

1. Algorithm of the results' evaluation of the "general blood test" in patients with anemia.

Indicator	Iron deficiency anemia	B12- folate deficiency anemia
Hemoglobin	decreased	increased
Color index	<0,85	>1,15
Reticulocytes	increased	decreased
ESR	increased	---
Serum iron level	decreased	---
B12 / folic acid level	---	decreased
Note	microcytosis, anisocytosis, poikilocytosis	macrocytosis, megalocytosis

2. Algorithm of the results' evaluation of the “ general urine test”

Parameter	Reference values
Color	Pale yellow to yellow
Transparency	Transparent
Density	1.003 – 1.040
pH	5.5 – 7.0
Chemical properties	
Protein	Negative
Glucose	Negative
Ketones	Negative
Urobilinogen	Negative
Nitrites	Negative
Bilirubin	Negative
Microscopy	
Flat epithelium	Negative
Transitional epithelium	Negative
Renal epithelium	Negative
WBC	0 - 5
RBC	0 - 2
Hyaline cylinders	Negative
Granular cylinders	Negative
Erythocyte-based cylinders	Negative
Amorphous phosphates	Negative
Uric acid crystals	Negative
Oxalates	Negative
Amorphous urates	Negative

Fungi	Negative
Mucus	Small amount
Bacteria	Negative

3. Algorithm of the results' evaluation of the "blood chemistry test "

Basic parameters	Normal range
Glucose	3.05 – 6.38 mmol/l
Glycosylated hemoglobin	4.8 – 5.9 %
Total protein	66 – 87g/l
Albumin	35 – 50g/l
Alanine aminotransferase (ALT)	0.1 – 0.68 mmol/h·l
Aspartate aminotransferase	0.1 – 0.45 mmol/h·l
Alkaline phosphatase	50 – 130 mmol/h·l
Amylase	200 - 800 U/l
Total bilirubin	3.4 – 20.5 mcmol/l
Direct bilirubin	5.1 mcmol/l
Indirect bilirubin	8.6 mcmol/l
Creatinine	M. 40 – 115 mcmol/l,
Urea	M. 3.8 – 7.3 mmol/l,
Uric acid	M. 180 – 420 mcmol/l,
Fibrinogen	2.5 – 4.0 g/l
Iron	M. 5.5 – 25.8 mcmol/l,
Cholesterol	2.58 – 5.85 mmol/l
Triglycerides	0.11 – 5.65 mmol/l
Total thyroxine	65 – 160nmol/l
Unbound thyroxine	9 – 25 pmol/l
Total triiodothyronine	1.17 – 2.5 nmol/l
Free triiodothyronine	4 – 8pmol/l
Creatine phosphokinase	0 – 150 U/l
MB - CPK	0 – 12 U/l
Cardiac troponine	0.01 – 0.1ng/ml

4. Thyroid gland palpation method.

The examiner should be positioned in front of the patient. Thyroid gland area should be examined prior to palpation in order to detect the enlargement. Thyroid gland isthmus is palpated first: place the right thumb over the isthmus location and move it gently downwards. Then check the lateral lobes reaching beyond the inner margins of sternoclavicular muscles. Ask the patient to

make a swallowing movement – it makes the palpation easier.

The parameters which are established by the palpation:

- position of the gland
- size of the gland (thyroid gland enlargement stage),
- consistency of the gland (presence or absence of nodes),
- pain,
- mobility.

Normally thyroid gland is elastic, painless and movable and not enlarged.

Diffuse thyroid gland enlargement: the smooth surface and the soft structure of thyroid gland are detected. Nodular goiter: dense nodes are detected in the thyroid gland region. Acute and subacute thyroiditis: thyroid gland is elastic, enlarged and painful. Malignancies: dense structure, possible loss of the thyroid gland mobility.

Thyroid gland enlargement stages:

I – isthmus is enlarged and can be visible and palpated during the swallowing movements.

