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METHODS OF CHECKING A HEALTHY AND SICK CHILD

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METHODS OF CHECKING A HEALTHY AND SICK CHILD

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On the subject of "Propaedeutics of children's diseases"

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The manual is recommended for students of all faculties, residents, master's-degree students and practicing pediatricians, studying in English. In the proposed training manual, the issues of the methodology for examining the organs and systems of the child, taking into account age characteristics, are considered. The compiler used the methods of standardization at a high level. The presentation of the content is adapted to educational technologies and complies with accepted standards. The presentation of the material is given sequentially, without unnecessary details, using figures, diagrams, photos, algorithms and tables. Based on this, it can be said, that the manual can be useful in acquiring skills and clinical knowledge.

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INTRODUCTION

Learning the methods of examining the child's organs and systems is the main task of children's propaedeutics. Classical examination methods of the human's body (examination, palpation, percussion, auscultation) have been used in medicine since ancient times.

Over the centuries, the examination methodology was continuously improved: percussion, palpation methods were updated, functional tests, formulas and normative indicators were applied. In recent years, the most modern instrumental-laboratory examination methods have been introduced in the practice of pediatrics, and these methods are used in the diagnosis of diseases.

In the course of this work, a doctor uses the methods of examination, percussion, palpation and auscultation.At the same time,using new instrumental-laboratory examination methods of diagnosis and treatmentmakes it easier to put an accurate and correct diagnosis quickly.

In the 2-3rd years of the medical faculties, students should learn the methods of examination of a healthy and sick child, learn the growth and development of the child's body, its age-specific characteristics, and distinguish the symptoms and syndromes of diseases. A future doctor must know modern laboratory instrumental technologies that speed up the diagnostic process and other method's of examination so as to minimize doctor's errors. All the mentioned basic knowledge is a solid foundation for "Pediatrics", a branch of medicine that studies the laws of growth and development of children, causes and mechanisms of disease development, methods of their detection, treatment and prevention.

SKIN AND SUBCUTANEOUS FAT LAYER EXAMINATION METHODOLOGY

EXAMINATION ALGORITHM

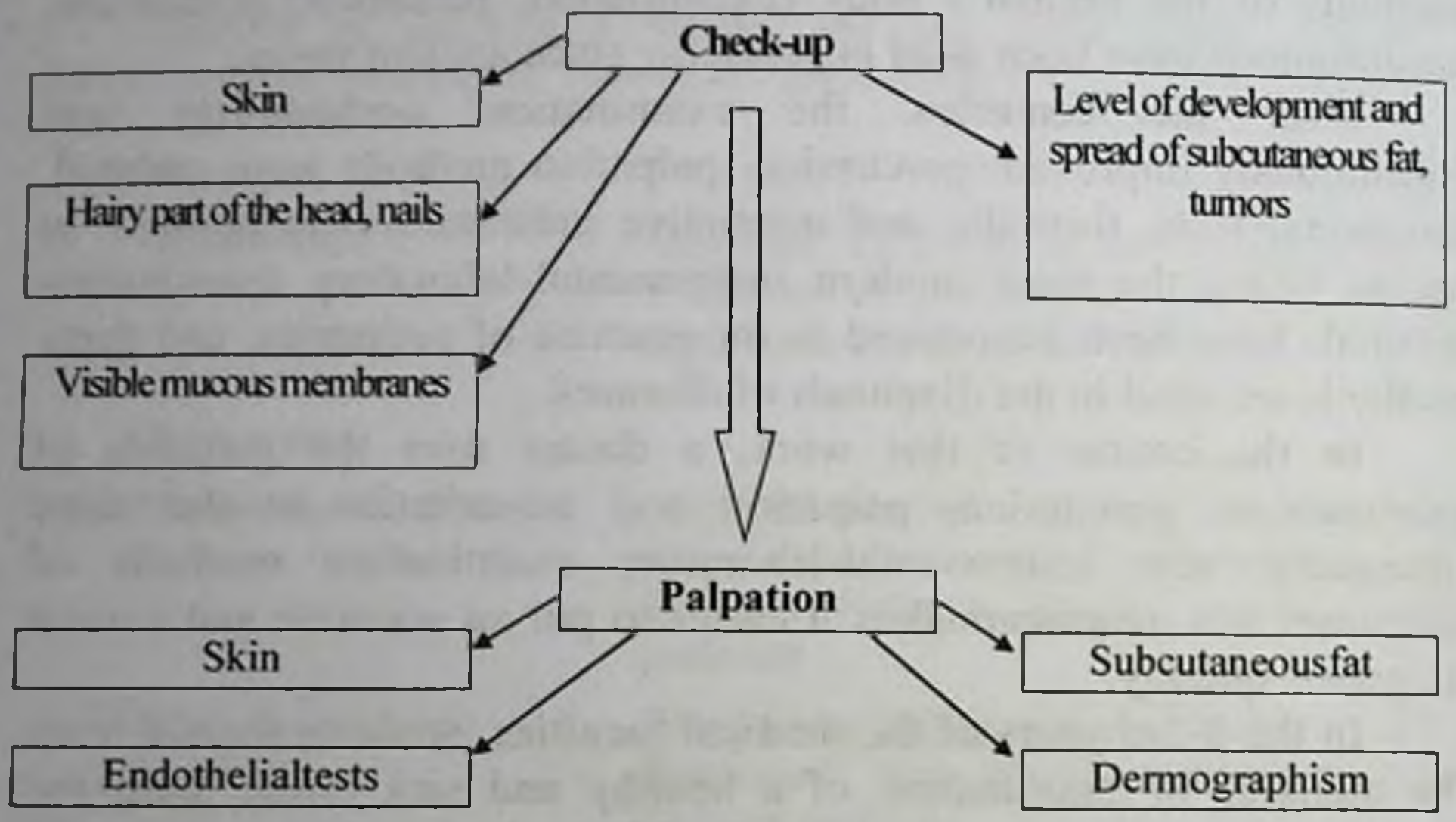

Figure 1. *Algorithm for checking the skin and subcutaneous fat layer*

Methods of skin examination: inquiry, check-up, palpation, determination of vascular fragility and dermographism (Fig. 1).

Clinical examination begins with an inquiry, by dint of which patients' skin and mucous membranes pallor, jaundice, various rashes, swellings can be determined. It is also important to know how the disease has developed and the dynamics of the existing symptoms.

Check-up isconducted under goodconditions with natural lighting (table 1). Young children should be completely undressed, and older children should be undressed gradually, according to the required area. Armpits, natural folds, anus, genitals must be seen. In different diseases, the skin color changes differently, for example: it turns white, red, yellow, cyanotic, earth-colored, and can be gray. On the skin, attention is paid to the expansion of the venous network, elements of rashes (Fig.2), pigmented and depigmented areas, scabs, scratches, elements of allergic diathesis (oily crusts on the cheeks, hairy part of the head and gneysis on the eyebrows), elements of cutting, scars.

Roseola- a spot of pink, red and dark red colours, up to 5 mm in diameter. The shape of roseola is round or irregular, the edges are smooth or uneven, it does not rise from the skin, disappears when pressed on the skin, then reappears. Many roseolas with a size of 1-2 mm are considered to be small point rashes.

Spot - like roseola in colour, but the size is from 5 to 20 mm, it does not rise from the skin. The shape of the spot is often wrong. It disappears when pressed on the skin and then reappears. If the size of the spot is 5-10 mm, it is called a small spotted rash, if it is 10-20 mm, it is called a large spotted rash.

Erythema- a large area of redand dark red colours, with a tendency to spread in the skin, larger than 20 mm in size.

Hemorrhages- bleeding in the skin, the size may be different. Hemorrhages do not disappear when pressed, their colourcan be red, cherry-like or purple at the beginning. Point bleeding are called petechiae. If the size is 2-5 mm, it is called purpura, if it is larger than 5 mm, it is called ecchymosis. Blood clots can also appear on other webs of the rash.

Papule -roseola color, raised from the skin, palpable, size from 1 to 20 mm. After the papules, pigmentation and peeling remain. A patient may also have roseola or spotting and papules, in this case a rash is called as roseolosis-papulez or spotted-papulez.

Tubercle- a formation similar to a papule, but when palpated, a dense infiltrate is detected on the skin. At the end, necrosis is developed, and the skin often becomes ulcerated, which is followed by scar or scarred atrophy.

Node- a limited formation, grows into the skin, the size can be 6-7 cm or more, often rises from the skin.

Bleb- a derivative that appears and disappears quickly, does not leave a trace. The size ranges from a few mm to 20 cm and larger, in various forms, raised from the skin. The color is white, light pink or light red. The appearance of bleb is often accompanied by itching.

Vesicle - 1-5 mm dense formation with a clear serous or bloody fluid inside. After drying, a transparent or gray crust appears, then falls off. Sometimes a small erosion may develop. After vesicle, there is no trace on the skin. In case of complications, the vesicle suppurates and a pustule appears. A group of vesicles on the background of reddened

skin is called herpes. A bubble is the same formation, but the size is from 5 mm to 10 cm and larger.

Table 1.

Features of examination of the skin and subcutaneous fat layer

Examination methods	Sequence, clinical symptoms	Characteristics (clinicalexamples)
Examination of skin coverings	Skin color	Pallor (anemia, edema, spasm of vessels), hyperemia (fever, erythrocytosis), jaundice (hepatitis), greenish color (mechanical jaundice), lemon-yellow (hemolytic anemia), cyanosis (pneumonia, goiter, respiratory foreign body, blue congenital heart defects); waxy (hypo- and aplastic anemia); gray (toxicosis) etc.
	Development of venous network	Venous web in the form of a "jellyfish head" (stasis in the portal vein system), venous web in the hairy part of the head (hydrocephaly, rickets); venous web in the upper part of the shoulder (enlargement of broncho-pulmonary nodes); vascular "asterisks" (chronic liver diseases).
	Skin rash elements: 1. time of appearance 2. localization 3. size 4. the number 5. shape	SeeFigure 2
Look at the hairy part of the head	Hair growth	Not enough, low growth, hair loss (seborrhoea, hypovitaminosis)
	Alopecia	Focal, total (tumor diseases, treatment with cytostatics, fungal diseases)
	Hair quality	Dry, brittle, hard (iron deficiency, hypovitaminosis)

Examination of the nail plates	Color	Yellow-brown, dull (fungal disease, iron deficiency)
	Shape	normal, deformed, clubbing (chronic hypoxia)
	Surface	Flat, shiny, thickened, thinned, eroded, onycholysis (fungal diseases)
Examination of visible mucous membranes	Color	Pinkish, pale (anemia), icteric, jaundiced (hepatitis)
	Humidity	Wet, dry
	Availability of plaque	thrush
	The presence of rash elements	Belsky-Filatov-Koplik rash (measles), hemorrhagic elements (thrombocytopenic purpura, DIC-syndrome)
Examination of subcutaneous fat	Level ofdevelopment	Enough, little
	Spread	Smooth, uneven

Symptomatology of skin rashes

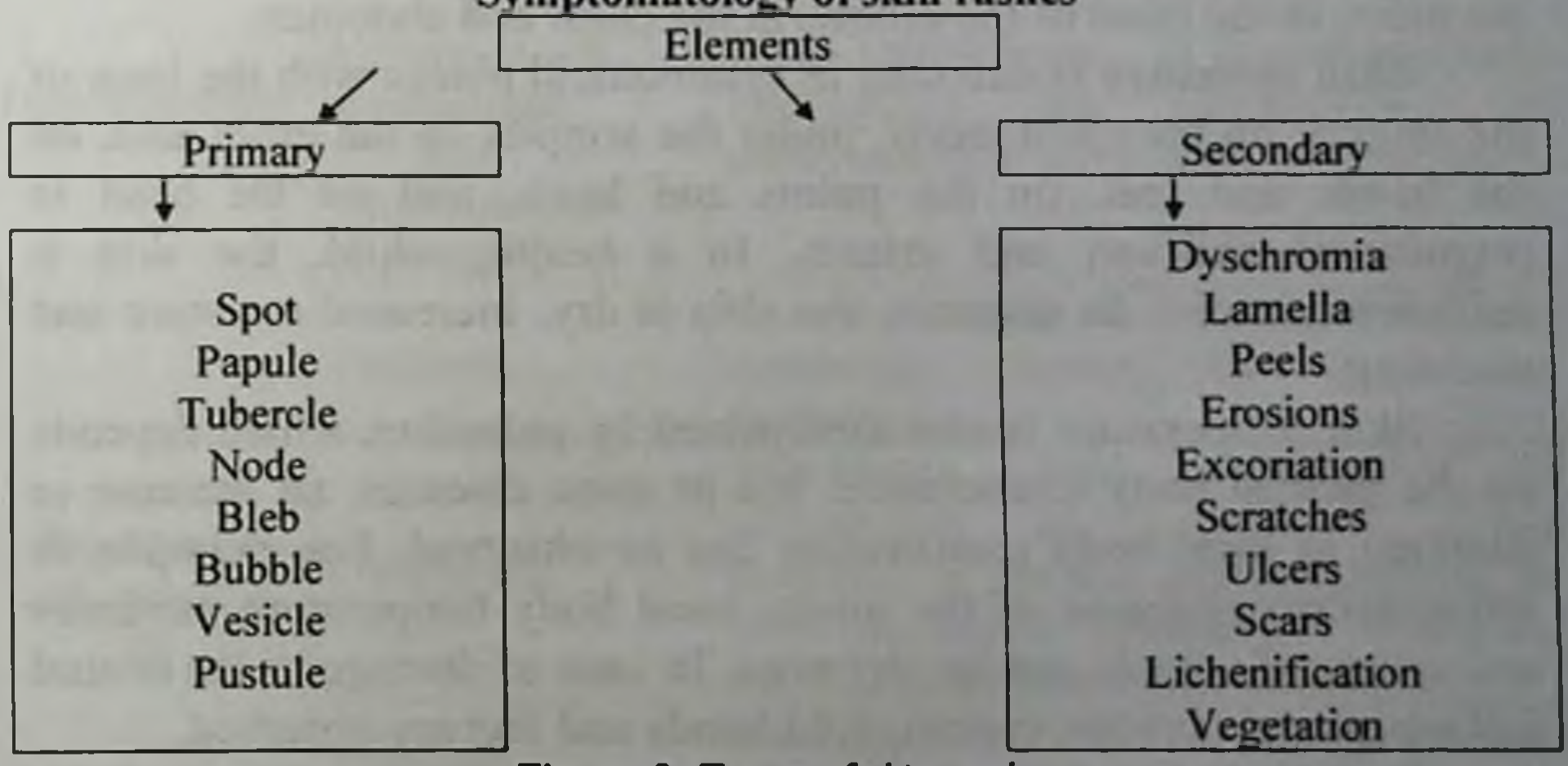

Figure 2. Types of skin rashes

When examining the hairy part of the head, we pay attention to sufficient or insufficient hair growth, thickness, hair follicles, brittleness and hardness of hair, hair growth on the lumbosacral region, crown-like hair growth on the head. It is necessary to pay attention to the abundance of small hairs on the forehead and other parts of the body.

When examining fingernails and toenails, it is necessary to examine their shape and surface. In addition, it is necessary to check the lower eyelid and the mucous membrane of the oral cavity, which is visible to the eye (color, gloss, presence of scratches). The oral cavity is examined inthe last turn in young children, as most children react negatively to this procedure. After examining the skin and subcutaneous fat, palpation begins.

Palpation should be done slowly, superficially, without causing pain to the child. The doctor's hand should be clean, warm and dry. During palpation, facial expressions of the child are observed, it is necessary to talk with him to distract from the examination.

In the palpation examination, importance is given to the thickness, elasticity, moisture, temperature and pain of the skin (table 2).

Determination of skin thickness and elasticity, the skin is folded with the thumb and index finger (without the subcutaneous fat layer) and the thickness is determined, then released. If the fold is smoothed out quickly, the skin elasticity is normal, if it is smoothed out slowly, the elasticity is reduced. Elasticity is determined on the back of the palm, in the bend of the elbow, in the chest and abdomen.

Skin moisture is detected in symmetrical places with the back of the fingers: on the chest, body, under the armpits, in the groin area, on the hands and feet, on the palms and heels, and on the head in prepubertal children and infants. In a healthy child, the skin is sufficiently moist. In diseases, the skin is dry, increased moisture and sweating.

Skin temperature is also determined by palpation, which depends on the general body temperature, but in some diseases, an increase or decrease in local body temperature can be observed. For example, in inflammatory diseases of the joints, local body temperature increases and spasm of vessels can be observed. In case of damage to the central and peripheral nervous system, cold hands and feet are observed.

Endothelial testsareconducted to assess the condition of the blood vessel wall. **Konchalovsky-Rumpel-Leede test**or a torniquet test, a rubber tourniquet or an arterial blood pressure cuff is placed on the middle third of the shoulder. Pressure is applied until the venous blood flow stops and a pulse should be detected in the ulnar artery. The tourniquet is put on for 3-5 minutes. When vascular fragility increases, more than 4-5 petechial hemorrhages appear below the tourniquet.

Table 2.

Features of palpation of skin and subcutaneous fat

Examination methods	Clinical symptoms	Characteristics (clinical examples)
Skinpalpation	Thickness, elasticity	Normal, decreased (hypotrophy, dystrophy, dehydration)
	Moisture	Sufficiently moist, dry (dehydration, hypotrophy, atopic dermatitis, ichthyosis); profuse sweating (vegeto-vascular dystonia, fever)
	Temperature	Normal, high (fever, inflammatory process, damage to the nervous system)
Endothelialtests	Konchalovsky-Rumpel-Leede test	Positive - up to 4-5 elements of petechial rash in the area of elbow flexion (increased vascular fragility)
	"Pinch" symptom	Positive - bleeding occurs in the pinched area after 24 hours (increased vascular fragility)
	"Hammer" symptom	Positive - bleeding after 24 hours in the chest area (increased vascular fragility)
Dermographism	1. Appearance 2. The speed of appearance and disappearance 3. Size (dispersed, non-dispersed)	White (predominance of sympathetic nerve innervation), red (predominance of parasympathetic nerve innervation), mixed
Palpation of subcutaneous fat	Thickness	Fat distribution is normal, excessive (paratrophy, obesity), low (hypotrophy, dystrophy)
	Consistency	Scleroderma –focal hardening of the subcutaneous fat, sclerema - diffuse hardening of the skin and subcutaneous fat layer, scleredema - thickening of the skin and subcutaneous fat layer with swelling
	Swellings	Local, general, anasarca (kidney diseases, heart failure)
	Turgor	Normal, decreased (lethargy and relaxation in hypotrophy, dehydration)

"Pinch" symptom: to check this symptom, the skin on the front or side surface of the chest is folded with the thumb and index fingers of both hands (there should be 2-3 mm between the fingers of the right and

left hands) and the parts of the fold are not facing each other - is pulled to the opposite side (like tearing paper). This test is determined after 24 hours. A positive symptom is when a petechiae appears at the pinch site.

"Hammer" symptom: the sternum is hit painlessly with a percussion rubber hummer. The appearance of hemorrhages on the skin indicates that the symptom has a positive result. The symptom is evaluated after 24 hours.

Examination of dermographism is conducted to determine which type of autonomic nervous system prevails in the patient. Phonendoscope angle orthe handle of the hammer is driven on the chest or abdomen. The period until a white or red line appears in the walking area (5-20 sec) is considered a latent period. Depending on the rate of disappearance of the scar, dermographism is evaluated as stable or unstable. White line - indicates the dominance of sympathetic nerve innervation, disappears after 8-10 seconds; red line – called red dermographism, disappears after 2-3 or more minutes, and this indicates the predominance of parasympathetic nerve innervation.

A painful dermographic reflex is observed when the skin is pricked with a needle tip. In this case, after 10-15 seconds, red spots up to 5 cm in width will appear at the place of contact of the needle, and this will last for 3-5 minutes or more.

The surface of the body is determined according to tables and nomograms, taking into account body weight and height (Appendix7).

Examination of the subcutaneous fat layer. When examining a child, it is also important to assess the level of development and spread of the subcutaneous fat layer. It is necessary to draw conclusions about the condition of the subcutaneous fat layer only after palpation. During palpation, the skin and subcutaneous fat layer are folded with the thumb and index finger of the right hand. The thickness of the subcutaneous fat layer is checked in several places, because the accumulation of fat in pathological conditions is different. Subcutaneous fat is checked successively on the abdomen (in the navel area), the chest (at the edge of the sternum), the back (under the shoulder girdle) the arms and legs (on the inner surface of the thighs and shoulders), the face (cheeks). According to the thickness of the subcutaneous fat layer, fat accumulation is assessed as normal, excessive or low. The level of development of the subcutaneous fat

layer can be assessed by somatoscopic method, by the determination of the bone relief in the shoulder girdle. When the subcutaneous fat layer is poorly developed (1 point), the contour of the shoulder girdle bones is clearly visible; when it is moderately developed (2 points), the relief of the shoulder girdle bones is somewhat flattened; when it is more developed than normal (3 points), the bone relief is smoothed, the contours are rounded.

Depending on the thickness of the subcutaneous fat layer:

- Local thickening of the subcutaneous fat layer -*scleroderma*;
- If subcutaneous fat is dense everywhere - sclerema;
- Thickening and swelling of the subcutaneous fat layer - scleredema.

Edema can be general and local (on the face, eyelids, hands and feet, general edema is called diffuse). Swelling on the face is visible on examination. Swelling in the legs should be detected by palpation. For this, the front surface of the tibia in the lower third is pressed with three fingers (index, middle, ring finger) of the right hand. If visible dimples appear after pressing, this is a sign of swelling, if the unevenness of the pressed area is detected only by palpator, it is called a pastiness. A healthy child does not detect swelling and stiffness.

When determining soft tissue turgor, the soft tissues on the inner surface of the thigh and shoulder are pressed with the thumb and index finger, and the feeling of resistance or tension is considered as turgor. When soft tissue turgor decreases, flabbiness and weakness of soft tissue is observed.

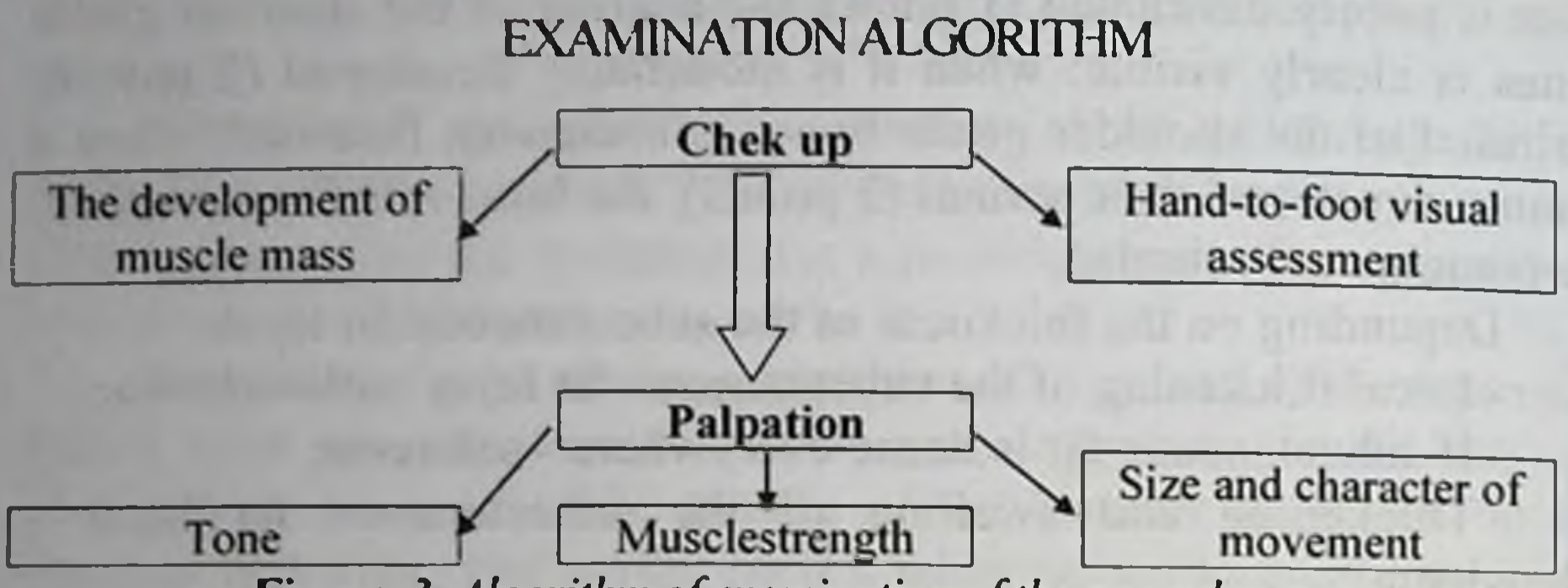

Figure. 3. Algorithm of examination of the muscular system

The level of muscle development or muscle mass, tone and strength, as well as the volume and nature of movements are determined (fig.3, table 3).

