

ii. Duration → per session
iii. Quantity and Quality of food ? → milk intake, protein intake
iv. Appetite → normal or decreased
v. Does the child feed himself?
vi. Timing → Where does he eat (if while watching TV → distraction)?
vii. Who observes the child while he eats?
viii. Excessive snacks and juice ?
ix. Parental dietary beliefs

Type and amount of milk (breast or formula , amount in ml per day)
Any nutritional def.
Feed volumes should be calculated as overfeeding is common in bottle-fed infants

PMH:

1. General → DM"Autonomic neuropathy",HTN ,DLP
2. Hx of malignancy → (carcinoma, lymphoma or other haematological disorders),
3. GI→
    a. irritable bowel syndrome → متلازمة الأمعاء المتهيجة
    b. Obstructed defecation, e.g. anal fissure, Crohn's disease
    c. Liver or gallbladder or pancreatic disease
4. Metabolic/endocrine→ Hyperthyroidism or hypothyroid
5. Malabsorption, e.g. lactose deficiency, coeliac disease
6. cerebral palsy or other neurodevelopmental disorders
7. bronchopulmonary dysplasia

PSH:

1. Recent surgery
2. Recent GI surgery
    a. following surgery for oesophageal atresia or diaphragmatic hernia.
3. Intestinal resection

DH , vaccination and allergy:

Drugs that can cause acute diarrhea :

- antibiotics, cytotoxics, PPIs and NSAIDs
- Laxative abuse

FH:

Family history of gastrointestinal disorder, e.g. gluten enteropathy, Crohn's?

SH:

Alcoholism ,smoking in the family

Box 14.1 'Red flag' clinical features in the vomiting child

Bile-stained vomit	Intestinal obstruction [see Ch. 11 (Neonatal medicine)]
Haematemesis	Oesophagitis, peptic ulceration, oral/nasal bleeding, and oesophageal variceal bleeding
Projectile vomiting, in first few weeks of life	Pyloric stenosis
Vomiting at the end of paroxysmal coughing	Whooping cough (pertussis)
Abdominal tenderness/abdominal pain on movement	Surgical abdomen
Abdominal distension	Intestinal obstruction, including strangulated inguinal hernia
Hepatosplenomegaly	Chronic liver disease, inborn error of metabolism
Blood in the stool	Intussusception, bacterial gastroenteritis
Severe dehydration, shock	Severe gastroenteritis, systemic infection (urinary tract infection, meningitis), diabetic ketoacidosis
Bulging fontanelle or seizures	Raised intracranial pressure
Faltering growth	Gastro-oesophageal reflux disease, coeliac disease and other chronic gastrointestinal conditions

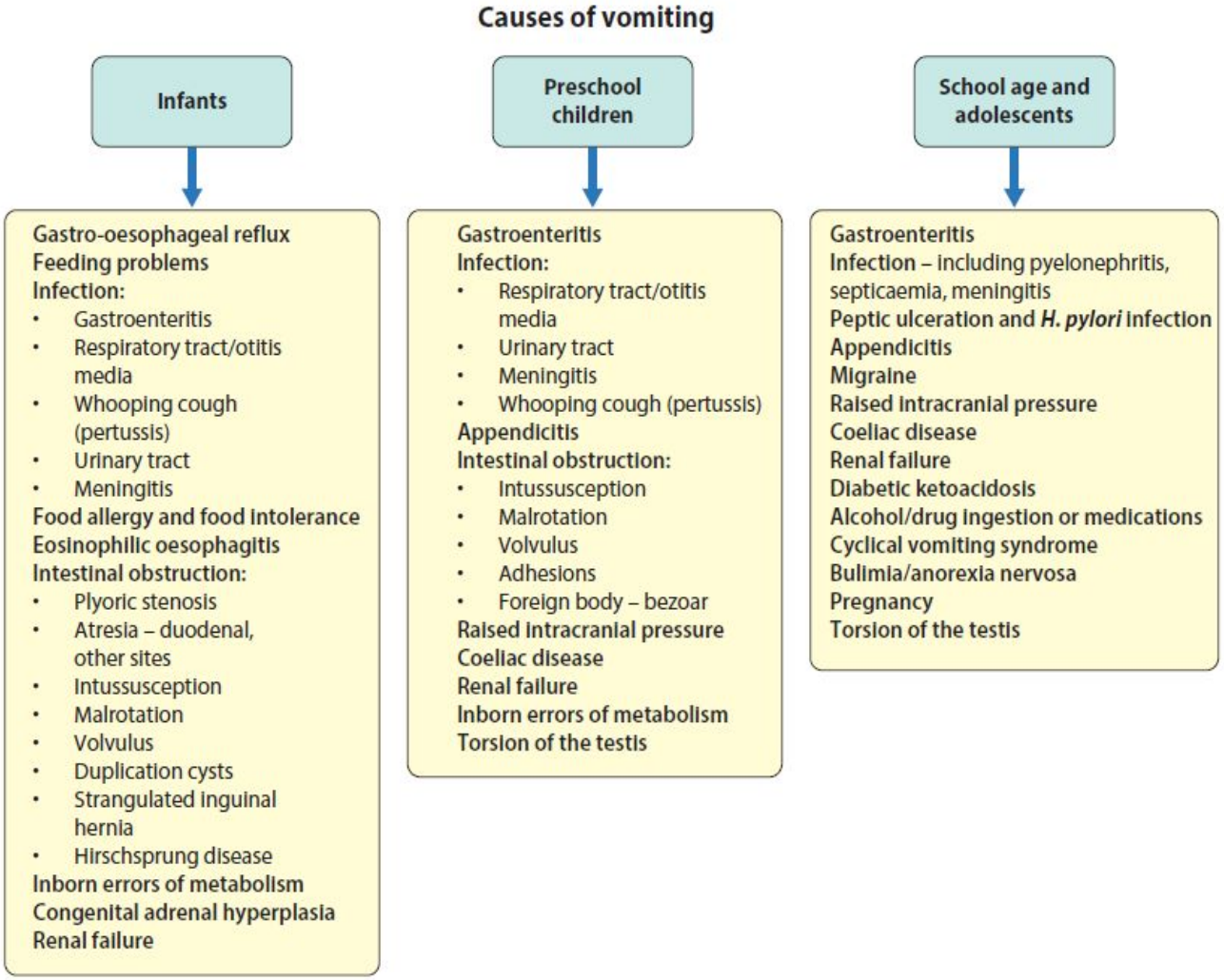


Figure 14.1 Causes of regurgitation/vomiting.

Vomiting in infants
• Common chronic cause is gastroesophageal reflux.
• If transient, with other symptoms, e.g. fever, diarrhoea or runny nose and cough, most likely to be gastroenteritis or respiratory tract infection, but consider urine infection, sepsis or meningitis.
• If projectile at 2–8 weeks of age, exclude pyloric stenosis.
• If bile stained, potential emergency – exclude intestinal obstruction, especially intussusception, malrotation and a strangulated inguinal hernia. Assess for dehydration and shock.

Difference between **Posseting vs regurgitation vs Vomiting**
Posseting and **regurgitation** are terms used to describe the non-forceful return of milk, but differ in degree. Posseting describes the small amounts of milk that often accompany the return of swallowed air (wind),
whereas regurgitation describes larger, more frequent losses. Posseting occurs in nearly all babies from time to time, whereas regurgitation may indicate the presence of more significant gastro-oesophageal reflux.
Vomiting is the forceful ejection of gastric contents.

Gastroenteritis

1. Most frequent cause of gastroenteritis in developed countries is rotavirus infection, which accounts for up to 60% of cases in children under 2 years of age, particularly during the winter and early spring
2. Bacterial causes → less common in developed countries but may be suggested by the presence of blood in the stools.
    a. Campylobacter jejuni infection, the most common of the bacterial infections in developed countries→ associated with severe abdominal pain.
    b. Shigella and some salmonellae→ dysenteric type of infection, with blood and pus in the stool, pain and tenesmus. Shigella infection may be accompanied by high fever.
    c. Cholera and enterotoxigenic Escherichia coli infection → profuse, rapidly dehydrating diarrhoea.
3. Protozoan parasite infection → Giardia and Cryptosporidium.

- In gastroenteritis there is a sudden change to loose or watery stools often accompanied by vomiting.There may be contact with a person with diarrhoea and/or vomiting or recent travel abroad.
- Conditions that can mimic gastroenteritis **(DDx)**
    a. Systemic infection → Septicaemia, meningitis
    b. Local infections →Respiratory tract infection, otitis media, hepatitis A, urinary tract infection
    c. Surgical disorders→ Pyloric stenosis, intussusception, acute appendicitis, necrotizing enterocolitis, Hirschsprung's disease
    d. Metabolic disorder→ Diabetic ketoacidosis
    e. Renal disorder→ Haemolytic uraemic syndrome
    f. Other→ Coeliac disease, cow’s milk protein allergy, lactose intolerance, adrenal insufficiency
- Dehydration leading to shock is the most serious complication and its prevention or correction is the main aim of treatment

- **Investigation**
    a. Stool culture → if child appears septic, if there is blood or mucus in the stools, or the child is immunocompromised, after recent travel, if the diarrhoea has not improved by day 7.
    b. Plasma electrolytes, urea, creatinine, and glucose
    c. blood culture
- Antidiarrhoeal drugs (e.g. loperamide, Lomotil) and antiemetics are **not given**
- Antibiotics are not routinely required to treat gastroenteritis, even if there is a bacterial cause.only indicated for suspected or confirmed sepsis,

Gastro-oesophageal reflux is the involuntary passage of gastric contents into the oesophagus. It is extremely common in infancy.

A predominantly fluid diet, a mainly horizontal posture and a short intraabdominal length of oesophagus all contribute. While common in the 1st year of life, nearly all symptomatic reflux resolves spontaneously by 12 months of age. This is probably due to a combination of maturation of the lower oesophageal sphincter, assumption of an upright posture and more solids in the diet.

- benign, self limited condition
- when it becomes a significant problem it becomes gastro-oesophageal reflux disease and needs treatment
- More common in:
    - cerebral palsy or other neurodevelopmental disorders
    - preterm infants, especially in those with bronchopulmonary dysplasia
    - following surgery for oesophageal atresia or diaphragmatic hernia.

Box 14.2 Complications of gastro-oesophageal reflux (i.e. gastro-oesophageal reflux disease)

- Faltering growth from severe vomiting
- Oesophagitis – haematemesis, discomfort on feeding or heartburn, iron-deficiency anaemia
- Recurrent pulmonary aspiration – recurrent pneumonia, cough or wheeze, apnoea in preterm infants
- Dystonic neck posturing (Sandifer syndrome)
- Apparent life-threatening events

- Investigation:"Investigations are performed if diagnosis is unclear or complications occur"
    - 24-hour oesophageal pH monitoring to quantify the degree of acid reflux
    - endoscopy with oesophageal biopsies to identify oesophagitis and exclude other causes of vomiting.
- Management
    - **Uncomplicated** gastro-oesophageal reflux→ excellent prognosis → managed by parental reassurance, adding inert thickening agents to feeds (e.g. Carobel), and smaller, more frequent feeds.
    - **Significant** gastro-oesophageal reflux disease is managed with acid suppression with either hydrogen receptor antagonists (e.g. **ranitidine**) or proton-pump inhibitors (e.g. **omeprazole**).

Pyloric stenosis

- More common in boys and in those with a family history
- Presents at 2–8 weeks of age, irrespective of gestational age
- Clinical features are:
    - vomiting, which increases in frequency and forcefulness over time, ultimately becoming projectile
    - hunger after vomiting until dehydration leads to loss of interest in feeding
    - weight loss if presentation is delayed.
    - Hypochloremic metabolic alkalosis with a low plasma sodium and potassium occurs as a result of vomiting stomach contents
    - Visible Gastric peristalsis may be seen as a wave moving from left to right across the abdomen
    - Olive sign :pyloric mass, which feels like an olive, is usually palpable in the right upper quadrant
    - Palpable abdominal mass on test feed,
    - Possible dehydration.
- Diagnosis
    - Unless immediate fluid resuscitation is required, a test feed is performed. The baby is given a milk feed, which will calm the hungry infant, allowing examination.
    - Ultrasound
- Management
    - correct any fluid and electrolyte disturbance with intravenous fluids.
    - Definitive treatment by pyloromyotomy

Dehydration

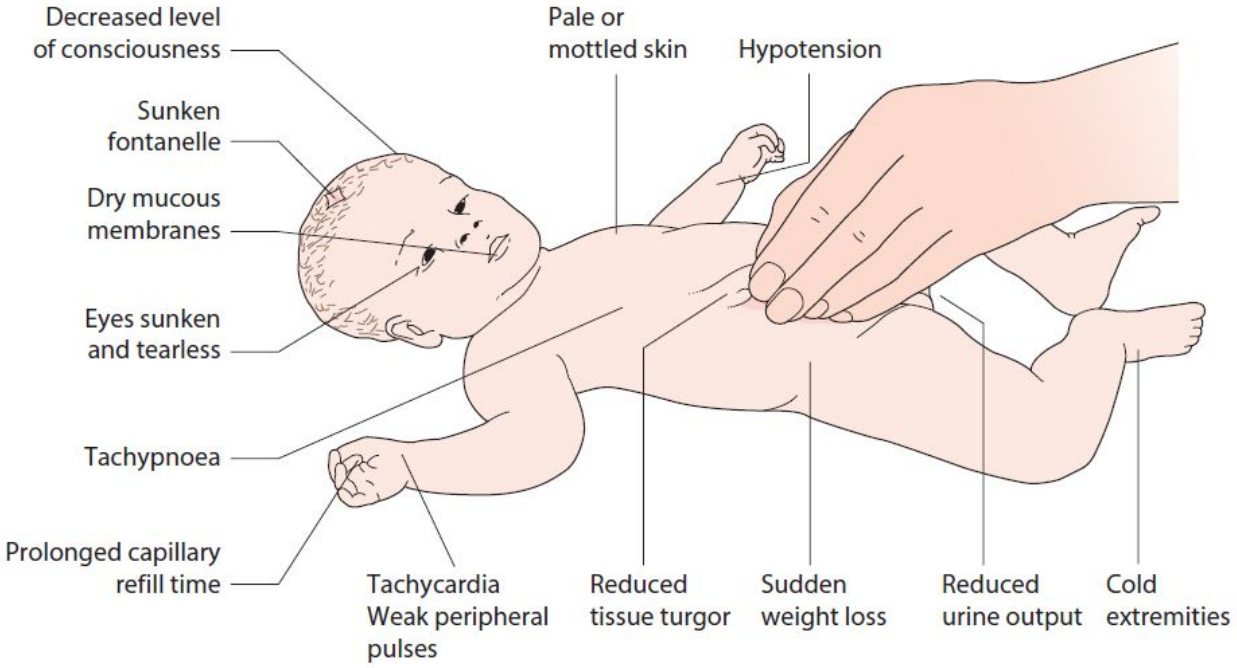


Figure 14.9 Clinical features of shock from dehydration in an infant.

#Clinical assessment of dehydration:The history and examination are used to assess the degree of dehydration as:

- no clinically detectable dehydration (usually <5% loss of body weight)
- clinical dehydration (usually 5% to 10% loss of body weight)
- shock (usually >10% loss of body weight; Fig. 14.9 and Table 14.1). Shock must be identified without delay.

Table 14.1 Clinical assessment of dehydration

	No clinical dehydration	Clinical dehydration	Shock
General appearance	Appears well	Appears unwell or deteriorating 🚩	Appears unwell or deteriorating
Conscious level	Alert and responsive	Altered responsiveness, e.g. irritable, lethargic 🚩	Decreased level of consciousness
Urine output	Normal	Decreased	Decreased
Skin colour	Normal	Normal	Pale or mottled
Extremities	Warm	Warm	Cold
Eyes	Normal	Sunken 🚩	Grossly sunken
Mucous membranes	Moist	Dry	Dry
Heart rate	Normal	Tachycardia 🚩	Tachycardia
Breathing	Normal	Tachypnoea 🚩	Tachypnoea
Peripheral pulses	Normal	Normal	Weak
Capillary refill time	Normal	Normal	Prolonged (>2 s)
Skin turgor	Normal	Reduced 🚩	Reduced
Blood pressure	Normal	Normal	Hypotension (indicates decompensated)

The more numerous and more pronounced the symptoms and signs, the greater the severity of dehydration.
(Adapted from National Institute for Health and Clinical Excellence (NICE): *Guideline. Diarrhoea and Vomiting in Children under 5*, London, 2009, NICE.)
🚩 'Red flag' sign – helps to identify children at risk of progression to shock.

Urinary system

Haematuria

PP

Name, age, gender

CC

Red urine , duration

HPI

1. Urine
    a. Color → red ,brown , orange,pink
    b. All over the course of urine flow or at the end or start of the flow
    c. casts
    d. Frothy urine
    e. stones
2. UTI
    a. FNW
    b. Dysuria, frequency, urgency
    c. Lethargy or irritable
3. Hx
    a. Sore throat or skin infection → when (2-3 weeks ago)
    b. Trauma to kidneys urinary tract or muscles .
    c. Family hx of similar complain or stones or hearing loss →Alport syndrome (esp. In males and uncles)
    d. Recent infection (URTI) or sick contacts or travel , time of infection (more common in winter)
    e. Drugs → rifampin , anticoagulant tx
4. ROS
    a. Skin → rash → site (symmetrically, Buttocks,Extensor surfaces of legs , arms and Ankles ? ,trunk spared ,palpable or not?) ,photosensitivity
    b. MSS → arthralgia ,bone pain ,periarticular oedema ,peripheral edema
    c. CNS →
        i. change in behaviour or seizures , decreased activity
        ii. Hearing loss
        iii. Ocular defects
    d. Face → butterfly rash , periorbital edema
    e. RS → hemoptysis , cough , SOB
    f. CVS (hemato) → easy bruisability, epistaxis, bleeding when brushing teeth, petechiae or purpura
    g. GI → N\V ,D\C,**abdominal pain** ,haematemesis and melaena

Investigation

Investigation of haematuria

1. All patients
    a. Urine microscopy (with phase contrast) and culture
        i. More than 3-5 RBC/HPF is abnormal
    b. Protein and calcium excretion
    c. Kidney and urinary tract ultrasound
    d. Plasma urea, electrolytes, creatinine, calcium, phosphate, albumin
    e. Full blood count, platelets, coagulation screen, sickle cell screen
2. If suggestive of glomerular haematuria
    a. ESR, complement levels, and anti-DNA antibodies
    b. Throat swab and antistreptolysin O/anti-DNAse B titres
    c. ANCA (antineutrophil cytoplasm antibodies)
    d. Renal arteriography
    e. Hepatitis B and C screen
    f. Renal biopsy if indicated
    g. if Alport syndrome suspected
        i. Test mother's urine for blood
        ii. Hearing test

Management

Urine that is red in colour or tests positive for haemoglobin on urine sticks should be examined under the microscope to confirm haematuria (>10 red blood cells per high-power field). Glomerular haematuria is suggested by brown urine, the presence of deformed red
cells (which occurs as they pass through the basement membrane), and casts, and is often accompanied by proteinuria. Lower urinary tract haematuria is usually red, occurs at the beginning or end of the urinary stream, is not accompanied by proteinuria, and is
unusual in children.
UTI is the most common cause of haematuria, although seldom as the only symptom.
#Acute nephritis
• Cause: usually post-infectious or follows a streptococcal infection, but also vasculitis (including Henoch–Schönlein purpura), IgA nephropathy, and familial nephritis.
• Clinical features: oedema (around the eyes), hypertension, decreased urine output, haematuria and proteinuria.
• Management: fluid and electrolyte balance, diuretics, monitor for rapid deterioration in
renal function

9.8 Causes of haematuria

Painless

- Glomerulonephritis
- Tumours of the kidney, ureter, bladder or prostate*
- Tuberculosis*
- Schistosomiasis*
- Hypertensive nephrosclerosis
- Interstitial nephritis (unless very acute/severe)
- Acute tubular necrosis
- Renal ischaemia (renovascular disease)
- Distance running or other severe exercise
- Coagulation disorders, anticoagulant therapy

Associated with pain

- Urinary tract infection
- Renal stones with obstruction
- Loin pain-haematuria syndrome

May be either

- Urinary tract infection
- Reflux nephropathy and renal scarring
- Adult polycystic kidney disease
- Renal stones without obstruction

*Painless provided there is no acute obstruction of the urinary tract.

Enuresis

PP:Name, age, gender
CC:Enuresis.during night or day ? , duration

HPI

1. Enuresis
    a. **Onset**→ Primary (not dry since birth) , secondary (loss of previously achieved urinary continence)
    b. **Duration** (if secondary) → since when
    c. **Timing** → During night only or during day or both ? or in early morning
2. ROS
    a. General → FNW
    b. CNS
        i. Spina bifida or and other spinal defect such as tethering of the cord.
            1. Tuft of hair or lipoma or sinus on the back
            2. abnormal perineal sensation and anal tone,
            3. abnormal leg reflexes and gait.
            4. Sensory loss in the distribution of the S2, S3, and S4 dermatomes
    c. Psychology
        i. emotional upset
        ii. developmental or psychogenic problem → developmental delay
    d. GI
        i. Constipation
    e. US
        i. Dysuria,urgency,frequency
        ii. Polyuria ,polydipsia → DM ,or DI ,or CKD
        iii. Abnormal Urine Stream, Constant wetness

PMH

1. DM ,or DI ,or CKD or sickle cell nephritis
2. Recent UTI
3. Bowel complaints (15 % with enuresis have encopresis)
4. Sleep Apnea Symptoms, Sleep Disorders
5. ADHD

FH

- Family hx of similar complaint

Investigation

1. Urine analysis

    a. Culture and microscopy
    b. Dipstick → glucose ,protein
2. Assessment of urinary concentrating ability
    a. osmolality of an early morning urine sample.
    b. Formal water deprivation test (Rarely)
3. Imaging
    a. US for bladder and ureter and urethra
    b. Urodynamic studies may be required.
    c. X-ray for spine
    d. MRI for spinal cord

Management

1. Star charts, bladder training, and pelvic floor exercises.
2. Constipation should be treated.
3. A small portable alarm
4. Anticholinergic drugs, such as oxybutynin → secondary Enuresis
5. Desmopressin → primary Enuresis

Acute kidney injury

PP:Name , age, gender
CC:Sudden increase in creatinine ,duration

HPI

1. General
    a. FNW
2. Skin
    a. Rash ,pale
3. MSS
    a. Arthralgia ,peripheral edema
4. CNS
    a. confusion, fatigue, seizures, decreased LOC
    b. HA
5. Eyes
    a. Periorbital edema ,pale
6. Endocrine
    a. Growth failure
7. Mouth
    a. Decreased feeding
    b. Anorexia
8. RS
    a. SOB, cough
9. CVS
    a. Chest pain
    b. Hematology
        i. Purpura or petechiae
        ii. Anemia
10. GI
    a. N\V, D\C ,abdominal pain , diarrhea and bloody diarrhea (2wks ago)
11. US
    a. Hematuria ,frothy urine ,dysuria ,frequency
    b. Decreased urine output
    c. Stones ,hx of stones
12. Infection → sick contact or travel or animal contact or eating uncooked beef
13. SH
    a. Smoking ,alcohol, toxin

PMH

1. growth failure,
2. anaemia,
3. disordered bone mineralization (renal osteodystrophy).

4. Urinary catheter
5. CKD , dialysis

PSH

1. Cardiac surgery

DH

FH

Investigation

1. Blood
    a. CBC and electrolytes
    b. Blood smear: schistocytes of HUS
    c. Complements, ANA, anti DNA, ANCA
2. Urine
    a. The fractional excretion of sodium
    b. Urinalysis for proteinuria (glomerular, tubular) or hematuria
    c. Urine sediment: RBC,WBC casts, crystals, myoglobin,red brown granular, tubular epithelial casts in ischemic, nephrotoxic ATN
3. Renal biopsy
4. Imaging
    a. US

Management

1. Metabolic abnormality
    a. Metabolic acidosis→ Sodium bicarbonate
    b. Hyperphosphataemia→ Calcium carbonate ,Dietary restriction
    c. Hyperkalaemia →
        i. Calcium gluconate if ECG changes
        ii. Salbutamol (nebulized or intravenous)
        iii. Calcium exchange resin
        iv. Glucose and insulin
        v. Dietary restriction
        vi. Dialysis
2. Dialysis and plasma exchange
3. monoclonal anti-terminal complement antibody eculizumab → for atypical HUS

#Oliguria (<0.5 ml/kg per hour

#The two most common renal causes of acute renal failure in children in the UK are haemolytic uraemic syndrome and acute tubular necrosis, the latter usually in the setting of multisystem failure in the intensive care unit or following cardiac surgery

#Causes of acute kidney injury

1) Prerenal
    - Hypovolemia:
        Gastroenteritis (Vomiting +diarrhea), burns, sepsis, haemorrhage , nephrotic syndrome (periorbital edema, recurrent infection)
    - Circulatory failure

2) Renal
    - Vascular:
        haemolytic uraemic syndrome, vasculitis, embolus, renal vein thrombosis
    - Tubular:
        acute tubular necrosis, ischaemic, toxic, obstructive
    - Glomerular:
        Glomerulonephritis
    - Interstitial:
        interstitial nephritis, pyelonephritis

3) Postrenal
    - Obstruction:
        congenital, e.g. posterior urethral valves
        acquired, e.g. blocked urinary catheter

HUS is a triad of acute renal failure, microangiopathic haemolytic anaemia, and thrombocytopenia. Typical HUS is secondary to gastrointestinal infection with verocytotoxin-producing E. coli O157:H7, acquired through contact with farm animals or eating uncooked beef, or, less often, Shigella. It follows a prodrome of bloody diarrhoea.

