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ALGORITHMS OF DOING PRACTICAL SKILLS AND SITUATIONAL TASKS IN PAEDIATRICS FOR PRACTICALLY-ORIENTED STATE FINAL EXAM

Textbook for 6th-year students of medical faculties

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The textbook provides material to prepare for the practically-oriented final state exam on childhood diseases and infectious diseases of children for the 6th-year students of medical faculties at higher educational institutions, the Ministry of Public Health of Ukraine, III-IV level of accreditation. The material is systematically distributed in sections to get answers for case studies and mastering practical skills, possession of which is necessary to pass the practically-oriented examination in childhood diseases and childhood infectious diseases.

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PREFACE

PRACTICALLY-ORIENTED STATE FINAL EXAMINATION IN CHILDHOOD DISEASES AND CHILDHOOD INFECTIOUS DISEASES: OBJECTIVE AND TASKS

(SPECIALTY “General Medicine”)

The normative form of state certification of graduates at higher educational establishments is a standardized test (Medical Licensed Integrated Test "KROK-2") and practically-oriented state examination. The practically-oriented state examination is conducted in the form of a final state examination. The practically-oriented state examination assesses the quality to solve typical problems by a specialist under conditions close to professional ones. The team of examiners examines every student during both parts of the final exam, gradually evaluating the student for all points of the first and second parts of the exam.

The following methods to carry out the final state examination in pediatrics and pediatric infectious diseases are planned:

Part I: control of the solution of typical problems and skills in a treatment facility that is close to professional activity while examining a sick child, performed at the bedside of the patient. During the first part of the practically-oriented state exam (when dealing with a sick child) the following tasks and skills of students are reviewed and evaluated separately according to the standard scale, followed by the final grade:

1. Gathering information about the patient (complaints, history, physical examination).
2. Assessment of laboratory and instrumental examination.
3. The preliminary diagnosis of the disease.
4. Drawing up a plan of prevention and preventive measures.
5. Determination of principles of treatment and nature of disease.
6. Determination of the regime and diet during treatment.
7. Defining the tactics during dispensary supervision of children.

The ability of students to solve typical tasks and students’ skills are checked at the Department of Pediatrics and Pediatric Infectious Diseases in the Regional Clinical Hospital № 1 in the following hospital departments: (1) Department of Iinfectious Diseases of the Neonatal Period, (2) Cardiologic and Heamathologic Department, (3) Department of Pulmonology and Allergology, (4) Infectious Department for Children, (5) Department of Droplet Infections, (6) Department of Intestinal Infections. All seven points during the first part of the exam are evaluated separately on a specific scale

and the final score of the first stage is displayed using the same scale (see methods of evaluation in the protocol attached).

Part II: During the second part of exam the team of examiners evaluates the level of abilities and skills of every student according to the "List ...", including:

1. Evaluation of physical development of children of all ages.
2. Prescription of a healthy diet to children of the first year of life and dietetic therapeutic feeding for sick children of all ages.
3. Assessment of additional methods in children's examination (two tests out of the following laboratory tests: blood, urine, feces, cerebrospinal fluid, bone marrow punctate, biochemical analysis of blood, ionograms, coagulogramme picture etc.) as well as decoding of one electrocardiogram or interpretation of one chest X-ray.
4. Organization of preventive measures, diagnosis and medical management of pediatric infectious diseases.
5. Providing emergency and intensive care for sick children.
6. Peculiarities of resuscitation of children at different ages (using simulators for demonstration).

For the second part of the exam each student takes a separate task. The points are estimated on the basis of points fixed in the individual protocol of evaluation and examination.

Points are defined as follows: points for the first (second) part of the exam are defined as an average of all points that are fixed in individual protocols of evaluation and examination of the relevant part of the exam.The resulting score for the practically-oriented state examination is defined as a sum of the first and second parts of the exam.

EVALUATION CRITERIA

of training level of the students at practically-oriented final state examination in Pediatrics and Pediatric Infectious Diseases (specialty "General Medicine")

Evaluation of results of the practically-oriented final state exam in childhood diseases and pediatric infectious diseases according the credit-transfer system of the educational process is carried out according to the Regulations of the Ministry of Public Health Care of Ukraine dated 15.04.2014, № 08.01-47/10395, "Instructions for Evaluation of Students' Learning Activities in the Implementation of European Credit Transfer System". Evaluation of professional training of students during the final state examination on childhood diseases and pediatric infectious diseases requires consideration of the results of the Integrated Licensed Examination "KROK - 2" in profile "Pediatrics". Evaluation of theoretical and practical training of

students during the final state examinations in pediatrics and pediatric infectious diseases is carried out by a standardized protocol.

The practically-oriented state examination is conducted according to the Order of the Ministry of Public Health Care of Ukraine dated 31.01.2005 № 53 "On Approval of the Regulations Concerning Organization and Order of State Certification of Students Studying at Higher Educational Establishments of III-IV Accreditation Levels in the Direction of Trainign "Medicine".

The primary points made in the protocols are defined as follows:

Performance of the common tasks and skills that are tested during the first part of the exam is evaluated by points: "1", "0.5" and "0" (performed, not fully performed, not performed). Scores are recorded in the records of individual conduction and evaluation of the first part of the exam. Solution of situational taks, basic skills that are tested during the second part of the exam, are evaluated by scores of "1" and "0" (completed, not completed). Scores are made in the records of individual conduct and evaluation of the second part of exam. Points for the first (second) part of the exam are calculated as an average of all scores that were recorded in the records of individual conduct and evaluation of the relevant part of the exam. Initial scores on the first (second) part of the exam are in the range from 0 to 1 and rounded off to two (2) decimal places.

CRITERIA TO EVALUATE THE PERFORMANCE OF TYPICAL TASKS, SKILLS AND STUDENTS' PRACTICAL SKILLS: THE FIRST PART OF THE EXAMINATION

Score "1" is given to a student who has perfectly mastered the technique of gathering information about the patient (complaints, medical history, physical examination) - complaints and anamnesis are collected completely, systematically, important things are separated, physical examination is complete, systematic, purposeful; correctly and fully interprets the results of laboratory and instrumental investigations; correctly establishes and defines the preliminary diagnosis of the disease according to modern classification; fully and correctly prescribes the regime and diet in the treatment and determines the nature and principles of treatment of disease, determines the tactics for the group of children under clinical supervision; fully and faithfully carries out preventive plans and preventive measures for diseases in children.

Score "0.5" is given to a student who generally can collect information about the patient (complaints, medical history, physical examination) - complaints and history are collected correctly, but unsystematically, physical examination is systematic, although it is not complete and unpurposefull;

generally correctly, but with minor inaccuracies or errors interprets the results of laboratory and instrumental investigations; according to modern classification establishes a preliminary diagnosis of the disease, although not clearly defines it; prescribes the correct diet, regime and treatment, establishes the principles of nature and cure of disease, but mistakes and errors are not always self-corrected, defines tactics for children under medical supervision and generally truly plans of preventive and anti-epidemic measures to disease, but not in its integrity and makes certain errors.

Score "0" is given to a student who does not master the methods of the gathering information about the patient (complaints, medical history, physical examination) - complaints and anamnesis collected incorrectly, unsystematically, physical examination irregular, incomplete and unpurposefull; wrong with gross errors interprets the results of laboratory and instrumental investigations; does not make a preliminary diagnosis of the disease; can not prescribe a profile and diet, incorrectly defines the principles and nature of treatment of disease; can not determine the tactics for contingent of children under clinical supervision; can not plan antiepidemic and preventive measures for infectious diseases.

SECOND PART OF THE EXAMINATION

Score "1" is given to a student who during the second part of the exam using the scales can assess the physical development of children of all ages, correctly solve situational problems with the purpose of nutrition for healthy children of the first year of life, therapeutic feeding for sick children of all ages; correctly evaluates the results of laboratory and instrumental studies, correctly interprets the electrocardiogram or chest X-ray, correctly solves the case studies of emergency and intensive care of sick children and performs measures of resuscitation for children of all ages.

Score "0" is given to a student who during the second part of the exam can not assess the physical development of children of all ages; incorrectly answers the questions in situational problems with prescribing nutrition for healthy children of the first year of life, clinical nutrition for sick children of all ages; can not evaluate the results of laboratory and instrumental investigations; can not interpret electrocardiograms or chest X-ray, makes mistakes; wrongly decided case studies in providing emergency care and intensive care to sick children; can not perform resuscitation for children of all ages.

The final score for practically-oriented state exam is defined as an average of scores of the first (CA1) and second (Ca2) parts of the test, multiplied by a factor of 200, rounded to integer. This resulting score is the student's score for the 200- point scale.

The formula for conversion:

$$\frac{(CA1+CA2)}{2} \times 200$$

Scores for practically-oriented final state exam in the 200-point scale are converted into four-point scale at the following criteria. Grades by multi- and four-point scales are written into the examination list of the group.

Criteria for evaluation of the traditional 4- point scale

Assessment by multi- (200) scale	Rating scale for four-point scale
From 180 to 200 points	5, "excellent"
From 140 to 179 points	4, "good"
From 101 to 139 points	3, "satisfactory"
100 points or less	2, "unsatisfactory"

During the ranking of students the scores on the final state examination in the 200-point scale are converted into ECTS. Scores in ECTS are not converted in four-point scale and vice versa. Ranking with the grades "A", "B", "C", "D", "E" is made by Deans for all students of one course enrolled in one specialty and have passed the exam. Students who received 100 points or less (score "2") shall not be entered in the list of students who are ranked. Ranking for the measurement of ECTS is carried by Deans by the number of points, achieved during the practically-oriented exam. The results are written in the appropriate examination lists and protocols.

Criteria for evaluation of ECTS

Assessment of ECTS	Statistical index
“A”	the best 10% of students
“B”	next 25% of students
“C”	next 30% of students
“D”	next 25% of students
“E”	last 10% of students

CHAPTER 1
PRESCRIPTION OF RATIONAL DIET FOR HEALTHY INFANTS IN THE FIRST YEAR OF LIFE AND OF DIETOTHERAPY TO SICK CHILDREN OF VARIOUS AGES

1.1 INTRODUCTION

Formation of children's health of an early age, their further psycho-emotional and intellectual development, condition of health in later years of life depend on the nature of feeding considerably. Breastfeeding is considered to be the only physiological type of feeding, which ensures a harmonious development and reserve of health in the child's body. None, even the best milk formula can be a complete substitute for breast milk.

The initiative of WHO/UNICEF «Baby friendly hospital" which was launched worldwide in 1991, was originally aimed at promotion of health of younger children by providing breastfeeding at all stages of medical care given to children and mothers. In the framework of the project "Child Health", UNICEF, together with the WHO and the Ministry of Public Health of Ukraine, supported actively its implementation in Ukraine. In order to realize it, health care institutions should follow **12 principles of breastfeeding:**

1. The management of medical institutions should keep to the policy regarding the breastfeeding practices regularly and bring it to the attention of all health personnel as well as pregnant and parturient women.
2. To teach all medical workers necessary skills concerning the support of breastfeeding, to instruct new employees.
3. To inform all pregnant women about modern principles, benefits and techniques of breastfeeding.
4. To help mothers start breastfeeding within the first 30 minutes after their childbirth. To provide a direct skin contact of mother and newborn (contact "skin to skin").
5. To teach mothers how to breastfeed and maintain lactation, even if they are temporarily separated from their children.
6. Do not give any food or drink other than breast milk to newborns, unless there are some medical indications.
7. To practice round-the-clock common stay of mother and baby in the same ward.
8. To encourage breastfeeding on demand of a child and not according to the schedule.
9. Do not give any sedatives which simulate maternal breasts (nipples, pacifiers) to infants who are breastfed.

10. To encourage each parturient woman to visit pediatric department of the polyclinic after being discharged from the obstetric department.
11. Practice of partner delivery. To practice free visits of relatives to mother and child in the maternity home.
12. To adhere to the International Code of marketing the breast milk substitutes, including their advertising and free distribution.

Thus, the initiative "Baby friendly hospital" in the work of health care institutions ensures:

1. The right of a baby for breastfeeding.
2. The right of a mother to breastfeed her baby.
3. The right of a baby and mother to stay together.
4. The right of a child for an adequate and harmonious development.

Traditionally, the following types of feeding are distinguished:

– **natural breastfeeding** – is a kind of feeding in which the baby gets its mother's (or wet-nurse's) milk during the first 6 months of life, which covers more than 80% of the amount and calorie content of a daily diet;

– **artificial feeding** – a kind of feeding in which a child only gets milk formula and mother's milk for the first 6 months of life, the amount of which covers less than 20% of the daily calorie content.

– **mixed feeding** – a kind of feeding in which, during the first 6 months a child gets its mother's (or wet-nurse's) milk, covering from 20 to 79% of the daily calorie content and amount of food.

At the same time, the experts from the WHO and UNICEF (1989, 1992) suggested the following terms to describe the types of feeding:

– **exclusively breastfeeding -** breastfeeding in which the child does not get anything but its mother's or nurse's milk (neither water nor other foods);

– **mostly breast-feeding -** feeding, in which the child does not get another meal (but he gets water, juices - not more than 30 ml per day, and medicinal forms of vitamins);

– **complemented (or partial) breastfeeding -** feeding, in which a child receives food: regular additional thick food (more than 30 g / day) or adapted milk mixtures (more than 100 ml / a day);

– **symbolic (or nominal) breastfeeding -** application to the mother's breast at which the baby almost does not get milk and its amount can not be considered in the energy supply.

Thus, the concept of breastfeeding in the terminology of the WHO / UNICEF which was adopted in our country corresponds to such terms as "exclusively breastfeeding", "mostly breastfeeding" and "complementary breastfeeding" (high level) to the concept of mixed feeding - "complementary (or partial) breastfeeding" (intermediate level); to the notion of artificial feeding - "symbolic (or nominal) breastfeeding" and "complementary

breastfeeding" (low level). In this case, as the experts of the European Society of Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN, 2008) explain their recently published comments, in accordance with the position of the WHO, the "exclusively breastfeeding" means that the child only receives breast milk and no other liquids or solid food, except for a small number of drops or syrup with vitamins, mineral additives or medications. "Mostly breastfeeding" includes feeding with breast milk in combination with the use of water or water-based beverages, such as application of solutions for oral rehydration. However, experts of ESPGHAN (2008) believe that the decision of the WHO experts to introduce the concept of "exclusively breastfeeding" was taken to support and strengthen the focus on breastfeeding. The experts of ESPGHAN (2008) also find that the concept of "exclusively breastfeeding" is useless, as well as being confusing.

Exclusively breastfeeding is the best type of feeding a child under 6 months. Natural breastfeeding of a baby should begin within the first 30 minutes after its birth and continue for one year and, if possible, even longer. The process of breastfeeding a baby is conveniently presented in the form of several periods, including the period before the woman gives birth to a baby and physiological cycle of development, extension and decrement of the lactation function.

The periods of natural breastfeeding:

1. Preparatory stage - formation of a psychological aim for the expectant mother to breastfeed (from school age and to the end of pregnancy).
2. The period of mutual induction – from the first application to the breast immediately after birth to the emergence of significant secretion of milk, or "flow" on the 3^{rd} -5^{th} days after birth.
3. Adaptation period - from an irregular feeding regime to creation of sustainable rhythm of hunger and satiety, increasing to a maximum the body weight gain in the infant (10-12 g/kg/day).
4. The basic period - successful feeding with gradually increasing or constant intervals, close emotional contact while feeding, good fatness of a child and sufficient accumulation of subcutaneous fat layer.
5. Period of transitional diet- from the beginning of milk-free diet to the formation of the ability to eat everything. It conventionally includes:

- adaptation to complementary feeding - from the introduction of minimum complementary foods until the first additional food becomes a source of energy, salts and vitamins;
- a period of substantial complementary foods while preserving at least two breastfeedings a day;
- weaning period (fewer than two breastfeedings per day).

Why is it so important to keep to the principles of early application of the child to the mother's breast, contact "skin to skin" after the birth and the common 24-hour stay with their mother in the maternity home? The stress a child experiences during the labour is known to be incomparable in power with any stressful situation in the coming years. The feeling of comfort and protection of a child from the first minutes of life can only be provided by the contact with its mother, by putting the baby on fer abdomen in the delivery room, applying to the breast immediately after birth, that is, a warm body contact for at least 60 minutes.

Early applying to mother's breast also:

- stimulates the production and secretion of milk;
- reduces the level of stress hormones in women;
- accelerate the allocation of the placenta, preventing postpartum hemorrhage in women;
- ensures invasion of a newborn's body with maternal bifidus bacteria and lactobacilli which will determine the formation of physiological microflora and immunity in the baby.

Mother's milk has unique properties to ensure harmonious growth and development of her baby. It contains the necessary nutrients for the baby in the ideal ratio, and a set of protective factors and biologically active substances. The composition of breast milk changes not only during the day, but also during the first year of life, meeting the changing requirements of the baby.

Advantages of breastfeeding:

1. Optimal and balanced level of nutrients and micronutrients (proteins, fats, carbohydrates, vitamins, minerals, trace elements).
2. High absorption of breast milk nutrients in the body of the child (unlike cow's milk).
3. A wide range of biologically active substances and protective factors - enzymes, hormones, hormone-like substances, immunoglobulins, lactoferrin, lysozyme, β-lactose bifidogenic factors (oligosaccharides).
4. Low osmolarity of breast milk (optimal load on the functionally immature kidneys of the child).
5. Sterility (reduces the risk of intestinal infections and diarrhea).
6. Optimal temperature.
7. Cost.

The balanced composition of basic plastic materials in breast milk is presented by all necessary proteins, fats and carbohydrates in the ratio of 1: 3: 6 (for comparison, in cow's milk the ratio is 1: 1: 1). Breast milk contains a complete set of all necessary vitamins and minerals in the most accessible form for absorbing, bifidogenic factors for the formation of normal intestinal

microbiota. Autolytic function of breast milk is due to the presence of enzymes, digesting proteins, fats and carbohydrates in its composition while the glands of the baby's digestive system are still immature.

Proteins of breast milk serum consist mainly of alpha-lactalbumin, an important component of enzymatic system. The results of qualitative and quantitative research of the WHO show that breast milk contains protein in an amount of 1,15 g/100 ml, with the exception of the first month, when the figure is 1,3 g/100 ml. The relationship between albumin and casein is 3: 2, which defines a high bioavailability of proteins for the child's body (in cow's milk the ratio is 1: 4 in favor of a high casein content).

Fats provide basic energy loss (in breastfeeding up to 50%), they are a part of cellular membranes, providing resistance to adverse factors of the external environment, have a positive effect on the function of all organs and systems, especially the cardiovascular, nervous and digestive ones, participating in synthesis of adrenal gland hormones, in the protection of the organism against the excessive heat loss, in the fat-soluble vitamins transportation(A, D, E). The composition of fats in mature human milk is perfect for a child and meets its physiological needs. The fat content by the end of feeding is considered to act as a regulator of saturation. In human milk mostly triglycerides are contained, which do not possess protective properties themselves, but after hydrolysis to free fatty acids and monoglycerides they are able to cause lysis of bacteria, viruses (including herpes viruses, HIV), fungi and protozoa. Among polyunsaturated fatty acids arachidonic and linolenic ones are especially important: their content in human milk is almost 2 times higher than in cow's milk (0,4 g and 0,1 g/100 mL, respectively). They affect most physiological functions that stimulate digestion along with maturation of cells in the intestines.

Carbohydrates are the main source of energy, as in the first months of life they supply 40% of calory need, and 60% of them later. Carbohydrates act as a component of connective tissue cells, of some enzymes, hormones and of immunity bodies. Proteins and fats are peoved to be better absorbed with them. On the first days and months the child's organism does not need more than carbohydrates contained in lactose (disaccharide), which can only be found in milk. Its amount in breast milk is twice as big as in cow's milk, the isomerous structure of lactose is different as well. Thus, beta-lactose of breast milk produces a favourable effect on the intestinal function, composition of lipids (reduces neutral fats contents), promotes the growth of intestinal microflora which is vitally necessary for the organism, promotes the synthesis of vitamins of B group. Alpha-lactose of cow's milk does not possess so pronounced positive effect. Beta-lactose is the main carbohydrate

of human milk, although it also contains galactose, fructose and other oligosaccharides in small amounts.

Vitamins are active partners in increasing the resistance of the organism, oxidative reactions, hematopoiesis and other vital processes. In the first weeks and even months, breast milk is an ideal type of food in this respect. It contains much more fat-soluble vitamins (A, D, E) and vitamin C than cow's milk. Breast milk contains twice as much vitamin A, three times as much vitamin C, much more vitamin E than cow's milk. In addition, the activity of vitamins in breast milk is much higher too. For example, the activity of the vitamin D in breast milk is by hundreds of times higher than in cow's milk. The amount of vitamins in women's milk largely depends on the mother's diet.

Ratio of calcium to phosphorus as 1: 2 in breast milk promotes the absorption of microelements by 3-4 times better than that of cow's milk, where the ratio is 1: 1.

Breast milk contains a large number of components, such as living cells, hormones, immune factors, regulators of biological age and others, which are not possible to reproduce by technology (Table 1). They will never be a part of any formula.

Table 1

Breastmilk components

Proteins	Alpha-lactalbumin, beta-lactoglobulin, caseins
	Enzymes, growth factors, hormones, lactoferrin, lysozyme, secretory Ig A and Ig G, Ig M
Nonprotein components	Alpha-amino nitrogen, creatine, creatinine, glucosamine, nuclear acids, polyamines, urea, uric acid
Lipids	Fat-soluble vitamins (A, carotene, D, E, K), fatty acids, phospholipids, sterols and hydrocarbons, triglycerides
Carbohydrates	B-lactose, oligosaccharides, glycopeptides, bifidus factor
Water-soluble vitamins	Biotin, Folin, holat, inositol, niacin, pantothenic acid, riboflavin, thiamine, vitamin B12, B6, C
Cells	Fragments of the cytoplasm, epithelial cells, lymphocytes, white blood cells, macrophages, neutrophils
Minerals	Bicarbonate, calcium, chloride, citrate, magnesium sulphate, potassium, soda, sulphate
Trace elements	Cr, Co, Cu, I, Fe, Mn, Mo, Ni, Se, Zn

Breastfeeding reduces the risk of the following conditions in the child:

1. Acute otitis in the middle ear.
2. Nonspecific gastroenteritis.
3. Severe infection of the lower respiratory tract.
4. Atopic dermatitis.

5. Asthma (young children).
6. Obesity.
7. Types 1 and 2 diabetes mellitus.
8. Children's leukemia.
9. Apnoea.
10. Necrotic enterocolitis.

Positive effect of breastfeeding on the woman:

1. Reduced risk of postpartum complications (bleeding, pyoceptic diseases).
2. Prevention of an unplanned pregnancy.
3. Reduced risk of type 2 diabetes, breast cancer and ovarian carcinoma.
4. Early termination or giving up breastfeeding may cause postpartum depression.

During the first days after birth, the mother's breasts produce colostrum - thick yellowish milk. Colostrum contains more proteins, antibodies and other protective factors than mature milk (Table 2). Colostrum has a mild laxative effect and contributes to the timely clearing mesonium out of the newborn's intestine, promotes the development and establishment of normal bowel function after the birth of a child, prevents allergies and other food intolerances. In its vitamin content colostrum differs from mature milk, vitamin A is especially abundant in it.