II – thyroid gland lobes and isthmus are visible and palpated during the swallowing movements.

III – thyroid gland takes place on the anterior surface of the neck and is smoothing the borders of the neck (making it look shorter).

IV – the shape of the neck is changed ; the enlarged thyroid gland looks like a tumor.

V – a huge size of the thyroid gland.

5. The algorithm of the lungs' percussion

Comparative frontal percussion of the lungs:

1. The position of the patient - hands are lowered;
2. Position of the doctor - in front and to the right of the patient;
3. Frontal percussion starts from the tops:
 - Place the finger-plessimeter in the supraclavicular fossa and parallel to the clavicle, the midclavicular line must cross the middle of the middle phalanx of the plessimeter.
 - Use a hammer finger to make the medium-strength strokes to the plessimeter finger.
 - The plessimeter finger is placed in the symmetrical supraclavicular fossa in the same position and strokes of the same force are applied.
 - Then conduct direct percussion on the clavicles.
 - Further percussion is performed in the subclavian region along the three intercostal spaces (I, II, III). In this case, the finger-plessimeter is placed in

the intercostal space parallel to the ribs so that the middle of the middle phalanx is crossed by the midclavicular line.

Comparative lung percussion in the lateral regions:

1. The position of the patient - hands are down and to the sides;
2. The position of the doctor is in front of the patient facing him;
3. A finger-plessimeter is placed on the chest in the armpit (along the intercostal space) parallel to the ribs so that the middle of the middle phalanx is crossed by the mid-axillary line.
4. Percussion of the symmetrical lateral sections of the chest along the intercostal space to the lower border of the lung is applied.

Comparative posterior percussion of the lungs:

1. Position of the patient - arms crossed on the chest. Bend the upper part of the body to the front;
2. The position of the doctor is to the left of the patient;
3. Firstly, percussion is performed in the suprascapular region. The finger-plessimeter is placed horizontally in the middle of the spine of the scapula parallel to the ribs;
4. Proceed the percussion in the interscapular region. The finger plessimeter is placed vertically and parallel to the spine. After each percussion on the left and on the right, the plessimeter is gradually moved down to the angle of the scapula;
5. Proceed the percussion in the subscapularis region along the VII, VIII intercostal spaces. The finger-plessimeter is placed horizontally along the intercostal space so that the middle of the middle phalanx is crossed by the scapular line.

The percussion sound is evaluated at each percussion point, and the sounds at the symmetrical points are compared;

6. Algorithm of the lungs' auscultation

1. The room should be quiet and warm.
2. The lungs are listened to in the upright position of the patient (standing or sitting), only if the patient is in a serious condition, it is possible to listen to them in the supine position.
3. Auscultation of the lungs, as well as percussion should be comparative and performed at the points of comparative lung percussion.
4. Auscultation of the lungs, compared to percussion, is not conducted along the topographic lines, but along the regions, starting with the supraclavicular regions (the region of lungs' apex), then the region of the pectoralis major muscles

a blunt one, while the plessimeter finger is located vertically. Normally, the right border is located on the right edge of the sternum or 1 cm outward from it in the 4th intercostal space.

When determining the upper border of the relative dullness of the heart, percussion is carried out on the left along the sternal line, the finger-plessimeter is located parallel to the sought-for border. Normally, the upper border is located on the third rib.

The left border of the relative dullness of the heart is determined in the intercostal space, where the apical impulse is preliminarily palpated. In this case, the plessimeter finger is placed vertically outward from the apical impulse and moved inward. If the apical impulse is not palpable, percussion is performed in the 5th intercostal space from the anterior axillary line to the right. Normally, the border of the relative dullness of the heart is located in the 5th intercostal space, 1-1.5 cm medially from the mid-clavicular line.

After the determination of the boundaries of the relative dullness of the heart, measure its transverse size. To do this, measure the distance with a ruler from the extreme points of the relative dullness of the heart to the anterior midline. Normally, the distance from the right border of relative dullness (4th intercostal space) to the anterior midline is 3-4 cm, from the left (5th intercostal space) is 8-9 cm, the sum of these values is the transverse size of the heart (11-13 cm).