Acid-Base Balance

- Normal pH = 7.4 → 7.35-7.45
- Normal pCO2 → 40 mmHg→ (35-45 mmHg)
- Normal HCO3- → 24 mEq/L→ 20-28 mEq/L
- Normal PO2 → > 60 mmHg
- Normal Na+ → 140
- normal Cl- = 104
- normal unmeasured anions = 12 ,normal AG= 6-12 meq/L.
- Simple acid-base disorder single primary disturbance
- Mixed acid-base disorder multiple primary acid-base disturbances
- Metabolic vs Respiratory
    - low {HCO3-} → Metabolic acidosis
    - high {HCO3-} → Metabolic alkalosis
    - low {CO2} → Respiratory alkalosis
    - High {CO2-} → Respiratory acidosis
- The Compensation Process:Compensation equations
    - Metabolic Acidosis → PCO2 = (PHCO3 x 1.5} +8 +/-2
    - Metabolic Alkalosis → PCO2 = (0.7 x delta {HCO3}) +40
    - Respiratory Acidosis
        - Acute → for each "10" increase In the PCO2 → PHCO3 increases by 1
        - Chronic → for each "10" increase In the PCO2 → PHCO3 increases by 3
    - Respiratory Alkalosis
        - Acute → for each "10" decrease In the PCO2 → PHCO3 decreases by 2
        - Chronic → for each "10" decrease In the PCO2 → PHCO3 decreases by 5
- anion gap = $[Na^+] - ([Cl^-] + [HCO_3])$
    - Anion Gap = Sodium - (Chloride + Bicarbonate)

7.30 Common causes of acid–base disturbance

Disturbance	pH	CO_2	HCO_3^-	Cause
Respiratory acidosis	↓	↑	↑	Acute ventilatory failure with: Severe acute asthma Severe pneumonia Exacerbation of COPD Thoracic skeletal abnormality, e.g. kyphoscoliosis Neuromuscular disorders, e.g. muscular dystrophy
Respiratory alkalosis	↑	↓	↓	Hyperventilation due to anxiety/panic Central nervous system causes, e.g. stroke, subarachnoid haemorrhage Salicylate poisoning, early phase
Metabolic acidosis	↓	↓	↓	Increased production of organic acids: Diabetic ketoacidosis Poisoning: alcohol, methanol, ethylene glycol, iron, salicylate Acute renal failure Lactic acidosis, e.g. shock, post cardiac arrest Loss of bicarbonate: Renal tubular acidosis, severe diarrhoea, Addison's disease
Metabolic alkalosis	↑	↑	↑	Loss of acid: Severe vomiting, nasogastric suction Loss of potassium: Excess diuretic therapy, hyperaldosteronism, Cushing's syndrome, liquorice ingestion, excess alkali ingestion: milk–alkali syndrome

Metabolic Acidosis:

1. Causes:
    a. Normal Anion Gap
        i. Diarrhea (most common cause!)
        ii. Renal Tubular Acidosis (RTA)
        iii. Addison disease
        iv. Urinary tract diversions
        v. Ammonium chloride intake
    b. ↑ Anion Gap
        i. Lactic acidosis
        ii. DKA
        iii. ARF: under-excretion of acids
        iv. Poisoning (salicylate)
        v. Inborn errors of metabolism ↑organic acids
2. Renal Tubular Acidosis (RTA):
    a. Distal (Type I) RTA
        i. congenital, or acquired or 2ry to medications
        ii. Autosomal dominant: mild RTA
        iii. Autosomal recessive: severe RTA (often + deafness)
        iv. Children may have hypokalemia, hypercalciuria, nephrolithiasis, nephrocalcinosis, rickets
        v. Patients can't acidify their urine and have a urine pH>5.5 despite metabolic acidosis
    b. Proximal (Type II) RTA
        i. In most pts it's part of Fanconi syndrome (generalized dysfunction of the proximal tubule)
        ii. Chronic hypophosphatemia is more clinically significant
        iii. Ability to acidify the urine is intact
        iv. 80-90% of reabsorption of HCO_3^- in proximal tubule any defect means: hypophosphatemia, hypokalemia, aminoaciduria, glycosuria → FTT
    c. Hyperkalemic (Type IV) RTA
        i. Renal excretion of acid + K^+ is impaired due to:
            1. Absence of aldosterone, OR
            2. Inability of the kidney to respond to aldosterone
3. Complications:
    a. Chronic metabolic acidosis→ FTT, rickets
4. Management:
    a. Correction of the underlying disorder
    b. **bicarbonate ,** Fluids → saline bolus 20ml/kg + HCO_3^- supplement
    c. In salicylate poisoning, alkali administration: ↑ renal clearance + ↓ amount in brain cells

Metabolic Alkalosis:

2 types, based on urinary chloride:

1. Urinary chloride <15 mEq/L → **Chloride-Responsive** "kidney trying to preserve chloride"
    a. Gastric losses: vomiting, most common cause, loss of H+& Cl- , nasogastric suction
    b. Pyloric stenosis : K+ loss, because pt ↑ reabsorption of H+ & ↓ excretion of K+ Paradoxical Aciduria!
    c. Cystic fibrosis
    d. Chloride losing diarrhea
2. Urinary chloride >20 mEq/L → **Chloride-Resistant**
    a. Increased BP
        i. increase aldosterone
            1. Adrenal adenoma or hyperplasia
            2. Cushing syndrome
            3. Glucocorticoid-remediable aldosteronism
            4. 17α-hydroxylase deficiency
            5. 11β-hydroxylase deficiency
        ii. Renovascular disease
        iii. Renin-secreting tumor
        iv. Liddle-syndrome
    b. Normal BP
        i. Gitelman syndrome → decreased Mg+2 , like taking a thiazide diuretic ,distal tubule
        ii. Bartter syndrome→ like taking loop diuretics ,thick ascending loop of Henle
        iii. Base administration
3. Clinical Manifestations and management
    a. Hypokalemia → Arrhythmias
    b. volume depletion in Cl-responsive → volume repletion with NaCl, KCl
    c. hypertension in Cl-unresponsive → volume repletion is contraindicated
    d. Gitelman and Bartter Syndrome→ oral K + K-sparing diuretics

Approach to Acid-Base Disorders:

ARMADA

A	R	M	A	D	A
Acidosis or alkalosis	Respiratory disorder ?? acidosis or alkalosis, check paCO2	Metabolic disorder ? acidosis or alkalosis ? check HCO3-	Anion Gap	Delta anion gap	Assess compensation

#Diarrhea → cause metabolic acidosis (loss of HC3O-3) ,hypernatremia (loss of Na more than water)
#Respiratory acidosis or alkalosis → Mechanical ventilation may be necessary
Hypokalemia/hypochloremia→ think Diabetes insipidus

#In case of hypokalemia, think either:

- ALKALOSIS → measure BP, then urine Cl-
- ACIDOSIS → distal/proximal RTA

Table A.2 Capillary blood gas interpretation. Sometimes used to measure blood pH and blood carbon dioxide (CO_2) on very small volumes of blood. Digit must be warm and free flowing blood sample. Bicarbonate (HCO_3) and base excess values are calculated. Abnormal results should always be repeated.

a) General guide

	Parameters	Normal	Acidosis	Alkalosis
Acidotic or alkalotic?	pH	7.31–7.41	<7.31	>7.41
Respiratory cause?	CO_2	4.6–6 kPa	↑	↓
Metabolic cause?	HCO_3 Base excess	22–26 mmol/L −2 to +2	↓	↑

b) More detailed analysis

pH	CO_2	HCO_3	Interpretation
Normal	Normal	Normal	Normal
<7.31	↑	Normal	Respiratory acidosis
<7.31	Normal	↓	Metabolic acidosis
<7.31	↑	↓	Mixed respiratory and metabolic acidosis
Normal	↑	↑	Compensated respiratory acidosis
Normal	↓	↓	Compensated metabolic acidosis
>7.41	↓	Normal	Respiratory alkalosis
>7.41	Normal	↑	Metabolic alkalosis
>7.41	↓	↑	Mixed respiratory and metabolic alkalosis

Proteinuria

PP → name , age, gender
CC:Proteinuria on urinalysis or periorbital oedema
This is the hx for nephrotic syndrome

HPI

1. Hx of time (PC.DOT)
    a. Progression and course
    b. Duration , onset and timing
        i. More at morning or late night ?
        ii. After exercise
        iii. during febrile illnesses
2. Edema
    a. Location
        i. periorbital oedema (particularly on waking,improving during day)
        ii. scrotal or vulval, leg, and ankle oedema
        iii. Ascites, abdominal distension
3. ROS
    a. Genreral
        i. FNW → fever, night sweats, wt loss
        ii. Sepsis
        iii. Abdominal pain → peritonitis,
        iv. Joint pain → septic arthritis
    b. Skin → Skin rash
    c. RS→ Breathlessness , cough
    d. CVS → chest pain, palpitation , exercise intolerance → HF that cause protein losing enteropathy
    e. GI → N\V, D\C,Abdominal pain → protein losing enteropathy
    f. RS
        i. Frothy urine
        ii. Hematuria
4. Recent
    a. Recent infection → throat infection or skin infection
    b. Recent sick contact
    c. Recent travel
    d. Recent Dehydration
    e. Recent bee sting
5. PMH
    a. Nephrotic syndromes
    b. Benign orthostatic (postural) proteinuria
    c. IgA nephropathy
    d. protein losing enteropathy
    e. Liver failure or hepatitis

f. DM
g. vasculitides→ Henoch–Schönlein purpura
h. SLE (systemic lupus erythematosus),
i. infections (e.g. malaria)
j. allergens (e.g. bee sting).
k. chronic kidney disease
l. hypertension

6. DH
    a. Phenazopyridine → cause frothy urine but not proteinuria
7. FH
    a. Consanguinity ?
    b. Nephrotic syndromes
    c. Benign orthostatic (postural) proteinuria
    d. DM
8. SH

Invsetigation

Investigations performed at presentation of nephrotic syndrome
• Urine protein – on test strips (dipstick)
• Full blood count and erythrocyte sedimentation rate
• Urea, electrolytes, creatinine, albumin
• Complement levels – C3, C4
• Antistreptolysin O or anti-DNAse B titres and throat swab
• Urine microscopy and culture
• Urinary sodium concentration
• Hepatitis B and hepatitis C screen
• Malaria screen if travel abroad

Urinary protein

- Spot Uprotein/U Creatinine ratio (mg/L: mmol/L). Normal: < 50 mg/mmol/l in first few months, and <20 mg/mmol/L in older children. Nephrotic range : >250 mg/mmol/L.
- Microalbuminuria: 30-300
- 24 hour urine collection: Most accurate. Normal: < 4mg/m2/h, Abnormal: 4-40 mg/m2/h, and Nephrotic range: > 40 mg/m2/h or > 50 mg/kg/day.

Dipstick Protein reading	Protein excretion gm/24 hours	Protein excretion mg/dL
Negative	<0.1	<10
Trace	0.1-0.2	15
1+	0.2-0.5	30
2+	0.5-1.5	100
3+	2.0-5.0	300
4+	>5.0	>1000

Diagnosis: heavy proteinuria and low plasma albumin

Causes of proteinuria
• Orthostatic proteinuria
• Glomerular abnormalities
– Minimal change disease
– Glomerulonephritis
– Abnormal glomerular basement membrane (familial nephritides)
• Increased glomerular filtration pressure
• Reduced renal mass in chronic kidney disease
• Hypertension
• Tubular proteinuria

Diseases that can mimic nephrotic syndrome by causing periorbital edema → allergy, conjunctivitis, and hay fever.

Steroid-sensitive nephrotic syndrome

• Characteristic features: 1–10-years-old; no macroscopic haematuria; and normal blood pressure, complement levels, and renal function.
• Management: oral corticosteroids, renal biopsy if unresponsive or atypical features.
• Complications: hypovolaemia, thrombosis, infection (pneumococcal), hypercholesterolaemia.
• Prognosis: may resolve or else there may be infrequent or frequent relapses.

Congenital nephrotic syndrome

Congenital nephrotic syndrome presents in the first 3 months of life. It is rare, it is more common in consanguineous families.

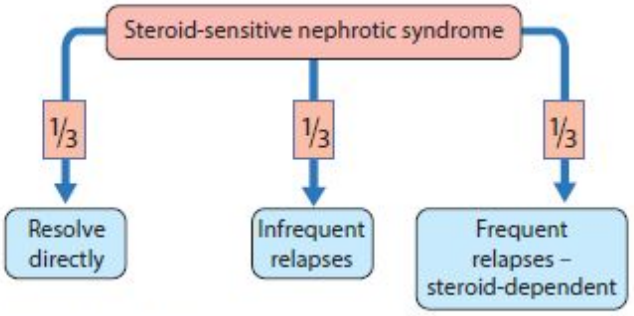


Figure 19.18 Clinical course in steroid-responsive nephrotic syndrome.

Endocrine system

Hypo\Hyper - Thyroidism

HPI+PE : {a → Hypo , b → hyper }

1. Skin
    a. Dry skin , dry thin hair \ cold, pale, mottled ,yellow “in jaundice”
    b. Sweating \ warm
2. Fat
    a. Increased wt
    b. Decreased wt
3. Muscle
    a. Muscle weakness, decreased muscle tone ,Slow-relaxing reflexes
    b. Muscle weakness ,Tremor
4. Bone
    a. Slipped upper femoral epiphysis , delayed growth
    b. Rapid growth in height, Advanced bone maturity
5. CNS
    a. Hypoactive ,Slow-relaxing reflexes,sleepiness
    b. Anxiety, restlessness ,Psychosis ,headache and nervousness
6. Eyes
    a. Periorbital edema
    b. Protruding eyes or staring , difficulty closing eyes,double vision
7. Development
    a. Poor concentration,Deterioration in school & work,Learning difficulties,delayed development ,delayed speaking
    b. Learning difficulties/ behaviour problems
8. Endocrine
    a. Cold intolerance “low body temperature” , Short stature/poor growth , delayed puberty
    b. Hot intolerance ,Rapid growth in height, Advanced bone maturity ,early puberty
9. Eyes
    a. Pale, puffy eyes with loss of eyebrows
    b. Exophthalmos,Ophthalmoplegia,Lid retraction,Lid lag (uncommon in children)
10. Face and skull
    a. coarse facies ,larger anterior fontanel, persistence of a posterior fontanel,
11. Mouth
    a. feeding problems,large tongue,Tooth eruption may be delayed,lingual thyroid
    b. Increased appetite
12. Neck
    a. Goiter ,hoarse cry
    b. Goitre (bruit), swelling in neck, dysphagia ,dyspnea, hoarseness of voice
13. CVS”heart”
    a. Bradycardia
    b. Tachycardia, wide pulse pressure ,tremor
14. GI and abdomen
    a. Constipation ,umbilical hernia

    b. Diarrhea
15. UGS
    a. Menorrhagia , Micropenis and undescended testes in boys
    b. Oligomenorrhea

Prenatal hx \\ Natal hx and birth:

1. Term or preterm \\\\ NICU

PMH and PSH:

1. Autoimmune disease
    a. vitiligo, rheumatoid arthritis, diabetes mellitus, Addison's disease , celiac
2. Down syndrome or Turner syndrome
3. Heart defects
4. Pituitary dysfunction → low GH ,low ACTH ,low GnRH → hypoglycemia
5. Viral infection → subacute granulomatous de quervain thyroiditis
6. Surgical removal or radioablation of thyroid

DH and allergies:

- As risk factors → Lithium, antithyroid drugs,amiodarone
- As a tx → thyroxine

FH:

Family hx of similar disease or other autoimmune disease :

a. vitiligo, rheumatoid arthritis, diabetes mellitus, Addison's disease , celiac

SH:

1. Diet → Iodine , iodination of salt

Investigation:

1. TFT → TSH, T4,T3
2. Antithyroid peroxisomal antibodies and thyroid-stimulating immunoglobulins (TSIs).

Management:

1. Hypothyroid → thyroxine
2. Hyperthyroid
    a. carbimazole or propylthiouracil
    b. Beta blocker for relief of anxiety, tremor, and tachycardia
    c. radioiodine treatment or surgery in the form of subtotal thyroidectomy. thyroxine replacement is often needed for subsequent hypothyroidis

Short Stature

PP

Name, age,gender

CC

Short stature

HPI

1. psychosocial short stature.
2. Nutrition
3. hypothyroidism
    a. Dry skin,increased wt, muscle weakness,lethargy , coarse face, periorbital edema,increased feeding , enlarged tongue , goiter , hoarse weak cry, constipation, menorrhagia
4. Craniopharyngioma → headache ,abnormal visual fields ,optic atrophy, or papilloedema on fundoscopy.
5. head injury, meningitis, and cranial irradiation → affects the pituitary
6. Skeletal abnormalities
7. Cardiac and Renal anomalies
8. Anemia of chronic disease
9. Malabsorption and GI symptoms
10. Ht ,wt ,head circumference (present ,previous and at birth)and gestational age
11. Father and mother Ht and Wt t(present ,before puberty ,at puberty) and age of menarche for the mother and puberty for the father and if they had the same problem
12. Pregnancy history: infection, intrauterine growth restriction, drug use, alcohol/smoking
13. Feeding history
14. Developmental milestones
15. Family history of constitutional delay of growth and puberty or other diseases?
16. Consanguinity pertaining to inherited conditions
17. Features of chronic illness, endocrine causes, e.g. hypothyroidism, pituitary tumour, Cushing's syndrome or psychosocial deprivation?
18. Medications, e.g. corticosteroids?
19. Educational status, to see if the child is getting all the attention needed.
20. Examination of the growth chart:
    a. Faltering growth with crossing of centile lines?
    b. Consider endocrine (including therapeutic corticosteroids), nutrition/chronic illness, psychosocial deprivation
21. Determine the mid-parental height
22. ROS
    a. RS → cough,SOB

b. GI → N\V ,D\C, abdominal pain. abdominal Distension , appetite
c. general→ FNW , recurrent infection

PMH & PSH

1. Chromosomal disorder/syndromes
    a. Down syndrome
    b. Turner syndrome → consider in all short females.
    c. Noonan syndrome
    d. Russell–Silver syndrome
2. Heart defects → Noonan + Down
3. long-term illness "Chronic illnesses" :
    a. coeliac disease
    b. Crohn's disease
    c. Chronic kidney disease
    d. **cystic fibrosis** – malabsorption, recurrent infections, increased work of breathing, and reduced appetite
    e. congenital heart disease – increased work of breathing.
4. Endocrine
    a. Hypothyroidism, GH deficiency, IGF-1 deficiency
    b. Steroid excess → Cushing syndrome
        i. Asthma or nephrotic syndrome
        ii. Ask if steroid is IV or inhaled or topical
        iii. Amount of dose , alternate day therapy?
    c. Laron syndrome→ GH insensitivity. high GH levels but low IGF-1
    d. hypopituitarism
        i. Hypoglycaemia (GH and cortisol deficiency).
        ii. Prolonged jaundice (cortisol and T4 deficiency).
        iii. Micropenis ± cryptorchidism (Gn deficiency).
        iv. Nystagmus (suggestive of optic nerve hypoplasia).
5. congenital midfacial or midline defects
    a. cleft palate, central incisor and septo-optic dysplasia.
6. craniopharyngioma,hypothalamic tumour

DH

1. Growth hormone as a treatment
2. steroid excess

FH

a family history of delayed growth and puberty but normal height as adults

Most short children have short parents and fall within the centile target range allowing for midparental height.
Constitutional delay in growth and puberty → delayed growth and puberty but normal final Ht,family history of delayed growth and puberty but normal height as adults
(They had delayed puberty. In case of a short boy, ask about the father's puberty– when did he start shaving or when did he first notice his voice changing. If a girl ask about the mother's puberty and growth pattern– when was her first menarche).

SH

Developmental Hx

- physical and emotional deprivation

Nutritional Hx

Ask about nutrition as a cause of short ht and low wt → Inadequate nutrition due to

- Insufficient food, restricted diets or poor appetite

Prenatal Hx

Pregnancy history: infection, intrauterine growth restriction, drug use, alcohol/smoking

Natal and birth Hx

- Small for gestational age
- extreme prematurity

Postnatal Hx

#Midparental ht :

- (father ht + mother ht)\2 + 7 for boys
- (father ht + mother ht)\2 - 7 for girls
- normal ht of child
    - +/- 10 cm from mid-parental ht for male
    - +/- 8.5 cm from mid-parental ht for female

#Short stature is usually defined as a height below the second centile (i.e. 2 SDs below the mean or below 3% .Or abnormal growth rate → child's height falling across centile lines. Compare ht with wt → is wt normal or decreased
#teased or bullied at school, poor self-esteem → because of their size

PE
VS
Wt,ht ,length ,BMI

Disproportionate short stature→ short limbs (skeletal dysplasias .eg, achondroplasia)
or short back (severe scoliosis or some storage disorders, such as the mucopolysaccharidoses.)
This is confirmed by measuring:
• sitting height – base of spine to top of head
• subischial leg length – subtraction of sitting height from total height
• limited radiographic skeletal survey to identify the skeletal abnormality.
• skeletal dysplasia – legs more affected than >back
• storage disorders – back more affected than>legs

Examination
• Dysmorphic features – chromosome/syndrome present?
(But in Turner syndrome other stigmata may be absent)
• Chronic illness, e.g. Crohn's, cystic fibrosis, coeliac disease,CKD?
• Evidence of endocrine causes?
• Disproportionate short stature from skeletal dysplasia?
• Pubertal stage?

Physical Examination:
General appearance and nutrition.
Body proportions.
Dysmorphic features.
Systemic examination, to look for any chronic illness that might be the cause of abnormal growth.
BP measurement.
Pubertal status, to tell if the patient has constitutional delay. It is also important to judge if it's too late to interfere.
Fundi examination, to look for signs of increased intracranial pressure.

Investigation

1. X-ray of the left hand and wrist for bone age
2. CBC
3. KFT+LFT→ Creatinine and electrolytes
4. TFT and prolactin
5. Calcium, phosphate, alkaline phosphatase
6. Karyotype
7. Anti-endomysial (EMA) ,anti-tissue transglutaminase (anti-TTGa) ,immunoglobulin A antibodies

8. ESR and CRP
9. GH and IGF-1
    a. Growth hormone provocation tests (using insulin, glucagon, clonidine, or arginine)
10. 0900 h cortisol and dexamethasone suppression test
11. MRI
12. Limited skeletal survey
13. Genetic evaluation

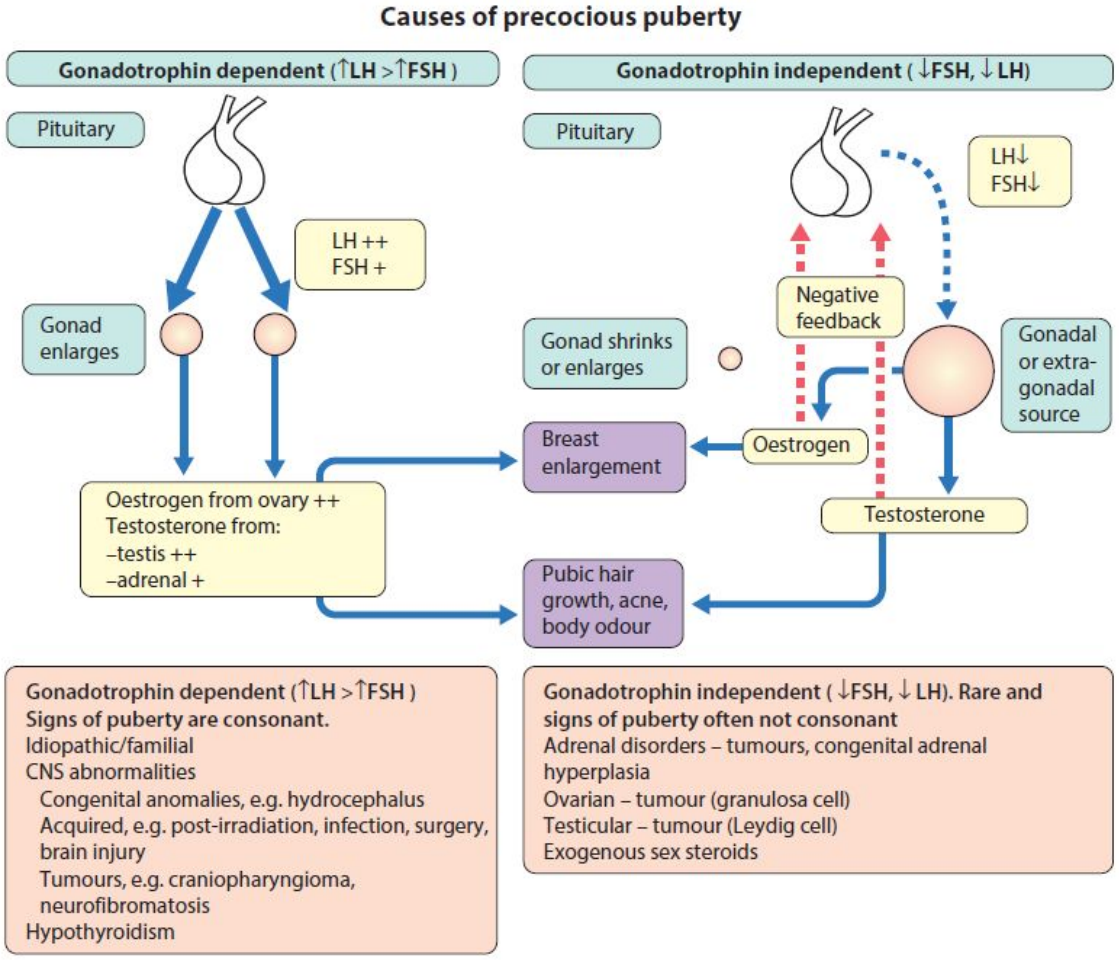
Tx

1. Treat the underlying cause
2. GH
3. IGF-1

Investigation	Significance
X-ray of the left hand and wrist for bone age	Some delay in constitutional delay of growth and puberty. Marked delay for hypothyroidism or growth hormone deficiency
Full blood count	Anaemia in coeliac or Crohn's disease
Creatinine and electrolytes	Creatinine raised in chronic kidney disease
Calcium, phosphate, alkaline phosphatase	Renal and bone disorders
Thyroid-stimulating hormone	Raised in primary hypothyroidism
Karyotype	Turner syndrome shows 45,XO, other chromosomal disorders
Anti-endomysial (EMA) and anti-tissue transglutaminase (anti-TTGa) immunoglobulin A antibodies	Usually present in coeliac disease
C-reactive protein (acute-phase reactant) and erythrocyte sedimentation rate	Raised in Crohn's disease
Growth hormone provocation tests (using insulin, glucagon, clonidine, or arginine in specialist centres)	Growth hormone deficiency
IGF-1	Disorders of the growth hormone axis, including IGF-1 deficiency
0900 h cortisol and dexamethasone suppression test	Cushing syndrome
MRI scan if neurological symptoms/signs	Craniopharyngioma or intracranial tumour
Limited skeletal survey	Skeletal dysplasia, scoliosis

Precocious puberty

The development of secondary sexual characteristics before 8 years of age in females and 9 years of age in males