Table 2

The content of proteins, fats, carbohydrates and salts in the breast milk of varying maturity

Type of milk	Proteins, g/l	Fats, g/l	Carbohydrates, g/l	Salts, g/l	Calorie content, kcal/l
Colostrum	80 – 110	28 – 41	40 – 53	8,1 - 4,8	1500
Transitional breast milk	23 – 14	29 – 44	57 – 66	2,4 - 3,4	1100
Matured milk	14 – 12	33 – 34	73 – 75	1,8 - 1,2	700
Cow's milk	30 – 34	36 – 39	44 – 46	7,1–8,0	630

Due to the unique composition of colostrum, it is important for the child to receive it from the first hours of life, which is only possible in case when mother and her baby stay together from the moment of birth, in frequent breastfeeding, exclusively breastfeeding without formula supplementation in the hospital.

However, we must remember that if lactation is unstable in the first days of life the child should not feel hungry! Starvation or malnutrition of a newborn affects its condition adversely, leading to protein-energy deficiency, disorders of water and electrolyte metabolism, dehydration, increased catabolic processes, a significant loss in body weight (5 - 10%), deranging postnatal adaptation and causes pathological syndromes. To feed babies temporarily not breastfed in the hospital, the expressed milk of the mother is used, and when it lacks or it is not secreted at all, then appropriate adapted mixtures should be used.

The daily infant's need for nutrients and energy depends on the child's age, type of feeding (natural or artificial) and body weight of the child. Therefore, the need for proteins, fats, carbohydrates and energy value in the first year of life are expressed per kg of body weight. The need for vitamins and minerals is expressed per day.

The need of the baby in protein during the first 3 months of life is 2,2 g/kg of body weight, during the next three months – 2,6 g/kg, in the 2nd half of the year – 2,9 g/kg of body weight (Table 3). The recommended norm of fat amount during the first year of life reduces from 6,5 g/kg in the 1st half to 5,5 g/kg of body weight in the 2nd half. The need for carbohydrates during the first year is virtually unchanged and constitues 13 g/kg of the baby's body weight.

The recommended norms of children in minerals and vitamins are only approved for six minerals (calcium, phosphorus, sodium, iron, zinc, iodine) and 10 vitamins (fat-soluble A, E, D and soluble: C, B1, B2, B6, PP, B12, folic acid). It should be emphasized, that these standards are averaged, while the real requirements for nutrients and energy in a particular child can greatly vary depending on the state of health, physical development and other individual characteristics. In this regard, while assessing individual diets of children in practice, deviation from the given norms by +/- 10- 20% is possible.

Table 3

Daily consumption rates of some food components and energy in the first year of life

Food agents	Measurement units	Age in months		
		0-3	4-6	7-12
Calorie content	kcal/kg	115	115	105
Protein (total)	g/kg	2,2	2,6	2,9
Animal protein	g/kg	2,2	2,5	2,3
Fat	g/kg	6,5	6,0	5,5
Linoleic acid	g/kg	0,7	0,7	0,7

Carbohydrates	g/kg	13	13	13
Calcium	mg	400	500	600
Phosphorus	mg	300	400	500
Magnesium	mg	55	60	70
Iron	mg	4	7	10
Zinc	mg	3	3	4
Iodine	mkg	40	40	50
Vit. C	mg	30	35	40
Vit. A	mkg	400	400	400
Vit. E	mg	3	3	4
Vit. D	mkg	10	10	10
Vit. B_1	Mg	0,3	0,4	0,5
Vit. B_2	Mg	0,4	0,5	0,6
Vit. B_6	mg	0,4	0,5	0,6
Vit. PP, niacin	mg	5	6	7
Folic acid	mkg	40	40	60
Vit. B_{12}	mkg	0,3	0,4	0,5

Table 4

Consumption norms for some food ingredients and energy in children older than a year

Food agents	**Measurement units**	**Age in years**							
		1-3	**4-6**	**6**	**7-10**	**males**		**females**	
						11-13	**14-17**	**11-13**	**14-17**
Calorie content	kcal	1540	1970	2000	2350	2750	3000	2500	2600
Protein, including animal pr.	g	53	68	69	77	90	98	82	90
		37	45	45	46	54	59	49	54
Fat, including vegetable oil	g	52	68	67	79	92	100	84	90
		7	9	13	16	18	20	17	17
Carbohydrates	g	212	272	285	335	390	425	355	360
Calcium	mg	800	900	1000	1100	1200			
Phosphorus	mg	800	1350	1500	1650	1800			
Iron	mg	10		12		15		18	
Zinc	mg	5	8	10		15		12	
Iodine	mg	0,06	0,07	0,08	0,1			0,13	
Vit. C	mg	40	45	45	45	50	60	60	
Vit. D	mkg	10	2,5						

Evaluation of breastfeeding is held during every mandatory medical examination of a child. It is necessary to assess whether the child is being applied to the mother's breast correctly as well as the efficiency of suction.

Signs of efficient suction: The child is sucking slowly and deeply with short breaks.

Signs of correct application of the child to its mother's breast: (fig. 1, 2):

1. The child's chin should touch the breast.
2. The child's mouth is open widely.
3. The lower child's lip is turned out.
4. The child takes over the most of the lower part of the areola.

Fig. 1. The baby is applied on to his mother's breast incorrectly

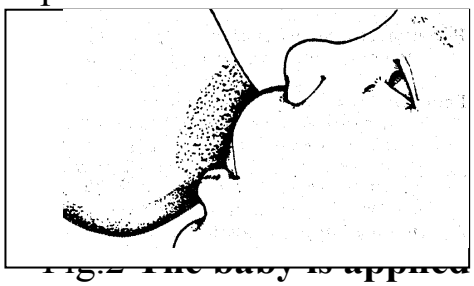


Fig.2 The baby is applied on to his mother's breast

One of the most common reasons for the introduction of milk formula in the diet of baby and of giving up exclusive breastfeeding is mother's concern about insufficient, in her opinion, amount of breast milk.

Reliable signs of lack of breast milk for the child:

1. Insufficient gain of the child's weight for a month.
2. "Dry diaper" symptom, which is indicative of reduced daily amount of urine, the baby urinates less than 6 times a day; the urine is yellow and concentrated, with sharp odor (the child who is breastfed in the first months must urinate not less than 6 times a day, the urine must be colorless or pale yellow).
3. Hungry stool (small amount, greenish colour, altered consistency).

The age periods when a child may need more breast milk are 3 weeks, 6 weeks and 3 months (hungry crises). It is due to the intense growth of the child at this time, which requires more frequent application to the breast and should not be a reason for the introduction of milk formula into the child's diet.

During breastfeeding, mother may experience lactation crises. This is a temporary reduction in the amount of milk for no apparent reason, which, on average, lasts for 3-4 days and is reversible. In this period mothers need psycho-emotional support and rest.

Measures for maintaining lactation during a lactation or hungry crisis:

1. More frequent putting to the breast.
2. Using special beverages possessing a lactogenic action.

3. Regulation of mother's regimen and diet (including optimal drinking regimen due to additional no less than one litre of liquid (tea, stewed fruit, juices).
4. Contrast showers on the breast area, soft rubbing with a towel.
5. Influence on the psychological condition of the mother.
6. Don't introduce milk formula in the child's diet without doctor's recommendation.
7. Using tea for lactation, in particular produced by Hipp.

Mixed feeding is a variation of partial breastfeeding, which includes additional feeding a child with milk formula. There is a mixed feeding close to the natural, if the daily diet predominately contains breast milk and that close to the artificial feeding, when milk formula dominates. Additional administration of milk formula is called complementary feeding. In mixed feeding use a teaspoon for complementary formula and only after putting the child to both breasts. We should conduct monitoring of weight to determine the amount of complementary formula.

The daily need for basic food ingredients of children of the first year of life on mixed feeding is presented in Table 5.

Table 5

Daily need for food ingredients per 1 kg of the body weight in children of the first year of life being on mixed feeding

Food agents	Child's age in months	Mixed feeding	
		Close to breastfeeding	Close to artificial feeding
Proteins	<4	2,0 – 2,5	3,0 – 3,5
	4 - 12	3,0 – 3,5	3,0 – 3,5
Fats	<4	6,5 – 6,0	6,5 – 6,0
	4 - 9	6,0 – 5,5	6,0 – 5,5
	9 - 12	5,5 – 5,0	5,5 – 5,0
Carbohydrates	0 - 12	12,0 – 14,0	12,0 – 14,0

Artificial feeding. In some cases, when breasfeeding is fully impossible the child's diet must correspond to his age and be adequate. Then, the child is fed on an adapted formula. The child's parents must be fully aware of the health risks to the child that exist when feeding the baby with formula. You must advise parents how to prepare the mixture safely and store it properly (do not use the mixture after more than 40 minutes from the time of its preparation). The amount of milk formula depends, to large extent, on the child's body weight. Keep in mind that the amount of food that is used for one feeding is not always the same throughout the day.

Contraindications for a woman to breastfeeding

1. Open tuberculosis with bacilla release.
2. Especially dangerous infections (smallpox, anthrax), tetanus.
3. Acute stage of mental illness.
4. Acute neglected syphilis.
5. Treating with cytostatic agents and with hormonal drugs.
6. HIV-positive status of the mother.

Contraindications to breastfeeding for a child are quite limited:

1. Heridetary enzymopathies, which prevent milk assimilation (galactosemia, phenylkenoturia, “maple syrop urine” disease, lactase deficiency).
2. Proved breast milk proteins allergy (extremely rarely).

Dietary habits, while feeding with formula, remain unrestricted. The introduction of complementary foods and food products to children who are bottle-fed, with adapted milk formula, is not different from those of breastfed children.

Milk formula classification. *Adapted milk formula* according to the degree of similarity to the composition of breast milk can be divided into *three categories*: highly adapted, less adapted and partially adapted.

The composition of highly adapted formula is the most similar to breast milk: the amount and ratio of proteins - serum protein / casein (70:30 or 60:40), the contents and structure of essential fatty acids (linoleic, linolenic and their families omega-3 and omega-6), carbohydrates (lactose), with a balanced content of vitamins, macro- and microelements, the contents of biologically active substances (taurine, choline, lecithin, inositol, L-carnitine). These mixtures are recommended at ages 0 to 6 months. If the name of the formula containes a prefix "pre" or the number "0", these products are intended for underweight newborns and preterm infants. According to the level of serum protein decomposition, milk formulas are divided into those containing deep or partial hydrolysis of proteins.

Less adapted formulas are casein ones (the ratio of serum proteins / casein (40:60 or 20:80), the main composition, the content of polyunsaturated fatty acids, vitamins and minerals is balanced to meet the needs of children of the second half year of life, so they are recommended after 6 months (so called following formulas with "2" or "3" marks). The composition of partially adapted milk formulas, that are casein ones, is just partially close to breast milk; they do not contain biologically active substances; they do not have a full range of polyunsaturated fatty acids; their trace element and vitamin composition is not balanced; in addition, they contain some substances, which are not inherent in human milk (starch, flour from different cereals, sugar), which increases the risk of adverse reactions.

Approximate calculation of the food requirements in infants under 12 months

1. Volumetric method. The infant's age and weight are considered. The approximate daily amount of food if the infant's weight corresponds to the average age norm is determined by means of Table 6.

Table 6

The approximate daily amount of food for an infant under 12 months

Infant's age	Daily amount of food, ml
From birth to the 8th day	70-80 day of the infant's life*
From 8 days to 2 months	1/5 of body weight
From 2 to 4 months	1/6 of body weight
From 4 to 6 months	1/7 of body weight
From 6 to 12 months	1/8 - 1/9 of body weight

* The need for milk in the infant's first week (8 days) of life (in ml): 1 feeding 10 x n; daily requirement (formula by A.F.Tour -Finkelstein): n x 70 (or 80 if the birth weight is more than 3,2 kg), where n is the age in days.

2. Caloric (energy) method. The energy requirements of the child are considered (Table 5). In exclusively breastfeeding the approximate calorie content of 1 liter of breast milk - 700 kcal is taken into consideration (Table 7).

Table 7

Daily energy requirements of an infant under 12 months

Infant's age	Daily energy requirements, kcal	Daily energy requirements, kJ
from 0 to 3 months	120	502
from 3 to 6 months	115	480
from 6 to 9 months	110	460
from 9 to 12 months	100	430

At the age of 6 months breast milk is still the main food for an infant, but there is a need to expand the diet of the child with complemantary foods (complementary feeding). Breast milk can not meet the needs of the 6 month-old infant for calories, micronutrients, especially iron, any more, and ensure his normal development.

Complementary feeding is the food, introduced in addition to breast milk (milk formula in case of artificial feeding) to an infant of the first year of life to satisfy growing plastic and energy requirements (Table 8).

Table 8

Calorie content, which must be ensured with complementary feeding

Age in months	6 - 8	9 - 11	12 - 23
Calorie content (kcal/day)	200	300	550

Due to the Recommendations of the European Federation of Food when the nursing mother's diet is adequate and her infant is healthy, all food supplenents should be introduced after 5,5 months (starting with juices), regardless of the type of feeding (Table 9).

Recommendations concerning the composition of the food to start complementary feeding with, are developed and approved by the experts of the European Society of Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN):

1. Food, containing gluten (gluten grains) should not be given to children under 4-6 months.
2. New foods shoud be introduced gradually, one by one, in order to detect food allergy or intolerance cases.
3. The amount of salt, sugar and spices that are added to the food during the complementary feeding should be strictly controlled.
4. Cereals for feeding infants should be enriched with iron.

The first food for complementary feeding that is offered to an infant aged 6 months may be cereals (give preference to cereals that do not contain gluten - buckwheat, rice, corn), vegetable or fruit puree. This food should be introduced 1-2 times a day, increasing the amount of meals gradually.

An infant under 8 months should be fed on additional food 3 times a day, while those aged 9-11 months have it 4 times a day. At the age of one year the infant should get complementary diet containing various foods. He should also be able to drink from a cup.

As to the food, produced in factories, which are used for complementary feeding, it is especially appropriate to use organic baby food (officially certified organic products) because they are more useful, secure and better absorbed by children. The widest range of organic foods - cereals, vegetable-and-meat, and fruit purees, juices, tea drinks are offered by the HiPP company.

Signs of readiness of a child to the introduction of complementary foods:

- Being able to hold up the head (to control his head and neck movements);
- Being able to sit up almost without support (in a high chair);
- Opening his mouth when the spoon with food is near it;
- Turning away from the spoon with food when he is not hungry;
- Closing his mouth with the spoon in it, keeping the food in his mouth and then swallowing, not pushing it or spitting out.

Table 9

Approximate scheme of introducting food and dishes of complementary feeding in natural feeding of infants of the first year of life*

Food and dishes for complementary feeding	Age when introducing, months	Amount depending on the infant's age				
		6 months	7 months	8 months	9 months	10-12 months
Juice (fruit, berry, vegetable), ml	6	30-50	50-70	50-70	80	100
Fruit purées, ml	6	40-50	50-70	50-70	80	90-100
Vegetable purées, g	6	50-100	150	170	180	200
Grains with milk,g	6 – 7	50-100	100-150	150	180	200
Cereals with milk, g	7 -8					
Dairy products, ml	8 - 9	-	-	50-100	100-150	150-200
Cheese, g	6,5 - 7,5	5-25	10-30	30	30	50
Egg yolk, pieces	7,0 - 7,5	-	1/8 – ¼	¼-1/2	1/2	½-1
Meat purée, g	6,5 - 7,0	5-30	30	50	50	50-60
Fish purée, g	8 -10	-	-	10-20	30-50	50-60
Vegetable oil, g	6	½ ts	½ ts	1 ts	1 ts	1 ts.
Butter, g	6 –7	½ ts	½ ts	1 ts	1 ts	1 ts
Wheat bread, g	8 – 9	-	-	5	5	10

* The table presents the approximate terms of introduction of complementary foods and its quantity. Therefore, the amount of food offered should be based on the principles of active feeding: to feed slowly and patiently, encouraging the child, but not forcing.

Clinical nutrition or dietotherapy is feeding a sick infant. It should correspond completely to the child's requirements for nutrients and energy, considers the features of metabolism as well as the condition of some organs and systems. It is a required component of complex treatment of children in case of many diseases and consists of using special food (diets) on the basis of defined sets of products, food production technologies and compliance with a special regimen of eating for therapeutic and prophylactic purposes (Table 10). The role of the dietotherapy in various childhood diseases is ambiguous. In some diseases it is the only clinical therapy possible. This group of diseases includes congenital disorders in amino acid and carbohydrate metabolism, those of gastrointestinal digestion and absorption (enzymopathies). A special diet for infants with these disorders may be helpful in prevention of dystrophy advance, of fatal outcome of the disease or development of deep mental disability of a child; it is also able to ensure an adequate mental and physical development.

Each diet has its therapeutic characteristics, including:

a) indications;

b) purpose;

c) sense of the diet which is determined by its chemical composition, range of products and by type of cooking;

d) dietary habits;

e) a list of foods and products that are recommended or contraindicated.

Table 10

Children's diseases demanding quantitative and qualitative changes in macronutrient diet composition

need:		increased	reduced	qualitative changes
Changes in the amount of macronutrients in medicinal diets of infants	Proteins	hypotrophy, anemia, osteomyelitis, chronic liver diseases (acute phase), weeping eczema, bronchiectasis, pancreatitis (attenuation), cystic fibrosis, rheumatism (active phase), recovery after acute infectious diseases	chronic glomerulonephritis, renal failure, enzymopathies with metabolism of amino acids disorders	congenital disorders of amino-acid metabolism (phenylketonuria, histidinemia, homocystinuria) celiac disease
	Fats	chronic glomerulonephritis with nephrotic component, renal failure, chronic liver diseases	obesity, cystic fibrosis, pancreatitis, diabetes, malnutrition of the second and third degree, acute intestinal infections, malabsorption symptom	biliary tract diseases, peptic ulcer, certain dermatoses
	Carbohydrates	chronic glomerulonephritis with nephrotic syndrome, renal failure	diabetes, obesity, certain dermatoses	diabetes, obesity, galactosemia and alactasia, secondary lactase failure, allergopathies, some dermatosis, rheumatism

There are some diseases, in which the dietotherapy is considered as one of the main treatments, other therapeutic actions are insufficient or totally ineffective without it. This group of diseases includes allergopathies, especially food allergies, obesity, diabetes, chronic diseases of the digestive system. Certain groups of specialized children's medical products are

produced: products for premature babies and those with low birth weight, for children with food intolerance, including food allergies, malabsorption syndrome; products for children with hereditary disorders, children with chronic somatic disorders, children with surgical pathology (for enteral nutrition).

In particular, a leading role in the treatment of food allergies belongs to hypoallergenic formulas which can be divided according to the level of protein breakdown into those containing deep or partial hydrolysis of proteins. And it is the use of hypoallergenic formula for the prevention of allergic diseases in children, including food allergies that is important and promising.

Finding the optimal milk formula for feeding children with atopic dermatitis and those who are allergic to cow's milk protein forced to choose to focus on the possibilities, avoiding the risks associated with using formulas with profound and partial hydrolysis of proteins, to achieve optimal results in reducing the clinical manifestations of the disease. Today such possibilities are provided by the only hypoallergenic nutrition program with the products by HiPP - «HiPP HA1 Sombiotis» and «HiPP HA2 Sombiotis" due to the fact that the formulas with partial hydrolysis are only used for the prevention of food allergy, and those with deep hydrolysis can be also used for treatment.

The formula «HiPP HA1 Combiotis" contains a deeply split serum protein which reduces the possibility of sensitization to the minimum. The formula should be recomended for children of any age with clinical manifestations of food allergy, as less than 0.1% of proteins have a molecular weight of more than 20 kDa which is associated with allergies, and more than 99,3% of all proteins have the molecular weight less than 5 kDa (including <1 kDa – 72,3% protein). Other advantages of the product «HiPP HA1 Combiotis" include the following: reduced amount of important food component lactose (68%), low osmolarity - 263 mOsm/l, enriched combination of probiotics - Lactobacillus (1,4h107/100 ml mixture) and prebiotics – galacto-oligosaccharides (GOS) (0,3 g/100 ml), and long-chain polyunsaturated fatty acids: Omega 6, Omega-3, arachidonic and docosahexaenoic ones which are necessary for the development of the nervous system and the retina.

«HiPP HA2 Combiotic» contains partially split protein: about 90% of peptides have a molecular weight of less than 5 kDa and around 7% - 5-20 kDa, thereby reducing the degree of sensitization mechanisms while working out the mechanisms of orally induced tolerance to cow’s milk protein ("food habits"). The formula is the next step in the program of curative and preventive nutrition of infants administered after 6 months of life to children

after prior curative product "HiRR HA1 Combiotis", amid subsiding clinical manifestations of atopic dermatitis, or in order to prevent food allergy in children with its high risk against the background of genetic susceptibility. This formula also contains a reduced amount of lactose (62%), has low osmolity (osmolarity of 242 mOsm/l), fortified with a combination of probiotics - Lactobacillus (2h107/100ml mixture) with prebiotics- galacto-oligosaccharides (0,4 g/100 ml).

In case of programmed and consistent use (first «HiPP HA 1 Combiotis" - deep hydrolyzate, and after 6 months - «HiPP HA 2 Combiotis" partial hydrolyzate) these products contribute to the normalization of the clinical manifestation in infants suffering from food allergy.

Designing dietary intake for sick children many factors should be considered: age of the child and its requirements for nutrients and energy, the nature of the disease, pathogenesis and metabolic disorders, functional disorders and stage of the disease (acute period of remission), the administered therapy. Now, the need for an adequate nutrition of sick children is scientifically substantiated; if possible, it should be already done in the early period of recovery as children can not tolerate long lasting food restrictions easily, their bodies get exhausted soon, they develop dystrophy of varying degree, because the body of an infant, who is growing and developing, has no significant reserves.

1.2 TASKS

№1. A child aged 8 months has liquid abundant stools, anxiety, daily vomiting, enlargement of the abdomen, reduction in body weight gain after introduction of cream of weat into his diet. Clinical diagnosis of common form of celiac disease was made. What syndrome developed in the child? Give advice concerning feeding. What grains can the child eat?

Correct answers: malabsorbtion syndrome. Continued strict gluten-free (agliadin-free) diet (the formula, the food must not contain components of basic grains - wheat, barley, rye, oats). Rice, buckwheat, corn, soybeans are allowed to be taken.

№2. The doctor is seeing a mother with her 6-month-old infant. The girl was born with the body weight of 3200 g. At the time of examination she weighs 5800 g (standard deviation - 2), body length is 65 cm (the median on the graph). The infant is breasfed; she is active. She doesn’t receive complementary foods. Evaluate the physical development of the child. What complementary foods are advisable to start with? What foods can also be introduced after six months?

Correct answes: Physical development is disharmonious with body weight deficiency. It is recommended, as the first complementary food, cereal porridge with milk as well as some rice or buckwheat porridge. At 6 months

the diet of the child can be complemented with fruit and vegetable purees as well as fruit juices.

№3. The child aged 1.5 years with intestinal cystic fibrosis developed signs of lack of fat-soluble vitamins. The child receives the enzyme-containing drug Kreon. What vitamins belong to fat-soluble ones? Which products contain them? What features of the diet with cystic fibrosis do you know?