Heart margins	relative dullness	absolute dullness
Right	4 intercostal space on the right edge of the sternum	4 intercostal space on the left edge of the sternum
Upper	3 rib on the left	4 rib on the right
Left	5th intercostal space 1-1.5 cm inwards from the midclavicular line	5th intercostal space 1-1.5 cm inwards from the margins of relative dullness or coincides with it

Defining the margins of absolute dullness of the heart

The right border of absolute dullness is determined by placing the finger-plessimeter vertically in the IV intercostal space outside of the border of the relative dullness and moving it to the left until a dull sound appears (use the quietest percussion). Normally, it is located to the left edge of the sternum.

To determine the upper border of the absolute dullness, the finger-plessimeter is placed outside of the upper border of the relative dullness, moving it down between the sternal and parasternal lines. Normally, it is located on the 4th rib.

The left border of the absolute dullness is determined by the V intercostal space. A finger-plessimeter is placed on somewhere outside of the left border of the relative dullness, and it must be moved until a dull sound appears. Normally, the left border of absolute dullness is located 1-1.5 cm inward from the border of relative dullness.

8. Auscultation points of the heart.

The first point is the apex of the heart, i.e. the region of the apical impulse or, if it is not determined, the left border of the heart at level V of the intercostal space (listening point of the mitral valve); during auscultation over the apex of a woman, if necessary, firstly she is asked to raise the left mammary gland;

the second point is the II intercostal space directly at the right edge of the sternum (the point of listening to the aortic valve);

the third point - II intercostal space directly at the left edge of the sternum (the point of listening to the pulmonary valve);

the second and third points are usually united by the concept of "base of the heart";

the fourth point is the base of the xiphoid process (the point of listening to the tricuspid valve).

fifth point - Botkin-Erb's point - III intercostal space at the left edge of the sternum (additional listening point of the aortic valve, corresponding to its anatomical projection).

9. Methodology of the blood pressure measurement.

1. Measurement of blood pressure (BP) should be carried out in a calm environment after 5 minutes of rest.

2. Within 30 minutes before measuring blood pressure, the patient should not smoke or drink coffee.

3. The cuff should cover at least 80% of the circumference of the upper arm and cover 2/3 of its length. The use of a cuff that is too narrow or short leads to overestimation of blood pressure values, too wide - to their underestimation. Standard cuff (12-13 cm wide x 35 cm long).

4. Place the cuff in the middle of the shoulder at the level of the heart so that its lower edge is 2-2.5 cm above the ulnar fossa, and a finger passes between the cuff and the surface of the shoulder.

5. When measuring by the auscultatory method, the air is pumped up to 20-30 cm Hg. above the values of SBP.

6. Let the air out slowly - 2 - 3 mm per second - and determine the I phase of Korotkoff tones (appearance) and V phase (disappearance), which correspond to SBP and diastolic blood pressure (DBP). When listening to Korotkov's tones to very low values or to 0, according to the DBP, the blood pressure level is considered, it is fixed at the beginning of the V phase. Blood pressure values are rounded to the nearest 2 mm.

7. Measurement should be carried out at least twice with an interval of 2-3 minutes. If the results differ by more than 5 mm Hg, it is necessary to re-measure in a few minutes.

8. At the first measurement of blood pressure should be determined on both hands, as well as in a sitting, standing and lying position. Higher values are taken into account, more accurately correspond to blood pressure.

9. Measurement of blood pressure in the first and fifth minutes after the transition to orthostasis must be performed in elderly patients, patients with diabetes mellitus and in all cases of orthostatic hypotension or if it is suspected.

10. Determination of the liver's borders (percussion according to Kurlov).

Percussion is performed with the patient lying on his back.