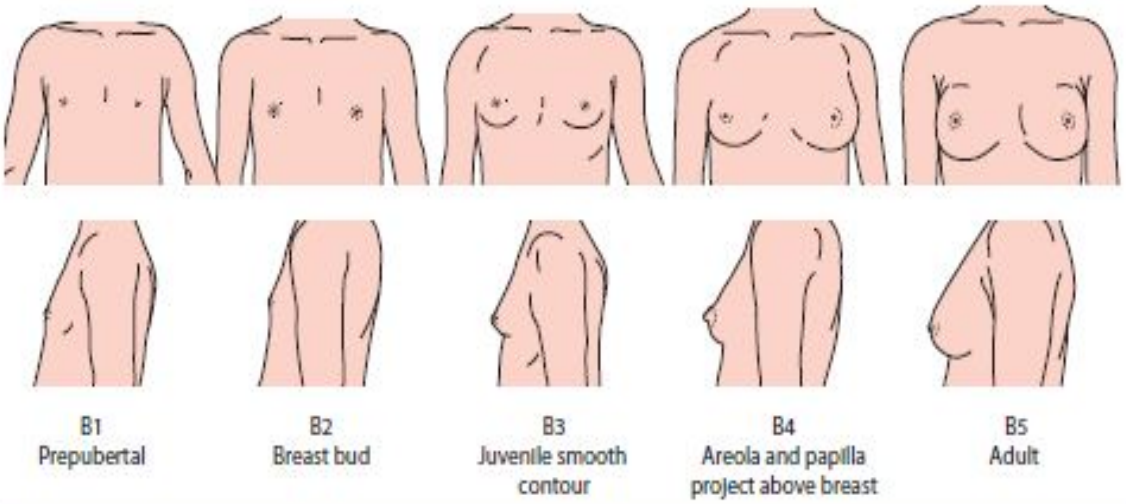


Investigation

1. Ultrasound examination of the ovaries and uterus is helpful in assessing the progress of puberty. The uterus will change from an infantile ‘tubular’ shape to ‘pear’ shape with the progression of puberty and the endometrial lining can be identified close to menarche.
2. cranial MRI scan → Tumours in the hypothalamic region
3. beta-human chorionic gonadotropin → liver tumor

Stages of puberty

(a) Female breast changes



B1
Prepubertal

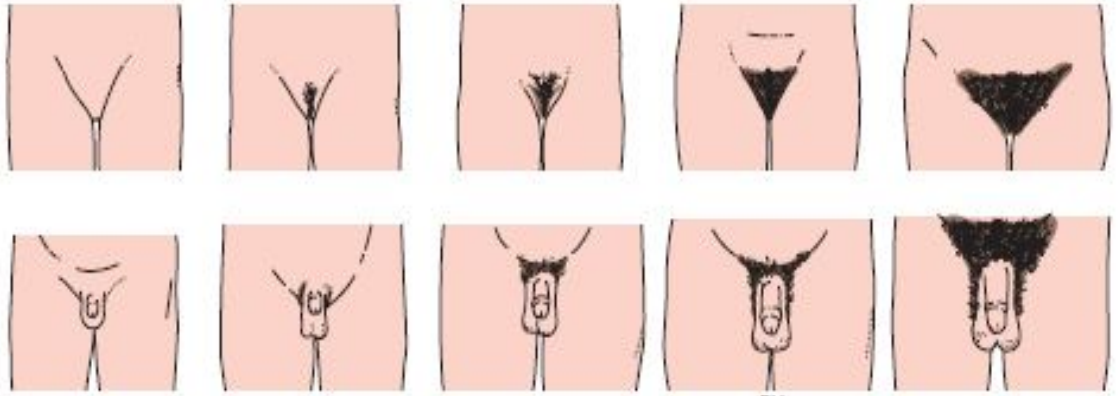
B2
Breast bud

B3
Juvenile smooth contour

B4
Areola and papilla project above breast

B5
Adult

(b) Pubic hair changes – female and male



PH1
Pre-adolescent
No sexual hair

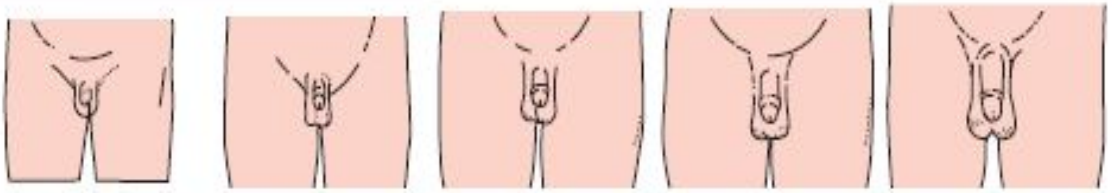
PH2
Sparse, pigmented, long, straight, mainly along labia or at base of penis

PH3
Dark, coarser, curlier

PH4
Filling out towards adult distribution

PH5
Adult in quantity and type with spread to medial thighs in male

(c) Male genital stages



G1
Preadolescent

G2
Lengthening of penis

G3
Further growth in length and circumference

G4
Development of glans penis, darkening of scrotal skin

G5
Adult genitalia

DM

PP:Name, age
CC:Excessive drinking (polydipsia), polyuria, weight loss

HPI:

1. Symptoms and signs of diabetes
    a. Early
        i. Most common – the ‘classical triad’:
            1. excessive drinking (polydipsia)
            2. polyuria
            3. weight loss
        ii. Less common:
            1. enuresis (secondary) , nocturnal enuresis
            2. skin sepsis
            3. candida and other infections
            4. Polyphagia
    b. Late – diabetic ketoacidosis
        i. Drowsiness
        ii. Altered level of consciousness → weakness, confusion → Coma and death
        iii. Smell of acetone on breath,polydipsia
        iv. Hyperventilation due to acidosis (Kussmaul breathing)
        v. N\V,Abdominal pain
        vi. Polyuria→ Dehydration → Hypovolemic shock
2. Symptoms of hypoglycemia
    a. when glu < 4 mmol\l or 72 mg\dl
    b. hunger, tummy ache, sweating, feeling faint or dizzy or of a ‘wobbly feeling’ in their legs.
    c. can cause seizures and coma.
    d. pallor and irritability, unreasonable behaviour.
3. Triggers of diabetic ketoacidosis
    a. Infection,stress , illness
    b. not taking insulin correctly
    c. Stroke
    d. certain medications such as steroids.
4. Other
    a. still awareness of hypoglycaemia?
    b. Diet

PMH + PSH:

- Any episodes of hypoglycaemia, diabetic ketoacidosis, hospital admission?
- coeliac and thyroid disease?

DH:

- Insulin regimen – appropriate?
- Steroids
- flu vaccination

FH:

SH:

- Absence from school
- Smoking, alcohol
- Sport

PE:

DKA→ On physical examination there is usually clinical evidence of dehydration, such as a dry mouth and decreased skin turgor. If the dehydration is profound enough to cause a decrease in the circulating blood volume, tachycardia (a fast heart rate) and low blood pressure may be observed. Often, a "ketotic" odor is present, which is often described as "fruity", often compared to the smell of pear drops whose scent is a ketone. If Kussmaul respiration is present, this is reflected in an increased respiratory rate

Lipohypertrophy or lipoatrophy (Fig. 26.8 a and b) at injection sites?
General overview (periodic):
• Normal growth and pubertal development, avoiding obesity
– measure height and weight and BMI and plot on growth chart at each visit
• Blood pressure check for hypertension yearly (age-specific centiles)
• Renal disease – screening for microalbuminuria, an early sign of nephropathy, annually from 12 years
• Circulation: - check pulses and sensation
• Eyes – retinopathy or cataracts are rare in children, but should be monitored annually from 12 years, preferably with retinal photography
• Feet – maintain good care, avoid tight shoes and obtain prompt treatment of infections - annually
• Screening for coeliac and thyroid disease at diagnosis, thyroid screening annually, coeliac again if symptomatic.
• Annual reminder to have flu vaccination

investigations :

Essential early investigations in diabetic ketoacidosis
• Blood glucose (>11.1 mmol/L)
• Blood ketones (>3.0 mmol/L)
• Urea and electrolytes, creatinine (dehydration)
• Blood gas analysis (severe metabolic acidosis) (pH <7.3 and/or bicarbonate <15 mmol/L),
• Evidence of a precipitating cause, e.g. infection (blood and urine cultures performed)
• Cardiac monitor for T-wave changes of hypokalaemia
• Weight (compare with recent clinic weight to ascertain level of dehydration)

Tests to perform when hypoglycaemia is present
Blood

1. Confirm hypoglycaemia with laboratory blood glucose
2. insulin,C-peptide

3. Growth hormone, IGF-1,
4. cortisol
5. fatty acids, ketones (acetoacetate, 3-hydroxybutyrate),
6. glycerol, branched-chain amino acids, acylcarnitine profile, lactate, pyruvate

First urine after hypoglycaemia

1. Organic acids
2. Consider saving blood and urine for toxicology, e.g. salicylate, sulphonylurea

Rheumatology

Joint pain

PP:age,gender
CC:Joints pain or swelling or redness .duration?

HPI:

1. Joint pain (SOCRATES)
    a. Site → distribution (mono,oligo,poly),symmetrical or asymmetrical ,large or small joints , lower or upper limbs
    - Is the pain migratory or persistent?
    b. Onset and hx of time “DOT.PC”
        i. Onset → gradual or sudden
        ii. Duration (more or less than 6 months , how many joints involved in the first 6 months)
        iii. Timing → at morning,at rest\exertion
        iv. course:increasing ,decreasing,constant
        v. Pattern:intermittent ,continuous
    c. Character
    d. Radiation
    e. Associated symptoms
        i. Early morning stiffness (for 30 mins) ,stiffness after periods of rest
        ii. Limitation of joint movement
        iii. Swelling,redness,hotness ,loss of fxn
        iv. refusal to move the joint or weight bear
        v. intermittent limp
        vi. deterioration in behaviour or mood or avoidance of previously enjoyed activities
    f. Exacerbating and relieving factors
        i. Exacerbated (worsening) by rest or inactivity
        ii. Relieved by movement and analgesia +NSAIDS
    g. Severity
2. Constitutional symptoms **(FNW)**
    a. **F**ever ,chills ,rigors
    b. **N**ight sweats
    c. **W**t loss ,anorexia
    d. fatigue

3. ROS
    a. Skin
        i. Rashes (malar rash on cheeks) or salmon-pink macular rash ,photosensitivity,ulcers,raynaud's
        ii. Alopecia
    b. MSS
        i. Proximal muscle weakness (pt can't stand up, can't brush hair (put arm on head)

ii. Bone pain

c. CNS
   i. EYES → redness or sicca
   ii. HA , seizures
d. Endocrine
e. RS → dyspnea,pleuritic chest pain,dry cough
f. CVS → chest pain
g. GI→ mouth ulcers(painless?),sicca , abdominal distension (hepatosplenomegaly)
h. US→ hematuria or frothy urine
i. Hematological → anemia (fatigue, فقر دم),coagulopathy (thrombosis in LL and brain), leukopenia (التهابات) , lymphadenopathy
j. Obstetric → history of abortion ,symptoms increase after preg

4. Risk factors “recent”
   a. Recent Diarrhea or sexual contact → reactive arthritis
   b. Recent intercurrent illness, dehydration or surgery→ crystal-induced arthritis
   c. Recent Prodromal illness → viral arthritis
   d. Recent trauma
   e. Recent travel

PMH:

- DM.HTN.DLP
- Paget disease of bone ,malignancy (bone ,or bone mets)
- Kidney stones and interstitial nephritis (in gout)
- primary hyperparathyroidism→ pseudogout

DH:

- Immunization hx
- Diuretics → can induce gout
- Chemotherapy → gout
- NSAID and steroids

FH:

- Of same disease
- arthritis and autoimmunity

SH:

1. diet
2. Smoking,alcohol?
3. Residence ? ,which floor ?
4. Occupation →athletes ?
5. Travel hx and sick contact
6. Sexual hx and drug misuse

#Diet → red meat and seafood can induce gout

Sexual activity → septic arthritis

PE:

on examination :

1. General
    a. Well looking or sick
    b. V\S → HR,RR, TEMP
2. inspection :
    a. gait
    b. deformity → genu valgum
    c. swelling ,redness
    d. chin size
    e. hands → swan neck, rheumatoid nodules ,swelling → in PIP or DIP or Wrist
3. palpation:
    a. pain,tenderness,swelling,warmth,edema
    b. wasting of muscles
    c. limitation of movement +crepitus
    d. Passive and active movement
    e. palpate for crepitus and effusions
4. measure the length of legs → leg length discrepancy
5. skin
    a. generalized rash, malar or discoid rash, erythema migrans, or subcutaneous nodules
6. oral cavity and eye including fundoscopic exam
7. abdominal exam as well as cardiac exam for murmurs and signs of failure

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Investigation

1. Joint aspiration→ gram stain and culture (sepsis)
2. Blood tests
    a. inflammatory markers→ ESR,CRP
    b. CBC (neutrophils) +viral serology
    c. Rheumatoid factor,Antinuclear factor “ANF”
    d. blood cultures → septic arthritis, osteomyelitis or rheumatic fever
3. If gonorrhea is suspected in sexually active (adolescent)patients, obtain pelvic, urethral, throat and rectal cultures as well
4. Imaging
    a. USS → for synovitis ,detect joint effusions
    b. X-ray
    c. MRI→ best test for suspected osteomyelitis
5. Renal biopsy in lupus nephritis

-onset:

gradual→ inflammatory

Sudden → septic,trauma,gout

-The number of joints involved has important diagnostic implications

• Monoarthritis: single joint

• Oligoarthritis: 4 joints or fewer

• Polyarthritis: 5 joints or more

-Ddx

Single joint	
Infectious	**Orthopedic**
Septic arthritis Gram positives Gonococcal arthritis	Trauma
Toxic/transient synovitis	Overuse syndromes
Osteomyelitis adjacent to joint	Slipped capital femoral epiphysis
Reactive arthritis	Legg-Calve-Perthes disease
Hematological	**Autoimmune**
Hemarthrosis	Juvenile idiopathic arthritis Oligoarticular
Neoplastic	Systemic Lupus Erythematosus
Osteoid osteoma adjacent to joint	
Osteosarcoma adjacent to joint	
Ewing's sarcoma adjacent to joint	

Multiple Joints	
Infectious	**Autoimmune**
Disseminated gonorrhea	Juvenile idiopathic arthritis 1. Oligoarticular 2. Polyarticular RF negative 3. Polyarticular RF positive 4. Systemic 5. Enthesitis-related arthritis 6. Psoriatic arthritis
Lyme disease	
Reactive arthritis	
Rheumatic fever Streptococcal-associated polyarthritis	
Other	
Systemic lupus erythematosus Kawasaki disease Inflammatory bowel disease Henoch-Schonlein purpura Connective tissue disorders Behcet's disease	

- Septic Arthritis
    - The most commonly affected joint in children is the knee and in infants is the hip
    - Patients may present with localized symptoms alone, or generalized fever, malaise and toxic appearance
    - Involved joints are kept immobile, flexed, and in the case of the hip abducted and externally rotated
- Reactive Arthritis
    - Arthritis associated with infection at a distant site
    - Primarily a clinical diagnosis once other etiologies are ruled out
    - Treatment is supportive with NSAIDs, rest, and treatment of underlying infection
    - Symptoms persist weeks to months and in 4-19% of patients become chronic (> 6 months)
- Acute Rheumatic Fever
    - Peaks at 5-15 years
    - The major Jones criteria in decreasing frequency are polyarthritis (60-80%), carditis (50-60%), chorea (10- 15%), erythema marginatum, and subcutaneous nodules
    - Minor criteria are fever, arthralgia, elevated ESR or CRP, and prolonged PR interval
    - The diagnosis is made with 2 major or 1 major and 2 minor criteria, plus confirmation of antecedent GAS infection
- Juvenile Idiopathic Arthritis
    - Arthritis of unknown etiology starting before the 16th birthday and persisting for > 6 weeks
    - Juvenile idiopathic arthritis
        - Oligoarticular
            - Most common subtype, best prognosis Arthritis in 1-4 joints Most often knees,treat with NSAIDS +/- intra-articular corticosteroids
        - Polyarticular RF negative
        - Polyarticular RF positive
        - Systemic
        - Enthesitis-related arthritis
        - Psoriatic arthritis
    - Treat with NSAIDs, intra-articular steroids (not systemic), methotrexate, and biologic DMARDS

Hematology

Anemia

PP:age,gender.
CC:Pallor, lethargy ,SOB + duration ?

HPI:

symptoms:

1. **General:**
    a. tire easily and young infants feed more slowly than usual.
    b. FNW → fever ,night sweats , wt loss .
2. **skin**:
    a. Pallor شحوب , jaundice اصفرار (in case of hemolytic anemia,ask when it started),coldness
    b. petechiae and easy bruising
3. **MSS** :
    a. muscle weakness, bone pain,joint pain
4. **CNS**:
    a. fatigue,poor concentration,HA ,dizziness,fainting.irritability
    b. **eyes**:yellow
5. **RS**:
    a. SOB (duration,onset, at rest or at exertion or when lying down, awake pt from sleep)
6. CVS
    a. **Cardio** :chest pain (socrates) ,palpitation.symptoms of heart failure
    b. **vascular**:low blood pressure and orthostatic hypotension (esp in blood loss),intermittent claudication of the legs.
    c. **hemato**:splenomegaly
7. GI : change color of stool (black or red ;bleeding),
    a. D\C ,N\V,abdominal pain
    b. (Hepatosplenomegaly)
    c. malabsorption:a lot of gases ,failure to thrive, other deficiencies
8. US:
    a. dark urine “hematuria “(due to Hb in hemolytic anemia)

Risk factors:

1. Recent bleeding →
    a. menstrual bleeding (heavy,# of pads ,freq),
    b. GI bleeding → melena (black stool),blood in stool , hematemesis(vomiting blood) ,
2. recent surgery or trauma
3. Dilutional anemia (acute volume infusion or volume overload like heart failure)

Causes:

#vit b12 def → gastrectomy,crohn's ,ileal resection.

ask about vit b12 def manifestation→ sore tongue (stomatitis & glossitis)

neurological manifestation(differentiate between folate and vit b12 def) :

a. Demyelination in **posterior columns** " loss of position/vibratory sensation in lower extremities",

lateral corticospinal tracts "UMNL ; upper motor neuron signs (increased deep tendon reflexes, spasticity, weakness, Babinski sign" and **spinocerebellar tracts** "ataxia"

b. Can lead to urinary and fecal incontinence, impotence

c. Can lead to **dementia**

#sickle cell anemia:

1. gallstones (pigmented)+jaundice\\CHF\\aplastic crisis"parvovirus"
2. vaso-occlusion:
    a. MSS:
        i. Painful crises involving bone—mc
        ii. **Hand–foot syndrome (dactylitis).** Often the first manifestation of sickle cell disease.
        iii. Avascular necrosis of joints—most common in hip and shoulder
    b. **CNS**
        i. **CVAs** (stroke)—the result of cerebral thrombosis
        ii. **Ophthalmologic complications** (e.g., retinal infarcts, vitreous hemorrhage, proliferative retinopathy, retinal detachment).
    c. **RS**
        i. **Acute chest syndrome**: Associated with chest pain, respiratory distress, pulmonary infiltrates, and hypoxia.
    d. CVS
        i. Repeated episodes of **splenic infarctions**—these lead to **autosplenectomy**
        ii. **Sequestration crises –** sudden splenic or hepatic enlargement, abdominal pain and circulatory collapse from accumulation of sickled cells in spleen
        iii. **Chronic leg ulcers** --typically over lateral malleoli.
    e. GI
        i. **Abdominal crisis** —mimics acute abdomen.
    f. UGS
        i. Renal papillary necrosis with **hematuria** (usually painless) and enuresis"inability to concentrate urine"
        ii. **Priapism**: Erection due to vaso-occlusion, usually lasting between 30 minutes and 3 hours.

3. Infectious complications."because of asplenia "
    a. Haemophilus influenzae, Streptococcus pneumoniae,Salmonella osteomyelitis

4. Adenotonsillar hypertrophy – causing sleep apnoea syndrome leading to nocturnal hypoxaemia, which can cause vaso-occlusive crises and/or stroke
5. Delayed growth".Short stature" and sexual maturation"delayed puberty", especially in boys
6. Acute vaso-occlusive crises precepitants:
    a. exposure to cold, dehydration, excessive exercise or stress, hypoxia or infection

complication:
-Pica(consumption of non-food items such as ice or soil or chalk)
-growth retardation and failure to thrive in small children.

PMH:

1. chronic illness(CA,renal failure,autoimmune "SLE,juvenile RA", chronic infection"TB,endocarditis,lung abscess")
2. previous AXR or CXR
3. viral infection → Parvovirus B19
4. prosthetic heart valves (hemolytic anemia)
5. cholelithiasis (hemolytic anemia)
6. bleeding disorder → von Willebrand disease, hemophilia
7. Malabsorption → celiac disease
8. (hypo or hyper) thyroidism
9. Ask about blood transfusion and its complication
    a. iron deposition→ MC
        i. Skin – hyperpigmentation
        ii. Pituitary gland – impaired growth and sexual maturation
        iii. Pancreas – diabetes
        iv. Heart – cardiomyopathy
        v. Liver – cirrhosis
    b. Infection:
        i. Hepatitis A, B, C \HIV \ Malaria \Prions (e.g. Creutzfeldt-Jakob disease)

PSH:gastrectomy,ileal resection,Meckel diverticulum

DH:

1) warfarin
2)chronic blood transfusion (is there any symptoms of hemochromatosis "liver cirrhosis ,CHF,bronze skin ,DM, joint and bone pain")
3)Isoniazid (tx of tb) ,chloramphenicol and lead poisoning. (causes of sideroblastic anemia)
4)methotrexate(folate antagonist) and phenytoin +hemodialysis → folate def.
5) PPI → vit b12 def

FH:ask about anemia, G6PD def. ,thalassemia,hemophilia.
SH:

1. race or region of living

2. sources of lead poisoning → old paint, inhalation of gasoline

Nutritional hx:

1. babies on milk → low iron,
    a. breast milk or formula (what type), cow milk → amount and freq
    b. time of weaning ?
    c. is cereal supplied with iron
    d. is vit c introduced (fresh fruit and vegetables) → increase iron absorption
    e. Tea +high fiber diet ? → decrease iron absorption
    f. red meat, fish ,liver and kidneys , green vegetables → high iron content
2. Female young pt → increased iron requirement and menstrual bleeding
3. vegetarian (duration;vit b12 def),green vegetables (and if it's overcooked ;folate def)
4. beans → فول

perinatal hx:

- Feto-maternal bleeding? , preterm ? ,NICU ? , normal or cs delivery

PE

iPPH, position and exposure

general:

pallor (look for pallor at the conjunctivae, tongue or palmar creases),jaundice (hemolytic anemia) .coldness

pain and distress

conscious oriented to time place and person

V\S → hypotension and tachycardia (if chronic presentation)

hands and extremities :

cold,pale , koilonychia (in IDA).

bone deformities (thalassemia major) or leg ulcers (sickle-cell disease)

face:

eyes:yellow

Bossing of the skull Maxillary overgrowth → beta thalassemia major

cardiac examination:

1) tachycardia (a fast heart rate), 2) bounding pulse,3) flow murmurs,4) cardiac ventricular hypertrophy (enlargement). 5)There may be signs of heart failure.

GI examination: hepatomegaly and splenomegaly → **HSM**

radiograph:

x-ray→ crew cut appearance (in thalassemia)

Investigation

labs→

- Hb and Hct "**H&H**" then MCV and retic count
- retic count :>2% good bone marrow response to blood loss or RBC destruction
  <2% inadequate bone marrow RBC production
- folate,vit b12. → methylmalonic acid (elevated in vit b12 only) and homocysteine (elevated in both folate,vit b12 def) → antibodies against intrinsic factor
- iron studies;fe+2 ,ferritin ,transferrin "TIBC;Total iron binding capacity "
  If GI bleeding (which cause IDA) is suspected—**guaiac stool test** or **colonoscopy**.
  Colon cancer is a common cause of GI bleeding in the elderly
- peripheral blood smear:
  target cells;
  Liver disease: Lecithin—cholesterol acyltransferase (LCAT)
  Alpha-thalassemia and beta-thalassemia (hemoglobinopathy)
  Hemoglobin C Disease
  Post-splenectomy:
  Auto Splenectomy by sickle cell anemia

  ring sideroblast → sideroblastic anemia
  hypersegmented neutrophils→ vit b12 def
  schistocytes and helmet cells→ hemolytic anemia
  Sickled RBCs— sickle cell anemia
  Heinz bodies —G6PD deficiency

- Hb electrophoresis
- haptoglobin ,LDH,indirect (unconjugated) bilirubin
- Direct Coombs test→ autoimmune hemolytic anemia
- Osmotic fragility→ hereditary spherocytosis