Correct answers: The fat-soluble vitamins include vitamins A, D, E, K. They are found in dairy products, liver, fish oil, chicken eggs, vegetable oil; vitamin K is found in both plant foods (spinach, tomatoes, peas, parsley) and animal products (meat, liver, fish). The daily diet calorie content of patients with cystic fibrosis is by 20-40% higher than normal due to proteins; fats are limited, table salt is also added.

№4. A newborn boy was diagnosed with phenylketonuria during the screening at the hospital. He is exclusively breastfed. What are the first signs of phenylketonuria? What treatment for phenylketonuria do you know? Give recommendations for further feeding.

Correct answers: The first symptoms of phenylketonuria are vomiting, sweating, odor ("mousy"), irritability, drowsiness, somnolence. The only treatment for phenylketonuria is elimination of foods containing the amino acid phenylalanine out of the diet. The child must be transferred to artificial feeding with specialized milk formulas containing extremely low amount of phenylalanine and normal number of other amino acids. These include: "Minafen" (England), "Berlofen" (Germany), "Lofenalak", "Phenyl-free" (USA).

№5. A girl aged 1 month is exclusively breastfed. After each feeding there is vomiting, watery stools, flatulence. Congenital lactose failure was diagnosed. What complications may occur in congenital alactasia? Give recommendations concerning the child’s feeding. What belongs to substitution therapy of alactasia in order to preserve breastfeeding?

Correct answers: Dystrophy, toxic kidney damage. Lactose must be completely excluded, you must administer feeding with lactose-free milk formulas. Introduce a dietary supplement - lactose enzyme to the diet.

№6. A child, aged five months, has abundant watery stools, skin rash, symptoms of anemia after the transfer on feeding with cow's milk. The blood serum contains a great amount of specific IgE to some cow's milk protein. What pathology developed in the child? What is the difference between the cow's and human milk concerning the protein content? Give recommendations concerning child feeding.

Correct answers: The child is allergic to cow's milk protein. The high content of casein, a relatively lower content of serum proteins. In case

breastfeeding is impossible, soy protein-based milk formulas or those with hydrolyzed hypoallergenic animal protein are recommended.

№7. A three-month infant weighing 5600 g, who has been fed on goat milk, was diagnosed with macrocytic megaloblastic anemia. Lack of which vitamins in the diet led to the development of anemia in the infant? Give advice on feeding. Calculate the daily amount of milk formula needed for the child?

Correct answers: Insufficient amount of vitamin B12 and folic acid in goat milk. The child should be fed on adopted milk formula. Volumetric method should be used and therefore the daily amount of the formula must be 1/6 of body weight that is 930 ml.

№8. The child is 8 months old, weighing 7500 g. He is being fed on cow's milk. No complementary foods have been introduced. Objectively: there are some bone deformations, looking like frontal tubers, craniotabes, bone bracelets, moderate liver enlargement, anemic syndrome, which was thought to be manifestation of rickets and polydeficient condition. Give advice concerning child feeding. List dishes for complementary feeding appropriate in this age. What is the daily need for proteins, fats and carbohydrates in a bottle-fed 8 month-old infant?

Correct answers: the child needs more animal food containing sufficient amount of vitamin D: egg yolk, liver (of fish and birds), butter. As to the main dishes of the complementary feeding, an 8 month-old infant can receive vegetable and fruit purees, porridge, meat foods. The daily requirement for protein is 3,5 g / kg and that for fat – 5,5 g / kg, for carbohydrates - 12 g/kg.

№9. A newborn child from the second pregnancy, second physiological birth was born weighing 3000 g, Apgar score was 8.9 points. What is the best type of feeding in this case? When can the child be breastfed for the first time after his birth? How often must the child be breastfed during the first days of life?

Correct answers: Exclusively breastfeeding. 30 minutes after birth. Daily breastfeedings "on demand", 8-12 times a day.

№10. The newborn girl is 2 days old, gestational age is 30 weeks, birth weight is 1400 g. No sucking and swallowing reflexes. The child is in an infant incubator. The mother has got breast milk. Give advice on feeding. Which mode of feeding should be used? What is the total consumption of calories per day for this child?

Correct answers: An enteral feeding with expressed breast milk. Fixed timing for feeding: the calculated daily amount of milk should be distributed for at least 8-12 feedings (every 2 or 3 hours). Total expenditure of calories

per day to ensure the life of the child with gestational age <32 weeks is at least 75 kcal/kg/day (up to 7 days of life).

№11. A 6.5 month-old boy is being breastfed; he receives 50 ml of apple juice 3 times a week. He remains restless after feeding. His body weight at the time of examination was 6500 g (standard deviation - 2), the body length was 68 cm (median on the graph). Assess his physical development. Assess the child's diet. What complementary foods should be given to the child first?

Correct answers: Physical development is disharmonious with body weight deficiency. The infant is being fed incorrectly because he should receive two more complementary foods at this age: vegetable puree and porridge. Cereals with milk should be recommended into his diet, which should be his first complementary food, as more nutritious energy food.

№12. The infant is 3 months old. He was born weighing 3000 g. He is being breastfed and lagging behind in physical development. Body weight is now 4900 grams (body mass deficit is 5%). According to the check weighing he gets about 550 ml of breast milk per day. How much is the daily requirement of milk for the child according to the energy method? Give advice on feeding. When should you give complementary foods to this child?

Correct answers: The daily requirement for calories = 120 (kcal) * 4.9 (kg) = 588 calories or 840 ml of breast milk. The child requires complementary feeding with adapted formulas. The complemenrary foods should be given after breasfeeding from both breasts.

№13. The infant is 6 months old. He is being bottle-fed; he has been getting apple juice since he was 4, and fruit and vegetable puree since he was 5. His physical and psycho-motor development is normal. Give advice on feeding. How should the daily amount of food be calculated by the volumetric method? What is the daily requirement for protein?

Correct answers: To introduce the second complimentary feeding in the diet and it should be some porridge. It is advisable to start with gluten-free (gliadin-free) ones. The daily amount of food for a 6 month-old infant is 1/8 of its weight. The daily requirement for protein in this case is 3,5 g/kg.

№14. The child is 2 months old. He was born weighing 3450 grams and is being exclusively breastfed. His actual weight is 5300 g. His psychomotor development corresponds to his age. What type of feeding is appropriate for the child? What is the caloric content in 1 liter of breast milk? What is the ratio of proteins, fats and carbohydrates in mature human milk?

Correct answers: Exclusively breastfeeding should be continued. The calorie content in 1L of mature breast milk is 700 calories. The ratio of proteins, fats and carbohydrates in breast milk is 1: 3: 6, which is optimal for the adequate development of the baby.

№15. The boy is 5,5 months old. He was born prematurely, weighing 3150 g; he is being breastfed and getting enough milk; he also drinks juice. He weighs 7300g currently (it is an average weight according to the schedule of body weight to age). Give recommendations for further feeding. What is the daily need for breast milk, measured by the amount method? What is the daily need for proteins, fats, carbohydrates and calories?

Correct answers: You can start the first complementary feeding: vegetable puree with some vegetable oil. The daily need for milk is 1/7 of body weight: 7300:7= 1040 ml. The need for protein is 2,5-3,0 g/kg, for fats –5,5-6,0 g/kg, for carbohydrates – 12-14 g/kg, for calories– 115 kcal/kg.

CHAPTER 2
ASSESSMENT OF PHYSICAL DEVELOPMENT AND PUBERTY DEGREE OF CHILDREN OF ALL AGES

2.1 INTRODUCTION

The condition of morphological and functional properties and the level of biological development is considered to be a physical development of children. The child's physical development is a complex of morphofunctional characteristics to ensure physical ability, performing physical, educational and working exertions according to the morphofunctional possibilities of schoolchildren at different age and of different sex. Due to the fact that the child is constantly in the condition of continuous growth of the total sizes of the body and development of its functions, the physical development reflects the dynamics of the process. Therefore, physical development should be considered as a process of stipulated age changes of the total sizes of the body, its proprtions, external status and functions.

Physical development of children is one of the criteria for the characteristic of sanitary-epidemiological wellbeing of the population, the index of the level of the body functional maturity. Due to incomplete processes of growth and development the body of a pre-school child is very sensitive to the effect of changes occurring in the surrounding.

Estimation of physical development is performed by means of comparison of anthropometric findings of a certain child with average values of these findings of separate sex-age groups – so-called standards. In most cases the interval in age groups of children at the age to 1 year is 1 month, to 3 years – 3 months, older – 1 year. The most important somatometric anthropometric indices enabling to estimate physical development of children is height (at the age to 24 months – body length), weight, chest circumference, and head circumference (especially at the age to 1 year). There are the following methods to estimate physical development by means of statistical analysis according to average anthropometric standards: 1.

Sigmatic deviations (profile of physical development); 2. By regression scales (parametric method); 3. Centile (non-parametric method) by the scales, one-dimentional and two-dimentional tables.

The most spread method to estimate physical development of a child is the method to estimate anthropometric parameters by the sex-age regression scales considering three main parameters of physical development: body length, body weight and chest circumference between these parameters in the process of growth and development of a child. This method prevails over other ones at the expense of possibility of simultaneous estimation of physical development (average, higher or lower of an average one) and its harmony (harmony, disharmony or sharp disharmony of physical development) of every child (individual level) and separate groups of children (population level).

Harmonious physical development of a child is detected when the body weight and chest circumference (according to the body length) are within the limits of a sinlge sigma of regression ($\pm \sigma_R$).

Dysharmoniuos is the condition when the body weight of a child and chest circumference (according to the body length) is above the limits of one sigma of regression ($\pm 1,1 - 2\ \sigma_R$). As a rue, these conditions are caused by deficiency (or excess) of the body weight and appropriate decrease of functional possibilities of the organism. Sharp disharmony of physical development is detected in case of excess of two regression sigmas ($\pm\ 2,1\ \sigma_R$) and caused by exhaustion or obesity against the ground of a sharp drop of functional abilities.

Harmony includes interrelation of anthropometric and functional parameters of physical development of a child in a certain period of development, presents valuable opinion concerning disorders of health and anables to make a timely decision to ensure valuable nutrition and hygienic estimation of harmfull environmental factors.

Methods to measure anthropometric parameters and use of standard values

1. The body height of children is performed in a standing position by means of a vertical height meter. The child is standing on a wooden board of the height meter with the back to its vertical bar touching it with the heels, buttocks, interscapular area with the shoulders retracted back (does not touch with the head). The arms must be lowered along the trunk, the abdomen is tighten, heels – together, forefeet – apart. The head position should be the following: the upper margin of the ear and lower margin of the eye socket are in one horizontal plane. A movable bar is put to the head without pressure but tightly.

2. The body weight is measured on medical scales. The child is put in the middle of the scales with immovable fixed levers. The handle of the lever is moved only after when the child is put on the scales and fix kilograms approximately to the body weight. After the body weight of the child is detected the lever is fixed (close the handle), and only after the child is taken from the plane of the scales.

3. The chest circumference is measured by means of a tape measure at rest. The tape measure should be applied in front along the medial sternal point, backward – under the lower margins of the scapulae. Measuring is made in a standing position with the arms along the trunk.

Physical development of a child is estimated by means of comparison of its individual anthropometric parameters with the standard ones presented in the tables (Tables 13-17) and diagrams of physical development of children at different ages.

Table 11

Evaluation of anthropometric parameters by means of centile and sigmal methods

Parameter	**Sigma deviations methods**	**Percentile methods**	**Evaluation**
Very high	> +3 σ	> 97 centile	A significant increase pathology, deviation from the norm
High	From +2,1 to +3 σ	90-97 centile	
Above average	From +1,1 to +2 σ	75-90 centile	The tendency to increase – nor at least - deviation from the nor
Average	+/- 1 σ	25-75 centile	Average - normal
Below average	From -1,1 to -2 σ	10-25 centile	The tendency to decrease – nor at least - deviation from the nor
Low	From -2,1 to -3 σ	3-10 centile	A significant decrease in deviation from the nor pathology
Very low	< -3 σ	< 3 centile	

Table 12

Evaluation of harmonious physical development

Evaluation of physical development	**Weight and chest circumference concerning the height**	
	By two-dimentional percentile tables	**By regression scales**
Harmonious	Within the limits of M ± 1 σR at the expense of muscular development	Weight within 25-75 percentiles
Disharmonious	Deviations are from	Weight within 10-25 or

Evaluation of physical development	Weight and chest circumference concerning the height	
	By two-dimentional percentile tables	By regression scales
	M ± 1,1 σR to M ± 2 σR due the deficiency of weight or excessive fat deposits	75-90 percentiles
Sharply dysharmonious	Deviations are +2,1 σR i > or -2,1 σR i <	Weight higher than 90 or lower than 10 percentiles

Table 13

Table to estimate physical development of children (age – 3-5 years, sex - boys) by regression scale

Parameters in comparison with average	Height	Weight, kg			Chest circumference, cm		
		-1 σ_R	M	+1 σ_R	-1 σ_R	M	+1 σ_R
Low (from M-2 σ and lower)	86,00	9,89	11,33	12,77	49,65	51,77	53,89
	87,00	10,19	11,63	13,07	49,89	52,01	54,13
	88,00	10,48	11,92	13,36	50,13	52,25	54,37
	89,00	10,78	12,22	13,66	50,37	52,49	54,61
	90,00	11,08	12,52	13,96	50,61	52,73	54,85
	91,00	11,37	12,81	14,25	50,84	52,96	55,08
Lower than average (from M- 1 σ to M-2 σ)	92,00	11,67	13,11	14,55	51,08	53,20	55,32
	93,00	11,96	1340	14,84	51,32	53,44	55,56
	94,00	12,26	13,70	15,14	51,56	53,68	55,80
	95,00	12,56	14,00	15,44	51,80	53,92	56,04
Average (M ± 1 σ)	96,00	12,85	14,29	15,73	52,03	54,15	56,27
	97,00	13,15	14,59	16,03	52,27	54,39	56,51
	98,00	13,44	14,88	16,32	52,51	54,63	56,75
	99,00	13,74	15,18	16,62	52,75	54,87	56,99
	100,00	14,04	15,48	16,92	52,99	55,11	57,23
	101,00	14,33	15,77	17,21	53,22	55,34	57,46
	102,00	14,63	16,07	17,51	53,46	55,58	57,70
	103,00	14,92	16,36	17,80	53,70	55,82	57,94
	104,00	15,22	16,66	18,10	53,94	56,06	58,18
Higher than average (from M+ 1 σ to M+2 σ)	105,00	15,52	16,96	18,40	54,18	56,30	58,42
	106,00	15,81	17,25	1869	54,41	56,53	58,65
	107,00	16,11	17,55	18,99	54,65	56,77	58,89
	108,00	16,40	1784	19,28	54,89	57,01	59,13
High (from M+2 σ and	109,00	16,70	18,14	19,58	55,13	57,25	59,37
	110,00	17,00	18,44	1988	55,37	57,49	59,61
	111,00	17,29	18,73	20,17	55,60	57,72	59,84

higher)	112,00	17,59	19,03	20,47	55,84	57,96	60,08
	113,00	17,88	19,32	20,76	56,08	58,20	60,32
	114,00	18,18	19,62	21,06	56,32	58,44	60,56
M=100,38 σ=4,44		M=15,48 σ_R=1,44 $R_{y/x}$=0,296			M=55,11 σ_R=2,12 $R_{y/x}$=0,238		

Table 14

Table to estimate physical development of children (age – 3-5 years, sex - girls) by regression scale

Parameters in comparison with average	Height	Weight, kg			Chest circumference, cm		
		-1 σ_R	M	+1 σ_R	-1 σ_R	M	+1 σ_R
Low (from M-2 σ and lower)	87,00	10,22	12,18	14,14	46,57	51,10	55,63
	88,00	10,44	12,40	14,36	46,75	51,28	55,81
	89,00	10,66	12,62	14,58	46,92	51,45	55,98
	90,00	10,88	12,84	14,80	47,10	51,63	56,16
	91, 00	11,10	13,06	15,02	47,27	51,80	56,33
Lower than average (from M- 1 σ to M-2 σ)	92,00	11,32	13,28	15,24	47,44	51,97	56,50
	93,00	11,54	13,50	15,46	47,62	52,15	56,68
	94,00	11,76	13,72	15,68	47,79	52,32	56,85
	95,00	11,98	13,94	15,90	47,97	52,50	57,03
Average (M ± 1 σ)	96,00	12,20	14,16	16,12	48,14	52,67	57,20
	97,00	12,42	14,38	16,34	48,31	52,84	57,37
	98,00	12,64	14,60	16,56	48,49	53,02	57,55
	99,00	12,86	14,82	16,78	48,66	53,19	57,72
	100,00	13,08	15,04	17,00	48,84	53,37	57,90
	101,00	13,30	15,26	17,22	49,01	53,54	58,07
	102,00	13,52	15,48	17,44	49,18	53,71	58,24
	103,00	13,74	15,70	17,66	49,36	53,89	58,42
	104,00	13,96	15,92	17,88	49,53	54,06	58,59
Higher than average (from M+ 1 σ to M+2 σ)	105,00	14,18	16,14	18,10	49,71	54,24	58,77
	106,00	14,40	16,36	18,32	49,88	54,41	58,94
	107,00	14,62	16,58	18,34	50,05	54,58	59,11
	108,00	14,84	16,80	18,76	50,23	54,76	59,29
High (from M+2 σ and higher)	109,00	15,06	17,02	18,98	50,40	54,93	59,46
	110,00	15,28	17,24	19,20	50,58	55,11	59,64
	111,00	15,50	17,46	19,42	50,75	55,28	59,81
	112,00	15,72	17,68	19,64	50,92	55,45	59,98
	113,00	15,94	17,90	19,86	51,10	55,63	60,16
M =99,82 σ=4,32		M=15,04 σ_R=1,96 $R_{y/x}$=0,220			M=53,34 σ_R=4,53 $R_{y/x}$=0,174		

Table 15

Distribution of body length according to the age of schoolchildren, cm

Age in years	Centiles											
	3	10	25	75	90	97	3	10	25	75	90	97
Sex	Boys						Girls					
6	108,7	110,0	113,8	122,2	125,8	129,5	102,5	107,8	112,0	121,3	124,8	127,6
7	112,5	114,5	118,5	127,9	131,5	135,5	110,4	113,8	118,0	126,3	130,5	134,6
8	116,3	119,5	123,8	133,4	137,3	141,3	116,2	118,1	123,3	132,2	136,0	140,8
9	120,5	124,5	129,0	138,6	142,8	147,0	120,6	123,7	128,3	138,6	141,5	146,3
10	124,5	128,8	133,5	143,5	147,9	152,4	124,9	128,2	133,1	143,6	147,7	152,1
11	128,0	132,8	137,8	148,5	153,4	158,6	128,7	132,4	137,8	149,1	153,5	158,4
12	132,0	136,7	142,3	154,2	160,2	165,4	132,9	136,7	142,7	154,4	158,6	163,8
13	136,8	141,2	147,3	160,4	166,6	171,6	137,7	141,6	148,0	159,1	163,0	167,7
14	142,9	147,8	154,1	166,7	171,8	176,6	143,7	147,5	153,0	162,9	166,6	170,0

Table 16

Two-dimentional centile scales of the body weight with different height of schoolgirls

Height, cm	Centiles						
	3	10	25	50	75	90	97
	Weight, kg						
120	16,8	17,8	19,6	21,0	22,8	24,6	26,2
121	17,0	18,2	19,9	21,4	23,3	25,0	27,0
122	17,4	18,6	20,4	21,9	23,8	25,6	27,6
123	17,8	18,8	20,6	22,6	24,4	26,0	28,2
124	18,0	19,2	21,0	22,8	24,9	26,8	29,0
125	18,2	19,4	21,4	23,0	25,2	27,3	29,9
126	18,4	19,8	21,6	23,6	25,8	28,0	30,8
127	18,8	20,2	22,0	23,9	26,2	28,8	31,6
128	19,0	20,6	22,6	24,6	26,8	29,4	32,6
129	19,4	20,9	23,0	25,1	27,4	30,0	33,4
130	19,8	21,4	23,6	25,6	28,0	30,8	34,4
131	20,1	21,8	23,5	26,2	28,6	31,8	35,4
132	20,4	22,2	24,6	26,8	29,1	32,5	36,5
133	20,8	22,7	25,0	27,2	20,8	33,3	37,5
134	21,4	23,5	25,6	27,7	30,5	34,0	38,8
135	21,9	23,7	26,1	28,2	31,4	34,8	40,0
136	22,3	24,2	26,6	28,9	32,3	35,5	42,0
137	22,8	24,6	27,0	29,5	33,0	36,3	43,3
138	23,1	25,1	27,6	30,2	33,8	37,2	45,0
139	23,4	25,9	28,0	30,9	34,9	38,1	46,4
140	23,6	26,4	28,6	31,4	35,4	38,2	48,0

141	24,1	27,0	29,1	32,3	30,3	40,8	50,0
142	24,6	27,5	29,7	33,0	37,4	42,3	51,8
143	25,0	28,0	30,3	33,7	38,0	43,6	53,3
144	25,6	28,7	31,1	34,6	39,0	45,0	55,0
145	26,2	29,4	32,0	35,4	40,2	46,7	56,8
146	26,7	29,9	32,7	36,3	41,4	48,4	58,4

Table 17

Estimation tables of physical development of boys at the age of 6-17 (regression scale by the body length)

Borders of sigmal deviations	Body length, cm	Body weight, kg			Chest circumference, cm		
		$M - \sigma_R$	M	$M + \sigma_R$	$M - \sigma_R$	M	$M + \sigma_R$
Boys, 12 years old							
High (from M+2 σ and higher)	169	43,24	48,86	54,47	71,54	75,60	79,65
	168	42,75	48,37	53,98	71,37	75,43	79,48
	167	42,26	47,88	53,49	71,20	75,25	79,31
	166	41,77	47,39	53,00	71,03	75,08	79,14
Higher than average (from M+1 σ to M+2 σ)	165	41,28	46,90	52,51	70,86	74,91	78,96
	164	40,79	46,41	52,02	70,69	74,74	78,79
	163	40,30	45,92	51,53	70,52	74,57	78,62
	162	39,81	45,43	51,04	70,35	74,40	78,45
	161	39,32	44,94	50,55	70,17	74,23	78,28
	160	38,83	44,45	50,06	70,00	74,06	78,11
Average values (from M+1 σ to M-1 σ)	159	38,34	43,96	49,57	69,83	73,88	77,94
	158	37,85	43,47	49,08	69,66	73,71	77,77
	157	37,36	42,98	48,59	69,49	73,54	77,59
	156	36,87	42,49	48,11	69,32	73,37	77,42
	155	36,38	42,00	47,62	69,15	73,20	77,25
	154	35,89	41,51	47,13	68,97	73,03	77,08
	153	35,40	41,02	46,64	68,80	72,86	76,91
	152	34,91	40,53	46,15	68,63	72,68	76,74
	151	34,42	40,04	45,66	68,46	72,51	76,57
	150	33,93	39,55	45,17	68,29	72,34	76,39
	149	33,44	39,06	44,68	68,12	72,17	76,22
	148	32,95	38,57	44,19	67,95	72,00	76,05
	147	32,46	38,08	43,70	67,78	71,83	75,88
Lower than average (from M-1 σ to M-2 σ)	146	31,97	37,59	43,21	67,60	71,66	75,71
	145	31,49	37,10	42,72	67,43	71,49	75,54
	144	31,00	36,61	42,23	67,26	71,31	75,37
	143	30,51	36,12	41,74	67,09	71,14	75,20
	142	30,02	35,63	41,25	66,92	70,97	75,02
	141	29,53	35,14	40,76	66,75	70,80	74,85

Low (from M-2 σ and lower)	140	29,04	34,65	40,27	66,58	70,63	74,68
	139	28,55	34,16	39,78	66,40	70,46	74,51
	138	28,06	33,67	39,29	66,23	70,29	74,34
	137	27,57	33,18	38,80	66,06	70,11	74,17
	136	27,08	32,69	38,31	65,89	69,94	74,00
M=152,87 σ=5,91		M=40,95 σ_R=5,62 y=-33,93+0,49*x			M=72,83 σ_R=4,05 y=46,64+0,17*x		

Instruction to estimate physical development of a child

Child's body weight

1. Loss of the body weight for the first days of life: 5 - 10% of the initial weight
2. Restpration of the lost body weight: 7 - 10 days of life.
Twice as much the body weigth at birth: 4 - 5 months of life.
Three times as much the body weight at birth: 1 year.
Four times as much: 2 years.
3. Average body weight:
3,5 kg at birth; 10 kg at a year; 20 kg at 5 years; 30 kg at 10 years.
4. Daily body weight gain:
20-30 g in th first 3-4 months; 15-20 g in the rest months up to one year.
5. Average annual body weight gain: 2,2 kg since 2 years to the age of puberty (periods of "rounding out" and "shooting up")

Child's height

1. Average body length: at birth – 50 cm, at 1 year – 75 cm, height at 3 years – 90 cm, at 4 years – 1 m (doubled length at birth), three times as much – 11-14 years.
2. Average annual addition to the height 4,5-7 cm since 4 years to the period of puberty.