- Along the right midclavicular line, quiet percussion is made from a clear pulmonary sound down the intercostal space until hepatic dullness appears, the upper border is marked along the outer edge of the plessimeter finger, facing the clear lung sound. And from the navel, a clear or tympanic sound to the appearance of hepatic dullness - the lower border of the liver. By connecting two points, measure the first size of the liver according to Kurlov. Usually it is $9 \text{ cm} \pm 1 \text{ cm}$. The upper limit of hepatic dullness is used to determine the other two sizes.

- Along the midline of the abdomen, percussion upward from tympanitis until hepatic dullness appears - the lower border of the liver. The upper border is conventionally taken as a point lying on the same level with the upper border of the first size of hepatic dullness along the median line. By connecting these points, measure the second size of the liver according to Kurlov, usually $8 \text{ cm} \pm 1 \text{ cm}$.

- The third size of the liver according to Kurlov is determined by percussion near the left costal arch parallel to it, starting percussion approximately from the anterior axillary line towards the sternum, percussion from tympanitis until hepatic dullness appears. The third size is usually $7 \text{ cm} \pm 1 \text{ cm}$.

11. Algorithm of the spleen's palpation

1. The patient is located on the right side with the left leg slightly bent and the left hand laid forward, under the head.

2. Palpation of the spleen is bimanual: the left hand is placed flat on the lower part of the rib cage on the left costal arch and slightly squeezes this area to limit the movement of the chest to the sides during inhalation and to increase the downward movement of the diaphragm and spleen. The terminal phalanges of 2-5 fingers of the right hand are placed parallel to the anterior edge of the spleen at the edge of the rectus abdominis muscle, the base of the hand is directed towards the pubis.

3. The second and third moments of palpation - the formation of a skin fold and "pockets": during exhalation, when the anterior abdominal wall relaxes, the fingertips of the palpating hand pull the skin towards the navel (skin fold formation), and then they are immersed deeply into the abdomen in the direction to the left hypochondrium (pocket formation).

4. The fourth point is palpation of the spleen: upon completion of the formation of a "pocket", which is carried out at the end of exhalation, the patient is asked to take a deep breath. The left hand at this time slightly presses on the lower part of the chest and the left costal arch, and the fingers of the palpating hands are slightly straightened and make a slight counter movement towards the spleen. If the spleen is enlarged, then it goes into the pocket and gives a certain tactile sensation. In the case of palpation of the spleen, its localization (in centimeters from the edge of the costal arch), consistency, shape and soreness are noted.

The healthy person has the spleen inaccessible to palpation, since its anterior edge is 3-4 cm above the costal arch, but if the spleen is palpated even at the edge of the costal arch, it is already enlarged 1.5 times.

12. Methods of ECG recording (12-channel electrocardiograph).

The study is carried out with the patient lying down, after resting for 15-20 minutes, and not earlier than 30 minutes after eating. The patient should be stripped to the waist, and the shins should also be exposed.

-On the inner surface of the legs and forearms in their lower third, 4 plate electrodes (or disposable electrodes) should be applied, firstly degrease the skin with alcohol in the places where the electrodes are applied, apply a layer of special conductive gel to the electrodes, install 6 chest electrodes on the chest using a rubber bulb - a suction cup ...

-Electrocardiograph wire should be connected to each electrode located on the limbs and chest corresponding color: right arm - red (R), left arm - yellow (L), left leg - green (F), right leg - black (N), chest electrode - white.

The chest leads proposed by Wilson in 1934 are localized as follows:

V1 - red wire is used to connect active electrode located in IV intercostal space near to right side of sternum;

V2 – yellow wire is used to connect active electrode located in IV intercostal space near to left side of sternum;

V4 – brown wire is used to connect active electrode located in the V intercostal space on the left medio-clavicular line;

V3 – green wire is used to connect active electrode located between V2 and V4, approximately on the level of IV rib on the left parasternal line;

V5 – black wire is used to connect active electrode located on the same horizontal line as V4 on the left anterior armpit line;

V6 – purple wire is used to connect active electrode located on the left medium armpit line on the same horizontal level as V4 and V5 electrodes.