The level of muscle development is evaluated by the relief of the muscles and its tone.

There are 3 levels of muscle development and muscle tone:

- Weak - the muscles feel soft, flabby, and the relief is not well expressed when palpated (1 point);

- Strong - the relief of the muscles is clearly expressed, the muscles are tense, hard (3score);

- Average – intermediate status (2 points).

It is difficult to determine the level of muscle development in young children, because the subcutaneous fat layer is well developed. In this case, the diameter of the shoulder is found in the following formula (in this measurement, the circumference of the bone is also taken into account): C = S-p*A, where C is the diameter of the shoulder muscles, S is the circumference of the shoulder, A is the thickness of the subcutaneous fat layer, p = 3.14. The obtained indicator is compared with the standards according to Hammond, Tanner and Whitehouse (Appendix 3). In this way, it is possible to determine the level of development of the child's muscles.

In young children, muscle tone is determined by passively bending the arms and legs and writing. Muscle tone is assessed based on the level of resistance and palpable consistency of the muscle tissue. Normally, muscle mass and tone should be the same in symmetrical areas. Increased muscle

tone is considered as muscle hypertonia, decreased muscle tone is considered as muscle hypotonia.

In toddlers, muscle strength is evaluated according to the child's voluntary movements (sit, walk, hold themself). In older children, muscle strength is checked using a dynamometer. A table of standards is used to assess arm muscle strength and body strength.

Table 3.

Peculiarities of examination and palpation of the muscular system

Examinationmethods	Clinicalsymptoms	Characteristics, clinicalcriteria
Examining individual muscle groups (from top to bottom)	Muscle mass: • Decreased • Atrophy • Hypertrophy	Suitable for age, gender; decrease in muscle mass (severe diseases, skinny children, prolonged bed rest, myopathies, myasthenia); atrophy (as a result of inactivity, myopathies, progressive muscular dystrophy, peripheral or central motor neuron damage - trauma, tumors, degenerative and inflammatory diseases of nerve columns); hypertrophy (exercise)
	Symmetry	Asymmetry of muscle mass (retardation of development, traumatic muscle deformation, diseases of the nervous system)
	Walking (moving)	Physiological, pathological
	Height	Infant scoliosis (incorrectly laying the child, rickets), compensatory scoliosis (after hip fracture, poliomyelitis), paralytic scoliosis (paralysis, paresis, myopathies), kyphosis, kyphoscoliosis (congenital anomalies of ossification, spine aseptic necrosis of bodies, rickets)
Palpation	Muscle tone Muscle hypotonia	Premature birth, immaturity, damage to neuromuscular synapses (botulism, myasthenia), damage to spinal nerves (spinal amyotrophies, poliomyelitis), brain damage (infantile cerebral palsy (ICP), columnar encephalitis, small chorea in rheumatism, brain trauma), acute and chronic malnutrition, water-salt

		metabolism disorders, rickets
	Muscle hypertonia	Physiological hypertension in children under 4 months, hypertonus in primary muscle diseases (myotonia), damage to neuromuscular synapses (strychnine poisoning, tetanus), damage to spinal cord nerves (meningitis, tumors, hematomyelia), hypocalcemic tetany
	Muscle strength	Decreased (eating disorder, sedentary lifestyle, rickets, myopathies, myasthenia)
	Movement activity	Decreased (nervous system damage, paresis, paralysis)

THE BONE-JOINT SYSTEM EXAMINATION METHODOLOGY

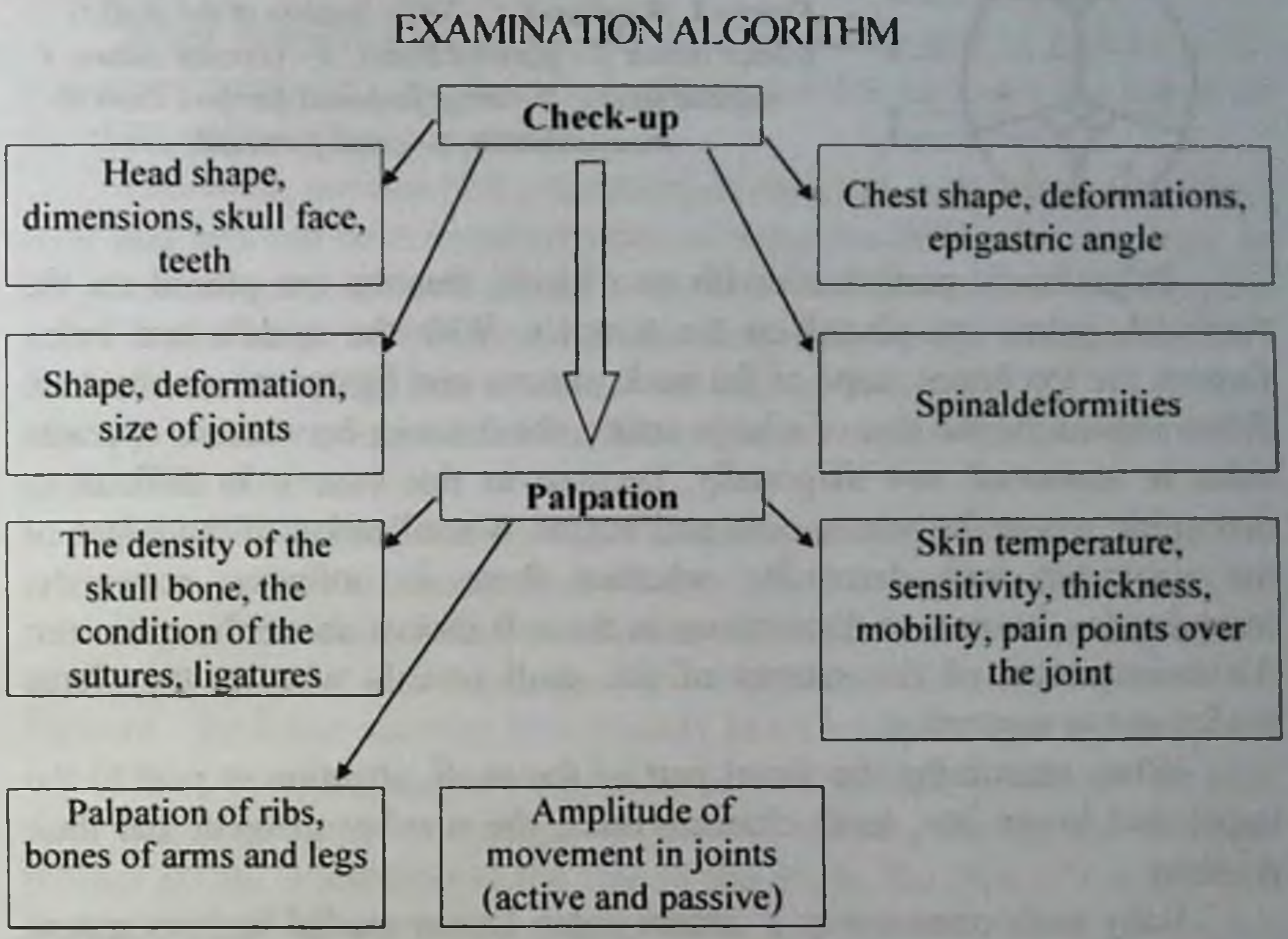

Figure 4. Bone system and joint examination algorithm

The method of objective examination of the bone system consists of examination, palpation, percussion and measurement (Fig. 4, Tables 4, 5).

The examination is carried out when the child is lying down, sitting and standing, the hands should be freely down. Then attention is paid to the child's movements: he is instructed to walk, sit, write and bend his arms and legs. It is possible to assess the state of the bone-joint system of toddlers by watching when they are planning.

The skeletal system begins with an examination of the head, then the body (chest, spine), arms and legs are examined.

When examining the head, attention is paid to its size and shape. To accurately determine the head circumference, it is measured with a centimeter tape.

The density of skull bones is determined by palpation, the position and size of sutures and ligatures in children of breast age are determined, the edges and density of large ligatures are checked (Fig. 5).

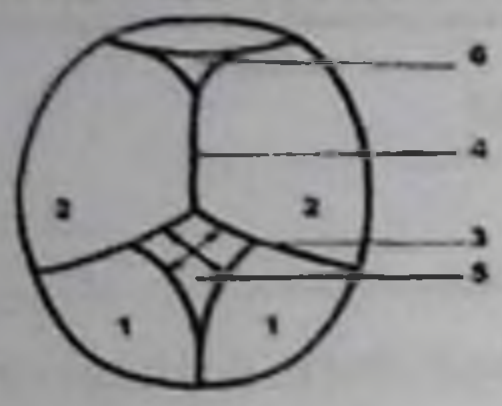

Figure 5. (Kapitan T.V., 2005) Sutures of the skull: 1 – frontal bones. 2 – parietal bones. 3 – coronal suture. 4 – sagittal suture. 5 – large fontanell (arrows show its measurement), 6 –small fontanell.

Palpation is performed with two hands, thumbs are placed on the forehead, palms are placed on the temples. With the middle and index fingers, the top bones, nape of the neck, sutures and ligaments are checked. When measuring the size of a large suture, the distance between its opposite sides is measured, not diagonally, because in this case it is difficult to determine where the suture ends and begins. Visualization of the edges of the sphincter will determine whether there is softness, concavity, irregularities, bumps, or depressions in the soft tissues above the sphincter. An examination of the sutures of the skull reveals whether they have tenderness or separation.

When examining the facial part of the skull, attention is paid to the upper and lower jaw, teeth characteristics, the number of teeth and their position.

Baby teeth come out in a certain order. Lower medial incisors appear at 6-7 months, upper medial incisors at 8-9 months. Lateral incisors (upper and lower) come out at 10-12 months. So, a child should have 8 teeth at the age of 1 if he/she is developing normally. After one year (at 12-15 months), the first molars appear, at 18-20 months the canine teeth, at 20-30 months the second molar teeth emerge.

In pediatric practice, the number of teeth that children under 2 years of age should have is found in the following formula: **number of teeth = n - 4**, where n is the child's age (in months).

Milk teeth change to permanent teeth at the age of 5-6. The first molars come out first, at the age of 6-8 the incisors are replaced, at the age of 8-9 - the lateral incicors, at the age of 10-11 –the canine teeth, at the age of 9-12 - the premolars are replaced, at the age of 12-13 the second molars, at the age of 18-25 third molars (wisdom teeth) appear at the age of Girls teething occurs faster than boys.

The following formula can be used to determine the number of permanent teeth for a certain age in comparison with normative indicators (regardless of gender):

X (number of permanent teeth) = 4n - 20, where n is the child's age (in years).

When examining the spine, attention should be paid to physiological curvatures (neck lordosis, thoracic kyphosis, lumbar lordosis), the height of the child, pathological curvatures.

The shape, position and proportions of the head, neck, chest, shoulders, arms and legs can be determined when viewing the child from the front. In the posterior view, attention is paid to the degree of formation of the shoulder scapulae, the shape of the spine, the symmetry of the waist triangles (formed by the inner line of the arm and the waist line on both sides). Pelvic flexion, hip-to-leg ratio, spinal curvature, limb flexion, and writing angles were determined in lateral view..

When examining the chest, its shape, symmetry, location of the ribs in relation to the chest and spine are evaluated. Other breast deformities: pectum carinatum or pectum excavatum. Garrison's furrow (a depression at the junction of the diaphragm, in which the rib arches are turned forward - the lower aperture is widened), heart hump is also important.

The size of the epigastric angle was determined. To determine this, both hands are placed upright on the rib arches, facing the sternum (corner point). According to the size of the angle, the type of constitution is determined: normosthenic (angle 90°), hypersthenic (obvious angle), asthenic (acute angle).

Palpation of the chest is done with the fingers along the ribs, from the anterior axillary line to the sternum. On palpation of the ribs, healthy children have little noticeable thickening at the junction of the rib to the auricle. In rickets, large bulges are detected at the border of the connection of bony and cartilaginous parts of the ribs (overgrowth of osteoid tissue, the ribs are inside the midline of the vertebral bone, called "rib beads").

When examining the hands, attention is paid to the symmetry of the bones and their size, and by palpation it is possible to determine the thickening of the ulnar epiphysis area (bracelets). Palpation is carried out with the child's arm slightly bent at the elbow joint, along the back surface of the joint, in the presence of bracelets, roller-like swellings are detected. With palpation, it is possible to identify bumps in the body of the phalanx of the fingers (in the diaphysis) (strands of pearls).

When examining the legs, there is symmetry of the buttock folds, the number of folds on the inner surface of the thigh (especially in newborns and

children under 1 year), shortness of the leg, X or O-shaped curvatures (Fig. 6), flat feet (Fig. 7) it is necessary to pay attention to its absence.

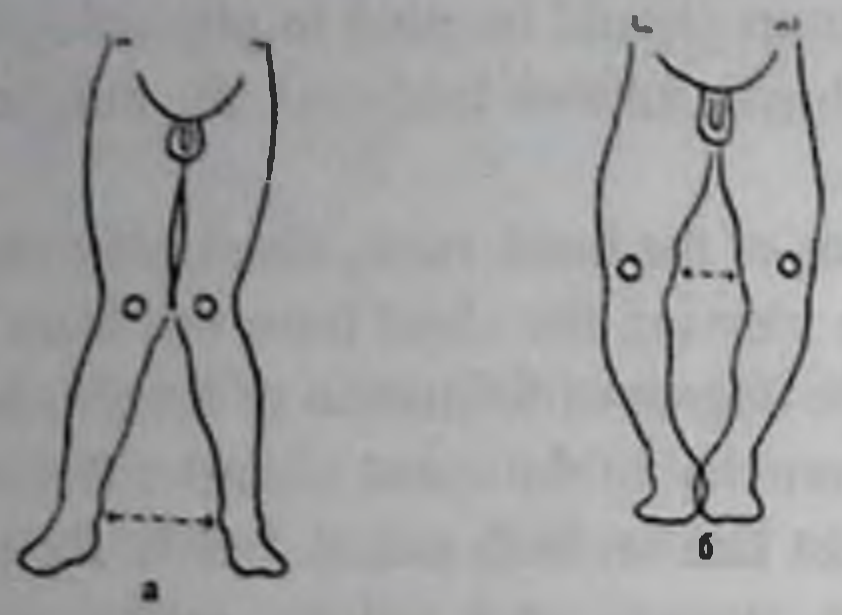

Figure 6. Types of leg deformation: a – X-shaped, b – O-shaped.

Figure 7. Plantogram (normal heel, flat valgus heel)

Examination of the joints is carried out by examiantion and palpation at the same time as examination of the bone and muscle system. During the examination, the shape of the joints, the presence of deformations, the colour of the skin in the joint area and its changes are determined. Joints with a centimeter tape: symmetrical areas are measured in the same places. The amplitude of active and passive movements is measured with a protractor.

By palpation, the temperature of the skin of the joint, the sensitivity, thickness and mobility of the skin over the joint, localization of swelling, point pain are determined.

In some pathological cases (diseases of the hematopoietic system), pain is detected in the bones (ribs, tubular bones) by direct percussion.

Table 4.

Features of the examination of the skeletal system

Examination methods	Clinical symptoms	Characteristics (clinical examples)
Examination of the head	Shape	Normally round, pathological forms - square, "Olympic" forehead, buttock, saddle deformity, tower-shaped skull, etc. (rickets, congenital syphilis, pathological bone fragility)
	The presence of deformations	Macrocephaly - increased head size (hydrocephaly, osteoid hyperplasia in rickets), microcephaly - reduced head

		size (deficiency of the brain in the fetus, craniostenosis - premature closure of the sutures of the skull).
	Facial part of the skull, teeth	Depression of the nasal cavity. strabismus (deformation of the base bones of the head). reduction of the transverse dimensions of the upper jaw, "gothic" palate. prognathism - protrusion of the front part of the upper jaw (congenital defects and developmental abnormalities)
	Teeth: • Number • The ratio of milk and permanent teeth • Growth direction • Wholeness • Enamelcolor	Late teething (hypothyroidism. rickets. severe eating disorders, Down's disease), overcrowding - supernumerary teeth. congenital absence of teeth, misalignment of growth. Getchinson's teeth - upper molars barrel-shaped deformation and incisal edge semi-oily (congenital syphilis), dentine and enamel defects (severe rickets and its complications, mineral and protein metabolism disorders), abnormal color of enamel: tooth decay darkening of the skin (iron preparations. bacteria of the leptotrichia group). yellow-mal color (tetracycline), yellow-green color - chlorodontia (severe hyperbilirubinemia during the newborn period, chronic hemolytic syndromes), red color - erythrodontia (congenital porphyria, disorder of porphyrin metabolism),caries - erosion of hard tooth tissues (rickets. ectodermosis. eating a lot of **sweets)**

Examination of the chest	Shape, the presence of deformations	Elevation of the chest in case of swelling of the lungs (obstructive bronchitis, bronchial asthma, bronchiolitis), asymmetry of the chest: "chicken chest", "bootstrap" chest, funnel-shaped chest (rickets, scoliosis, lung development defects, bone or muscle pathologies), Filatov-Garrison syndrome - subsidence at the junction of the diaphragm (rickets, rickets-like diseases), "rickets beads", heart curvature (heart defects accompanied by right heart strain)
	The size of the epigastric angle	Normosthenic type of constitution - 90°, hypersthenic - obtuse angle, asthenic - acute angle
Examination of the spine	Whether there are curvatures or not	Lordosis - forward bending of the spine, kyphosis - backward bending, scoliosis - sideways bending (rickets, rickets-like diseases)
	Position of lumbar triangles	Normally symmetrical
Examination of hands and feet	Shoulder girdle and the relative length of the humerus	Long arms (Marfan's disease), Short limbs (chondrodystrophy)
	Whether there are deformations	Bulges in the diaphysis of bone phalanges (osteopathies), thickening of small interphalangeal joints (rheumatoid arthritis)
	The symmetry of the buttock folds, the number of folds on the inner surface of the thigh	Normally symmetrical, the number of folds is the same on both sides
	Crooked legs	X-shaped and O-shaped (rickets, rickets-like diseases)
	Heel deformation	Clubfoot - equinovarus heel (as

		a result of congenital developmental defects, paralysis), horse heel - heel in a strongly flexed position (as a result of weak or spastic paralysis - carpopedal spasm in spasmophilia)
	Flatfeet	Pseudoflat feet (due to fat pad on the heel in children under 18 years old), pathological flat feet (general weakness of connective tissue, hypotonic form of cerebral palsy in children, weak paralysis in poliomyelitis)
Examination of joints	Shape, size, deformations	Deformations, increase in size (swelling in mesh arthritis, rheumatoid arthritis)
	The color of the skin above the joint	Hyperemia of the skin over the joint (infectious, traumatic or rheumatic arthritis)
	Movement amplitude	Limitation of movement, pain when moving (arthritis, systemic diseases of connective tissue)

Table 5.

Features of palpation of the bone-joint system

Examination methods	Clinical symptoms	Characteristics, clinical examples
Head palpation	Density of skull bones	Normally, the bones are dense, in newborns, the edges and sutures are somewhat softer, pathological softening of the occipital bone - craniotabes (rickets), bone defects in the area of the parietal and transverse sutures (xanthomatosis).
	• Suture, fonatanel conditions • Size • Condition of the connective tissue membrane	Early closure of the large fontanel (pathological acceleration of the ossification process, microcephaly), late closing of the fontanel (rickets, hydrocephalus), diastasis of sutures, increased pulsation, bulging (increased internal pressure of the brain in

	(swelling, retraction, pulsation) • The condition of the edges of the fontanel (flatness, uniformity)	hydrocephalus, meningitis), retraction of the fontanel (dehydration - ecchymosis)
Palpation of ribs	Deformation, thickening	Hemispherical protrusions - "rosaries" (rickets) in the transition from the bone part of the ribs to the cartilagenous part.
Palpation of the bones of hands and feet	Painful	Bone palpation is usually painless, painful (osteomyelitis)
	Deformation, thickening	Thickening in the area of the epiphysis of the ulna - wrists (rickets), bumps on the diaphysis of the phalanges of the fingers "strings of pearl" (rickets)
Palpation of joints	Temperature, sensitivity, thickness and mobility of the skin over the joint. Thickening, swelling. Localization of pain points	Inflammatory symptoms: swelling of soft tissues, hyperemia, limitation of movement and pain, local temperature increase (arthritis - in infectious, traumatic, rheumatic, connective tissue systemic diseases)

EXAMINATION ALGORITHM

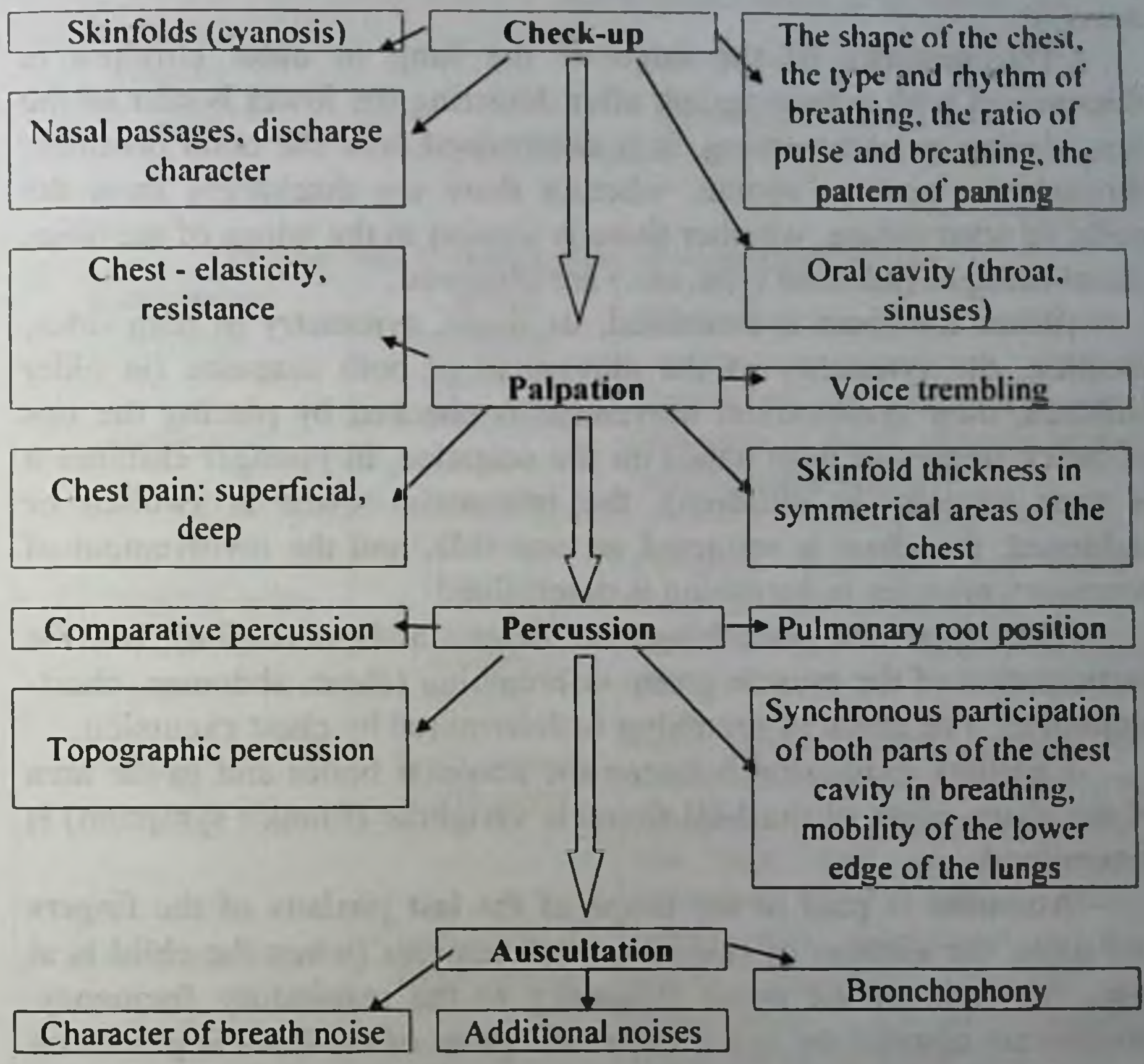

Figure 8. Algorithm for checking the respiratory system

Complaints and anamnesis are determined by inquiry: when and how the child got sick, the dynamics of the main symptoms of the disease are asked. Changes in voice, character of cough are evaluated.

