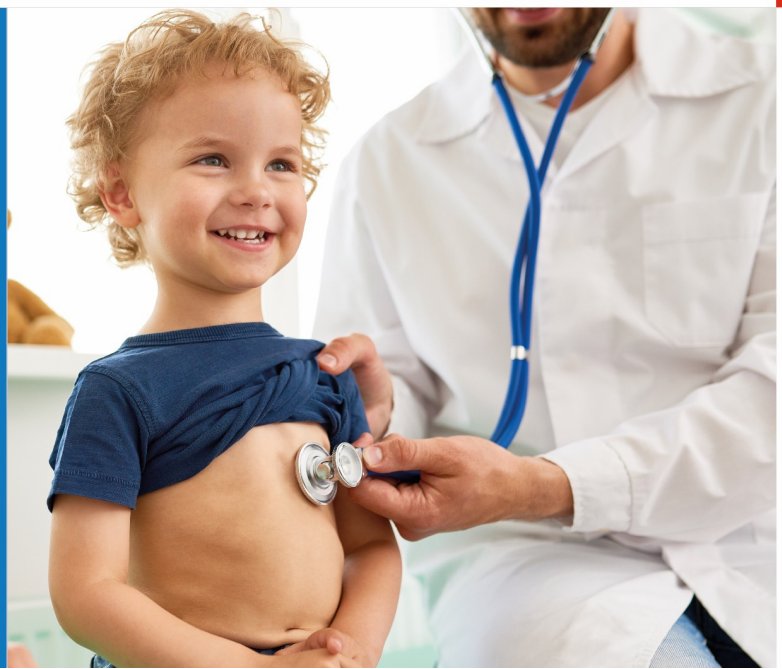
Tanta University
Faculty of Medicine
Pediatric Department

CLINICAL PEDIATRICS

For medical students

17th Edition
2021-2022



By Staff Members of
Tanta Pediatric Depatment

VISION

"PROVIDING HIGH QUALITY HEALTH CARE FOR CHILDREN AND THEIR FAMILIES IN OUR COMMUNITY- REGARDLESS OF THE ABILITY TO PAY- THROUGH THE STAFF OF ACADEMIC PROFESSORS, PROFESSIONAL NURSES AND TRAINED RESIDENTS USING THE AVAILABLE RESOURCES TO HELP DIAGNOSE, TREAT AND PREVENT PEDIATRIC ILLNESS CONTINUING TO BE AN EDUCATIONAL HOSPITAL TO TRAIN NEW SPECIALISTS AND A RESEARCH CENTER FOR PEDIATRIC HEALTH CARE NEEDS IN OUR COMMUNITY".

DEPARTMENT OF PEDIATRICS

Tanta University

MISSION

- ***Improving our educational role through continuous improvement of our programs for undergraduate students' education, post graduate residencies training and the staff research.***
- ***Improve the quality and quantity of research in our hospital to serve the specific needs in our community.***
- ***Providing the best medical care for our community children through hospital departments, clinics, and emergency unit.***
- ***Using the hospital resources to bring the upmost recent affordable medical equipment to improve services quality.***
- ***Work with the concerned organizations and authorities to spread awareness of children health care in our community.***

History Taking

Pediatrics

Clinical Examination

History Taking

Personal History

1- **Name:** It should include initial name and family name

2- **Sex:** Certain diseases are more common in one sex than the other, e.g:

In males: G6PD deficiency, hemophilia, aortic regurge and nephritic syndrome are more common

In females: mitral stenosis and rheumatic chorea are more common

3- **Age:** ***Age groups:***

- Neonatal period: First 4 weeks after birth.
- Infancy: 1-12 months. (up to 2 years by some authors)
- Toddlerhood: 2-3 years.
- Early childhood (preschool age): 3-6 years.
- Late Childhood (School age): 6-12 years.
- Adolescence: 12-20 years.

4- **Residence:** Urban or rural

5- **Occupation of parents:** a clue to educational level and socioeconomic status.

6- **Date of admission** to hospital.

Complaint

The cause of seeking medical advice:

- In the parents' or child's own words.
- No leading questions.
- No medical terminology: e.g. one can say "difficulty of breathing" but not "dyspnea".
- Should be arranged chronologically: the first complaint to occur is mentioned first then the next one and so on.
- Recorded in numerical fashion.
- Duration of each complaint.

Present History

A. Analyze each complaint:
   a. Onset: Sudden, acute or gradual.
   b. Course: Progressive, regressive, stationary, intermittent or remittent.
   c. Duration.
   d. Factors relieving and factors aggravating.
   e. Response to therapy if any.

B. Other symptoms of the same system affected

C. Symptoms of other systems that may be involved.

D. Ask about general condition: e.g: Fever, appetite, weight loss

E. Investigations done and treatment received.

Past History

I. ***Obstetric (Perinatal) History:***

II. ***Developmental History:***

III. ***Dietetic History:***

IV. ***Vaccination History:***

V. ***History of Past Illness:***

- Similar condition.
- Previous hospital admission.
- Etiologic or precipitating factors for the present complaint.
- Infectious diseases or parasitic infestations.
- Surgical or interventional procedures
- Accidents or trauma.

Family History

- Consanguinity.
- Number of siblings.
- Similar conditions, related conditions, and other familial diseases.
- Health of family members.
- Family pedigree.

General Examination

Pediatrics

Clinical Examination

General Examination

I. General Appearance

- Consciousness.
- Orientation to time, place and persons.
- Looks (well, ill, toxic, dysenteric).
- Body built.

II. Complexion

A. Pallor: Pallor is inspected in:

- Inner side of the lips
- Palm and sole creases
- Nail beds
- Palpepral conjunctiva

Pallor

B. Jaundice: Yellowish discoloration of skin, mucous membranes and sclera

Jaundice

C. Cyanosis:

- **Definition:** Bluish discoloration of the skin and mucous membranes due to the presence of reduced hemoglobin more than 5gm/dl in the capillary blood, or the presence of abnormal hemoglobin as methemoglobinemia.
- **Types:**
  1- ***Peripheral cyanosis:*** in tip of nose, lips, lobule of the ear, fingers and toes
  2- ***Central cyanosis:*** like peripheral type + cyanosis of mucous membranes

Central Cyanosis

Peripheral Cyanosis

	Central	Peripheral
Mechanism	Dimininshed arterial oxygen saturation	Diminished flow of blood to the local part
Sites	On skin and mucous membranes e.g. tongue, lips, cheeks etc.	On skin only
Clubbing and polycythemia	Usally associated	Not associated
Temperature of the limb	Warm	Cold
Local heat	Cyanosis remains	Cyanosis abolished
Breathing pure oxygen	Cyanosis decreased	Cyanosis persists

3- Differential cyanosis:

- In upper half of the body: TGA with PDA
- In lower half of the body: PDA with reversed shunt

III. Special Decubitus

- Leaning forwards (e.g. in pericarditis or pericardial effusion)
- Lying on the affected side of the chest (e.g. in pleurisy)
- Orthopnea or semisitting position (e.g. in lung congestion)
- Squatting position (e.g. in TOF)
- Opisthotonus or arched back (e.g. in meningitis)

IV. Vital Signs

1- Pulse (Heart rate)

2- Blood pressure

3- Temperature; rectal, sublingual, and axillary.

4- Respiratory rate

1. Pulse

Apical pulse:

Indications:

- Any child <2 years
- Cardiac disease
- Radial pulse is difficult
- Radial pulse is irregular

Radial pulse:

❖ *Surface anatomy of the radial artery:*

The radial artery can be felt at the wrist in the interval between the flexor carpi radialis tendon (medially) & the lower part of the anterior border of radius (laterally)

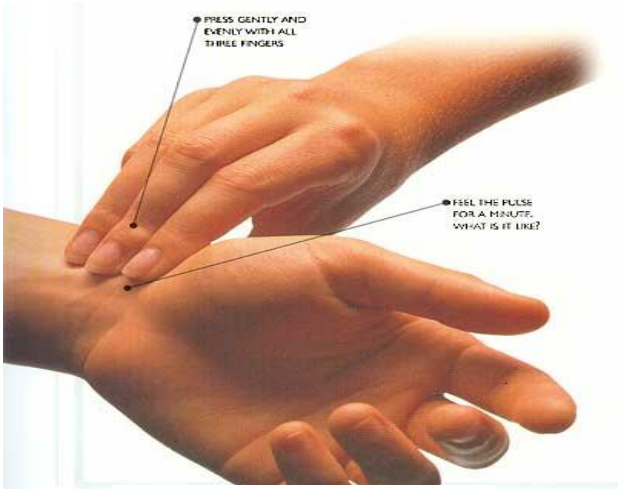
❖ *Technique:*

- The patint should be lying supine & the examiner standing on his right side.
- It is best felt with the tips of the 3 fingers (index, middle and ring) of the right hand.
- The patient's forearm being pronated and the wrist slightly flexed and the forearm supported

❖ *The following observations should be systematically made:*

1- RATE :

- It is counted, not when the fingers are first laid upon the pulse, but when any quickening due to nervousness of the patient has subsided.
- The patient should be quite or asleep.
- Count the beats for not less than one minute.
- Compare pulse rate with apical heart rate.
- The normal heart rate is:
    - ***Newborn:*** 120-140 b/min
    - ***Infant:*** 110-120 b/min
    - ***At 4 years:*** 90-110 b/min
    - ***At 9 years:*** 80-100 b/min
    - ***At 12-14 years:*** 70-90 b/min



Radial pulse examination

- Fever increases the pulse rate by 10-15 beats/1^{o}C temperature rise.
- ***Tachycardia*** is increased heart rate, while ***bradycardia*** is decreased heart rate.

2- RHYTHM:

- Comment on interval between subsequent impulses.
- The normal heart has regular rhythm.
- ***Arrhythmia*** may be ***regular*** or ***irregular*** irregularity.

3- FORCE (systolic blood pressure): (normal, increased or decreased)

- It is the external pressure needed to occlude blood flow in the artery completely.

- Its assessment is by the use of 3 fingers; the distal one segregates the radial from ulnar collateral connection, the proximal one exerts the gradually increased pressure force, until the middle finger no more feels the pulse wave.

4- VOLUME (pulse pressure): (normal, increased or decreased)

- The amount of elevation of the palpating (middle) finger at the arrival of each pulse.

5- CHARACTER:

- The palpating finger conveys to the examiner the mental picture of the pulse-wave in the form of a curve with ascending limb, summit and descending limb. e.g.

Warer-hummer pulse

❖ ***Water-hammer pulse (Corrigan's pulse):***

- It is forceful, collapsing beat with increased volume due to wide pulse pressure
- It is characterized by rapid ascend and descend and short summit.
- It is felt when the patient's arm is elevated and the wrist is grasped with the palm of the examiner's hand against its palmar surface.
- Causes: PDA, Aortic regurgitation, peripheral A-V fistula.

❖ ***Thready pulse:***

- Weak rapid pulse, difficult to palpate.
- Causes: shock & heart failure.

❖ ***Pulsus ulternans:***

- A strong beat followed by a weak one and so on.
- Causes: severe myocardial diseases e.g. cardiomyopathy.

❖ ***Pulusus paradoxicus:***

- It is the decrease in the systolic BP of more than 10 mmHg (with decreased pulse volume) during inspiration and return to normal during expiration. i.e. ***exaggerated normal ohenomenon.***
- Causes: cardiac tamponade.

Carotid pulse examination

Brachial pulse examination

6- EQUALITIE ON BOTH SIDES:

- Unequality suggests congenital problems, e.g. aortic coarctation, cervical rib

7- CONDITION OF VESSEL WALL:

- Press by the fingers to empty the artery, then roll the empty wall

8- COMPARE RADIAL PULSE WITH: other pulsations (carotid, brachial, femoral and dorsalis pedis)

Dorsalis Pedis Pulse Examination

2. Blood Pressure

❖ *INTRODUCTION*

1- SURFACE ANATOMY OF BRACHIAL ARTERY:

It occupies of the medial part of the cubital fossa (just medial to the biceps tendon) until 1 cm below the bend of the elbow.

2- Blood pressure is best measured by a sphygmomanometer of the mercury type.

3- The width of the cuff should be 40-50% of circumference of upper arm.

4- The inflated bag (air bladder) should be long enough to encircle 80-100% of the limb and not more than 1.5 circuit.

5- In any cardiac patient, the blood pressure should be measured in the four extremities.

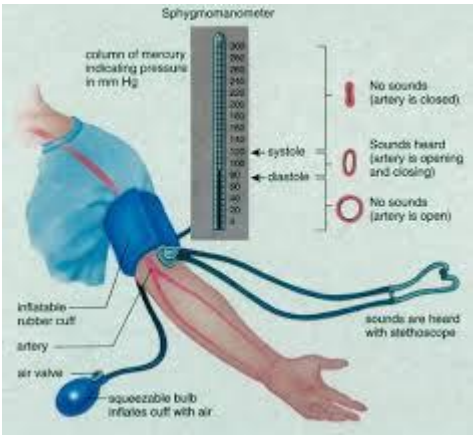
6- Normal values for BP are present in standard value for sex and age, but roughly:

- ✓ Systolic BP = 90 + age in years
- ✓ Diastolic BP = 55 + age in years

Variable cuff sizes

❖ *TECHNIQUE*

- The patient should be in sitting position at ease with the arm at the heart level.
- The upper arm should be bared completely.
- The examiner should be sitting with the his eyes at the level of mercury column of the sphygmomanometer.
- Select proper sized cuff.



- The cuff should be applied closely to the upper arm, with the lower border not less than 1 inch from the cubital fossa.
- The radial pulse is palpated while the cuff is inflated to a pressure 10 mmHg above the level at which pulse can no longer be felt.
- The bell of the stethoscope is then placed lightly over the brachial artery.
- The pressure in the cuff is lowered, 5 mmHg at a time, until the first sound is heard (the systolic pressure).
- Continue to lower the pressure in the cuff until the sounds become suddenly faint or inaudible (diastolic pressure)

❖ ***OTHER BENEFIT FOR BP:***

1- Pulsus Paradoxus

- Measurement systolic blood pressure during slow respiration, or during held inspiration and held expiration.
- Inflate the cuff above systolic blood pressure and release it at a rate of 2-3 mmHg per second.
- When Korotkoff sounds are first heard, pump the cuff up slightly and confirm that the systolic reading is taken during expiration.
- Then, deflate the cuff very slowly to determine when the sounds are first heard during both inspiration and expiration. If the difference between the two measurements is greater than 10 mm, pulsus paradoxus is present

2- Pulse Pressure: Difference between systolic & diastolic BP.

3- Hill's sign: Elevated BP in the legs more than the arms indicating aortic regurgitation.

3. Respiratory Rate

- Assess respiration before any invasive procedure, while the child is calm and not crying.
- Count the ***respiratory rate*** (RR) for at least one minute (don't let the child know you are counting)
- Assess by either: Listening to breath sounds or Observing chest and abdominal movements.

- Note ***rhythm*** (regular or irregular) and ***depth*** (shallow, normal or deep).
- Normal RR:
    - ✓ ***At birth:*** 30-50 cycles/min
    - ✓ ***Infants:*** 20-40 cycles/min
    - ✓ ***Preschool children:*** 20-30 cycles/min
    - ✓ ***School children:*** 20-25 cycles/min
    - ✓ ***At puberty:*** 15-20 cycles/min

4. Temperature

- Select the site (axillary, oral, rectal or from the ear) according to age, condition and the least traumatic to the child.

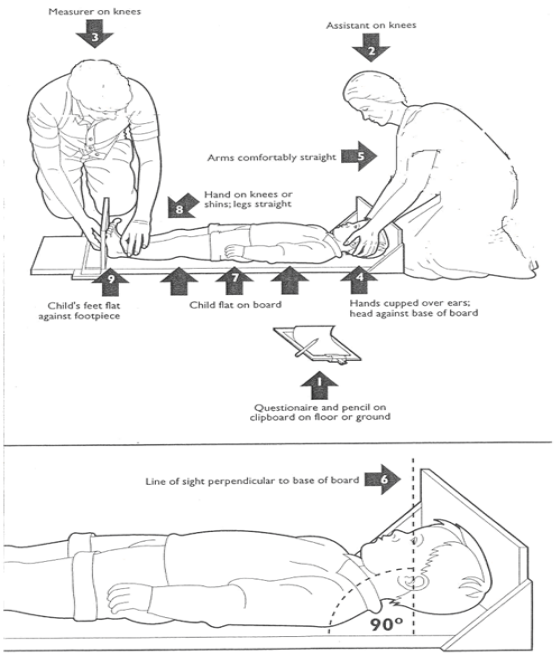
- Normal body temperature: 36.6 – 37.2 ^{o}C orally, substract 0.5^{o}C if rectally, and add 0.5^{o}C if axillary.

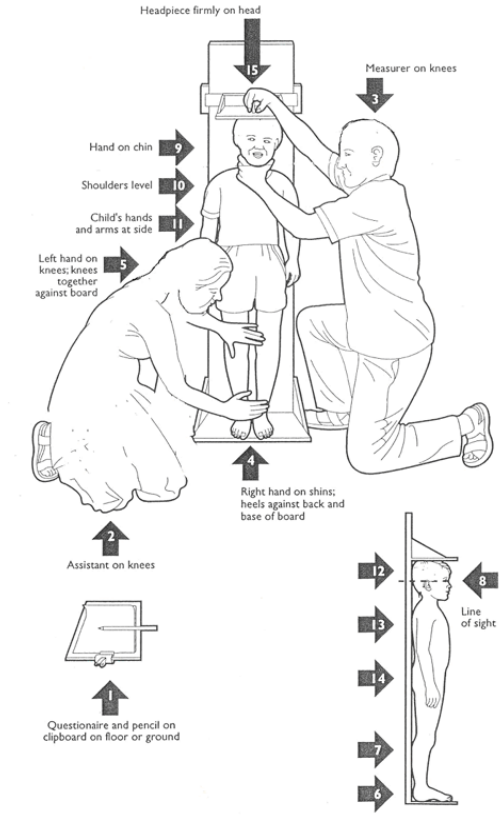
V. Anthropometric Measures:

1. Weight

2.Length/Heigh

– Recumbent length is measured in infants (below 2years) while the height is measured in older children.





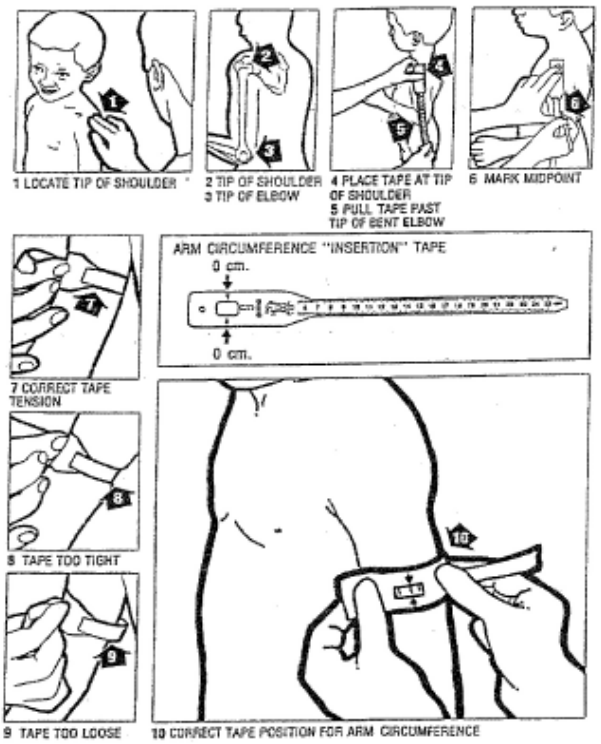
3. Head Circumference

- The infant is in sitting position
- The examiner is on the right side.
- The tape is applied firmly over the glabella, just above eyebrows, and occi pital protuberance (occipto-frontal circumference).
- NORMALLY, the head circumference is 35 cm at birth, 41 cm at 3 months, 43 cm at 6 months, 44 cm at 9 months, and 45 cm at 12 months.

Head circumference

4. Mid-arm Circumference

- Measured in the ***non-dominant arm***, midway between the acromial and olecranon processes.
- NORMALLY, it is between 13.5-14.5 cm in children 1-5 years.

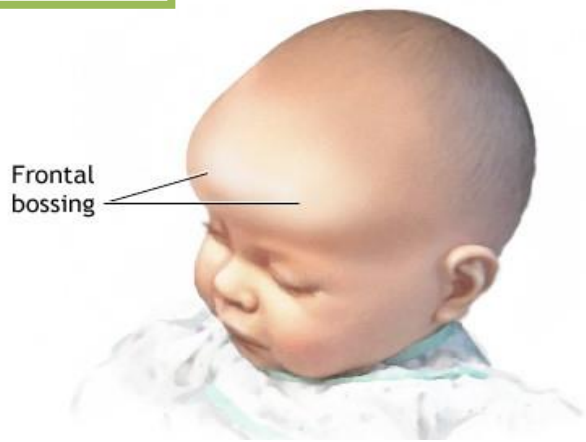


VI. Regional Examination:

1. Head

1) Skull:

- Shape.
- Circumference.
- Craniotabes.
- Fontanelles: size, tension.
- Bossing.
- Sutures.
- Bone defect.



2) Anterior Fontanel Examination

- The infant must be in sitting position or is held upright, calm and not crying.
- Palpate the anterior fontanel (AF) and comment on:
  i. SIZE: measure in 2 perpendicular lines: sagittal & coronal
  ii. SURFACE: compare the surface of AF with the plane of surrounding skull
  iii. TENSION: palpation of AF without crying
  iv. PULSATION:

3) Scalp

- Hair : thin, easily broken, luster, flag sign
- Skin lesions : alopecia, infections

4) Face:

- Complexion : pallor, cyanosis, jaundice.
- Shape
- Rash : malar rash

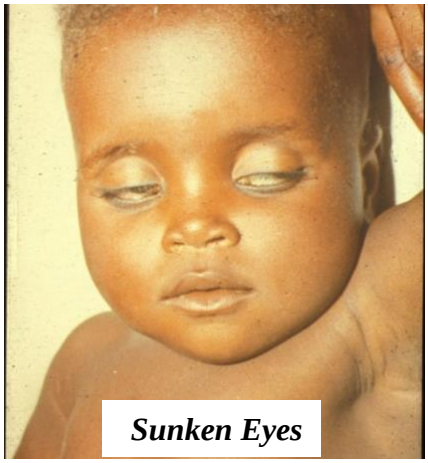
Malar rash

5) Eyes:

- Eyelids (puffiness)
- Palpebral fissures
- Ptosis
- Conjunctiva (Congestion, jaundice)

6) ***Eye balls:***

- Squint
- Nystagmus
- Protruded (exophthalmos)
- Sunken eyes (dehydration)
- Size : macrophthalmia, microphthalmia
- Reflexes



Sunken Eyes

7) ***Nose***

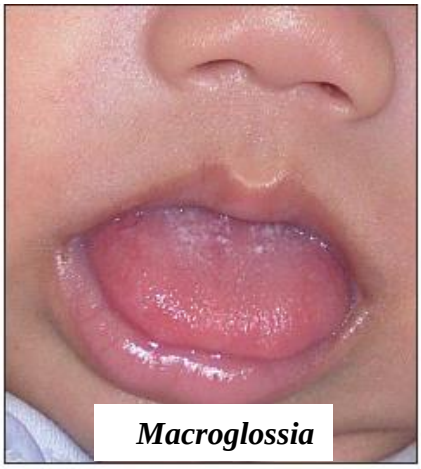
- Discharge
- Obstruction
- Working alae nasi

8) ***Lips:*** color, fissures.