- Lead switch position 0 adjusts the amplification of the electrocardiograph and records the calibration millivolt. If necessary, you can change the gain: decrease it if the amplitude of the ECG teeth is too large (1 mV = 5 mm), or increase it if their amplitude is small (1 mV = 15 or 20 mm).

- Set the speed of ECG registration by pressing the speed button to select the corresponding parameter (25 mm / sec).

- Check the quality of the placement of the electrodes, looking at the ECG display in leads I and II, switching the leads with the arrow keys "up" and "down".

- Immediately after the end of the study, on a paper tape, indicate the surname, name and patronymic of the patient, age, date and time of the study.

13. Analysis of the results of the electrocardiogram.

First steps

- Pacemaker establishment (sinus/non-sinus rhythm);
- Rhythm of cardiac complexes (regular/irregular rhythm);
- HR establishment;
- Electric heart axis establishment;
- Calculate the duration and amplitude of waves and duration of cardiac cycle intervals;
- Check the presence of:
 - Atrial or ventricular hypertrophy;
 - Automatic function disorder, activation or conduction disorders;
 - Coronary failure manifestations control.

Sinus rhythm criteria

- Presence of P wave before each QRS complex;

- Positive P wave in II standard lead;
- Similar polarity, amplitude, shape and duration of P waves for all heart cycles of particular lead;
- Similar P-Q interval for each ventricular complex; normal P-Q duration (0.12 – 0.18 seconds).

HR calculation for ECG

- Calculate the R-R distance (in millimeters) in 4-5 consequent cycles;
- Calculate the average for this distance in millimeters;
- Calculate the duration of average R-R interval by multiplication of average distance (in mm) by 0.02 (duration of 1 mm distance at mean stripe movement speed 50 mm/sec) or by 0.04 (duration of 1 mm distance at mean stripe movement speed 25 mm/sec);
- Calculate the HR using the following formula: $HR = 60/R-R$.

Parameters of waves and intervals

P wave reflects the electric activity of atria (depolarization process distribution). Amplitude: 0.5 – 2.5 mm, duration: 0.06 – 0.08 seconds.

Q wave reflects the activation of left side of the inter-ventricular septum. Duration: less than 0.03 seconds; amplitude – less than $\frac{1}{4}$ of the following R wave amplitude for the same lead.

R wave reflects the activation of ventricles. It is a positive wave for all leads. R wave amplitude in different leads depends on electric axis position. For normal electric axis position the maximum amplitude is recorded in II standard lead; for chest lead consequent increase of R wave amplitude is reported for V1-V4 followed by the decrease in the left chest leads. R wave duration is 0.05 – 0.08 seconds.

S wave reflects the terminal activation of the left ventricle. It is not a permanent wave. S wave is always negative. The deepest S waves are recorded in chest leads V1 and V2.

QRS complex reflects the complete depolarization of ventricles. QRS complex duration is 0.06 – 0.08 seconds (up to 0.1 seconds).

T wave reflects repolarization of ventricles. T wave amplitude: 3-8 millimeters. T wave duration: 0.10 – 0.25 seconds.

P-Q interval is the time interval from P wave start to Q wave starting point (R). It reflects the time required for the impulse to pass through the atria, atrio-ventricular node, His bundle and pedicles and Purkinje's fibers up to contractile myocardium. Normal P-Q interval duration: 0.12 – 0.18 seconds.

S-T segment is an interval from QRS complex end to T wave. It reflects the complete activation of both ventricles. Normally it is located on the iso-electric line; however, it can be horizontally elevated over the iso-electric line by 0.5 mm or

located within 0.5-1 mm below the iso-electric line. It can also be oblique elevated over the iso-electric line in right chest leads.

R-R intervals reflect the total duration of heart cycle. Normally all R-R intervals are regular; the difference should be less than 0.15 seconds (or 10%). If the difference of heart cycles duration (R-R) is higher, the rhythm is considered irregular.