Head circumference

1. Average head circumference at birth – 35 cm.
2. Addition of the head circumference: 1 cm every month to one year (the first 3 months – 2 cm every month), further - +10 cm for the whole period of growth.

Chest circumference

1. At birth 2 cm less than head circumference.
2. Equal to the head circumference at 4 months.
3. Since one year addition is +1,5 cm annually (at 5 years – 55 cm), since 10 years - +3 cm.

Formulas to calculate anthropometric parameters

Approximate calculation of the body mass (m):

To 6 months: $m=m_0 + 800$ n; since 6 to 12 months: $m=m_0 + 4800 + 400$ (n - 6), where

m_0 – body weight at birth in g, n – age in months.

Since 2 to 10 years: m (kg)=10 + 2 n, older than 10: m (kg)=30 + 4 (n - 10), where n – age in years.

Approximate calculation of the body length (l), cm:

During the first years of life – the first quarter + 3 cm monthly, the second quarter - + 2,5 cm monthly, the third quarter - +2 cm monthly, the fourth quarter - +1-1,5 cm monthly.

In children older than a year: L=100 - 8(4 - n); in children older than 4: L=100 +6 (n - 4), where n – age in years.

Approximate calculation of the head circumference (C), cm:

Before 6 months: C=43 - 1,5 n; since 6 months to one year: C=43 + 0,5 n, where n – age in months.

From 1 to 5 years: C=50 - 1(5 - n); older than 5 years: C=50 + 0,6(n - 5), where n – age in years.

Approximate calculation of the chest circumference (CC), cm:

Before 6 months: CC=45 - 2 n; from 6 months to one year: CC=45 + 0,5 n, where n – age in months.

From 1 to 10 years: CC=63 - 1,5(10 - n); older than 10: CC=63 + 3(n - 10), where n – age in years.

Sigmal curves to estimate physical development (see appendices).

While estimating physical development of children and teenagers the **level of sexual development** is determined, which is one of the most reliable index of biological maturity. The level of sexual development is determined by the signs of secondary sexual characteristics (stages of sexual development of boys and girls by Tanner, see Fig. 10, and their age sigmal deviations – on Fig. 4, 5).

Girls and boys

Development of pubic hair growth (by Tanner): P1 – absence of hair; P2 – signle short hairs, in girls – along the vulvar lips, in boys – near the base of the penis; P3 – hairs become darker, thicker, curly, spread over the pubis; P4 – growth by an adult type but less space; P5 – as in the adults – hairs located on the whole pubis, spread to the hips and along the linea alba abdominis (in boys).

Girls

Development of hair growth in axillary area: A0 – absence of hair; A1 – single hairs; A2 – hair is thicker in the center; A3 – hair is thick, long, curly along the whole axillary area.

Development of the mammary glands: Ma0 – the glands do not project, the nipple does not rise over the mammary oreola; Ma1 – the glands do not

project, the nipple rises over the mammary oreola; Ma2 – the mammary oreola is of a big size, together with the nipple it forms a cone, the mammary glands project a little; Ma3 – the mammary glands are rather large, the nipple and mammary oreola are cone-shaped; Ma4 – the nipple rises over the mammary oreola, the body of the gland and its shape look in an adult woman.

By Tanner: stage I – the glands are not developed, the nipple rises a little, stage II – the stage of swelling of the gland, the diameter of the mammary oreola enlarges; stage III – further enlargement of the gland and oreola without separation of their outline; stage IV – the mammary oreola projects and the nipple with formation of the secondary prominence over the outline of the gland; V – the mammary glands as in an adult woman, the oreola is in the general outline of the mammary gland.

Me – the age of the first menstruation (menarche); Me0 – absence of menstruation; Me1 – menarche (the first menstruation); Me2 – unstable menstrual cycle; Me3 – regular menstruations during a year.

Boys

Development of hair growth in axillary area: A0 – absence of hair; A1 – single hairs on a small central area of the armpit; A2 – thick staring hair in the whole armpit; A3 – hair is thick, curly along the whole axillary area.

Genitals by Tanner: G1 – penis, scrotum and testes are childish; G2 – enlargement of the testes and scrotum, the penis usually is not enlarged, the skin of the scrotum becomes wrinkled and reddish; G3 – further enlargement of the scrotum and testes + enlargement of the penis longitudinally mainly; G4 – further enlargement of the scrotum and testes + enlargement of the penis in thickness mainly; G5 – corresponds to the adult type.

Development of hair growth on the face: F0 – absence of hair; F1 – single hairs over the angles of the upper lip; F2 – pigmentation of hair and its spread to the middle line; F3 – spread to the upper part of the cheeks and under the lower lip; F4 – hair as in adult men.

Changes of voice timbre: V0 – childish voice; V1 – mutation (breaking) of the voice; V2 – male timbre.

Growth of the thyroid cartilage: L0 – absence of growth signs; L1 – beginning of growth; L2 – Adam's apple.

Psychomotor development of a child reflects formation of various parts of the nervous system in certain periods of life. Psychomotor development of a child is estimated during every preventive examination using tables 18-20 with age characteristics of psychomotor development of a child.

Psychomotor development of a child is estimated by the following criteria:

- motor function – purposeful manipulative activity of a child;

- statics – fixation and keeping certain parts of the trunk in necessary position;
- sensor reaction – formation of appropriate reactions to light, sound, pain, touch;
- language – expressive speeking and understanding of speech;
- psychic development – positive and negative emotions, formation of social age.

While estimating psychomotor development of a child it should be considered that the results of the examination depend on a number of factors such as child's humour, degree of comfort, surrounding where the examination is performed etc. To be sure of the absence of a function or its decrease a repeated examination should be performed.

Intensity of development and changes in the dynamics of motor, psychic, sensor spheres is more pronounced during the first year of life, which requires regular medical observation of a child.

Methods to check unconditioned reflexes

Searching reflex – while stroking the angle of the mouth a child turns its head into the side of stimulus, half-opens the mouth and tries to touch the place of irritation with the tongue. It is well developed before feeding and is seen in children of 3-4 months.

Lip reflex – a slight tap with fingers causes contraction of the orbicular muscle of the mouth, the lips are stretched as a proboscis. It is physiological reflex to 2-3 momths.

Grasping upper reflex – while pressing on the palm surface of the child's hand the fingers clench. It is physiological reflex to 3-4 momths.

Crawling [Bauer's] response – prone position, the head is in the middle line. In this position a child makes crawling movements – spontaneous crawling. In case a palm is put to the foot sole a child pushes off from it. It is physiological reflex to 4 momths failing later.

Moro's (startle) reflex - prone position. The reflex is provoked by various methods – tap on the surface where a child is lying, sound or vibration stimulus. Appropriate reaction of a child is drawing arms apart, stretching legs which were bent and pressed to the tummy before – 1 phase of Moro's reflex. Raising the arms with the tendency to grasp the trunk – 2 phase of Moro's reflex. The reflex is well seen to 4 month, failing later.

Detection of unconditioned reflexes (persisting) in children during later than physiological terms is considered as retardation syndrome of reflex reduction of newborns which usually is interpreted as unfavourable neurological signs and is associated with pathology of the nervous system.

2.2 TASKS

№1. A child, having Turner-Shereshevsky syndrome, is of 12.5 years old. Height 138 cm, weight 32 kg. Assess the physical development of the child, using curves which are enclosed.

Correct answer: weight - below average, height - low, which is typical for specified chromosomal aberrations.

№2. A child is examined on the day of birth, gestational age is 40 weeks, weight is 3600 g, body length - 52 cm, head circumference - 35 cm. Estimate the physical development of the child, using curves which are enclosed.

Correct answer: a child is full-term, anthropometric indices are between 75 and 90 percentiles higher than average according to gestational age.

№3. Boy is 14 years old - pituitary dwarf. Weight 23 kg, height 122 cm. Estimate physical development of a child, using curves which are enclosed.

Correct answer: physical development of the child lags behind the average of 7 years, it is this age where the marked height and weight as the average value.

№4. A girl is 13.5 years old. She complains of thirst and weight loss in recent months and was diagnosed diabetes mellitus. Weight 33 kg, height 156 cm. Estimate physical development of a child, using curves which are enclosed.

Correct answer: height – average, weight - low. Weight loss apparently associated with the development of diabetes.

№5. The boy is 11.5 years old. Weight is 36 kg, height is 148 cm. Estimate physical development of a child, using curves which are enclosed.

Correct answer: the average child height, high body weight, obviously obese.

№6. The girl is 7 years old, she was diagnosed with Cushing's syndrome, pituitary. Height - 110 cm, weight - 30 kg. Assess the physical development of a child, using curves which are enclosed.

Correct answer: height – low, weight - above average, which corresponds with suspected pathology.

№7. A girl of 14 years is a swimmer for 5 years. Weight - 62 kg, height - 158 cm. Erisman’s index (chest circumference - height/2) = 9 cm. Excess of fat is absent. Assess the physical development of a child, using curves which are enclosed.

Correct answer: height – average, weight - above average, apparently due to muscle development.

№8. Examination of the boy of 7.5 years finds that he suffers from congenital hypoplastic Fanconi anemia. Weight - 15 kg, height - 108 cm. Estimate physical development of a child, using curves which are enclosed.

Correct answer: very low weight and height of the child - signs of infantilism because of congenital disease.

№9. The girl is 6,5 years, for the second time within a year was diagnosed with ascariasis. Weight - 15 kg, height - 116 cm. Estimate physical development of a child, using curves which are enclosed.

Correct answer: the girl with an average height of low body weight (in the range of (-) 2 - (-) 3 sigma).

№10. Young male with Marfan syndrome is 17 years old. Weight - 66 kg, height - 192 cm. Estimate physical development, using curves which are enclosed.

Correct answer: a young man of average weight, very high height.

№11. Mother of a girl who is 10 years, complains of continuous vomiting and significant weight loss of her daughter for the last 6 months. No any significant physical abnormalities were found. Her height is 134 cm, weight is 18 kg, 6 months ago the weight was 31 kg. Assess physical development, using curves which are enclosed.

Correct answer: a child's body weight is very low, with an average height for a calendar age of 10 years, perhaps a girl has neurogenic anorexia.

№12. Child with Down syndrome is 8 months old, does not sit, does not stand on the legs with support. Body length 64 cm, weight 6800 g (birth length - 50 cm, weight - 3300 g). Head circumference 42 cm. Assess the physical development of a child, using curves which are enclosed.

Correct answer: the length of the body - below average, weight – low, head circumference - below average. Retardation in physical development is concerned, probably with chromosomal disorders.

№13. A 16-year boy was diagnosed with Klaynfelter syndrome. Height 188 cm, body weight 57 kg, delayed sexual development. Assess physical development, using curves which are enclosed.

Correct answer: height - above average, weight - below average.

№14. A baby is 9 months old, the patient has the intestinal form of cystic fibrosis. Weight - 6300 g, body length - 64 cm, head circumference - 45 cm. Assess the physical development of a child, using curves which are enclosed.

Correct answer: head circumference - medium, height – low, weight - very low, corresponding to endogenous malnutrition 3rd degree

№15. Child is 2 months old, from birth has diarrhea, diagnosed with congenital absence of lactase. At birth, weight and body length were 50 cm

and 3600 g respectively. Currently, weight is 3400 g, body length - 54 cm. Assess the physical development of a child, using curves which are enclosed.

Correct answer: weight - very low, body length - below average corresponding to III degree of malnutrition.

CHAPTER 3
CLINICAL TASKS IN NOSOLOGIES OF PEDIATRIC PROFILE WITH COMMENTS AND EXPLANATIONS

Diseases of the blood and blood-forming organs and disorders involving the immune mechanism

№1

A 24-month old boy was born at term gestation of 36 weeks and up to 6 months of age was breastfed. Complaints: pallor, loss of appetite, predominantly is fed by whole cow's milk, sometimes eats paper. Examination: T 37,5°C, BP 90/52 mm Hg, HR 145, RR 32, height 87 cm (50%), weight 13.6 kg (75%). Severe pallor of the skin and mucous membranes, cheilitis, hair is dry, dull, coilonichia, lymph nodes are not palpable. Breathing is puerile. Cardiac tones are rhythmic, systolic murmur of II degree at the apex. Liver +1 cm below costal arch, spleen is not palpable. Stool is of normal color. CBC: Hb 62 g/l, Ht 19,8%, MCV 54 fL, RDW 17%, 1,8% of reticulocytes, platelets 589 G/l, leukocytes 4.8 G/l. Blood smear: microcytosis, hypochromia, moderate anisocytosis polychromasia.

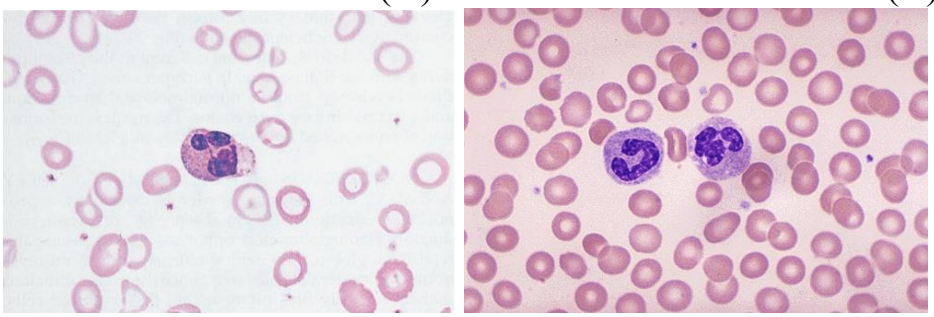
1. What is the most likely previous diagnosis?
2. Evaluate the CBC. What lab methods may confirm the diagnosis? What diseases are in the list for the differential diagnosis?
3. What is the treatment and its approximate duration? Evaluate the effectiveness of treatment if after three days of treatment - RDW 27%, reticulocytes 17%, and in 2 weeks - Hb 85 g/l, MCV 64 fL.

Correct answer:

1. Severe iron deficiency anemia.
2. Hypochromic microcytic severe anemia with low reticulocyte count. Decrease of serum iron (less than 12 mcM/l), transferrin saturation (less than 25%), serum ferritin (less than 10 mcg/l) and increase of the total iron-binding capacity (more than 70 mcM/l). Hemoglobinopathies, lead poisoning, atransferrinemia, hypothyroidism, systemic connective tissue diseases, sideroblastic anemia etc.
3. Iron replacement therapy. During 1-2 months - basic treatment (3-6 mg/kg of elemental iron daily), 3-4 months - supporting course (1-2 mg/kg of

elemental iron per day). Treatment is effective, because there is reticulocyte crisis, increase in RDW, Hb and MCV.

Fig. 3. Patient's blood smear (A) versus normal blood smear (B)



№2

A 14-year old boy complains of swelling, severe pain and tenderness of the right elbow and knee joints which occurred after injury. Anamnesis: intermuscular hematomas were noticed in the child for the first time at the age of 1 year. Examination: skin and visible mucous membranes are pale, swelling and tension of the skin over the elbow and knee joints on the right (see fig.). BP 105/65 mmHg, HR 110 per min. Other organs and systems: no any pathological manifestations were found. CBC: Hb – 90 g/l, RBC – 3,0 T/l, reticulocytes – 0,5%, platelets – 220 G/l, WBC - 8 G/l, neutrophils: stabs - 7%, segmented - 62%; eosinophils – 1%, lymphocytes - 24%, monocytes - 6%, ESR - 13 mm/hour. Coagulogram: clotting time (by Lee-White) – 60 min., prothrombin time – 28 sec, prothrombin index - 60%, thrombin time – 17 sec, activated partial (kefalin-kaolin) thromboplastin time - 3 minutes (normal 45-55 sec), fibrinogen – 3,4 g/l. Hemostatic disorders are corrected by adding adsorbed plasma.

1. What is the most likely diagnosis? What is the type of inheritance of this disease, if the father and mother of a sick child are clinically healthy? What type of bleeding characterizes this group of hemorrhagic diseases?
2. The principles of treatment of the patient.
3. What is the criterion for severe disease?

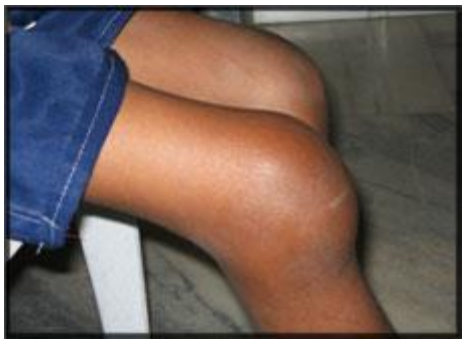


Fig. 4. Right sided hemarthrosis.

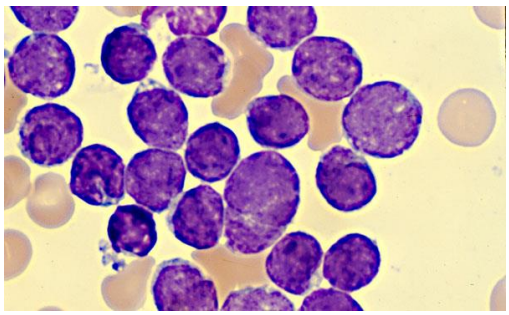
Correct answers:

1. Hemophilia, type A (factor VIII deficiency). X-linked recessive. Hematoma type of bleeding.
2. Replacement hemostatic therapy with factor (concentrate of AHG A - VIII), which is not enough to hemostatic blood concentrations (up to 50-75%) (in pediatric patients is recommended in these cases p to 80-100%) in the first day (30-50 IU/kg) followed by twice-daily administration of single maintenance dose (½ of initial dose) during at least a week because of the severity of bleeding present in this patient. The formula for calculating the dose: IU of factor VIII = (weight in kg) (50 ml plasma/kg) (1 IU factor VIII/ml plasma) (desired increase in factor VIII levels minus available factor in patient's blood). IU of factor VIII = (48 kg) (50 ml/kg) (1 IU factor VIII/ml) (0,73 (0,75-0,02) = 1752 IU OR IU of factor VIII = weight in kg's desired level of growth deficit factor x 0.5 = 48 kg x 73% x 0,5 = 1752 IU. After hemostasis for pain relief - cooling, immobilization, if necessary - painkillers except aspirin, after 2-3 days - exercise with passive movements.
3. The severe form of the disease indicates the level of factor VIII in the blood from 0 to 1%.

№3

A 10-year old boy presents with a chief complaint of fever and increasing tiredness since the last episode of upper respiratory infection (URI). He has a decreased appetite and has lost 2 kg over the last 2 weeks. He has some shortness of breath when he climbs upstairs. His medical history is unremarkable, there is no family history of relevant medical problems. Examination: T 38,5ºC, HR 120, RR 32, BP 110/56. He is alert, tired and slightly pale. He has bilateral cervical nodes, posterior cervical nodes, axillary nodes, and inguinal nodes palpable (about 1-2 cm), mobile and non-tender. His chest exam (breasts, lungs, heart) is normal. His abdomen is flat and non-tender with normal bowel sounds. His liver edge is palpable at the costal margin. His spleen is palpable 4 cm below the left costal margin, painless. Severe pain when pressing on the sternum. CBC: Hb 70 g/l, Ht 24%, MCV 100, WBC 56 G/l, 14% lymphoblasts, 80% lymphocytes, 6% atypical lymphocytes. Platelets 23 G/l. Chest X-ray: clear lung fields but a wide mediastinum. Bone marrow aspirate and biopsy: 90% of blasts (see fig.).
1. What is the diagnosis? What complication may develop in the child in case of starting therapy?
2. Interpret laboratory data, for which diseases these changes may be typical?
3. Principles of treatment.

Fig. 5. Bome marrow smear: lymphoblasts.



Correct answers:

1. Acute lymphoblastic leukemia. Tumor lysis syndrome, DIC, hemorrhagic syndrome, immune suppression, etc.
2. Anemia severe/moderate, critical thrombocytopenia, leukocytosis with an unusual differential of cells (lymphocytosis, blasts), increased ESR. For leukemia, generalized infection or autoimmune process.
3. Polychemotherapy due to protocol.

№4

An 11-year old boy complains of the body rash and nasal bleeding. Examination: T 36,5ºC, BP 100/65, cuff-test is strongly positive (multiple perechiae appeared after taking BP), skin and mucous membranes are pale, there are asymmetrically localised multiple petechiae and purpura, single ecchymosis at different stages of reverse development in the skin of the upper and lower extremities (see pic.). On the back of the throat there is a blood clot, multiple hemorrhages on the mucous membrane of the mouth. Lymph nodes are not palpable. HR 90 per min, clean, rhythmic tones. RR 18 per min, clear percussion sound, vesicular breathing. The abdomen is soft, painless, liver +1 cm below the costal arch, spleen is not palpable. Urine is normal. CBC: Hb – 93 g/l, RBC – 3,1 T/l, reticulocytes - 5%, platelets – 2 G/l, WBC - 8 G/l, neutrophils: stabs - 7%, segmented - 72%; eosinophils – 0%, lymphocytes - 20%, monocytes - 1%, ESR - 10 mm/hour. Bleeding time (by Duke) – 20 min, coagulogram - within normal limits.

1. What is the most likely diagnosis? What diseases are accompanied by qualitative and quantitative changes of platelets?
2. Describe the changes in laboratory values.
3. The principles of treatment.