9) ***Teeth:*** Number, color, decay, gum hypertrophy.

10) ***Buccal mucosa:***

- Color.
- Dry or moist
- Rash, purpura



Macroglossia

11) ***Tongue :***

- Macroglossia : congenital hypothyroidism
- Strawberry : scarlet fever.
- Fissured (scrotal) : Down syndrome.

12) ***Tonsils:*** size, color, exudates, membrane, and ulcer.

13) ***Ears***

- Discharge
- Mastoid tenderness

Strawberry Tongue

2. Neck

Examine the neck for:

1- Position.
2- Movement.
3- Neck rigidity (meningitis)
4- Lymph nodes.

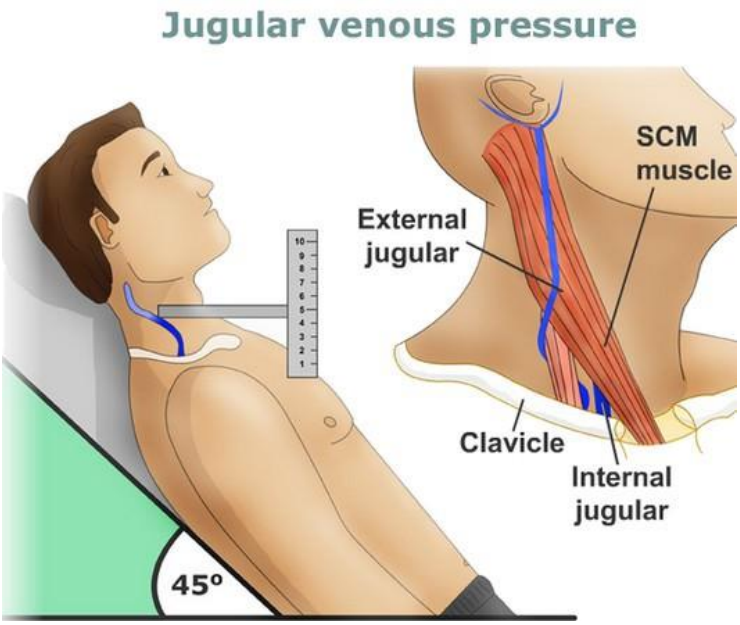
5- Position of trachea.
6- Vessels: arteries (pulsations), veins (congestion).
7- Muscles.
8- Thyroid gland.

Examination of Neck Veins

❖ Surface anatomy of the external jugular vein:

It begins at the angle of mandible and runs down the neck along a line drawn from the angle of the mandible to the middle of the clavicle crossing sternomastoid muscle obliquely.

When it is not obvious, it can be brought into view by the effort of blowing with the mouth closed, or gentle pressure at the end of the vein just above clavicle.



❖ Technique:

1- Congested or Not:

- The patient in semi-sitting position (45° position)
- The head is centralized and supported.
- The neck muscles must be relaxed.
- The patient must not strain or hold his breath
- The examiner inspect the level of filling of external jugular vein.
- NORMALLY, in this position, the mean level will be invisible.

2- Degree of Congestion:

- If a level of congestion is visible with the patient in ***45-degree position***: imagine 2 horizontal plains, one passing through the sternal angle, and the other passing at the highest point of filling of the vein.
- When the congestion reaches the whole length of the neck in 45-degree position, the height of the congestion can be estimated ***in 90-degree position.***

- When the highest level of the filling is still invisible in 90-degree position, the congestion can be only be stated to be ***very severe***

3- Pulsating or Not:

- Look for the highest point of filling, in the congested vein, is it pulsating or not.(venous pulsation and not arterial pulsation)

3.Extremities

A. Hands and feet:

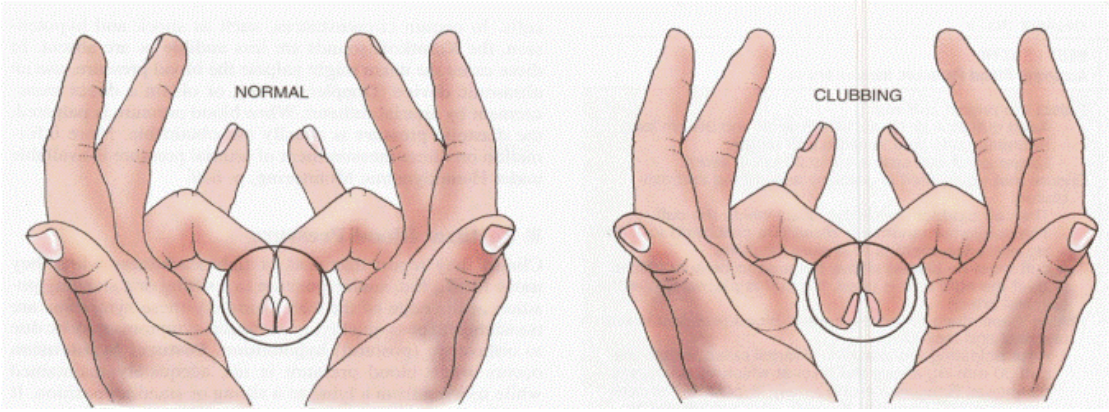
Absent thumb

- Deformities: e.g absent thumb in Fanconi's anemia
- Palmar and planter creases
- Handedness
- Arthritis
- Abnormalities in number or shape of fingers and toes.
- Sweating (e.g. thyrotoxic crisis)
- Palmar erythema (e.g. liver cell failure)
- Tremors

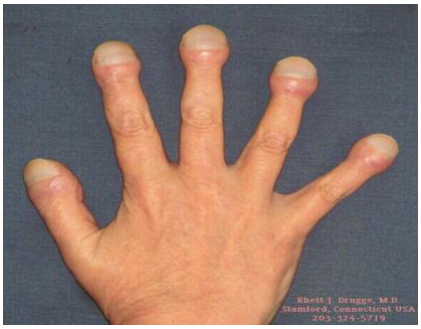
Capillary refill

B. Nails

- Capillary refill
- Splinter hemorrhage
- Spooning (koilonykia)
- ***Clubbing:***
  - Types of clubbing:
    - I- Pale clubbing
    - II- Blue clubbing
  - degrees of clubbing:
    - I- 1st degree: Obliteration of the angle
    - II- 2nd degree: Increased convexity (***Parrot peak*** appearance)
    - III- 3rd degree: ***Drum stick*** appearance
    - IV- 4th degree: Pulmonary osteodystrophy



Blue clubbing



Pale clubbing

C. Long bones:

- Deformities
- Broad epiphysis
- Cellulitis
- Oedema

D. Joints

- Arthritis
- Deformities

E. Spine

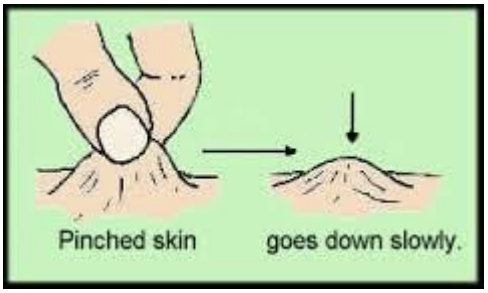
- Deformity
- Movement
- Tenderness

4. Skin

Inspection

Color, eruption, hemorrhage

Palpation of The Skin



1- Touch the skin with the dorsum of the fingers (temperature)
2- Pass the hand gently over the skin (smooth or thick-dry or wet)
3- ***Skin turgor:*** Pinching the skin up between the forefinger & thumb (thin or thick, subcutaneous fat) and get it return to its place (elasticity)
4- ***Oedema:*** Press the skin with the thumb over a bone for 20-30 seconds.(sacrum, chin of the tibia, dorsum of the foot, behind the malleoli of the tibia & fibula) to test for oedema.


Test for Oedema

5.Lymph Nodes

- ✓ Examination of the lymph nodes forms part of the routine for most body systems.
- ✓ It should be remembered that there is a great number of lymph nodes that are not accessible to the examining hand for example: in the intestinal mesentery, and mediastinum.
- ✓ There are several groups of lymph nodes that are accessible for physical examination, including:

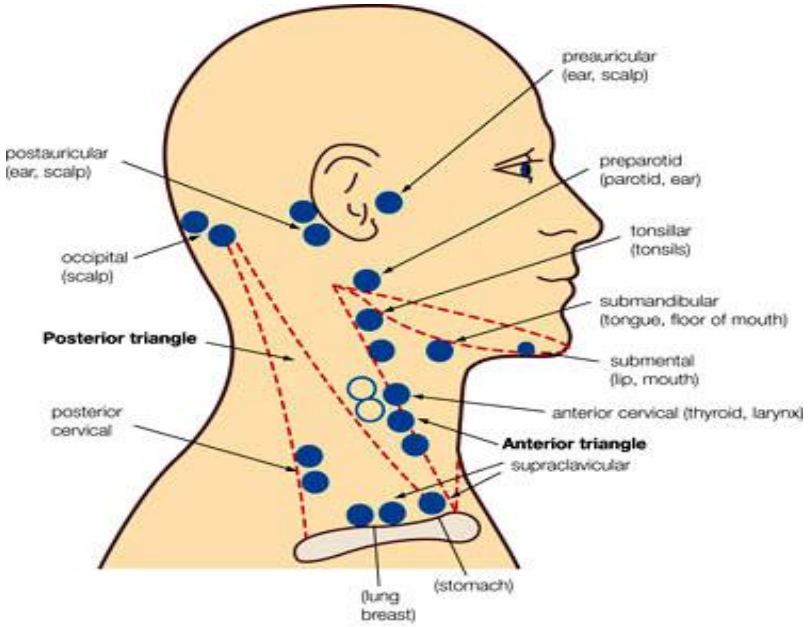
I- Cervical LNs:

A. Transverse group: submental, submandibular, preauricular, postauricular and occipital.

B. Vertical group:

a. Midline group: prelaryngeal and pretracheal

b. Superficial and deep groups related to the sternomastoid muscle.



Cervical lymph nodes

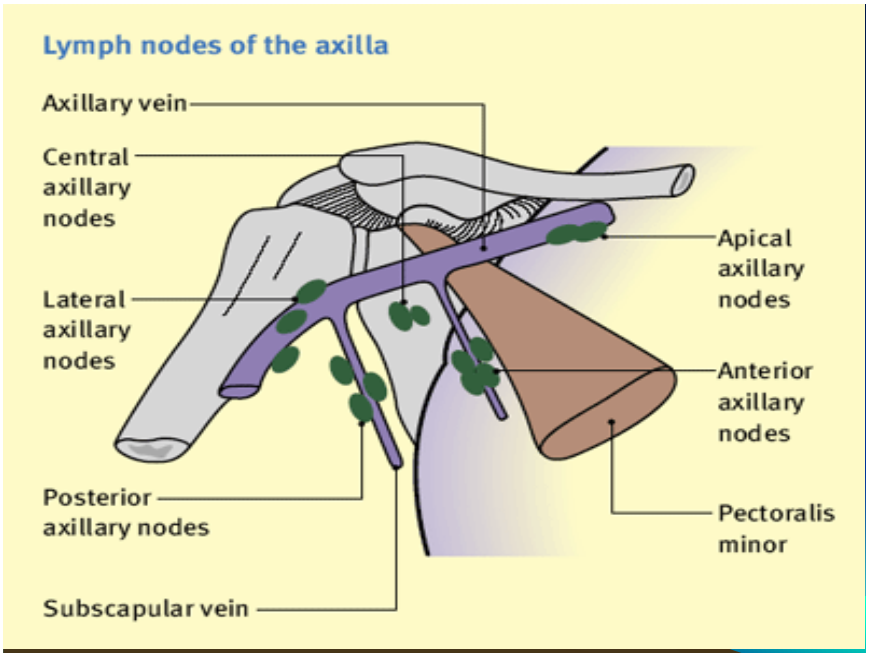
II- <u>Supraclavicular LNs</u>

III- <u>Axillary LNs:</u> Anterior, posterior, medial, lateral and apical

To examine the nodes at the right axilla:

a. The patient should be sitting comfortably and you should stand at their right-hand side.

b. Support their right arm abducted to 90° with your right hand.



c. Examine the axilla with your left hand.
d. To examine the nodes at the left axilla, perform the opposite maneuver to the above.

IV- InguinalLNs:

a. Horizontal chain which runs just below the inguinal ligament
b. Vertical chain which runs along the saphenous vein.

V- Epitrochlear LNs: Place the palm of the right hand under the patient's slightly flexed right elbow and feel with your fingers in the groove above and posterior to the medial epicondyle of the humerus.

VI- Popliteal LNs: Best examined by passively flexing the knee and exploring the fossa with the fingers of both hands.

VII- Paraaortic LNs

❖ **HOW TO EXAMINE LNs:**

A. Inspection

Large nodes are often clearly visible on inspection, particularly if the enlargement is asymmetrical. If nodes are infected, the overlying skin may be red and inflamed.

B. Palpation

Lymph nodes should be palpated using the most sensitive part of your hands the fingertips.

❖ **FINDINGS:**

Similar to the considerations to make when examining a lump during palpation of lymph nodes, the following features should be assessed:

1- Site: Important diseases such as both acute and chronic infections and metastatic carcinoma will cause localized lymphadenopathy depending on the site of primary pathology.

2- Number: How many nodes are enlarged? Make a diagram and detail the palpable nodes clearly and carefully.

3- Size: Normal nodes are not palpable. Palpable nodes, therefore, are enlarged. You should measure their length and width.

Abnormal lymph node size criteria:

- ***Epitrochlear Lymphadenopathy*** *>0.5 cm*
- ***Inguinal Lymphadenopathy*** *>1.5 cm*

- ***Submandbular lymphadenopathy*** *>1.5cm*
- ***Other Lymphadenopathy*** *>1.0 cm*

4- Consistency:

Rock-hard nodes*: Metastatic cancer*

Firm-rubbery nodes: *Lymphoma*

Soft nodes: *Inflammation or infection*

Shotty nodes (multiple small size): *Viral*

5- Tenderness: painful, tender nodes usually imply infection.

6- Fixation: nodes that are fixed to surrounding tissue are highly suspicious of malignancy.

7- Matted nodes:

Benign causes: tuberculosis, sarcoidosis, lymphogranuloma venereum

Malignant causes: metastatic cancer, lymphoma

8- Overlying skin: inflamed nodes may cause redness and swelling in the overlying skin. Spread of a metastatic carcinoma into the surrounding tissue may cause oedema and surface texture changes.

Cardiac Examination

Pediatrics

Clinical Examination

Cardiac Examination

Symptoms of Cardiovascular Affection:

1. ***Perinatal history:***
   - Maternal DM, cyanosis, respiratory distress
2. ***Symptoms of lung congestion:***
   - Poor interrupted feeding, dyspnea, tachypnea, sweating on feeding in infants, orthopnea, recurrent chest infection, cough and hemoptesis.
3. ***Symptoms of systemic congesion:***
   - Edema, right hypochondrial pain, oliguria and dyspepsia.
4. ***Symptoms of low cardiac output:***
   - Fatigue, pallor and cold extremities
5. ***Symptoms of arrhythmia:***
   - Palpitation, irritability and continuous crying
6. ***Chest pain***
7. ***Cyanosis***
8. ***Pressure symptoms:*** Dysphagia

Local Cardiac Examination

It is better to combine inspection and palpation together for better assessment of the heart.

A. Inspection:

I. Shape of the precordium:

- It can be assessed by having the child lay supine, and looking from the feet or the head at the precordial area.
- ***Precordial bulge*** suggests *cardiac enlargement* which may be :
  - ✓ Acute: due to pericardial effusion.
  - ✓ Chronic: due to heart disease dating since early childhood (either congenital or acquired) .

II. Apex:

- The apical impulse is the outermost and lowermost cardiac thrust.
- It is visible in normal thin children, and when there is heart disease.
- Apex becomes invisible (***silent precordium***) in : thick chest wall, obesity, pericardial effusion, pleural effusion, emphysema, severe cardiomyopathy or if it is behind a rib.
- Full comment on the apex is done by combined inspection and palpation.

III. Other pulsations:

- Normally they are absent.
- Pulsations can be classified into:

A. *Precordial:*

- Apex
- Pulmonary (2nd left intercostal space)
- Aortic (2nd right intercostal space)
- Left parasternal (3rd & 4th left intercostal spaces)
- Right parasternal.

B. Extra-precordial:

- Suprasternal.
- Epigastric.

B. Palpation:

A. Apex:

Comment on the apex beat includes:

1. Site:

- The point of maximal cardiac impulse is located first using the palm of the hand, then the tips of the fingers.

Palpation of the apex

- Normal site:
  - ✓ At birth and infants: in the ***4th*** left intercostal space ***outside*** the MCL.
  - ✓ 2-7 years: : in the ***4th*** left intercostal space ***at*** the MCL
  - ✓ > 7 years: : in the ***5th*** left intercostal space ***at or just outside*** the MCL

- Shift of the apex:
  - ✓ Laterally & downwards: left ventricular (LV) enlargement.
  - ✓ Laterally: right ventricular (RV) enlargement.

2. ***Size:***
   - ***Localized*** (one space): normal, or LV enlargement.
   - ***Diffuse*** (> one space or > 2cm): RV enlaregment.
3. ***Rate:***
   - Compare the apical heart rate with the radial pulse rate
   - Difference >10 beats /min: ***pulsus deficit*** (in AF)
4. ***Rhythm:***
   - For diagnosis of arrhythmias: regular or irregular
5. ***Force:***
   - Either increased (***strong apex***) or decreased (***weak apex***)
6. ***Duration:***
   - Either increased (***sustained apex)*** or decreased ***(not sustained)***
7. ***Character:***
   - Using force and duration the character of the apex may be:
     - ✓ ***Hyperdynamic*** (strong, not sustained): volume overload
     - ✓ ***Heaving*** (strong, sustained): pressure overload
8. ***Thrills: (palpable murmurs)***
   - Shivering sensation felt over the area of maximal auscultatory intensity of the murmur
   - Presence of a thrill means presence of a murmur, and not the reverse.
   - Comment on a thrill must include site of maximum intensity and timing:
     - ✓ ***Systolic over apex:*** mitral incompetence
     - ✓ ***Diastolic over apex:*** mitral stenosis
     - ✓ ***Systolic over left 3rd & 4th intercostal spaces:*** VSD
     - ✓ ***Systolic over right 2nd space or carotid artery:*** aortic stenosis
     - ✓ ***Systolic over left 2nd space:*** pulmonary stenosis
     - ✓ ***Continuous thrill over the left clavicle:*** PDA

Other Pulsations (&Thrills):

1- ***Pulmonary area:***

– Pulsations are present when pulmonary artery is dilated as in pulmonary hypertension. If they are present, diastolic shock must be searched for.

** ***Diastolic shock:***

- It is ***palpable accentuated 2nd heart sound*** in the pulmonary area due pulmonary hypertension. .
- ***Method:*** The patient sits in bed, leans forwards and holds his breath in expiration while putting the finger tips of the examiner in the pulmonary area.

2- Aortic area:

- Pulsations are present in aortic dilatation as in aortic incompetence or stenosis, systemic hypertension, or rarely aneurysm of the aorta.

3- Left parasternal area:

- Pulsations are due to RV dilatation (tricuspid or pulmonary incompetence, ASD) or RV hypertrophy (pulmonary hypertension or stenosis) .

4- Right parasternal area:

- Pulsations are due to huge enlargement of RA or LA .

5- Suprasternal area:

- Pulsations occur in aortic incompetence, aortic aneurysm, or in hyperkinetic states (fever, severe anemia, hyperthyroidism).

6- Epigastric pulsations:

- They may be originating from one of three:

  a. *Right ventricular:* (felt from upwards-downward) due to RV hypertrophy or dilatation.

  b. Aortic: (felt from backwards-forwards) due to aortic aneurysm or in thin children.

  c. *Hepatic:* (felt from the right) due to tricuspid incompetence.

C. Percussion:

- It is a rough method for estimation of the cardiac size in children and is much less accurate than radiology.
- It is of value in diagnosis of cardiomegaly, pericardial effusion and mediastinal shift.
- To percuss the heart the patient must be in supine position and the examiner standing on his right side
- Steps of percussion of the heart include:

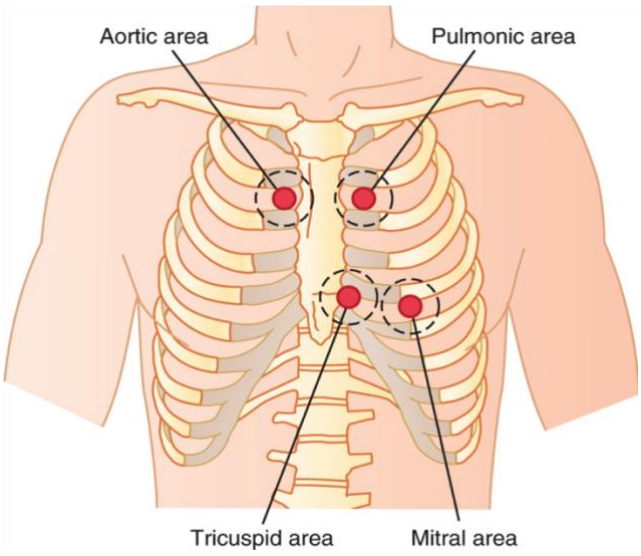
1. ***Percussion of the upper border of the liver:***
   - Percuss (by ***heavy percussion***) from above downwards in the right MCL.
   - Normally, it's present in the right 5th intercostal space in the MCL.
2. ***Percussion of the right border of the heart:***
   - At one intercostals space above the upper border of the liver, percuss from outside inwards towards the heart, to determine the right border of the heart.
   - Normally, there is no dullness outside the right sternal border.
   - ***Dullness outside the right sternal border*** occurs in: RA dilatation & pericardial effusion.
3. ***Percussion of the left border of the heart:***
   - ***For the apex,*** start percussion from the left midaxillary line to the position of the palpable apex, to define whether the cardiac dullness starts coinciding with the position of apex or not.
   - ***For the left border,*** percuss from the left over the lung resonance working towards the heart at the spaces in between the apex (5th space) and base (2nd space).
   - Normally, no dullness outside the apex and the cardiac waist is preserved.
   - ***Dullness outside the apex*** occurs in: pericardial or pleural effusion, lung consilidation, collapse or fibrosis.
   - ***Loss of cardiac waist*** occurs in: LA dilatation.
4. ***Percussion of the base:***
   - Percuss the 2nd space on either side (right then left) very close to the sternal border.
   - If you detect an impaired note or dullness at the 2nd space, then you have to percuss this space again starting a away from sternum and working inwards towards the sternal border to determine the width of dullness.
   - ***Dullness of the pulmonary area*** (2nd left space): pulmonary hypertension with pulmonary artery dilatation.
   - ***Dullness of the aortic area*** (2nd right space): aortic dilatation.
5. ***Percussion of the lower half of the starnum:***
   - ***Direct percussion:*** for tenderness in infective endocarditis & leukemia
   - ***Indirect percussion:*** normally the upper 2/3 of sternum is resonant. Dullness of the lower half of the sternum occurs in LV enlargement.