Objective examination of respiratory organs includes the following methods: examination, palpation, percussion and auscultation (Fig. 8).

Check-up (table 6). A general examination begins with the child's face. The colour of the skin and visible mucous membranes,

the presence and degree of cyanosis, whether the cyanosis is constant or occurs when the child sucks, cries, during physical exertion, the spread of cyanosis (perioral, general, hands and feet)) is taken into account.

The mobility of the edge of the lung in older children is determined with a dermograph after detecting the lower border of the lung during quiet breathing. It is determined how the child breathes: through the nose or mouth, whether there are discharges from the nose, of what nature, whether there is tension in the wings of the nose, facial changes (adenoid type, etc.) are observed.

When the chest is examined, its shape, symmetry of both sides, location, the symmetry of the movement of both scapulae (in older children, their symmetrical movement is checked by placing the tips of index fingers of both hands on the scapulae, in younger children it is seen visually in children), the intercostal space is swollen or tightened, the chest is retracted on one side, and the involvement of accessory muscles in breathing is determined.

The type of breathing is determined according to the participation of the muscle group in breathing (chest, abdomen, chest-abdomen). The depth of breathing is determined by chest excursion.

Capillary expansion between the scapular bones and in the area of the sharp edges of the I-III thoracic vertebrae (Frank's symptom) is determined.

Attention is paid to the shape of the last phalanx of the fingers and nails, the number of respiratory movements (when the child is at rest), the ratio of the pulse frequency to the respiratory frequency. Breaths are counted by eye or when the palm of the hand is placed on the child's chest or stomach, in newborns and children of weaning age, the number of breaths can be counted by bringing the stethoscope closer to the child's nose. The number of breaths is counted for at least one minute (newborns may have physiological apnea). The following types of dyspnea are distinguished when breathing is accelerated:

- inspiratory (difficultybreathing);
- expiratory (difficultyexhaling);
- mixed (both phases of breathing are difficult).

Conditions affecting the type of dyspnea are presented in Figure 9. Breathing rhythm is also determined during the examination.

Inspiratory dyspnea	→	Obstruction of the upper respiratory tract, goiter, foreign body, cysts and tumors, congenital narrowing of the larynx, trachea and bronchi, abscess of the larynx, etc.
Expiratory dyspnea	→	Obstructivebronchitis, bronchialasthma
Mix dyspnea	→	Bronchiolitis, pneumonia

Figure 9. Dyspnea types

Table 6.

Peculiarities of examination of respiratory organs

Examination methods	Clinical symptoms	Characteristics, clinical examples
Appearance	Cyanosis • Permanent • Local • General	Cyanosis of the skin, oral mucosa (shortness of breath, diseases of the cardiovascular system)
Examination of the nasal passages	Discharge character Foreign body Diphtheria plaque	Discharge from the nose: serous, mucous, mucous-purulent, crusty, bloody (rhinitis of mixed etiology, diphtheria)
Voice	Voice change Suffocation	Harsh barking cough, change in voice, difficulty exhaling (diphteria – true croup and false croup -ARVI)
Oral examination	Condition of the throat, tonsils	The back wall of the larynx, hyperemia of the arches (pharyngitis), enlargement of the tonsils, hyperemia, spot-like or membranous plaques (angina, diphtheria of the throat)
Chestshape	Cylindrical Barrelshaped Deformations	See Table 4
	Synchronous participation of both sides of the chest in breathing	Shortness of breath on one side (pleurisy, tuberculous bronchoadenitis, atelectasis, chronic pneumonia)
	Chest Excursion (Mobility)	Excursion restriction (acute pulmonary edema, bronchial asthma, pulmonary fibrosis, intercostal neuralgia)

	Pulse and respiratory rate ratio	Normal ratio is 3-3.5:1 (in children under 1 year old), 4:1 (in older children), 2:1, 3:1 (lung diseases)
	Breathing rhythm	Acceleration of breathing – tachypnea (in case of damage to the respiratory system, diseases of the cardiovascular system, anemia, fever, distress syndrome, pain), decreased breathing - bradypnea (uremia, poisoning with sleeping pills, increased intracranial pressure, newborn terminal stage of distress syndrome in premature babies), pathological types of breathing: Kussmaul-type breathing (disorders of exchange processes with acidosis - diabetic coma, acetonemic addition, kidney tubule diseases), Cheyne-Stokes type breathing (heart or end-stage renal failure, brain tumors, encephalitis, meningitis), Biot-type breathing (reticular brain lesions) (Fig. 10)
	Participation of accessory muscles in the act of breathing	Difficulty of breathing indicates dyspnea (Fig. 9)

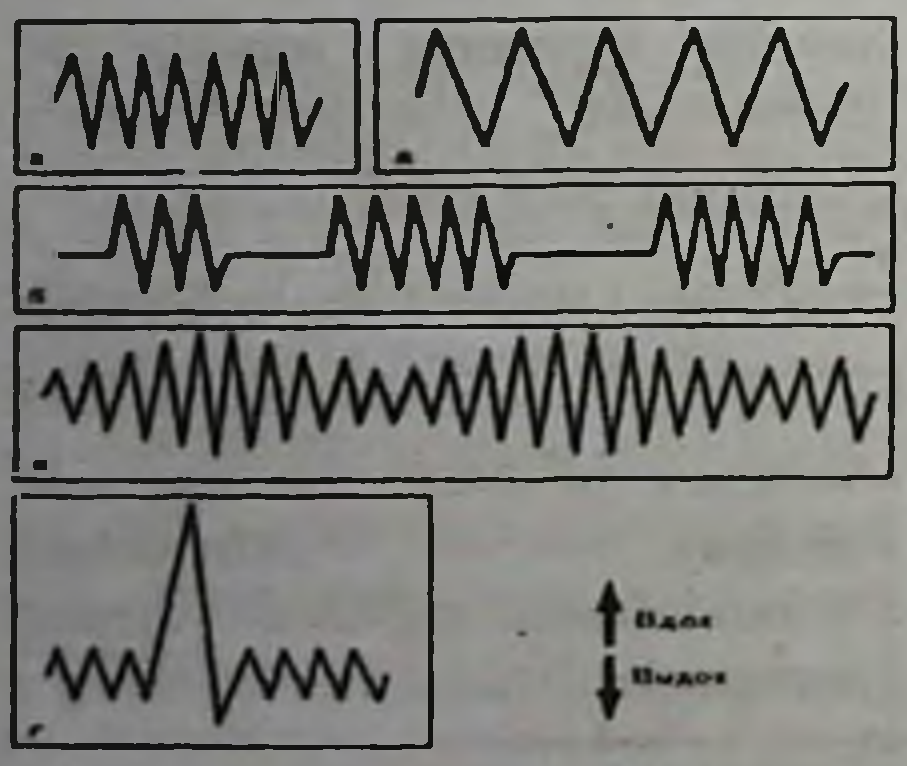

Figure 10. *Respiratory rhythm disorders: a – normal breathing, b – Biot type, v – Cheyne-Stokes type, g – breathing with exhalation, d – Kussmaul type breathing.*

Palpation. By palpation, the condition of the skin in the chest area is determined (local profuse sweating, increased sensitivity - hyperesthesia,

swelling). Palpation is done by light stroking with both hands, where the hands are placed in symmetrical areas of the chest. Palpation allows you to determine the location and degree of pain in the chest. Resistance was determined by pressing the chest from front to back and from the side. To detect voice tremors, the palms of the hands are placed symmetrically on the chest and the child is asked to repeat the words: "rector", "prorector", "director", the sounds used when children cry. In this case, chest vibration is felt from the vibration of the voice. Normal tremors in the upper part of the chest, especially on the right side of the spine and in-between the upper edge of the scapulawill be strong. When checking the development of skin and subcutaneous fat layer in symmetrical areas of the chest, attention is paid to the thickness and turgor of folds.

Percussion. During lung percussionit is necessary to pay attention to the symmetry of the position of the chest. Percussion of the front surface of the chest in early children in the supine position is easy, and young children need to be held by someone. Children who cannot hold their heads are placed on their stomach or on the palm of left hand (the thumb holds the child under the left armpit, the index finger on the right vertebral bone, the other fingers on the right side of the chest) is percussed from behind. When percussing children under one year of age, they should be in a vertical position, the assistant holds the child in his hands. Children 2-3 years old are examined sitting on a table, and older children are examined standing. During percussion of the back, the child is instructed to bend forward. In anterior surface percussion, the child should have lowered his hands. Severe patients can be percussed sitting or lying down, but the body should be positioned symmetrically on both sides.

In children, percussion is mainly performed directly. In older children or children with a well-developed subcutaneous fat layer, indirect percussion can be performed.

Direct percussion: the middle and index fingers of the right hand are placed along the ribs with the finger in a half-bent position. When hitting with a half-bent finger or a falling finger, it is necessary to pay attention to the fact that not only the finger, but also the whole palm moves like a pendulum. In this case, the sound is clear, concise and gives full information about the density of the environment. In direct percussion, together with the character of the resulting sound, it is possible to determine the boundaries of the dense environment.

Indirect percussion: The middle finger of the left hand should act as a plessimeter and stick tightly to the examined area. Percussion strokes are performed with the right index finger, the finger should be bent at the interphalangeal joints and should not touch other fingers. The middle phalanx of the left index finger is struck, the blow should be short, it should be struck with movement not only in the palm of the hand, but also in the elbow joint. In children, percussion is usually performed more slowly, the direction of percussion is from a clear sound to a dull sound, hitting the intercostal space or the ribs.

Topographic percussion of the lungs: determine the lower borders of the lungs (Table 7) starts from the right lung. In this case, the plessimeter finger is placed parallel to the desired limit. Percussion is performed from top to bottom along the midclavicular, mid-axillary and scapular lines in children under 3 years old, and additionally along the anterior, posterior axillary and paravertebral lines in children older than 3 years. Then the lower limits of the left lung are determined on the same lines. When determining the lower borders of the lungs, the child's hands are slightly removed from the body, so as not to move the borders of the lungs. In older children, mobility of the lung edge is determined. For this, the lower borders of the lungs is determined by the demographer in the usual way during quiet breathing, the child is instructed to hold a deep breath, and the lower border of the lungs is determined again.

The maximum inhalation and exhalation is the distance of the lung borders, the mobility of the lower lung borders is measured by a centimeter tape on 3 main lines.

In children under 1 year of age, the lower border of the right lung is one rib higher than the left because the liver is relatively large and supports the diaphragm.

Comparative percussion is done from the right and left along the midline, starting from the I-II ribs in early-aged children, I-III ribs in preschool children, and I-IV ribs in school-aged children.

As usual, in the case of deep exhalation, the lower border of the lungs can be determined.

The upper borders of the lungs are also determined by topographic percussion. In children under one year of age, it is performed anteriorly on the line connecting the middle of the sternoclavicular junction and the trapezoid muscle, and posteriorly on the line connecting the middle of the trapezoid muscle and the processusspinosus of the VII-cervical vertebra. In older

children, the apex of the lung is above the pubic bone. The location of the apex of the lung in this position is called Krenig's area. The width of Krenig's areas is measured in children older than 10 years. Plessimeter finger is placed in the middle of the supraclavicular fossa perpendicular to the clavicle and percussed towards the shoulder and neck. The width of Krenig areas is expressed in centimeters. Normally it is equal to 3-5 cm.

Table 7.

The lower limits of the lungs in children

Lines	Sides	Child's age	
		upto 10 years old	Over 10 years old
Midclavicular	Rightlung	VI rib	VI rib
	Leftlung	-	-
Mid-axillry	Right lung	VII-VIII ribs	VIIIrib
	Leftlung	IX rib	VIII rib
Scapular	Right lung	IX-X rib	X rib
	Leftlung	X rib	X rib
Paravertebral	the level of the XI processus spinosus of the thoracic vertebrae		

Comparative percussion allows to find areas of pathology depending upon the lung sound. The anatomically identical right and left lung regions are compared. Then the right and left sides are compared along the anterior, middle and posterior axillary, scapular and paravertebral lines, percussion is done sequentially. The plessimeter finger is placed between the ribs in all areas of the lungs, and between the shoulder blades, parallel to the spine. When percussing the front and side surfaces of the chest, the child should put his hands on his head, and lower them when percussing the back surface. During percussion, the child's head is slightly bent forward.

The following sounds can be determined on lung percussion:

1. Clear pulmonary sound
2. A muffled sound of different tones:

a) low muffled sound;

b) absolute muffled sound;

s) muffled sound with a tympanic tone.

3. Different tones from tympanic to box-like sound (like over the guts).

In healthy children, each part of the lungs gives its own sound. The percussive sound is short at the root of the lung, lower, and high under the scapulae. The liver affects the volume of the sound under the right scapula.

In the normal position of the lungs and bronchi above the root of the lung, a relatively muffled lung sound is detected. The border of this area is between the scapulae in-between IV and VI ribs on the right, V and VII ribs on the left. Comparative percussion performed in symmetrical areas of the lungs allows to determine infiltrative and tumor-like changes in the lymph nodes located along the bronchial tree as well as fluid in the pleural cavity.

In exudative pleurisy, if the fluid does not occupy the entire pleural cavity, Ellis-Damuazo-Sokolov line can be determined (Fig. 11).

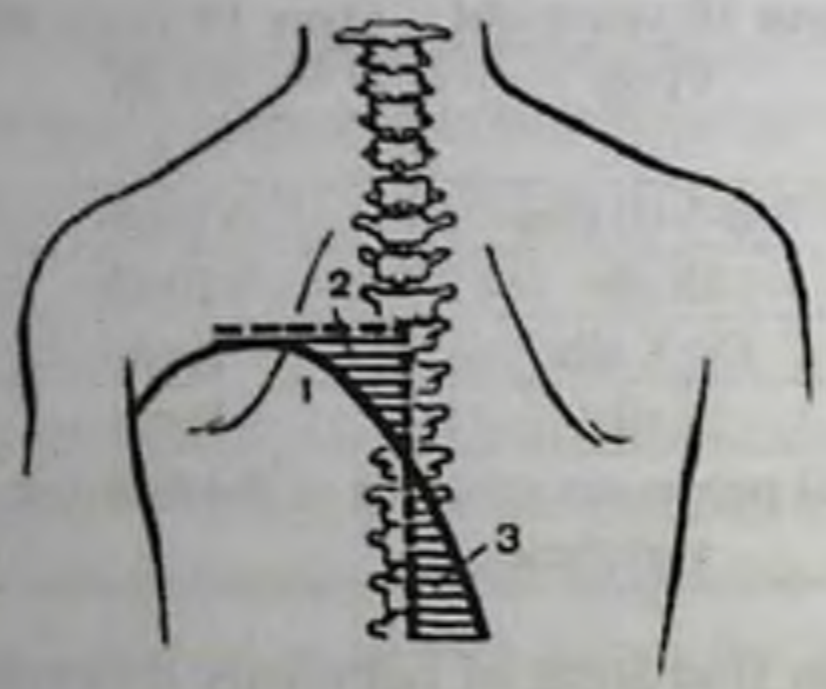

Figure 11. *Percussive sound changes in exudative pleurisy: 1 – Ellis-Damuazo-Sokolov line, 2– Garland triangle, 3 – Rauchfus-Grocco triangle*

The location of the tracheal bifurcation can be determined by tapping on the processusspinosus of the thoracic vertebral column: in the area of the processusspinosusof the IV vertebra in early-aged children, V vertebra in preschool children, VI vertebra in school-aged children. If when percussing the processusspinosusbottom-up, the percussive sound is muffled below the indicated areas, this means that the bifurcation lymph nodes are enlarged. **(Corani's symptom).**

Philosopher's bowl symptom: Percussion is made between the first and second ribs on both sides towards the sternum (plessimeter finger is placed parallel to the sternum). Normally, hoarseness is detected in the chest, in this case the symptom is considered negative. If hoarseness reaches the sternum, the symptom is positive.

Arkavin symptom: along the mid-axillary line from the bottom towards the axillary fossa percussion is being performed. Normally, hoarseness is not observed and this symptom is negative. The symptom is positive when the lymph nodes at the root of the lung are enlarged (it should be remembered that if the plessimeter finger is placed on the edge of the pectoralis major muscle, the percussive sound becomes dull, this error may lead to the conclusion that Arkavin's symptom is positive).

Auscultation. Before listening, the child's nasal passages should be cleared. The lungs are heard using a biauricular stethoscope in symmetrical places: at the tip, on the front surface of the lungs, in the lateral areas, under the axilla, in the back parts of the lungs - above, between and below the scapula, in the paravertebral areas. To hear the lingual segment, the stethoscope should be inserted into the left nipple (heart apex). Hearing and percussing the child is convenient in a sitting position, in young children, the arms are spread out or bent at the elbows and joined on the stomach. Severe patients can be heard lying down. The patient should lie flat and breathe through the nose. Preschool and school-age children should be shown breathing. The nature of the breath may be as follows:

a) vesicular - exhalation takes 1/3 of respiration;
b) rough - exhalation takes more than or ½ part of inhalation;
c) bronchial - exhalation is heard better than inhalation.

In addition, increased or decreased breath is distinguished (inhalation or exhalation increases or decreases). In this way, different variants of breath are determined: vesicular, increased roughness, weakened bronchial, etc. the causes of pathological changes in breathing are presented in Fig. 12.

When listening to children up to 6 months, the type of breathing is weakened vesicular. In children aged 6-18 months, vesicular breath (puerile breath) is heard, which increases with the prolongation of exhalation. According to the mechanism of occurrence, puerile breath is close to rough or sharp breath. To distinguish puerile breath characteristic of healthy children from rough breath observed in diseases of the bronchial apparatus, its distribution (rough breath is heard in certain areas of the lungs, while puerile breath is heard over the entire lung surface) and accompanying symptoms should be taken into account.

Additional breath noises can also be heard during auscultation: rales, crepitation, pleural friction sound. Preschool and school-age children are instructed to take deep, mouth breaths to better hear rales. To determine the nature of rales, the child is instructed to cough and the lungs are heard again. In children of breast age, crying is used, in which the child takes a deep breath.

The following patterns of rales are distinguished: dry (whistling, buzzing); moist (large, medium and small bubbled); crepitation; pleural friction sound.

Crepitation is heard only at the peak of inspiration, and pleural friction sound is heard both during inspiration and expiration. The pleural friction noise increases when the phonendoscope is pressed on the chest at the

hearing site. Rales in the lower respiratory tract should be distinguished from conductive rales in the upper respiratory tract. Conductive rales are heard well above the nose and mouth, pass to scapulae and the processusspinosus of the thoracic vertebrae, do not change in the different auscultation areas, are better felt when the palm is placed on the chest.

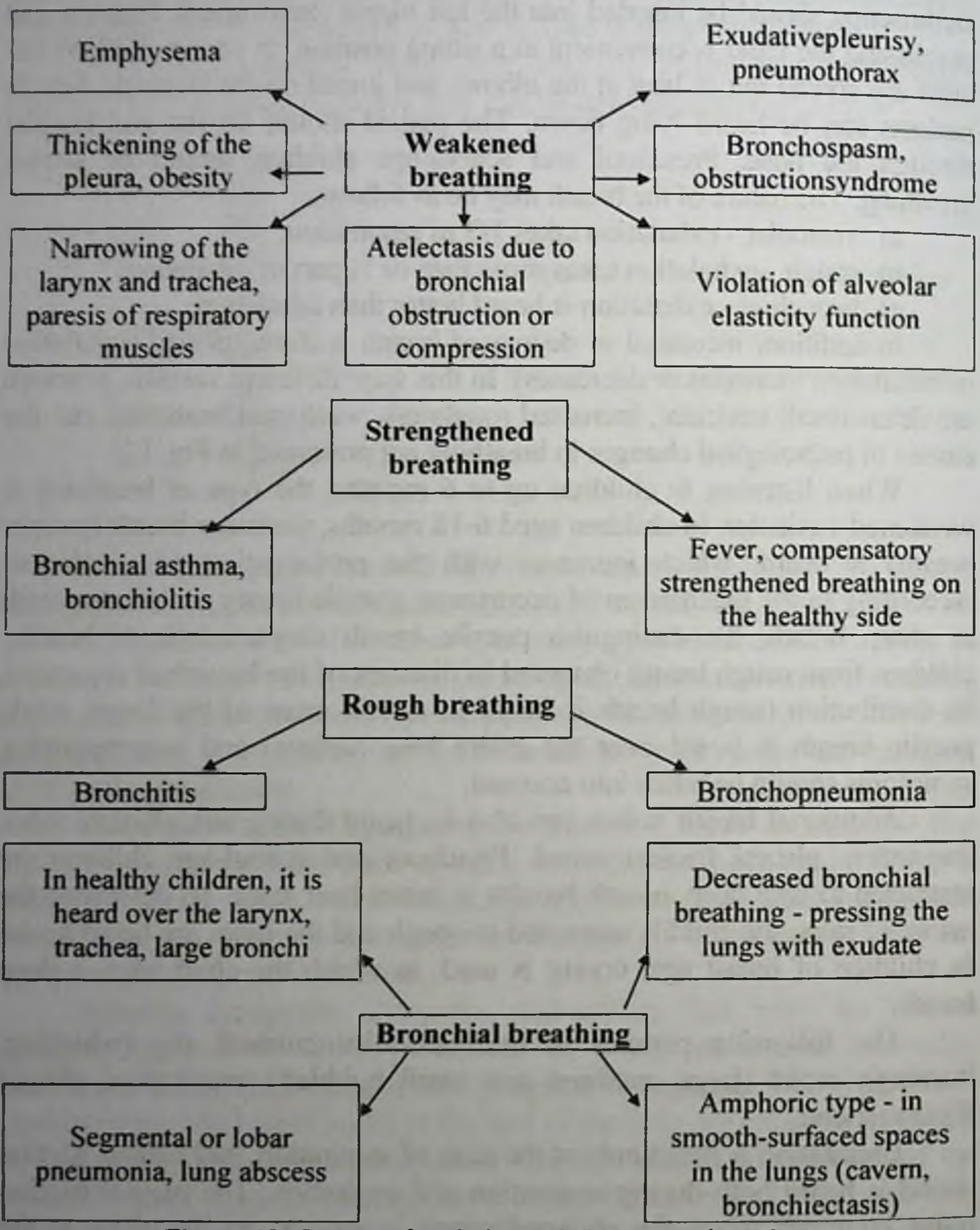

Figure 12. *Causes of pathological changes in breathing*

With the help of auscultation, bronchophonia (increased sound transmission when the lung tissue is thickened) can be heard. Bronchophonia occurs when a child cries in symmetrical areas of the chest, or when he/she repeats the following: "kis-kis", "rys-rys" etc. When the lung tissue is dense, the sound is well transmitted to the auscultation areas and the symptom is considered positive. **D'Espina's symptom:** while the child whispers ("kis-kis", "rys-rys") starting from the 7-8th thoracic vertebra, from the bottom up, it is heard over the processusspinosus of the vertebrae. Normally, the sound increases sharply in the area of 1-2 thoracic vertebrae (negative symptom).