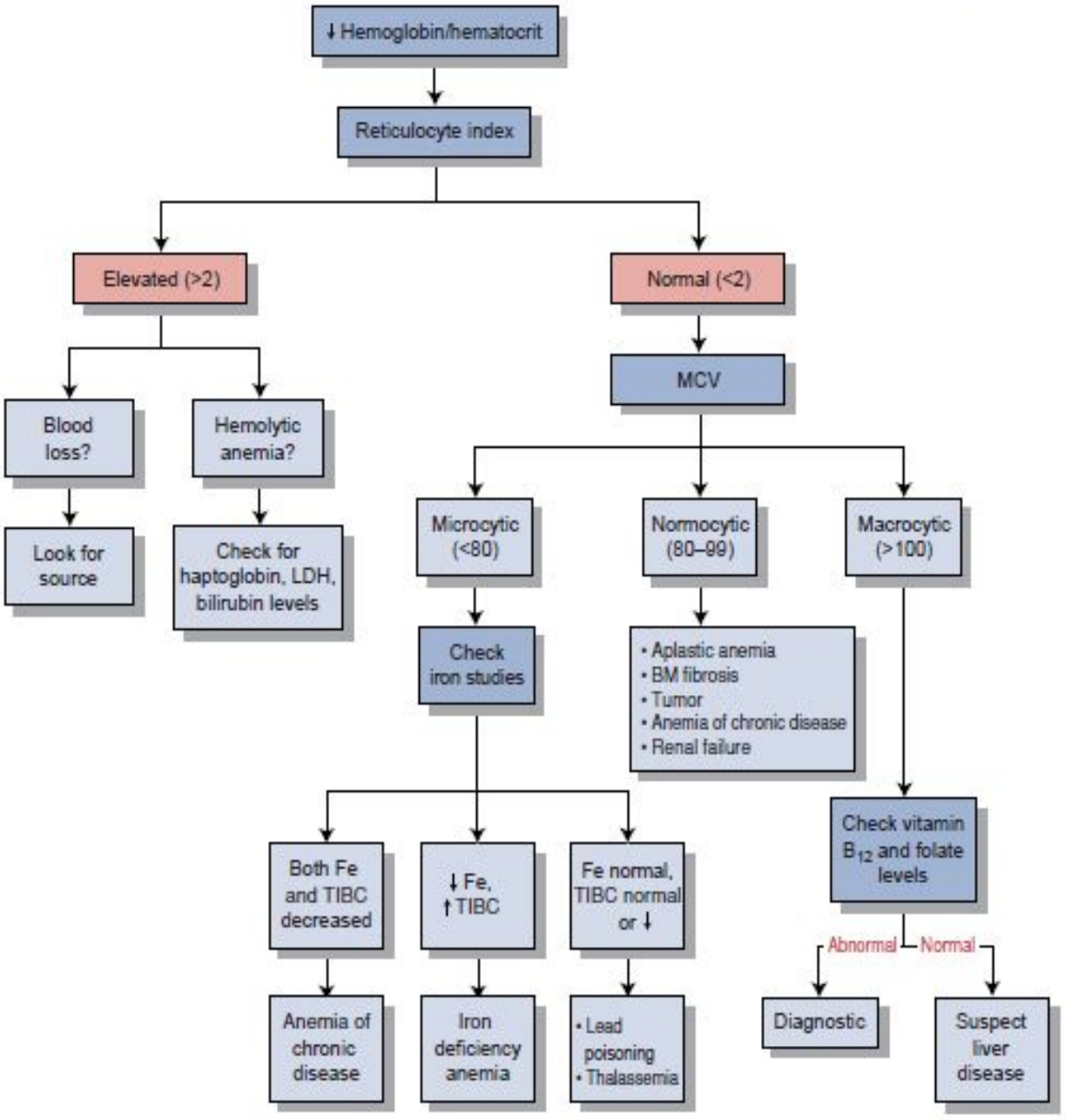
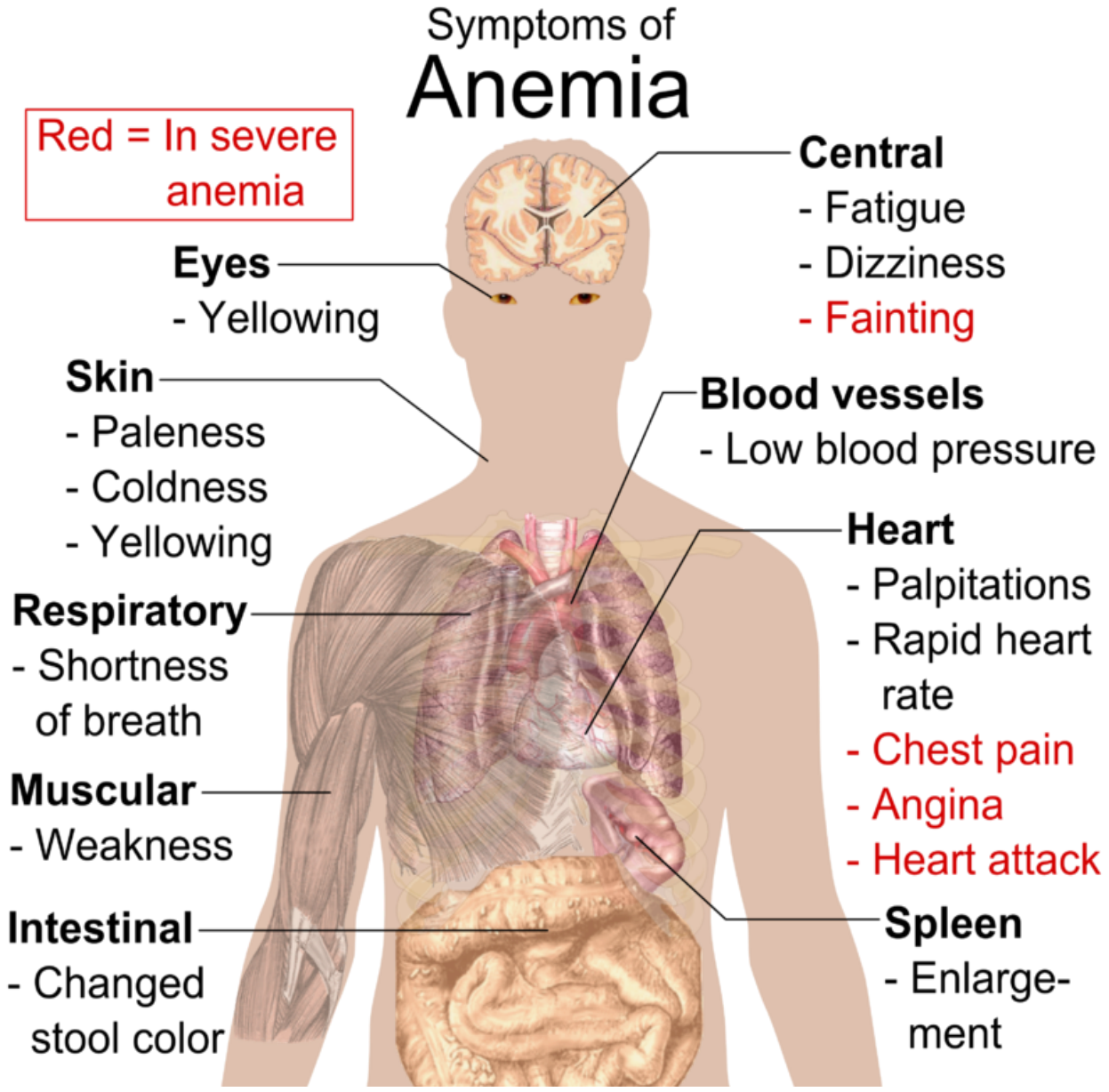
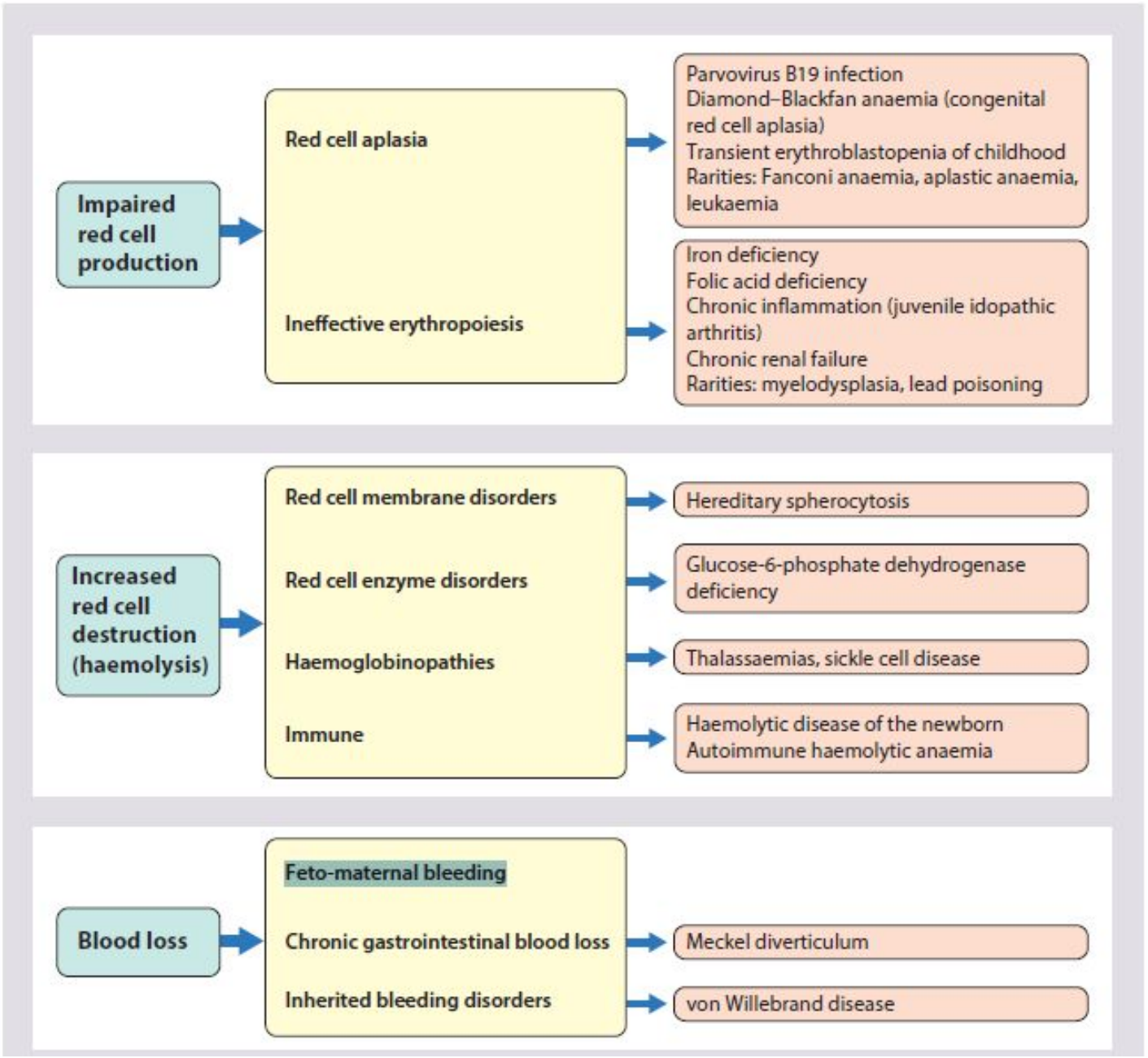

↓ Hemoglobin/hematocrit
Reticulocyte index
Elevated (>2)
Normal (<2)
Blood loss?
Hemolytic anemia?
Look for source
Check for haptoglobin, LDH, bilirubin levels
MCV
Microcytic (<80)
Normocytic (80–99)
Macrocytic (>100)
Check iron studies
• Aplastic anemia
• BM fibrosis
• Tumor
• Anemia of chronic disease
• Renal failure
Check vitamin B_{12} and folate levels
Both Fe and TIBC decreased
↓ Fe, ↑ TIBC
Fe normal, TIBC normal or ↓
Abnormal
Normal
Anemia of chronic disease
Iron deficiency anemia
• Lead poisoning
• Thalassemia
Diagnostic
Suspect liver disease

Table 5.1: Laboratory Findings in Microcytic Anemia

STATE	FERRITIN	TIBC	SERUM IRON	% SATURATION
Normal	.	300(jg/dl.	100 pg/dL	33%
Iron Deficiency Anemia	Low	High	Low	Low
Anemia of Chronic Disease	High	Low	Low	Low
Sideroblastic Anemia	High	Low	High	High
Pregnancy and oral contraceptives	.	High	.	Low



Causes of anaemia in infants & children



Box 23.2 Drugs and chemicals which can cause haemolysis in children with G6PD deficiency

Antimalarials

- Primaquine
- Quinine
- Chloroquine

Antibiotics

- Sulphonamides (including co-trimoxazole)
- Quinolones (ciprofloxacin, nalidixic acid)
- Nitrofurantoin

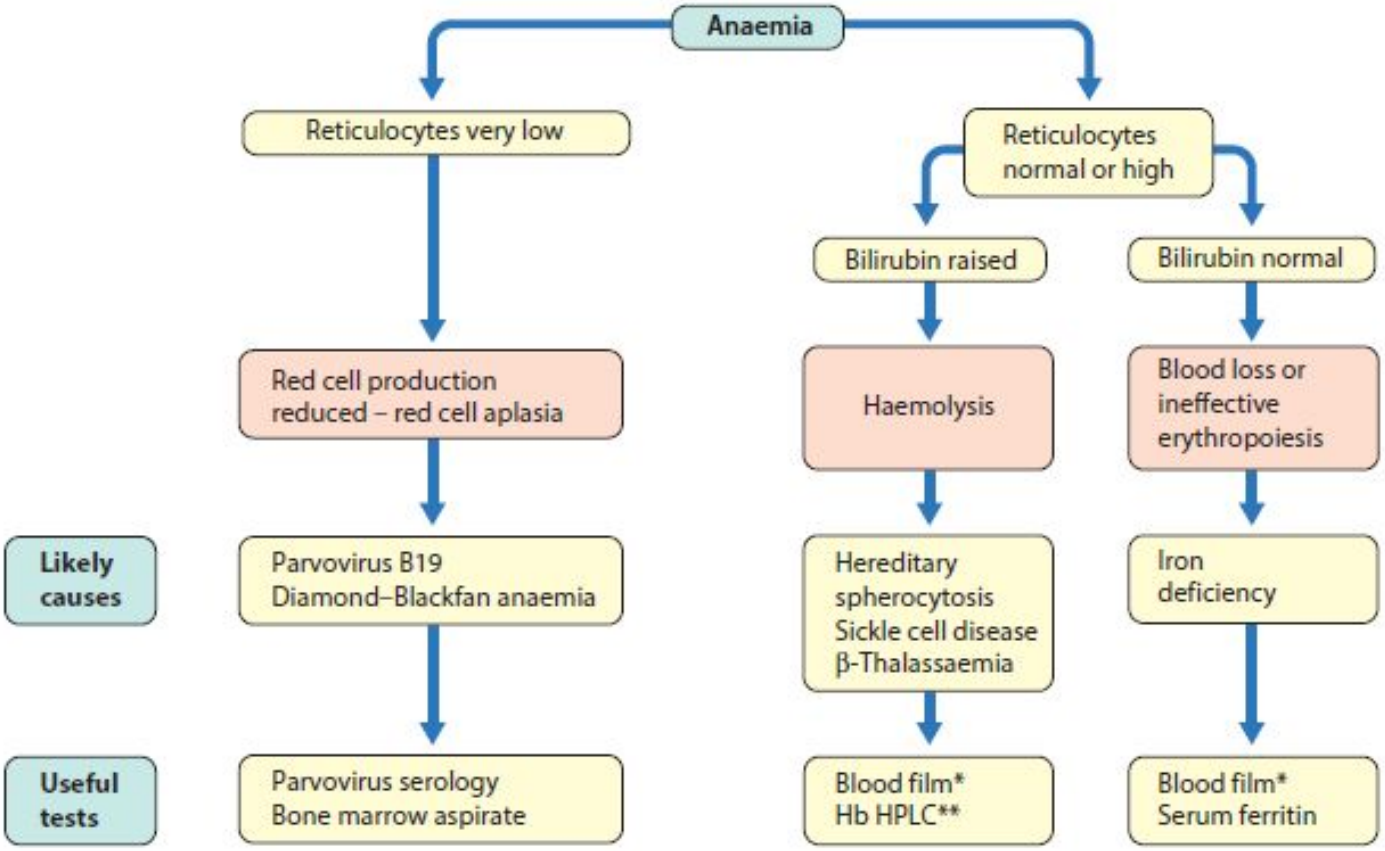
Analgesics

- Aspirin (in high doses)

Chemicals

- Naphthalene (mothballs)
- Divicine (fava beans – also called broad beans)

Simple diagnostic approach to anaemia in children



*Blood film shows spherocytes in hereditary spherocytosis, sickle cells and target cells in sickle cell disease, hypochromic/microcytic red cells in thalassaemia and in iron deficiency.

** Hb HPLC, high performance liquid chromatography (in some laboratories Hb electrophoresis is used instead) shows:

- in sickle cell disease – HbS and no HbA is present
- in β-thalassaemia major – only HbF is present
- in β-thalassaemia trait – the main abnormality is an increased level of HbA_2
- in α-thalassaemia trait – Hb HPLC is normal

#IDA

Iron may come from:

• breastmilk (low iron content but 50% of the iron is absorbed)

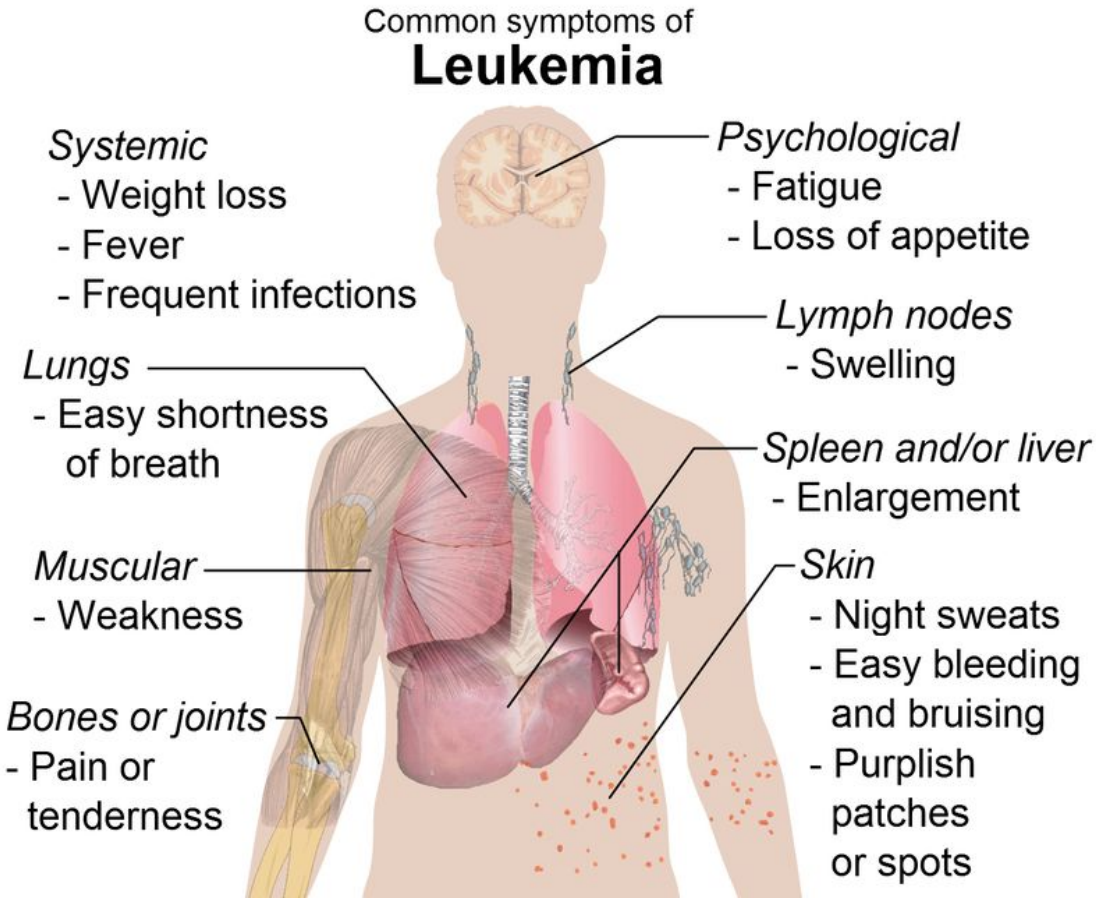
• infant formula (supplemented with adequate amounts of iron)

• cow's milk (higher iron content than breastmilk but only 10% is absorbed)

• solids introduced at weaning, e.g. cereals (cereals are supplemented with iron but only 1% is absorbed).

Iron deficiency may develop because of a delay in the introduction of mixed feeding beyond 6 months of age or to a diet with insufficient iron-rich foods, especially if it contains a large amount of cow's milk (Box 23.1). Iron absorption is markedly increased when eaten with food rich in vitamin C (fresh fruit and vegetables) and is inhibited by tannin in tea

leukemia & lymphoma



CC:easy bruising, pale skin, fever, and an enlarged spleen or liver.or painless lymphadenopathy

Signs and symptoms

1. MC symptoms in children → easy bruising, pale skin, fever, and an enlarged spleen or liver.
2. **P**latelets Low → easily bruised, bleed excessively, or develop pinprick bleeds (petechiae).nosebleeds.bleeds when brush teeth,hematuria.
3. **R**BC Low → anemia → dyspnea ,lethargy and pallor.
4. **W**BC Low →
    a. infection→ tonsillitis ,ear infection , sores in the mouth, or N\V ,D\C , life-threatening pneumonia or opportunistic infections.
    b. Ask about:
        i. Mouth pain or sores
        ii. Ear rubbing or dyspnea or cough
        iii. N\V ,D\C , abdominal pain
        iv. Dysuria
5. other symptoms:
    a. FNW → fevers, chills and rigors, night sweats, wt. loss (unintended)
    b. General → Malaise, anorexia, weakness ,feeling fatigued and sick, other flu-like symptoms.
    c. itching

    d. Nausea or a feeling of fullness or abdominal pain due to an enlarged liver and spleen; this can result in unintentional weight loss.
6. LN swelling (painless ? , site) and hepatosplenomegaly → Nausea or a feeling of fullness or abdominal pain due to an enlarged liver and spleen; → unintentional weight loss.
7. **CNS** →
    a. Headaches → MC
    b. Uncommon neurological symptoms like migraines, seizures, or coma can occur as a result of brain stem pressure. Vomiting, nerve palsies
8. MSS → muscular weakness , bone and joint pain and tenderness
9. psychological → fatigue and loss of appetite
10. Testicular enlargement

PMH :

- Down syndrome or other syndromes

Risk factors for leukemia :

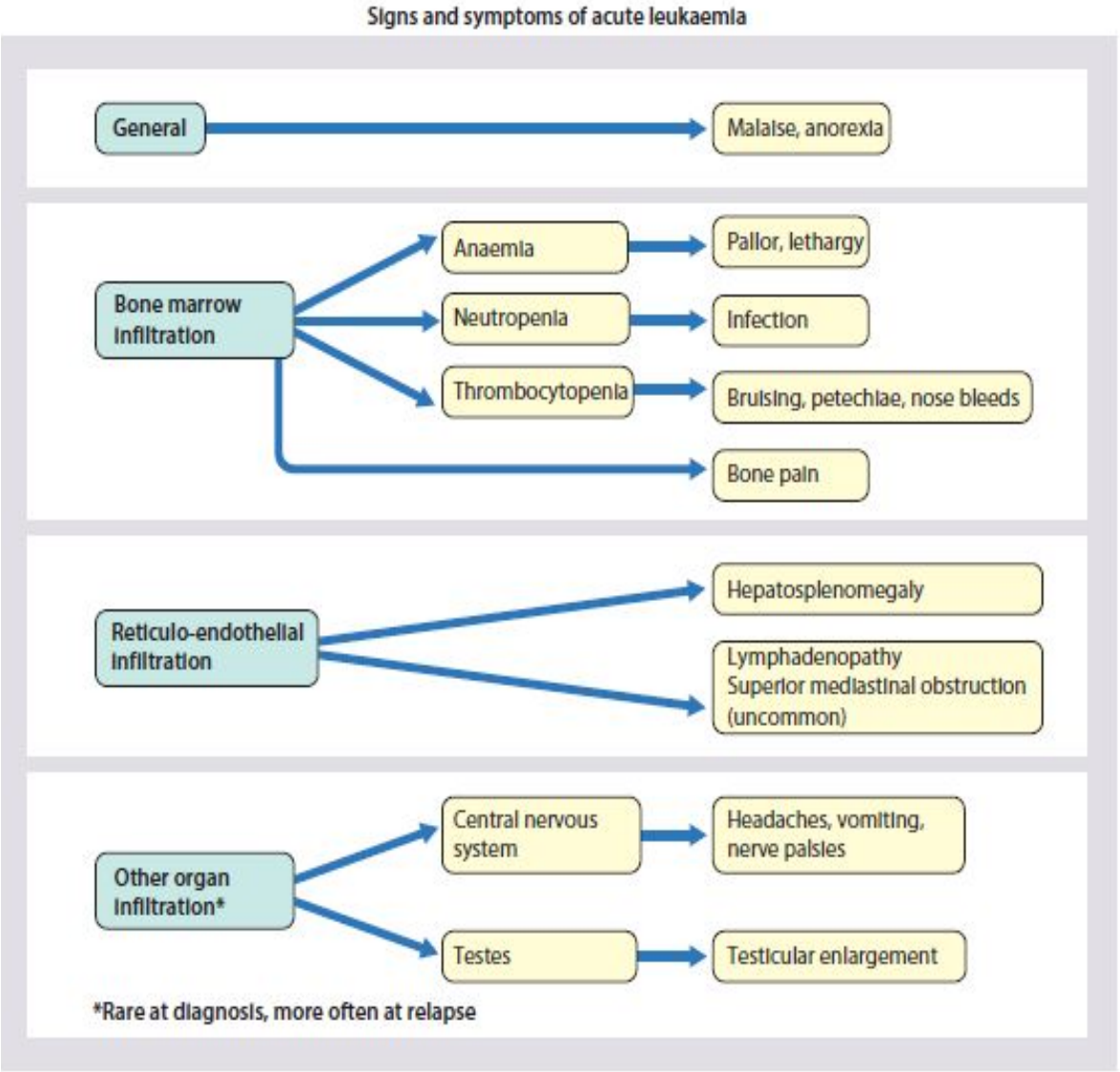
1. smoking, ionizing radiation, some chemicals (such as benzene),
2. Prior chemotherapy,
3. PMH → Down syndrome.
4. FH→ People with a family history of leukemia are also at higher risk.

Risk factors for lymphoma:

1. Hodgkin lymphoma :
    a. infection with Epstein–Barr virus and a history of the disease in the family.
2. non-Hodgkin lymphomas “common types” :
    a. autoimmune diseases, immunosuppressant medications.
    b. HIV/AIDS, infection with human T-lymphotropic virus,
    c. some pesticides.
    d. Eating large amounts of red meat and tobacco smoking may also increase the risk

Labs:

1. CBC
2. Bone marrow biopsy and aspiration with immunological and cytogenetic characteristics
3. Clotting screen
4. Lymph node biopsy
5. Following diagnosis, blood chemistry tests can be used to determine the degree of liver and kidney damage or the effects of chemotherapy on the patient.
6. CSF examination
7. Imaging
    a. bones (X-ray), the brain (MRI), or the kidneys, spleen, and liver (ultrasound). CT scans can be used to check lymph nodes in the chest, though this is uncommon.
    b. PET scan for monitoring the Tx



22.6 Signs and symptoms of acute leukaemia.

Physical Examination

Thyroid examination

1. IPPH → introduction permission, privacy, hand hygiene
2. Position and exposure → sitting and exposure is from the neck to the nipples.
3. General
    a. First impression:
        i. conscious, alert and oriented to time, place and person.
        ii. Hyperthyroidism: restless and agitated.hyperactive and restless,wearing less clothes than normal “according to the weather” due to feeling of hotness.
        iii. Hypothyroidism: slow motion and apathy.wearing more clothes than normal “according to the weather” due to feeling of cold
        iv. Dysmorphic features
        v. Growth parameters → head circumference, wt ,ht
    b. Vital signs “V\S” → RR,HR,BP,temp, BMI
        i. Pulse:
            1. asses volume in carotid and brachial arteries.
            2. Hyperthyroidism: tachycardia with irregular irregularity (it causes
            3. atrial fibrillation).
            4. Hypothyroidism: bradycardia.
            5. Regular irregularity can be a normal variation.
        ii. BMI:
            1. Hypothyroidism: increased.
            2. Hyperthyroidism: decreased.
4. Hands
    a. Hypothyroidism
        i. Thenar muscle wasting, cold and dry .
        ii. Signs of carpal tunnel
    b. Hyperthyroidism
        i. Sweaty, warm and palmar erythema
        ii. Fine tremor “shaking”
        iii. Onycholysis
        iv. Thyroid acropachy: tender wrist, clubbing and periosteal bone formation. → in graves disease
5. Face
    a. Hypothyroidism
        i. Apathetic face
        ii. Bilateral ptosis
        iii. Loss of lateral one third of the eyebrow
        iv. Periorbital edema
    b. Hyperthyroidism
        i. Exophthalmos (examine from above or lateral side).
            1. Elevated upper eyelid, depressed lower eyelid, difficulty with convergence, absent forehead wrinkling when looking forward
        ii. Corneal ulcer.
        iii. Orbital edema (Graves’ disease).

iv. Conjunctivitis, Chemosis (redness and edema).
v. Examine ophthalmoplegia (follow the letter H to test for diplopia and nystagmus).
vi. Lid **lag** (follow an object going down vertically) occurs in hyperthyroidism (catecholamines affect nerve conduction). → dynamic sign
    1. Normally → you can't see the sclera above the cornea
    2. Abnormally → there is lid lag and you can see the sclera above the cornea
vii. Lid **retraction** (seeing sclera above iris or wider sclera below the iris). → static sign

c. Examine scalp:
    i. Hypothyroidism → Dry and coarse .
    ii. Hyperthyroidism → Sweaty .
    iii. Alopecia in both hypothyroidism and hyperthyroidism.