D. Auscultation:

- The patient should be supine, lying quietly, breathing normally, and in quiet circumstances.
- Concentrate on every parameter of auscultation separetly: heart sounds, added sounds, and the murmurs.
- The ***diaphragm*** of the stethoscope is placed ***firmly*** on the chest for ***high-pitched*** sounds, whereas a ***lightly*** placed ***bell*** is optimal for ***low-pitched*** sounds.

Areas of auscultation: (heard in anti-clockwise or clockwise direction)

1. ***Mitral area:*** the apex.
2. ***Pulmonary area:*** the 2nd left intercostal space.
3. ***First aortic area:*** the 2nd right intercostal space.
4. ***Second aortic area (left parasternal area):*** the 3rd & 4th left intercostal spaces.
5. ***Tricuspid area:*** the lower left sternal border.
6. ***Back:*** the interscapular area (for murmurs of congenital heart disease. e.g. coarctation of the aorta).



Areas of auscultation

Systematic comment on auscultation of the heart should include :

I. ***Heart sounds:*** 1st & 2nd heart sounds.
II. ***Additional sounds:*** 3rd, 4th heart sounds, ejection click, opening snap..
III. ***Murmurs:*** systolic, diastolic and continuous.

I. Heart sounds

- The 1st heart sound is caused by closure of the *atrioventricular valves* (mitral & tricuspid), whereas the 2nd heart sound is caused by closure of the *semilunar valves* (aortic & pulmonary).

- The 1st heart sound is best heard at the *apex* or *tricuspid area*, whereas the 2nd heart sound is best heard at the *pulmonary area* (pulmonary component) or *aortic area* (aortic component) .

- Comment on the heart sounds should include: *Intensity* - *Splitting.*

1. *First heart sound (S1) :*

A. *Intensity:*

- ***Audible:*** normal or average intensity **(Lubb)** .
- ***Distant:*** (or inaudible): in obesity, pericardial or pleural effusion & emphysema.
- ***Weak:*** in cardiomyopathy & myocarditis.
- ***Muffled:*** in mitral incompetence (masked by the pansystolic murmur)
- ***Accentuated:*** in mitral or tricuspid stenosis, tachycardia with increased COP as fever, anemia or muscular exercise.

B. *Splitting:* *Split* S1 (rare): in right bundle branch block & Ebstein anomaly.

2. *Second heart sound (S2):*

A. *Intensity:*

- ***Audible:*** normal or average intensity **(Dup) .**
- ***Weak:*** in pulmonary stenosis, aortic stenosis, Fallot tetralogy & tricuspid atresia.
- ***Accentuated:*** in pulmonary hypertension & systemic hypertension.

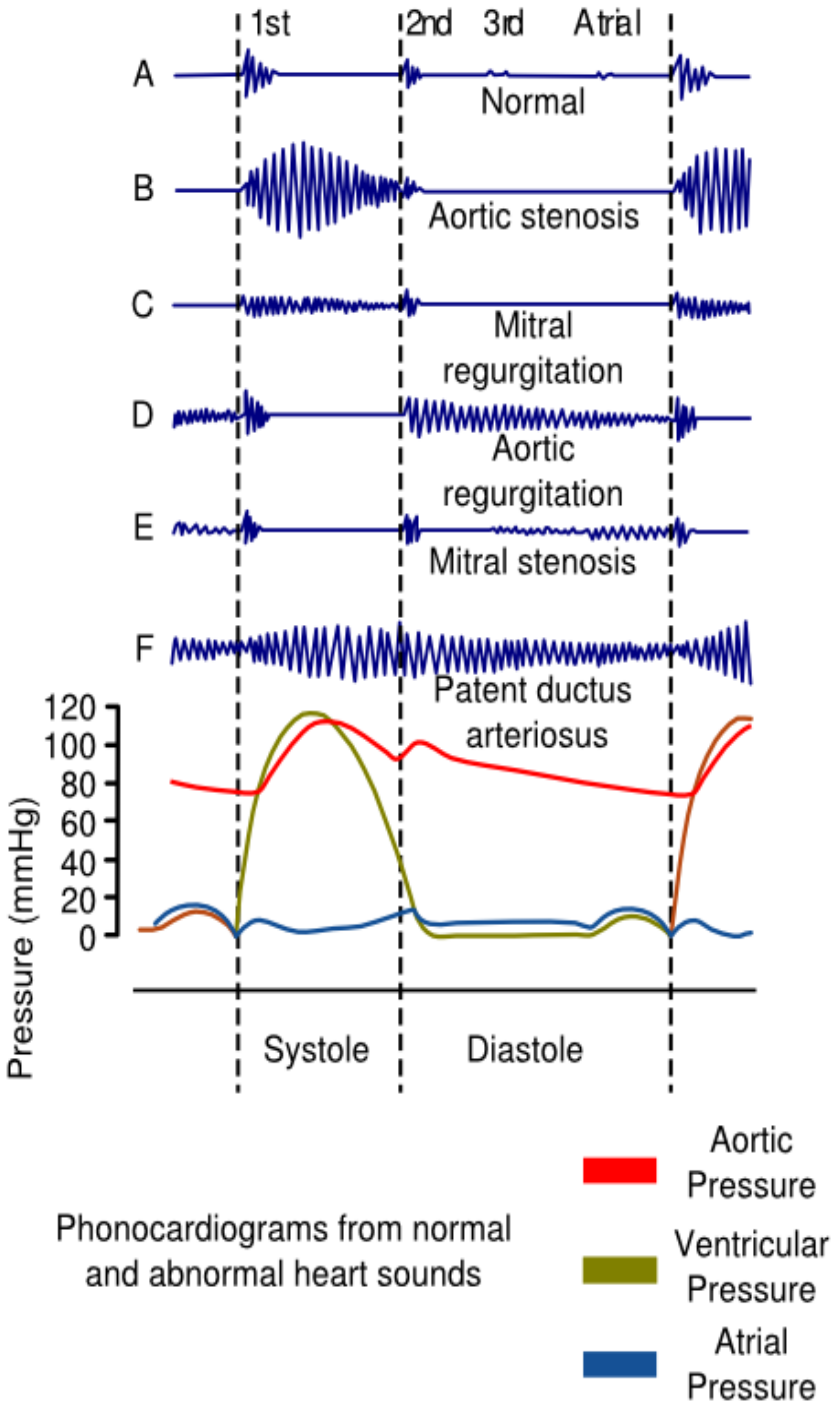
B. *Splitting:*

- ***Normally,*** closure of the pulmonary valve follows that of the aortic valve because of the lower pressure in the RV so there is ***physiological splitting*** of S2 which increases during inspiration and decreases during expiration (due to increased venous return during inspiration with increased RV ejection time and thus delaying pulmonary valve closure).
- This splitting is best heard over the ***pulmonary area*** (because the aortic and pulmonary components are both heard at the pulmonary area (while only the aortic component is heard at the aortic area).
- ***Wide fixed splitting of S2*****:** in ASD (due to prolongation of RV ejection time) - right bundle branch block (due to delayed electrical activation of RV).
- ***Narrow splitting of S2:*** in pulmonary hypertension (due to earlier closure of the pulmonary valve).
- ***Single S2 (absent splitting):***
  - ✓ Absent pulmonary component (severe pulmonary stenosis, pulmonary

atresia & tetralogy of Fallot)

- ✓ Absent aortic component (aortic stenosis)
- ✓ When pulmonary component is inaudible (in TGA)

- ***Paradoxical (reversed) splitting of S2 :*** the aortic component follows the pulmonary component (severe aortic stenosis - systemic hypertension – left bundle branch block



Phonocardiograms from normal and abnormal heart sounds

II. Additional heart sounds

1. ***Third heart sound (S3):***
   - It is due to ***rapid filling*** of the ventricles by blood.
   - Best heard with the ***bell of stethoscope*** at or inside the apex in ***mid-diastole***.
   - It may be heard in normal infants and children.
   - Heard in large VSD & CHF with tachycardia as a ***gallop rhythm*** (= S3 + tachycardia)
2. ***Fourth heart sound (S4) :***
   - It is due to ***atrial contraction***, best heard at the apex or lower left sternal border in ***late diastole***.
   - It is always ***pathologic***, heard in CHF.
   - S3 may merge with S4 as a ***summation gallop***.
3. ***Ejection click:***
   - Heard in ***early systole*** after S1, in semilunar valve stenosis (aortic & pulmonary).
   - ***Midsystolic click*** heard at the apex, often preceding a ***late systolic*** murmur, suggests mitral valve prolapse.
4. ***Opening snap:***
   - It is heard in diastole ***after S2*** at the apex in patients with severe mitral stenosis.
5. ***Pericardial rub:***
   - It is superficial, scratchy, ***to & fro sound***, heard in patients with pericarditis.
   - It is best heard at the lower left sternal border and ***not related to heart sounds***.
   - It increases in intensity by ***leaning forwards*** or by ***pressure with the diaphragm*** of stethoscope.

III. Murmurs

Comment on murmurs should include:

1. ***Timing:***

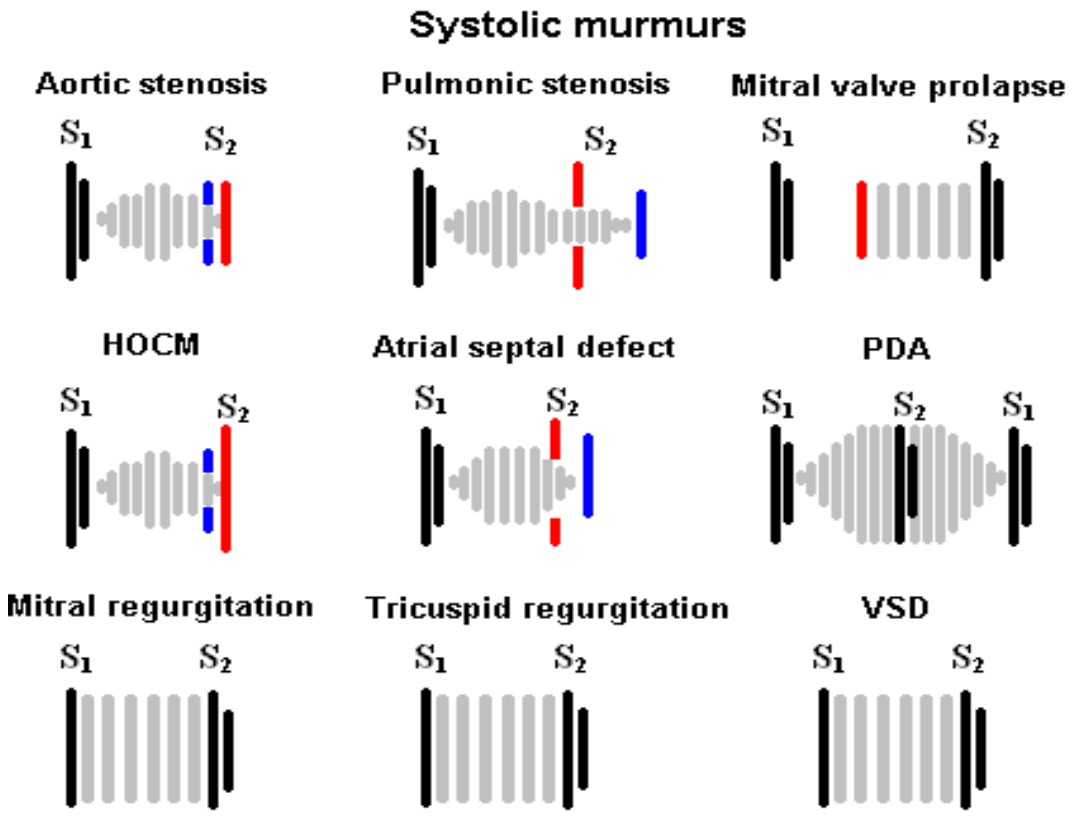
   A. ***Systolic :***

      a. **Pansystolic:** Begin with S1 (which becomes muffled), and continues through systole until S2 with constant intensity, e.g.:

MR, TR, VSD.

b. **Ejection systolic (midsystolic):** there is an interval between S1 and the onset of murmur, which increases to a peak in midsystole and the decreases and ends before S2 (crescendo-decrescendo), e.g.: ***AS, PS***.

c. **Late systolic:** heard in late systole before S2 following a midsystolic click, caused by ***mitral valve prolapse***.



B. Diastolic :

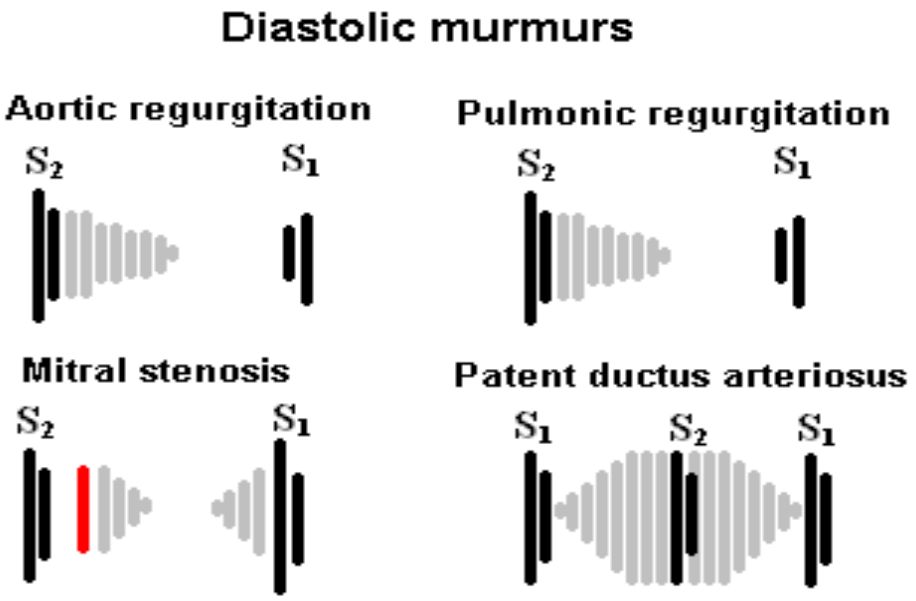
a. **Early diastolic:** short decrescendo murmur just after S2 and diminishes towards mid diastole, e.g.: ***AR, PR.***

b. **Mid-diastolic:** rumbling, low-pitched, heard in middiastole, causes: ***MS, TS, relative MS or TS, Carey-Coombs murmur.***

c. **Late diastolic (presystolic):** they are actually accentuation of mid-diastolic murmurs, due to atrial systole through narrowed mitral or tricuspid valves, causes: ***Severe MS, Severe TS.***

C. Continuous:

They begin in systole and continue into diastole, through S2 without interruption ***(machinary murmurs),*** e.g. ***PDA, A-V shunt.***



2. ***Site of maximal intensify :***
   - ✓ It is very important to detect it very accurately, as it diagnoses the site of origin of the murmur.
3. ***Propagation :***
   - ✓ Radiation to other areas. e.g. pansystolic murmur of mitral incompetence is propagated to the axilla.
4. ***Character:***
   - ✓ Some murmurs have special character:
     - ➢ Soft blowing (mitral incompetence)
     - ➢ Harsh (VSD, aortic stenosis, pulmonary stenosis)
     - ➢ Rumbling (mitral stenosis)
     - ➢ Machinery (PDA)
     - ➢ Musical or vibratory (innocent murmur) .
5. ***Intensify (grade):***
   - ✓ There are 6 grades for murmurs (thrill is present in the last 3 grades) :-.
     - ***Grade I* :** very faint I just audible.
     - ***Grade II*:** soft I easily audible.
     - ***Grade III* :** moderately loud.
     - ***Grade IV:*** loud. ***(+ thrill)***
     - ***Grade V* :** very loud. ***(+ thrill)***
     - ***Grade VI* :** very loud, can be heard with the stethoscope off the chest. ***(+ thrill)***

6. ***Quality (pitch) :***
   - ✓ ***High-pitched murmurs:*** (best heard with the diaphragm of stethoscope): mitral incompetence - VSD - aortic incompetence.
   - ✓ ***Low-pitched murmurs:*** (best heard with bell of stethoscope): mitral stenosis - tricuspid stenosis.

7. ***Effects of respiration, Posture and exercise:***

   a. Respiration: murmurs from the right side of the heart increase in intensity during inspiration (e.g. tricuspid incompetence), whereas murmurs from the left side increase during expiration (e.g. mitral incompetence).

   b. Posture: some murmurs are not affected by supine or sitting position (e.g. mitral incompetence), whereas some murmurs are best heard in the sitting position (e.g. aortic incompetence) or in the left lateral position (e.g. mitral stenosis) .

   c. Exercise: it may increase the intensity of some murmurs (e.g. mitral stenosis - innocent murmur)

8. ***Thrill:***
   - ✓ It may be systolic (with systolic murmurs) or diastolic (with diastolic murmurs)

Diagnosis of a Pediatric Cardiac Case

Diagnosis	Rheumatic	Congenital
1. Etiological diagnosis	R.H.D.	C.H.D.
2. Anatomical diagnosis	Valvular lesion	Cyanotic or Acyanotic , most probably .....
3. Activity	Active (carditis) or not active	----------
4. Functional diagnosis	Compensated (no CHF) or Decompensated (CHF)	Compensated (no CHF) or Decompensated (CHF)
5. Complications	P.H. , ...	P.H. , ...
6. Associated conditions	Arthritis , Chorea , Skin manifestations	Other congenital anomalies or syndromes.

Chest Examination

Pediatrics

Clinical Examination

Chest Examination

Symptoms Related to Chest Diseases:

1. ***Cough:***
   - Dry, wet or cough with expectoration ?
   - Diurnal, nocturnal or day & night ?
   - Seasonal variation or not ?
   - Related to feeding or not ?
   - Related to effort or exercise ?
   - Related to special foods, odors, drugs ?
   - Related to special position or not ?
   - Character (brassy, spasmodic, whooping…..)
2. ***Expectoration:***
   - Amount: scanty or copious ?
   - Nature: serous, mucoid, purulent ?
   - Color : whitish, brownish, greenish or blood tinged ?
   - Relation to special position ?
3. ***Difficulty of breathing:***
   - Rapid breathing
   - Interrupted feeding, irritability and continuous crying
4. ***Respiratory noises:***
   - ✓ **Snoring:** inspiratory noise of irregular quality produced by partial obstruction in the nasooropharynx.
   - ✓ **Stridor:** Inspiratory harsh sound caused by an obstruction to breathing in the larynx or upper trachea. It is predominantly an inspiratory sound but there is also a soft expiratory element if obstruction is in the subglottic area or upper trachea.
   - ✓ **Grunting:** Expiratory sound caused by momentary closure of the glottis.
   - ✓ **Wheezing:** Continuous musical sound heard mainly during expiration. It indicates intrathoracic airway obstruction.
   - ✓ **Rattling:** Coarse, irregular sounds heard mainly during inspiration. Usually it is indicative of significant secretions in the trachea or major bronchi.

5. ***Hemoptesis***
6. ***Chest pain***
7. ***Hoarseness of voice***

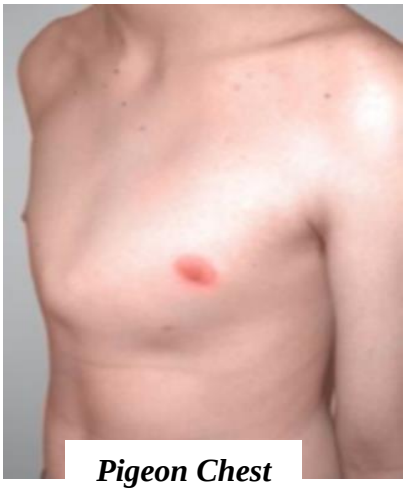
Local Chest Examination

A. Inspection :

I. Shape of the chest:

- ***In infancy:*** the transverse diameter and the antero-posterior diameter are equal so that chest appears ***rounded***.
- ***After 2 years:*** the transverse diameter increases and the chest appears ***transversely oval***.
- **Abnormalities in shape** of the chest are either ***symmetrical*** or ***asymmetrical*** abnormalities :
  - **Symmetrical abnormalities:**
    - ***Barrel chest*** in chronic obstructive lung disease (e.g persistent asthma)
    - ***Anterior projection of the sternum (pigeon chest or pectus carinatum):*** seen in rickets, osteomalacia, and congenital isolated anomaly
    - ***Depression of the sternum (pectus excavatum):*** in isolated congenital anomaly or in chronic adenoid or tonsillar hypertrophy .

Pectus excavatum



Pigeon Chest

- **Asymmetrical abnormalities:**
  - ***Pulge*** e.g chronic effusion, empyema
  - ***Retraction*** e.g chronic collapse, fibrosis

II. Respiratory Movement:

1. *Rate:*

- Normal RR:
  a. ***At birth:*** 40-50 cycles/min
  b. Infants: 30-40 cycles/min
  c. Preschool children: 20-30 cycles/min
  d. School children: 20-25 cycles/min
  e. At puberty: 15-20 cycles/min
- Tachypnea is increased RR ≥ 30% of predicted.
- Tachypnea is the earliest sign of respiratory distress. It can be defined when:

Age	Respiratory Rate (cycle / minute)
Neonate	≥ 60
Infant	≥ 50
Young child	≥ 40
Elder child	≥ 30

2. *Rhythm:*

- ***Cheyne-Stokes respiration*** (Deep then shallow respiration alternating with periods of apnea) occurs in cerebral edema.
- ***Biot's breathing*** (periods of apnea alternating with four or five breaths of normal depth) seen in association with increased intracranial pressure, meningitis, encephalitis or respiratory center depression.