Characteristics of palpation, percussion and auscultation of respiratory organs are shown in Table 8.

Stange-Gench functional test. It is held in children older than 4-3 years. When the child takes a maximum breath, he holds his breath (Schtange test) and stops breathing after maximal exhalation (Hench test). Breathing time is counted in seconds.

Instrumental examination methods:x-ray, bronchoscopy, bronchography, examination of external respiratory indicators, examination of gas content of blood, etc.

Table 8.

Respiratory organs features of palpation, percussion, auscultation

Examination methods	Clinical symptoms	Characteristics, clinical examples
Chest palpation	Elasticityandre-sistance	Decreased elasticity and resistance (exudative pleurisy, lung tissue tumors and thickening)
	Pain	Superficial pain (damage to muscles, nerves, bones), deep pain - pleural (increases when breathing, decreases when the chest is pressed and bent to the sick side)
	Skinfold thickness in symmetrical areas of the chest	Skin fold thickening (exudative pleurisy, especially purulent, tuberculous bronchoadenitis)
	Voice trembling	Increased voice vibration (densification of lung tissue, presence of cavities in the lungs), decreased voice vibration (bronchial obstruction, exudate, pneumothorax, pleural tumor)
Percussion	Comparative percussion	**Percussive sound dulling** (pneumonia, pulmonary embolism, pulmonary edema,

		atelectasis, pleural effusion, enlarged heart, compression by a tumor in the chest cavity, fluid obstruction la cavity destructive pneumonia, echinococcal cyst, exudative and fibrinous pleurisy), tympanic sound (cavern in pulmonary tuberculosis, abscess, tumor in the stage of decay, cyst, diaphragmatic hernia, pneumothorax), box-like sound (pulmonary emphysema)
	Topographic percussion	A decrease in the height of the peak of the lung, a decrease in the width of the Krenig's fields (in tuberculosis, swelling of the lung tissue), a lowering of the lower borders of the lungs (emphysema, keeping the diaphragm down), an increase in the lower borders (chronic inflammation inflammatory process, exudative pleurisy, pneumothorax, flatulence, ascites, hepatosplenomegaly, elevation of the diaphragm as a result of abdominal tumors), decreased mobility of the lung edges (emphysema, lung tissue swelling, lung tissue inflammation or edema, adhesions between the pleural sheets), complete immobility of the lung edges (hydrothorax, pneumothorax, growth of connective tissue in the pleural space, paralysis of the diaphragm)
	Pulmonary root position	Dullness of percussion sound below the bifurcation of the trachea (enlargement of bifurcation lymph nodes), dullness above the bifurcation of the trachea (enlargement of paratracheal lymph nodes), positive symptoms of Filatov and Filosofov cups (enlargement of lymph nodes in the anterior pleura), paravertebral dulness in the area of the root of the lung and under the axilla - Arkavin's symptom (enlargement of bronchopulmonary lymph nodes). Causes of enlarged lymph nodes in the chest area: lymphadenitis in acute and chronic respiratory infections, tuberculosis, lymphosarcoma, lymphogranulomatosis,

		leukemia, sarcoidosis
Auscultation	The character of the main breathing	Slightly reduced breathing (newborn babies and children 3-6 months old), puerile breathing (children from 6 months to 5-7 years old), vesicular (children older than 7 years old), pathological changes in breathing (see the diagram below)
	Pathological noises: 1. Rales 2. Crepitation 3. Pleural friction noise	Dry rales (bronchitis, bronchial asthma), wet rales (pneumonia, cavernosum, bronchiectasis, bronchiolitis, bronchitis, pulmonary edema) Crepitation (croupous pneumonia in the damping stage, the first 1-3 days of the disease and the stage of resolving pneumonia) Pleural friction sound (fibrinous pleurisy, pleural tumors, pleural tuberculosis)
	Bronchophony	Increased bronchophonia (pneumonia, tuberculosis, atelectasis, over caverns and bronchiectasis, open pneumothorax), positive d'Espin and de la Camp symptom (enlargement of bronchial lymph nodes). Smith's symptom (enlargement of paratracheal lymph nodes). Decreasedbronchophonia (inobesechildren, pleurisy, hydrothorax, hemothorax, pneumothorax)

EXAMINAION ALGORITHM

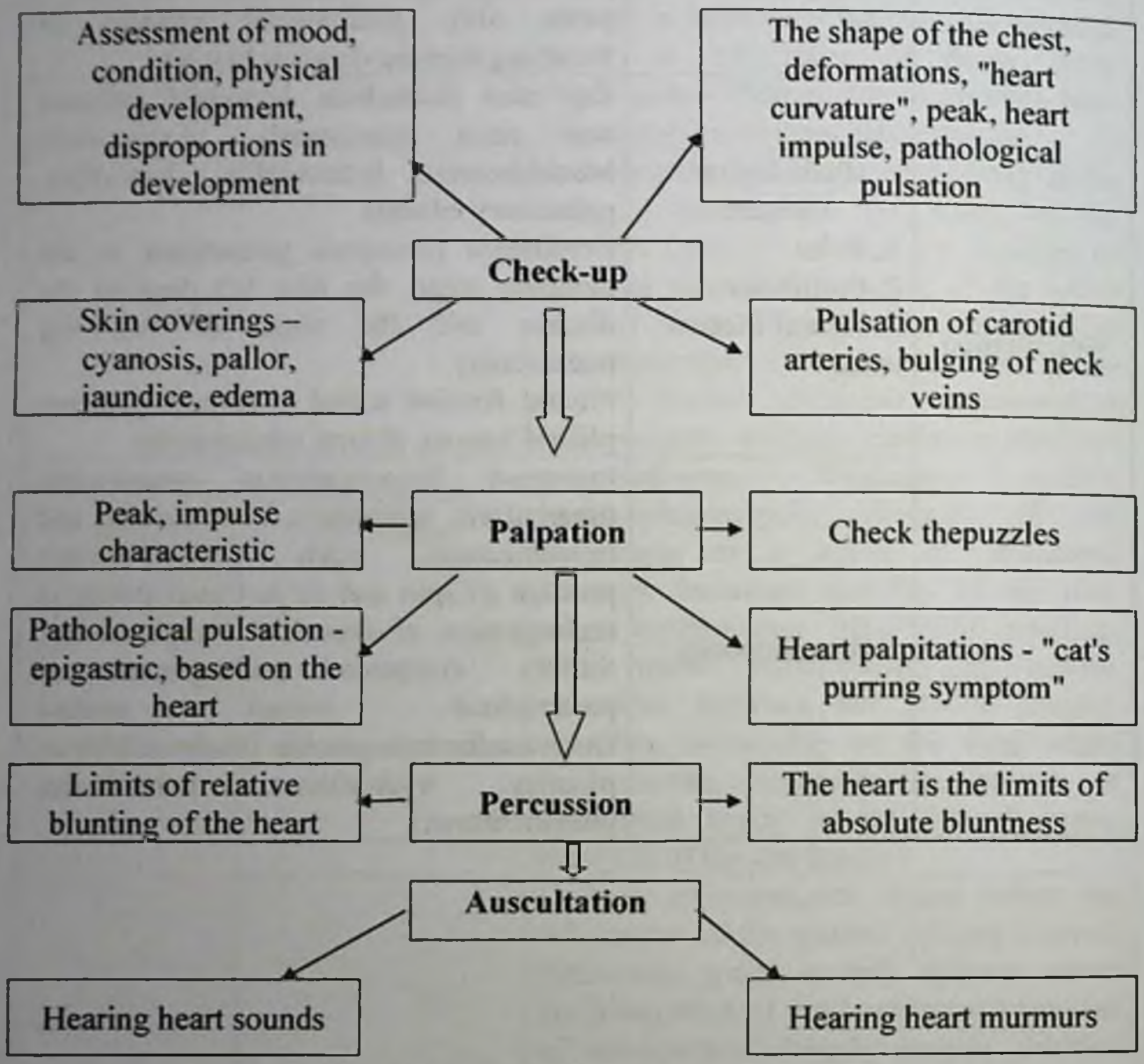

Figure 13. Algorithm for checking the cardiovascular system.

The method of objective examination of the cardiovascular system consists of anamnesis, examination, palpation, percussion and auscultation (Fig. 13). Additional examination methods include measurement of arterial blood pressure and functional tests of the cardiovascular system.

Anamnesis. After listening to the complaints of a sick child, it is necessary to clarify the following:

1) Does the child lag behind his peers in action games;

2) Does he get tired when he goes up the stairs;

3) Is there intermittent cyanosis (when shouting, crying, sucking, physical exertion);

4) Have there been cases of swelling, fainting, fainting with convulsions.

In older children, it is necessary to pay attention to panting, heart pain, palpitations, cardiac arrest, edema, hemoptysis, sleep disorders, dizziness, arthralgia. It should be determined when the disease started, what caused the disease, how the disease progressed, what treatments were received, and what the result was. It is necessary to pay attention to previous diseases and family anamnesis.

Check-up (Table 9). The examination begins with the patient's face and neck. Importance is given to the color of the skin, whether there is cyanosis, pallor, jaundice. When examining the neck, it is determined whether there is pulsation of the carotid arteries (strong pulsation of the carotid arteries is called "carotid play"), whether there is pulsation of the jugular veins. In older children, some swelling of the jugular veins in a horizontal position is normal, but this condition should disappear when the child is in a vertical position.

Then the chest is examined. It is important whether there is an asymmetric hump in the chest in the area of the sternum or on the side of the heart – heart hump, whether it gives pulsation. In the area of the heart, it is determined whether there is flattening or sinking in the intercostal areas.

Apex beat is seen - during cardiac systole, periodic, rhythmic pumping of the chest is observed in the area of the apex of the heart. In asthenic children, the apex beat is clearly visible, in obese children it may not be visible. In healthy children of breast age, the apex beat is determined in the IV-rib space, after 1 year in the V-rib space. During the pathology, there may be a "negative apex beat" - during the heart systole, the peak area sinks inward. Sometimes, in palpation of the heart area of the chest, heart palpitations spreading to the chest and epigastric area are detected. This is mainly due to contraction of the right ventricle, which fills the chest. Healthy children do not have apex beat. Epigastric pulsation can be observed in healthy children with hypersthenic constitution.

When examining the hands and feet, attention is paid to the shape of the last phalanx of the fingers and nails, swelling and acrocyanosis.

Table 9.

The examination of the cardiovascular system

Examination methods	Clinical symptoms	Characteristics, clinical examples
Assessment of physical development	Somatometry Somatoscopy	Growth retardation (chronic disorders of hemodynamics and tissue trophism when the disease lasts for a long time)
	Upper and lower body developmental disproportions	Good ("athletic") development of the shoulder girdle and weak development of the lower body (coarctation of the aorta)
Examination of skin coverings	Color (paleness, cyanosis, jaundice) Temperature Humidity Swellings	Distal part of the hands and feet - cyanotic color of the palm, feet, fingertips, marble-coloured cold, sticky to the touch skin, (circulation failure), bluish cyanosis (congenital heart defect (CHD) with aortic dextroposition), purple cyanosis (vascular complete transposition), pink-red "redness" on the cheeks (mitral valve stenosis), slight icterus of the skin (UTN with a tricuspid valve defect), swelling of the feet, calf, fluid accumulation in the cavities in severe cases (blood circulation deficiency)
Examination of the neck area	Visible pulsation of the carotid arteries and jugular veins	Strong pulsation of carotid arteries (aortic valve insufficiency), swelling pulsation of jugular veins (superior vena cava compression, obliteration, thrombus occlusion, tricuspid valve insufficiency)
Examination of the chest	Deformations, Breathing frequency and rhythm. The presence of depressions between the ribs	Parasternal "heart curvature" (dilatation of the right side of the heart), if it is located laterally (enlargement of the left side of the heart), the anterior-posterior size of the chest increases and the bulging of the upper third of the sternum (small hypervolemia within the circulation) **Table 4**
Examination of the heart area	Apex beat	Increased cardiac peak impulse (left ventricular hypertrophy), decreased impulse (left ventricular dilatation)
	Heart beat	It is not detected normally, it is detected only in pathological cases
Examination of the abdomen	Epigastricpulsation	Pulsation in the epigastric area (hypertrophy and dilatation of the right ventricle)

Palpation. By palpation, the characteristic of the heartbeat is determined. The examiner places the palm of the right hand with the base on the left edge of the sternum, the fingers should cover the area of the apex beat. The found heart beat is palpated with the index, middle and ring fingers. The characteristics of the heart beatare determined: localization, area, height, strength. In a healthy child, the peak beat area is 1-2 cm. The beat height is characterized by the amplitude of oscillation in the beat area: high and low peak impulses are distinguished. Peak force is measured by the pressure applied to the fingers - average, strong and weak.

By palpation, systolic or diastolic heart murmur observed in stenosis of the heart valves is detected ("machine-like" murmur), for which the palm is placed completely in the area of the heart. In this way, pericardial friction noise can sometimes be determined.

The nature of epigastric pulsation is determined by palpation. If the diffuse epigastric pulsation goes from top to bottom - a sign of right heart hypertrophy, if it goes from right to left - an increase in liver pulsation, if it goes from back to front - it indicates aortic pulsation.

The child's pulse is checked by palpation. The pulse is evaluated in several places. The pulse in the ulnar artery should be checked on both sides at the same time, if there is no difference, it can be checked with one hand. In this case, the child's hand is placed in the plane of the heart, it stands in a relaxed position. The examiner holds the child's hand with his right hand from the back in the area of the wrist, while the examiner's thumb is on the side of the elbow of the child's hand, the artery is palpated with the index and middle fingers. The pulse in the femoral artery is checked in the child's vertical and horizontal positions, the right hand is palpated with the index and middle fingers in the groin area, at the exit of the artery from the pubic ligament. When determining the pulse in the arteria dorsalis pedis, the child is in a horizontal position, the examiner holds the foot from the back with his palm. The artery is palpated with 2-3-4 fingers. In children under one year, the pulse is checked in the temporal artery, for this, the artery is pressed against the skull with a finger. In children of breast-feeding age, the pulse frequency and rhythm are determined on a large scale (without undressing the child). The ratio of pulse and breathing frequency is determined.

The pulse is characterized by frequency, rhythm, tension, volume, form (Table 10). To determine the pulse frequency, not less than one

minute is counted, the number of parallel heart contractions is also counted (by auscultation or peak impulse), in which case there may be a difference between the number of heart contractions and the pulse frequency, this is called "pulse deficit".

Table 10.

Pulse characteristics in children

Parameters	Evaluation
Frequency	Count pulse impulses in 1 minute
Rhythm	Rhythmic, arrhythmic, respiratory arrhythmia
Tension	Normal, pulsus durus and pulsus mollis
Volume	Satisfactory, pulsus plenus and pulsus vacuus
Form	Normal, pulsus celer, pulsus tardus, pulsus altus, pulsus parvus.

Pulse rhythmicity is assessed by the uniformity of the interval between pulse impulses (rhythmic and arrhythmic pulses are distinguished). In children of school age, respiratory arrhythmia (respiratory arrhythmia) occurs: the pulse increases during inhalation and decreases during exhalation. Holding your breath will eliminate this arrhythmia.

Pulse tension is determined by the force required to press the pulse. The following types are distinguished by tension: a pulse with normal tension, a hard pulse - pulsus durus and a soft pulse -pulsus molluscs.

Volume is checked with two fingers: the proximal finger presses the artery until the pulse disappears, and the distal finger feels the artery filling with blood. According to the volume, the following types are distinguished: full pulse - pulsus plenus (fuller than usual) and empty pulse -pulsus vacuous (less complete than usual).

The pulse form is represented by the rate of rise and fall of the pulse wave, and this is done by moderately pressing the artery with both fingers. The pulse has the usual form, fast - pulsus celer (pulse wave rises and falls quickly) and slow, empty pulse - pulsus tardus (pulse wave rises slowly and falls as slowly).

Also, a high pulse - pulsus altus (good pulse filling and fast falling) and a low pulse - pulsus parvus (slow, low filling and slow falling) are distinguished. These types of pulse are usually accompanied by other forms: celer-et-altus (the pulse is fast, good or overfilled, then the pulse wave falls quickly) and tardus-et-parvus (the pulse wave rises slowly, underfills and falls slowly).

Percussion. Heart percussion is done in a horizontal or vertical position of the child. Heart size, configuration, and vascular bundle size are determined by percussion. Percussion is done from clear sound to dull sound. There is a difference between direct and indirect percussion (see the section on lung percussion). In indirect percussion, the plessimeter finger is tightly placed on the chest, it should be parallel to the detected border. percussion is performed with moderate force and low volume. Percussion should be done on the middle phalanx. Plessimeter marks the border of the heart from the outer edge of theplessimeter finger, in the area that produces a loud percussive sound.

With low percussion, the limits of "relative" dullness of the heart are determined (Table 11), in the following order: right, left, upper. Determination of the right border begins with the determination of the border of the dullness of the liver from the right mid-clavicular line down from the III inter-costal space (in children under 2 months along the parasternal line, in older children with high percussion along the ribs or intercostal spaces). Then the plessimeter finger is raised up to the space of one rib, the position is changed at a right angle and slowpercussion with "small steps"towards the sternum is performed. The limit is determined from the outer edge of the plessimeter finger.

Table 11.

Heart relative dullness limits and the transverse size of the heart

Limits	Child's age			
	upto 2 yearsold	2-7 yearsold	7-12 yearsold	Over 12 yearsold
Right	Right parasternal line	Inwards from the right parasternal line	Between the right parasternal and right sternal lines	Between the right parasternal and right sternal lines, closer to the sternal line, then the right sternal line
High	II-rib	II-costal interval	III-rib	III-rib or III intercostal space
Left	2 cm outwards from the left mid-clavicular line	1 cm outwards from the left mid-clavicular line	0.5 cm outwards to the left mid-clavicular line	At or 0.5 cm inwards from the left mid-clavicular line
Transverse size	6-9 cm	8-12 cm	9-14 cm	9-14 cm

The left border corresponds to the apex beat. If it cannot be determined, percussion is performed continuously along the IV or V intercostal space, starting from the mid-axillary line. The plesimeter finger is placed parallel to the desired border, the back of the finger should always be in front when it is moved towards the heart. Thus, in the axillary area, the plessimeter finger is tightly placed on the chest, not with the palm surface, but with the side surface. Percussion should always fall perpendicular to the surface of the heart (from front to back, not from left to right), not perpendicular to the chest (in this case, the back border of the heart is determined). Percussion is made until the sound becomes dull and the plessimter is marked from the outer edge of the finger.

Upper border: the plessimeter finger is placed on the left parasternal line, starting from the first rib space, percussion is performed downwards. A mark is placed from the outer edge of the finger (on the outer side relative to the heart) when the dullness of the percussive sound appears. The transverse size of the heart is expressed in centimeters and is the sum of the distance from the center of the chest to the right border of the heart and from the center of the chest to the left border of the heart.

Determining the limits of the absolute dullness of the heart is also in this order: right, left, upper. Under normal conditions, the absolute limits of the heart are not determined in children.

The procedure for direct percussion of the relative borders of the heart is the same as for indirect percussion.

Direct pecussion of the cardiac borders is determined by the middle finger bent at a right angle in young children. The child should be in a horizontal position.

Percussion is performed from the II-costal space on both sides to determine the borders of the vascular bundle. Plessimeter finger is placed parallel to the sternum in the mid-clavicular line and percussion is made towards the sternum until there is a dull sound. Plessimeter is marked from the outer edge of the finger. Marks are measured in centimeters.

Auscultation. A child's heart sounds, when he/she is lying on the left sideas well as after physical exertion (if the child's condition is appropriate), is heard with a soft biauricular stethoscope. The doctor stands to the right of the child.

Auscultation points and arrangement (Fig. 14):

1) Bicuspid valve (mitral) - at the apex of the heart or at the 5th point (place of valve projection);

2) aortic valves - in the II-intercostal space on the right side of the chest;

3) pulmonary artery valves - in the II-intercostal space on the left side of the chest;

4) thricuspid valve –slightly to the right from the sternum, at the junction of the V-rib head to the sternum;

5) At the Botkin's point, the aortic valves are heard, the junction point of III-IV left ribs to the sternum.

Figure 14. Classical places of listening to heart sounds (according to Louisad): 1 – apex of the heart (mitral valve); 2 – pulmonary artery valve, 2nd intercostal space to the left; 3 – aortic valve, 2nd intercostal space to the right; 4 – tricuspid valve; 5 – Botkin point

When listening to the heart, we check the rhythm of the heart, the clarity of the tones, and whether both tones are heard at 5 points, which one is louder, whether there is hesitation or murmurs. If so, whether they are heard in systole or diastole, whether the murmur is related to the tone (whole during the tone, at the beginning, in the middle, at the end), the duration, strength, timbre of the murmur (abundant, rough, blowing, rustling, rumbling, sliding, "like pouring water", "like scattered sand", " like prolonged exhalation», soft, musical, indistinct), it is necessary to determine the epicenter of the murmur, its irradiation (to the armpit, epigastric area, shoulder, neck veins, femoral artery). Functional, physiological (accidental) (Fig. 15) and pathological (organic) murmurs are distinguished. All sounds should be represented in a graph.

Table 12.