Correct answers:

1. Idiopatic (autoimmune) thrombocytopenic purpura. Quantitative disorders (thrombocytopenia): pathology of cells division, the effect of dilution, reduced production (leukemia, aplastic conditions, radiation, drugs, cancer patients, tuberculosis), increased destruction (DIC, storage diseases, hypersplenism), immune mechanisms (auto-, allo-, medications, acute allergic reaction, izoimmunisation in infants), consumption (TTP, DIC,

microangiopathy). Qualitative disorders (thrombocytopathy): congenital (rare) - of platelet adhesion (von Willebrand disease, Bernard -Soulier syndrome), aggregation (Glanzmann thrombastenia), secretion, synthesis of TXA_2; acquired (often) - medications, aspirin, uremia, fibrin degradation products, myeloproliferative syndrome, cardiopulmonary shunts.
2. Moderate normochromic anemia, reticulocytosis (posthemorrhagic), increased ESR, prolonged bleeding time.
3. In most cases do not require treatment because the disease is self limited. Treatment is necessary only to prevent intracranial hemorrhage (frequency less than 0,1%) or other serious internal bleeding. Intravenous immunoglobulin (IgG 0,8-1 g/kg in the two administration), oral prednisolone (4 mg/kg of termination 21 days) or intravenous methylprednisolone (30 mg/kg for 3 days). The combination of immunoglobulin and steroids are synergistic and can be used in severe hemorrhagic syndrome. The administration of anti-D- immunoglobulin (25-50 mg/kg 2 days) effective in Rh-positive individuals.

№5

A 12-yaer old boy complains of fatigue, sweating, skin itching at night, weight loss about 6 kg (15%). Examination: T 37,6°C, HR 95, RR 18. Anterior cervical and supraclavicular lymph nodes are enlarged, of tight consistency, not conglomerated, painless, 3-4 cm in size, palpable like the "potato in sack". Heart tones are rhythmic, clear. Clear percussion sound, vesicular breathing. The abdomen is soft, liver +1 cm, spleen +3 cm below the costal arch, painless. CBC: Hb - 100 g/l, RBC - 3.3 T/l, platelets - 220 G/l, WBC - 14 G/l; neutrophils: stabs - 18%, segmented - 47%, eosin. - 6%, lymphocytes - 20%, mon. - 9%, ESR - 18 mm/h. Punctate of lymph node: accumulation and mixture of lymphocytes, plasma cells, histiocytes, reticular cells, eosinophils, many cells are Sternberg-Reed's and Hodgkin's (see pic.).
1. What is the most likely diagnosis? What other histologic variants of the disease exist?
2. What is the required amount of clinical and laboratory examinations?
3. What is the optimal choice of treatment strategy?

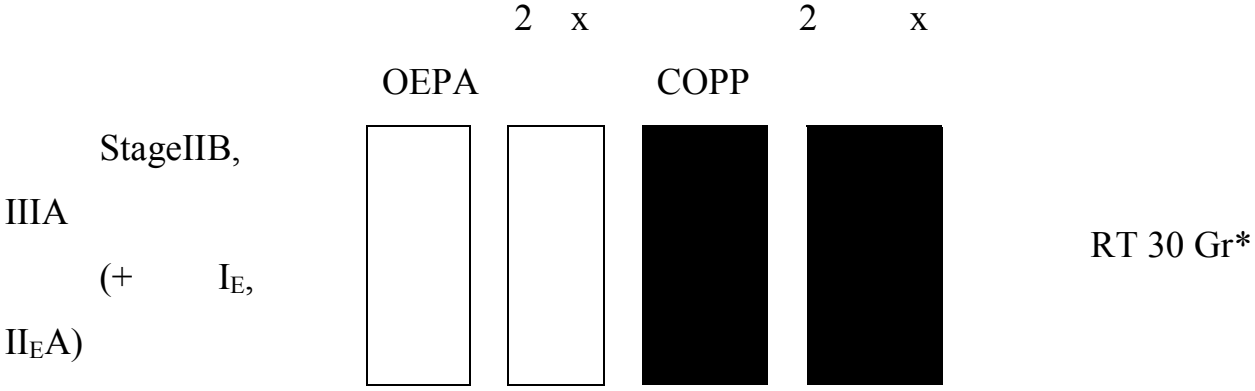
Correct answers:

1. Hodgkin's lymphoma, stage IIIA, mixed-cellularity type. There are four pathologic subtypes based on morphology: nodular sclerosing, mixed-cellularity subtype, lymphocyte-rich, lymphocyte depleted.
2. Therapeutic staging involves the following necessary clinical and laboratory investigations: careful records of all determined by palpation enlarged lymph nodes (including their size), the size of the liver and spleen, nasal examination (lymph tissue); ultrasound of the abdomen and peripheral

lymph nodes; X-ray of the chest in two projections; computed tomography of the chest (with technology of research of lungs and soft tissues); computed or magnetic resonance tomography of all clinically or sonographically registered as affected regions (for radiotherapy planning and assessment of response to treatment); complete blood count, coagulogramme, alaninaminotransferase, aspartataminotransferase, gamma-GT, alkaline phosphatase, lactate dehydrogenase, serum creatinine; viral serological study (Epstein-Bar virus, cytomegalovirus, herpes simplex, varicella, HIV), toxoplasmosis, Candida, Aspergillus; electrocardiography.

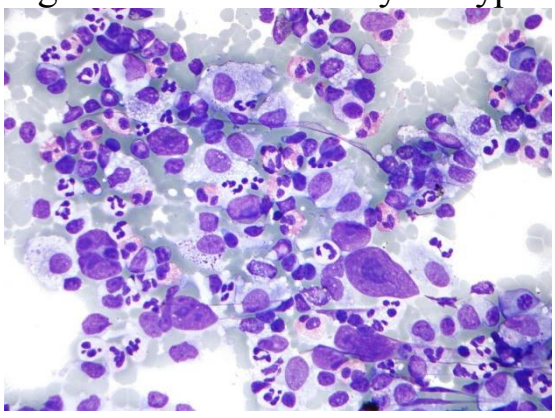
3. Treatment includes combination of chemotherapy with radiation exposure of the affected regions. Most effective for children and less dangerous in terms of long-term effects are schemes: OEPA and COPP (Protocols DAL-HD-90 and GPOH-HD-95).

Scheme of lymphoma treatment in children (males)



* up to 35 Gr in case of big residual tumor.

Fig. 6. Mixed-cellularity subtype of Hodgkin's lymphoma.



№6

A 14-month old male infant with resistant to therapy high fever and severe cough is in emergency department. The onset of illness was abrupt. The mother reports that he is frequently ill and was hospitalized 2 months ago for pneumococcal pneumonia. Examination: T 39,9°C, HR 142, RR 58, BP 100/60, oxygen saturation 98%, weight 7 kg (<5th percentile). He is tired, moving little,

with mild chest retractions. Ear canals contain purulent drainage. Heart sounds are clear, dullness to percussion over the posterior upper chest, decreased breath sounds in the area of dullness with occasional fine crackles. His abdomen is scaphoid and soft, no hepatosplenomegaly. Blood culture is positive for pneumococcus. Immunologic work up: elevated IgM, undetectable IgG and IgA with diminished total B lymphocytes (CD19), a deficiency of CD40 ligands on T cells. He is placed on monthly IVIG replacement therapy with trimethoprim-sulfamethoxazole prophylaxis for Pneumocystis carinii pneumonia and he begins to gain weight and he clears his ear infections.

1. What is the diagnosis? What are the typical clinical findings in this group of primary immunodeficiency?
2. What is the clinical approach to suspected immunodeficiency?
3. What are the causes of the secondary immunodeficiencies in children?

Correct answers:

1. Hypogammaglobulinemia with high IgM (hyper-IgM syndrome) (group of primary T-cell and combined immunodeficiency). Presentation in early infancy, poor growth or failure to thrive, persistent oral thrush, opportunistic infection.
2. The history should include the onset and type of infections, the frequency, chronicity, severity and responses to the previous treatments. The associated conditions such as failure to thrive, autoimmune disease, congenital anomalies and family history of consanguinity, fetal wastage and early childhood deaths should be noted. Types of infections and presentations are helpful for differentiation of primary immune defects.
3. Malnutrition, infection (congenital rubella, HIV infection, infectious mononucleosis and other such infections), protein-losing enteropathy, nephrosis, sickle cell disease, infiltrative diseases such as histiocytosis, leukemia, metabolic problems such as diabetes mellitus, uremia, vitamin and mineral deficiency, immunosuppressive medications, splenectomy, disruption of barrier protection (burns, severe eczema, catheters).

№7

A newborn boy. On the 4th day dark stool (tar –like) appeared, once there was vomiting as coffee grounds, and hemorrhage in the locations of injections was revealed. A child was born from III mature pregnancy, second delivery, birth weight 3400 g, body length 52 cm. The score on Apgar scale is 7/8 points. The baby started breastfeeding since the 1st day. Examination: non toxic appearance, T 36,2°C, the skin is clean, pale, with subicteric shade, HR 180/minute, during auscultation – rhythmic tones, over the lungs: during percussion – the vesicular resonant sound, during auscultation – a puerile breathing, no rales, RR = 46/min. Palpation: abdomen is soft; liver and spleen

are not enlarged. Umbilical wound is wet, covered with hemorrhagic crust. At the time of physical examination the child defecated a dark stool (see pic.), the diapers around the stool are pinky.

1. What is the most likely primary diagnosis? What other conditions it should be differentiated with?
2. What additional investigation should be done? What is pathogenesis?
3. Principles of emergency therapy.

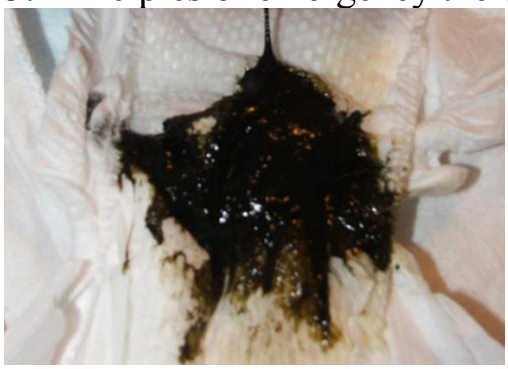


Fig. 7. Tar –like stool.

Correct answers:

1. Haemorrhagic disease of newborn, the classical form. From syndrome of swallowed maternal blood.
2. Apt test, platelet count, prothrombin time. Hemorrhagic disease of the newborn is resulting from vitamin K deficiency and the subsequent failure to produce clotting factors II, VII, IX and X (the prothrombin time is markedly prolonged). This transient deficiency of vitamin K is thought to result from poor placental transfer, marginal content in breast milk, inadequate intake of breast milk and a sterile gut (lack of vitamin K producing GI flora).
3. Fresh frozen plasma, vitamin K1.

№8

A newborn baby, the second day of life. Intense jaundice appeared at the end of the first day of life. A child from the second pregnancy and delivery. Weight at birth 4100 g, length 54 cm. Examination: T 36,5°C, the anterior fontanel is slightly sunken, the oral mucosa is tacky, there is jaundice of the lower extremities, muscular tonus is slightly decreased, swallowing and sucking reflexes are normal. The normal percussive lung sound, puerile breathing, RR 42 per min, HR 146 bpm, tones are rhythmic, clear. The abdomen is soft, painless on palpation. The liver +3 cm below the costal arch, spleen +1 cm. The rest of the umbilical cord is dry. Blood group of mother - 0 (I), Rh-negative, the child's - 0 (I), Rh-positive, direct Coombs test is positive. The G6PD is normal. CBC: Hb - 124 g/l, white blood cells – 16,5 G/l, stabs - 6%, segmented - 38%, lymphocytes - 45%. Bilirubin total - 405 mcM /l, indirect – 398,0 mcM/l. Total protein levels: 68,3 g/l.

1. What is the most likely primary diagnosis?

2. What other conditions should this disease be differentiated with?
3. Principles of therapy.

Correct answers:

1. Hemolytic disease of newborn, Rh – incompatibility, icteric form, severe.
2. With inborn hepatitis, sepsis, cytomegalovirus infection, listeriosis, microspherocytosis, G6PDase deficiency, etc.
3. Operation of replacement blood transfusion, phototherapy.

№9

A 3200 g term newborn female is delivered via normal spontaneous vaginal delivery to a 21-year old G1P0 syphilis non-reactive, group B strep (GBS) negative, rubella immune, hepatitis B surface antigen negative mother with early preeclampsia, thrombocytopenia and no fever. Rupture of membranes occurred 12 hours prior to delivery with clear fluid. Apgar scores 8/9. Examination: lethargic, fontanelle is soft and flat, T 37,4°C, HR 140, BP 46/37, RR 56, heart tones are normal, 4 sec capillary refill, skin is slightly pale and mottled, persistent grunting, shallow respirations, good aeration over lungs, abdomen is soft, decreased muscle tone and a weak, intermittent cry. Oxygen saturation is 99% in room air. CBC: Hb 145 g/l, WBC 3,2 G/l, 6% segs, 14% stabs, 76% lymphocytes, platelets 168 G/l. Blood glucose 2,9 mM/l. The chest X-ray: fluid in the right fissure, diffuse streakiness on the left, and a normal cardiac silhouette. CBG (capillary blood gas) pH 7,31, pCO_2 43, pO_2 44, BE-4. CSF: 2430 RBCs, 20 WBCs, 1% PMN, 17% lymphs, 82% monos, glucose 1,6 mM/l, protein 133 mg/dl, gram stain shows no organisms.

1. What diagnosis should be suspected? What are the risk factors?
2. What would be the full assessment for such cases?
3. What would the recommendations be (if any) for further treatment?

Correct answers:

1. Early neonatal sepsis? Risk factors: prematurity, chorioamnionitis, prolonged rupture of membranes, maternal fever, fetal tachycardia and depression at birth.
2. The full sepsis work-up: CBC differential, platelet count; total WBC and Immature/Total ratio (initial and serial); blood, urine and CSF cultures; CXR (plus a tracheal aspirate for gram stain and culture if the patient is intubated); equivocal: gastric aspirate for gram stain and culture, CRP, IL-6; clinical exam of the infant.
3. Start broad spectrum antibiotics (combined IV aminoglycoside and expanded-spectrum penicillin antibiotic therapy) while waiting culture results.

Diseases of the nervous system
№10

The child was born from the I pregnancy and I delivery; gestation age is 40 weeks, body weight - 3800 g, length - 56 cm. Delivery was with complications: primary weakness of labor and labor induction; meconial amniotic fluid. Physical examination of the baby at birth: tactile reaction and *primitive reflexes* are absent, diffuse cyanosis and diffuse muscle atony. Head: large fontanel 2×2 cm, big labor tumor of skull skin with hemorrhagic rash; myosis, *photoreaction* of *pupils is weak*. Heart rate – 60 per min, muffled heart sounds; respiratory rate – 20 per min, arrhythmic breathing (*gasping respiration).*

1. What is the most likely provisional diagnosis?
2. Basic steps of neonatal resuscitation.
3. What additional methods of investigation are needed to confirm the diagnosis?

Correct answers:

1. Severe intrapartum asphyxia of mature neonatal infant.
2. Provide warmth; clear airway by endotracheal suction, followed by tracheal intubation, positive-pressure ventilation and oxygen supplementation. If the heart rate is < 60 bpm, start chest compressions during 30 sec (at least 100 compressions per minute, compression-to-ventilation ratio of 3:1), followed by drug therapy: 0,01% epinephrine (0,1 ml/kg by IV or 0,3 ml by endotracheal administration) and crystalloid (10 mL/kg of 0,9% NaCl by IV).
3. CBC; blood gases (PaO_2 and $PaCO_2$) and acid-base status (pH, BE and lactate of blood); serum biochemistry (blood glucose, urea and creatinine); blood electrolytes; blood group and Rh; SpO_2 monitoring and neurosonography.

Diseases of the circulatory system
№11

A girl is 13 months old. She was hospitalized because of her parents' complaints about her fatigue during feeding, sudden intensification of cyanosis and dyspnoea while crying, increased sweating and retardation in physical development. The murmur over the heart was heard since birth. Examination: delayed physical and psychomotor development. There is diffuse cyanosis of the skin and mucous membranes. During the examination when the child was anxious cyanosis increased significantly, tachypnoe appeared, the child became very restless. The infant calmed a little bit after taking a position with legs pressed to the abdomen (the knee-chest or squatting position). T 36,6°C, HR 178 per min, BP 80/45 mm Hg, RR 64 per

min. The left heart border reaches an anterior axillary line and right border is 1,5 cm externally from the right parasternal line. The loud harsh systolic murmur is auscultated over the heart, it is transmitted widely but most intensely is heard in the second intercostal space along the left edge of the sternum. Clear lung sounds are heard above lungs on percussion, auscultatory - vesicular breathing. CBC: Hb - 184 g/l, RBC - 5,8 T/l, WBC – 7,8 G/l, neutrophils: stabs - 5%, segmented – 39%; eosinophils - 3%, lymphocytes - 50%, monocytes - 3%, ESR - 4 mm/hour. Chest X-ray - see pic. Oxygen saturation - 83% on oxygen by nasal prongs.

1. What is the most possible preliminary diagnosis? What complications have developed in the child? How is it possible to differentiate pulmonary from cardiac causes of cyanosis in the newborn?
2. Describe pathological changes of the heart shadow on X-ray (see picture).
3. What medications do you recommend for the treatment of the tet spells (cyanotic-tachypneic attacks) in the child? What is urgent medical aid?

Correct answer:

1. Congenital heart disease: Fallot's tetralogy, decompensation, paroxysmal hypercyanotic attack (“tet” spell). A hyperoxy test may be helpful, whereby an arterial pO2 is measured in room air, which is then compared to arterial pO2 measured in FiO2 of about 90% - 100% for about 10-15 minutes. Respiratory problems with alveolar hypoventilation usually improve with pO2 measurements well above 100 - 150 mmHg, whereas in right-to-left shunt cardiac lesions, the improvement in arterial pO2 is minimal. Echocardiogram and chest X-ray are useful in differentiating these causes.
2. The cardiac silhouette has been likened to that of a boot or wooden shoe (“coeur en sabot”).
3. Propranolol. Placement of the infant in the knee-chest position, while making certain that the infant's clothing is not constrictive, administration of oxygen and injection of morphine subcutaneously in a dose not more than 0,2 mg/kg.

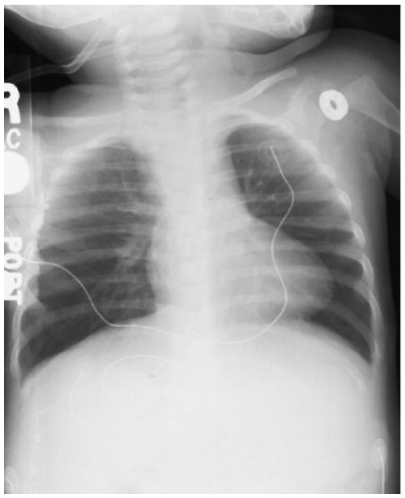


Fig. 8. Chest X-ray.

№12

A full term 5-week old male (the product of uncomplicated pregnancy) with the complaints of increasing lethargy, tachypnea, retractions, sweating, poor feeding for a week after febrile illness with cough and rhinorrhea. Examination: T 36,8, RR 72, HR 160, BP 92/68. Acyanotic, pale, lethargic, with moderate subcostal and intercostal retractions. No any lymphadenopathy. Over

the lungs there are scattered crackles with slightly decreased aeration in the lower lung fields. Heart rate is regular and rhythmic, a gallop is noted at the cardiac apex, with a loud holosystolic murmur at the mid lower left sternal border with radiation to the cardiac apex. The abdomen is soft, non-distended, and non-tender, the liver edge is palpable 4 cm below the right costal margin. There is no splenomegaly. His extremities are cool, with no radial-femoral delay in peripheral pulses. The capillary refill is delayed to 4 sec. Chest X-ray: cardiomegaly with a moderate degree of pulmonary edema, no pleural effusions. ECG: left axis deviation, biventricular hypertrophy. Echocardiogram: a large perimembranous ventricular septal defect, heart chambers are dilated, left ventricular contractility is below the normal range, no pericardial effusion.

1. What is the most possible preliminary diagnosis? What complication has developed in the child? What is the dominant mechanism by means of which infants and young children increase their cardiac output?
2. Describe pathological changes of the heart shadow on X-ray (see figure). What are the clinical symptoms of the pulmonary congestion and of systemic venous congestion?
3. What medications do you recommend for the treatment?

Correct answer:

1. Ventricular septal defect, congestive heart failure (volume overload: large left to right shunt) by increasing heart rate.
2. Cardiomegaly with bilaterally increased pulmonary arterial markings. The symptoms of pulmonary congestion: tachypnea, wheezing, rales, cyanosis, dyspnea, orthopnea, persistent cough. The symptoms of systemic venous congestion: hepatomegaly, jugular venous distention, peripheral edema.
3. Digoxin, diuretics and drugs for afterload reduction.

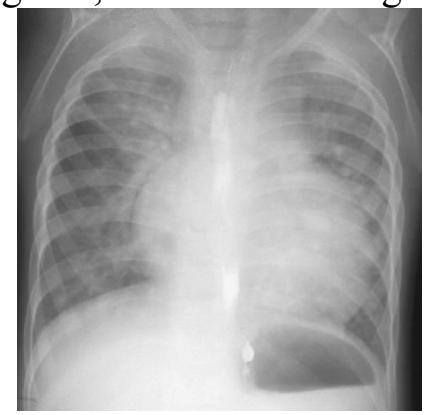


Fig. 9. PA chest X-ray.

№13

A 5-year old female with Turner syndrome and complaints about dyspnoea with exercise. Examination: T37,5°C, HR 94, RR 26 per min, BP right arm 100/70, BP left arm 130/85. Heart: normal heart sounds; mild ejection

systolic murmur heard along the left sternal border with radiation to the back between the scapulae. Lungs are clear to auscultation. Abdomen without organomegaly or masses palpable. Extremities: femoral pulses are slightly diminished to palpation; no peripheral edema, clubbing or cyanosis of the nail beds. Chest X-ray: cardiac/thoracic ratio of 0,55, normal cardiac configuration, and normal pulmonary vasculature. ECG: tall R waves of 45 mm in lead V5, and 40 mm in lead V6. Echocardiogram: coarctation of the aorta. MRI: narrowing of the distal aortic arch just beyond the origin of the left subclavian artery and also an aberrant right subclavian artery originating from the proximal descending aorta below coarctation. Chromosomes are obtained revealing 45XO pattern.

1. What is the diagnosis? What other anomalies associate with such heart defect? Do equal blood pressures in the right arm and left leg exclude the diagnosis of coarctation of the aorta?
2. What are the target organs of the blood hypertension in the child? What are the typical changes in chest X-ray?
3. Describe the methods of treatment.