3. *Depth of respiration:*

- Hyperpnea = deep breathing. E.g. ***Kussmaul breathing***: Rapid deep respiration seen in metabolic acidosis.
- Hypopnea = shallow breathing (seen in narcotic overdose and shock).

4. *Type:* **(thoracic, abdominal or paradoxical):**

- ✓ ***In newborn and young infants:*** it is mainly abdominal.
- ✓ ***After 4 -5 years:*** it is mainly thoracic.
- ✓ ***Paradoxical respiration*****:** The diaphragm rises with indrawing of the

abdominal wall on inspiration and the abdomen becomes prominent on expiration suggesting ***diaphragmatic paralysis***.

5. ***Equality on both sides:*** Significantly unequal movement suggests unilateral lung pathology.

III. Action of accessory muscles: which are usually not active. They become active only in patients with respiratory distress causing retractions which is normally absent.

- ✓ ***In upper airway obstruction*** (as in croup): working ala nasi & suprasternal retraction.
- ✓ ***In lower airway obstruction***: intercostal, subcostal, supraclavicular and suprasternal retractions.

Intercostal retractions

IV. Assessment of mediastinum:

- ***Cardiac pulsation***: visible or not
- ***Tracheal shift***: (visible or not) in elder cooperative child asked to do pressure by chin against resistance in sitting position and inspect trachea in between the two sternomastoid muscles.

V. Any visible abnormalities:

- ✓ **Vertebral anomalies:** e.g.. lordosis, kyphosis, scoliosis...
- ✓ **Rosary beads:** costochondral junction swellings e.g. rickets.
- ✓ **Harrison sulcus:** deep groove rualong the sides of the chest parallel to the lower ribs corresponding to the attachment of the diaphragm) seen in rickets and chronic obstructive pulmonary diseases.
- ✓ **Scars, dilated veins, pigmentation ... etc.**

Rosary beads

B. Palpation :

I. Assessment of mediastinum:

I. Position of cardiac apex beat:

- In absence of obvious heart disease and scoliosis, a change in the location of apical impulse should suggest deviation of mediastinum due to lung disease.

II. Position of the trachea:

Palpation of trachea

- Normally the trachea is central or slightly deviated to the right.
- Marked deviation to one side indicates either:
  1- ***Pulling the trachea to the diseased side*** (e.g., collapse or fibrosis in the ipsilateral side) or
  2- ***Pushing it to the healthy side*** (e.g., pneumothorax or pleural effusion in the contra lateral side).
- ***Anterior displacement*** of the trachea (a trachea that is easily palpated with shallow suprasternal notch) is seen in ***mediastinitis***.
- Trachea ***not easily palpated*** with deep suprasternal notch is seen in the presence of ***anterior mediastinal tumor***.

II. Chest Expansion:

- By placing your hands on the patient's back, with thumbs together at the midline, ask the patient to breathe deeply.

- Normally, the palms move equally as demonstrated by symmetrical movements of the thumbs going away from the midline with each inspiration and coming back together during expiration.
- Significant asymmetric movement suggests the presence of effusion, collapse, consolidation or other pathology of the lung or chest wall on the ***side with reduced movement***

III. Tactile vocal fremitus (TVF):

The palm of the right hand should be applied flat on the upper, middle, and lower zones of the chest on the front and the back while the child is asked to repeat the word (أربعة - أربعة)

- **NORMALLY**, the hand detects vibrations of equal intensity on the both sides of the chest.
- **Causes of decreased TVF**:
    1- Lung hyperinflation
    2- Bronchial foreign body
    3- Pleural effusion
- **Causes of increased TVF**:
    1- Lung consolidation
    2- Compression collapse of the lung
    3- Large cavities near chest surface

IV. Rhonchus Fremitus (Palpable rhonchi):

- Palpable vibrations felt in cases of moderate to severe narrowing of the bronchial tree.

V. Tenderness: Sternal or rib tenderness is noticed in leukemia, trauma, osteochondritis of ribs or infection...etc.

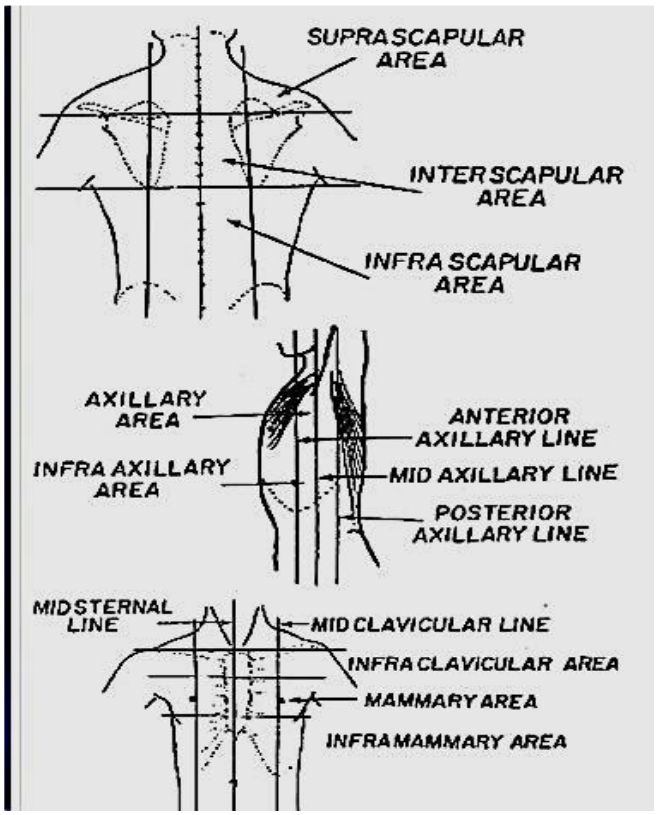
VI. Any obvious swelling:

- Its nature (solid or cystic), temperature, tension and tenderness

C. Percussion :

❖ CHEST LAND MARKS:

– Each side is divided from above downward into ***supraclavicular*** (above the clavicle), ***infraclavicular*** (up to the level of the 2nd rib), ***mammary*** (up to the 5th rib), and ***inframammary*** regions.

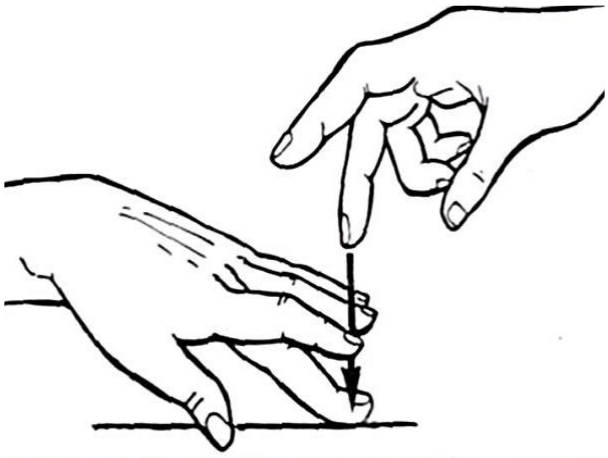


– On the lateral aspects, there are two areas: the ***axillary region*** (up to the level of the 4th rib) and the ***infra-axillary*** region.

– In the back, one either side, the regions from above downward are: ***suprascapular, interscapular***, and ***infrascapular***.

❖ GENERAL RULES OF PERCUSSION:

1. The middle finger of the left hand (pleximeter finger) is placed on the chest wall.
2. The other fingers should not touch the chest wall as they may dampen the resonance.
3. The middle phalanx of the pleximeter finger is then struck by the tip of the middle finger of the right hand (the percussing finger).



4. The percussing finger should be perpendicular, not at an angle.
5. The striking finger should strike back quickly, to avoid dampening the resonance that is created.
6. The movement of the striking finger should originate at the wrist not the elbow.
7. The pleximeter finger should be placed parallel to the line of expected dullness.

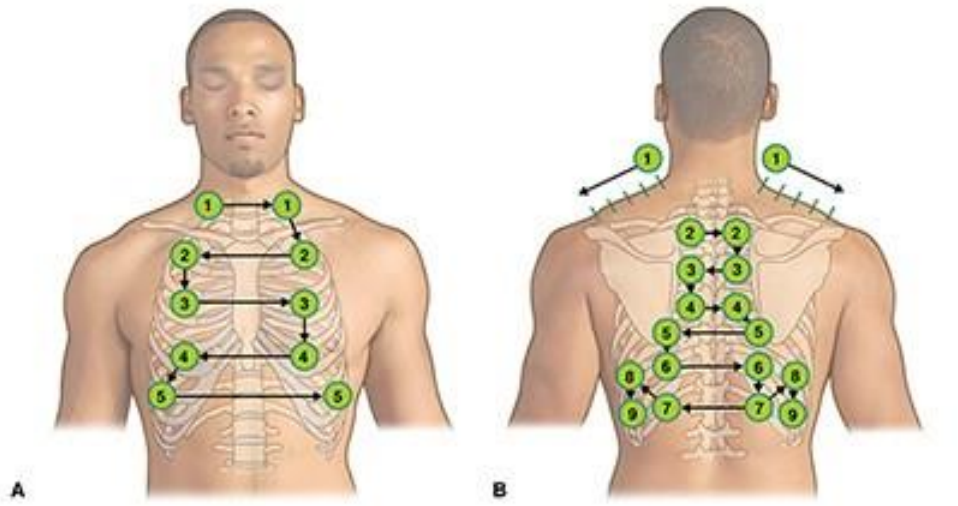
❖ HOW TO PERCUSS THE CHEST:

I. Heavy percussion

- Determination of the upper border of the liver.
- Mapping out the area of cardiac dullness.

II. Light percussion for lung proper:

1. Comparison of the percussion note in comparable areas on the two sides
2. Percuss space by space (right 1st space, then left 1st space)
3. Prcuss line by line (right parasternal, then left parastenal, MCL, AAL, MAL, PAL, scapular line, paravertebral line)
4. Percuss from top to bottom (first space, then second space)
5. ***Normally:*** The healthy lungs are ***resonant***, being most resonant below the clavicles and scapulae and, least resonant over the scapulae. The lower border is found to lie in the mammary line at 6^{th} rib, in the midaxillary line at the 8^{th} rib, in the scapular line at the 10^{th} rib.



III. Special percussion:

- ✓ ***Apex of the lung*** (***kronig's isthmus***): bounded by medial 2/3 of the clavicle (anterior), medial 1/3 of scapular spine (posterior), normally it is hyper-resonant.
- ✓ ***Traubes area:*** see abdominal examination.
- ✓ ***Tidal percussion:*** for assessment of diaphragmatic mobility and to differentiate between supra and infra diaphragmatic dullness**.**

❖ TONES OF CHEST PERCUSSION

- ➢ **Hvper-resonance:**
  1- The normal lungs at apices ***(kronig's isthmus)***
  2- Lungs of small infants
  3- Children with thin chest wall
  4- Emphysema
- ➢ **Tympanitic:** e.g. Pneumothorax
- ➢ **Dullness:**
  1- Cases of consolidation, fibrosis and collapse of the lungs
  2- Pleural thickening
  3- Small pleural effusion.
- ➢ **Stony dullness:** Massive pleural effusion.

D.Auscultation:

- Listen to ***breath sounds*** and equality of ***air entry*** on both sides in all lung zones from top to bottom.
- Note the intensity of breath sounds, symmetry, length of inspiration and expiration.
- Listen for the pause between inspiration and expiration, and quality of pitch of the sound.
- Note the presence of ***adventitious sounds.***

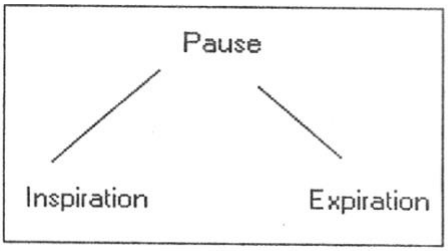
1. Breath Sounds

Normally, there are two types of breath sounds:

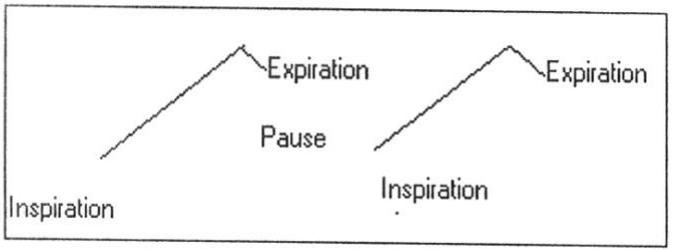
1- ***Bronchial Breathing:*** Breath sounds heard over the tracheobronchial tree. The bronchial breathing is heard normally over the trachea and over the manubrium sterni.

2- ***Vesicular Breathing:*** Breath sounds heard over the lungs are called

. ***Characteristics of bronchial and vesicular breathing***



Bronchial breathing



Vesicular breathing

Bronchial breathing	Vesicular breathing
It is louder, has a higher pitch, inspiration and expiration are equal and there is a pause between inspiration and expiration.	It has a lower pitch and is softer than bronchial breathing. Expiration is short if at all heard, and there is no pause between inspiration and expiration

Bronchial breathing would suggest conditions, which remove the muffling effect of the alveoli on -breath sounds:

Three types of bronchial breathing are known:

1-***Tubular breathing*** in cases of:

a- Pulmonary consolidation e.g., lobar pneumonia, or pulmonary TB,

b- Area of pulmonary collapse above and medial to massive pleural effusion.

2-***Amphoric breathing*** in cases of tension pneumothorax with bronchopleural fistula..

3-***Cavernous breathing*** over pulmonary cavitations.

Despine sign

Bronchial breathing heard over the vertebral column **below** the normal level.

The normal level:

- From birth to 5 years : down to the level of the second thoracic vertebra
- 5 – 10 years : to the 3rd thoracic vertebra
- 10 years : to the 4th thoracic vertebra.

Vesicular breathing with prolonged expiration is heard in case of bronchial obstruction.

2. Adventitious Sounds

They originate in the lungs and airways and are always abnormal.

1- Crepitations:

- They are interrupted inspiratory bubbling sounds produced by passage of air though fluids (secretions) in airways and alveoli.
    a. ***Fine crepitations:*** in congestive heart failure.
    b. ***Medium sized crepitations:*** in bronchitis, bronchiolitis, bronchopneumonia, and resolving lobar pneumonia.
    c. ***Coarse crepitations:*** in pulmonary edema, organophosphorus poisoning, and pulmonary hemorrhage.

2- Rhonchi:

- They are continuous musical usually expiratory sounds, accompanied with prolonged expiration, and produced by narrowing of airways. They are caused by disease causing audible wheeze.
- Rhonchi are described as either:
    a. ***High pitched (sibilant):*** caused by obstruction of the bronchioles
    b. ***Low pitched (sonorous):*** caused by obstruction of larger bronchi or intrathoracic trachea.

3- Pleural friction rub:

- It is a harsh grating sound synchronous with respiration, indicating friction on movement between the two layers of pleura.
- It is well heard in cases of pleural diseases due to bacterial or viral infection of lungs or pleura, collagen diseases, trauma.. .etc.

3. Vocal resonance

❖ VOCAL RESONANCE (VR):

- Ask the child to say and repeat "ninety - nine" and auscultate the chest. Normally the sound is transmitted through the lung and is heard over the chest wall with a resonant quality.
- Normally, the impression is that, these words being produced just at the chest piece of stethoscope.
- The words are, however, indistinct.
- Compare the corresponding areas of the two halves of the chest.

Bronchophony (Increased VR): If the sounds seem to be produced nearer to the ear than chest piece.

Whispered pectoriloquy. If the words become clear and seem to be spoken right into the auscultator's ears.

Bronchophony and /or whispered pectoriloquy occur in cases of:

1] Pulmonary consolidation e.g., lobar pneumonia, and pulmonary TB.

2] Pulmonary collapse above and medial to massive pleural effusion.

3] Large pulmonary cavity.

Vocal resonance Is diminished or absent In:

1] Pulmonary diseases: foreign body obstruction, and emphysema

2] Pleural diseases: pleural thickening, pleural effusion, and pneumothorax

Diagnosis of a Pediatric Chest Case

Diagnosis of chest case
1-What is the lesion(Etiological Diagnosis) →Allergy, Infection;..
2-What is the lesion (Anatomical Diagnosis)→Upper right lobar
3-Pathological Diagnosis →Collapse, consolidation,…
4-Functional Diagnosis →Respiratory failure
5-Complications
6-Associations

Abdominal Examination

Pediatrics

Clinical Examination

Abdominal Examination

Symptoms of gastrointestinal affection:

1. ***Appetite:*** whether:
   - Normal
   - Polyphagia: increased appetite
   - Anorexia: loss of appetite
   - ***Pica:*** abnormal appetite.
2. ***Nausea.***
3. ***Vomiting:*** It should be analyzed as regard:
   - ✓ **Spontanous or related to meals.**
   - ✓ **Type of vomiting:** Simple regurgitation or projectile.
   - ✓ **Frequency:** number of times / day
   - ✓ **Amount**
   - ✓ **Content of vomitus:**
     - Food
     - Blood: Hematemesis
     - Coffee ground
     - Bilious
     - Fecal matter
4. ***Dysphagia:*** difficulty in swallowing
5. ***Dyspepsia:***
6. ***Abdominal pain:*** pain can be known in infants by crying or withdrawal of lower limbs to the abdomen.

   It should be analyzed as regard:

   a) Site
   b) Radiation
   c) Nature of pain: colicky, dull aching, stitching, heaviness
   d) Precipitating factors
   e) Relieving factors
7. ***Abdominal enlargement:*** localized or diffuse
8. ***Bowel habits:*** constipation, diarrhea, dysentery
9. ***Halitosis:*** bad odor of the mouth

10. Dyschazia: painful defecation

11. Jaundice

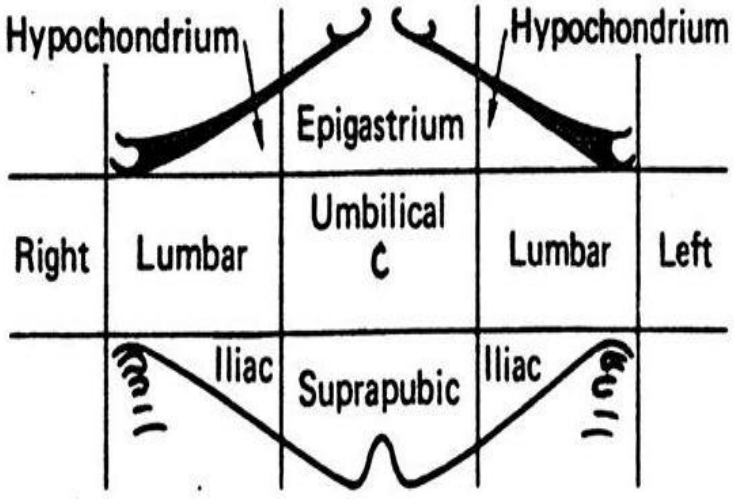
12. Gastrointestinal bleeding:

- ***a. Hematemesis:*** Vomiting of blood (fresh or coffee ground)
- ***b. Hematochezia:*** Fresh bleeding per rectum
- c. ***Melena:*** Passage of black, tarry stool
- ***d. Occult blood in stool***

Local Abdominal Examination

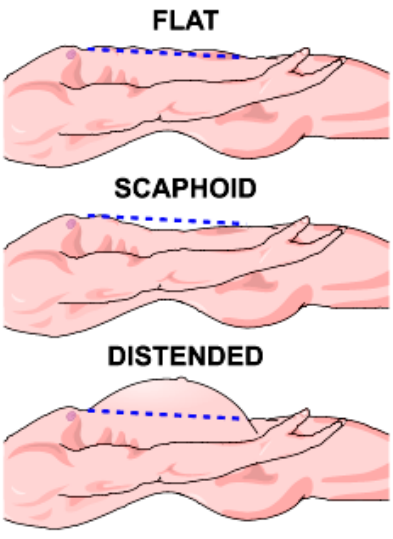
A. Inspection :

The abdomen can be divided into nine quadrants as in the diagram



1. Abdominal contour:

- ***Normally:*** the abdomen has a normal full contour with slight convexity, with preserved concavity of the flanks.
- ***Abnormally:***
  - A. Abdominal enlargement:
    - Diffuse: The causes of fullness can be described under ***five F's***- fat, flatus, feces,



fluid, and fetus. Abdominal distension due to laxity of the abdominal wall is seen in rickets and hypothyroidism.

- Localized: hernia, mass, distended bladder

B. Scaphoid abdomen: cachexia, congenital diaphragmatic hernia.

2. Subcostal angle:

a) Examined by two thumbs meeting at the xiphesternum.

b) ***Normally:*** right angle

c) ***Obtuse angle:*** due to increased intra-abdominal pressure either due to ascites, mass or huge organomegaly.

d) ***Narrow angle:*** in chest deformity and rickets.

3. Divarication of recti

a) Elicited by asking the patient to rise unsupported from recumbent position.

b) Presence of space or bulge between recti indicates long-standing increase of intra-abdominal pressure.

4. Respiratory movements:

a) Normally, the abdominal wall moves out with inspiration and moves in with expiration.

b) These movements are reversed in diaphragmatic paralysis, collapsing during inspiration and becoming prominent during expiration.

c) Movements of the abdominal wall with respiration are diminished or absent due to guarding of abdominal muscles in peritonitis.

5. Visible peristalsis:

a) These movements are seen in an oblique light, which are visible normally in thin individuals.

b) Peristaltic movements of the stomach are easily visible over the left upper quadrant of the abdomen in emaciated infants with ***pyloric stenosis***.

c) Peristalsis of large intestines due to obstruction is seen in the lower quadrants and the flanks. Movement is from right to left.

6. Visible masses: Site, size, shape.

7. Surgical scars: site, type, shape, healing, keloid formation.

8. Striae

9. Obvious pulsations: Pulsations of the epigastric region may be seen in thin individuals, hepatic or right ventricular enlargement.

10. Distended abdominal veins:

a) Distended veins seen in the epigastrium may indicate obstruction of the inferior vena cava, whereas prominent veins of the abdominal wall in portal obstruction are usually periumbilical.

b) Normally the flow of blood is downward in veins below the umbilicus. In the presence of obstruction to the inferior vena cava, the direction of blood flow is from below upward.