Palpation, percussion of the cardiovascular system And features of auscultation

Examination methods	Clinical symptoms	Characteristics, clinical examples
Chest palpation	Point of maximal impulse (PMI) 1. Localization 2. Field 3. Height 4. Power	Strong, diffuse and downward displacement of the PMI (left ventricular hypertrophy, dilatation)
	Heart beat	A strong heart impulse (cardiac hypertrophy)
	Vibration on the mitral valve	Systolic murmur in the right 2nd intercostal space (aortic stenosis), left 2nd intercostal murmur (patent ductus arteriosus, pulmonary artery stenosis), heart diastolic flutter at the apex (mitral stenosis)
Abdominal palpation	Epigastric pulsation	Pulsation from top to bottom in the epigastric area, increasing during breathing (hypertrophy and dilatation of the right ventricle)
	Liver pulsation	Hepatic venous pulse (tricuspid valve insufficiency)
Palpation of peripheral arteries	Checking the pulse 1. rhythmicity 2. tension 3. completeness 4. height 5. plane 6. shape 7. frequency	Respiratory arrhythmia (especially clearly observed in children from 2 to 10-11 years old), acceleration of the pulse by 10-15% of the age norm - tachycardia, slowing of the pulse by 10-15% of the age norm - bradycardia, altering pulse (healthy in newborns, left ventricular muscle damage)
Percussion	Limits of relative and absolute dullness of the heart Borders of vascular bundle	Expansion of heart borders (CHD, myocarditis, pericarditis, circulatory failure)
Auscultation	Hearing the heart 1. rhythm 2. sonority	A rhythm reminiscent of the beating of the embryocardia, a metronome - equal pitch of tones (I and II), equal intervals between tones (indicates structural

		differentiation of the myocardium in premature and normal newborns, pathology in older age), at the apex of the heart decreased I[st] tone (myocardial weakness, mitral insufficiency), increased I[st] tone at the apex of the heart (mitral stenosis), increased III tone, galloping rhythm (decreased left ventricular contractility)
	Heart murmurs 1. systolic, diastolic 2. relationshipwithtone 3. duration 4. power 5. timbre 6. murmurepicenter 7. irradiation	Holosystolic, ribbon-like murmur is well heard at the top of the heart, transferred to the axilla (mitral regurgitation), loud systolic murmur after the first sound, heard throughout the systole, maximal chest between the III-IV ribs (interventricular systolic defect), from a fading diastolic regurgitation murmur to the left in the III-IV intercostal space (aortic insufficiency), a single "crack" after the I tone at the apex of the heart. or a group of crackles, as well as a systolic murmur blowing or rough -musical character, increase in standing position (mitral valve prolapse), group of functional murmurs and borderline murmurs (see Fig. 14).
Auscultation of veins	Visible pulsation or arterial pulse is heard at the identified point	Systolic murmur on the aorta (coarctation of the aorta, aneurysm of the aorta), tones on the vessels - carotid, subspinal, femoral arteries (aortic valve insufficiency), double Traube's tone, double Durose murmur on the femoral artery (aortic valve insufficiency)
Measure BP	Arterial hypertension	Secondary arterial hypertension (kidney diseases - glomerulonephritis, pyelonephritis, renal tuberculosis, amyloidosis, nephroblastoma, diseases of the endocrine system - pheochromocytoma, Itsenko-Cushing syndrome, adrenogenital syndrome,

		hyperthyroidism)
	Arterial hypotension	Arterial hypotension (shocks for various reasons, orthostatic syndrome, endocrine disorders - hypothyroidism, pituitary cachexia, aortic stenosis, heart failure)
Carrying out functional tests	Shtange's test Shalkov's test Orthostatic test	See the text

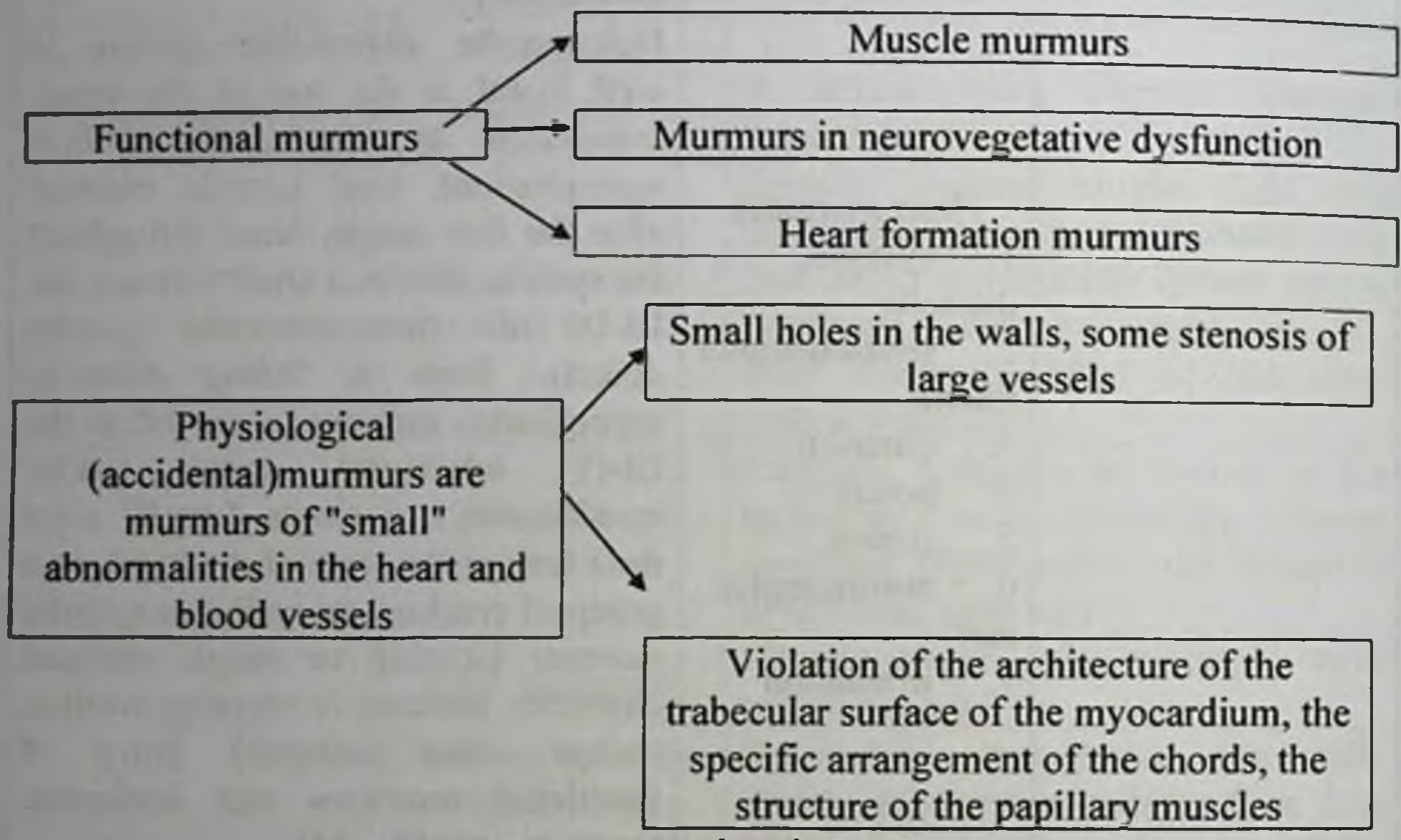

Figure 15. Functional and organic noises.

Measurement of arterial blood pressure (AB)

AB measurement is recommended after resting for 10-15 minutes in the right arm (in both arms and legs according to the instructions) with the patient in a sitting or horizontal position three times with an interval of 3 minutes. The cuff should be of the required size, its width should be half of the circumference of the shoulder. Higher scores are taken as required AB. AB determined after 10 minutes of rest corresponds to normal or "random" pressure. If the normal ("random") AB is not within the norms of the age, the AB is measured again after 30 minutes - this is called the "residual" AB. The difference between "accidental" and "residual" AB is called "extra" AB. If AB tends to increase, the "additional" pressure indicators are 15 mm above the wire. and more, sometimes the wire rises up to 30-50 mm. In newborn

babies, the maximum AB is 76 mm above the wire, at 1 year old - up to 80 mm above the wire. In children older than one year, AB is found according to the AFTur formula: 90 + 2n, from here - the child's age in years. Minimum AB is ½-1/3 of maximum AB. The difference between the maximum and minimum AB is called pulse pressure.

Auscultatory Korotkov-Yanovsky method, palpatory method, tachooscillography, direct measurement of AB are used.

Auscultatory method according to Korotkov-Yanovsky

In this method, it is measured using a Riva-Rocchi tonometer or a sphygmatonometer. The size of the cuff should correspond to the child's age. The hand is relaxed, palm up. The cuff is placed 2 cm above the elbow joint, there should be a space between the cuff and the shoulder where one finger can fit. When measuring AB, the rate of change of the mercury level in the monometric tube during decompression should not exceed 3 mm per pulsation. The stethoscope is placed in the elbow joint without pressing on the brachial artery. The appearance of heart sounds corresponds to the maximum pressure, and its disappearance corresponds to the minimum pressure.

During the decompression of AB after physical exertion, the appearance of heart sounds corresponds to the maximum pressure, and the transition of high tones to low tones corresponds to the minimum pressure. When measuring diastolic pressure (minimum), it is recommended to pay attention to 2 features, the transition of high tones to low tones and their disappearance.

Palpatory method

Most often, in children under 1 year of age, when AB cannot be determined by auscultation, the palpatory measurement method is used. In this method, only the maximum (systolic) pressure can be determined based on the appearance of a pulse in the elbow artery during decompression. In this case, the systolic pressure is 5-10 mm lower than the auscultatory one.

Auscultative and palpatory methods are also used to determine AB in the leg. When the child is lying on his stomach, the cuff is placed on the thigh 3 cm above the knee. AB is measured as measured by hand. The stethoscope is inserted into the popliteal fossa into the popliteal artery. Only the systolic pressure is determined when determining the pressure in the leg by palpation.

In this case, the systolic pressure is 5-10 mm lower than the one obtained by auscultation method.

Tachooscillography method

This method was developed by N.N. Savitsky. In this case, AB is measured by recording the curve of changes in vessel volume during compression (tacho-oscillogram).

Ultrasound method. This method is based on the registration of the ultrasound signal reflected by a special device during decompression, with high accuracy, it can be used in children of any age..

Direct measurement. Direct measurement of AB (blood method) is rarely used in pediatric practice. It is often used in preparation for operative intervention in children's surgery.

Functional testing methodology

1. Shtange's test.

After the child takes 3 deep breaths, holds his breath after the 4th breath, the breath holding time is considered. Age average quotients (in sec):

6 age -16 10age - 37
7 age - 26 11age - 39
8 age - 32 12age - 42
9 age - 34 13age - 39

In cardiovascular diseases, the breath holding time is reduced by 50% or more. In this case, it can be determined that the state of decreased blood oxygen saturation is hidden.

2. Orthostatic test. The child lies in a quiet (motionless) horizontal position for 5-10 minutes. Arterial blood pressure and pulse are measured, then the child is made to stand up and immediately these indicators are measured again. The functional state of the cardiovascular system is evaluated according to the difference between pulse frequency and AB indicators. In a healthy child, the pulse increases to 10-14 times per minute. Maximum and minimum blood pressure changes up to 10 mm above the norms. In a negative reaction, the child's pulse exceeds 15 beats, BP decreases.

3. Shalkov's test with a selective amount of physical strain applied.

Maximum and minimum blood pressure, pulse, respiratory rate are measured by the Korotkov method when the child is lying down. Then the strain is selected according to the child's state of health and physical fitness.

After 3-5-10 minutes after exercise, AB, pulse and respiratory rate are measured.

First strain: the child in lying position is instructed to sit on the bed 3 times and lie down again. Second strain: the same movement is performed 5 times. Third strain: the same movement is performed 10 times. The fourth strain: the child is instructed to squat 5 times for 10 seconds in a standing position. Fifth strain: the same movement, but 10 squatings in 20 seconds. Sixth strain: the same movement, but 20 squating in 30 seconds.

It is allowed to move to the next strain only when there is an adequate response to the previous one.

Normally, the pulse, respiratory rate and AB indicators return to their initial state within 3-5 minutes. In a positive reaction, there is no shortness of breath and fatigue after physical exertion. The heart rate increases up to 25% of the resting state, the maximum AB is slightly increased, the minimum AB is unchanged or slightly decreased. After 3 minutes of strain, all indicators return to initial values. In an inadequate reaction to physical exertion, the pulse increases sharply (increases by 50% or more from the resting state), the maximum AB decreases, the minimum AB does not change or increases, the recovery period lasts 5-10 minutes or more.

There are four main types of reaction of the cardiovascular system to standard physical exertion (10-20 times of squattingsin 20-30 seconds) (R.A. Kalyujnaya). The first type (positive reaction) - MV (minute volume) increases up to 30% from the initial state and returns to normal in the 3rd minute of recovery. The second type (disregulatory reaction) – MV exceeds the initial value by more than 30% and returns to normal in 3-5 minutes of the recovery period (observed in children with vegetative dystonia of various origins). The third type (relatively negative or late fatigue reaction) - after MV increases in response to strain, it decreases from the initial value in 3-5 minutes of the recovery period, this condition is observed in secondary toxic-infectious cardiopathies accompanied by myocardial dystrophy. The fourth type (absolutely negative or early fatigue reaction) - MV decreases from the initial value after strain, the stroke volume and systolic pressure decrease, this condition is observed in myocarditis with a severe violation of myocardial contractility.

EXAMINATION ALGORITHM

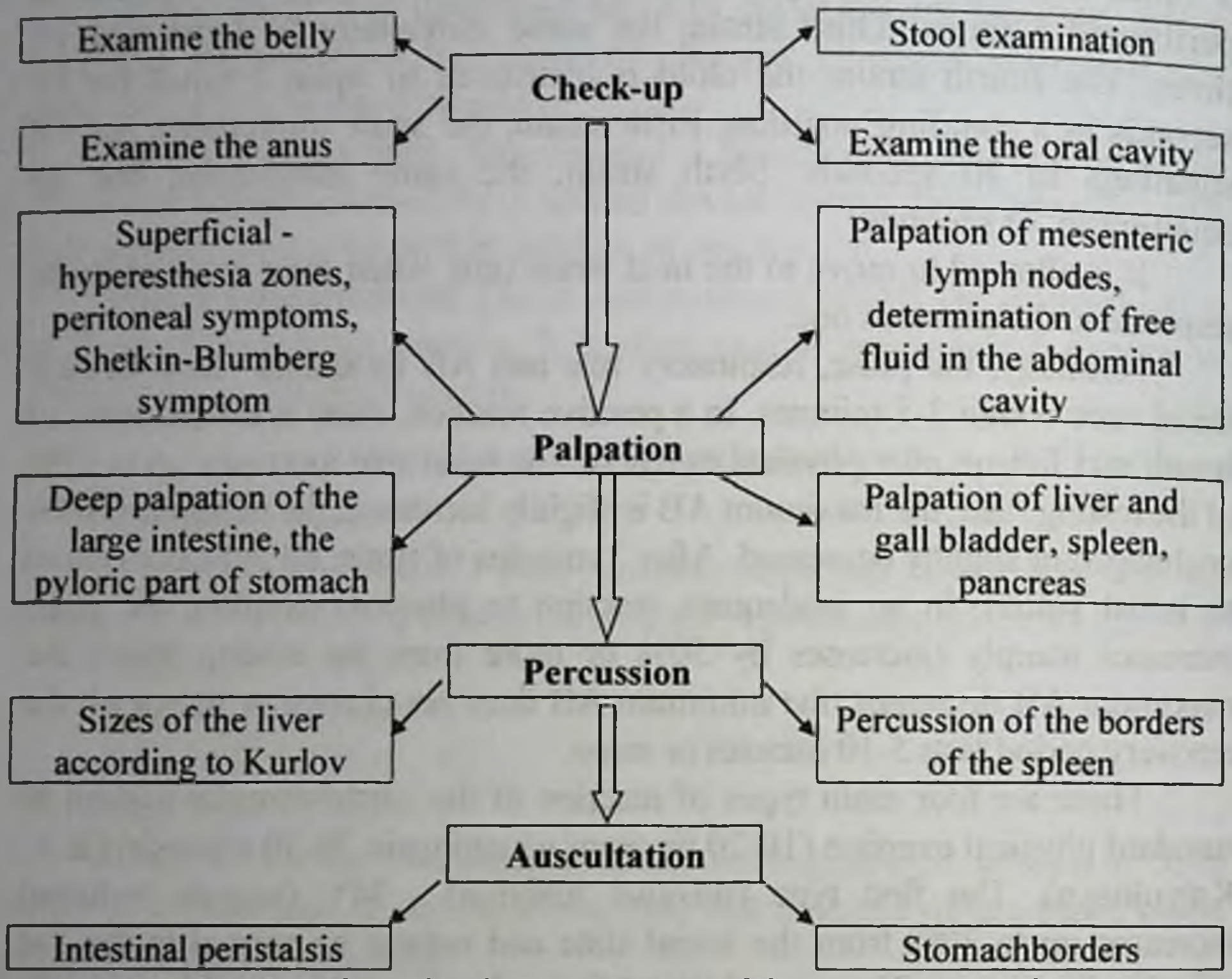

Figure 16. Algorithm for examination of the gastrointestinal tract

Examination of the gastrointestinal tractconsists of palpation, percussion and auscultation (Fig. 16).

Anamnesis collection: The type of food, rate of eating and the time when pain occurs should be determined. The main symptoms are a bitter taste in the mouth and a smell. Swallowing can be free, difficult, impossible, painful. Abdominal pain –the time of occurrence, character, localization, duration, dyspeptic symptoms - vomiting (time of occurrence and character of vomit masses), nausea, heartburn, belching, constipation (diarrhea, constipation, the characteristics of stools), flatulence, intestinal bleeding, appetite (good, bad, spoiled, refusal to eat) are determined.

The check-up (Table 13) starts from the abdomen, then the anus is examined and ends with the oral cavity (in babies). Horizontal and vertical

position of the child's abdomen. It is necessary to see: the shape and size of the abdomen (abdominal circumference is measured with a centimeter tape in the navel area), symmetry, participation in the act of breathing, whether there is visible peristalsis.Abdominal skin characteristics - tension, colour, venous network development, separation of rectus abdominis muscles, navel (bulging, flattened, drawn in). When the anus is examined, it is checked whether it is open, cuts, mucous membrane cracks, rectal prolapse. Stool is examined (color, smell, blood, mucus, presence of undigested food residues, consistency). The child's mouth is examined with a spatula: the spatula is taken in the right hand, and the child's head is held with the left hand. Lips, cheeks, gums, soft and hard palate, condition of the mucosa, color (pale, pink, dark red, yellow), moisture (dryness), cracks, sores, rashes, enanthema, the presence of Filatova-Koplik spots should be taken into account. Tongue examination - the size and location of the tongue, color (dark red, pale, bluish, "varnished"), the appearance of the nipples, white or gray coating, aphthous ulcers, the presence of a "geographic" tongue. The condition of the gums (swollen, covered with caries), the condition of the teeth (numerous, permanent and milk teeth, caries), the smell from the mouth is examined. Examination of the oral cavity ends up with the throat examination. For this, the spatula is inserted to the root of the tongue and slightly pressed down, the child opens his mouth wide (the tongue should be in the oral cavity). The size of the tonsils (normally they do not protrude from the palatal arches), their surface, scar, purulent plugs in the crypts, are important.

Table 13.

Examination of the organs of the gastrointestinal tract

Examination methods	Clinical symptoms	Characteristics, clinical examples
Examination of the oral cavity and throat	Color Moisture The presence of rashes Tongue Tonsils	Sharply limited hyperemia - "sore throat" (scarlatina), ulcerative defects on the mucous membrane (aphtosis, ulcerative stomatitis), coating of the mucous membrane of the gums with Filatov-Koplik spots (measles), hyperemia on the back wall of the larynx and lymphoid follicles (pharyngitis), tonsils enlarged, protruding, hyperemic, swollen (angina)
Abdominal	Shape, size,	Abdominal enlargement

examination	symmetry	(obesity, flatulence, pneumoperitoneum, ascites, enlargement of parenchymal organs, abdominal tumor, megacolon), abdominal asymmetry: swelling of the upper abdomen (severe pylorospasm, upper intestinal obstruction in the small intestine, liver enlargement)), swelling of the middle and lower part of the abdomen (megalocystis, paralysis of the bladder, paralysis of the abdominal muscles, abdominal tumor), depression of the abdominal wall (constant vomiting, severe diarrhea,acute peritonitis, severe weight loss, large diaphragmatic hernias)
	Abdominal wall rigidity	Rigidity - tension of the abdominal wall (symptom of inflammatory or traumatic damage to internal organs: diffuse peritonitis, permanent abdominal trauma, intestinal obstruction, intestinal perforation, inflammatory diseases of the intestine, the condition of abdominal organs after operations)
	Participation of the abdominal wall in the act of breathing	The movement of the abdominal wall is limited (local peritonitis, acute appendicitis, cholecystitis), the abdominal wall is motionless, tense (disseminated peritonitis)
	Development of a venous network under the skin	Visible venous network in newborns (a sign of umbilical cord sepsis), in children older than I year (portal hypertension)
	Navel	Wet navel (umbilical granuloma), omphalitis -

		inflammation of the umbilical wound, hernias of the navel and abdominal wall (umbilical hernia, pre-umbilical hernia, epigastric hernia)
Anus examination		Atresia of the anus and rectum, congenital stenosis of the posterior opening, prolapse, anal fissures, fistulae of the posterior excretory tract, cysts, rectal prolapse
Assessment of stool	Color The smell Pathological mixtures Consistency	Stool is profused, liquid, gray-green like "swamp water", mucous (salmonella). Stool is liquid, mucous, bloody and purulent (dysentery), stool is profused, bloody with mucous, "raspberry jelly" type (amoebiasis)

Abdominal palpation. The doctor sits to the right of the patient, facing him. The child lies with his shoulders, legs slightly bent at the hip and knee joints, arms stretched across the body, without a pillow on his head. When palpating the abdomen, the child should be distracted by the question. During palpation, the degree of tension of the abdominal press muscles, the degree of pain in different parts of the abdominal wall, and local densities are determined. The scheme of clinical topography of the abdomen is used to determine the localization of the detected changes(Figure 17).

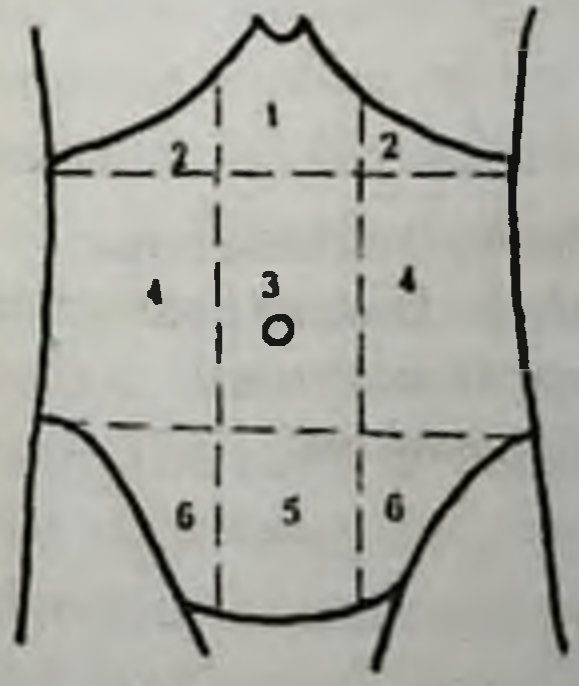

Figure 17. *Clinical topography of the anterior abdominal wall: 1 – epigastric region; 2 – subcostal regions (right and left), 3 – umbilical region, 4 – lateral regions (right and left), 5 – suprapubical region,*
6 – iliac regions (right and left).

In superficial or orienting palpation, the abdominal wall is stroked with the fourth finger of the right hand, lightly pressing the abdominal wall. Local

pain and Zakharin-Ged skin hyperesthesia zones are determined. The following zones of hyperesthesia are distinguished (Fig. 18-19):

- Choledochoduodenal - the right upper quadrant (the area bounded by the right rib arch, the abdominal line and a perpendicular line passing through the navel to this line);
- Epigastric zone occupies the area of the epigastrum (the area above the line connecting the right and left rib arches);
- Shofar zone is located in the area between the white line of the abdomen and the bisector of the upper right square;
- Pancreatic zone - a linear zone, the mesogastric area from the navel to the spine;
- Pancreas-body-and-tail-pain zone completely occupy the left upper quadrant;
- Appendicular zone – lower right square;
- Sigmoid zone - left lower quadrant.