6. Neck
    a. Inspection
        i. SMD → scars, masses, distended veins.
        ii. Scars (collar scar at the crease of the neck indicates previous thyroid surgery).
        iii. swelling and redness.
        iv. Symmetry.
        v. Ask the patient to swallow → observe any abnormalities.
        vi. Ask the patient to protrude his tongue → Thyroglossal cyst: if the cyst exists, skin moves up with the cyst.
            1. Thyroid → move with swallowing
            2. Thyroglossal cyst → move with swallowing and tongue protrusion
        vii. Ask the patient to open his mouth → observe any masses. → Lingual thyroid
        viii. Pemberton's sign (thyroid enlargement can cause SVC obstruction).
        ix. Check hoarseness which in common in hypothyroidism.
    b. Palpation
        i. Palpate while the patient swallows while standing behind the patient.
        ii. Fix one hand on one lobe and palpate the other lobe if a nodule is felt ask the patient to swallow and comment using SPACESPIT (size, position, attachment, consistency, edge, surface and shape, pulsation, inflammation and thrills).
        iii. Lymph nodes. → cervical and supraclavicular
        iv. Mediastinum:
            1. Tracheal tug.
            2. Tracheal deviation.
            3. Cricosternal distance
    c. Percussion
        i. On the sternum → becomes dull of a goiter extends retrosternally or if the whole thyroid is displaced.
    d. Auscultation
        i. Bruit over the thyroid is characteristic of Graves' disease.
        ii. To reduce transmission, ask the patient to:

1. Hold his breath.
2. Place your hand on the root of the neck to reduce transmission
3. from the jugular vein.

7. Other
    a. Legs:
        i. Pretibial myxedema (pink or brown scars with thick skin): Graves' disease.
        ii. Myxedema (non-pitting edema): hypothyroidism.
        iii. Proximal myopathy → ask the pt to stand without using his\her hands
    b. Deep tendon reflexes:
        i. Hyperthyroidism: hyper-reflexia
        ii. Hypothyroidism: delayed relaxation.

Graves disease

1. Exophthalmos and ophthalmoplegia
2. Thyroid acropachy
3. Pretibial myxedema
4. Thyroid bruits

Respiratory System

1. IPPH → introduction permission, privacy, hand hygiene
2. Position and exposure →semi sitting “45 degree” and exposure from the neck to the umbilicus.
3. General
    a. First impression
        i. The patient is conscious, alert and oriented to time, place and person.
        ii. Oxygen mask or ventilator.
        iii. Comfortable or distressed.
        iv. Using accessory muscles for respiration.
        v. Audible sounds (wheezes, stridor,hoarseness of voice) ask the patient to clear his throat and take a deep breath.
        vi. Cyanosis of the lips and underside of the tongue.
        vii. Dysmorphic features
        viii. Growth parameters → head circumference, wt ,ht
    b. Vital signs “V\S” → RR,HR,BP,temp, BMI, O2 Sat
        i. Pulsus paradoxus: a fall in diastolic blood pressure of more than 10 mmHg can occur in cardiac tamponade.
4. Hands
    a. Hot/cold. Sweaty/dry.
    b. Palmar erythema (indicates CO2 retention as in COPD, cirrhosis,hyperthyroidism and polycythemia).
    c. Cyanosis. \ Pallor.
    d. Fine tremor (seen in patients taking β-agonist or theophylline bronchodilator inhalers).
    e. Asterixis:
        i. Ask the patient to hyperextend his wrists and abduct his fingers for 30 seconds and observe for flapping tremor.
    f. Clubbing:
    g. tenderness of the wrist
5. Face
    a. Nasal flaring
    b. Sclera and conjunctiva for pallor and jaundice.
    c. Ptosis Horner’s syndrome
    d. Tongue, mouth ulcers and dental hygiene.
    e. Upper Respiratory Tract
        i. Ears
        ii. Sinuses
        iii. Nose (polyps, mucus, etc)
        iv. Mouth and throat (inflammation)
6. Neck
    a. Scars.
    b. Vein engorgements.

c. Lymph nodes “scalene +supraclavicular” (a palpable supraclavicular node strongly suggests metastatic spread of lung cancer; localized cervical lymphadenopathy is a common presenting feature of lymphoma).
d. JVP.

7. Chest
    a. Inspection
        i. When you inspect the posterior thorax, make sure to ask the patient to sit up and cross his hands.
        ii. Use of accessory muscles: SCM. Scalenes, Intercostal muscles ,Subcostal indrawing,Paradoxical abdominal breathing
        iii. Foot of the bed → symmetry , shape,deformity,breathing pattern ”abdominothoracic/thoracoabdominal breathing.”
        iv. Rt side of the bed → scars, masses , distended veins, swelling, skin lesions, inspect the axilla
        v. Symmetrical, bilateral breathing,
            1. Check for paradoxical breathing
        vi. Antero-posterior:lateral diameter ratio (normally 5:8).
        vii. Check for deformities:
            1. Barrel-shaped hyperinflated chest with intercostal indrawing in COPD patients.
            2. Kyphoscoliosis (can be due to childhood poliomyelitis or spinal TB) causes CO2 retention and cor pulmonale.
            3. Pectus carinatum (pigeon chest) with prominent Harrison’s sulci can be caused by uncontrolled childhood asthma,osteomalacia or rickets.
            4. Pectus excavatum (funnel chest)
        viii. Pemberton's sign ask the patient to raise both hands and observe the face for plethora; positive in SVC obstruction.
    b. Palpation
        i. Ask the patient if he is feeling any pain; start from the area furthest from the pain and gently palpate it at the end.
        ii. **Superficial palpation** for tenderness (maintain eye contact to observe any discomfort or pain), subcutaneous emphysema and superficial masses.
        iii. **Mediastinum**:
            1. Upper mediastinum → Tracheal tug, tracheal deviation, Cricosternal distance”normally 3-4 fingers (5cm).”
            2. Lower mediastinum → apex beat → normally midclavicular 5th intercostal space
        iv. **Tactile vocal fremitus** (palpate using your metacarpophalyngeal bony prominence while the patient says ninety nine or أربعة وأربعين) → normally symmetrical bilateral tactile vocal fremitus;
            1. Increased vibration indicates consolidation.
        v. **Chest expansion** (place your hands with your fingers extended around the sides of the patient’s chest and ask him to take a deep breath) normally the chest expands up to 2.5 cm on each side (symmetrical bilateral chest expansion).
    c. Percussion

i. Normally, it is bilateral symmetrical resonant.
ii. Lung apex→ clavicle → midclavicular till the 6th rib→ axilla till the 8th rib→ posterior till the 11th rib
iii. Locate the upper border of the liver at the right 5th intercostal space.
iv. From the posterior chest, percuss for diaphragmatic excursion (locate the diaphragm with full expiration and then full inspiration) ,normally the distance should be between 5 and 8 cm (less than 5 cm indicates hyperinflation or bilateral phrenic nerve palsy).

d. Auscultation
i. Symmetrical bilateral vesicular breathing (abnormally can be bronchial).
ii. **Added sounds** (wheeze, crepitation, pleural rub, crackling and pneumothorax click) ask the patient to clear his throat as crackling decreases after that in bronchiectasis.
iii. **Vocal resonance** (ask the patient to say ninety nine or أربعة وأربعين) →
normally, it is symmetrical bilateral vocal resonance; the numbers are
iv. only clearly audible in cases of consolidation.
v. **Whispering pectoriloquy** (higher sounds indicate consolidation).
vi. **Egophony** (ask the patient to say the letter ‘e’, normally it is heard as an ‘e’; in pneumonia, the letter ‘a’ is heard).

8. Other
a. Liver. → Ascites.
b. Lower limb edema → Pitting edema (can result from cor pulmonale).
c. DVT.
d. Erythema nodosum (present in sarcoidosis, SLE and TB).
e. Non-tender subcutaneous nodules may occur in patients with disseminated cancer.

Respiratory system examination checklist → next page

General

Inspection

- ❑ ABCs
- ❑ Distressed? Talking full?
- ❑ Body habitus
- ❑ Well vs unwell looking
- ❑ Depth/effort breathing
- ❑ Quality of voice (hoarse, stridor, wheeze)

Vital Signs

- ❑ Blood pressure
- ❑ Heart rate
- ❑ Respiratory rate
- ❑ O2 Sat
- ❑ Temperature

Extra-Pulmonary Examination

General

- ❑ Clubbing
- ❑ Peripheral and central cyanosis
- ❑ Nasal flaring
- ❑ Use of accessory muscles
  - ❑ SCM
  - ❑ Scalenes
  - ❑ Intercostal muscles
  - ❑ Subcostal indrawing
  - ❑ Paradoxical abdominal breathing

Upper Respiratory Tract

- ❑ Ears
- ❑ Sinuses
- ❑ Nose (polyps, mucus, etc)
- ❑ Mouth and throat (inflammation)
- ❑ Position of trachea/tug
- ❑ Superficial lymph node system

Pulmonary Examination

Posterior Chest

- ❑ Inspection
  - ❑ AP diameter/shape
  - ❑ Deformities (scoliosis, kyphosis)
  - ❑ Respiratory movement (symmetry)
- ❑ Palpation
  - ❑ Chest wall for lumps/bumps
  - ❑ Skin abnormalities
  - ❑ Tenderness
  - ❑ Chest wall excursion/expansion
  - ❑ Diaphragmatic excursion
  - ❑ Tactile fremitus
- ❑ Percussion
  - ❑ Resonance, dullness
- ❑ Auscultation (use diaphragm of stethoscope)
  - ❑ Breath sounds (vesicular, BV, bronchial, quiet)
  - ❑ Inspiratory/expiratory phase (3:1)
  - ❑ Adventitious sounds (wheeze, rubs, stridor, crackles)
  - ❑ Egophony, whispered petriloquoy

Anterior Chest

- ❑ Inspection
  - ❑ Surgical scars
  - ❑ Deformities (scoliosis, kyphosis)
  - ❑ Respiratory movement (symmetry)
- ❑ Palpation
  - ❑ Chest wall for lumps/bumps
  - ❑ Skin abnormalities
  - ❑ Tenderness
  - ❑ supra-sternal notch – mobility, deviation
  - ❑ Tactile fremitus
- ❑ Percussion
  - ❑ Resonance, dullness
- ❑ Auscultation (use diaphragm of stethoscope)
  - ❑ Breath sounds (vesicular, BV, bronchial, quiet)
  - ❑ Inspiratory/expiratory phase
  - ❑ Adventitious sounds (wheeze, rubs, stridor, crackles)
  - ❑ Egophony, whispered petriloquoy

Cardiovascular system

1. IPPH → introduction permission, privacy, hand hygiene
2. Position and exposure →semi sitting “45 degree” and exposure from the neck to the umbilicus.
3. General
    a. First impression
        i. The patient is conscious, alert, and oriented to time, place and person.
        ii. Comfortable or distressed.
        iii. Cyanosis.
        iv. IV lines
        v. Dysmorphic features
        vi. Growth parameters → head circumference, wt ,ht
    b. Vital signs
        i. Comment on radial pulse:
            1. Rate, compressibility, and regularity.
            2. Radio-radial delay (subclavian and aortic diseases due to volume difference).
            3. Radio-femoral delay (coarctation of the aorta due to volume difference).
            4. Collapsing pulse (aortic regurgitation and PDA).
            5. Pulse deficit: difference between radial pulse and heart more than 10 (atrial fibrillation). Only do this if the pulse is irregular
        ii. Comment on brachial and carotid artery:
            1. Always palpate the brachial artery with the same hand (palpate the right brachial artery with your right hand).
            2. Volume (normal, small or large).
            3. Character:
                a. Collapsing: aortic regurgitation and PDA.
                b. A slow-rising pulse with a reduced peak: aortic stenosis.
                c. Bisferens: concomitant aortic stenosis and regurgitation, and HOCM.
                d. Alternans: advanced heart failure.
        iii. Blood pressure (normal or pulsus paradoxus).
        iv. Temperature. BMI. Respiratory rate
4. Hands
    a. Warm and sweaty hands (autonomic stimulation); cold and clammy hands (hypotension and shock).
    b. Tar or nicotine stains → in adolescence
    c. Capillary refill
    d. Fine or flapping tremor.
    e. Clubbing (not common in endocarditis).
    f. Splinter hemorrhage (infective endocarditis and vasculitic disorders) up to 3 is a normal variant.
    g. Xanthomata.

h. Janeway lesion (not common in endocarditis) thenar or hypothenar eminence of palm and soles. → painless , blanch on pressure
i. Osler's nodes (not common in endocarditis) finger pads and toes. → painful,raised, red
j. Nail fold infarcts (not common in endocarditis).
k. Peripheral cyanosis.
l. Petechial rash on legs and conjunctiva (vasculitis or transiently in infective endocarditis) might be confused with meningococcal disease.

5. Face
    a. Corneal arcus,Xanthelasma → (hyperlipidemia)
    b. Malar flush (mitral stenosis due to CO_2 retention and its vasodilatory effects).
    c. Central cyanosis.
    d. Dental hygiene.
    e. Ask for an ophthalmoscope.
    f. Roth's spots (infective endocarditis)seen on fundoscopy with a white center
6. JVP and carotid artery
    a. Inspection
        i. Tilt the head to the left and look tangentially. The carotid pulse is an outward one wave, whereas the jugular pulse is inward 2 waves (a and v waves).
        ii. Kussmal sign: JVP increases with inspiration (seen in pericardial constriction (tamponade), severe right ventricular failure and restrictive cardiomyopathy).
        iii. Sit the patient upright; JVP should decrease.
    b. Palpation
        i. Compress the root of the neck; the jugular pulse is obliterated.
        ii. Jugular vein cannot be palpated.
        iii. Abdomino-jugular reflex: compress for 10 seconds on the liver, JVP should rise.
        iv. Measure the JVP above the sternal angle (normally up to 4 cm).
    c. Auscultation
        i. Auscultate for venous hum which is due to an air fistula resulting in turbulence (ask the patient to take a breath and hold it to prevent tracheal transmission).
7. The precordium
    a. Inspection:
        i. foot of the bed → symmetry of the chest wall.
        ii. The right side of the bed:
            1. Chest wall deformities.
            2. Vein engorgements.
            3. Visible apex beat pulsation.
            4. Scars:
                a. Midline sternotomy: CABG, aortic valve replacement.
                b. Left submammary scar: mitral valvotomy.
                c. Infraclavicular scars: defibrillator or pacemaker implantation.
            5. Increased WOB – tachypnea, intercostals indrawing, tracheal tug, head bobbing, nasal flaring
    b. Palpation
        i. Ask about pain.

ii. Palpate the apex beat:
    1. Normally gently tapping in the left midclavicular 5th intercostal space (locate it with index and middle finger).
    2. It is tapping in mitral stenosis; a double apex beat is characteristic of HOCM.
    3. If you cannot localize it, roll the patient to the left.
iii. Palpate for **heaves** (an impulse lifting the hand) using the heal of the hand:
    1. An apex heave is caused by left ventricular hypertrophy (place your hand horizontally).
    2. A left parasternal heave is caused by right ventricular hypertrophy (place your hand vertically).
iv. Palpate for **thrill** (palpable vibrations) using the bony prominence of the metacarpo-phalangeal joints:
    1. At the apex: mitral regurgitation.
    2. Right and left lower parasternal regions: VSD.
    3. Other areas for loud murmurs.

c. Auscultation
    i. With each auscultation, palpate the carotid artery to differentiate S1 from S2 (S1 occurs with the pulse).
    ii. Auscultate the apex (mitral), left 4th intercostal space (tricuspid), left 2nd intercostal (pulmonary), right 2nd intercostal (aortic).
    iii. Carotid auscultation: (ask the patient to hold his breath to reduce tracheal transmission) for aortic stenosis radiation.
    iv. Left axillary auscultation for mitral regurgitation radiation.
    v. Use the bell to listen to:
        1. S3, S4 and mitral stenosis at the apex.
        2. Tricuspid stenosis on the left 4th intercostal space.
    vi. Maneuvers:
        1. Turn the patient to the left without removing the bell from over the apex and listen for mitral stenosis.
        2. Put the diaphragm on the 3rd left intercostal space (Erb's area) while the patient is supine, ask the patient to lean forward,expire and hold his breath without removing the diaphragm.Listen for aortic regurgitation.
    vii. After auscultation, comment: normal S1, S2, no splitting, no added sounds, no S3, no S4.
    viii. murmurs if found(location, duration, timing, pitch, intensity and character)

8. Others
    a. Pulmonary crackles, Crepitation.
    b. Hepatomegaly,Ascites.
    c. Lower limb edema, sacral edema.
    d. Pulses ,ulcers,edema of lower limb

	HOCM	AS
Valsava	↑	↓
Squats	↓	↑
EC	×	√
Mumur of AR	×	√

EXAMINATION	OSCE ITEMS	
Initial	**Inspection** ❑ ABCs ❑ Distressed? ❑ Well vs unwell looking ❑ Level of consciousness	
General Appearance	**Inspection** ❑ Body Habitus ❑ Dysmorphic features **Measure and Plot on Growth Chart** ❑ Weight ❑ Height ❑ Head circumference	**Vital Signs** ❑ Heart rate ❑ Respiratory rate ❑ Blood pressure ❑ O2 Sat ❑ Temperature

Inspection	**Hands/wrists/fingers/toes**
	❑ Clubbing
	❑ Cyanosis
	❑ Capillary refill
	Chest
	❑ Shape
	❑ Precordial bulge
	❑ Pectus carinatum/excavatum
	❑ Scars
	❑ Visible cardiac impulse
	❑ Increased WOB – tachypnea, intercostals indrawing, tracheal tug, head bobbing, nasal flaring
	HEENT
	❑ Eyes
	  ❑ Scleral icterus
	  ❑ Pallor
		❑ Mouth
		  ❑ Central cyanosis
		  ❑ Volume status
		❑ Neck
		  ❑ Accessory muscle use
		  ❑ Carotid auscultation and palpation
		  ❑ Rate, rhythm, volume, upstroke
		  ❑ Pulsus parvis et tarvus
		  ❑ Waterhammer pulse/bounding pulses
		❑ JVP (often not done in children < 8 years)
		  ❑ Biphasic
		  ❑ Changes with position
		  ❑ Increases with AJR
		  ❑ Changes with respiration
		  ❑ Non-palpable
		  ❑ Obliterable

Peripheral Examination	**Palpation** ❑ Radial, brachial and femoral pulses (rate, rhythm, volume, contour) ❑ Brachial-femoral delay ❑ Dorsalis pedis and posterior tibial pulses (rate, rhythm, volume, contour)	
Precordium Palpation	**Palpation** ❑ Apex ❑ Position (5th ICS/MCL, size-quarter, duration, 2/3 systolic, pulsation) ❑ Right ventricular heave/thrills ❑ Palpate all 4 auscultatory areas	❑ Liver (<2 cm BCM) ❑ Spleen ❑ Limb edema ❑ Sacal edema

Auscultation	**Auscultation of the Heart**
	❑ All 4 valve areas
	  ❑ S1, S2, S3, S4 (bell, diaphragm)
	  ❑ Murmurs
	❑ Location of loudest sounds
	❑ Location of radiation of sounds (axilla, back, neck)
	❑ Maneuvers (bell, diaphragm)
	  ❑ Inspiration (right sided murmurs)
	  ❑ Isometric contraction (hand grip), squat stand, exercise (MVP)
	  ❑ Valsalva (HCM)
	  ❑ Left lateral decubitus (mitral valve stenosis)
	  ❑ Seated, leaning forward, exhaling (Ao, Pm)
		Auscultation of Lungs
		❑ Crepitations

Peripheral vascular system

Peripheral arterial system examination

1. IPPH → introduction permission, privacy, hand hygiene
2. Position and exposure →semi sitting “45 degree” and exposure “according to the limb examined”
3. Face and neck
    a. Corneal arcus, xanthelasma,xanthomas
    b. Ptosis,miosis, anhydrosis → horner syndrome
    c. Hoarseness of voice
    d. Dilated veins in neck or shoulder → axillary or subclavian vein occlusion
4. The arms
    a. Hands →
        i. Muscle wasting, splinter hemorrhage
        ii. Peripheral cyanosis
        iii. fingertips scar or nail pits
        iv. Calcinosis and nailfold capillary loops
    b. Examine the radial and brachial pulses.
    c. Measure the BP in both arms and record the higher reading.
5. The abdomen
    a. Inspect for obvious pulsations.
    b. Palpate and listen over the abdominal aorta in the epigastrium
6. The legs
    a. Inspect and palpate the legs and feet for color, temperature and edema.
    b. Muscle wasting or tenderness, skin changes
    c. Onycholysis, fungal infection in between toes
    d. Ask the patient to raise his leg by flexing his hip (may be limited by a neurogenic cause).
    e. Note scars from previous vascular or non-vascular surgery.
    f. Note the position, margin, depth and color of any ulceration.
    g. Look between the toes for ulcers and at the heels for ischemic changes (these are the commonest sites of ‘pressure sores’).
        i. Ulcer → location ,size ,depth, margin (regular or irregular” , surrounding skin, base (pink → granulation \\\gray → sloughing \\\ black → necrotic)
    h. Palpate the femoral pulse (midinguinal point lateral to the femoral vein and medial to the femoral nerve) and auscultate it for bruits.
    i. Palpate the popliteal pulse by flexing the knee to 30° and slide the fingers of both hands 2-3cm below the knee crease to compress the artery against the back of the tibia as it passes under the soleal arch.
    j. Palpate the posterior tibial pulse midway between the medial malleolus and heel.
    k. Palpate the dorsalis pedis pulse just lateral to the tendon of extensor hallucis longus, which best appears as the patient extends his big toe.

Gastrointestinal System

1. IPPH → introduction permission, privacy, hand hygiene
2. Position and exposure →supine with a pillow under his head, Exposure is from the nipple to the mid-thigh. For social reasons, just expose from the xiphoid process to the pubic tubercle.
3. General
    a. First impression
        i. From the foot of the bed.
        ii. The patient is conscious, alert and oriented to time, place and person
        iii. Cachectic or obese.
        iv. Looking well ?
        v. Distress and pain (rolling pain in renal colic).
        vi. Posture (writhing vs. minimal movement)
        vii. Colour (icterus, jaundice, pale)
        viii. Rashes (eg. Dermatitis Herpetiformis)
        ix. Dysmorphic features
        x. Growth parameters → head circumference, wt ,ht
    b. Vital signs (HR, BP, respiratory rate, temperature and BMI)
4. Hands
    a. Clubbing (indicates liver cirrhosis, IBD or malabsorption disease).
    b. Pallor; especially at the creases of the palm.
    c. Palmar erythema (due to high estrogen levels in males; can be normal in pregnancy).
    d. Asterixis (seen in liver cirrhosis).
    e. Leukonychia (due to low albumin levels).
    f. Koilonychias (due to malabsorption anemia).
    g. Tar and nicotine stains. → in adolescence
    h. Muscle wasting in the thenar and hypothenar eminences (due to low protein levels in liver disease).
    i. Dupuytren's contracture
5. Face
    a. Examine the sclera for jaundice (it first appears in the mucosa under the tongue).
    b. Pallor (indicates anemia due to iron, vitamin B12 or folate deficiencies).
    c. Mouth
        i. Infections
        ii. Angular stomatitis
        iii. Gingivitis.
        iv. Dental hygiene.
        v. Tongue (glossitis in iron deficiency, beefy tongue in B12 deficiency)
        vi. Fetor hepaticus (due to dimethyl sulfide) or halitosis due to uremia.
    d. Parotid gland enlargement (due to sialadenosis of the salivary glands in alcohol abuse or recurrent vomiting in bulimia) must be examined from the foot of the bed to check for symmetry.
6. Neck
    a. Examine all lymph nodes.
        i. Cervical, axillary, inguinal, hepatosplenomegaly

ii. Troisier's sign (enlarged Virchow's node/ left scalene node seen in gastric or pancreatic cancer lymph is conducted through the thoracic duct).