11. Unusual pigmentation: Hyper-pigmentation, ecchymosis, purpura.

12. Hair distribution

13. Umbilicus:

a) Site:

- **Normal:** midway between xiphisternum and symphesis pubis.
- **Abnormal site:**
  - ✓ ***Downward shift:*** ascites or upper abdominal mass
  - ✓ ***Upward shift:*** pelvic mass

b) Shape:

- **Normal:** inverted
- **Abnormal:**
  - ✓ ***Slit shape:*** edema of the abdominal wall
  - ✓ ***Flat or everted:*** ascites or intra-abdominal mass
  - ✓ ***Deeply inverted:*** obesity

c) Presence or absence of umbilical hernia.

d) Pigmentation:

- ***Brown:*** in TB peritonitis
- ***Cullen's sign:*** bluish discoloration around the umbilicas in intraperitoneal hemorrhage

Cullen's sign

e) Umbilical discharge:

- ***Pus:*** omphalitis
- ***Urine:*** patent urachus
- ***Stool:*** patent vitellointestinal duct
- ***Bile:*** fistula with gall bladder

14. Inspection of the back and external genitalia

B. Palpation :

A. SUPERFICIAL PALPATION:

- Exploration of the abdominal wall muscle tension (rigidity).
- Locating painful areas, rebound tenderness and muscle guard.
- Feeling for skin temperature.

B. DEEP PALPATION:

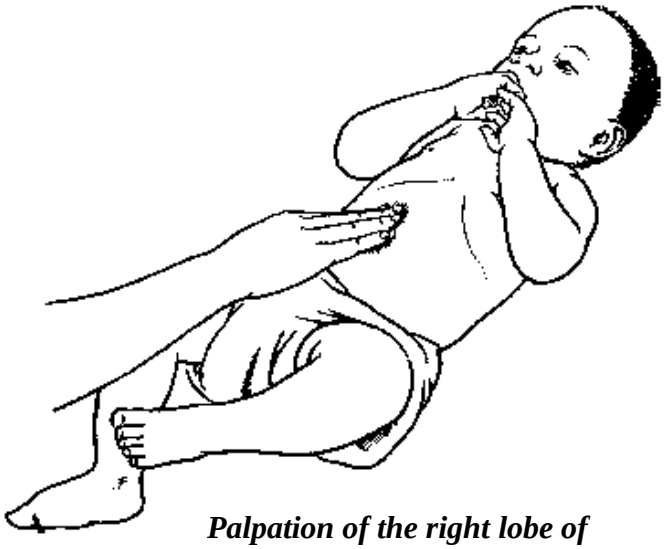
a. Palpation of organs (liver, spleen, kidneys, cecum and sigmoid colon)
b. Abdominal masses: intra-abdominal or extra-abdominal, location, size, contour, consistency, mobility, tenderness, pulsation.
c. Palpation of the umbilicus.

1. Palpation of The Liver

- The patient in the supine position, relaxed, arms at sides, and knees flexed.
- The examiner standing on the right side of the patient, his hands should be warm.

A. Right lobe of the liver:

- Place the right hand flat on the abdomen, its edge towards the right costal margin and to the outer side of the rectus muscle.
- Depress the edge of the hand slightly so as to push up a fold of skin and ask the patient to take a long breath (in cooperative children)



Palpation of the right lobe of the liver

- If the edge of the liver is palpable, it will be felt as a ridge under the edge of the hand.
- Comment on the:

1. ***Site of the lower border:*** normally, the lower edge extends below the right costal margin in midclavicular line (MCL) from 1-3 cm during the first 6

months of life, < 2cm from 6 months to 4 years, <1cm from 4-12 years, unless the upper border is percussed below the 5th inter costal space.

2. ***Edge (bourder)*:** rounded or sharp.
3. ***Consistency:*** soft, firm, or hard.
4. ***Surface:*** smooth or irregular
5. ***Tenderness***
6. ***Pulsations***

B. <u>Left lobe of the liver:</u>

- Place the right hand flat on the abdomen, in the midline starting above the umbilicus and moving towards the xiphisternum.
- The edge of the left lobe of the liver is normally not palpable, due to the overlying rectus abdominus muscle.
- If it is palpable, so it is pathological. Comment in the same way as for the right lobe.

2. Palpation of The Spleen

- The patient in the supine position, relaxed, arms at sides, and knees flexed.
- The examiner standing on the right side of the patient, his hands should be warm.
- Start palpating with the right hand beginning from right lower quadrant and proceed ***diagonally*** toward the left upper quadrant.
- Normally the lower ***pole*** of the spleen is not palpable unless it's at least three times its normal size.

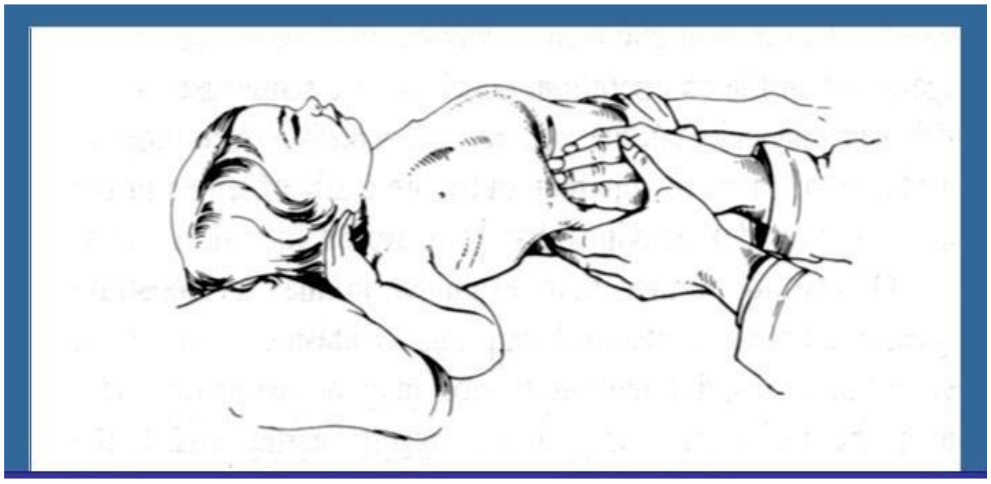
Short's maneuver

- If the lower pole is not palpable, place the flat of the left hand over the edge of the costal margin and firmly bring the ribs and lateral abdominal wall medially. This is called ***Short's maneuver.***
- If still not felt, the patient is asked to roll over on to his right side towards the examiner.

- If the lower pole of the spleen is felt, comment on:
    1. ***Site of the lower pole***
    2. ***The splinic notch on the anterior border***
    3. ***Bourders:*** rounded or sharp.
    4. ***Consistency:*** soft, firm, or hard.
    5. ***Surface:*** smooth or irregular
    6. ***Tenderness***
    7. ***Pulsations***

3. Palpation of The Kidneys

- The patient in the supine position, relaxed, arms at sides, and knees flexed.
- The examiner standing on the right side of the patient, his hands should be warm.
- Place one hand upon and below the last rib behind, the other immediately below the costal margin in front.
- Posterior hand should press the loin forwards, while the other hand pushes the anterior abdominal wall backwards, upwards and inwards.
- Normally, the lower part of the kidney can be felt (especially, the right) in thin children.
- If the kidney is palpable: test for ballotment.



Bimanual examination of the right kidney

Palpable Spleen	Left Kidney
1. It is in left hypochondrium	1. It is in left lumber region or loin
2. Moves with respiration towards right iliac fossa	2. Moves downward and forward
3. Well defined medial border	3. Round upper end
4. Notch is present	4. No notch present
5. Get above the swelling- possible	5. Get above the swelling- not possible
6. Insinuation of finger between the mass and left costal margin is not possible	6. Insinuation of finger between the mass and left costal margin is possible
7. On percussion: Dullness over the mass which is continuous with the left lower chest	7. On percussion: Colonic resonance over the mass
8. The mass is palpable	8. The mass is palpable as well as ballotable.

4. Palpation of Other Intra-Abdominal Masses

- If any mass is felt in the abdomen, describe its characteristics under the following headings:
    1. Location
    2. Shape
    3. Size (dimensions)
    4. Upper-Lower borders
    5. Does it cross the midline, or is it in the midline?
    6. Is it attached to the abdominal wall?
    7. Is it firm, hard, soft, or cystic?
    8. Does it move with respiration?
    9. Is it movable?
- Masses over the right lower quadrant are usually related to the appendix but may be due to cecal masses.
- A pyloric mass is felt over the right upper quadrant, typically at a point 1 inch above and to the right of the umbilicus.

5. Palpation of The Inguinal Region

- In the inguinal region, feel for the presence of hernia, hydrocele of the cord, undescended testes, and lymph nodes.
- If a hernia is present, it is usually of the indirect variety and is often associated with hydrocele. Describe whether it is easily reducible. Does it become large on coughing or crying? Does it transilluminate?
- Enlarged lymph nodes are very common in the inguinal region and are not significant unless they are unusually large or tender (see general examination).

C. Percussion :

- Normally, the abdomen sounds tympanic on percussion, except when percussed over solid organs such as the liver or a full bladder.
- A highly tympanic note is heard in intestinal obstruction or paralytic ileus.
- A dull note on an enlarged abdomen may indicate free fluid in the abdominal cavity or a tumor.

1. Detection of Ascites

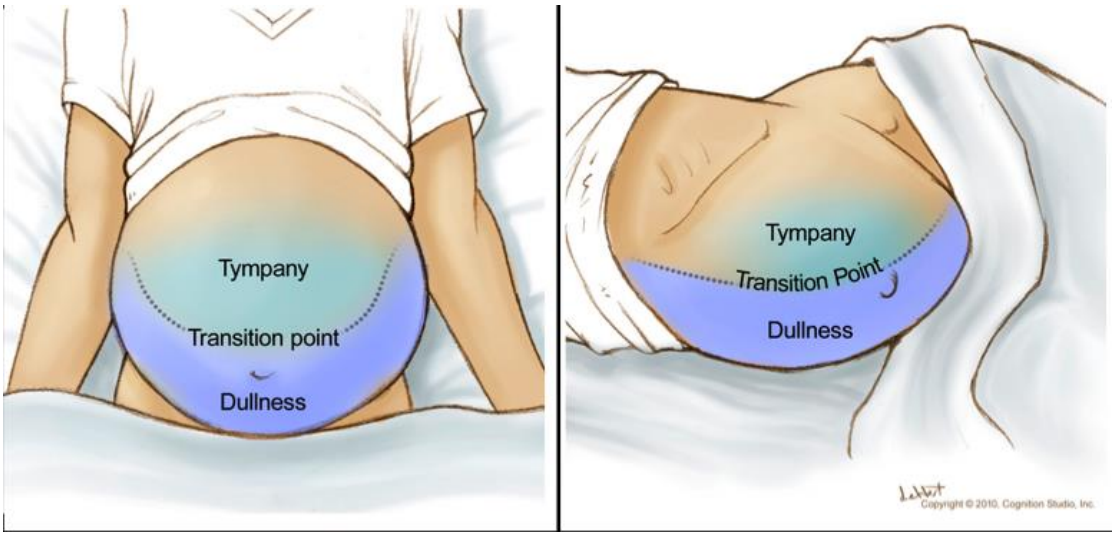
There are three methods to elicit signs of free fluid in the peritoneal cavity:

1) <u>Knee-Elbow Position:</u>

- To detect minimal amounts of fluid, place the patient in a knee-chest position and percuss over the peiriumbilical area.
- Normally this area should not be dull on percussion.

2) <u>Shifting dullness:</u>

- To detect moderate amounts of fluid
- With the patient in the supine position, place a finger on the flank parallel to the midline.
- Start percussion below the umbilicus, starting from the midline (the area of expected resonance) moving in the direction of the flank (area of expected dullness), either right or left (move away from the dullness of organomegaly).
- Once a dull note is elicited, keep your hand in position and ask the patient to roll over and lie on the opposite side without taking the pleximeter finger off.



The movement of free fluid in the peritoneal cavity

- After the fluid has time to settle at the dependent position, percuss again. percussion will now give a tympanic note over the same area where it was dull when the patient was supine.

Direction of percussion of the flanks

3) Transmitted fluid thrill:

- With the patient supine, have a third person place the edge of the hand vertically on the midline of the abdominal wall.
- The examiner now places the palm of the hand on one side and taps with the fingers on the opposite flank.
- If free fluid is present, one can feel a fluid wave created by the tap.
- This method is suitable for detection of tense ascites.

Transmitted fluid thrill

2. Percussion of The Liver

Upper border of the liver:

- By heavy percussion, begin at 2nd intercostal space in right mid-clavicular line.
- Percuss down until impairment is detected (upper border).

Lower border of the liver:

- Use very light percussion at the right lower quadrant and pass upwards until dullness is noticed (lower edge)

The Span of the liver:

- The vertical height between upper border and lower edge is liver span.
- NORMALLY, The span ranges from 4.5-5cm at 1 week to 6-8cm in children.

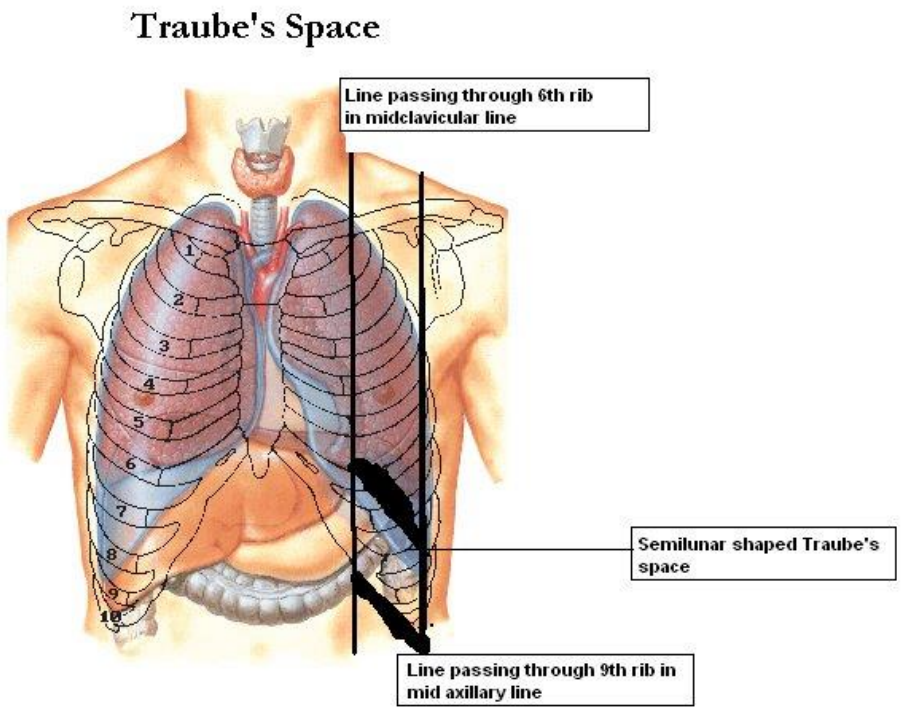
3. Percussion of The Spleen

- Percussion in left mid-axillary line in 7th,8th,9th intercostals space starting from above over the lung resonance working downwards towards the upper pole of the spleen.
- Normally, spleen is not palpable (except in the first 2 years it may be palpated up to 2cm below left costal margin), and dullness is elicited at 9 - 11 intercostal space in midaxillary lines.

4. Percussion of Traub's area

Bourders of Traub's erea:

- Left 6th rib in midclavicular line
- Left 9th rib in midaxillary line
- Left 11th rib in midaxillary line
- Left 8th costal cartilage in parasternal line



It is bounded by:

- ***Above:*** lower border of left lung
- ***Left:*** anterior margin of the spleen
- ***Below:*** left costal margine
- ***Right:*** left lobe of the liver

D.Auscultation :

1. Intestinal sounds:

- ✓ Normally, the bowel sounds are best heard along a diagonal line 6 inches long starting 1 inch to the left and above the umbilicus and running toward the right lower quadrant.
- ✓ The sounds have a ***gurgling quality***.

- ✓ These sounds are ***increased*** and have ***a higher pitch*** in the presence of gastroenteritis.
- ✓ The sounds have a ***metallic quality*** during early stages of intestinal obstruction.
- ✓ These ***sounds*** are absent in the presence of paralytic ileus and late in obstruction.
- ✓ In the presence of ascites and peritonitis, the sound may be ***distant***.

2. Bruit:

- ✓ On the kidney: renal artery stenosis
- ✓ On the liver: vascular tumour

3. Rub:

- ✓ ***Splenic:*** perisplenitis and splenic infarction
- ✓ ***Hepatic:*** perihepatitis and liver secondaries.

4. Venous hom:

- ✓ A continous murmur heard over areas with increased vascularity e.g over the epigastrium in portal hypertension

5. Succussion splash:

- ✓ In case of ***pyloric obstruction*** due to increased air and fluids in the stomach.
- ✓ It is elicited by racking the abdomen from side to side with one hand.

E. Examination of the renal angle :

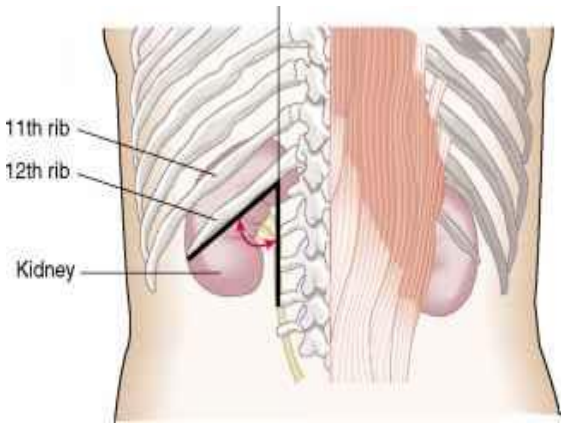
The angle is located between the last rib andlateral border of sacrospinalis muscle.

1.Inspection: normally, it is ***concave***. Any bulging indicates a renal or suprarenal masses.

2. Palpation: for masses, tenderness.

3.Percussion: normally it is ***resonant***. Any dullness indicates renal mass.

4. Auscultation: for arterial bruit of renal artery stenosis.



Position of the renal angle

Neurologic Examination

Pediatrics

Clinical Examination

Neurological Sheet:

1- Personal History

2- Complaints:

- Motor complaints
- Sensory complaints
- Complaints related to cerebral function
- Visceral complaints
- Complaints related to other systems

3- Present History:

- Onset
- Course of the disease

4- Past History:

A- Obstetric History:

- Prenatal
- Natal
- Post-natal

B- Past history of any previous illness till now

5- Family History:

- Consanguinity.
- Similar conditions.
- Age of father and mothers and their general health.
- Siblings and their health.
- History of deaths and abortions.

6- Vaccination History.

7- Dietetic History

8- Developmental History

General Examination

Vital Measurements:

- Pulse
- Temperature

- Respiratory rate
- Blood pressure

Anthropometric Measurements:

- Weight
- Length
- Head circumference
- Mid-arm circumference

Regional examination:

- Head and neck.
- Extrimities.
- Skin and mucous membranes
- Joints

Systemic examination:

- **Heart.**
- **Chest.**
- **Abdomen & external genitalia**
- **Nervous system.**

Local Examination of Nervous System in a Child

1. Mental status:

- Consciousness
- Mood (Affect)
- Behaviour
- Intelligence

2. Handedness

3. Speech & articulation

4. Cranial Nerve Examination

I. OLFACTORY NERVE (CN 1):

- Usually can not be tested in infants and young children.
- In cooperative children, it can be examined as follows: with closed eyes, ask the patient to identify the scent of common objects such as chewing gum or chocolate, peppermint, and peanut butter, that are familiar to the child. Never use strongly aromatic substances or irritants as ammonia because their detection involves 5th CN.

II. OPTIC NERVE (CN 2):

- The ability to follow moving object or moving light.
- Picking up of objects.
- Light reflex.
- Fundus examination.

III. Oculomotor (CN 3), Trochlear (CN 4), and Abducens Nerves (CN 6):

- Movements of eyes in the six cardinal directions.
- Examination of the two pupils (normally equal and reactive).
- Eye lids (normally no ptosis).

IV. Trigeminal Nerve (CN 5):

a. **Sensory part is tested by Corneal reflex:** Blowing in one eye causes closure of both eyes.

b. **Motor part:**
   - Ask the patient to open his mouth widely; ***deviation of jaw*** towards one side indicates weakness of the muscle on that side.
   - Ask the patient to bite firmly; the ***masseter and temporalis*** muscles are palpated on both sides to detect any weakness or atrophy.
   - ***In infants,*** palpate the masseter and temporalis muscles during suckling or feeding.

c. **Reflex part: Jaw Jerk** (normally absent).

V. Facial Nerve (CN 7):

Upper face

- Closure of both eyes.
- Elevation of eye brows.
- Frowning.

Lower face

- Symmetry of nasolabial folds.
- Deviation of the angle of the mouth (to the healthy side).

VI. Nerve VIII (Cochlear And Vestibular):

A. Auditory function:

- A normal newborn will pause briefly during sucking when a bell is presented, but after several stimuli the pauses will cease as habituation occurs. The neurologically abnormal infant will not habituate.
- The normal hearing infant will turn his head toward a sound by 3 months of age.
- The presence of ***normal language indicates normal hearing***.
- ***Audiometry or brain stem-evoked potential*** testing is mandatory for any child or infant suspected of a hearing loss.

B. Vestibular function:

Can not be tested in infants and young children.

VII. Glossopharyngeal Nerve (CN 9):

- The nerve is tested by observing the gag reflex to tactile stimulation of the posterior pharyngeal wall.

VIII. Vagus Nerve (CN 10):

- Examination of uvula and soft palate (palatal branches).
- Look for the voice of the patient (laryngeal branches).
- Ask about swallowing (pharyngeal branches).

IX. Accessory Nerve (CN 11):

- Lesions in the accessory nerve result in paralysis and atrophy of the sternomastoid and trapezius muscles.
- ***To test for trapezius***, ask the patient to shrug the shoulder. In infants, look for the spontaneous movements of shoulders.
- ***The sternomastoid muscle is tested by*** forceful rotation of the head and neck against the examiner's hand. In infants, look for the spontaneous movements of the neck.

X. Hypoglossal Nerve (CN 12):

- The hypoglossal nerve innervates the tongue.
- Examination of the tongue includes an assessment of its motility, size, and shape and the presence of atrophy or fasciculations.
- Tongue deviates towards side of lesion on protrusion.
- If the injury is bilateral, tongue protrusion is not possible.