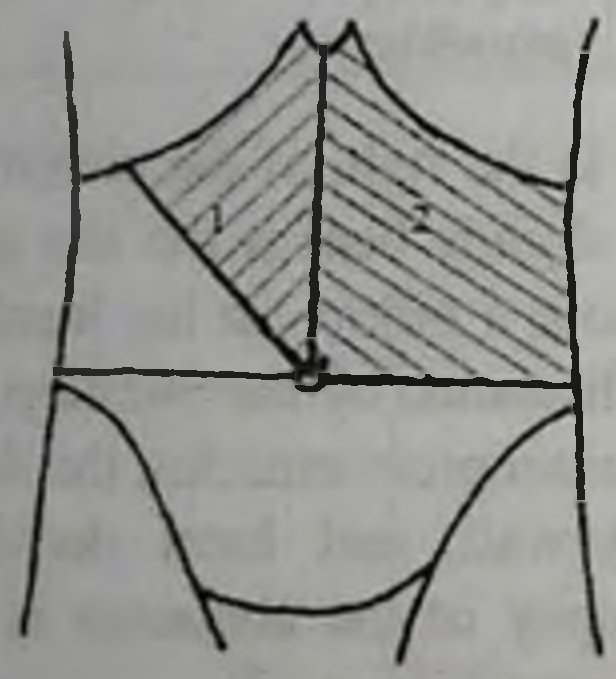

Figure 18. Skin hyperesthesia zones:
1 – Shofar zone;
2 – Pancreas body and tail zone

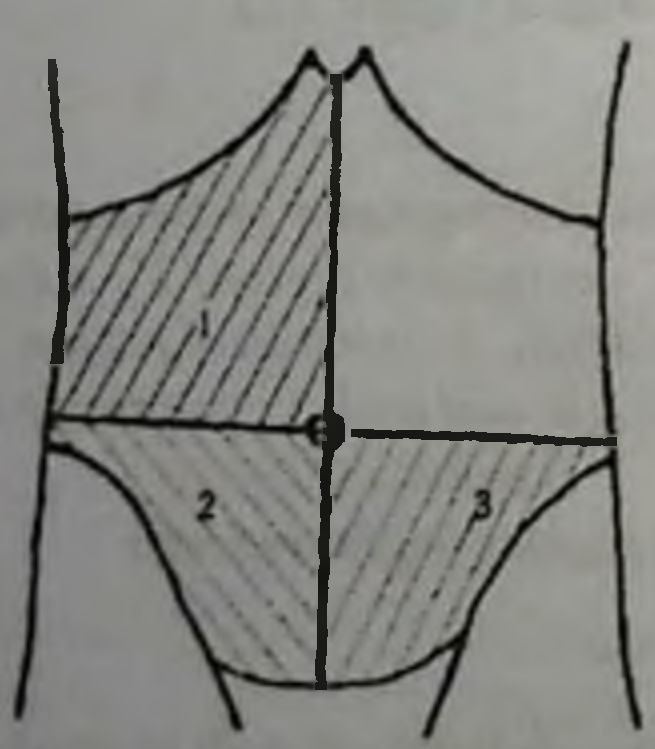

Figure 18. Skin hyperesthesia zones:
1 – Choledochoduodenal zone
2 – Appendicularzone
3 –Sigmoidzone

Superficial palpation is followed by deep, topographical palpation. First, it begins by palpating the large intestine: sigmoid colon, cecum,

transverse colon. Then the liver, spleen, pancreas and mesenteric lymph nodes are palpated.

Colon palpation. Palpation of the sigmoid colon is performed in the left lateral area with the palm of the right hand and some fingers bent, the line of the last phalanges of the finger is parallel to the length of the sigmoid colon. Consistency, diameter, mobility, elasticity and pain are determined.

Palpation of the cecum palpation of the sigmoid colon is done with the right hand in the left iliac region. Along with the cecum, the ascending colon is palpated.

Palpation of the transverse colon Performed with the fingers of both hands placed at a non-passable angle. The abdomen is palpated on both sides in the midline, 2-3 cm above the navel. When exhaling, the fingers enter the abdominal cavity, then go around the intestine.

When palpating any part of the large intestine, attention should be paid to the following characteristics: localization, shape, consistency, size, surface condition, motility, palpation, and presence of pain.

Liver and gallbladder palpation. Palpationof the liver and gall bladder begins by gradually moving the fingers from the mesogastric to the right epigastric region. The palm touches the front wall of the abdomen, light pushes are made with the fingers. This allows you to feel the relatively dense edge of the liver protruding from the rib cage. Two main types of liver palpation are distinguished:

1. Gliding palpation according toStrajesko: the patient is lying on his shoulders, his legs are slightly bent, a pillow is removed from his head. The fingers of the right hand (palpating) are placed parallel to the lower edge of the liver, light sliding movements are made from top to bottom. The entire palpable surface of the liver is palpated with sliding movements. Sliding palpation is often used in infants and young children.

2. Bimanual palpation according to Obraztsov: the right hand is placed completely on the right side of the abdominal wall in the area of the navel or below. With the left hand, the chest is grasped from the bottom of the right half. The child is instructed to take a deep breath while the doctor dipping the right hand deep into the abdomen. While inhaling, the right hand is directed forward and up from the abdomen. In this case, the lower edge of the liver moves down and touches the fingers pressing on the front wall of the abdomen. During palpation of the liver, its consistency, surface flatness, pain, and how far it protrudes from the rib cage are determined. Normally, in children under 3 years of age, the right lobe of the liver protrudes 1-1.5 cm

below the costal arch, and at the age of 5, it is at the edge of the costal arch. Normally, the entire anterior margin is palpated in the epigastric region.

During palpation of the gall bladder, it is necessary to pay attention to its projection, that is, to the intersection point of the right rib arch with the outer edge of the rectus abdominis muscle (Ker's point). In children, the gallbladder is rarely palpated, but palpation of the biliary tract is noted. To do this, it is necessary to check the response of the muscle wall with pushing movements in symmetrical areas on the right and left side. Pain when the Ker point is pressed is a symptom of the lower phrenicus, pain when the middle of the legs of the thoracolumbar muscle is pressed is a symptom of the upper phrenicus.

Stomach palpation. With the palpation of the outer edge of the rectus abdominis in the epigastric area, information can be obtained about the state of the pyloric part of the stomach and the duodenum. The body of the stomach can be palpated in the epigastric area with sliding movements from top to bottom and opposite movements.

Palpation of the spleen. Palpation of the spleen is also done in two ways (like the liver): sliding and bimanual. The palpation technique is the same as in liver palpation, but in bimanual palpation, the child lies on the right side with legs bent and head bent to the chest (the chin should touch the chest).

Palpation of the pancreas by Grot. The patient lies with his shoulders, a roll is placed under the waist. The leg is bent at the knee joints. The fingers of the right hand are inserted into the abdominal cavity along the outer edge of the left rectus muscle in the left upper quadrant. The child is palpated when exhaling. Fingers reach the spine at the level of the navel and palpate the ribbon-like pancreas that crosses the spine obliquely.

In older children, the pancreas can be palpated bimanually. In this case, the fingers of the right hand perform the function of receiving sensations when palpating, and the fingers of the left hand placed on it perform the function of deep penetration into the abdominal cavity with pressure.

Palpation of the pancreas can be done in the right-side lying position and in the sitting position.

Palpation of mesenteric lymph nodes. In Sternberg's zones (left upper quadrant and right lower quadrant of the abdomen) palpation is performed along the root of the sphincter. The fingers of the right hand are inserted into the abdominal cavity along the outer edge of the rectus muscle in the area of the left upper quadrant and the right lower quadrant. The direction of the

fingers is towards the spine, then in a sliding motion from top to bottom along the spine. During palpation of mesenteric lymph nodes, their number, size, pain and mobility are examined.

By means of deep palpation, pain points are identified in various diseases of the abdominal organs (Fig. 20). There are a lot of pain points, let's mention a few of them:

- Kehr's point – gall bladder point;
- The Mayo-Robson's point is a painful point on the body and tail of the pancreas, located on the bisector of the left upper quadrant, less than 1/3 of the costal arch.;
- Desjardin's point is a painful point of the head of the pancreas, located in the bisector of the upper right square, 5 cm from the navel (choledochopancreatic zone);
- Boas's point – pain when pressing on the area of the 10th-11th-12th thoracic vertebrae;
- Openkhovsky's point - pain when pressing on the area of the sharp edges of the 10-11-12th thoracic vertebrae (the last two pain points are characteristic of gastric and 12th duodenal ulcers).

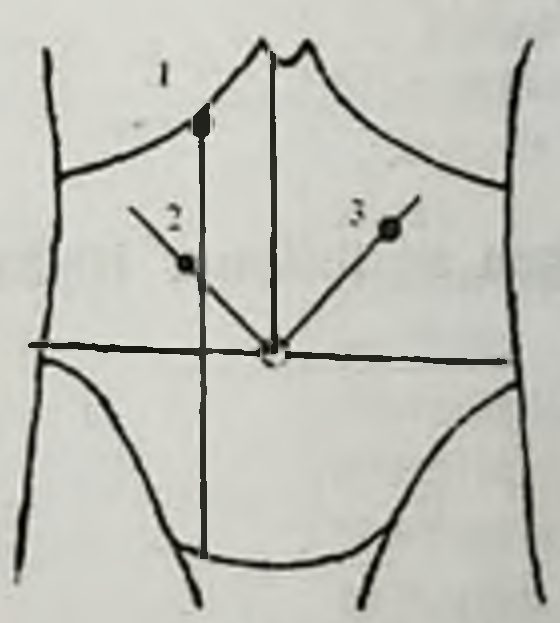

Figure 20. *Location of Kehr (1), Desjardin (2), Mayo-Robson's (3) pain points on the front surface of the abdominal wall.*

Pain symptoms:

- Georgievsky-Mussy's symptom (phrenicus symptom) - m. pressing between sterno-cleido-mastoideus legs (in liver and gall bladder diseases there is pain on the right side).
- Murphy's symptom - in the area of the gall bladder, the fingers of the right hand are inserted under the ribs with the palm surface up. The patient is in a vertical or slightly forward sitting position. The patient is instructed to inhale and exhale and it is determined that there is pain (gallstone disease, gallbladder atony).
- Ortner-Grekov's symptom - hitting the right rib arch with the edge of the palm (positive in gall bladder and liver diseases).

Detection of free fluid in the abdominal cavity by palpation called the fluctuation method. For this, the left hand is completely placed on the side surface of the abdominal wall, and the opposite side is briefly tapped with the fingers of the right hand. These impulses cause the fluid to vibrate, and the fluid fluctuation is felt as a wave symptom on the left arm (fluctuation). In order for the energy of the wave to be transmitted to the fluid and not to the abdominal wall or intestinal mesentery, the assistant should lightly press the center of the abdomen with the edge of his palm, thereby eliminating the transmission of the wave along the abdominal wall or intestines.

Abdominal percussion. In children older than 5 years, the size of the liver is determined by percussion. Percussion is done on three lines (middle axilla, middle spine and middle line). The upper border of the liver in the midline was approximately determined by lowering it perpendicular to the chest from the upper border of the midspinal line. It is percussed from below along two lines (middle spine and middle lines). The plesimeter finger is placed parallel to the borders of the liver, percussion is performed from a clear sound to a dull sound.

Sizes of the liver according to Kurlov. The upper and lower margins of the liver are measured in cm according to 3 lines (Figure 21):

1) Right medioclavicular line;
2) Front median line;
3) Left coastal arch or right angle bisector.

The results of the size of the liver are written as follows: 10x8x5 centimeters.

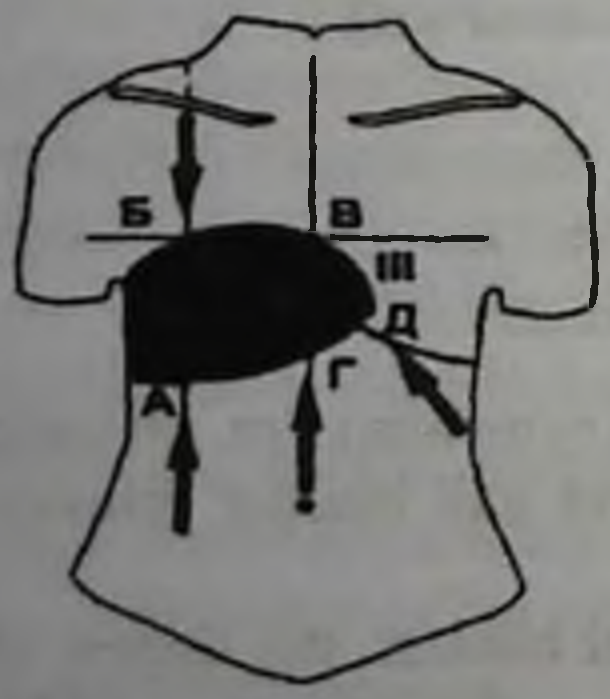

Figure 21. Liver borders by Kurlov (arrows indicate the direction of percussion and palpation movements)

Percussion of the spleenis done along two lines: along **the left middle axillary line**, the cross-section size of spleen is determined. Its length is defined approximately on the level of **the central line** of the cross-section of the spleen, very often on the X rib). Longitudinal and transverse measurements are taken with a centimeter tape. In a healthy child, the anterior

border of the spleen does not extend beyond the anterior axillary line, the posterior border does not extend beyond the posterior axillary line. It liesin-between the IX and XI ribs, transversely to the left.

Abdominal auscultation. During auscultation of the abdomen, peristalsis of the intestines and their rumbling can be heard. In pathology, sounds can increase, decrease or disappear.

It is possible to determine the borders of the stomach using a mixed examination method - auscultation and percussion (auscultofriction). The stethoscope is placed in the stomach area, percussion is performed with one finger along the white line of the abdomen from the xiphoid process to the navel. The place where the sound is lost is the lower border of the stomach. This method can determine the size and shape of the stomach.

Features of palpation, percussion and auscultation of digestive organs, with clinical examples are shown in Table 14.

Table 14.

Palpation, percussion and auscultations of digestive organs.

Examination methods	Clinical symptoms	Characteristics, clinical examples
Abdominal palpation	**Superficial palpation:** Skin hyperesthesia - Zacharin-Ged zones. Abdominal wall tension. Peritoneal symptoms. Shetkin-Blumberg symptom	Abdominal wall tension - muscle protection, peritoneal symptoms, positive Shchetkin-Blumberg symptom (peritonitis, appendicitis, cholecystitis, inflammation of the peritoneum during wound perforation)
	Deep palpation: Colon palpation: 1. sigmoid 2. cecum 3. ascending colon 4. the last part of the ileum and the appendix 5. transversecolon	Restricted motility of the sigmoid colon (perisigmoiditis, short colon), restricted cecum motility (peritifitis, short colon), pain on palpation of the cecum (dysentery, typhoid, tuberculosis), firm sigmoid colon consistency (stool stones, ulcer inflammatory process), pain and rumbling on palpation of the ileum (enteritis), roughness of the surface of the ileum (typhoid, lymphogranulomatosis, lymphosarcoma), pain on palpation of the transverse colon (colitis)
	Palpation of the	Descending the greater curvature

	greater curvature of the stomach	(gastroptosis, gastric atony, stenosis of the pyloric part)
	Palpation of the pyloric part	Dense granular mobile 2-4 cm size derivative (pylorostenosis)
	Palpation of the pancreas	Pain in the Shofar zone, Dejardins and Mayo-Robson points (pancreatitis)
	Liver palpation	**Liver enlargement:**infectious genesis (viral hepatitis, parasitosis, disseminated tuberculosis, infectious mononucleosis), metabolic disorders (kwashiorkor, diabetes, initial stage of liver cirrhosis, toxic diseases, mushroom and alcohol poisoning), venous dullness (right heart bleeding, thrombosis of hepatic veins), blood diseases (leukemia, lymphogranulomatosis, hemolytic anemias), trauma in tumors, cholestasis and diseases of the bile ducts (stones, parasites, blockage with a tumor, cholestasis in medicinal jaundice, cholangitis). Decreased liver size (acute dystrophy of the liver in viral hepatitis B, cirrhosis) The edges of the liver may be dense, stone-like (fibrocholangiocystosis, lymphogranulomatosis). The surface of the liver is flat, smooth, softer, with severe pain (acute dullness in cardiovascular failure, hepatitis, cholangitis, cholecystocholangitis)
	Gallbladder symptoms	Murphy, Ortner, Ker, Mussi, Boas' symptoms are positive (inflammation of the gallbladder and bile ducts)
Abdominal percussion-si	Borders of the liver according to Kurlov	It is detected in children older than 5-7 years
	Percussion of the borders of the spleen	Splenomegaly, see Table 17
Abdominal auscultation	Hearing intestinal peristalsis	Increased peristalsis, rumbling (inflammatory process, gas accumulation - flatulence, fluid accumulation), decreased peristalsis (peritonitis)
	Stomach borders - method of auscultofrication	Determine the size and shape of the stomach

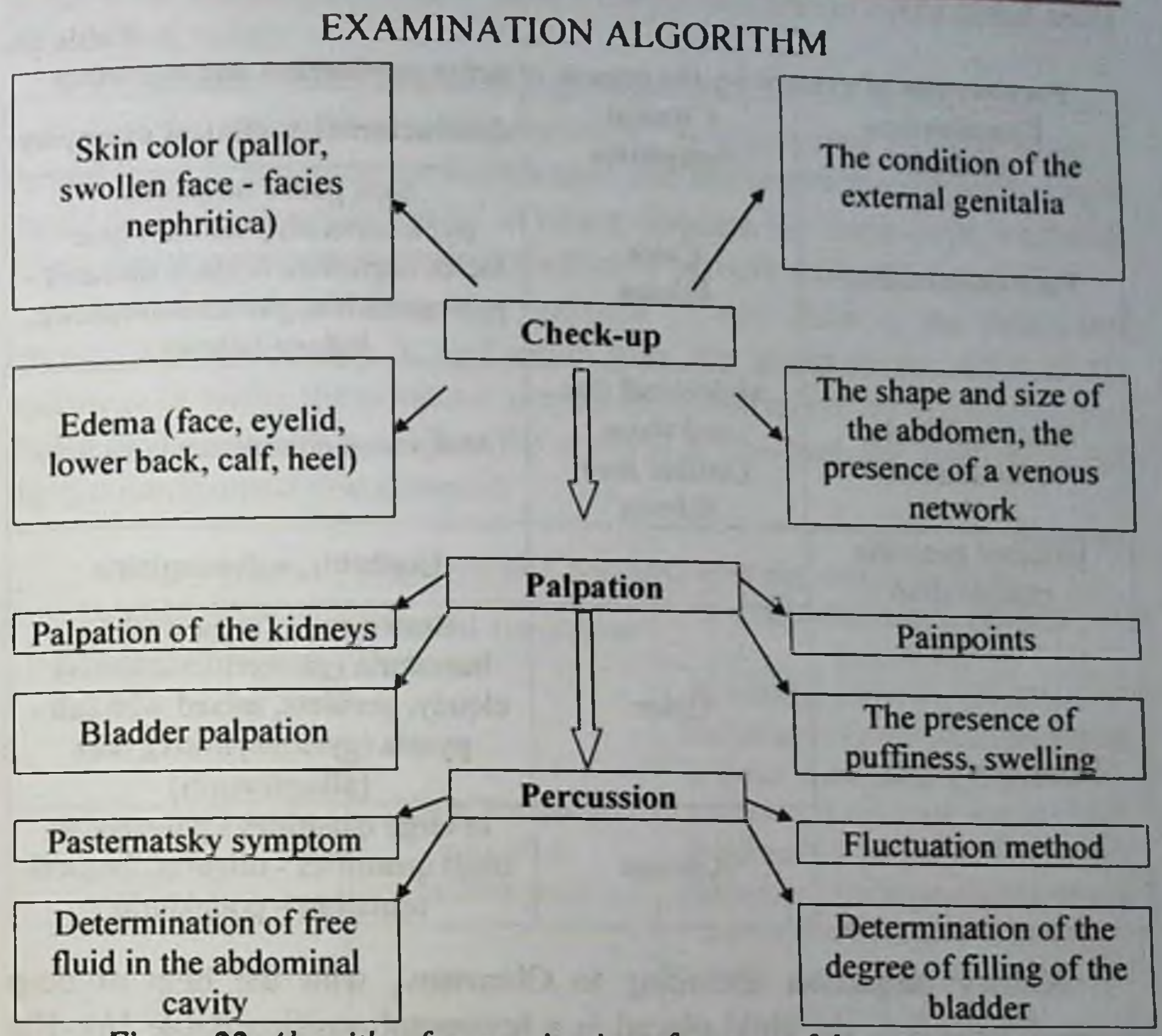

Figure 22. *Algorithm for examination of organs of the urinary system*

Clinical examination of the urinary system consists of anamnesis collection, check-up, palpation and percussion (Fig. 22).

Anamnesis collection includepassport information, anamnesismorbi and vitae. Patients' complaints include the presence and nature of pain, its intensity, duration, localization, irradiation, factors that increase or decrease pain, dysuric disorders, the amount and rhythm of urination. Also, it is necessary to determine the amount of urine excreted in one day (urinary diuresis), the color and smell of urine.

During **check-up** it is necessary to pay attention to the color of the skin, edema of the face, eyelids, the lower back, legs, heels and other parts of the body, the shape and size of the abdomen, the presence of a venous network in the abdomen, the condition of the external genital

organs (for the purpose of determining urethritis and vulvovaginitis) (See Table 15).

Table 15.

Peculiarities of examining the organs of urine production and excretion

Examination methods	Clinical symptoms	Characteristics, clinical examples
Face examination	Color Edema	Skin pallor (nephritis, pyelonephritis), swollen face - facies nephritica (kidney diseases - pyelonephritis, glomerulonephritis, kidney failure)
Body and limbs examination	Abdominal size and shape Lumbar area Edema	Abdominal enlargement (ascites)
External genitalia examination		Urethritis, vulvovaginitis
Urine examination	Color	Brown-red - "meat wash" - hematuria (glomerulonephritis); cloudy, purulent, mixed with salt - pyuria (pyelonephritis), dark (alkaptonuria)
	Amount	In large quantities - polyuria, in small quantities - oliguria, frequent urination – pollakiuria

Kidney palpation according to Obraztsov, with the help of deep bimanual palpation, the child placed in a horizontal position (table 16). The child lies with his shoulders, legs slightly bent. The doctor puts his left hand under the lower back in the area of the lower edge of the rib cage, keeping his fingers together. The hands are brought closer until the anterior and posterior abdominal wall are united. A child who is asked to take a deep breath - the lower pole of the fallen kidney is palpated.

Palpation when the child is standing: the child's body is bent at a right angle, hands are lowered. The doctor's left hand is on the child's waist, and his right hand is outside the straight line of the abdomen at the level of the rib cage. The palpation technique is the same as in the supine position.

By palpation - pressing on the skin of the lower third of the front medial surface of the thigh, shin and foot – edema or tissue patency is confirmed.

The bladder is examined by deep palpation in the area of the bladder while the child is lying down.

Percussion method determines the upper (slow percussion) and lower poles of the kidneys, the lateral border, but the percussion of the kidneys has no practical value.

Percussion reveals the following symptoms:

- The symptom of hitting the kidney area proposed by Pasternatsky - the left hand is placed on the lumbar area and hits it with the edge of the right hand (on the right and left side), in young children, the lunbar area is hit with a bent finger areas of a doctor symmetrically on both sides;
- When determining the presence of free fluid in the abdominal cavity, slow percussion is performed from the navel to the sides of the abdomen, in which the tympanic percussion sound in the navel area becomes duller as it moves away. When the position is changed, the fluid shifts and the tympanic sound also changes;

Table 16.

Peculiarities of palpation and percussion of the urinary organs

Examination methods	Clinical symptoms	Characteristics, clinical examples
Palpation of the kidneys	Deep bimanual palpation byObraztsov	In healthy children, palpation of the kidneys (most often the right) is done at an early age and when nutrition is reduced, and in older children it is palpated only during pathology. Enlargement of one or both kidneys (nephroblastoma, cystic kidney, hydronephrosis, prerenal hematoma)
Edema		The detection technique is given in the text
Bladder palpation	Palpation of the suprapubic area	Bladder palpation (full bladder)
Percussion	Pasternatsky symptom of hitting the kidney area	Positive Pasternatsky symptom (nephritis)
	Determination of free fluid in the abdominal cavity - fluctuation method	Dullness of sound from the navel to the sides of the abdomen, positive fluctuation symptom (ascites)
	Bladder fullness	The detection technique is given in the text
Bloodpressure measurement		Hypertension (nephritis)

- Fluctuation method: the left hand is completely placed on the side surface of the abdominal wall, the fingers of the right hand briefly hit the abdominal wall from the opposite side, the left hand feels the resulting splash of water;
- When determining the degree of bladder filling, percussion is performed along the white line of the abdomen, from the navel to the pelvis, and a dull sound is produced.

The examination ends with the measurement of arterial blood pressure.