ECG evaluation in patients with acute Q myocardium infarction located in the posterior wall of the left ventricle

Q wave present. ST elevation in II, III and aVF leads.

Specific laboratory parameters reflecting the myocardium infarction:

-Troponine levels;

MB fraction of creatine phosphokinase/

Basic medications for treatment of acute myocardium infarction

-Nitrates;

-Morphine (narcotic analgesic drugs);

-ACE inhibitors;

-Anti-aggregation drugs;

-Direct anti-coagulants;

-Coronary arteries angiography followed by stent introduction.

14. Analysis of the results of echocardiography.

Parameters	Normal values
Left ventricle	
- terminal diastolic diameter	37 – 55, mm
- terminal systolic diameter	26 – 37, mm
- diastolic volume	55 – 149, mm
- systolic volume	18 – 40, mm
- ejection fraction	55 – 65 %
- posterior wall thickness	9 – 11, mm
Inter-ventricular wall thickness	9 – 10, mm
Right ventricle	
- diameter	7 – 26, mm
- wall thickness	2 – 4, mm
Left atrium	20 – 36 (4), mm
Aorta radix	20 – 38, mm
Aortavalves opening amplitude	17 – 25, mm
Pulmonary artery isthmus	11 – 22, mm
Maximum flow rate as measured by Doppler sonic test, m/sec	
Trans-mitral flow	0.6 – 1.3

Trans tricuspidal flow	0.3 – 0.7
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15. Pulse oximetry. (determination of oxygen saturation).

Insert one of the fingers into the clamp of the device. Before examination, you should make sure that the finger is not dirty. After turning on the device, the numbers appear on the display:

- heart rate (norm 60 - 90 contractions);
- level of blood oxygen saturation (norm 95 - 100%).

16. Analysis of the results of pneumotachometry.

Preparation for the study: the study is carried out on an empty stomach or 2 hours after a meal. The patient is asked not to smoke 24 hours before spirometry, not to drink alcohol. 30 minutes before the study, it is necessary to exclude active physical exercises, sit in a calm environment. Clothing on the subject should be comfortable and free so as not to hamper the movements of the chest. Cancel short-acting bronchodilators 4 hours before the study after consultation with the attending physician. If the patient uses an inhaler, you should take it with you. Carry a handkerchief.

Procedure: the patient sits right in the chair, hands are located on the armrests. The study is performed using a spirometer, which is designed both for spirometry and pneumotachometry. A disposable mouthpiece is put on the spirometer for each patient, and a nose clip is placed on the patient's nose. After several calm breathing cycles (inhale-exhale), the patient performs a forced breath and immediately, without holding his breath, forced expiration. If a cough occurs, the study is stopped and continued after a few minutes. The appearance of hemoptysis or chest pain requires the cessation of pneumotachometry. The procedure is repeated several times to obtain several results. Then the doctor evaluates the graphic image, the obtained indicators and formulates a conclusion.

17. Algorithm for determining body mass index using the formula: the ratio of height and weight.

Measurement of body weight is carried out on a medical scale with an accuracy of 100 g. The scale plane is set horizontally to the floor. The patient should stand in the middle of the plane of the scales and not move during the measurement. Height is measured with a stadiometer. The subject should stand on its plane with his back to the rack with a scale, touching it with three points: heels, buttocks and

spine at the level of the line connecting the lower angle of the shoulder blades. The head should be slightly tilted so that the outer edge of the external auditory canal and the lower edge of the orbit are on the same line parallel to the floor. The person who takes the measurement stands on the side of the subject and lowers the tablet on his head, which moves on a centimeter scale. The counting is carried out along the bottom edge of the tablet.

Body mass index is determined by the formula:

2 ,

where: m - body weight in kilograms, h - height in meters, and measured in kg / m².

The body mass index was developed by the Belgian sociologist and statistician Adolphe Ketele.