7. Chest
    a. Gynaecomastia in males (due to increased estrogen level).
    b. Breast atrophy in females (due to low levels of sex binding globulin, needed for progesterone deposition in the breast, and high levels of androgens).
    c. Spider naevi (normal up to 5 in females or more in pregnancy; pathological in males).
    d. Hair distribution (should be symmetrical).
    e. Scratch marks (bile salt accumulation in nerve endings cause an itching sensation).
    f. Tattoos (a risk factor for hepatitis B and C). → in adolescence
8. Abdomen
    a. Inspection
        i. Foot of the bed
            1. Symmetrical bilateral abdomen.
            2. Abdominal contours (scaphoid, bulging flanks, protuberant, etc)
            3. Pattern of breathing (thoracoabdominal or abdominothoracic)
            4. abdominal rigidity and immobility indicate GI pathology.
            5. Umbilicus is centrally located and inverted (an everted umbilicus indicates ascites or hernia; the umbilicus may appear bluish and distended due to an umbilical varix).
        ii. Right side:
            1. SMD → Scars ,masses , distended veins
            2. Bruises.
            3. Stoma.
            4. Spider nevi (blood flowing centrally).
            5. Caput medusa (blood flowing radially) indicates portal hypertension.
            6. Itching scars.
            7. A hard subcutaneous nodule palpable at the umbilicus (sister Mary Joseph's nodule) may indicate metastatic cancer.
            8. Striae:
                a. Brown: pregnancy.
                b. Pinkish: Cushing's.
                c. White: previous pregnancy, after weight loss, obesity.
            9. Visible peristalsis in the upper abdomen indicates obstruction of the distal stomach. (eg in. Pyloric Stenosis)
            10. Visible cough impulse (seen in hernias after asking the patient to cough).
            11. Protrusions (umbilical hernia, diastasis recti)
            12. Dilated superficial veins (if visible, examine the direction of blood flow blood flows downwards in SVC obstruction and upwards in IVC obstruction)
    b. Palpation
        i. Make sure the patient's abdominal muscles are relaxed by flexing his hip and knees (90°) or distract him (to eliminate guarding). If they are not relaxed, this indicates rigidity.

ii. Counter-clockwise superficial and deep palpation starting from the right iliac fossa.
iii. Superficial palpation for tenderness, superficial masses and to gain the patient's confidence.
    1. Tenderness (peritoneal irritation, somatic or visceral pain).
    2. Guarding (voluntary vs involuntary)
iv. A palpable gallbladder results from obstruction of the cystic duct (mucocele) or obstruction of the common bile duct (pancreatic cancer).
v. Deep palpation:
    1. Deep masses and deep tenderness.
    2. Murphy's sign (deep palpation of the gallbladder during deep inspiration from the mouth. If inspiration ceases due to tenderness, it indicates acute cholecystitis).
    3. Rebound tenderness (deep palpation and sudden removal of the hand in the right iliac fossa causes severe pain in appendicitis).
    4. McBurny point tenderness (appendicitis)
    5. Special tests for Appendicitis
        a. Rovsing's sign (pressure wave)
        b. Obturator sign (pain on hip int. rotation)
        c. Psoas sign (pain on hip flexion hip)
vi. Organomegaly (make sure the patient breathes from his
vii. mouth):
    1. Liver:
        a. Use percussion to find the upper border of the liver (start from the second intercostal space).
        b. Start from the right iliac fossa and gradually move up 1 cm at a time until you find the lower border of the liver (palpate during inspiration and move during expiration).
        c. Normally the lower edge is smooth and sharp (a rolled lower border is abnormal).
        d. Comment on the surface (smooth/nodular).
        e. Check if the liver is smooth or hard.
        f. Check for tenderness over the liver.
        g. A pulsatile liver indicates tricuspid regurgitation.
        h. Calculate the liver span (normally 6-12cm).
        i. The liver is enlarged in early cirrhosis, but often shrunken in advanced cirrhosis.
    2. Spleen:
        a. Start from the right iliac fossa and gradually move diagonally to the left hypochondrium.
        b. The spleen is normally not palpable unless it is 3X its size.
        c. Make sure you differentiate between the spleen and left kidney.
        d. Splinting of the spleen (roll the patient to the right and try to palpate the spleen. only palpable if it is twice its size).
        e. Percussion on the left midaxillary 9th, 10th and 11th intercostal spaces (normally dull).

f. Percussion on the left anterior axillary 9th, 10th and 11th intercostal spaces (normally resonant)

3. Renal:
    a. Bimanual palpation (always place the right hand above the abdomen and the left hand below).
    b. Balloting (the kidneys should be easily palpated from above and below).
    c. Costovertebral angle tenderness : Check for tenderness from the back by gently tapping with your fist on the area just lateral to the vertebral column and below the costal margin.

c. Percussion
    i. Presence of tenderness ?
    ii. Percuss the 9 areas of the abdomen (normally tympanic).
    iii. Resonance below the fifth intercostal space suggests emphysema or Chilaiditi's sign (the interposition of the transverse colon between the liver and the diaphragm).
    iv. Ascites:Shifting dullness + Fluid thrill
d. Auscultation
    i. Sounds (Presence vs absence)
    ii. Quality (Frequency and Pitch [high?])
    iii. Just to the right of the umbilicus (iliac area) to hear the abdominal sounds (normally 5-6 sounds per minute; if no sounds are heard,auscultate for another minute) absence of bowel sounds implies paralytic ileus or peritonitis; increased frequency of bowel sounds → occurs in intestinal obstruction.
    iv. Liver: bruits + Perihepatic friction rub.
    v. Aorta just above the umbilicus.
    vi. Spleen for friction rub.
    vii. Renal artery bruit (2-3 cm above and lateral to the umbilicus on both sides).
e. Succussion splash
f. Groin:
    i. Femoral hernia
    ii. Inguinal hernias
    iii. Inguinal lymphadenopathy
    iv. Testicular mass or torsion
    v. Anus – Imperforate, malpositioned, evidence of abuse

9. Other
    a. Per rectal examination.
    b. Genitalia.
    c. Hernia.
    d. Lymph nodes.
    e. Lower limb edema.
    f. Pyoderma gangrenosum (seen in IBD).
    g. Hair loss.
    h. Erythema nodosum (seen in IBD).
    i. Femoral bruit for stenosis.
10. Chronic liver disease

    a. Jaundice
    b. Spider naevi
    c. Palmar erythema
    d. Ascites
11. Liver failure
    a. Fetor hepaticus
    b. Asterixis
    c. Late neurological symptoms (spasticity and extension of the arms and legs; extensor plantar responses).

Gastrointestinal Physical Exam Checklist → next page

EXAMINATION	OSCE ITEMS		
General Inspection	☐ Growth parameters (HC, L, Wt, BMI) ☐ Well/Unwell ☐ Mental Status ☐ Posture (writhing vs. minimal movement) ☐ Colour (icterus, jaundice, pale) ☐ Nutritional status ☐ Peripheral edema ☐ Rashes (eg. Dermatitis Herpetiformis)	**Extra-intestinal Manifestations of IBD:** ☐ Aphtous Ulcers ☐ Uveitis ☐ Arthritis ☐ Clubbing ☐ Rashes	**Stigmata of Chronic Liver Disease:** ☐ Muscle wasting ☐ Palmar erythema ☐ Leukonychia ☐ Asterixis ☐ Strawberry angiomas ☐ Caput medusae ☐ Gynecomastia ☐ Jaundice ☐ Edema ☐ Parotid enlargement
Inspection	**Abdominal** ❑ Abdominal contours (scaphoid, bulging flanks, protuberant, etc) ❑ Peristaltic waves (eg in. Pyloric Stenosis)	❑ Scars (surgical – risk for Bowel obstruction) ❑ Skin abnormalities (abdominal wall veins, hemangiomas) ❑ Protrusions (umbilical hernia, diastasis recti)	
Auscultation	**A. Bowel Sounds** ❑ Sounds (Presence vs absence) ❑ Quality (Frequency and Pitch [high?])	**B. Vascular** ❑ Bruits (aorta, iliac, femoral, renal) ❑ Bruits/venous hums around palpable liver mass (if applicable)	
Percussion	**General:** ❑ Presence of tenderness **Specific:** ❑ Hepatomegaly	❑ Splenomegaly (Traube's space - below left 6th rib, above costal margin, medial to axillary line) ❑ Ascites ○ Shifting dullness ○ Fluid wave	
Palpation	**A. General Palpation** Superficial Palpation ❑ Tenderness (peritoneal irritation, somatic or visceral pain). ❑ Guarding (voluntary vs involuntary) Deep Palpation ❑ Rebound tenderness (peritonitis) ❑ McBurny point tenderness (appendicitis) ❑ Murphy's sign for cholecystitis **Organomegaly:** ❑ Hepatomegaly (liver span, liver edge consistency – boggy or fibrotic) ❑ Splenomegaly ❑ Enlarged kidneys (hydronephrosis or renal or adrenal masses)	**Special tests for Appendicitis** ❑ Rovsing's sign (pressure wave) ❑ Obturator sign (pain on hip int. rotation) ❑ Psoas sign (pain on hip flexion hip) **Sitting up:** ❑ Assess for CVA tenderness **Groin:** ❑ Femoral hernia ❑ Inguinal hernias ❑ Inguinal lymphadenopathy ❑ Testicular mass or torsion ❑ Anus – Imperforate, malpositioned, evidence of abuse	

Motor system examination

1. IPPH → introduction permission, privacy, hand hygiene
2. Position and exposure
3. Inspection
    a. Symmetry and deformities.
    b. Abnormal movements (fasciculation, tremors, myoclonic jerks).
    c. Dysmorphic features
    d. Growth parameters → head circumference, wt ,ht
4. Palpation
    a. Wasting or hypertrophy.
    b. Tenderness.
5. Tone
    a. Passively move the joint through its full range of movement, slowly and quickly.
    b. Upper limb:
        i. Hold as if shaking hand and support the elbow.
        ii. Flex and extend the hand, forearm, and shoulder.
        iii. Rotate the forearm.
    c. Lower limb:
        i. Rotate the leg from one side to another.
        ii. Briskly lift the knee in flexed position.
        iii. Knee and ankle clonus
6. Power
    a. Ask about pain.
    b. Assess power against gravity then apply resistance.
    c. Compare both sides:
    d. Upper limb:
        i. Shoulder abduction.
        ii. Elbow flexion and extension.
        iii. Wrist extension.
        iv. Finger flexion and extension.
        v. Thumb abduction.
    e. Pronator drift.
    f. Lower limb:
        i. Hip flexion and extension.
        ii. Knee flexion and extension.
        iii. Ankle dorsiflexion, plantar flexion, eversion and inversion.
        iv. Big toe extension.
7. Reflexes
    a. Deep tendon reflexes:
        i. Keep the patient relaxed, compare both sides and use reinforcement if necessary.

ii. Record as increased, normal, diminished, present only with reinforcement or absent.
iii. Test the following jerks: biceps (C5), Supinator (C6), triceps (C7), knee jerk (L3, L4) and ankle (S1).
iv. Hoffman's reflex and finger jerk (present in UMN lesion).

b. Superficial reflexes:
i. Abdominal reflex (T8-12) normally, the umbilicus deviates to the stroked side; an absent reflex indicates an UMN lesion or damage to T8-10.
ii. Cremasteric reflex (L1, L2).
iii. Plantar reflex (S1, S2) normally, the big toe flexes; the big toe extends and other leg flexors contract in an abnormal response.

c. Primitive reflexes (snout, grasp, palmomental and glabellar tap).

8. Coordination (cerebellar function)
a. Stance and gait:
i. o Assess the normal gait and tandem gait.
ii. o Make sure you support the patient.

b. Assess speech for dysarthria and staccato speech.
c. Assess the eyes for horizontal nystagmus or double vision.
d. Upper limb:
i. o Tone (hypotonia).
ii. o Pendular reflexes.
iii. o Finger-to-nose test for dysmetria, intention tremor and dyssynergia (make sure you change the speed and position of your finger).
iv. o Assess for dysdiadochokinesia by asking the patient to perform rapid alternating movement.
v. o Rebound phenomenon (ask the patient to extend his arms, stroke them gently and observe them rebound to their original position).

e. Lower limb:
i. o Tone (hypotonia).
ii. o Pendular reflexes.
iii. o Heel-to-shin test.

Pediatric Neurological Exam Checklist – Systemic Exam

EXAMINATION	OSCE ITEMS	
Initial	**Inspection** ❑ ABCs ❑ Distressed? ❑ Well vs unwell looking ❑ Level of consciousness	
General Appearance	**Inspection** ❑ Body Habitus ❑ Dysmorphic features **Measure and Plot on Growth Chart** ❑ Weight ❑ Height ❑ Head circumference	**Vital Signs** ❑ Heart rate ❑ Respiratory rate ❑ Blood pressure ❑ O2 Sat ❑ Temperature
Screening Exams	**Cardiac** ❑ Heart sounds **Abdominal** ❑ Hepatic enlargement **Neck** ❑ Supple/Meginismus ❑ Kernig's test ❑ Brudzinski's test	**Skin** ❑ Hyperpigmented lesions – café au lait spots ❑ Hypopigmented lesions – ash leaf spots **Spine** ❑ Scoliosis ❑ Tuft of hair

Pediatric Neurological Exam Checklist – Motor, Sensory, Reflexes

EXAM	OSCE ITEMS			
Inspection	**Visible abnormalities** ❑ Hypertrophy ❑ Wasting	❑ Seizure activity ❑ Chorea	❑ Fasciculation ❑ Tremor (postural, intention, resting, etc)	❑ Athetosis ❑ Dystonia
Palpation	**Strength UPPER EXTREMITY** Fingers (resist force) ❑ Abduct little finger (C8, **T1**) ❑ Grip your fingers (C7, **C8**) ❑ Make an "O" (C6, C7, C8) ❑ MP joint extension (**C7**, C8) Wrist ❑ Extension (**C6**, C7) ❑ Flexion (**C7**, C8) Elbow ❑ Flexion (C5, C6) ❑ Extension (C6, **C7**, C8) Shoulder ❑ Shoulder external rotation (elbow's flexed 90°) (**C5**, C6) ❑ Shoulder abduction (**C5**, C6) ❑ Shoulder shrug (**XI**, C3-5) Thumb ❑ Abduction (plane of palm)(**radial nerve C7**, C8) ❑ Adduction (plane of palm)(**ulnar nerve** C8, **T1**) ❑ Abduction (perpendicular to palm) (**median nerve** C8, **T1**) ❑ Opposition (**median nerve** C8, **T1**) **Reflexes UPPER EXTREMITY** ❑ Biceps (C5) ❑ Brachioradialis (C5, C6) ❑ Triceps (C7) ❑ Finger flexors (C8)		**Strength LOWER EXTREMITY** Patient (do with gait) ❑ Heel walk (L4, **L5**) ❑ Toe walk (S1, S2) Foot (resist force) ❑ Toes extension (L5, S1) ❑ Great toe flexion (S1) ❑ Foot inversion (L4, L5) ❑ Foot eversion (L5, S1) ❑ Foot extension (L4, L5) ❑ Foot flexion (S1, S2) **Reflexes LOWER EXTREMITY** ❑ Knee jerk (L2, L3, **L4**) ❑ Posterior tibialis (L5) ❑ Ankle jerk (S1) ❑ Babinski sign ❑ Crossed adduction	Knee (resist force) ❑ Knee extension (L2-L4) ❑ Knee flexion (**S1**, S2) Hip (resist force) ❑ Hip flexion (**L1-L3**/L4) ❑ Hip extension (L5, **S1**) ❑ Hip adduction (L2-L4) ❑ Hip abduction (L5)

Other Components	**Muscle Power** 0 = none 1 = flicker 2 = move with no gravity 3 = against gravity 4 = against some resistance 5 = against resistance	**Muscle Tone** ❑ Normal ❑ Spasticity and clonus ❑ Rigidity and cogwheel ❑ Hypotonia	**Deep Tendons Reflexes** 0 = absent 1 = trace 2 = normal 3 = brisk 4 = clonus (non-sustained) 5 = sustained clonus

EXAM		**OSCE ITEMS**

Palpation	**Sensory LOWER EXTREMITY**
	❑ Perianal (S2-S4)
	❑ Lateral/sole of foot (S1)
	❑ Dorsum of foot/1st web space (L5)
	❑ Medial ankle and shin (L4)
	❑ Medial thigh above patella (L3)
	❑ Anterior mid thigh (L2)
	❑ Lateral thigh below inguinal ligament (L1)
	
	Sensory UPPER EXTREMITY
	❑ Medial arm near elbow (T1)
	❑ Little finger, distal radial border, dorsal base of thumb near web space (C8)
	❑ Middle finger (C7)
	❑ Lateral forearm (C6)
	❑ Lateral arm/deltoid (C5)
		Modalities
		❑ Touch
		❑ Pain
		❑ Temperature
		❑ Vibration
		❑ Proprioception
		❑ Cortical sensation
		  ❑ stereognosis
		  ❑ tactile discrimination
		  ❑ graphesthesia

Neonatal Examination

General :

1. The baby must be fully undressed during the examination.
2. Appearance + Color:
    a. Well looking ?
    b. Active, crying, calm ?
    c. Rash ?
    d. Dysmorphic features ,
    e. NI:pink
        i. acrocyanosis in neonates is benign
    f. Abnormal;
        i. Pale
        ii. Jaundice : look in mucus membranes and skin
        iii. Central Cyanosis (around the core, lips, and tongue)
        iv. Plethoric → polycythaemia
3. Posture: NI is flexion of both upper and lower limbs
4. V/S;(in the newborn period)
    a. RR ; respiratory rate (normally 40 to 60 breaths per minute)
    b. Pulse (normally 120 to 160 beats per minute)
    c. BP ; in upper and lower limbs to exclude coarctation of aorta
    d. Temp
    e. O2 sat
5. Body measurement ;
    a. Head circumference
    b. Wt
    c. Length
6. Signs of respiratory distress
    a. Nasal flaring
    b. Retraction : intercostal ,subcostal ,substernal
    c. Grunting
    d. Use of accessory muscles
    e. Abnormal RR (increased or absent or irregular)

Face

1. Skull
    a. Fontanels
        i. NI is at level or **slightly** depressed
        ii. Bulged or intense (may be due to crying or due to problem like hydrocephalus or Meningitis) → cranial ultrasound should be performed to check for hydrocephalus.
        iii. posterior fontanelles ossify within 2 or 3 months after birth.

        iv. Anterior fontanelle is a diamond-shaped membrane-filled space located between the two frontal and two parietal bones of the developing fetal skull. It persists until approximately 18 months after birth
    b. Hematoma or caput succedaneum
2. Distance between eyes
3. Nasal bridge
4. Ears
    a. Deformities ,low set ears, which are associated with renal anomalies in 10% of patients
5. Eyes
    a. Red reflex(normal is red or orange) with an ophthalmoscope.
        i. White → cataract
        ii. Other abnormalities
            1. Glaucoma ,retinoblastoma
6. Lip and palate
    a. Cleft lip and palate which is associated with CNS (at midline) anomalies ;ex absent corpus callosum

Neck

1. Short ? skin folds ?

Chest

1. Inspection
    a. Chest deformities
        i. Pectus Excavatum (Sunken Chest)
        ii. Pectus Carinatum (Pigeon Chest)
        iii. Poland syndrome, is a rare birth defect characterized by underdevelopment or absence of the chest muscle (pectoralis) on one side of the body,
    b. Nipples (number, site , symmetry)
    c. Breast enlargement – may occur in newborn babies of either sex
2. Palpation
    a. Apex beat
3. Percussion
4. Auscultation of chest
    a. Symmetrical Bilateral air entry?
    b. Heart sounds , Heart murmur (if present do upper and lower limb blood pressures, and pre-ductal and post-ductal pulse oximetry should be checked followed by an echocardiogram)

Abdomen

1. Inspection
    a. Shape → bulging, flat, scaphoid

    b. Umblical stumb
        i. Normally → one umbilical vein (larger), two umbilical artery (smaller)
        ii. Single umbilical artery is associated renal anomalies
        iii. Local skin around the umbilicus→ redness, discharge, tenderness
2. palpation
    a. Soft and lax?
    b. Liver might be palpable (normal) → normally extends 1 cm to 2 cm below the costal margin
    c. Spleen (normally not palpable)
    d. Slight distension may be present (normal)
    e. Femoral pulses, screen for coarctation
        i. Reduced in coarctation of the aorta.
        ii. Increased → patent ductus arteriosus.
3. Percussion

Genitalia

1. Female
    a. Labia majora and minora ,slight edema is normal
        i. Normally labia majora is totally covering the labia minora
2. Male
    a. scrotum
    b. Undescended testes ?
    c. Hypospadias?
3. Anus ;
    a. Imperforated or patent? , position ?
    b. Female pt with imperforated anus might defecate through vagina

Back

1. Sinuses ,tuft of hair ,lipoma,deformities,swelling,
2. Mongolian blue spot.

Extremities

1. Five fingers in each hand , Five toes in each foot
2. Nails
3. Examine for DDH “Developmental Dysplasia of the Hip “
    a. Barlow, Ortolani
    b. Barlow manoeuvre, the hip is held flexed and the femoral head is gently adducted and pushed downwards. If the hip is dislocatable, the femoral head will be pushed posteriorly out of the acetabulum
    c. Ortolani manoeuvre to see if the hip can be returned from its dislocated position back into the acetabulum. While gently abducting the hip, upward leverage is applied, dislocated hip will return with a ‘clunk’ into the acetabulum

4. Positional talipes – the feet often remain in their in utero position. Unlike true talipes equinovarus, the foot can be fully dorsiflexed to touch the front of the lower leg

Primitive reflexes

1. Moro reflex
2. Rooting and sucking reflex
3. Stepping reflex
4. Grasp reflex

Growth parameters

1. Head circumference → surrogate measure of brain size
    a. Average is 35 cm
    b. Inspect for micro or macrocephaly
2. Length
    a. Average at birth is 50 cm
3. Wt
    a. Between 2.5-4.2
    b. See if large or small for gestational age, → more risk of hypoglycemia (which is as bad as hypoxia on the CNS)

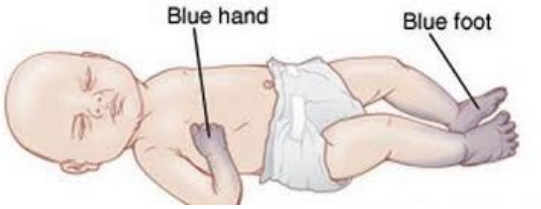
Jaundice

- Use transcutaneous bilirubin measurement to detect bilirubin level then use chart to see if he/she need phototherapy
- Risk factors for jaundice:
    - Hemolysis
    - ABO or Rh incompatibility
    - G6PD deficiency
    - Asphyxia

Discharge indication

1. >24 hour of observation
2. Passed stool and urine
3. Normal examination
4. Stable vital signs
5. No risk factors

Theory
#NI:normal
#Acrocyanosis — Acrocyanosis is often seen in healthy newborns and refers to the peripheral cyanosis around the mouth and the extremities (hands and feet) . It is caused by benign vasomotor changes that result in peripheral vasoconstriction and increased tissue oxygen extraction and is a benign condition.
Acrocyanosis is common initially after delivery in the preterm and full term newborn Intervention normally is not required



#vital signs (normal neonatal VS)

RESPIRATION

Normal Variations

30 to 60 respirations per min
Average - 40 respirations per min

HEART RATE (APICAL)

Normal Variations

100 to 160 beats per min
100 while sleeping
160 while crying

TEMPERATURE

Rectal
90.0° F to 99.5° F
(35.6° C to 37.5° C)

Axillary
97.6° F to 98.6° F
(36.5° C to 37.0° C)

BLOOD PRESSURE (AT BIRTH)

Average
75/42

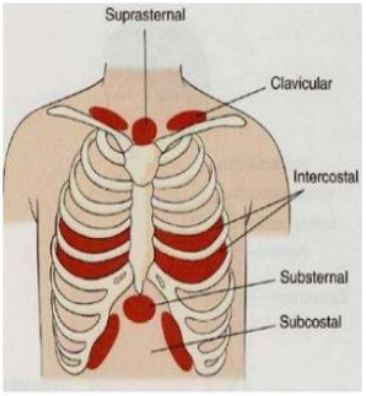
Systolis
60 to 80 mm Hg

Diastolic
40 to 50 mm Hg

Retraction

Retraction Severity

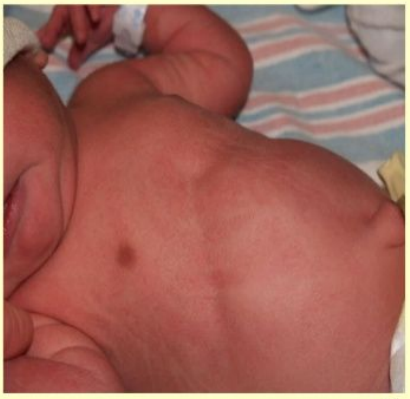
- Mild retractions
  - Subcostal or Substernal
- Moderate retractions
  - Intercostal or Supraclavicular
- Severe retractions
  - Suprasternal or Sternal



http://intranet.tdmu.edu.ua

15. Respiratory system:

- **Slight substernal retraction evident during inspiration**



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#grunting:
abnormal, short, deep, hoarse sounds in exhalation that often accompany severe chest pain. The grunt occurs because the glottis briefly stops the flow of air, halting the movement of the lungs and their surrounding or supporting structures. Atelectasis in the newborn also causes grunting, which results from the effort required to fill the lungs.
#The Moro reflex is an infantile reflex normally present in all infants/newborns up to 3 or 4 months of age as a response to a sudden loss of support, when the infant feels as if it is falling. It involves three distinct components:

-spreading out the arms (abduction)
- unspreading the arms (adduction)
-crying (usually)
The primary significance of the Moro reflex is in evaluating integration of the central nervous system. It is distinct from the startle reflex,and is believed to be the only unlearned fear in human newborns.

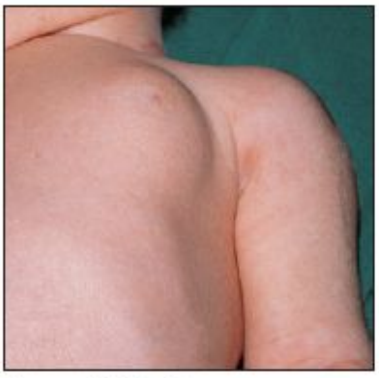


Figure 10.14a Breast enlargement in a newborn infant.

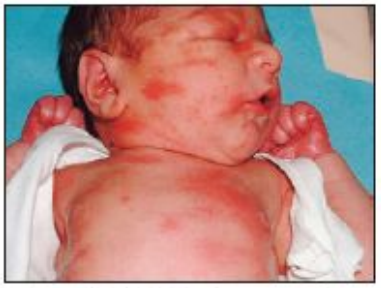


Figure 10.14b Erythema toxicum (neonatal urticaria) often has a raised pale centre (Courtesy of Nim Subhedar.)

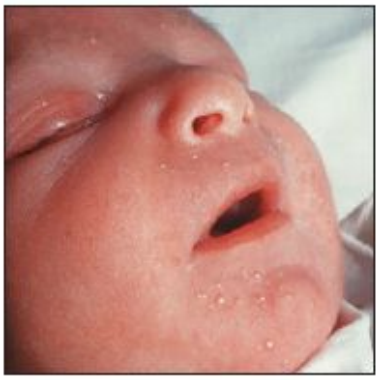


Figure 10.14c Milia (Courtesy of Rodney Rivers.)

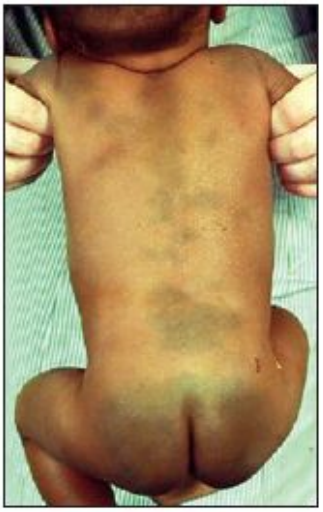


Figure 10.14d Mongolian blue spot.