EXAMINATION ALGORITHM

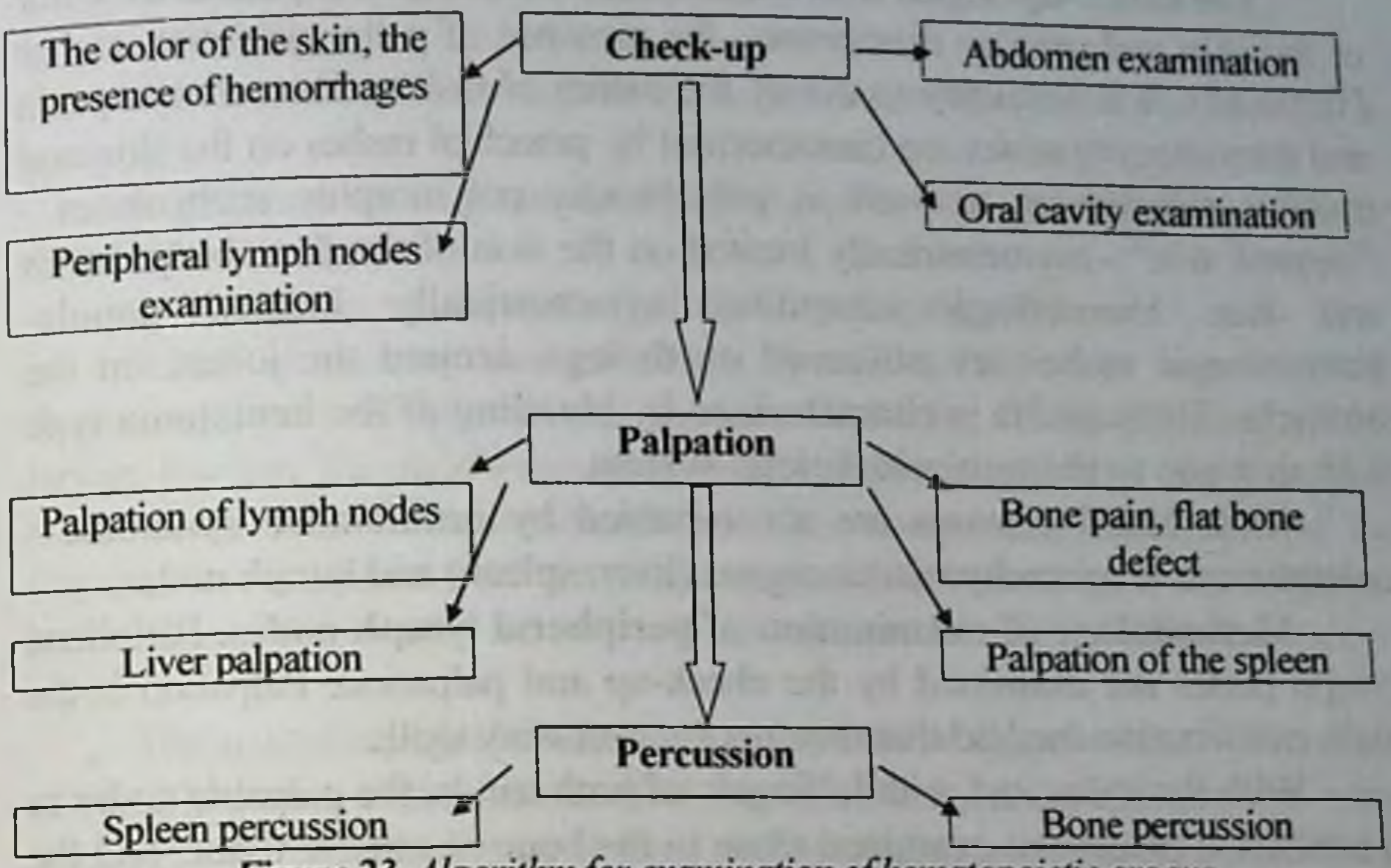

Figure 23. Algorithm for examination of hematopoietic organs.

Anamnesis. When collecting anamnesis, it is necessary to determine when and how the first symptoms of the disease appeared. Most blood diseases (hemorrhagic diatheses, crises of hemolytic and aplastic anemia) begin acutely: the body temperature rises, hemorrhagic rash on the skin, skin discharge or jaundice increase, the liver, spleen, lymph nodes enlarge.

When acute leukemia develops, parents often pay attention to the fact that the child has become weak, restless, appetite decreases, and body temperature rises for no reason. Sometimes children complain of pain in the joints and bones. Diarrhea and abdominal enlargement (due to splenomegaly) are observed in children of early age.

A complete genealogical history should be collected. It is necessary to determine the presence of blood diseases (hemophilia, Willebrand's disease, bleeding conditions, prolonged jaundice in childhood and later), tumor processes in close relatives.

It is necessary to pay attention to the factors that caused the outbreak of blood disease. For example, before the development of hemorrhagic diseases

(thrombocytopenic purpura, hemorrhagic vasculitis), vaccinations, viral infections, hemolytic, aplastic anemia crisis may be associated with taking drugs.

The check-up begins with the child's face. Attention is paid to the color of the skin and mucous membranes, the presence of pallor, jaundice, rashes (Table 17). It is necessary to clarify the nature of rashes. Thrombocytopenia and thrombocytopathies are characterized by petechial rashes on the skin and mucous membranes, as well as polychrome, polymorphic ecchymoses - "leopard skin" - asymmetrically located on the skin of the face, body, hands and feet. Hemorrhagic vasculitis, symmetrically located papule-hemorrhagic rashes are observed on thelegs, around the joints, on the buttocks. Hemophilia is characterized by bleeding of the hematoma type with damage to the musculoskeletal system.

Most blood diseases are accompanied by proliferative syndrome - enlargement of parenchymatous organs (liver, spleen) and lymph nodes.

Methodology of examination of peripheral lymph nodes. Peripheral lymph nodes are examined by the check-up and palpation. Palpation is the main examination method that requires the necessary skills.

With the index and middle fingers of both hands, the palpable nodes in symmetrical places are examined close to the bone or muscle tissue, and the lymph nodes located in the subcutaneous fat tissue are palpated as well.

Palpation is done in the following order: deep and superficial parotid lymph nodes; submandibular lymph nodes - under the angle of the lower jaw; submental and anterior cervical lymph nodes - along the anterior border of the sternocleidomastoid muscle; posterior cervical lymph nodes - along the posterior border of the sternocleidomastoid muscle; supraclavicular lymph nodes - in the supraclavicular fossa;subspinal lymph nodes - in the subspinal fossa; axillary lymph nodes - in the axillary fossa;cubital lymph nodes - in cubital fossa; thoracic lymph nodes - palpated on the lower edge of the major pectoral muscle;popliteal lymph nodes - in the popliteal fossa(table 17).

When examining the axillary lymph nodes, the doctor's hand is placed perpendicular to the ribs, the fingers are inserted deep into the axilla, the soft tissues are pressed against the rib, and the fingers are lowered along the chest. Cubital lymph nodes are palpated as follows: the doctor holds the patient's arm opposite to the examined arm by the lower third of the shoulder, the child's hand is bent at the elbow joint, with the next index and middle finger with sliding movements, the sulcus bicipitalis lateralis et medialis is palpated in the area of the elbow and above.

If the lymph nodes are palpated, the following should be determined:

- Number (many, few, one or two);
- Size (cmormm);
- Consistency (soft, elastic, dense);
- Mobility;
- Relationship with neighboring nodes (nodes are separate or united in a group);
- Relation to surrounding tissues, skin and subcutaneous tissue (adhesive or not);
- Sensitivity to palpation (painful or painless).

When examining the peripheral lymph nodes, it is necessary to determine the conditions of the Pirogov-Waldeyer lymphatic ring in the larynx. For this, the child's mouth is opened wide with the help of a spatula, it is necessary to see the tonsils of the palate (between the arches) and the lingual buds located at the root of the tongue. It is necessary to pay attention to the size of the tonsils, the color of the mucous membrane, the presence of pus.

The nasopharyngeal folds are located behind the choanae. When they grow, it becomes difficult to breathe through the nose, the child snores when he sleeps, his voice becomes hoarse, and hearing decreases. "Adenoid" facial features: enlarged forehead, thick lips, mouth always open (mouth breathing), relaxed facial expression. If there is a cleft palate, nasopharyngeal folds can be seen, and if there is a suspicion of their enlargement, they are palpated with the index finger (by the doctor).

The method of examination of the liver and spleen is presented in the section "The gastrointestinal tract organs examination methodology".

Table 17.

Examination, palpation and percussions of hematopoietic organs and

Examination methods	Clinical symptoms	Characteristics, clinical examples
Appearance	Skin color: • Pallor • Jaundice • Thereisbleeding	Pallor of the skin and mucous membranes (anemia), lemon-colour yellowing of the skin and sclera (hemolytic anemia, deficiency of glucose-6-phosphate dehydrogenase in erythrocytes, abnormalities in the

		structure of hemoglobin). Hemorrhages on the skin and mucous membranes - petechial, ecchymoses, hematomas (hemorrhagic diseases)
Check-up and palpation of peripheral lymph nodes	Peripheral lymph nodes (LN) group: 1. Anterior cervical 2. cervical 3. Deep and superficial parotid LN 4. Submandibular LN 5. Submental LN 6. Posterior cervical LN 7. Axillary LN 8. Supraclavicular/infraclavicular LN 9. thoracic LN 10. cubital LN 11. Inguinal LN 12. Popliteal LN	Normally, there are one or two lymph nodes in a group that can be palapated: elastic, painless, mobile (not connected to the surrounding tissues), no more than 3 groups of lymph nodes can be palpated in a healthy child. Lymph nodes enlargement: A) acute regional enlargement, with a local skin reaction - hyperemia, swelling, pain on palpation (pyoderma, furuncle, angina, otitis, when wounds are infected, eczema, lymphadenitis in gingivitis). B) acute diffuse enlargement (children's infection - rubella, measles, scarlet fever, infectious mononucleosis, adenovirus infection, influenza). C) enlargement of lymph nodes in tuberculosis (most often in the neck) is dense, painless, a group of united lymph nodes is prone to caseous erosion and fistula development, nodes are connected to each other and to the surrounding tissue, in disseminated tuberculosis lymph nodes diffuse enlargement is observed.

		G) enlargement of lymph nodes in brucellosis, toxoplasmosis, fungal diseases. D) blood diseases and tumor diseases (acute and chronic leukemia, lymphogranulomatosis, lymphosarcoma, myeloma). E) reticulohistiocytosis.
Joint examination	Increase in size, deformation, pain, limitation of movement	Bleeding into the joint (hemophilia)
Oral cavity examination	The mucous membrane of the oral cavity: • necrotic ulcers • hemorrages	Necrotic ulcers on the mucous membrane of the oral cavity and throat (acute leukemia, aplastic anemia), hemorrhages (acute leukemia, thrombocytopenic purpura)
Abdominal examination	Increase in size	Enlargement of the upper abdomen is associated with enlargement of the liver and spleen (acute leukemia, lymphogranulomatosis).
	Painsyndrome	Pain syndrome (abdominal syndrome in hemorrhagic vasculitis, nerve-vascular bundle compression with retroperitoneal hematoma in patients with hemophilia)
Palpation of lymph nodes	A group of lymph nodes	Enlargement - seeabove
Liver palpation	Hepatomegaly	Seetable 14
Palpation and percussion of the spleen	Splenomegaly	Palpation of the edge of the spleen indicates that it has increased 1.5-2 times. **Splenomegaly:** in infectious diseases (typhoid, hepatitis, malaria, congenital syphilis, disseminated tuberculosis, brucellosis, fungal sepsis,

		infectious mononucleosis), blood diseases (leukemia, lymphogranulomatosis, hemolytic anemia, acute and chronic thrombocytopenia), hemodynamic disorders (liver cirrhosis, heart failure, splenic vein thrombosis), poisoning and metabolic diseases, splenic tumors (lymphosarcoma, hemangioma, splenic cysts). **Agenesis of the spleen, asplenia** (congenital malformation)
Palpation and percussion of bones	Painful. Defects in the flat bones of the skull	Pain on palpation and percussion of the bones (leukosis), defects in the flat bones of the skull (reticulosis)

NERVOUS SYSTEM EXAMINATION METHODOLOGY

General principle. Aneuropathologist conducts an in-depth examination of this system. But the child is periodically seen by a pediatrician, who is the first to be consulted when the child is sick. The course and outcome of the disease largely depend on the pediatrician's tactics.

It is possible to draw a conclusion about the child's nervous system based on his condition, reaction to the examination, behavior, consciousness.

In pediatrics, 2 descriptive synonyms are used to characterize the nervous system (NS): neuropsychological development (NPD) and psychomotor development.

Evaluation criteria of NPD:

- **Motility**
- **Statics**
- **Sensory reactions**
- **Speech**
- **Mental development**

Motility is a child's manipulative activity directed towards a specific goal.

Physiological muscle hypertonia at rest is characteristic for a healthy newborn child, and this is observed even during sleep. Muscle hypertonia is expressed symmetrically in all cases of the child. The joints of the hands are bent, pressed to the chest, fingers are pressed into fists, thumbs are brought to the palm of the hand. Also, the legs are bent in all joints and the hips are slightly turned aside, the reverse bending is strong in the soles of the feet. Movements of a newborn baby are limited, chaotic, and with a little tremor. Tremor and physiological muscle hypertonia gradually fade after a month.

The motility of a healthy child develops later in the following order:

1) In 2-3 weeks, the child stops looking at something bright;

2) The manual activity of his hands develops in the 4th week: the child brings his hands closer to his eyes, looks at them, massages the blanket. In the second half of the year, he takes a bottle with milk and drinks milk from it;

3) At 4-5 months, the coordination of the back muscles develops, which is seen when he turns over on his stomach when lying on his

back, and at 5-6 months when he turns over on his back when he lies on his stomach;

4) At the end of the 1st year, when the child is interested in something and walks to another corner of the room, the process of walking is not a sign of motility, but acoordinated movement of all muscles in the necessary direction.

In the future, the development of motility will includeeverything from the first time holding a pencil to playing music on the violin, piano, embroidery, knitting and other manipulations of an adult.

Statics

Statics - fixing and holding certain parts of the body in the desired position.

The first sign of statics - holding the head - appears at 2-3 months, at 3 months the child should hold the head well in a vertical position.

The second sign - the baby swallows - 6-7 months of development. In addition, at 6 months, the child begins to crawl, at 7 months it crawls well.

The third sign - the child stands up - 9-10 months.

The fourth sign - the baby walks - at the end of 1 year.

Sensory reactions

Sensory reactions are an adequate reaction of the child to the influence of environmental factors and his own requirements. One of the manifestationsin newborn is food dominance: as the time of feeding approaches - the child gets hungry and cries. Then sucks his mother's breast,calms down and falls asleep.

At the end of the first month, a few minutes after the start of feeding, there is a pause, the child carefully looks at his mother's face, grabs her breast. In the second month, a smile is formed, and in the third month, when he sees his mother, he moves his limbs with joy. All this indicates the formation of conditioned reflexes to external influences.

When evaluating sensory reactions, it is necessary to pay attention to the fact that the signs are dynamic in time, that is, the formation of each criterion is different at each age.

Signs of sensory reactionsinclude hearing, sight, and focusing attention. These signs are examined by a neurologist in 2 months of the child's life.

1) to assess hearing, the doctor claps his hands at a distance of 30-40 cm from the ears of the child lying on the swaddling table. When hearing is well developed, the child should blink.

2) to check sight, the doctor carries a bright object at a distance of 30 cm above the eye of the lying child - when the vision develops, the child should observe the movement of the object.

Speech

By the end of one year, sensory speech appears - the baby understands some words heard from around. This is manifested in turning the head, moving hands, etc.

Speech appears in a child at 4-6 weeks, when it begins to give out **the first sounds**. (a, gu-u, eee, etc.). (hum, buzz)

At 6 months, the child pronounces separate syllables (ba-ba-ba, ma-ma-ma, etc.) without understanding their meaning, and this is called **babble.**

By the end of 1 year, the baby's lexicon contains 8-12 words, the meaning of which he understands (give, dad, mother, etc.), among them, there are onomatopoetics (um-um - to eat, wow- wow– for a puppy, tik-tak–a clock, etc.).

By the end of 2 years, vocabulary reaches 300 and short sentences appear.

Mental development.

This criterion is formed on the basis of the formation of nervous system, the formation of other previous criteria, the upbringing and development of the child. It is a sign of human mental capacity and intelligence. A firm conclusion about the state of higher nervous activity can be made at the age of 5-6.

In order to assess the condition of the nervous system, in addition to the above-mentioned criteria,the pediatrician should also determine the expression of phylogenetically strengthened unconditioned reflexes of newborns and infants.

Permanent reflexes are present throughout life. Their main ones are:

- Swallowing reflex
- Tendon reflexes of the limbs
- Corneal reflex

- Conjunctival reflex
- McCarthy's supraorbital reflex.

Transitory reflexes – present at birth but gradually disappear at a certain age. These are:

- Oral reflexes (truncal, the reflex arc closes in the medulla)
- Spinal reflexes (the reflex arc closeswithin the spinal cord)
- Myeloencephalic (controlled by centers in medulla and midbrain) reflexes.

Basic oral reflexes:

- Sucking reflex (detected by 10-12 months)
- Kussmaul-Henzler's rooting reflex (3-4 months) - when the skin in the corner of the mouth is touched, the child moves its head in the direction of the irritation
- Lip reflex (2-3 months) - when touching child's lips with a finger, he/shebrings the lips out forming a trunk.
- Babkin's reflex (2-3 months) - when the child's palm is pressed with thumbs, the child opens his mouth and bends the head forward to the chest.

Basic spinal reflexes:

- Defense reflex (2 months) - when a newborn baby is placed on the stomach, he/she reflectorily turns the head to the side
- Supporting reflex (2 months) - the doctor holds the child under the arms from the back and at the same time supports the head. Thus, the child bends the legs at the hip and knee joints. If the child is lowered downwards such that he/she touches the table, he/she will support him/herself with the legs on it.
- Stepping reflex (2 months) - if the child is in the position of supporting reflex and the doctor inclines him/her forward a little, the child takes some steps forward.
- Robinson's (upper grasp) reflex (3 months) - the child holds the fingers of the doctor's palm tightly, sometimes the doctor can lift the child up in this position
- Moro's (startle) reflex - at a distance of 15-20 cm from the child's head, the doctor claps on the surface where the child is lying. The child, at first, spreads the arms widely apart and extends the fingers. - the first phase of the Moro's reflex, then brings the hands to the initial position - The second phase of the Moro reflex.

- Kernig's reflex (4 months) - if the doctor bends the legs of a child in the knee and hip joints (in a lying position), the child cannot extend the legs in the knee joint. Reflexes are indicators for assessing the condition of the meninges, spinal roots, and pyramidal systems
- Bauer's crawling reflex (4 months) - if the child is laid on his/her stomach, he/she tries to raise the head and at the same time crawl; if the hand is tightly pressed against the child's foot, the child actively pushes it away.
- Babinski's reflex (4-6 months, sometimes up to 1-2 years) - when the sole of the foot is scratched from the heel to the toes, a slow dorsal extension of the big toe and – to some extent – extension of other toes take place. This reflex evaluates the state of the pyramidal system.
- Galant's reflex (3-4 months) - if the first and second fingers are passed along the paravertebral lines from top to bottom while the child is lying on the side, an arc-shaped flexed movement of the trunk towards the irritator occurs.
- Perez's reflex (3-4 months) – the reflex causes pain! If the child is laid on his stomach and the index finger is pressed slightly from the coccyx up to the end of the neck along the spinous processes of the vertebrae, the child will experience short-term apnea, then a sharp scream, raising the head and pelvis, flexion of the limbs, muscle hypertonus, sometimes calls for defecation and urination.

The main myeloencephalical posotonic reflexes include:

- symmetrical cervical tonic reflex (up to 2 months) - if the baby's head is passively bent while lying down, his/her arms become flexed, and the legs are extended.
- asymmetric cervical tonic reflex (up to 2-3 months) - if the head of a child in a lying position is passively turned to one side so that the chin touches the shoulder, the limbs of that site are extended while the limbs in the opposite site become flexed.

The basic **Righting reflexes** which are not present at birth and are formed at a certain time, are the following:

- **Upper Landau's reflex** (appears at 4 months) - a child lying on his abdomenflexes his arms, raises his head and the upper part of his body and stands in this position;
- **Lower Landau's reflex** (appears at 5-6 months) – a child lying on his/her abdomen raises the legs and simultaneously extends them.

***When evaluating the results of the examination of conditioned reflexes, the following should be taken into account*:**

- their presence or absence
- at presence– symmetrical or not
- appearance and disappearance
- appropriateness of the expression of the reflex to the child's age.

Reflexes should disappear in time when neuro-psychological development is normal. Interpretation of violations of neuro-psychological development:

1. Absence of reflexes at the appropriate age indicates delayed neuro-psychological development.

2. If reflexes are detected at an age when they should not be, they are considered pathological.

Stages of formation of PMD

General rules of PMD verification:

- in a warm room;
- one hour after feeding, when the child is not hungry;
- first, the state of each of the 5 signs is determined;
- after that, the child is placed on his/her back, then on his/her abdomen, and then held in a vertical position, unconditioned reflexes are examined. Finally, pain reflexes are examined.

In order to accurately assess the formation of PMD in time, 6 stages are conditionally defined:

I stage - 0-1 month
II stage - 1-3 months
III stage - 3-6 months
IV stage - 6-9 months
V stage - 9-12 months
VI stage - 1-3 years old.

Therefore, after evaluating the expression of 5 criteria, the data obtained on PMD should be compared with the child's age. Normally, PMD indicators should correspond to the indicators of the age stage. Sometimes the time of formation of these criteria is shifted: one of them is one stage earlier, and the other is one stage later. Prolonged illness, lack of education can leave all indicators behind by one stage, but not more.. This level of PMD is functional. A delay of 2 or more stages of

PMD is a pathological delay in development, in which case a diagnosis of encephalopathy is made.

Determination of PMD in preschool children (4-6 years old) is based on 5 indicators (Appendix 10), which determines the development of social communication features and some mental functions.

1. Thinking and speech indicate the development of the child's intellect and the general level of mental development.

2. Motor development shows that the child's movements have developed: it indirectly indicates the state of PMD (in children with a change in behavior, there is often a change in motor development).

3. Attention and memory refers to the child's ability to focus on one thing, to sustain attention, to remember and recall information (short-term and long-term memory).

4. Social indicators show the child's ability to communicate and include: the ability to adapt his own wishes and desires to the wishes and desires of other children, and the ability to work together with other children..

It is of great importance to assess school maturity, i.e. preparedness for school education, in the examination of PMD of 6-year-old children. Eligibility for school is determined by assessment using special tests(Appendix 11).

There are 3 groups of indicators in the examination of PMD of schoolchildren (appendix 13): emotional-vegetative, psychomotor, behavioral and intellectual development.

THE AUTONOMIC NERVOUS SYSTEM EXAMINATION METHODOLOGY

The autonomic nervous system (sympathetic and parasympathetic parts) controls the activity of internal organs, smooth muscles, endocrine orhans, tissue trophism, thermoregulation and other metabolic processes. This regulation is based on the reflectory principle.

Examination of autonomic reflexes of the skin

Autonomic reflexes of the skin are assessed by examining local and pilomotor dermographism.

Local dermographism- Check out the section "Methodology for checking the skin and subcutaneous fat layer".

Pilomotor (hair) reflexoccurs when the skin is cooled with an ice cube or a tampon soaked in cold water, or when the back surface of the neck (superior trapezius muscle) is pinched. As a result of these effects, the smooth muscles of the hairs shrink and the phenomenon of "goose-skin" appears in the affected area. Spinal cord injury is not observed in this reflex.

When **examining sweating reflexes**heating pads, subcutaneous pilocarpine and aspirin are used. External heat (heater) stimulates the spinal parts of the autonomic nervous system. Pilocarpine affects the final sweat-secreting systems (fibers, ganglia). Aspirin affects the sweat-secreting center of the hypothalamus. To determine the level of sweating in different parts of the body, Minor's probe is used: an alcohol-oil solution of iodine is applied to the skin (face, body, arms and legs) in the form of longitudinal stripes, and after drying, starch is sprinkled on these areas. Areas where sweat is separated are colored purple-black. It is necessary to pay attention to the segmentation of sweating disorders. Sweating disorder can be unilateral (if there is a lesion on one side) and bilateral.