Correct answer:

1. Coarctation of the aorta, which accounts for 6% of all congenital heart diseases. Patients with Turner syndrome have coarctation more commonly than the general population. Other anomalies associated with aortic coarctation include bicuspid aortic valve (85%) that may obstruct left ventricular output, and an aberrant origin of the right subclavian artery distal to coarctation (1%). No aberrant right subclavian artery originating below coarctation will produce equal pressures in the right arm and leg. It is important to measure the blood pressure in both arms and at least one leg in order to detect the blood pressure differential caused by aortic coarctation.
2. Hypertension produces stress on several organs (target organs), including the kidneys, eyes, and heart, causing them to deteriorate over time. Chest X-ray may display cardiomegaly with left ventricular hypertrophy configuration. In long lasting cases, rib notching due to erosion of the lower anterior portion of the rib by dilated collateral arteries can be assessed.
3. There are several surgical techniques used to repair coarctation of the aorta: resection and end to end anastomosis of the proximal and distal ends; resection with interposition of a tube graft; longitudinal incision with insertion of a synthetic graft to enlarge the diameter.

№14

A 12-year old boy complains of fever up to 40°C, joint pain and swelling, shortness of breath for 4 days. Two weeks ago the child was sick with pharyngitis. Examination: T 39,1°C, HR 156, RR 36 per min, BP 105/65, enlarged, erythematosus tonsils with exudates. Lungs are clear, heart sounds are

rhythmic with a loud holosystolic murmur on the apex with radiation to axilla. Heart point of maximum impulse is prominent at the 6th intercostal space in the mid-axillary line. Abdomen is soft, liver edge is 6 cm below the costal margin. Child's left knee and right ankle are swollen, warm and extremely tender. ESR 28 mm/hour, a CRP of 11 mg/dl, chest X-ray: cardiomegaly. ECG: PR interval 0,22 sec. Antistreptolysin O titer is 750.

1. What is the diagnosis? What are the criteria of the diagnosis?
2. What is the most common valvulitis in this disease?
3. Describe the treatment.

Correct answer:

1. Acute rheumatic fever. Major criteria: carditis, arthritis. Minor criteria: elevated ESR, CRP, prolonged PR plus preceding streptococcal infection (streptococcus pyogenes) in the pharynx: elevated antistreptolysin O titer.
2. The most common valve involved is the mitral valve, the second – the aortic valve.
3. Hospitalization, a daily dose of benzylpenicillin is 1 500 000 - 4 000 000 units in older children and in adolescents and 600 000-1 000 000 IU in younger children during 10 - 14 days, followed by transition to using of benzathine benzylpenicillin 600 000 - 800 000 IU for children and 1,5 million – 2,4 million IU for teenagers intramuscularly every 2 weeks. Pathogenetic treatment - nonsteroidal anti-inflammatory drugs (aspirin, indomethacin, diclofenac sodium, nimesulide, etc.). In severe carditis - prednisolone 1-2 mg/kg/day 2-4 weeks with its gradual withdrawal.

№15

A 13-year old female with a 4 day history of fever, nausea, vomiting, anorexia, shortness of breath, chills and night sweats. Her past medical history is remarkable for minor ventricular septal defect. Examination: T 38,9°C, HR 144, RR 40 per min, BP 95/50 mm Hg, oxygen saturation 92% in room air. She is toxic in appearance, mild conjunctival hemorrhages. Lung exam reveals coarse bibasilar breath sounds, cardiac exam reveals loud, harsh, blowing holosystolic murmur, heard best over the lower left sternal border, no gallops. Her abdominal exam is normal. Chest X-ray: multiple delicate nodular opacities bilaterally. CBC: Hb 124 g/l, platelet count 300 G/l, WBC 25,5 G/l, 28% stabs, 57% segs, 10% lymphs, 5% monos. ESR – 38 mm/hour. Urinalysis: microscopic hematuria. CT of the chest: septic emboli in both lungs. Blood culture: Staph. aureus grows out.

1. What is the diagnosis? What is the etiology and what are the criteria of the diagnosis? What are the types of carditis?
2. What are the criteria of the diagnosis?
3. Describe the treatment.

Correct answer:

1. Infective endocarditis. Alpha-hemolytic streptococci (which includes S. viridans) are responsible for 75% of subacute endocarditis and S. aureus is responsible for 50-70% of acute endocarditis. Carditis (inflammatory conditions of the heart) includes myocarditis, pericarditis and endocarditis. Endocarditis includes valvular inflammation (often called valvulitis). Aortitis is sometimes included in carditis. Endocarditis may be infectious or due to rheumatic fever. Pericarditis and myocarditis are usually viral or post-viral, but they may be due to rheumatic fever as well. Autoimmune conditions may also cause carditis.
2. Duke criteria of the infective endocarditis: the major – positive blood cultures x2 and endocardial abnormalities on echocardiography; the minor – presence of a predisposing condition (i.e., valve abnormality), fever greater than 38°C, embolic episode (i.e., splenic infarct), and immunologic phenomena (i.e., Osler nodes). The patient is considered to have infective endocarditis if 2 major criteria or 1 major plus 3 minor criteria are found.
3. IV antibiotics (vancomycin and gentamicin).

№16

This is a 1-month old male (full term, uncomplicated pregnancy) with a chief complaint of fever, lethargy and poor feeding. Examination: T 38,3°C, HR 248, RR 74 per min, BP 90/60. He is well nourished, but pale, lethargic, with mild subcostal retractions. The lungs are clear to auscultation with good aeration. His heart is tachycardic with a regular rhythm. No murmur is heard. His abdomen is soft, non-distended, non-tender. His liver is 3 cm below right costal margin. His extremities are cool. Capillary refill time is 3 seconds. Chest X-ray: cardiomegaly and mild pulmonary edema. 12 lead ECG: see fig. (narrow complex tachycardia (rate of 240 bpm) with no visible P-waves), mild ST segment depression.

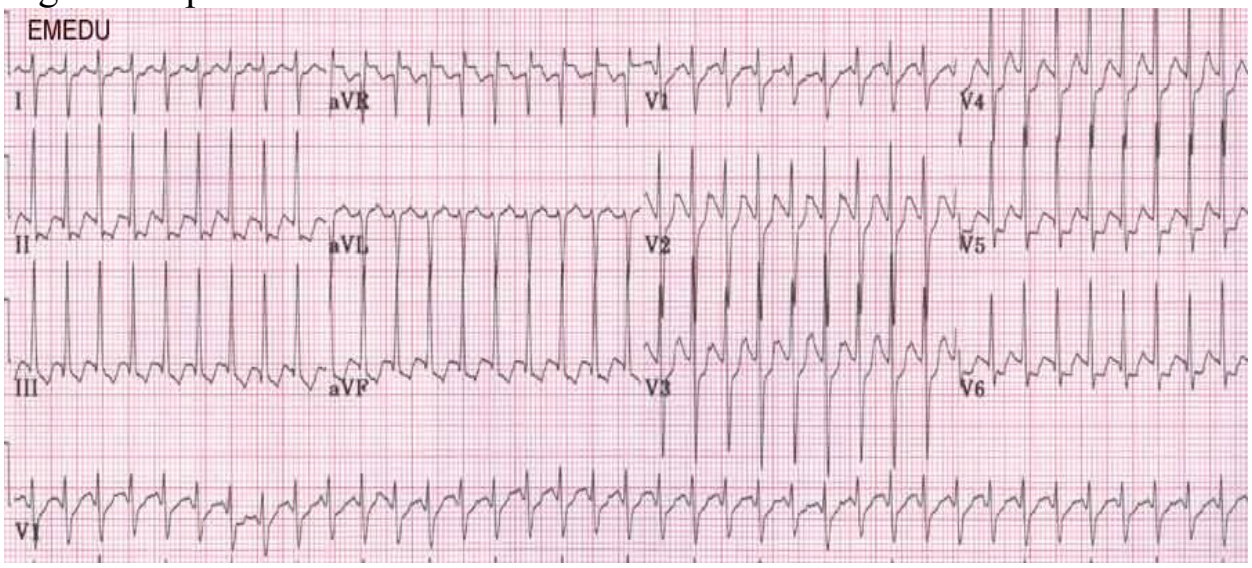


Fig. 10. ECG

1. What is the diagnosis? What is the complication? Classification of the types of this disorder.
2. What additional examination may be proposed in case of heart arrhythmia?
3. Describe the treatment.

Correct answer:

1. Supraventricular tachycardia (SVT), mild congestive heart failure. Supraventricular tachycardia is the most common abnormal tachycardia in the pediatric age group. The most common types of SVT in children include atrioventricular reentrant tachycardia (AVRT), which includes Wolff-Parkinson-White syndrome (WPW), and AV nodal reentrant tachycardia (AVNRT, formerly called Lown-Ganong-Levine or LGL syndrome).
2. 12 lead electrocardiogram and rhythm strip, chest X-ray, echocardiogram, Holter or event monitor, an exercise study.
3. If the patient presents in an unstable condition immediate electrical cardioversion may be required. If the patient is clinically stable, vagal maneuvers may be initially attempted to convert tachycardia: bearing down (as though having a bowel movement, i.e., Valsalva maneuver), or inducing the diving reflex using an ice bag to the face or submerging the patient's face into a container of ice water. Other vagal maneuvers such as eyeball pressure and unilateral carotid massage are less effective and may be harmful. Next step – rapid IV bolus dose of adenosine. Adenosine causes transient AV block and sinus bradycardia thus interrupting the reentrant circuit involving the AV node and accessory pathway. Potential side effects with adenosine include hypotension, bronchospasm, and flushing. Other modes of acute treatment include the use of digoxin, verapamil, propranolol, transesophageal or transvenous pacing. Do not use digoxin on patients with ventricular pre-excitation (e.g., WPW).

№17

A 10-year old boy complains of weight loss despite of increased appetite, nicturia and polyuria started 3 months ago, abdominal pain. Examination: T 37,1°C, RR 42, HR 104, BP110/65. His weight is 26 kg (25%tile). Oral mucous membranes are tacky, skin pinch goes back more than 2 sec (see fig.). His capillary refill is 3 seconds. Heart tones are clear, rate is regular; over the lungs – clear breath sounds. Reflexes are normal. Abdomen – normal bowel sounds, no tenderness. Biochemistry (serum): glucose 23 mM/l, urea 8 mM/l, creatinine 40 mcM/l, Na 131, K3,2, Cl 98 and bicarbonate 12 mM/l, CBC: Hb - 146 g/l, RBC – 4,8 T/l, WBC – 7,9 G/l, eosinophils - 5%, neutrophil stabs - 6%, segments - 40%, lymphocytes - 48%,

monocytes - 1% ESR- 3 mm/hour. Urinalysis: specific gravity 1032, acidic, acetone + +, glucose – 3,1%.

1. What is the preliminary diagnosis? What complication has developed?
2. What is hemoglobin A1C?
3. List the principles of treatment including complications.

Fig. 11. Skin pinch.

Correct answer:

1. Diabetes mellitus type I, severe form, new-onset. Complication: ketoacidotic status, dehydration.
2. HgA1C is the combination of hemoglobin and glucose. It is elevated when the glucose levels are high and it is a good marker for diabetes control.
3. Rehydration, IV insulin therapy (0,1 IU/kg – start dose, 0,1 IU/kg/hour – maintenance therapy under a glycemic control), symptomatic medications.

№18

14-month old child. Mother complains of sudden onset of the tonic and clonic spasms, which disappeared by themselves before emergency care was given. Mother complains of weakness, increased sweating and poor appetite of the child. The child was born with weight 3100 g, breastfed since the birth. Examination: weight = 9,8 kg, skin and mucous membranes are pale, turgor of soft tissues and hypodermic fatty tissue are satisfactory, but the muscles tonus is considerably decreased, child is not able straighten the body while the feet are based on hard surface, is sitting only with support. Hands are flexed at the wrists with hyperextended fingers at the proximal and distal interphalangeal joints and flexion at the metacarpophalangeal joints. Both thumbs are flexed upon the palm (see fig.). Feet are plantar flexed. Neurologic exam: symmetric hyperreflexia, decreased muscle strength and tone. Palpable and visible enlargement of the costochondral junctions (see fig.) and thickening of the distal parts of the arm bones. There are positive symptoms of Trusso and Erb. HR 140, RR 34 per min. Over the lungs: during percussion – the vesicular resonance, during auscultation – rough breath. Mild extension of abdomen, lower edge of liver is projected 1

cm lower the right costal area; the spleen is on the level of the left costal arch. CBC: Hb – 90 g/l, erythrocytes - 3,3 T/l, color index – 0,80, leucocytes – 9,0 G/l, neutrophils; stabs - 7%, segmented - 34%, eosinophils - 1%, lymphocytes - 52%, monocytes - 6%, ESR 8 mm/h. Ionogram of blood: Ca total – 1,6 mM/l, Ca 2+ (ionised) = 0,5 mM/l, P – 0,6 mM/l. Activity of blood alkaline phosphatase – 1200 IU. Ultrasonography of the brain – without pathological changes. Chest X-ray: enlargement of the costochondral junctions. Radiographs of wrists: cuffing, fraying and widening of the epiphysis and metaphysis.

1. What is the full clinical diagnosis and its complications?
2. What other conditions should thid disease be differentiated with?
3. Principles of treatment.

Fig. 12. Clinical manifestation in child.

Correct answer:

1. Vitamin D deficiency rickets , subacute course, active period, the severity – II stage. Acute hypocalcemic tetany. Deficient hypochromic anemia, mild form.
2. Should be differentiated with disease of de Toni- Debre-Fanconi, secondary rickets like tubular osteopathy, renal tubular acidosis, hypophosphatasia.
3. Treatment of rickets, during spasms – diazepam, calcium medications (1 ml/kg of 10% Ca gluconate solution IV over 1 hour). Oral supplementation of 250 mg calcium carbonate every six hours and 4,000 IU of vitamin D (ergocalciferol) per day. After clinical and radiographic improvement over the next several months, vitamin D dose is reduced to the recommended daily of 400 IU.

Respiratory diseases

№19

The child was born from the I pregnancy and I delivery; gestation age is 40 weeks, body weight - 3800 g, length - 56 cm. Delivery was with complications: primary weakness of labor and labor induction; meconial amniotic fluid. Physical examination of the baby at birth: tactile reaction and primitive reflexes are absent, diffuse cyanosis and diffuse muscle atony. Head: large fontanel 2×2 cm, big labor tumor of skull skin with hemorrhagic

rash; myosis, photoreaction *of* pupils is weak. Heart rate – 60 per min, muffled heart sounds; respiratory rate – 20 per min, arrhythmic breathing (gasping respiration).

1. What is the most likely provisional diagnosis?
2. Basic steps of neonatal resuscitation.
3. What additional methods of investigation is needed to verify the diagnosis?

Correct answers:

1. Severe intrapartum asphyxia of mature neonatal infant.
2. Provide warmth; clear airway by endotracheal suction, followed by tracheal intubation, positive-pressure ventilation and oxygen supplementation. If the heart rate is < 60 bpm, start chest compressions during 30 sec (at least 100 compressions per minute, compression-to-ventilation ratio of 3:1), followed by drug therapy: 0,01% epinephrine (0,1 ml/kg by IV or 0,3 ml by endotracheal administration) and crystalloid (10 mL/kg of 0,9% NaCl by IV).
3. CBC; blood gases (PaO_2 and $PaCO_2$) and acid-base status (pH, BE and lactate of blood); serum biochemistry (blood glucose, urea and creatinine); blood electrolytes; blood group and Rh; SpO_2 monitoring and neurosonography.

№20

A 10-year old girl complains of paroxysmal cough, wheezing (mainly early morning and at night) and chest tightness occurring several times a day during last week. Administration of salbutamol gave some relief for 2-3 hours. She experiences such recurrent episodes of cough, wheezing and expiratory dyspnea during last 5 years, especially after physical activity. The girl had atopic dermatitis since 3 month till 2 years of age. The mother of the child is suffering from chronic urticaria, and grandmother of the girl had hay fever. Physical examination: T= 37,2ºC, hyperemia of pharyngeal mucus membrane, rhinitis. RR=40 per min, prolonged expiratory phase. Lung percussion: tympanic sound; lung auscultation: a lot of whistling expiratory rhonchi over the all lung fields. Muffled heart sounds during heart auscultation, HR – 100 per min. Abdomen is soft during palpation, liver + 2 cm below right arch of the ribs. CBC: Hb - 128 g/L, Er - 4,3 x l0 ^{12}/L, WBC - 5,8 x 10^9/L , neutrophils: stabs - 1%, segments 48%, eosinophils - 14%, limphocytes - 29%, monocytes - 8%; ESR - 3 mm/h.

1. What is the most likely provisional diagnosis?
2. Which additional investigation should be done for verification of disease etiology and severity?
3. What are the principles of initial treatment for this patient?

Correct answers:

1. Atopic bronchial asthma, persistent moderate, exacerbation, complicated by respiratory failure, 1st grade.
2. Spirometry with provocative (physical exercise) test and test with bronchodilators (short-acting β_2-agonist or ipratropium bromide), cytological analysis of sputum, peakflowmetry, skin prick tests with allergens, serum total or specific IgE.
3. Nebulizer therapy: repeated administration of rapid-acting inhaled β2-agonist or ipratropium bromide. Early introduction of systemic glucocorticosteroids (dexamethasone, prednisolone by IV or IM administration). Oxygen supplementation. Systemic theophillins (Aminophylline or 2% Euphylline: initial dosage 7-10 mg/kg by IV, diluted with 0,9% NaCl.

№21

Parents of a 3-year old boy complain of his nonproductive cough, noisy breathing and fever up to 37,8°C during the last 2 days. Previously healthy boy has become sick acutely, his family and individual allergological anamnesis are not burdened. Objectively: pale skin, rhinitis, the chest is in inspiration position, hyperinflated, excess use of accessory muscles. RR = 38 per min, HR = 118 per min. Tympanic sound elicited symmetrically by lung percussion. Lung auscultation reveals prolonged expiratory phase, bronchial breathing and moderate amount of dry whistling and moist rales over the all lung fields, without asymmetry. Heart tones are clear, rhythmic. Abdomen is soft during palpation, liver + 1,5 cm below right arch of the ribs. CBC: Hb - 120 g/L, Er - 5,3 x l0 ^{12}/L, WBC - 4,8 x 10^9/L , neutrophils: stabs - 2%, segments 38%, eosinophils -3%, lymphocytes - 48%, monocytes - 9%; ESR - 12 mm/h.
1. What is the most likely diagnosis? What is the main clinical syndrome?
2. Which diseases should it be differentiated with?
3. What are the principles of initial treatment for this patient?

Correct answers:

1. Acute obstructive bronchitis. The main clinical syndrome is bronchial obstruction.
2. Bronchial asthma, bronchial or esophageal foreign body, pneumonia, bronchiolitis, tuberculosis, bronchopulmonary dysplasia anatomic abnormalities (central airway abnormalities, malacia of the larynx, trachea, and/or bronchi, tracheoesophageal fistula, laryngeal cleft, tracheal or bronchial tumors, mucociliary clearance disorders (cystic fibrosis primary ciliary dyskinesias bronchiectasis), aspiration syndromes (gastroesophageal reflux disease), immunodeficiency disorders (IgA deficiency, B-cell

deficiencies, AIDS), congenital heart disease with left-to-right shunt (increased pulmonary edema).
3. Nebulized rtherapy: bronchodilators (rapid-acting inhaled β2-agonist or ipratropium bromide) and corticosteroids (budesonide, fluticasone). Oral bronchodilators (sustained-release theophillins, β2-agonist). Systemic glucocorticosteroids (dexamethason, prednisolon by IV or IM administration) for severe bronchial obstruction.

№22

A 5-month old girl has become sick acutely with fever up to 37,8°C and coryza. On the 2nd day her condition worsened: appeared unproductive cough, shortness of breath, wheezing. Objectively during examination on the 3d day: general condition is severe, peryoral cyanosis, nasal flaring, subcostal and intercostal retractions, and excess use of accessory muscles. Body temperature 38,2°C, RR = 60 per min, HR = 140 per min. Bandbox resonance elicited symmetrically by lung percussion. Lung auscultation reveals bronchial breathing, a lot of fine crackles together with overt wheezes, and, as well, prolonged expiratory phase. Heart sounds are muffled, rhythmic. Abdomen is soft during palpation, liver + 2 cm below right arch of the ribs. Defecation occurs 5 times a day, stool is loose without any pathological changes. CBC: Нь - 118 g/L, Er - 4,3 x 10^{12}/L, WBC - 6,2 x 10^9 /L, neutrophils: stabs - 1%, segments 30%, eosinophils - 3%, lymphocytes - 58%, monocytes - 8%; ESR -8 mm/h. Chest radiography reveals hyperinflated lungs with patchy atelectasis.
1. What is the most likely diagnosis, complication?
2. What are the most common etiological factors?
3. What are the principles of treatment of this disorder?

Correct answers:

1. Acute bronchiolitis, complicated by 2nd grade respiratory failure.
2. Respiratory syncytial virus (RSV) is responsible for >50% of cases. Other agents include parainfluenza, adenovirus, Mycoplasma, and, occasionally, other viruses.
3. Cool humidified oxygen. Adjunctive therapies: antipyretics, rehydration, nebulized bronchodilators (short-acting β_2-agonist or epinephrine), corticosteroids (whether parenteral, oral, or inhaled). Ribavirin, an antiviral agent administered by aerosol is useful for infants with congenital heart disease or chronic lung disease. Antibiotics have no value unless there is secondary bacterial complications (pneumonia) developed.

№23

A 5-year old child was admitted to the hospital with the diagnosis of acute right-sided lobar pneumonia. On the fifth day of antibiotic treatment (IV Ceftriaxon and oral Azithromycin) the child's general condition deteriorated: mixed dyspnea, right sided chest and abdominal pain appeared, complicated by deep breathing and coughing; relapse of fever up to $40,5^0$C; had once vomiting. Objectively: the child is grunting, has intoxicated appearance, and lies on his right side. RR= 45 per min, HR= 110 per min. Dullness (flatness) on the right side on percussion (demarcated upper line goes medially from the vertebral column (Th7-Th8) toward the angle of the scapula). Absent breath sounds and rough inspiratory and expiratory friction rubs are heard on lung auscultation on the right side. CBC: НЬ - 100 g/L, Er - 3,5 x 10^{12}/L, WBC - 17,9 x 10^9 /L, neutrophils: stabs - 25%, segments 38%, eosinophils - 0%, lymphocytes - 33%, monocytes - 4%; ESR - 20mm/h.

1. What complication most likely has developed?
2. Which additional investigation should be done for verification of this complication?
3. What are the principles of treatment of this disorder?

Correct answers:

1. Right sided pleurisy, accompanied by pleural effusion.
2. Chest radiograph (frontal and lateral position), chest ultrasonography (supine and upright patients' position) or X-ray computed tomography, toracentesis with examination of fluid (culture for bacterial, fungal and mycobacterial agents; antigen testing; Gram stain; biochemistries and pH; cytological profile).
3. Admission (transfer) to the surgical department; antipyretics and analgesia, thoracentesis, chest tube drainage, antibiotics (IV administration: Cephalosporins *(*3rd or 4th generation) + Aminoglycosides*,* Vancomycin or Clindamycin, Carbapenems+ Aminoglycosides*).*

№24

The disease of a 7-year old child started suddenly with a shaking chill followed by high fever (39,2°C), dry, hacking, unproductive cough and progressive dyspnea. Objectively: body temperature 39,5°C, RR = 44 per min., pulse – 148 per min. General condition of the child is severe: pale skin with circumoral cyanosis, adynamia, anorexia, respiratory distress syndrome and mixed dyspnea. Mucous membranes of the oral cavity are dry, lips are crackled. During the examination intercostal chest retractions and groaning breathing have been revealed. Physical findings are asymmetrical: respiratory excursion lag on the left side, dullness on percussion and diminished breath sounds with accompanying fine bubbling crackles during inspiration on

auscultation were noted over the lower third of the left lung field. Heart sounds are muffled. Abdomen is soft during palpation. Liver and spleen are not palpable. Urination occurred 3 times for the last 24 hours. CBC: Нb - 100 g/L, Er - 3,3 x 10^{12}/L, WBC - 19,2 x 10^{9} /L, neutrophils: stabs - 24%, segments 57%, eosinophils - 1%, lymphocytes - 15%, monocytes - 2%; ESR - 38 mm/h, toxic granulation of leukocytes. Chest radiography reveals consolidation in the left lower lobe.