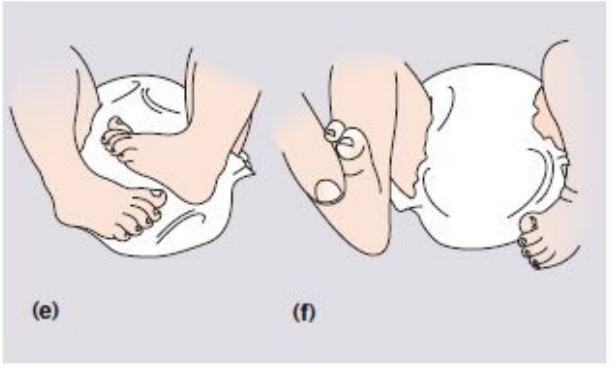
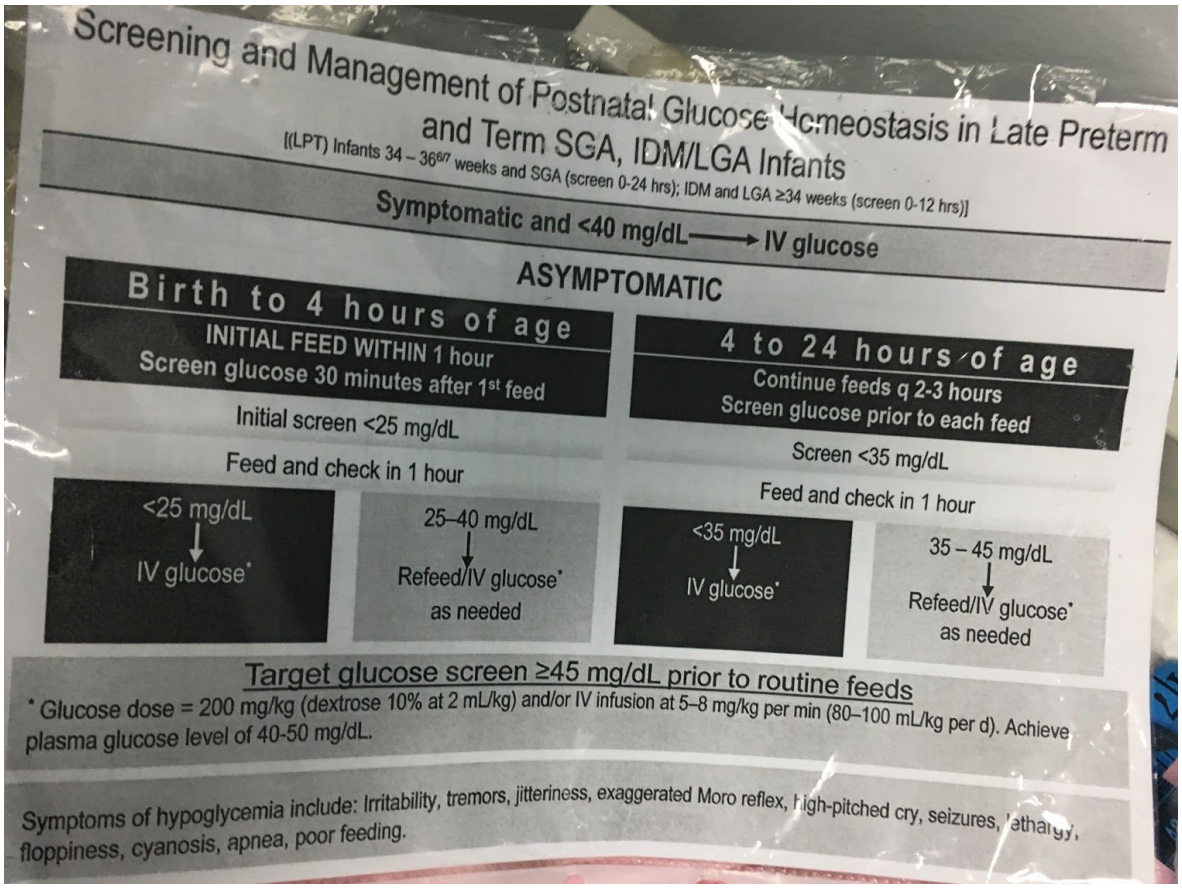


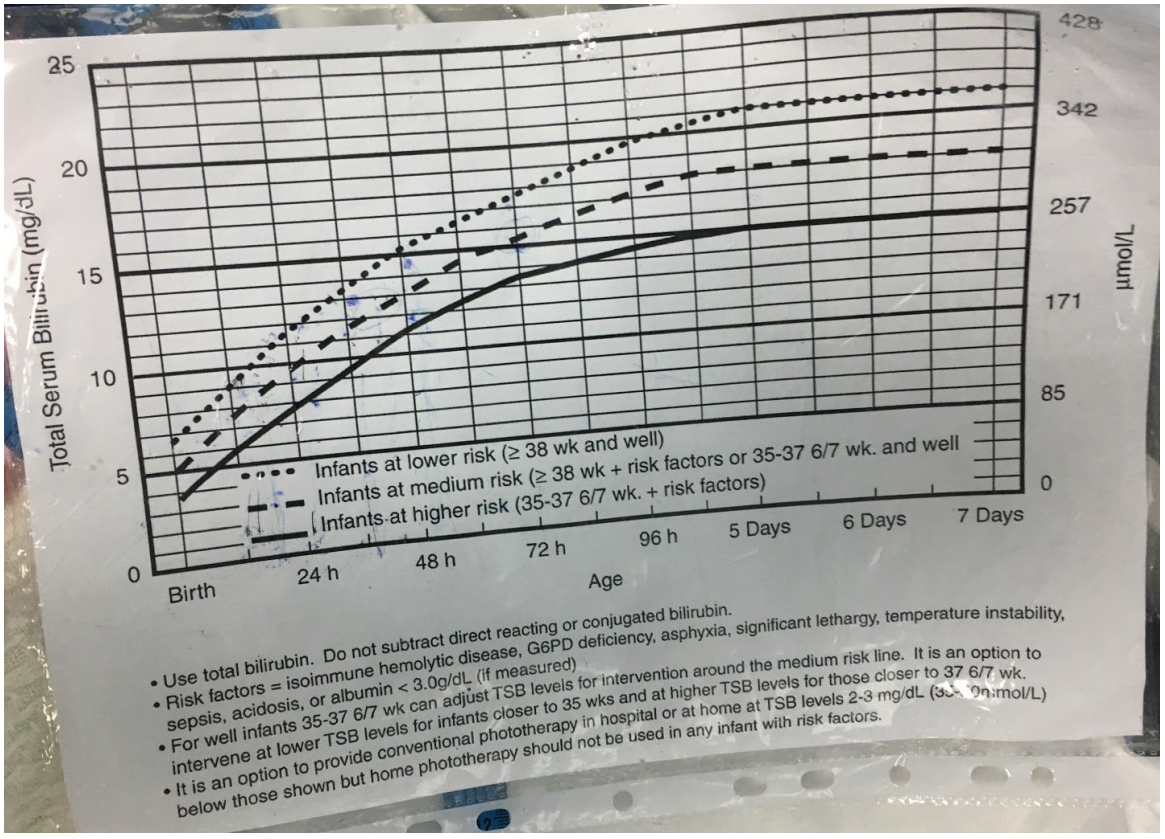
Figure 10.14e Positional talipes. Appearance at birth.

Figure 10.14f The foot can be fully dorsiflexed to touch the front of the lower leg. In true talipes equinovarus this is not possible.

Hypoglycemia chart

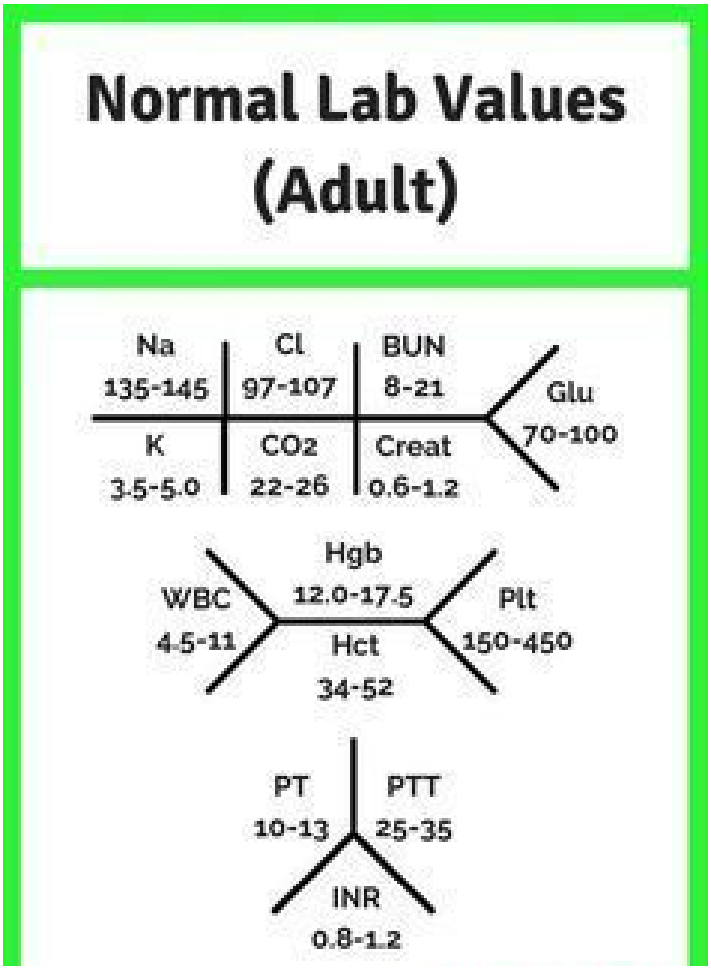


Bilirubin chart



Investigations

CBC



LABS	NORMAL RANGE
Na+	136-145
K+	3.5-5.0
Cl+	98-106
Ca+	9.0-10.5
Albumin	3.5-5.0. Liver
Crea	0.7-1.3. Kidney
BUN	10-20. Kidney
Glucose	70-110
WBC	5000-10000
RBC	(M)4.7-6.1(F)4.2-5.4
Hgb	(M)14-18(F)12-16
Hct	(M)42-52(F)37-47
PLTS	150,000-400,000.ASA
PT	11-12.5
PTT	60-70. Heparin
INR	0.9-1.2. Coumadin
ALT	(M)10-40(F)7-35.Liv
AST	12-31. Liver

Table A.3 Normal ranges: haematology

Age	Haemoglobin (g/L)	Mean corpuscular volume (fl)	White blood cells ($\times 10^9$/L)	Platelets ($\times 10^9$/L)
Birth	145–215	100–135	10–26	150–450 at all ages
2 weeks	134–198	88–120	6–21	
2 months	94–130	84–105	6–18	
1 year	113–141	71–85	6–17.5	
2–6 years	115–135	75–87	5–17	
6–12 years	115–135	77–95	4.5–14.5	
12–18 years:				
Male	130–160	78–95	4.5–13	
Female	120–160	78–95	4.5–13	

Table A.1 Common blood tests and their interpretation

Blood test		Normal value	Interpretation
Urea and electrolytes	Sodium	130–150 mmol/L	Low in relative water excess (or sodium loss). High in water loss (i.e. dehydration)
	Potassium	3.5–4.7 mmol/L	Elevated in renal failure/dysfunction. Low in recurrent vomiting
	Urea		Elevated in dehydration but also in gastrointestinal bleeding
	Creatinine		Elevated in renal disease (and dehydration)
Full blood count	Haemoglobin	110–140 g/L	See Table A.3 for variation with age
	Mean cell volume		If low, suggests either iron deficiency or haemoglobinopathy
	White cell count		High in infection, low in severe infection. Very high or low in malignancy
	Platelet count	150–450 × 10^9/L	High in infection. Low if consumed, i.e. DIC (disseminated intravascular coagulation), ITP (immune thrombocytopenic purpura)
Blood gas (capillary)	pH	pH 7.31–7.41	Low is acidosis, high is alkalosis
	Partial pressure of carbon dioxide	4.5–6 kPa	High values suggest respiratory cause for any acidosis [see Tables A.2 and 27.5 for further details]
Blood glucose	Glucose	2.6–6.0 mmol/L	High in diabetes, elevated by stress. Low in children with metabolic diseases
Inflammatory markers	C-reactive protein (CRP)	<5 mg/L (laboratory values vary)	Elevated in infection or proinflammatory state. Rises and falls more quickly than ESR
	Erythrocyte sedimentation rate (ESR)	<10 mm/h (laboratory values vary)	
Blood culture	Bacteraemia		Will identify bacteria in the blood if sufficient volume. Typically takes 48 h to achieve growth in culture
Thyroid function tests	Thyroid stimulating hormone (TSH)	0.3–5.5 mIU/L	Elevated in hypothyroidism (unless due to hypopituitarism, when thyroid-stimulating hormone will remain low and free T3/T4 is required)
	Free T3/T4		

at birth (term baby) → RBC: 4.8-7.1X10^6, Hemoglobin: 14-23, Hematocrit: 44-64, WBC: 18K-25K, Platelets: 150K-350K

CSF

Normal CSF Values

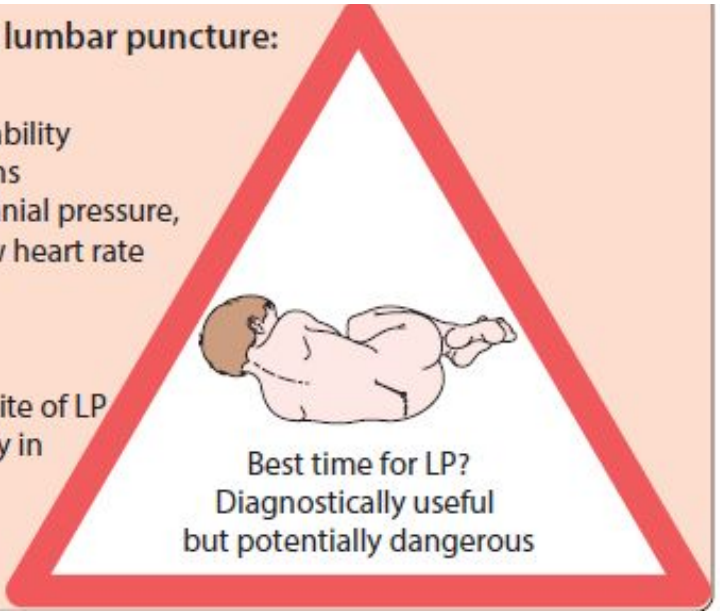
	Newborn	Child
Sugar	32-60 mg/dL	50% of serum
Protein	Term ≤ 170 Preterm ≤ 150	≤ 40
RBC	5	5
WBC	25	5-7
Neutrophils	60%	Zero

Typical changes in the CSF in meningitis or encephalitis, beyond the neonatal period

	Aetiology	Appearance	White blood cells	Protein	Glucose
Normal	—	Clear	0–5/mm^3	0.15–0.4 g/L	≥50% of blood
Meningitis	Bacterial	Turbid	Polymorphs:↑↑	↑↑	↓↓
	Viral	Clear	Lymphocytes:↑ (initially may be polymorphs)	Normal/↑	Normal/↓
	Tuberculosis	Turbid/clear/ viscous	Lymphocytes:↑	↑↑↑	↓↓↓
Encephalitis	Viral/unknown	Clear	Normal/↑ lymphocytes	Normal/↑	Normal/↓

Contraindications to lumbar puncture:

- Cardiorespiratory instability
- Focal neurological signs
- Signs of raised intracranial pressure, e.g. coma, high BP, low heart rate or papilloedema
- Coagulopathy
- Thrombocytopenia
- Local infection at the site of LP
- If it causes undue delay in starting antibiotics



Chest X-ray

The standard chest X-ray is a posteroanterior (PA) view . In an anteroposterior (AP) film the X-ray source is in front of the patient, which tends to enlarge anterior structures such as the heart.

Examination sequence

Systematically check:

1. **Name**, date and orientation of the film: AP films are usually marked as such. Otherwise assume PA.
2. **Lung fields**: should be equally translucent. Identify the horizontal fissure running from the right hilum to the sixth rib in the axillary line.
3. **Lung apices**: look specifically for masses, cavitation and consolidation above and behind the clavicles.
4. **Trachea**: confirm this is central, midway between the ends of the clavicles. Look for paratracheal masses, retrosternal goitre.
5. **Heart**: check that heart shape is normal and the maximum diameter is less than half the internal transthoracic diameter (cardiothoracic ratio). Look for any retrocardiac masses.
6. **Hila**: the left hilum should be higher than the right. Compare the shape and density of the two hila; both should appear concave laterally. A convex appearance suggests a mass or lymphadenopathy.
7. **Diaphragms**: the right hemidiaphragm should be higher than the left. The anterior end of the right sixth rib should cross the mid-diaphragm. If not, the lungs are hyperinflated.
8. **Costophrenic angles**: these should be well-defined, acute angles. Loss of one or both suggests pleural fluid or pleural thickening.
9. **Soft tissues**: note the presence of both breast shadows in female patients. Look around the chest wall for any soft-tissue masses or subcutaneous emphysema
10. **Bones**: look closely at the ribs, scapulae and vertebrae for fractures and metastatic deposits in each bone (Figs 7.23 and 7.24).

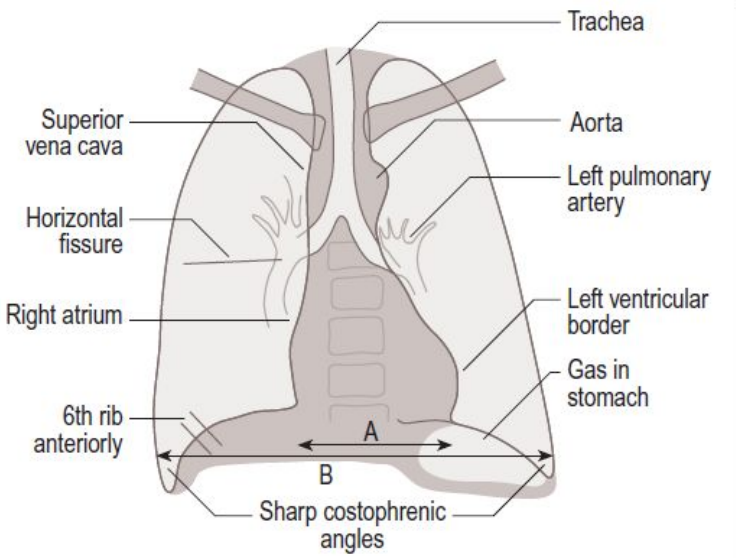
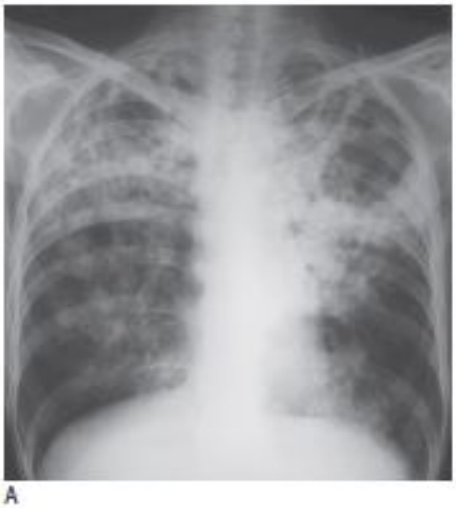
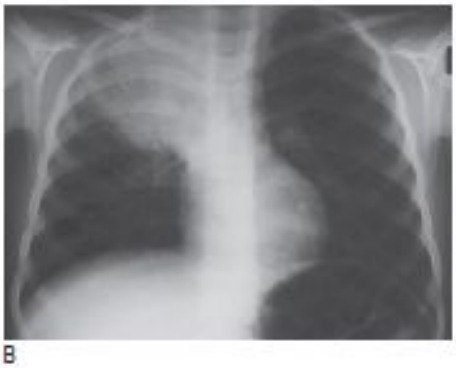


Fig. 7.22 Normal posteroanterior chest X-ray. Note vertebral outlines just seen through the heart shadow. A/B: the cardiothoracic ratio should be <50%.



A



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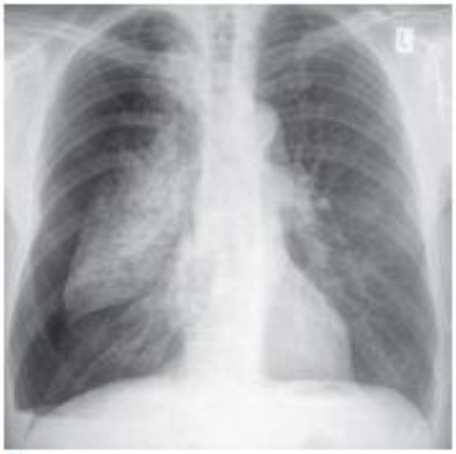

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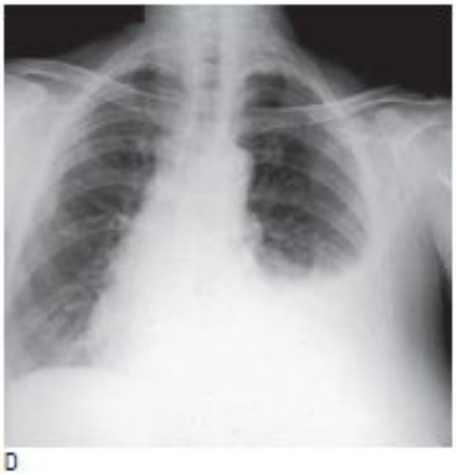

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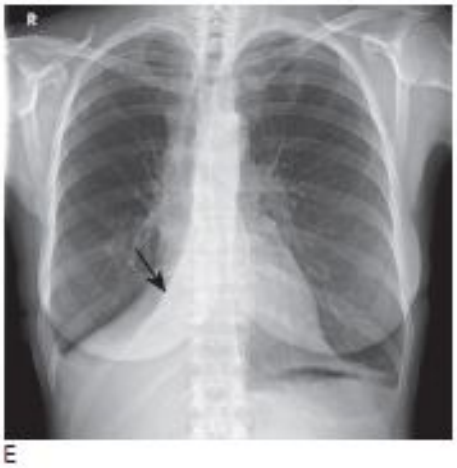

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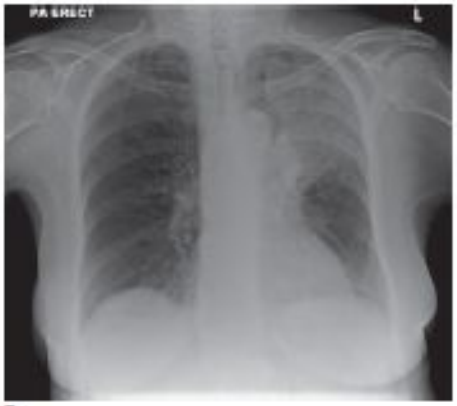

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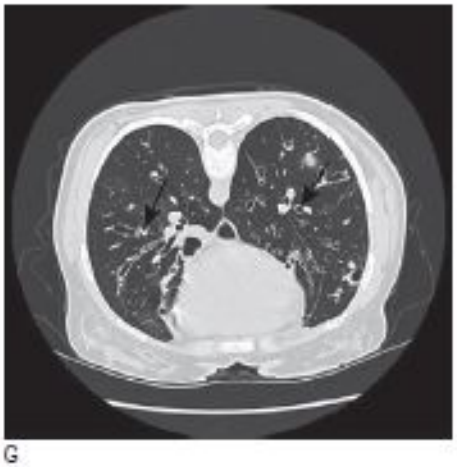
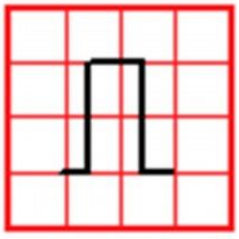
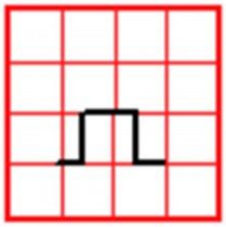


G

Fig. 7.23 Examples of chest X-ray abnormalities. **(A)** Tuberculosis: consolidation and cavitation in both upper zones. **(B)** Right upper-lobe pneumonia containing air bronchograms. **(C)** Right pneumothorax. **(D)** Left pleural effusion. **(E)** Posteroanterior chest X-ray showing straight line of collapsed right middle lobe (arrowed). **(F)** Left upper-lobe collapse. **(G)** CT thorax showing bronchiectasis: typical dilated bronchi which are larger than adjacent pulmonary artery (signet ring sign) (arrows).

APPROACH TO PEDIATRIC ECGS

Source → http://learn.pediatrics.ubc.ca/body-systems/cardiology/approach-to-pediatric-ecg/

1. Check the name , date,age of the patient and Check for old ECGs (to compare with an old one)
2. Technical Aspects
   - Is the ECG full standard?
   - Full standard means that the ECG was not reduced in size so that it can fit on the paper
   - Look at the left hand side of each line
   - If it is full standard, the rectangle's height should be 2 big squares
   - 
   - If it is half standard, the rectangle's height is only 1 big square. You will need to double all the waves to normalize them
   - 
   - paper speed?
     - The standard speed is 25mm/sec
     - That means each little box is 0.04 seconds, each big box is 0.2 seconds, the whole strip is 6 seconds
     - Now look at the top of the ECG, there should be a print out of what speed the ECG was ran at
     - For tachyarrhythmias, the speed of the ECG may have been increased to 50 mm/sec in order to visualize the p waves; in this case, the speed and duration of the ECG components will need to be doubled
3. **Rate**
   a. Normal, Fast or Regular Rates
      i. Find 2 adjacent R waves, count the number of big squares between the R's
      ii. Divide 300 by the number of big squares : this is your rate
      iii. Or Find a QRS complex that starts on a thick line, then count the thick lines using these numbers "300-150-100-75-60-50" to the next QRS
   b. Slow or Irregular Rates
      i. The easiest way to calculate the rate is to count the total number of QRS complex along the length of the entire strip and multiply it by 10: this is your rate (bpm)

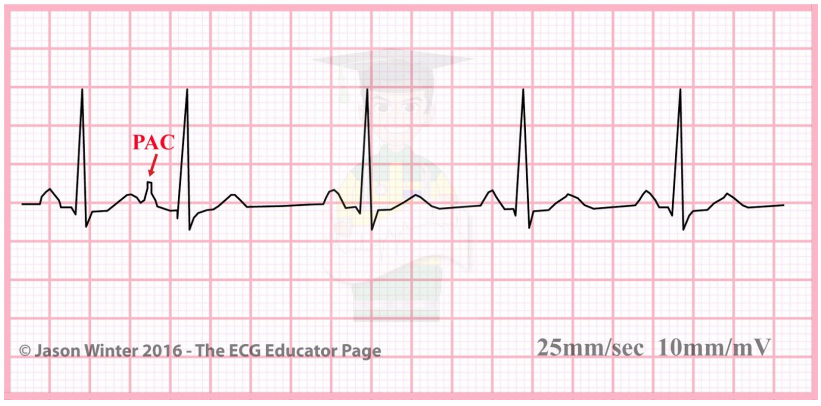
ii. Note: The normal value for heart rate ranges dramatically depending on your patient's age.