5. Motor System Examination:

1- Muscle Power

A- Voluntary movements:

- look for the spontaneous movements.
- Muscle power is graded by a scale of 0-5 as follows:

0 = no movement,

1 = minimal contraction,

2 = movement only in the horizontal plane (with gravity),

3 = movement against gravity,

4 = movement against gravity and resistance, and

5 = normal strength.

B- Involuntary movements: tested by flexion withdrawal of the limbs in response to stimulation.

2- Muscle tone:

- Muscle tone is tested by assessing the degree of resistance when an indivdual joint is moved passively.
- Abnormalities of tone consist of hypotonia and hypertonia.
- Hypertonia may be ***spasticity*** or ***rigidity***.

3- Posture.

4- Muscle status: Wasting or hypertrophy.

5- Involuntary movements.

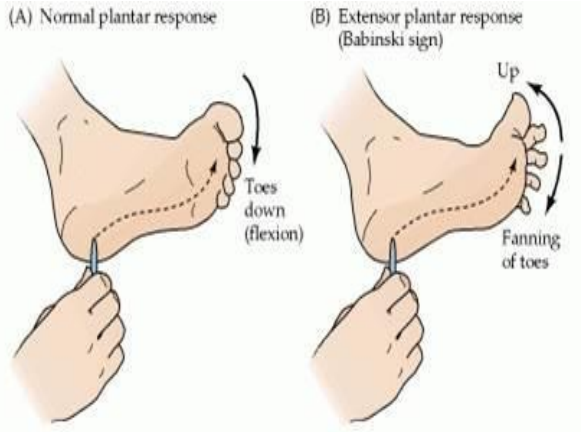
6- Coordination.

7- Stance and gait.

6. Reflexes:

A- Superficial:

The plantar reflex: [S1]



- It is obtained by stimulation of the external portion of the sole of the foot, beginning at the heel and extending to the base of great toe.
- The stimulus should be a blunt instrument such as: handle of knee hammer, a key, or end of a ball-point pen.
- Firm pressure from the examiner's thumb is also a useful method for eliciting the response.
  - ✓ ***Normal response*** is ***plantar flexion*** of the big toe, other toes flex and adduct, and the entire leg withdraws.
  - ✓ ***Abnormal response*** (***The Babinski reflex***); is characterized by extension of the great toe often with fanning of the remaining toes. It is considered positive with the presence of the first component only. It indicates ***pyramidal tract lesion***.

The cremastric reflex: [L2]

- Only in males.
- It is obtained by stroking upper medial aspect of thigh with a blunt instrument.
- Normal response will be contraction of cremastric muscle with elevation of scrotum on side of stimulation.
- It is lost in lesions above L2.

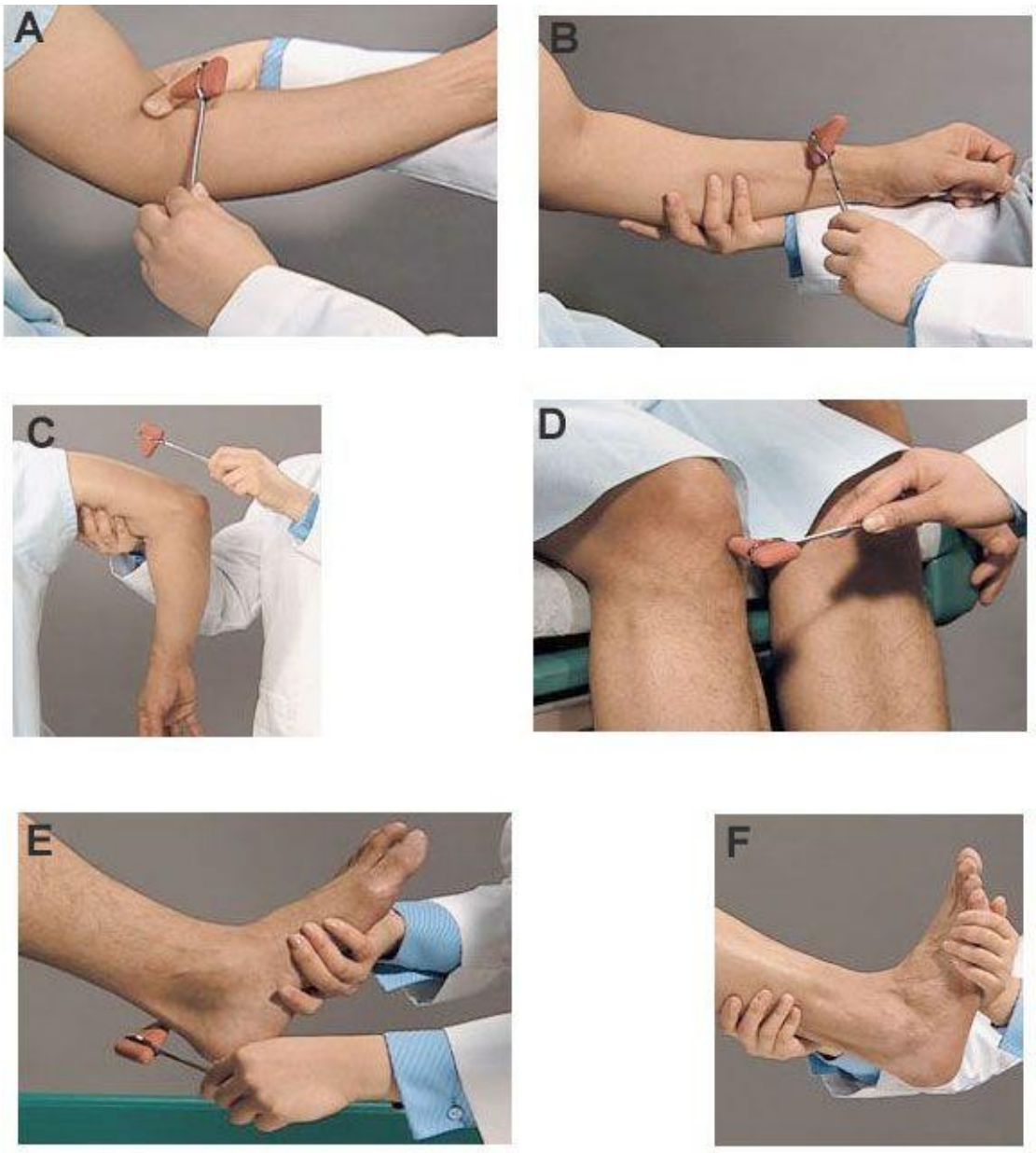
Abdominal reflex: [T7-T12]

- It is obtained by stroking the 4 quadrants of abdominal wall with blunt instrument.
- The response will be contraction of abdominal wall as shown by movements of the umbilicus towards the side of the stimulus.
- It is lost with lesions of thoracic segments starting from T8.

The anal cutaneous reflex: [S2,3,4]

- It is obtained by stimulation of the perianal skin by pinprick.
- The response will be contraction of external anal sphincter with indrawing of anal opening. It is lost with lesions of S2,3,4.

B- Deep reflexes:



The biceps reflex: (C5 & C6):

- Patient's arm is held with elbow in flexion & supported by one hand of the examiner.
- The thumb of the supporting hand is held over the insertion of biceps tendon.
- The thumb is tapped with a reflex hammer.

- The response will be contraction of biceps with or without flexion of elbow.

The Triceps reflex: (C6 – C8):

- Patient's arm flexed at 90 degrees at elbow.
- Forearm supported by the examiner.
- Sharp tap over triceps tendon.
- The response will be contraction of triceps with or without extension of elbow.

The Brachioradialis reflex: (C5 & 6):

- Patient's arm between pronation and supination. .
- Forearm supported by the examiner or on the patient side.
- Sharp tap over styloid process.
- The response will be flexion of forearm with supination.

The knee jerk: (L2 - L4):

- Patient sits with the knees hanging free and loose or supine with knees relaxed, flexed at 30 - 40 degrees and supported by the examiner's hand.
- Sharp tap over patellar tendon with a reflex hammer.
- The response will be visible contraction of quadriceps & extension at the knee.

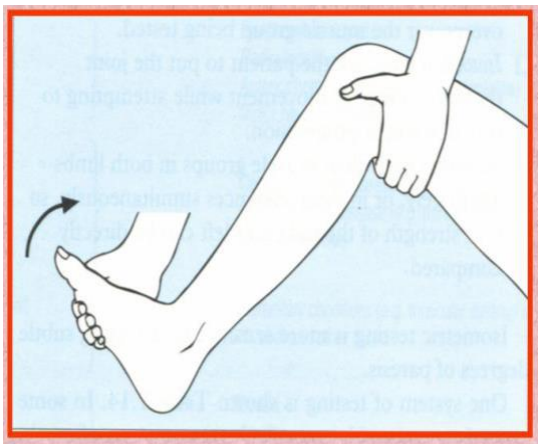
The ankle jerk: (S1 & S2):

- Patient lies prone with the knees flexed at 90 degrees or supine with hip flexed, externally rotated with the knees flexed with foot lying over anterior aspect of the other leg.
- Hold toes down firmly.
- Sharp tap over tendoachillis with a reflex hammer.
- The response will be visible contraction of gastrocnemius & plantar flexion.
- In infants, it is difficult to obtain by percussing the Achilles tendon in this age group.

Clonus:

- Sudden stretching of a tendon and maintenance of such stretch will lead to rapid movement of joint due to alternating contraction of agonists and antagonists.
- It indicates impairment of higher control centers with pyramidal tract lesions.

- ***The ankle clonus:***



  - Patient lies supine with the knees flexed at 90 degrees supported by examiner hand.
  - Forefoot is held by the other hand.
  - Suddenly dorsiflex and maintain dorsiflexion.

- ***The patellar clonus:***
  - Patient lies supine with the knees extended.
  - Superior border of patella is held by the examiner & pushed toward the foot

7. Sensory System Examination:

N.B: in infants and young children, pain sensation only can be tested.

A. Superficial sensations:

a. ***Pain*** is tested by pinprick (sharp pin)

b. ***Touch*** by a piece of cotton

c. ***Temperature*** by two test tubes containing hot and cold water (at about 45° C and 10°C, since very hot or cold water will cause pain sensation and the patient is confused).

B. Deep sensations:

a. ***Joint sense*** is tested with the eyes closed

i -Sense of position

ii - Sense of passive movement

b. ***Pressure sense*** (painless pressure and painful pressure i.e. deep pain) is. tested by squeezing gently deep structures as calf muscles; when this is done strongly, one is then testing deep pain sensibility

c. ***Vibration sense*** is tested usually over bony prominences by a tunning fork. of 128 vibrations per second.

C. Cortical (Combined) sensations:

The following tests are done with the eyes closed:

a. ***Point localization:*** The patient is asked to place his finger on the point where his skin was touched by the examiner.

b. ***Two points discrimination:*** It is tested by using two pins or the two limbs of a blunt compass needle. Two points can usually be distinguished from one when they are 0.3-0.5 cm apart on the fingertip, 1 cm on the palm, and 5 cm on the back

c. ***Stereognosis:*** It is tested by the ability to recognize the nature of common objects (e.g. various coins or a key) placed in the hand.

d. ***Graphesthesia*** (traced-figure identification): it is the ability to recognize numbers or letters written on the skin (usually palm of the hand). Its absence indicates a cortical lesion.

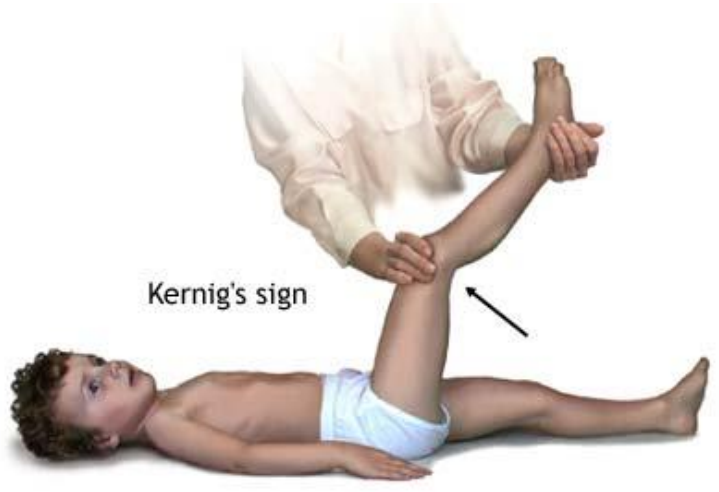
8. Signs of Meningeal Irritation:

1- NECK RIGIDITY

- The examiner places his hand behind the patient's occiput and flexes the head so that the chin touches the chest.
- Normally this movement can be carried out without pain.
- In meningeal irritation the test causes pain in the neck and the movement is resisted by spasm in the extensor muscles of the neck.

2- KERING' SIGN

- This sign is tested by attempting to carry out passive extension of the patient's knee when his hip is fully flexed.
- Again, normally this movement can be carried out without pain.
- In meningeal irritation the test causes pain and spasm of the hamstrings, leading to painful and limited extension of the knee.



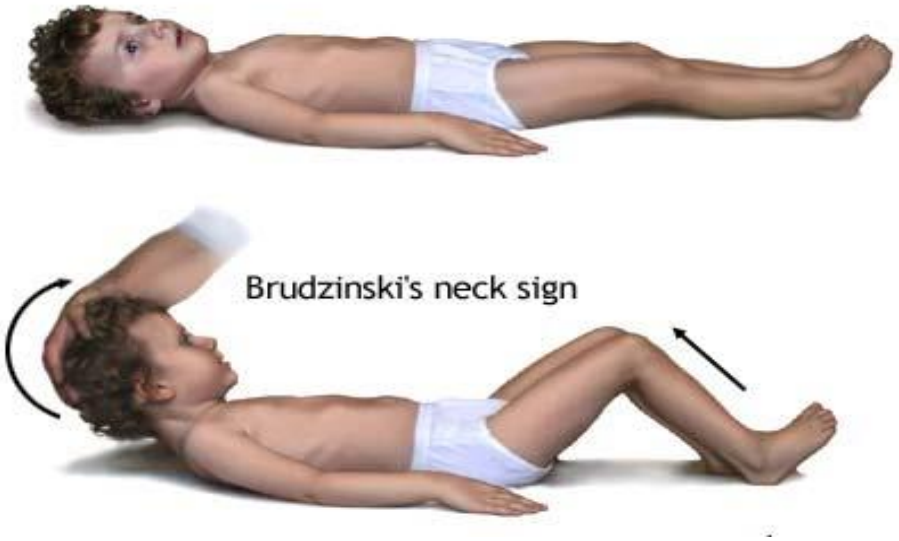
3- BRUDZINSKI'S SIGN

A. Brudzinski's neck sign:

- With the patient supine, the physician places one hand behind the patient's head and places the other hand on the patient's chest.
- The physician then raises the patient's head (with the hand behind the head) while the hand on the chest restrains the patient and prevents the patient from rising.
- Flexion of the patient's lower extremities (hips and knees) constitutes a positive sign.

B. Brudzinski's contralateral reflex sign:

- The patient's hip and knee are passively flexed on one side; if the contralateral leg bends in reflex, identical contralateral reflex is demonstrated.



9. Examination of The Spine:

Inspection: For any abnormality e.g pigmentation, hair, skin dimple.

Palpation: For any tenderness.

Neonatal Examination

Pediatrics

Clinical Examination

Neonatal Examination

Characteristics of the healthy full term newborn

1. ***Clinical vital signs:***
   - ***Pulse :*** Normally 120 to 160 beats per minute
   - ***Respiratory rate.*** Normally 40 to 60 breaths per minute
2. ***Body measurements:***
   a. ***Weight:*** The average weight for term babies (born between 37 and 41 weeks gestation) is about 3kg. Newborn babies may lose as much as 10 percent of their birth weight. in the first few days.
   b. ***Head circumference:*** Normally it is about 35 cm
   c. ***Length:*** Normally it is about 50 cm

Vernix caseosa

3. ***Skin:***
   - The skin may be covered by a white, greasy, easily removable material called ***vernix caseosa***.
   - ***Mongolian spots*** over the back are normal findings
4. ***Head and Neck:***
   - **The fontanels** (size and tension) and sutures should be assed.
   - **Caput succedaneum** due to scalp edema that crosses the midline
   - It should be distinguished from **Cephalhematoma** , which does not cross the midline and is caused by subperiosteal bleeding.
   - Unusual facies suggests dvsmorphic syndromes.

Mongolian spots

5. ***Chest:***
   - **Enlargements of the breasts** may be a **normal finding** due to hormonal withdrawing

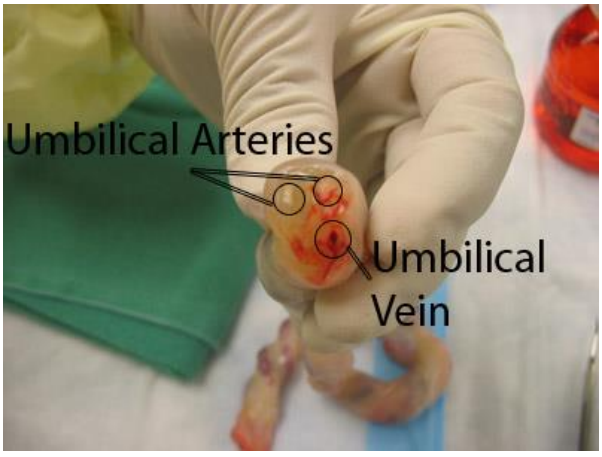
- The chest of the newborn normally is **barrel-shaped and smooth at birth**, and expands symmetrically.
- Occasional irregularities in respiratory rate with apnea up to 10 seconds can be normal.

6. ***Heart and blood vessels***

- Maximal cardiac impulse is felt in the left fourth intercostal space . .
- Murmurs are present in a large number of normal newborns, but the lack of a murmur does not eliminate a diagnosis of congenital heart disease.

7. ***Abdomen***

- The liver's edge usually is felt 1 to 2 cm below the costal margin.
- The umbilical cord contains two arteries, which are small and thick-walled, and one vein, which is larger and thin-walled.



Umbilical cord

- Umbilical hernia is a common finding .

8. ***Genitalia***

- The baby should urinate within 24 hours.
- Testes normally are in the scrotum of term infants.
- The newborn's penis is greater than 2cm in length. .

- A mucoid vaginal discharge is present in nearly all mature female infants
- Mild scrotal hydrocele is a common normal finding.

9. Anal area

- Normal newborn should defecate within 24 hours.

10. Neurologic Examination

✓ Moro's reflex:

➢ ***Who to illicit:***

- The Moro reflex is obtained by placing the infant in a semi-upright position. The head is momentarily allowed to fall backward with immediate re-support by the examiner's hand. (Fig 72)
- The child will symmetrically abduct and extend the arms(shoulders & Elbows), fingers opening, followed by flexion and adduction of the arms(shoulders & Elbows)in an embrassement-like action.
- It can also be produced by loud noise or sudden motion.

➢ ***Timing:***

- It appears at birth & disappear by 4 month.

➢ ***An asymmetric response (unilateral absence):***

- May signify a fractured clavicle, brachial plexus injury, or hemiparesis.

➢ ***Bilateral Absence:***

- Suggests significant dysfunction of the CNS.

➢ ***Persistant moro reflex beyond 4 month:***

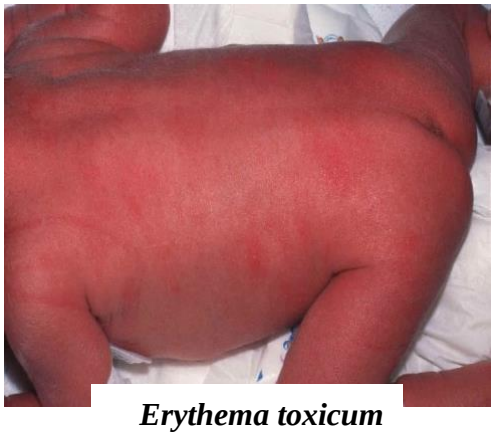
- In ceses of cortical brain damage.

✓ **Other neonatal (primitive) reflexes include:**

1- Palmer and planter grasp reflex
2- The parachute reflex
3- Rooting reflex
4- Suckling reflex
5- Placing reflex
6- Stepping or walking reflex
7- Tonic neck reflex
8- Neck rightening reflex

Milia

11. Physiological phenomena of the newborn:



Erythema toxicum

- Physiological weight loss loss (5-10 %)
- Overriding (moulding) of the bones of cranial vault
- Vernix caseosa.
- Acrocyanosis.
- Physiological jaundice
- Lanugo hair
- Mongolian spots
- Milia (plugged sweat glands of the nose)
- Erythema toxicum (vesicles on red base)
- Bluish sclera
- Divercation of recti
- Mucoid vaginal discharge, may be blood tinged (pseudomenses)
- Breast engorgement
- Periodic breathing
- Jitteriness

Life Support

Pediatrics

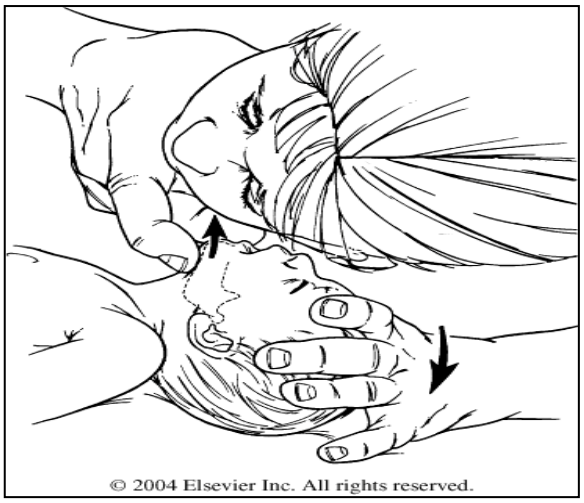
Clinical Examination

Steps Of Out-Hospital Basic Life Support

When you are confronted with an arrested infant or child, do the following steps:

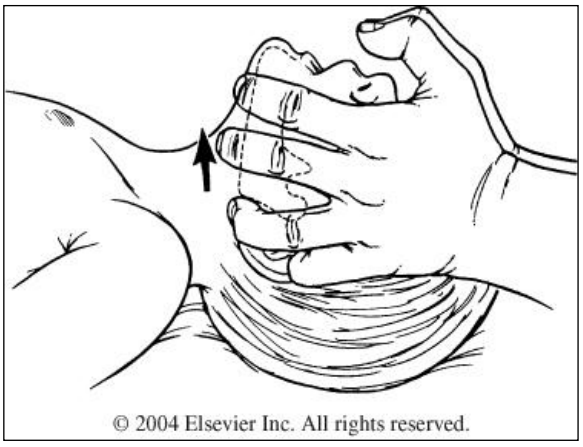
1- Share actively.
2- Be sure that nothing endanger you or the victim.
3- Chick responsiveness.
4- If responsive observe.
5- If unresponsive go to step 6
6- Opening Airway

Open Airway – No cervical spine injury (Head Tilt – Chin Lift Maneuver) :



- One hand is used to tilt the head, extending the neck. The index finger of the rescuer's other hand lifts the mandible outward by lifting on the chin.