1. What is the most likely diagnosis?
2. What are the most common complications of this disorder?
3. What are the principles of treatment of this disorder?

Correct answers:

1. Acute community-acquired bacterial pneumonia, localized in the left lower lobe, complicated by 2nd grade respiratory failure.
2. Pulmonary complications: respiratory failure, pleural effusion, empyema, pneumatoceles (thin-walled cavities; bullas), pneumothorax, pyopneumothorax, lung abscesses. Extrapulmonary complications: bacteremia and toxic shock syndrome, pericarditis, heart failure, meningitis, hypoxic encephalopathy, suppurative arthritis and osteomyelitis, otitis media, pyelonephritis, DIC.
3. Antibiotic management (oral or parenteral administration depending on severity): beta-lactamase-stable antibiotics (amoxycillin clavulanate), 2nd or 3rd generation cephalosporins (cephuroxime, cephadroxil, cephotaxime, cephtriaxon), possibly combined with aminoglycosides or macrolids. Second choice antibiotics are 4th generation cephalosporins and carbapenems. If the signs of staphylococcal pneumonia are suspected (e.g., pneumatoceles, empyema), initial therapy should also include vancomycin or clindamycin. Supportive therapy includes adequate hydration, high humidity, oxygen supplementation and antipyretics (acetaminophen or ibuprofen).

№25

The patient M., 8 years old, was admitted to the hospital with complaints of fever, shortness of breath. The boy is sick since birth: recurrent productive cough with a big amount of yellow-green very viscous sputum and frequent fatty loose stool. He has had already 8 episodes of pneumonia. Physical findings: body weight - 29 kg, height- 140 cm. Skin is dry and pale, with a grayish tint, perioral cyanosis. Nasal polyps and digital clubbing are present. Increased anteroposterior diameter of the chest, over the lungs generalized hyperresonance, scattered crackles and expiratory wheezes. RR – 40 per min, HR – 120 per min. Heart sounds are rhythmic, muffled, systolic murmur on the apex. Abdomen is soft during palpation, liver + 6 cm below right arch of the ribs. Stool is white-grey, fatty. Biochemical blood analysis:

bilirubin total 64 mcM/L, direct – 52,0 mcM/liter, AlAT - 35 U/l, Sweat chlorides - 120 mmol/L. Sputum culture is positive for Pseudomonas aeruginosa.

1. What is the most likely diagnosis? What complications have been developed?
2. What are the main etiological and pathogenetical factors?
3. What are the principles of treatment of this disorder?

Correct answers:

1. Cystic fibrosis, mixed (pulmonary and gastrointestinal) severe form. Chronic purulent obstructive bronchitis, complicated by 1st grade respiratory failure. Chronic pancreatic insufficiency, hepatobiliary disease. Failure to thrive, malnutrition.
2. Cystic fibrosis (CF**)** is autosomal recessive genetic disorder, associated with mutations of the cystic fibrosis transmembrane regulator (CFTR) gene. CFTR gene codes for c-AMP regulated chloride channels, located in exocrine glands, which are responsible for normal viscosity of exocrine glands secretion (mucus, pancreatic juice, bile, etc.). Fundamental pathophysiologic importance of CF are failure to clear mucous secretions, lack of water in mucous secretions, increased salt content in sweat and other serous secretions, and chronic infection limited to the respiratory tract.
3. Airway clearance therapy: chest physical therapy**,** bronchodilators (rapid-acting inhaled β2-agonist), mucolytics (N-acetylcysteine, human recombinant DNase, hypertonic solutions of NaCl), inhaled antibiotic therapy (aerosolized colistin or tobramycin for eradication of P. aeruginosa). Nutritional therapy: high-protein, high-calorie diet with normal amounts of fat, fat-soluble vitamins (A, D, E, K) and mineral (Ca) supplements, pancreatic enzyme replacement (Kreon). Antibiotic therapy (oral and IV): Staph. aureus (Dicloxacillin, Cephalexin, Clindamycin, Amoxicillin-clavulanate, Vancomycin), P. aeruginosa (Ciprofloxacin, Ceftazidime, Amikacin, Netilmicin, Cefipime, Carbenicillin, Meropenem), Burkholderia cepacia (Trimethoprim-sulfamethoxazole, Azithromycin, Chloramphenicol, Meropenem). Ursodeoxycholic acid usage for prevention and improvement of liver function, abnormalities associated with biliary cirrhosis.

№26

A 8-year old boy complains of intermittent nasal congestion and itching, sneezing, clear rhinorrhea and conjunctival irritation. These symptoms are seasonal (spring-summer time). Objectively: continuous open-mouth breathing, rhinorrhea with clear nasal secretions, rise to the nasal crease, dark circles under the eyes, conjunctival edema and mild hyperemia. RR=22 per min. Lung auscultation reveals vesicular breathing; additional

sounds (rales, rhonchi) are absent. HR=88 per min. Heart sounds are clear and rhythmic during auscultation. Lung auscultation reveals vesicular breathing; additional sounds (rales, rhonchi) are absent. Abdomen is soft during palpation. CBC: Hb - 122 g/L, Er - 4,3 x l0 ^{12}/L, WBC - 6,8 x 10^9/L , neutrophils: stabs - 1%, segments 49%, eosinophils - 7%, lymphocytes - 37%, monocytes - 6%; ESR - 3 mm/h. Total serum IgE = 503U/ml. Allergen-specific IgE: cows milk +, cats dander +, house dust mites ++, molds ++, mix of trees pollinate +++, mix of grasses pollens ++++.

1. What is the most likely diagnosis?
2. What are the principles of treatment of this disorder?
3. What specific preventive method of treatment should be recommended for this patient?

Correct answers:

1. Pollen disease (hay fever). Seasonal allergic rhinitis, conjunctivitis. Sensibilization to trees and grass pollens allergy.
2. Oral antihistamines for symptoms relief (H1-receptor antagonist: Brompheniramine, Cetirizine, Diphenhydramine, Desloratadine, Loratadine) and Decongestants (Pseudoephedrine, Phenylephrine, Oxymetazoline). Intranasal sprays require frequent administration: intranasal inhaled corticosteroids (Beclomethasone, Budesonide, Flunisolide, Fluticasone, Mometasone), intranasal Cromolyn sodium (inhibition of mast cell degranulation). Leukotriene modifying agents (Montelucast) have lower treatment effect.
3. Specific allergen immunotherapy (administering gradually increasing doses of allergens to a person with allergic disease for the purpose of reducing or eliminating the patient's adverse clinical response to subsequent natural exposure of those allergens).

№27

The child was born from I pregnancy and I delivery; gestation age is 30 weeks, body weight is 1450 g. Delivery was with complications: oxytocin labor induction. Apgar score: on the 1 min – 5, and on the 3 min – 4 points; Downes' ***score*** is 8 points. Objectively: body temperature = 36,5°C, central cyanosis, SaO_2 = 84%, HR=180 per min, RR=65 per min, shallow respirations, audible grunting, intercostal and subcostal retractions, nasal flaring, periodical episodes of apnea. Lung auscultation reveals diminished breath sounds and fine rales on the both sides. Heart sounds are rhythmic, muffled, but no murmurs. Oliguria. CBC: Hb - 215 g/l, RBC -5,8 T/l, WBC - 12,2 G/l, neutrophils stabs - 4%, sehmented - 51%, eosinophils - 2%, lymphocytes - 58%, monocytes - 5%, ESR 15 mm/hour. Blood: glucose = 4,2

mM/L; PaO_2 < 50 mm Hg (hypoxemia), $PaCO_2$ > 45 mm Hg (hypercapnia), pH < 7,2 (acidosis).

1. What is the most likely provisional diagnosis?
2. What are the principles of treatment of this disorder?
3. What are the methods to prevent this disorder?

Correct answers:

1. Respiratory distress syndrome (RDS): Hyaline membrane disease.

2. Supportive care of any low birth weight infant: usage of an isolette or radiant warmer and core temperature maintained between 36,5 and 37°; calories and fluids should initially be provided by IV with early introduction of minimal enteric feeding. Warm humidified oxygen to keep arterial levels between 50 and 70 mm Hg (SaO_2 85–95%). Indications for assisted mechanical ventilation are signs of severe or complicated RDS: arterial blood pH < 7,2; arterial blood $P_{CO_2} \geq 60$ mm Hg; arterial blood $P_{O_2} \leq 50$ mm Hg at O_2 concentrations of 70–100%; persistent apnea. Therapy requires careful and frequent monitoring of HR and RR, SaO_2, Pa_{O_2}, Pa_{CO_2}, pH, bicarbonate, electrolytes, blood glucose, hematocrit (PCV), blood pressure, and temperature. Rescue treatment (in the 1st 24 hr of life) includes multidose endotracheal (every 6–12 hr for a total of 2 to 4 doses) instillation of exogenous surfactant **(**synthetic or natural). Natural surfactants include Survanta (bovine), Infasurf (calf), and Curosurf (porcine). Synthetic lung surfactants include Surfaxin (KL4 surfactant) and Exosurf. Metabolic acidosis requires administration of Sodium bicarbonate (1–2 mEq/kg over a 15–20 min through the peripheral or umbilical vein). Hypotension should be treated with cautious administration of volume (crystalloid) and early use of vasopressors (dopamine or less effective dobutamine); sometimes with hydrocortisone (1–2 mg/kg/dose IV every 6–12 hr). Empirical antibiotic therapy (penicillin or ampicillin with an aminoglycoside) is indicated until the results of blood cultures are available.

3. Repeated weekly corticosteroid administration (betamethasone or dexamethasone) is recommended for all women in preterm labor (24–34 wk gestation) who are likely to deliver a fetus within 1 week. Administration of the 1st dose of surfactant into the trachea of symptomatic premature infants immediately after birth (prophylactic) or during the 1st few hours of life (early rescue).

Digestive diseases

№28

The boy who is 9 years old complains of pain in the epigastric area. Sometimes the child at night wakes up because of pain with hypersalivation, occasionally - nausea, accompanied by discomfort in the epigastric area. The

boy is sick for 2 months, it started in spring. The child did not receive any treatment. Examination: T 36,2°C, RR - 42 per min., HR – 132 per min., BP - 90/50 mmHg. Skin is clean, pale. Tongue is dry, near the root is whitish-yellow. Abdomen is scaphoid, soft. Palpation of the abdomen reveals pain reaction in the pyloroduodenal zone. The liver and spleen are not enlarged. Stool is unstable, dark recently. On examination - defecation, stool was like melena. CBC: Hb - 90 g/l, RBC – 2,83 T/l, reticulocytes – 3%, platelets - 190 G/l, WBC -11 G/l, neutrophils: stabs - 7%, segmented - 49%, eosinophils - 3%, lymphocytes - 38%, monocytes - 3%, ESR - 12 mm/hour. Coprogram - 5-6 leukocytes in visual field, the positive Gregerson test (for occult blood in feces).

1. What is the preliminary diagnosis?
2. What additional methods of investigation are the most informative in this case? Is melena indicative of upper or lower GI bleeding?
3. What complication has developed in this case and what are the signs of it? What's your tactic in this situation?

Correct answer:

1. Peptic ulcer disease, new onset, gastro-intestinal bleeding.
2. Endoscopic investigation, radiographic contrast study of the abdomen. Melena is usually indicative of upper GI bleeding, but sometimes it may be due to lower GI bleeding. The black color is due to blood exposure to acid. Acid fermentation can occur in the cecum. If this occurs and the transit time is relatively slow, bleeding in this area can be presented as melena. Bleeding from Meckel's diverticulum can also result in acid exposure in the lower GI tract.
3. Gastro-intestinal bleeding; tachycardia, hypothermia, decreased blood pressure, melena. The assessment of hemorrhagic shock symptoms (ABC), emergency care, consultation of surgeon.


Fig. 13. Melena.

№29

A 14-year old boy has a four year history of intermittent diarrhea, mild abdominal pain, anemia and anorexia, absence of weight gain. His diet is normal with adequate iron intake. Family history is negative for any GI diseases.

Examination: T 37,5°C, HR 98, RR 18 per min, BP 110/70 mm Hg. Height and weight, 145 cm and 35 kg, both less than the 5% percentile, but not cachectic. Skin and membranes are pale, flat fingernails, teeth are pitted and discolored. Examination of the heart and lungs are normal, abdomen is slightly protuberant and hyperresonant. Bowel sounds are slightly hyperactive. Stool examination is negative for blood and reducing sugars. The 72-hour fecal fat study shows a moderate increase in fat content. Gregerson test is negative (for occult blood in feces). Chloride sweat test - 22 mM/l. Serologic human anti-tissue transglutaminase ELISA test is positive for autoantibodies. Biopsies from the duodenal and proximal jejunal area reveal severe villus atrophy consisting of flat mucosa with deep crypts (see fig.).

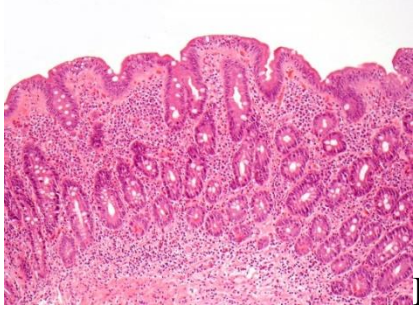


Fig. 14. Biopsy of the small intestine showing villous atrophy (flat villi).

1. What is the diagnosis?
2. What laboratory stool investigations are the most informative in the differential diagnosis of malabsorbtion syndrome?
3. What's your treatment tactic in this situation?

Correct answer:

1. Gluten-sensitive enteropathy or celiac disease.
2. Stool analysis: Quantitative stool fat analysis for 72 hours, consistency, pH (due to acidic stools in the presence of fermented sugars and reducing sugars in carbohydrate malabsorption), stool bile acids (increased in bacterial overgrowth syndromes), presence of large serum proteins (such as alpha-1-antitrypsin, may be indicative of protein-losing enteropathy, ova and parasites (for Giardia), testing for chronic intestinal infections (such as C. difficile or Cryptosporidium), consistency, fecal leukocytes (such as in inflammatory bowel disease), and occult blood.
3. Strict gluten-free diet. Correction of nutritional deficiencies.

№30

A 7-month old child is formula fed, despite trials of different types of formulas his clinical course was remarkable for bloating, diarrhea and failure to thrive. Child has developed a daily cough and some respiratory difficulty due to which was hospitalized several times. He continued to have loose, large, greasy, foul-smelling stools and failure to thrive. Examination: T 37,1°C, HR 120, RR

45 per min, BP 80/60 mm Hg, oxygen saturation 97% in room air, weight 6,0 kg (<5th percentile). Mild nasal congestion, heart sounds are regular, clear, lungs with wheezing and rales. Abdomen is soft, protuberant, non-tender, active bowel sounds. Chest X-ray (see fig.): hyperexpansion with increased peribronchial markings. Pilocarpine sweat test: Cl 110 mMl/l. Genetic testing for mutation analysis: positive for one copy of Delta F508 and one copy of R1066C.

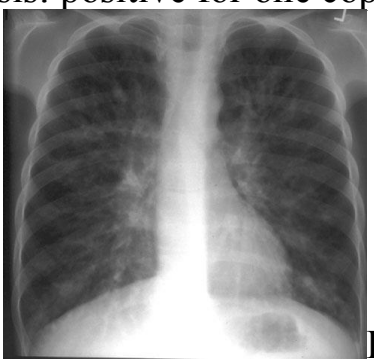


Fig. 15. Chest X-ray o f the patient.

1. What is the diagnosis? What is the etiology and pathogenesis of this disease?
2. What is the diagnostic triad of this disease?
3. What's your treatment tactic in this situation?

Correct answer:

1. Cystic fibrosis is the most common, autosomal recessive inherited disease of white people associated with a dramatically decreased life expectancy. CF mutations have been localized to chromosome 7, band q31. This locus codes for a transport protein named cystic fibrosis transmembrane conductance regulator (CFTR). More than 800 mutations are now known. Caucasian associated delta F508 defect is the most common mutation found. CFTR protein functions as a chloride channel regulated by cAMP dependent protein kinase phosphorylation.
2. A positive sweat test in association with pancreatic exocrine dysfunction (maldigestion as opposed to malabsorption) and lung disease is the diagnostic triad of CF.
3. Pancreatic replacement enzymes, dietary regulation and the replacement of the fat-soluble vitamins (A,D,E,K) play a major role in treating CF. Therapy of the pulmonary manifestations includes mechanical mobilization of thick secretions by chest physical therapy and postural drainage (the use of nebulized rhDNase (Pulmozyme); antibiotic therapy aimed at specific organisms is the main point of therapy.

№31

A 19-day old newborn is brought to the emergency department with a chief complaint of unexplained recurrent crying due to possible abdominal pain (he pulls his legs up while he is trying to defecate). During 4 days there were

daily episodes of the intractable crying during 2-3 hours, nothing has relieved the crying. He has been acting normally between daily episodes of fussiness. He is formula fed without vomiting or diarrhea. He was born in term with no any problems, with good weight gain. Examination: T 36,8°C, HR 128, RR 34 per min, BP 80/55 mm Hg, oxygen saturation 100% in room air. Height, weight and head circumference correspond to his age, soft fontanelle, good eye contact. Vigorously feeding during exam. All exams are normal. His abdomen is soft and non-distended, non tender. Bowel sounds are active.

1. What is the most possible diagnosis?
2. What are the criteria of this diagnosis?
3. What's your treatment tactic in this situation?

Correct answer:

1. Infant's colic.
2. The four clinical signs of colic are: 1) paroxysmal onset, 2) distinctive high-pitched pain cry, 3) physical signs of hypertonia and 4) inconsolability. Colic presents as intermittent and unexplained crying during the first three months of life by babies that are otherwise healthy. The "infant colic syndrome" (paroxysmal fussing) basically involves cyclic discrete periods of intractable crying, usually on a daily basis, with onset at 1-4 weeks of age (may be as early as the first week of age) and dramatic spontaneous improvement by 3-4 months of age. In addition to infant irritability, colic is characterized by recurrent episodes, excessive restlessness or activity, or diminished consolability. Colic is distinguished in that the crying is paroxysmal, intense and different in type from normal fussing and crying.
3. Do not make the diagnosis of colic for patients with any of the history "red flags", associated with intractable crying in infancy: fever, premature rupture of membranes (>24 hours), perinatal maternal fever/infection, neonatal jaundice; maternal drug use; poor feeding, poor weight gain; significant decrease in level of activity, cyanotic/apneic "spell", or seizure-like episode; bilious or projectile vomiting, history not suggestive of classical "infant colic syndrome", history suggestive of physical abuse; antibiotic pre-treatment ("partially treated" sepsis/meningitis); history of recent head trauma.

№32

A 10-year old girl complains of poor appetite, nausea, sour taste in the mouth, general weakness and dull abdominal pain usually 1,5 hours after eating. Abdominal pain periodically disturbed throughout the year, worsening were associated with the violations in diet. Family history is not remarkable. Examination: skin pale is pink, clean, tongue with thick gray coating, abdomen is soft, painful on palpation in the epigastric, pyloroduodenal area, positive Mendel's symptom. pH metry: basal pH of the fundus of the stomach – 1,2,

basal pH of the antral part – 4,0. Urea breath test is negative. Gastroscopy: mucous membrane of the antrum is red, swollen, thickened folds, duodenal mucosa without lesions.

1. Formulate the clinical diagnosis according to modern classification.
2. Assess acidity. What does urea breath test determine?
3. What medications may be recommended in this case?

Correct answer:

1. Chronic antral superficial gastritis, with increased acidity, exacerbation.
2. Hyperacidity. Urease activity of H. pylori - intragastric infection.
3. Medications include antispasmodics (myotropic antispasmodics - papaverine, drotaverine; M-cholinolytics - gastrozepin, , prifinium bromide); antisecretory drugs (proton pump inhibitors and histamine H_2 receptor blockers); antacids (based on aluminum hydroxide or phosphate, magnesium hydroxide or oxide) .

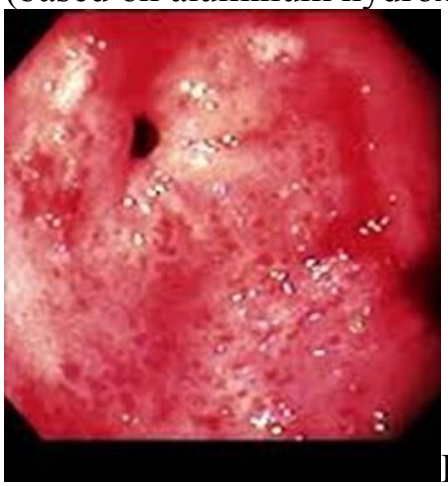


Fig. 16. Gastroscopy.

№33

A girl of 13 years old complains of almost constant pain in the right upper quadrant, nausea, bitter taste in the mouth, headache, drowsiness. Sick for three years, worsening is provoked by food poisoning. Examination: T 37,5°C, HR 92, RR 22 per min, BP 100/65 mm Hg, skin is pale-pink, clean, tongue with whitish coating, dry. Abdomen is soft, painful in the right upper quadrant, positive Ker, Murphy, Ortner symptoms, liver, spleen are not enlarged. CBC: WBC – 12,2 G/l, ESR - 20 mm/hour. Biochemical analysis of blood: total bilirubin – 20,5 mcM/l, AlAT – 0,68 mcM /hour x ml, cholesterol – 5,3 mM/l. Duodenal tube biliary tract drainage: the portion B of bile is muddy, contains mucus, in the sediment - leucocytes and epithelial cells.

1. Formulate the clinical diagnosis according to modern classification.
2. Assess laboratory findings. What are the ultrasound criteria of the disease?
3. The principles of drug therapy.

Correct answer:

1. Chronic cholecystitis, moderate severity, exacerbation.
2. Leukocytosis, a moderate increase of ESR, biochemical indicators of blood on top of the normal ranges, inflammatory changes in the gallbladder bile (portion B). Ultrasound criteria: thickening of the walls of the gallbladder, the presence of sediment in the cavity of the gallbladder.
3. Antispasmodics, bile course of therapy, if necessary - antibacterial therapy (penicillins, macrolides, cephalosporins).

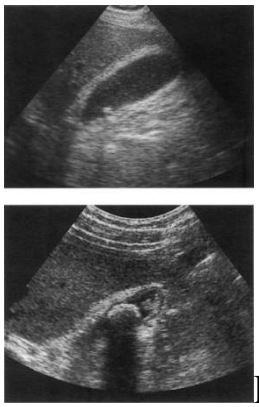


Fig. 17. Ultrasound picture of cholecystitis.