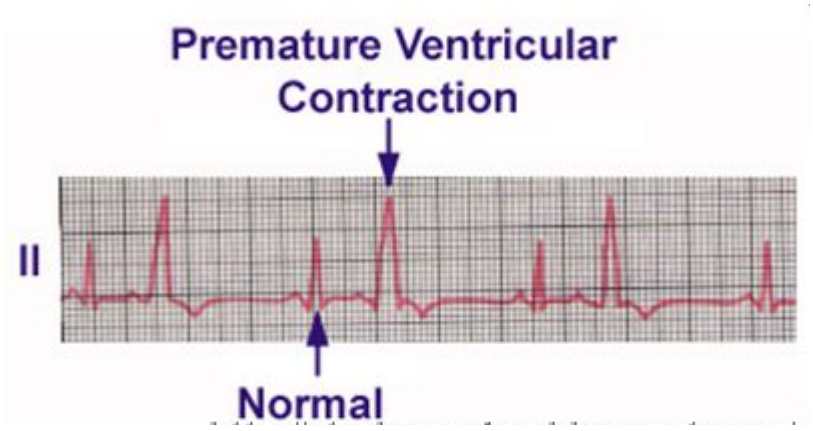
4. Rhythm
    a. Analysis
        i. Is the rhythm sinus? Sinus rhythm:
            1. Is there a P wave before each QRS complex?
            2. Is there a QRS complex after every P wave?
            3. Are the P waves upright in leads I, II, III?
            4. Do all P waves should look the same?
            5. Are all P wave axis normal (0° to +90°)?
            6. Are the PR intervals constant?
        ii. Is the rhythm fast or slow?
        iii. Is the rhythm regular or irregular?
            1. Do the P waves and QRS follow a regular pattern?
            2. If it is irregular, is it consistently irregular or Inconsistently irregular?
            3. Consistently irregular = some form to the pattern of irregular complex i.e. predictable
            4. Inconsistently irregular = no pattern at all i.e. unpredictable
    b. Abnormal Rhythms

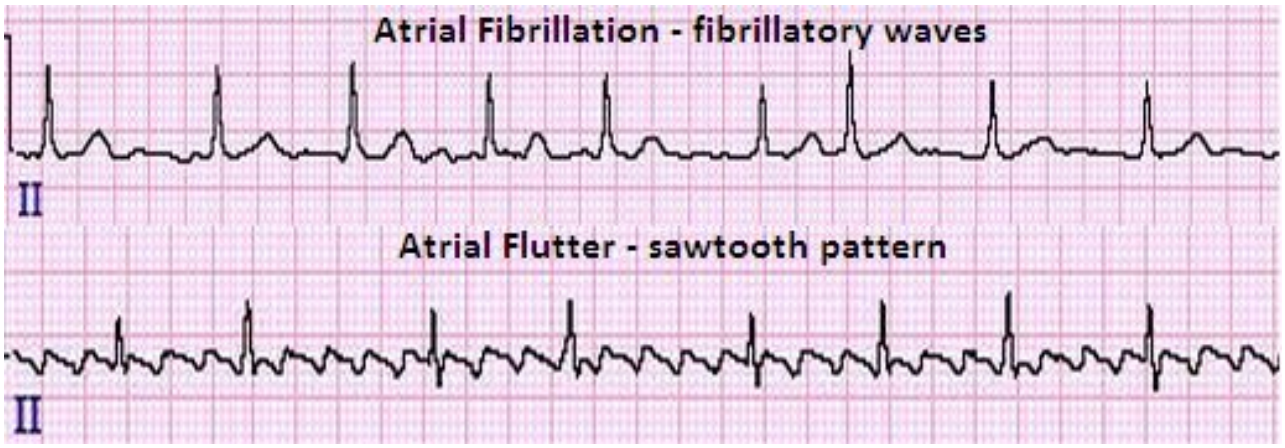
Premature Atrial Contraction (PAC)	● Length of two cycles (R-R) usually shorter ● Preceded by P wave, followed by normal QRS ● No hemodynamic significance
Premature Ventricular Contraction (PVC)	● Premature, wide QRS, no P waves, T wave opposite to QRS ● I.e. multifocal, bigeminy, trigeminy, couplets ● Maybe normal if uniform and decrease with exercise
Atrial Flutter	● Rapid atrial rate (~300 bpm) with varying ventricular rate ● Sawtooth pattern ● Suggests significant pathology

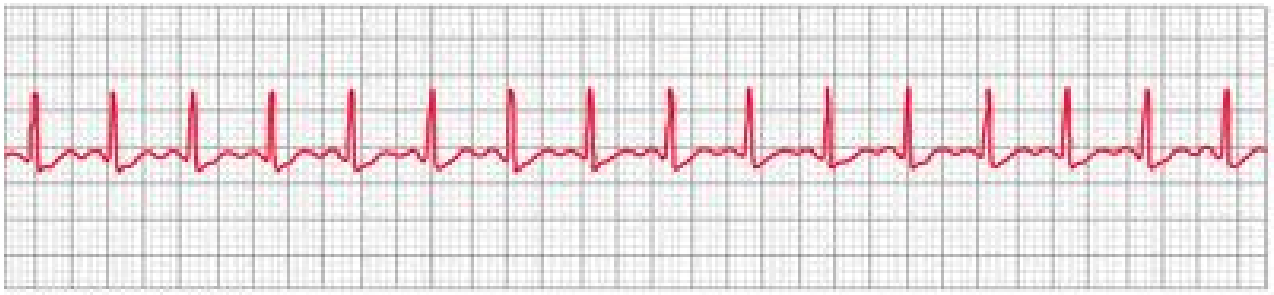
Atrial Fibrillation	• Very fast atrial rate (350-600 bpm) • Irregularly irregular • No P waves, normal QRS • Suggests significant pathology
Ventricular Tachycardia	• Wide, unusually shaped QRS • T waves opposite direction of QRS • HR 120-200 bpm • Suggests significant pathology
Ventricular Fibrillation	• Very irregular QRS • Rate is rapid and irregular • “terminal arrhythmia”

Premature Atrial Contraction (PAC)

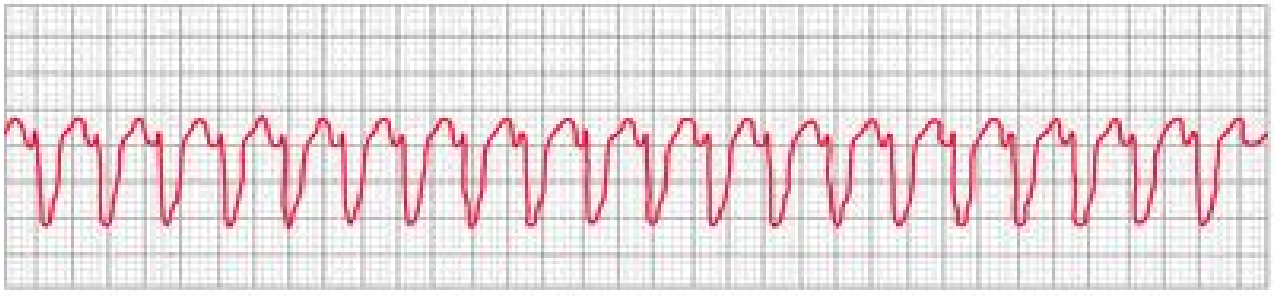




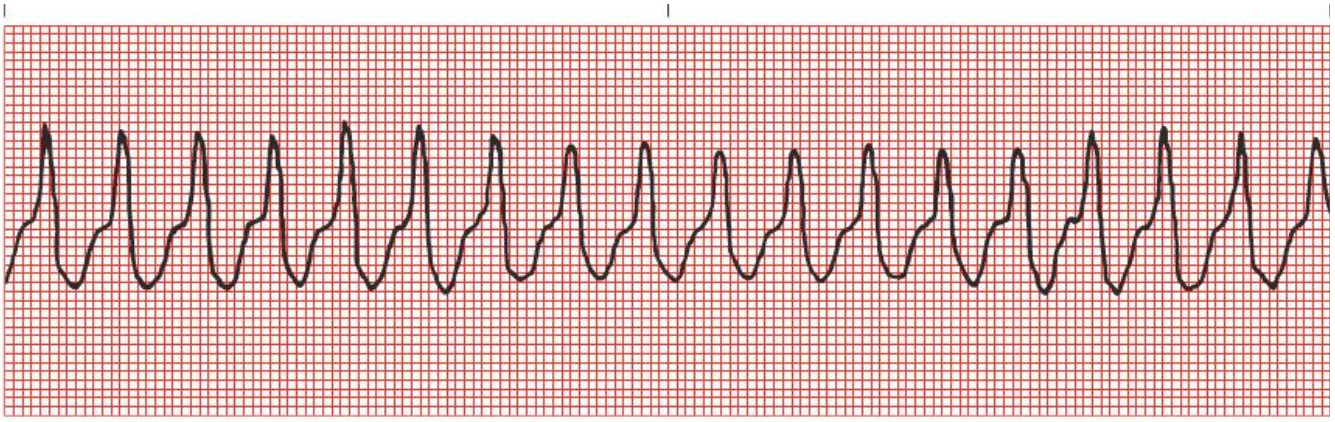




Sinus tachycardia

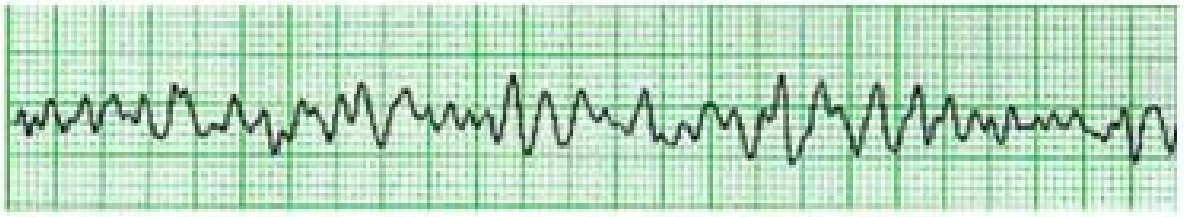


Ventricular tachycardia



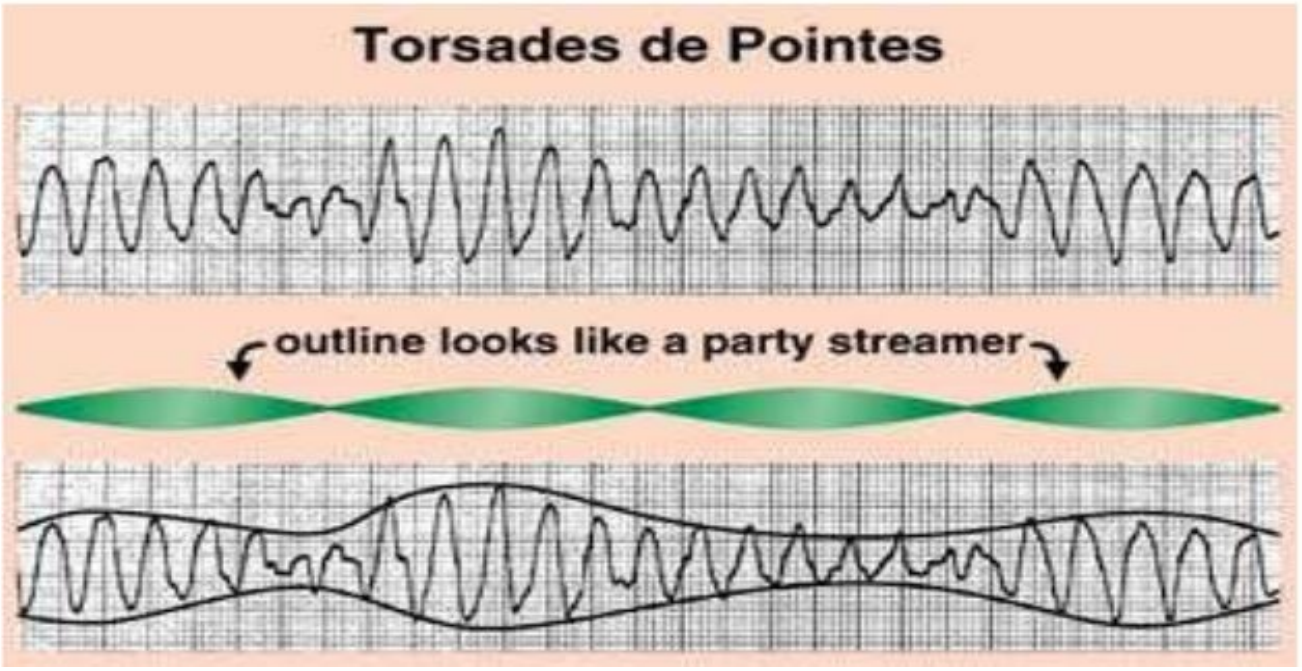
◆ Ventricular tachycardia (V-tach).

Ventricular Fibrillation

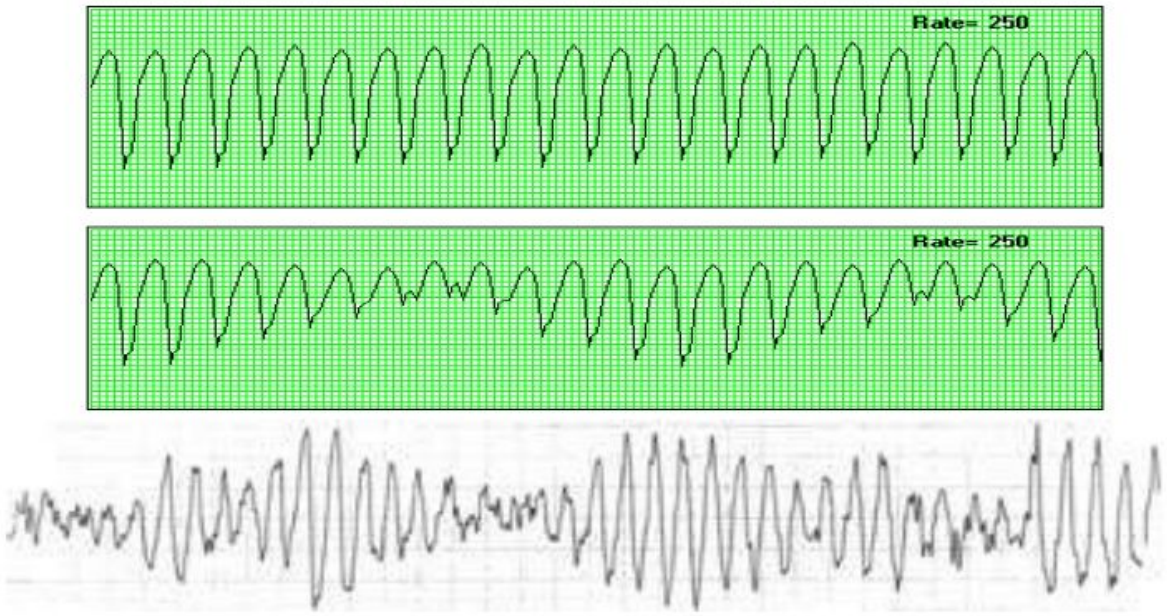


Torsades de Pointes

Multifocal Ventricular Tachycardia

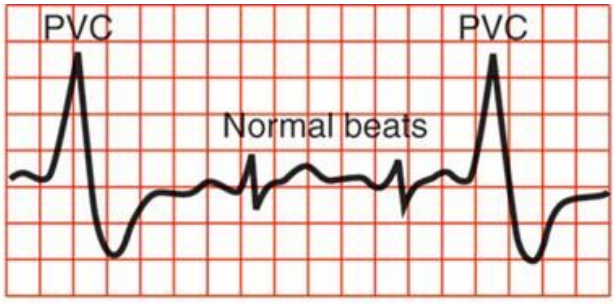


Ventricular Tachycardias

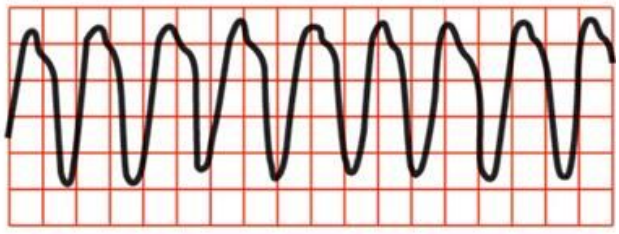


Monomorphic, Polymorphic, Torsades de Pointes

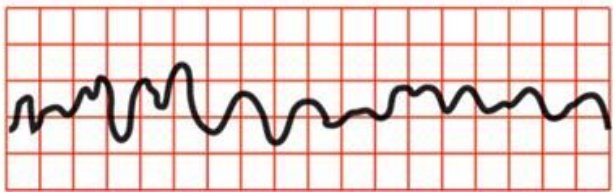
Premature ventricular contractions (PVC)

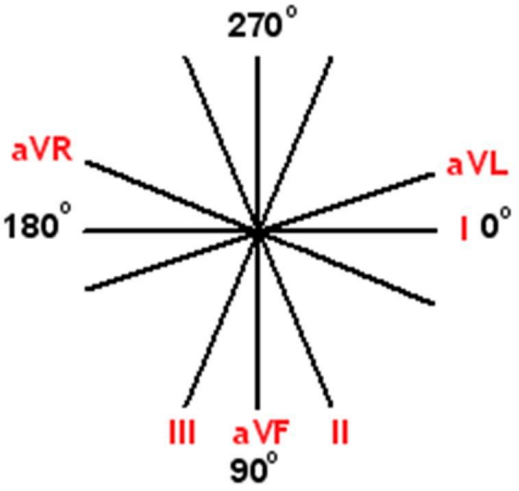


Ventricular tachycardia



Ventricular fibrillation

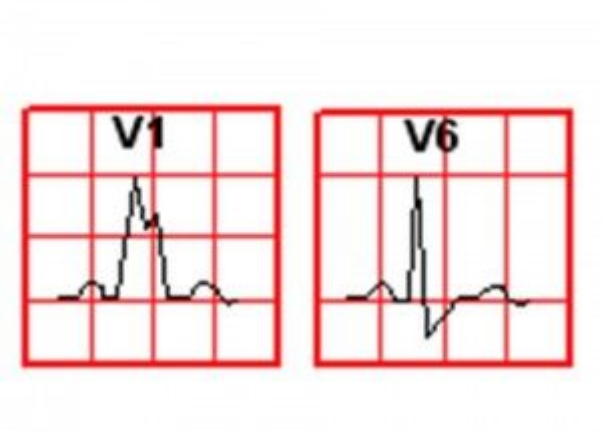


5. Axis
    a. Normal axis varies with age – i.e. newborns have a right axis deviation because the left and right ventricles are the same size due to fetal circulation
    b. Look at the QRS complex of Lead I and Lead aVF
    c. Is the QRS complex of Lead I more negative (downgoing or conduction away from the lead) or positive (upgoing or conduction towards the lead)?
    d. Is the QRS complex of Lead aVF more negative or positive?
    e. 

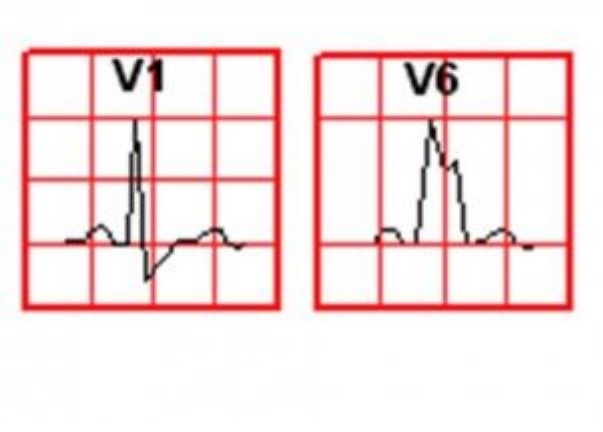
Lead I	Lead aVF	Axis
+	+	Normal
+	–	Left Axis Deviation
–	+	Right Axis Deviation
–	–	Extreme Right Axis Deviation

6. P Wave and PR Interval
    a. PR = beginning of P to beginning of QRS
    b. P wave normal is 2-3 little squares (0.08-0.12); if wide P wave = left atrial enlargement
    c. If P wave is taller than 2-3 little squares = right atrial enlargement
    d. PR interval is dependent on age; if PR is wide = first degree AV block
7. QRS Complex
    a. If beginning of Q to end of S is longer than 2-3 small squares: bundle branch block
    b. Look for the “M” sign in either V1 or V6

c. If the “M” is on V1: Right bundle branch block (RBBB)



d. If the “M” is on V6 : Left bundle branch block (LBBB)



8. QTc Interval
    a. Beginning of Q to end of T
    b. QT corrected interval for heart rate because as HR decrease, QT lengthens and vice versa
    c. Normal: <0.45 (<6 months), <0.44 (>6 months)
    d. QTc = QT / square root of RR interval
    e. DDx prolonged QT: long QT syndrome, hypokalemia, hypomagnesemia, hypocalcemia, neurologic injury
    f. Prolonged QT predisposes to ventricular tachycardia and associated with sudden death
9. T wave
    a. DDx of **peaked**, pointed T = hyperkalemia, LVH
    b. DDx of **flattened** T waves = hypokalemia, hypothyroidism

10. Ventricular Hypertrophy

11. Right ventricular hypertrophy “If any of the following”:
    i. R wave >98% in V1 or S wave >98% in I or V6
    ii. Increased R/S ratio in V1 or decreased R/S in V6
    iii. RSR’ in V1 or V3R in the absence of complete RBBB
    iv. Upright T wave in V1 (>3 days)
    v. Presence of Q wave in V1, V3R, V4R

vi. DDx of RVH: ASD, TAPVR, pulmonary stenosis, TOF, large VSD with pulmonary HTN

12. Left ventricular hypertrophy "If any of the following" :
    i. R >98% in V6, S >98% in V1
    ii. Increased R/S ratio in V6 or decreased R/S in V1
    iii. Q >5mm in V6 with peaked T
    iv. DDx: VSD, PDA, anemia, complete AV block, aortic stenosis, systemic HTN

Other subjects not present in this book.

These subjects are rare in OSCE exam, and are not present in this book. So you should study them from other source

1. Child abuse
2. Down Syndrome
3. Reye syndrome
4. Asphyxia
5. Hypocalcemia, and Rickets (Hypocalcemic Rickets,Hypophosphatemic Rickets)
6. Malignant disease → Wilms Tumor,Neuroblastoma,Brain tumours
7. Idiopathic Increased ICP (Pseudotumor Cerebri)
8. Immunodeficiency,Child with Recurrent Infections
9. Familial Mediterranean Fever (FMF)
10. Osteomyelitis
11. Microcephaly and Macrocephaly
12. Delayed puberty
13. Acute abdominal pain → Acute appendicitis,Intussusception, Meckel diverticulum,Recurrent abdominal pain
14. Inflammatory bowel disease
15. Constipation
16. Hirschsprung disease
17. Kawasaki disease

Past OSCE Stations

Source → Peds-OSCE-and-Notes-corrected

1. **1st rotation** OSCE 's questions (1/7-22/8)
    a. 1st station: Hx (3 y/o boy fever + seizures), a case of meningitis.
    b. 2nd station: cardiovascular physical exam + questions about RF.
    c. 3rd station: Hx (6 m/o boy cough + fever + recurrent infections), a case of CF.
2. **2nd rotation**:
    a. 6 year old child with asthma → respiratory examination, what is the treatment
    b. 3 month old infant with SOB for 1 month duration → heart failure Name 3 common causes of heart failure at this age
    c. 5 year old child with morning eye puffiness for 5 days--> nephrotic syndrome What are the most 3 imp investigations you should ask for
3. 3rd rotation:
    a. The mother of an 11 year-old child presented to you complaining that her son's eyes have been yellow for two days. Take an appropriate history and answer the examiner's question. Diagnosis: acute viral hepatitis. Examiner question: if after ordering liver enzymes you find that ALT and AST are elevated. Name 5 investigations you would order to confirm your diagnosis.
    b. The mother of a 5 year-old child presents to you complaining that her son has had red colored urine for the past number of days. Take an appropriate history and answer the examiner's questions.Diagnosis: post-streptococcal glomerulonephritis. Examiner questions: name the investigations you would order to confirm your diagnosis.
    c. This patient presented with lower limb weakness. Please perform a focused neurological exam and answer the examiner's questions. Examiner question: if lab tests show a greatly elevated CPK. Name the top two differential diagnosis for this patient's condition.
4. 4th rotation:
    a. developmental examination of a child, mention 2 ddx of global developmental delay
    b. you are in the ER, a 3 year-old child came complaining of rash. Take hx and answer examiners questions (HSP, q: what investigations you need to order)
    c. a 6 month-old baby complains of cough and fever. Take hx and answer examiners questions.(Bronchiolitis, q: after examination he was found to have RR 60, sat 88%,... How are you going to manage him)
5. 5th rotation:
    a. Examine GI (Full) and mention what are the possible causes of bloody diarrhea of a ~ 6 y/o child
    b. Examine Respiratory (Full; Chest & Back) and answer how to manage a case of acute Asthma
    c. Take Full history of Headache for a child and mention the DD

5th year pediatric OSCE (2011)

1. 1st group:
    a. Hx (fever & vomiting which are non specific at all & you should ask about many differential diagnoses from meningitis to UTI)
    b. P/E: Cardiac exam for a patient with syncope + differential for syncope
    c. Lab: Urinalysis with microscopic hematuria & RBC casts
2. 2nd group:
    a. Hx: Upper airway obstruction with deferential (croup, epiglottitis, tracheitis, laryngomalacia, tracheomalacia, etc.)
    b. P/E: developmental
    c. Lab: CBC (anemia)
3. 3rd group:
    a. Hx: FTT
    b. P/E: respiratory (chest) exam
    c. Lab: CSF
4. 4th group:
    a. Hx: Gastroenteritis
    b. P//E: developmental
    c. Lab: Jaundice, which will lead to a Dx of hepatitis

5th year pediatric OSCE (2012)

1. 1st one
    a. csf analysis (b6l3 herpetic encephalitis, DIAGNOSIS & TTT)
    b. respiratory exam (the history was about a 4 year old female pt came after she swallowed a foreign body…do a full respiratory exam and what are the findings?
    c. history of diarrhea (it was GASTROENTERITIS)
2. 2nd one
    a. Developmental assessment (b6l3 3omro 9 months)
    b. History b6l3 (croup)
    c. Pt presented with syncope...(do physical examination)
3. 3rd one
    a. Hx (sinusitis)
    b. Measure head circumference then put it on the chart (then lazem t7ke 2no microceph...wb9eer discussion about its types and management in each one) then discussion about short stature
    c. Examine lower limb for hypotonia (neurological examination) then discussion about leukodystrophy
4. 4th one
    a. fever history in 15-day-old patient – < (sepsis)
    b. resp exam
    c. developmental exam for a 1-year-old patient
5. 5th one

a. history: an infant with diarrhea of 1-week duration.
b. Examination of the cardiovascular system of a child with a hx of myocarditis.
c. Neurological exam of the lower limb of a child with proximal muscle weakness(just motor).

5th year pediatric OSCE (2013)

1. 1st group:
    a. Hx: Diarrhea and vomiting in 2 years old baby + question about signs of dehydration in PE
    b. Hx: Jaundice in 2 days old neonate (physiological) + question about tests to order
    c. P/E: Respiratory examination + question on Mx of wheezy patient in ER with SPO2 95
2. 2nd group:
    a. Hx: cough of 15 minutes duration. Give DDx. Dx is F.B. Findings on X-ray.
    b. Hx: 3 years old with high fever 38.5. Give DDx. Investigations. Dx is occult bacteremia
    c. Abdominal exam
3. 3rd group:
    a. Hx: vomiting in 3 months old baby. Give DDx. Dx is pyloric stenosis.
    b. Developmental
    c. P/E: examine cardiac function
4. 4th group:
    a. Hx: knee swelling/pain: DDx, Dx is RF. Mention criteria
    b. PE: Respiratory, questions about cystic fibrosis
    c. Develeopmental assessment: baby is premature, you have to correct the age

Pediatrics OSCE 2014

1. 1st Group:
    a. Complete a motor neurological examination of the lower limb of this patient and comment on the findings.
    b. History for cough and fever of three days duration for a 3 year-old boy. What is your list of differential diagnoses?
    c. History for fever and convulsions. What are three contraindications for lumbar puncture?