Open Airway – Suspected cervical spine injury (Jaw Thrust Maneuver):



- Alternatively, the jaw thrust maneuver can be used when a history of trauma or damage to the cervical spine is suspected. If there is difficulty in its performance preceed with head tilt chin lift .

Check breathing by looking for respiratory movements, listen and feel for expired air.

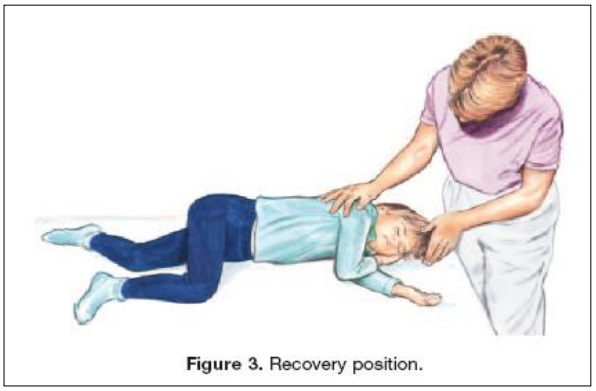


Figure 3. Recovery position.

- ✓ **If all are okay:** keep in recovery position

- ✓ **If respiratory movements are observed but nothing felt nor heard:** suspect foreign body obstructing airway: Clearing Airway by:

I. *In infants:*

5 Back blows followed by 5 chest thrusts

Back blows:

- Hold the infant or child in a prone position and deliver up to five blows to the middle of the back between the shoulder blades.
- The head must be lower than the chest during this manoeuvre.
- This can be achieved by holding a small infant along the forearm or, for older children, across the thighs.

Chest thrusts (if FB is not relieved by five back blows)

- Place the child in a supine position.
- Give up to five thrusts to the sternum.
- The technique of chest thrusts is similar to that for chest compressions.
- The chest thrusts should be sharper and more vigorous than compressions and carried out at a slower rate of 20/min.

II. *In children:*

a. *Conscious child: abdominal thrusts*

- In children over one year deliver up to five abdominal thrusts after the second five back blows.
- Use the upright position (Heimlich maneuver) if the child is conscious
- Up to five sharp thrusts should be directed upwards toward the diaphragm
- Abdominal thrusts are not recommended in

infants because they may cause damage to the abdominal viscera

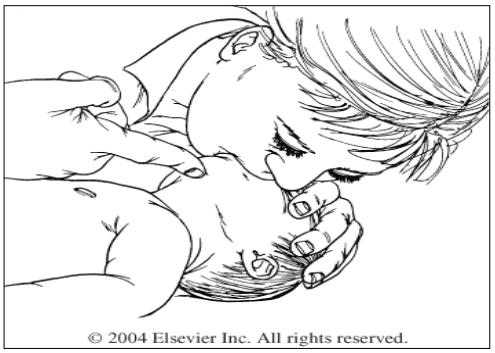
b. Unconscious child: abdominal thrusts

- Unconscious children must be laid supine and the heel of one hand placed in the middle of the upper abdomen.
- In children over one year deliver up up to five abdominal thrusts after the second five back blows.

✓ **If No Breath: give 2 effective breaths by:**

A. Rescue Breathing

Rescue breathing in an infant



- The rescuer's mouth covers the infant's nose and mouth, creating a seal.
- One hand performs head tilt while the other hand lifts the infant's jaw.
- Avoid head tilt if the infant has sustained head or neck trauma.

Rescue breathing in a child

- The rescuer's mouth covers the mouth of the child, creating a mouth-to-mouth seal.
- One hand maintains the head tilt; the thumb and forefinger of the same hand are used to pinch the child's nose.

B. Bag and Mask Breathing

1-Select the appropriate sized mask

2-Be sure there is a clear airway

3-Position of the baby head: the neck should be slightly extended .

4-The mask is held on the face with the thumb and index finger encircling much of the rim of the mask (C – shaped), while the ring and fifth fingers bring the chin forward (E – shaped).

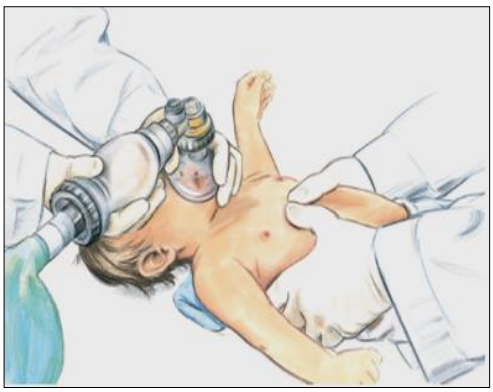
5-An air-tight seal between the rim of the mask and the face is essential.

After effective breathes:

- **Child starts breathing:** put child in recovery position. Observe.
- **No breathing after 2 effective breathes:** start immediate combined ventilations and cardiac compressions:

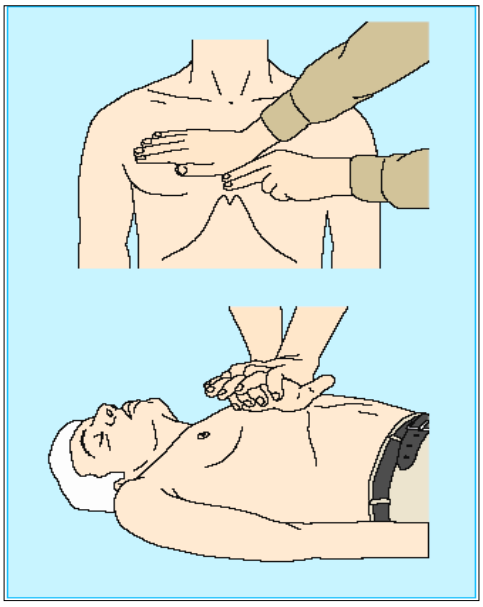
Combined Ventilations and Cardiac Compressions:

In an *infant victim,* rescuers should compress the lower third of the sternum with two fingers of one hand; the upper finger should be one finger's breadth below an imaginary line joining the nipples



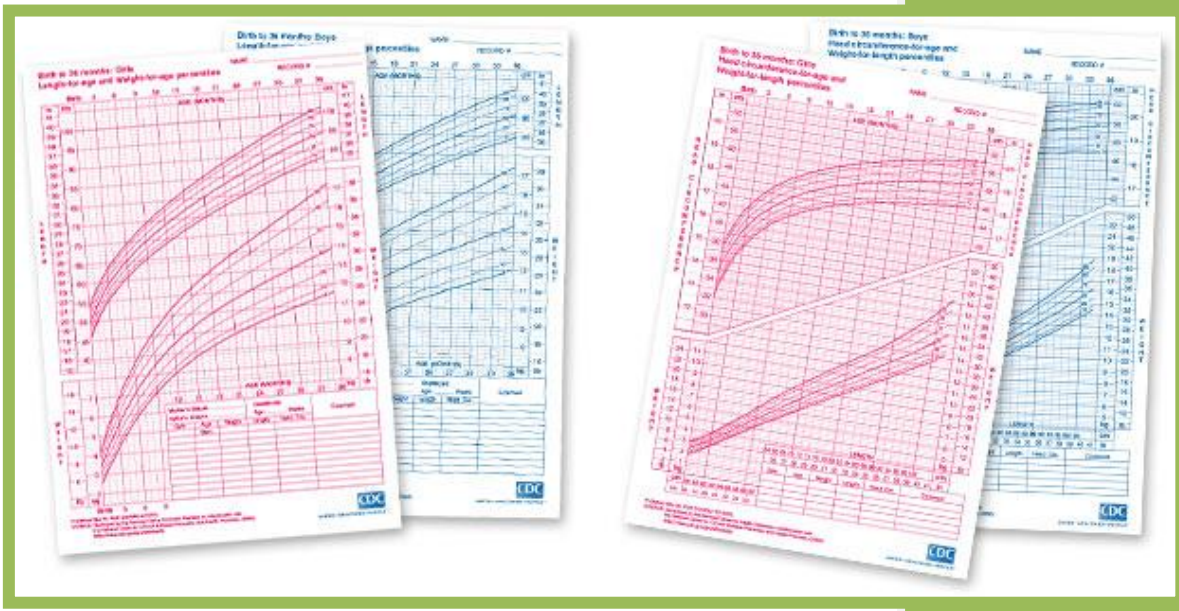
When more than one healthcare provider is present, two-thumbed (chest encirclement) method of chest compression can be used for infants. The thumbs are aligned one finger's breadth below an imaginary line joining the nipples, the fingers encircle the chest, and the hands and fingers support the infant's rib cage and back. The compression rate is 100/min and the compression to ventilation ratio is 30:2.

Chest compression in children



- Locating hand position for chest compression in a child.
- Note that the rescuer's other hand is used to maintain head position to facilitate ventilation
- **In larger, older children (over the age of eight years)** the adult two-handed method of chest compression is normally used. The compression rate is 100/min and the compression to ventilation ratio is 30:2, but the compression depth changes to 4-5 cm.
- In smaller children less than 8 years, 30:2 ratio is used so long as there is only one rescuer, with 2 rescuers, 15:2 ratio is then recommended.

Growth Charts



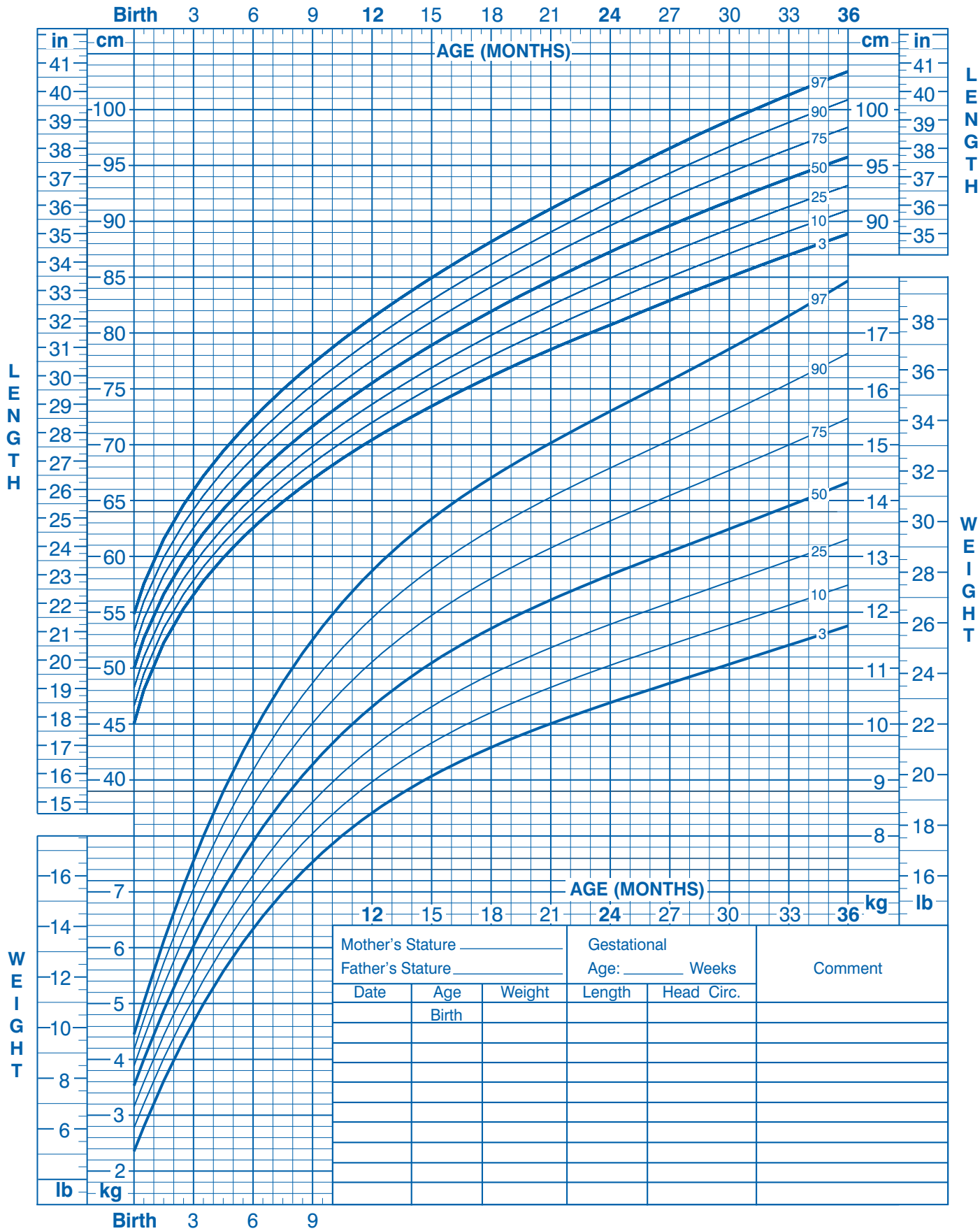
Pediatrics

Clinical Examination

Birth to 36 months: Boys
Length-for-age and Weight-for-age percentiles

NAME _____

RECORD # _____



Published May 30, 2000 (modified 4/20/01).

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

CDC
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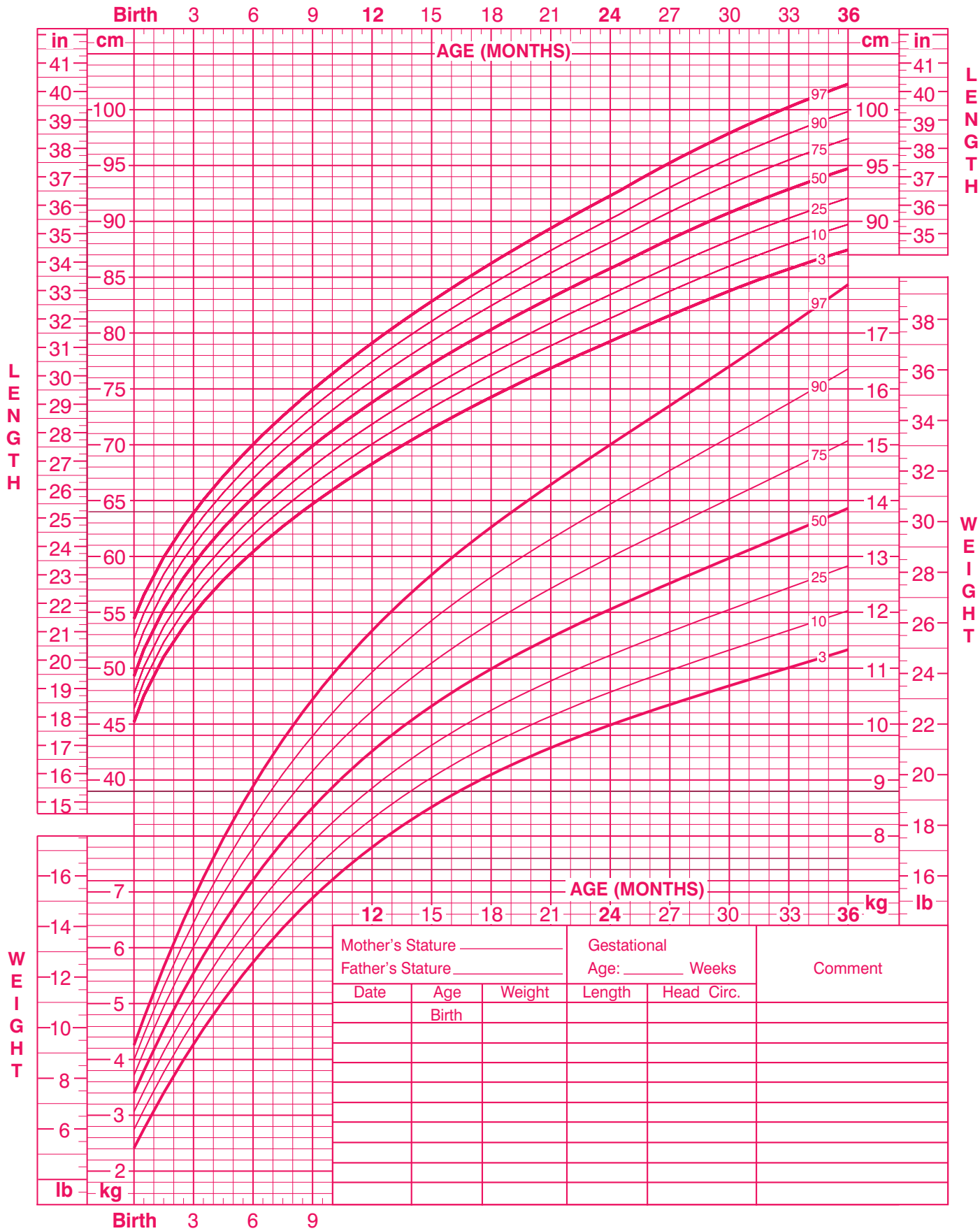
Birth to 36 months: Girls
Length-for-age and Weight-for-age percentiles

NAME _____

RECORD # _____



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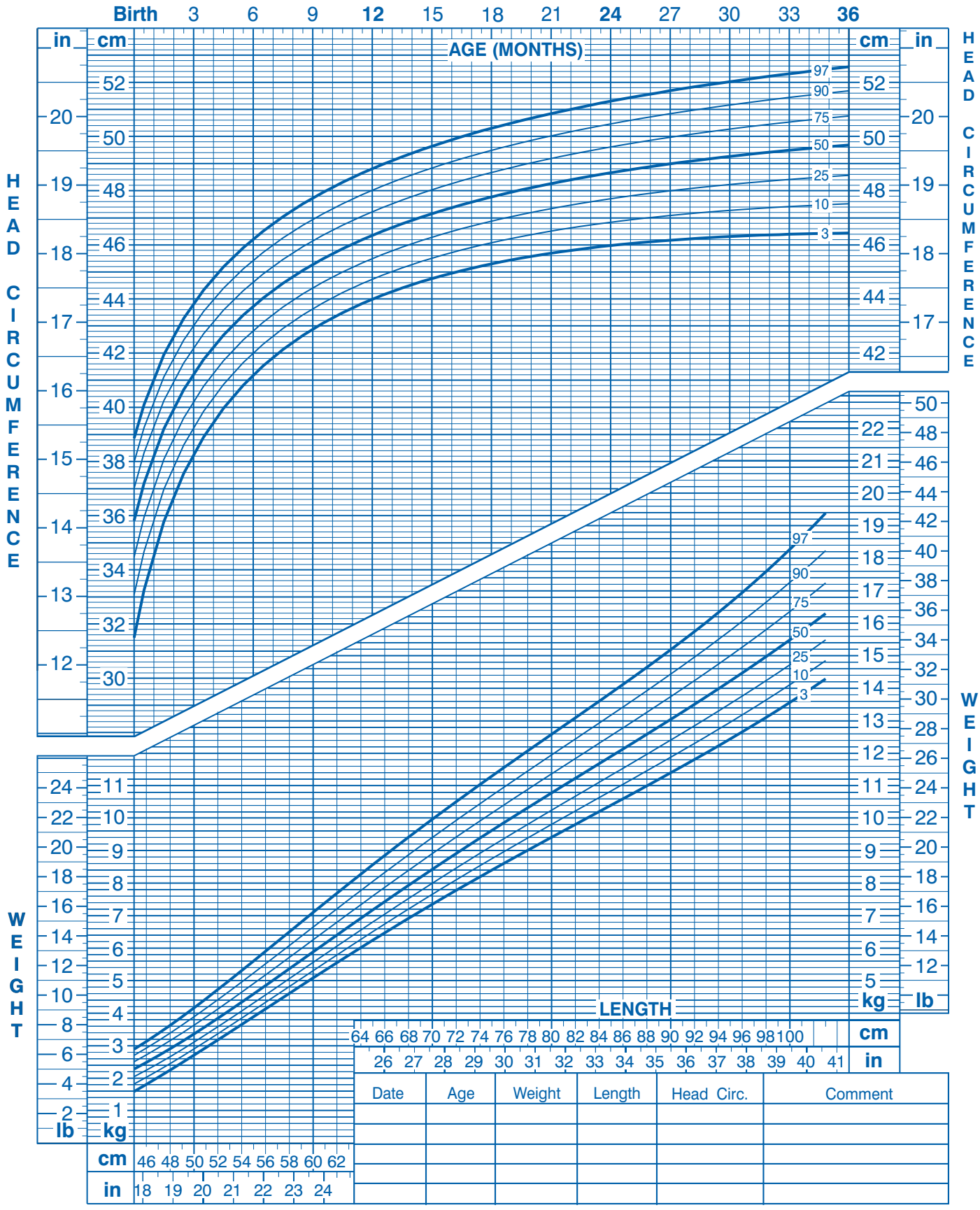
Birth to 36 months: Boys
Head circumference-for-age and
Weight-for-length percentiles