Features of vascular tone regulation

Examination of indicative autonomic reflexes

Eye-heart reflex (Ashner) the front and side surfaces of the patient's eyeballs are pressed with two fingers for 20-30 seconds. Pulse, respiratory rate, BP are measured before and after the click. Normally, the pulse decreases by 8-10, BP decreases, breathing deepens and decreases. If there is no such effect, the reflex is evaluated negatively. This reflex is positive in 1-3 months. In newborns, the pulse increases when the eyeball is pressed.

Epigastric reflex: the abdominal wall is pressed in the epigastric area. In this, the child should lie in a relaxed position. The doctor inserts his hand until the abdominal aortic pulsation is felt. In this case, the pulse should decrease by 4-12 beats. If the tone of the sympathetic nervous system is increased, it will decrease even more.

Orthostatic test -normallywhen the child moves from a horizontal position to a vertical position, the pulse increases by 10-12 beats.

Clinostatic test- normally, when the child moves from a vertical position to a horizontal position, the pulse decreases by 10-12 beats. In the case of dysfunction of the vegetative parts of the nervous system, the pulse rate increases.

Methods of instrumental examination of the nervous system

1. Craniography (X-ray examination of the skull).
2. Transillumination (diaphanoscopy).
3. Electroencephalography (EEG).
4. Rheoencephalography (REG).
5. Computer tomography.
6. Magnetic resonance imaging.
7. Electromyography.
8. Cerebrospinal fluid examination.

The state of the endocrine system can be assessed by skin, subcutaneous fat, physical development, somatometry, since most endocrine glands cannot be directly examined. Only the thyroid gland, sebaceous glands and testicles in boys can be examined.

On palpation of the thyroid gland, the doctor is positioned behind the child. The thumbs should be placed posteriorly, and II-V fingers – anteriorly, to sternocleidomastoid muscle. The child moves the head a bit anteriorly, which relaxes servical muscles, and does swallowing movements. The doctor, this way, can sense the thyroid gland, which is being moved at the same time.

Palpation of the testicles:it is necessary to determine whether the testicles have fallen into the scrotum. It is necessary to pay attention to the shape, consistency, density, whether there is liquid – discharge and the size of the testicles.

Examination of the endocrine system also includes examination of symptoms of increased excitability of muscles (in spasmophilia). For this purpose, the following symptoms are determined:

Hvostek's symptom - when the fossa canine is hit with a percussive hammer, the eyelid muscles contract, and sometimes the muscles of the upper lip as well.

Trusso's symptom - when the child's arm in the middle of the humerus is squeezed with the tourniquet, the child's hand takes the form of an obstetrician's hand (due to hand spasm).

Lyust's symptom –when hitting with a percussive hammer, involuntary flexion of the foot occurs.

METHODOLOGY OF COLLECTING AN ANAMNESIS

1. **Passport information:**

a) surname, first name and father's name.
b) age and date of birth.
c) residential address.
g) parents' place of work (position, address, phone number).
d) institution where the child attends.
e) who has sent and with what diagnosis

2. **Anamnesis Morbi:** Complaints on the day of examination are grouped according to the organs systems of the bodies. The time of onset of the disease, with what symptoms the disease began, the dynamics of the symptoms, the treatment carried out and its result (if any, it should be indicated).

3. **Anamnesis Vitae** (collected from parents): how many pregnancies and how many deliveries the mother has gone through. Other pregnancy peculiarities: toxicosis during pregnancy, risk of premature birth, complications during childbirth - asphyxia, traumas. Treatments in pregnancy. Baby's Apgar score. Physiological decrease in body weight. Infant jaundice. The umbilical cord disruption. Body weight at the time of from the maternity hospital. On what day was the BCG vaccination done. The nature of feeding up to one year, the introduction of additional food (what sort of food and when was introduced). Dynamics of body weight and length, head and chest circumference up to one year. Static-dynamic functions, speech, development of conditional reflexes, the order and time of teething. Previous illnesses. Features of child care. Bad habits. School attendance and learning. Additional training. Tuberculin tests.

4. **Epidemiological anamnesis:** previous infectious diseases (age), preventive vaccinations (which, when), whether or not the child has been in contact with infectious patients during the last 3 weeks.

5. **Genetic anamnesis:**Genealogy, health of family members(family tree diagram, appendix 15).

6. **Allergological anamnesis:** the child's skin, mucous membranes and the presence of exudative-catarrhal diathesis. The presence of allergic diseases in family members (atopic dermatitis, bronchial asthma, pollinosis, etc).

7. **Functional anamnesis:** ask about organs systems (cough, sneezing, dyspnea, heart palpitations, heart pain, abdominal pain, urination, constipation, sleep, etc.).

When collecting the anamnesis of children under 3 years of age; antenatal anamnesis, the course of the newborn period, the features of feeding, physical and psychomotor development are given in full. If necessary, it is expanded in older children.

Summary of anamnesis: proposed diagnosis or syndrome, or systemic damage, health group (Appendix 16).

Appendix 1
DETERMINE THE LEVEL OF DEVELOPMENT OF SECONDARY SEXUAL CHARACTERS

Puberty is determined by the degree of development of secondary sexual characteristics and the following indicators are taken into account: hair growth under the armpit (A) and pubic area (P), the degree of breast development in girls (Ma) and the onset of menstruation (Me) are taken into account.

Hair growth in the pubic area

No hairs	P0
A couple of short hairs	P1
Hairs are abundant and long in the central area	P2
The hair is long, curly, thickly covering the triangle.	P3
The hairs are on the chest and along the linea alba	P4

Hair growth under the armpits

No hairs	A0
A couple of short hairs	A1
Hair is abundant in the central area of the armpit	A2
The hair is long, curly, thickly covering the armpit area	A3

Breastdevelopment

Glands are not prominent, raised above the nipple area	Ma1
The circumference of the nipple is large, the nipple is enlarged, forming a cone, the gland is slightly swollen	Ma2
The glands are enlarged, the nipple and its circumference are cone-shaped	Ma3
Raised from the circumference of the nipple, the body of the gland is of the size and shape of an adult female.	Ma4

The state of sexual development is represented by the general formula: A, P, Ma, Me. The level of development of each symptom and the age at first menstruation are indicated, for example A0, P1, Ma2, Me0 or A2, P3, Ma3, Me 14.

Appendix 2

STANDARD INDICATORS OF SHOULDER SKIN FOLD THICKNESS AND MUSCLE CIRCUMFERENCE IN CHILDREN

Age	Standard thickness of shoulder skin fold (mm) (according to Hammond, Tanner, Whitehouse)		Standard shoulder muscle circumference (cm) (according to Hammond, Tanner, Whitehouse)	
	Boys	Girls	Boys	Girls
New born.	6.0	6.5	-	-
6 months	10.0	10.0	11.4	12.1
12 months	10.3	10.2	12.7	12.4
1.5 yearsold	10.3	10.2	12.9	12.5
2 yearsold	10.0	10.1	13.1	12.8
3 yearsold	9.3	9.7	13.3	12.9
4 yearsold	9.3	10.2	14.0	12.7
5 yearsold	9	9.4	14.1	13.9
6 yearsold	8.2	9.6	14.7	14.2
7 yearsold	7.9	9.4	15.3	14.8
8 yearsold	7.6	10.1	16.0	15.3
9 yearsold	8.2	10.3	16.3	15.3
10 yearsold	8.2	10.4	17.1	16.6
11 yearsold	8.9	10.6	17.6	17.3
12 yearsold	8.5	10.1	18.5	18.3
13 yearsold	8	10.4	19.6	19.1
14 yearsold	7.9	11.3	20.8	19.6
15 yearsold	6.3	11.4	23.0	20.8

Appendix 3
PREPAREDNESS FOR SCHOOL

Test number	The test explanation	Evaluation (inpoints)
Test I	Draw 10 points with a distance of 1 cm between them	1 point – accurate transfer of the sample. Dots are drawn, not circles. Symmetry of shapes is preserved in both horizontal and vertical forms. Can be some inaccuracies. When larger, it should not exceed 2 times. 2 points - the symmetry is slightly violated, 1 point may go out of the column or row. Lines can be drawn instead of dots. 3 points – the group of points are inaccurately drawn, the symmetry is broken, the pentagonal shape is partially preserved. The number of points can be few or many (from 7 to 20). 4 points - the points are drawn in the same type, but a geometric shape can be recognized. The size and quantity of dots is irrelevant. But other images, such as lines, are not possible. 5 points – scribbles.
Test II	Copy and write the sentence HE ATE SOUP on a special 4x12-sized card, the letters should not be more than 1.5 cm in size.	1 point - the sentence can be read, the letters are larger than 1 cm, but not more than 2 cm, the size of the letters can be larger or smaller in relation to one another, but no more than 30%. 2 points - the sentence can be read, the letters are close to the sample, but not similar in size to each other. 3 points – can read at least 4 letters. 4 points - at least 2 letters are similar to the sample, all other letters can be identified. 5 points – scribbles.
Test III	Draw a picture of a person: head, face, body, ears, hair, arms and legs, 5 fingers on each hand, clothes.	1 point –The picture should contain: head, face, hair, ears, body, arms and legs, 5 fingers on hands, clothes. 2 points –Has no neck, hair and one finger on either hands or legs. 3 points - the head, body, and limbs are drawn in the form of a "stick".Has no neck, arms, hair, clothes, fingers, and soles. 4 points - superficial drawing, head, limbs in the form of a "stick" 5 points – scribbles.

<table>
<tr><td colspan="7">Each test (by Kerna-Iraseka) is rated out in 5 points: 1 point is the best performance, while 5 points show the worst. A normal child should get lower than 9; 3-5 points - excellent psychomotor development, 6-7 points –mature A variant (good outcome). 6-9 points –mature B variant (good outcome), 10 points - immaturity.</td></tr>
<tr><td>Test VI</td><td colspan="6">The dynamics of body weight and height should be within norms.</td></tr>
<tr><td rowspan="7">V test</td><td colspan="5">Teething</td></tr>
<tr><td>Age</td><td>Sex</td><td>Retardation</td><td>Normal</td><td>Acceleration</td></tr>
<tr><td rowspan="2">Up to 6 years</td><td>male</td><td>0-1 teeth</td><td>2-4 teeth</td><td>7-9 teeth</td></tr>
<tr><td>female</td><td>0-1</td><td>2-4</td><td>7-12</td></tr>
<tr><td rowspan="2">5 years 9 months - 6 years 6 months</td><td>male</td><td>0-1</td><td>2-6</td><td>7-12</td></tr>
<tr><td>female</td><td>0-2</td><td>3-8</td><td>7-10</td></tr>
<tr><td rowspan="2">6 years 6 months and older</td><td>male</td><td>0-5</td><td>5-10</td><td>7-12</td></tr>
<tr><td>female</td><td>0-6</td><td>6-11</td><td>11-12</td></tr>
<tr><td>Test VI</td><td colspan="6">Must pronounce 30 words correctly, as well as words with consonants</td></tr>
<tr><td>Test VII</td><td colspan="6">Themonometric testshoud be taken.</td></tr>
<tr><td colspan="7">Conclusions:
Prepared to study at school– mature A variant, the level of development of mental processes is good, the child has mastered the kindergarten program well, and well aware that he/she is going to school.
Conditionally prepared to study at school–mature B variant, the level of development of mental processes is low, and the child has received satisfactory results in the test.
Unprepared to study at school - the development of thinking, attention, and speech is at a low level. The child has not sufficiently mastered the kindergarten program.</td></tr>
</table>

Appendix 4
HEALTH GROUPS

Groups	Characteristic
I	Healthy children. Children who have no history of illness or have few illnesses, who come down with ARVI up to 4 times a year are included. Physical development is in the average range, harmonious, neuro-psychic development is age-appropriate, the functional state of the systems is intact, there may be some morphological shifts (anomaly of nails, underdeveloped deformation of the auricle, some stigmas, etc.), which do not affect the child's health and does not require correction. The presence of some carious teeth.
II	This group includes children whose biological anamnesis is aggravated by some functional and morphological changes. Healthy children who are at risk ofdeveloping chronic diseases. They are divided into 2 groups: IIA and IIB.
IIA	Healthy children with minimal risk of developing chronic disease. This includes disorders in the perinatal period; the mother's suffering from extragenital diseases, occupational injuries, alcoholism, the age of the mother at the time of delivery is younger than 18 or older than 30 years, toxicoses in the I and II half of pregnancy, the risk of miscarriage, bleeding, increase/decrease of BP. Disturbances in the intranatal period - rapid or protracted labor, prolonged dehydration, umbilical cord or placental pathology, abnormal position of the fetus. Poor genetic anamnesis.
IIB	This group includes healthy children born from a mother with multiple pregnancies, prematurely, or with a large body mass. Underdeveloped children or those affected by fetal intrauterine infection are also included in this group. Asphyxia, birth trauma, hemolytic diseases, acute severe illness in the early neonatal period, rickets of the 1st degree, significant complications of rickets, excess body mass or body mass deficiencies of the 1st and 2nd degrees. Susceptibility to allergic conditions, pylorospasm without hypotrophy. Some congenital anomalies that do not require surgery: expansion of the umbilical ring, separation of the rectus abdominis muscles, the size of the great fontanell is decreased, flat feet, functional changes in the cardiovascular system; I-II hypertrophied adenoid, II-degree hypertrophy of the tonsils, arcuation of the nasal septum without respiratory rhythm disturbances, frequent ARVI with such complications as,for example, bronchitis or pneumonia; the risk of anemia, thymomegaly, subcompensated caries.

	(the presence of 6-8 carious teeth); some neurotic reactions, pathological habits, retardation of mental development, stuttering, mild myopia, accommodation disorder without binocular vision impairment without amblyopia, positive tuberculin test, convalescence of acute infectious and non-infectious diseases.
III	Group III includes children with chronic diseases or congenital pathology (compensation stage). In this case, children get sick almost every month. The disease rarely, if not severe, returns. There are no significant changes in the child's general condition, well-being, and actions. Children's resistance suddenly decreases.
IV	This group includes children with chronic diseases, congenital malformations (subcompensationstage). In them, the main disease often relapses. The child's general condition and well-being are disturbed. After intercurrent diseases, the recovery period is prolonged.
V	Group V includes children suffering from severe chronic diseases, at risk of severe disability or disabled children.

OBJECTIVE CHILD EXAMINATION PROTOCOLS
Protocol №1
PHYSICAL DEVELOPMENT

1. The day of examination.
2. Full name
3. Age (date of birth).
4. Complaints during examination.

I. Somatometry

- Body weight - kg
- Height - cm
- Body mass index (BMI)
- Head circumference - cm
- Chest circumference - cm

II. Somatoscopy

- proportionality (ratio of head circumference and body length, limbs and body length);
- bone system (teething);
- subcutaneous fat layer (the level of distribution);
- muscular system;
- sexual development.

III. Physiometry

- Dynamometry.
- Spirometry.

Conclusion:

Protocol №2
SKIN, MUCOUS MEMBRANES, SUBCUTANEOUS FAT LAYER

1. The day of examination.
2. Full name
3. Age (date of birth).
4. Complaints during examination.

I. SKIN CHECK-UP

- color
- the presence of rashes
- In case of rashes: - localization;
  - characteristics;
  - background;
  - sensation (itching, skin rash).

PALPATION

- elasticity;
- humidity (dry, slightly drier, relatively humid, humid, hyperhydrosis);
- temperature (increased, decreased, locally or along the entire surface).

DERMOGRAPHISM

- color;
- prevalence;
- time of appearance and disappearance.

II. SKIN DERIVATIVES CHECK-UP

- head hair (color, integrity, areas of alopecia);
- soft feathers - enough, a lot (where);
- nails (nail plate: clarity, deformation, flatness, brittleness).

III. VISIBLE MUCOUS MEMBRANES CHECK-UP

- color;
- cleanliness (presence of rash);
- humidity;
- glitter

Tongue - swelling, condition of nipples, appearance (color, localization).

IV. SUBCUTANEOUS FAT LAYER CHECK-UP

level of development (sufficient, excessive, low);
distribution (uniform, non-uniform, by which type);
PALPATION
thickness in cm (abdomen, chest, shoulder, thigh, back, face);
consistency - elastic, dense (where);
turgor of soft tissues (increased, decreased);
edema (localization).

Conclusions:

Protocol №3
BONE-MUSCLE SYSTEM, JOINTS

1. The day of examination.
2. Full name
3. Age (date of birth).
4. Complaints during examination.

I. BONE SYSTEM

EXAMINATION, PALPATION

1. Head (shape, deformation, circumference in cm, ratio of the skull and face).

In children up to 1.5 years old -fontanells:

The name of the fontanell;

size (in cm);

edges (hard, elastic, soft, roughness);

attitude to the bones of the skull (swollen, sunken).

2. Eyeballs (symmetry).
3. Hard palate (shape, presence of defects).
4. Teeth (the name, number, presence of defects, bite).
5. Neck (reflection of neck lordosis, deformation).
6. Chest (shape, circumference in cm, deformation, type of body structure).
7. Spine (level of development of physiological curvatures, stature, signs of scoliosis).
8. Hands (length in cm, deformations).
9. Legs (length in cm, deformations).
10. Sole (flat feet, deformities).

II. Muscular system

EXAMINATION, PALPATION

1. Walking (physiological, pathological).
2. Facial muscles (level of development, symmetry).
3. Neck muscles (symmetry, strength, tone).
4. Body muscles (level of development, tone).
5. Arm muscles (level of development, symmetry, circumference of shoulder and forearm muscles in cm, strength, tone).
6. Leg muscles (level of development, symmetry, circumference of thigh and calf muscles in cm, strength, tone).

III. Joints

- form;
- deformation;
- skin above the joint (color, temperature);
- swellings;
- volume of active and passive activities;
- painfulness (on palpation, when moving)

Conclusions:

Protocol №4
RESPIRATORY ORGANS

1. The day of examination.
2. Full name
3. Age (date of birth).
4. Complaints during examination.

CHECK-UP

- type of breathing (abdominal, chest, mixed);
- respiratoryrhythm;
- respiratoryrate (perminute);
- pulse and respiration ratio;
- breathing through the nose (free, difficult);
- discharge from the nose (mucous, purulent, scaly);
- voice (shout);
- chestshape;
- the participation of auxiliary muscles in the act of breathing;
- dyspnea (expiratory, inspiratory, mixed);
- cough (dry, hoarse, productive, wheezing);
- sputum (amount, character);
- throat - tonsils (size, color, appearance, symmetry);
- pharyngeal wall (mucous layer character).

PALPATION

- chest resistance and easticity;
- pain;
- voice trembling.

PERCUSSION

1. Comparative:
- lung sound character;
- localization.
2. Topographical:
- pulmonary apex borders;
- Krenig's fields;
- lower borders of the lungs;
- pulmonary motility.

AUSCULTATION

- type of breathing (puerile, vesicular);

- rales (type, place, related to cough or not);
- pleuralfrictionnoise;

LYMPH NODES IN THE CHEST:

- Filatov's symptom (front, back).
- Philosopher's bowl symptom.
- Symptoms of Korani, Medovikov, Arkavin
- d'Espin's symptom.
- Smith's symptom
- **Conclusions**:

Protocol №5
CARDIOVASCULAR SYSTEM

1. The day of examination.
2. Full name
3. Age (date of birth).
4. Complaints during examination.

CHECK-UP

- cyanosis, acrocyanosis;
- chestdeformity;
- digital clubbing;
- visible pulsation of veins and heart;
- tumors;
- dyspnea

PALPATION

- pulse (symmetry, frequency, rhythm, fullness, tension, shape, pulse deficit);
- apex beat (localization, area, height);
- pathologicaltremor.

PERCUSSION

- the limits of the relative dullness of the heart;
- the limits of the absolute dullness of the heart;
- vascular bundle width (cm);
- heart length (cm);
- heart diameter (cm).

AUSCULTATION

1. Heart tones (at each point):
- sonority (clear, muffled, etc.);
- rhythm.
2. Heart murmur:
- place of hearing and point of maximum hearing;
- character (systolic, diastolic);
- irradiation;
- strength (inpoints);

- relationtobodyposition;
- reactiontophysicalexertion.

3. Pericardial friction noise.

Blood pressure:

- on the hands;
- onthelegs.

Conclusions:

Protocol №6
GASTROINTESTINAL TRACT

1. The day of examination.
2. Full name
3. Age (date of birth).
4. Complaints during examination.

CHECK-UP

- skin (color, cleanliness);
- sclera (color);
- mucous of the oral cavity and anus;
- tongue;
- excretory ducts of salivary glands;
- teeth (presenceofcaries);
- swallowing (free, difficult);
- abdomen (shape, participation in breathing, venous network, hernias);
- diarrhea (daily frequency, color, smell, consistency, presence of pathological impurities).

PALPATION

1. Surface:

- front wall of the abdomen (tension, pain);
- symptom of exposure to the peritoneum;
- watersplashsymptom.

2. Deep:

- Stomach (large curvature location, consistency, pain), Mendel's symptom;
- bowels (size, surface, consistency, motility, pain, distention);
- pancreas (surface character, consistency, pain);
- Shofar zone, Desjardins point, Mayo-Robson point;
- liver (how many cm it protrudes from the rib cage, surface characteristics, consistency, pain);
- gallbladder symptoms (Kera, Ortner, Murphy, Mussi).

PERCUSSION

- the borders of the stomach.
- Liver size according to Kurlov (from 5 years).

AUSCULTATION

- Time of passage of food through the esophagus;
- Stomach borders by auscultofriction method.

Conclusions:

Protocol №7
ORGANS OF URINE PRODUCTION AND URINE EXCRETION

1. The day of examination.
2. Full name
3. Age (date of birth).
4. Complaints during examination.

CHECK-UP

1. Skin (color, moisture).
2. Edema.
3. Externalgenitalia:
   - developmentalanomalies;
   - mucous membranes (color, cleanliness, moisture);
   - discharge from the urethra (character).
4. Urination (daily frequency, pain, involuntary, incontinence).

PALPATION

1. Edema
2. Urinary bladder (protrusion (cm), consistency, pain)
3. Kidneys (consistency, surface character, pain)

PERCUSSION

1. Borders of the bladder;
2. Borders of kidneys:
   - upper pole;
   - lower pole.
3. Pasternatskiy's symptom of
4. Detection of free fluid in the abdominal cavity (symptom of flushing)

Conclusions:

Protocol №8
CHILD'S NEURO-PSYCHOLOGICAL DEVELOPMENT

1. The day of examination.
2. Full name
3. Age (date of birth).
4. Complaints during examination.

Psychometrics

Indicators	Epicrisis period
VA (vision analyzer)	
HA (hearing analyzer)	
E (emotions)	
HG (hand gesture)	
CO (common operations)	
US (understood speech)	
AS (active speech)	
Games	
S (skills)	
SD (sensory development)	
G (grammar)	
AA (artistic activity)	

The test on preparedness for school by Kern-Irasek (in preschool children)

Conclusions: Neuro-psychological development (NPD) group, pre-school age.

Protocol №9
ENDOCRINE SYSTEM

1. The day of examination.
2. Full name
3. Age (date of birth).
4. Complaints during examination.

1. Hypophysis

Examination of clinical signs of hypo- and hyperfunction

- Physical development
- Body proportions
- Sexual development

2. Thyroidgland

- Examination (deformation of the neck area, appearance of the gland when swallowing, pulsation).
- Palpation (consistency, pain, mobility, swelling, adhesions).
- Percussion.
- Auscultation (noises of different intensity on the gland).

4. Parathyroid glands

Examination of clinical signs of hypo- and hyperfunction

- Walking
- Deformation of bones
- Convulsions
- Increased nerve-reflex excitability (Trusso, Hvostek's symptoms).

5. Adrenal glands

Examination of clinical signs of hypo- and hyperfunction

- Skin (marble-coloured, hyperpigmentation);
- Hypertrichosis;
- Deformation of the spine;
- Body weight
- Subcutaneous fat layer

Palpation (kidney poles).

Percussion (determining the percussive borders of the kidney).

6. Gonads

- Examination (external genital structure, size, developmental anomalies, compatibility with the child's sex).
- Secondary sexual characteristics.

Conclusions:

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