NAME _____

RECORD # _____



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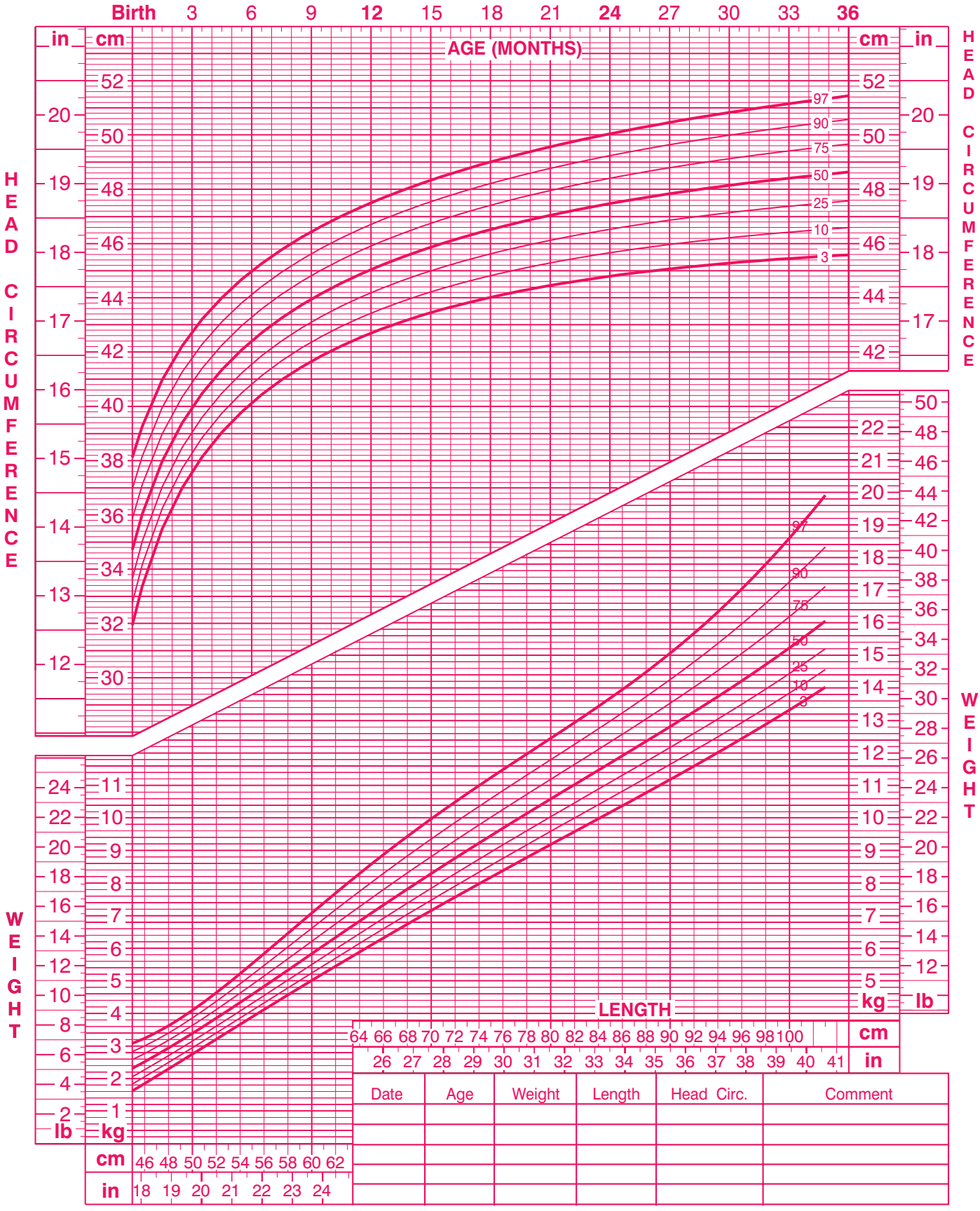
Birth to 36 months: Girls
Head circumference-for-age and
Weight-for-length percentiles

NAME _____

RECORD # _____



Date	Age	Weight	Length	Head Circ.	Comment

Published May 30, 2000 (modified 10/16/00).
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2 to 20 years: Boys
Stature-for-age and Weight-for-age percentiles

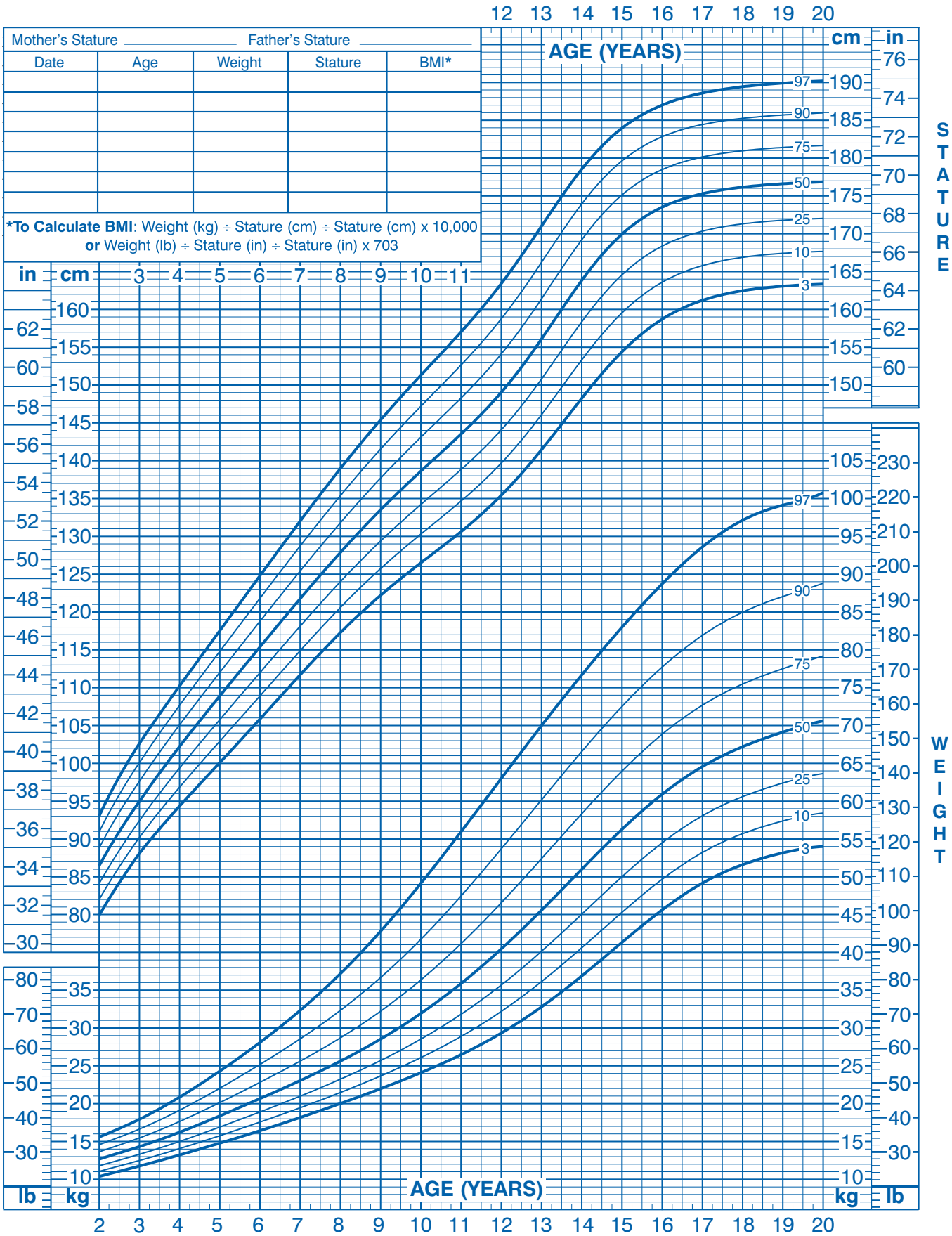
NAME _____

RECORD # _____

Mother's Stature _____ Father's Stature _____

Date	Age	Weight	Stature	BMI*

***To Calculate BMI**: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703



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2 to 20 years: Girls
Stature-for-age and Weight-for-age percentiles

NAME _____

RECORD # _____

Mother's Stature _____ Father's Stature _____

Date	Age	Weight	Stature	BMI*

***To Calculate BMI**: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703

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http://www.cdc.gov/growthcharts

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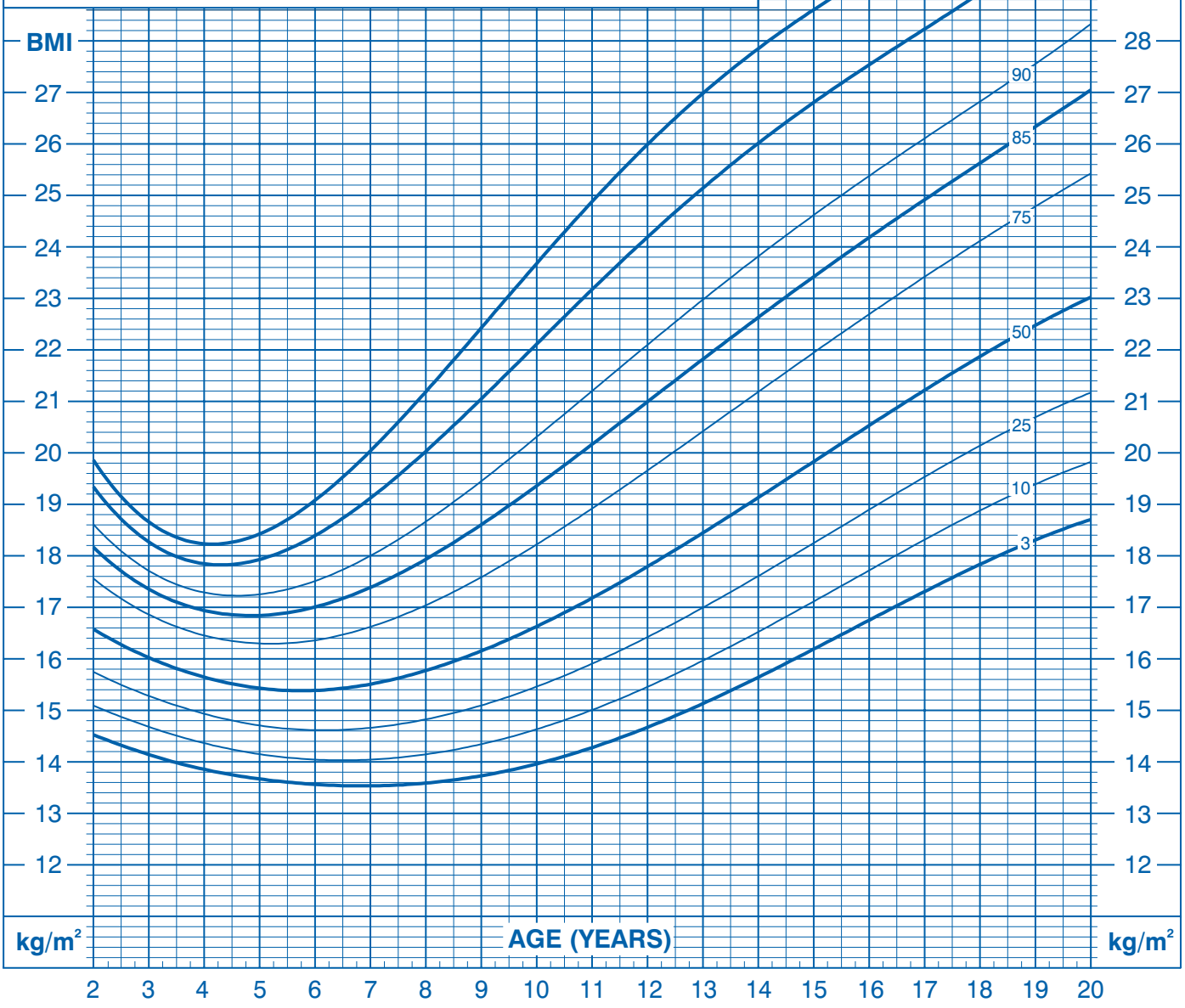
2 to 20 years: Boys
Body mass index-for-age percentiles

NAME _____

RECORD # _____

Date	Age	Weight	Stature	BMI*	Comments

***To Calculate BMI**: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703



Published May 30, 2000 (modified 10/16/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

CDC
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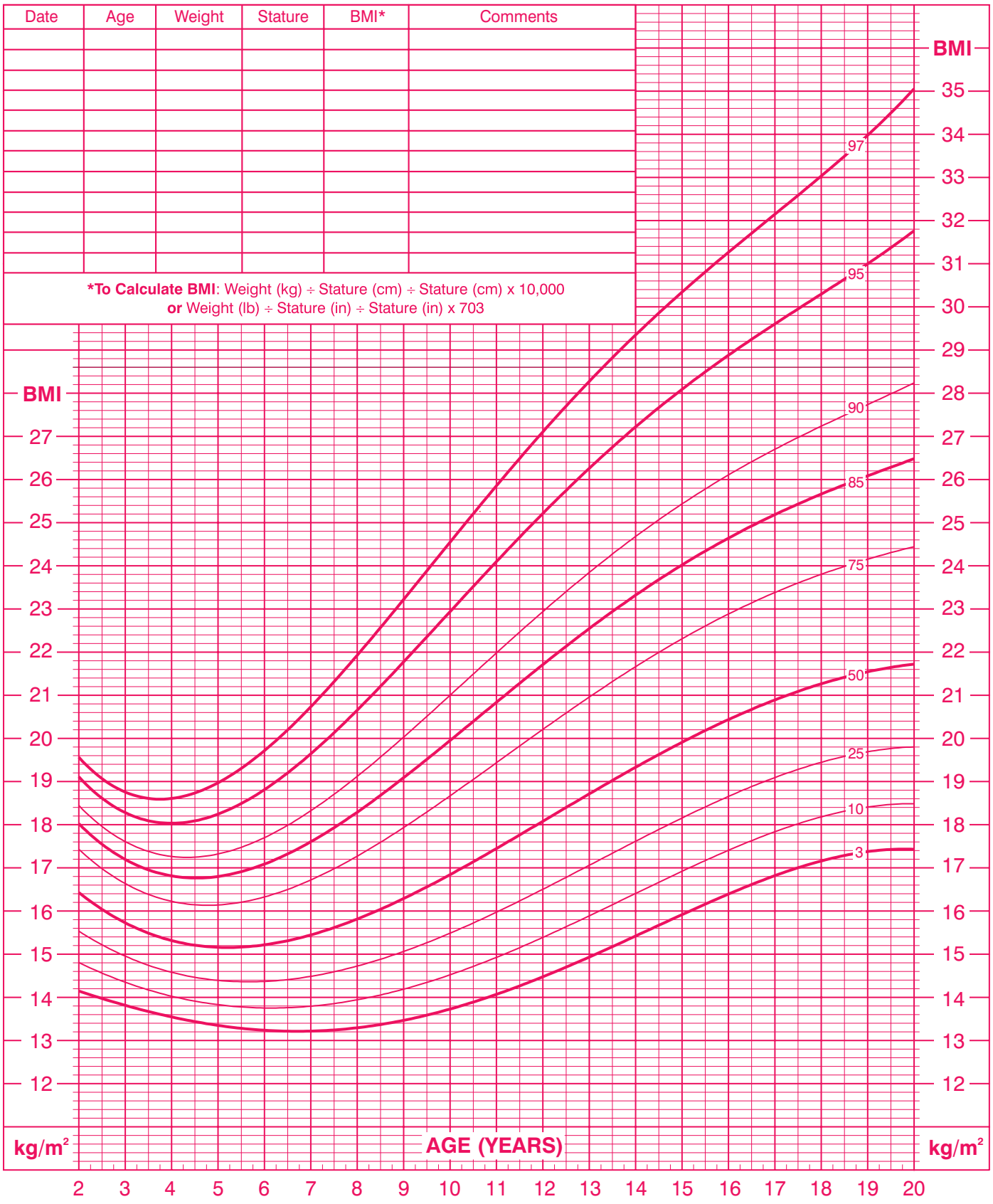
2 to 20 years: Girls
Body mass index-for-age percentiles

NAME _____

RECORD # _____

Date	Age	Weight	Stature	BMI*	Comments

***To Calculate BMI**: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703



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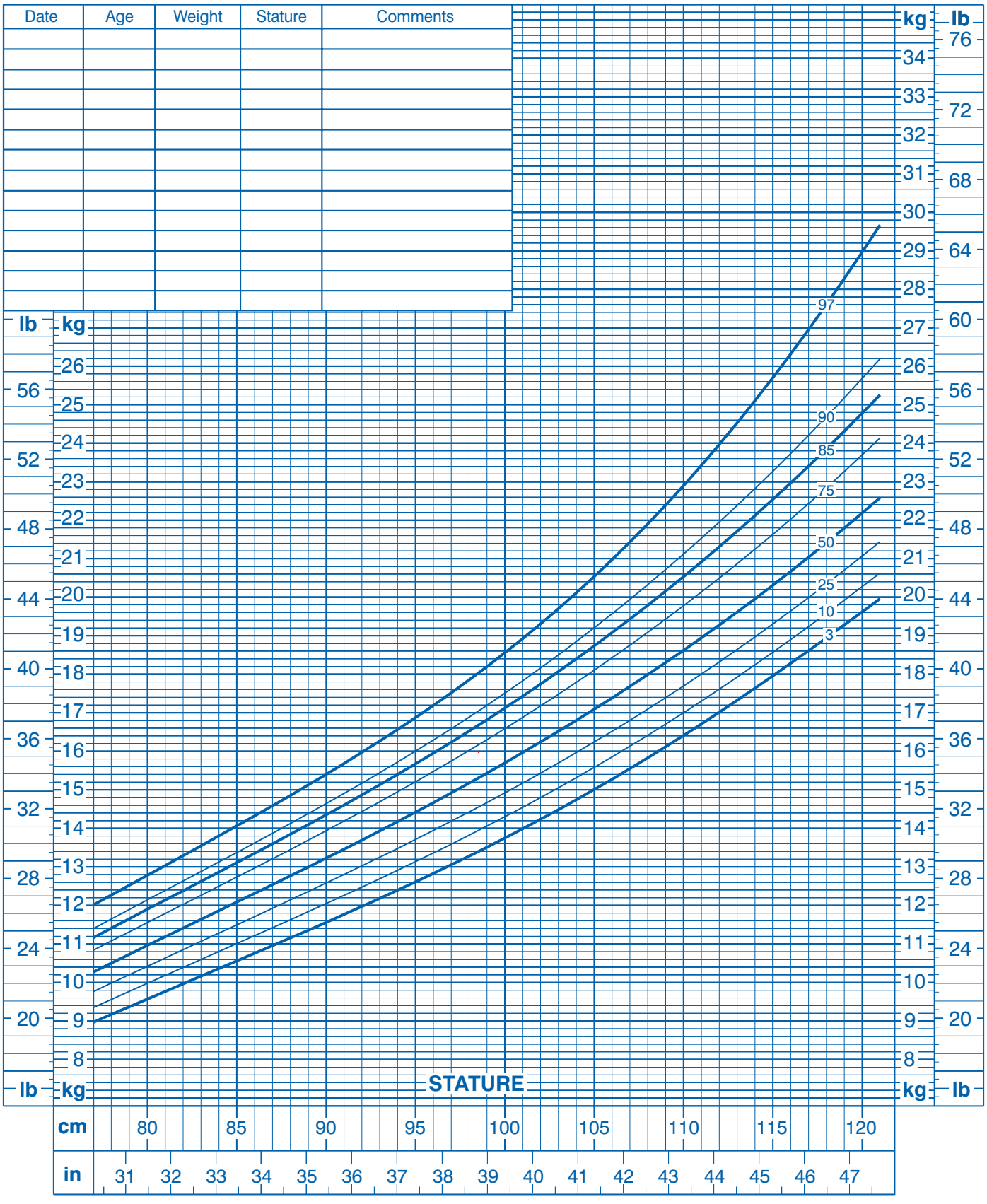
NAME _____

RECORD # _____

Weight-for-stature percentiles: Boys

Date	Age	Weight	Stature	Comments



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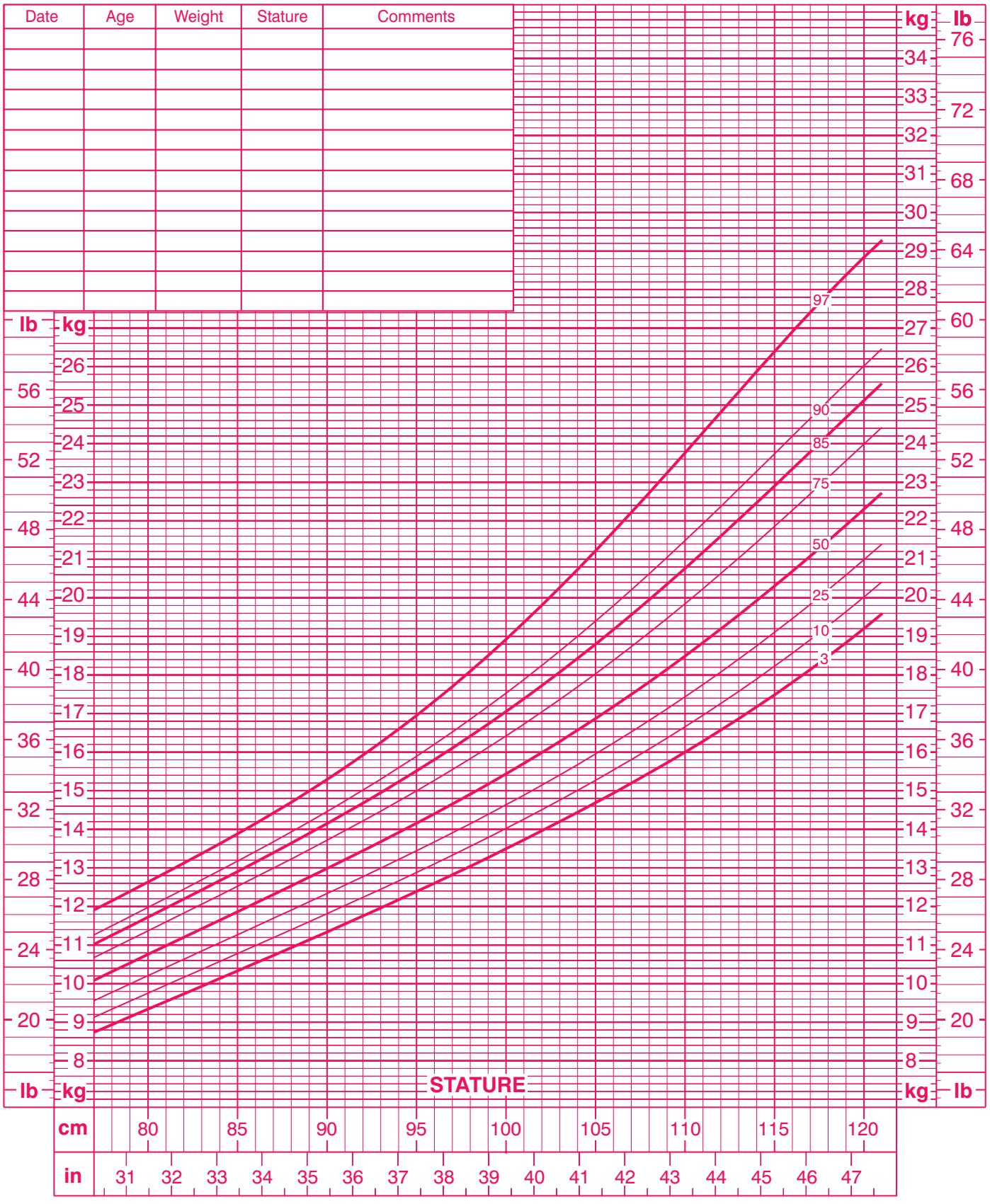
NAME _____

RECORD # _____

Weight-for-stature percentiles: Girls

Date	Age	Weight	Stature	Comments



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IMPULSE

AHMED ELEMAM