№34

An 18-year old girl presents a 2-year history of pancreatitis (2 mild and self-limited episodes of acute pancreatitis). In between attacks for 1 year she has had persistent abdominal epigastric pain with infrascapular radiation exacerbated by meals. She has lost 7 kg of weight. No any alcohol intake. There is no evidence of glucose intolerance or history of chronic diarrhea. Recently empiric cholecystectomy for possible microlithiasis and endoscopic retrograde cholangiopancreatography with pancreatic sphincterotomies were performed, but the episodes persisted. Physical examination, blood test and abdominal computed tomography results are normal. Endoscopic ultrasound: see fig. Genetic tests: no disease-causing mutations in *PRSS1* were identified, screening for the 100 most common *CFTR* mutations and *SPINK1* showed the patient to be transheterozygote: *CFTR* Δ*508* and *SPINK1* N34S.
1. Formulate the most possible clinical diagnosis.
2. What is the modern definition of the disease?
3. What are the endoscopic ultrasound criteria of the disease?

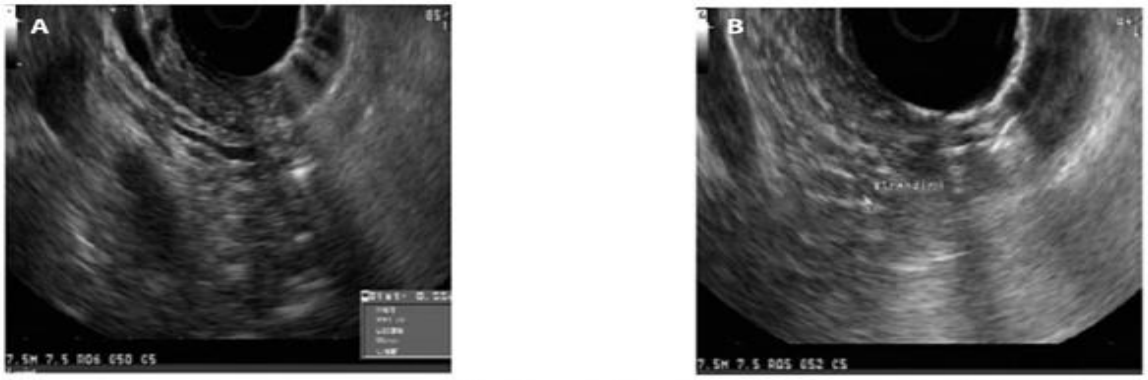
Correct answer:

1. Idiopathic chronic pancreatitis of early onset.
2. Chronic pancreatitis is a progressive and destructive necroinflammatory disorder of the pancreas characterized by irreversible fibrosis of the gland with eventual failure of exocrine and endocrine functions. Episodes of inflammation and abdominal pain are dominant clinical features early in its

course. At the endstage, parenchymal and ductal calcifications are often associated with gland failure.

3. Endoscopic ultrasound of the pancreas: hyperechoic strands and foci, parenchymal lobulation, small shadowing calcifications in the pancreatic head, echogenic main duct wall and irregular main duct contour

Figure 1. **Endoscopic Ultrasound (EUS) Images**



EUS images (A and B) show features consistent with the diagnosis of chronic pancreatitis. The parenchyma has increased echogenic foci, stranding with lobulation. The pancreatic duct has an irregular contour with increased echogenicity of the wall.

Fig. 18. Endoscopic ultrasound of the pancreas.

№35

A boy of 11 months old has low-grade fever, lethargy, loss of appetite, intermittent irritability. Vaccination was missed. In the maternity ward the child has received blood transfusion because of hemolytic disease of the newborn. Recently child's parents noticed that his urine leaves dark spots on the diapers. Examination: weight deficiency, skin and mucous memdranes are yellowish, palmar erythema, muffled heart tones, HR - 130 bpm, lower edge of liver is projected on 4 cm lower the right costal arch, dense during palpation, spleen is projected on 2 cm lower the costal arch. Biochemical analysis of blood: total bilirubin - 157 mcM/l, direct bilirubin - 117 mcM/l, albumin - 35 g/l, Na – 125 mM/l, K – 3.5 mM/l, AlAT-ase - 144 U/l, AsAT–ase = 88 U/l (in norm – until 20), prothrombin time is 15,0 seconds (prolonged). HBsAg is positive over the past 6 months. The level of serum HBV DNA - 25,000 IU/ml (10^5 copies/ml).

1. Evaluate the results of additional examination methods.
2. Describe the clinical diagnosis according to modern classification. What are the diagnostic criteria? Specify the possible complications.
3. Principles of treatment.

Correct answer:

1. Hyperbilirubinemia mainly due to direct fraction, increased cytolytic enzymes (AlAT, AsAT); decrease in liver clotting factors, in albumin; HbsAg is positive, positive hepatitis B virus DNA in the blood.
2. Chronic viral hepatitis B, moderate level of activity. Diagnostic criteria: detection of HbsAg within 6 months or more, the level of serum HBV DNA>

20,000 IU/l, steady or periodic increase levels of AlAT/AsAT, moderate level of activity – increase of AlAT below 9 standards. The syndrome of portal hypertension, hypersplenism, cirrhosis, liver failure, hepatic encephalopathy, hemorrhagic syndrome.
3. Interferon alfa is the main agent of treatment. Drugs: interferon alfa-2b, peginterferon alfa-2a, lamivudine, adefovir dipivoxil, entecavir, telbivudine.

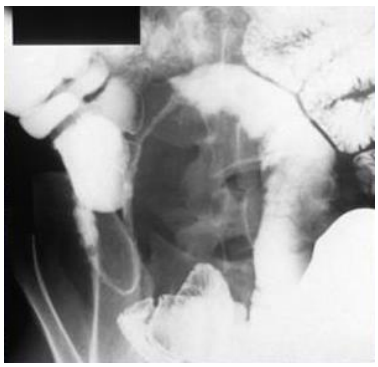
№36

A 17-year old female has had the episodes of fever and diarrhea accompanied with weight loss in the past 2 years. Examination: T 37,2°C, HR 88, RR 18, BP 105/70 mm Hg, height 162 cm, weight is 42 kg, tacky mucous membranes, no rashes, regular heart rhythm, no murmurs, vesicular breathing over the lungs, abdomen is non-tender, scaphoid, diffuse nonspecific pain, bowel sounds are overactive, lymph nodes, liver and spleen are not palpable. Rectal examination: no any masses or severe tenderness, anus is normal. Stool: positive Gregersen test (for occult blood), positive for WBCs, but no eosinophils (Wright's stain of the stool). CBC: WBC 10 G/l, Hb 98 g/l, Ht 32%, MCV 68 fL, MCHC 28 g/dL, reticulocyte count is 1,9%. X-ray examination of colon after double-contrast barium enema: nodularity, skip areas, a string sign (see fig.), fistulas formation.
1. What is the diagnosis and categorizing? What is the specific feature of this disease?
2. What are the common histologic findings in this disease?
3. What is the treatment?

Correct answer:

1. Crohn's disease. Categories: fistulizing, fibrostenosing and inflammatory type. Regional areas of transmural inflammation that affects any part of the gastrointestinal tract from the mouth to anus.
2. Transmural inflammation, skip areas, aphthoid lesions, fissuring ulceration, granuloma, fibrosis. Joints: arthralgias, arthritis. Integument: erythema nodosum, pyoderma gangrenosum. Eyes: episcleritis, uveitis, orbital myositis. Hepatobiliary system: sclerosing cholangitis, chronic active hepatitis. Pancreas: pancreatitis. Renal system: nephrolithiasis, hydronephrosis. Coagulation system: hypercoagulability. Bone: decreased bone density.
3. Step-by-step therapy: sulfasalazine is the usual treatment, corticosteroid and immunomodulatory therapy (6-mercaptopurine or methotrexate) in moderate to severe cases, biologic and surgical therapies are at the top of the treatment pyramid.

Fig. 19. A string sign (narrowed terminal ileal lumen).



Diseases of the urinary and male reproductive system
№37

A 10-year old boy 2 weeks after experienced pharyngitis developed the following symptoms: fever, weakness and poor appetite, swelling of the face and hematuria. Poststreptococcal glomerulonephritis was diagnosed. The patient's condition has become worse in 2 days after admission to hospital: oliguria, headache and lethargy appeared. Objectively: body temperature 37,8°C, HR=65 per min, RR=32 per min, BP=140/85 mmHg. Skin is pale, peripheral edema (especially periorbital). Heart sounds are weakened, arrhythmic. Lung auscultation reveals bronchial breathing and diffuse moist rales. Abdomen is soft during palpation; liver + 6 cm below right arch of the ribs, not painful. Urine analysis: cola-like color, specific gravity - 1028, protein - 1,5 g/l, sugar - not found, bile pigments – negative, WBC - 15-20 in field of view, RBC – covering all field of view, RBC casts. Serum biochemistry: urea – 9,0 mM/L, creatinine - 135 mcM/L, cholesterol – 5,2 mM/l, K^+=6,6 mM/L, Na^+=120 mM, Ca^+=2,0 mmol/L.

1. What complication has developed in this patient?
2. What are the electrocardiographic signs of hyperkalemia?
3. What are the principles of treatment for hyperkalemia?

Correct answers:

1. Acute renal (intrinsic) failure. Electrolyte Imbalance *(*hyperkalemia, hyponatremia, hypocalcemia).
2. The earliest electrocardiographic change seen in patients with developing hyperkalemia is the appearance of peaked T waves. This may be followed by widening of the QRS intervals, ST segment depression, ventricular arrhythmias, and cardiac arrest.
3. Hyperkalemia (>7mM/L), especially if accompanied by electrocardiographic changes, require emergency measures in addition to Sodium polystyrene sulfonate resin (Kayexalate). The following agents should be administered: Calcium gluconate 10% solution (1,0mL/kg IV) over 3–5 min; Sodium bicarbonate (1–2mEq/kg IV) over 5–10 min; regular insulin

(0,1 U/kg) with glucose 50% solution (1mL/kg) over 1hr. Persistent hyperkalemia in case of acute renal failure is an indication for dialysis.

№38

The parents of a 10-year old boy are concerned about his weight: they state that boy abruptly become “fat”. Recently the boy has got feelings of tightness in the extremities, weakness, and difficult breathing during regular physical exercise. Two weeks ago the patient had episode of acute respiratory tract infection. Objectively: body temperature 37,8°C, HR=78 per min, RR=28 per min, BP=110/65 mmHg. Skin is pale; generalized edema (especially face, hands, legs and feet, scrotum). Heart sounds are weakened, rhythmic, systolic murmur above the apex. Lung auscultation reveals bronchial breathing and diffuse moist rales. Abdomen is increased in volume, swollen, soft during palpation; liver + 6 cm below right arch of the ribs, not painful. CBC: Hb - 105 g/l, RBC - 3,3 T/l, WBC - 10,2 G/l, neutrophil stabs - 2%, segments - 30%, eosinophils - 5%, lymphocytes - 58%, monocytes - 5%, ESR 18 mm/hour. Urine analysis: cloudy, specific gravity - 1038, protein - 3,5 g/l, sugar - not found, bile pigments – negative, WBC - 10-15 in a field of view, RBC – 2-3 in the field of view, waxy casts. Serum biochemistry: urea – 6,0 mM/L, creatinine - 135 mcM/L, cholesterol – 10,2 mM/l, total protein – 42 g/L.

1. What is the most likely diagnosis (syndrome)?
2. What are the principles of treatment of this disorder?
3. What are the major causes of nephrotic syndrome?

Correct answers:

1. Minimal change glomerulopathy (nephrotic syndrome).
2. The general approach to treatment of minimal change glomerulopathy is corticosteroid therapy: prednisone (60 mg/m2 /day) within 4 to 6 weeks until a complete remission with disappearance of proteinuria. Treatment is generally continued for 6 weeks after complete remission of proteinuria. During those 6 weeks, the prednisone dose should be changed to alternate-day administration (with dose decrease to 40 mg/m2 /day) or to gradual reduction in the daily dose of prednisone. Induction of remission with prednisone therapy is followed by administration of cyclophosphamide (2 mg/kg for 8 to 12 weeks) or chlorambucil (0,1-0,2 mg/kg/day for 8 weeks).
3. Classification of causes of nephrotic syndrome: primary glomerular diseases (minimal change disease, membranous nephropathy, focal glomerulosclerosis); secondary glomerular diseases (post-infectious; streptococcal etc), metabolic (dermatomiositis, myxedema), connective tissue diseases and vasculitis (i.e. SLE, Goodpasture's, scleroderma), neoplastic

(lymphoma, leukemia), drugs (gold, penicillamine), systemic diseases (amyloid), inherited diseases (sickle cell disease, nail-patella syndrome etc).

№39

A 5-year old girl has become sick suddenly with fever up to 38,5°C and loss of appetite. On the next day abdominal pain, nausea and vomiting, accompanied with frequent urination, appeared. Objectively: the child looks toxic. Face skin is pale, mild periorbital puffiness. Body temperature 39,2°C, RR = 25 per min, HR = 120 per min. Heart sounds are clear, rhythmic. Lung auscultation reveals vesicular breathing, no rales. Abdomen is soft during palpation. Pasternatsky symptom is positive on the left side. CBC: WBC - 16,2 x 10^9/L, neutrophils: stabs - 15%, segments 50%, eosinophils - 3%, lymphocytes - 25%, monocytes - 7%; ESR - 18 mm/h. Urine analysis: cloudy, specific gravity - 1015, protein – 0, 9 g/l, sugar - not found, bile pigments – negative, squamose flat epithelium – in a big amount, WBC - 60-70 in the field of view, leached erythrocytes - 3-5 in the field of view, bacteria are covering the whole field of view. Coprogramme - without pathological abnormalities.

1. What is the most likely provisional diagnosis? What are the most possible etiological factors?
2. Which additional investigation should be done for differential diagnosis and further management of this child?
3. What is therapeutic management approach?

Correct answers:

1. Acute pyelonephritis. The major (75–90%) etiological factors in females are colonic bacteria (Escherichia coli, Klebsiella spp., Proteus spp., Pseudomonas spp.).
2. Urine: gram stain, urine culture, C-reactive protein, serum biochemistry (BUN, creatinine, protein, cholesterol), electrolytes (Na^+, Cl^-, K^+ and Ca^{2+}), titers of antistreptolysin-O/Anti-DNase B, ANA, throat and blood cultures, imaging studies (ultrasound investigation of abdomen, kidneys and bladder, voiding cystourethrogram, renal scanning with technetium-labeled dimercaptosuccinic acid or glucoheptonate).
3. Adequate liquor intake (alkaline mineral water, cranberry juice). Children who are dehydrated, are vomiting, or are unable to drink fluids, are ≤1 year of age, or in whom urosepsis is possible should be admitted to the hospital for intravenous rehydration and intravenous antibiotic therapy. A 10- to 14-day course of broad-spectrum antibiotics are preferable: combination of 3d generation cephalosporins (cephtriaxone, 50–75 mg/kg/24 hr) or ampicillin (100 mg/kg/24 hr) with an aminoglycoside (gentamycin, 3–5 mg/kg/24 hr in 1 to 3 divided doses). The route of antibiotic administration (oral, IV or IM)

depends on patient's age, the disease severity and complications. The oral fluoroquinolone ciprofloxacin is an alternative agent for resistant microorganisms, particularly Pseudomonas, in patients older than 17. The clinical use of fluoroquinolones in children should be restricted because of potential cartilage damage. Long-term prophylaxis against reinfection (recurrent urinary tract infection) includes usage of sulfamethoxazole-trimethoprim, trimethoprim, or nitrofurantoin at ⅓ of the normal therapeutic dose once a day.

№40

A 10-year old girl is complaining of frequent painful urination, frequency and pelvic pain relieved after urination. These symptoms appeared for the first time in her life 5 days after the episode of acute respiratory viral infection. Objectively: body temperature 37,4°C, RR = 24 per min, HR = 80 per min. General condition is satisfactory, skin color is white-pink, no rash or edema are present. Heart sounds are clear, rhythmic. Lung auscultation reveals vesicular breathing, no rales. Abdomen is soft during palpation. Palpation of suprapubic region is painful. Pasternatsky symptom is negative on the both sides. CBC: WBC 10,2 x 10^9/L, neutrophils: stabs - 8%, segments 34%, eosinophils - 5%, lymphocytes - 45%, monocytes - 8%; ESR - 12 mm/h. Urine analysis: cloudy, specific gravity - 1017, protein – traces, sugar - not found, bile pigments – negative, squamose epithelium – in a big amount, WBC - 15-20 in the field of view, fresh red blood cells – 15-20 in a field of view, bacteria – 5-10 in the field of view. Urine culture is negative. Ultrasound investigation: kidneys are without abnormal changes, bladder dilation; after urination some amount of urine is still present in the bladder.

1. What is the most likely provisional diagnosis?
2. What are the most common etiological factors?
3. What is therapeutic management approach?

Correct answers:

1. Acute hemorrhagic cystitis.
2. E. coli (usually with type I fimbriae), adenovirus types 11 and 21. Exposure to allergens may lead to development of eosinophilic cystitis.
3. Oral usage of sulfonamides (trimethoprim-sulfamethoxazole: 6-12 mg/kg/24 h by trimethoprim or 30-60 mg/kg/24 h by sulfamethoxazole) or nitrofurantoin (5–7 mg/kg/24 hr in 3 to 4 divided doses) or amoxicillin (50 mg/kg/24 hr). In some cases intravesical dimethyl sulfoxide instillation is necessary. Treatment of eosinophilic cystitis usually includes antihistamines and nonsteroidal anti-inflammatory agents.

№41

The parents of an 18-month boy complain about weakness and bad appetite of their child, polyuria and polydipsia, constipation, recurrent episodes of vomiting, frequent episodes of acute respiratory infections. The child is not gaining weight and not growing properly since 6 month of age. The elder brother of the child died at the age of 6 due to chronic renal failure. Objectively: body temperature 37,2°C, RR=26 per min, HR= 88 per min. Weight=9,1 kg, height =71 cm. The child is fair skinned and blond; skin is dry. Large head with protruding forehead. Symmetrical muscle hypotonia; protruding abdomen; deformity of the chest and low extremities (curved). There is retardation of movement (does not walk alone) and cognitive development (speaks by jargon, does not pronounce words). Hb - 85 g/l, RBC - 3,0 T/l, urine analysis reveals proteinuria, glycosuria, phosphaturia, aminoaciduria, acidic pH (<5,5). Serum: glucose-4,9 mM/L; hyperchloremic metabolic acidosis, hypophosphatemia, hypocalcaemia, elevation of alkaline phosphatase activity.

1. What is the most likely provisional diagnosis? What are the most possible etiological factors?
2. Which additional investigation should be done for differential diagnosis and further management of this child?
3. What is therapeutic management approach?

Correct answers:

1. Proximal renal tubular acidosis (renal Fanconi syndrome).
2. CBC, urine analysis, C-reactive protein, serum biochemistry (glucose, BUN, creatinine, protein (albumine), cholesterol), electrolytes (Na^+, Cl^-, K^+ and Ca^{2+} and acidity), glucose tolerance test, titers of antistreptolysin-O, anti-DNase B, ANA, ultrasound investigation of the abdomen and kidneys, X-ray of the vertebral column, bones of extremities), level of thyroid hormones.
3. Bicarbonate replacement up to 20 mEq/kg/24 hr in the form of sodium bicarbonate or sodium citrate solution (Bicitra or Stohl solution). Phosphate and calcium supplementation. High doses of Vitamin D (2000 U/kg/day) are indicated. Patients with symptomatic hypercalciuria (recurrent episodes of gross hematuria), nephrocalcinosis (nephrolithiasis) may require thiazide diuretics to decrease urine calcium excretion. Growth retardation treatment with pharmacologic doses of recombinant human growth hormone (rHuGH). In case of anemia associated with development of chronic renal failure, recombinant human erythropoietin therapy is required. Renal transplantation is an option in patients with renal failure.

№42

The child (male) was born from the II pregnancy and II delivery; gestation age is 38 weeks, body weight - 2950 g, length - 50 cm. Maternal ultrasonography on 32 weeks demonstrated oligohydramnios**,** nonvisualization of the bladder, and absent kidneys. Physical examination: the newborn has a characteristic facial appearance: the eyes are widely separated with epicanthic folds; the ears are low set, small and posteriorly rotated; the nose is broad and compressed flat (beaked nose); the chin is receding (micrognathia); and there are limb anomalies. In 1 hour the infant rapidly became critically ill: severe dyspnea, tachypnea, and cyanosis appeared. The chest appeared asymmetric with an increased anteroposterior diameter and bulging of the intercostal spaces on the right side; hyperresonance and absent breath sounds on the right side. The heart is displaced toward the left side. Urination is absent (anuria). Ultrasound investigation of the newborn reveals bilateral renal agenesis. The infant died 12 hours after birth due to pulmonary failure.

1. What is the most likely provisional diagnosis?
2. What is pathogenesis of this disorder?
3. What is prognosis for infants suffering from this disorder?

Correct answers:

1. Potter syndrome: renal agenesis and pulmonary hypoplasia, complicated by pneumothorax.
2. Potter syndrome can occur in any severe renal cystic or dysplastic disorders, which leads to oligohydramnios (anhydroamnios) due to decreased fetal urine formation. The absence of amniotic fluid during fetal life leads to pulmonary hypoplasia and fetal compression, which results in abnormal positioning of the hands and talipes, and characteristic altered facial appearance.
3. Newborns with Potter syndrome die of respiratory insufficiency secondary to severe associated abnormalities of pulmonary development. Other common cause of neonatal death, associated with the Potter phenotype, is renal failure due to cystic renal dysplasia, renal hypoplasia and obstructive uropathy.

№43

A 10-year old boy complains of periodical abdominal and flank pain, episodes of arthralgia. The father of the patient has kidney stone disease. Objectively: body temperature 36,4°C, RR = 20 per min, HR = 78 per min. General condition is satisfactory, skin color is white-pink, no rash or edema are present. Heart and lungs are without pathology. Abdomen is soft during palpation. Pasternatsky symptom is negative on both sides.

CBC: WBC - 8,2 x 10^9/L, neutrophils: stabs - 4%, segments 30%, eosinophils - 5%, lymphocytes - 55%, monocytes - 6%; ESR - 8 mm/h. Urine analysis: cloudy, specific gravity - 1018, protein – traces, pH – acidic, sugar - not found, squamose flat epithelium – 15-20 in the field of view, WBC – 4-5 in a field of view, fresh red blood cells – 10-12 in the field of view, crystals of oxalate - in a big amount, bacteria – not found. Urine culture is negative. Ultrasound investigation: calculi (1-2 millimeters in diameter) in kidney pelvises.

1. What is the most likely provisional diagnosis?
2. What additional investigation should be done for differential diagnosis?
3. What is therapeutic management approach?

Correct answers:

1. Hyperoxaluria. Dysmetabolic oxalate nephropathy.
2. CBC, urine (urinalysis, urine culture, calcium:creatinine ratio,spot test for cystinuria; 24-hr collection for: creatinine clearance, calcium, phosphate, oxalate, uric acid, dibasic amino acids if cystine spot test result is positive), serum (calcium, uric acid, phosphorus, electrolytes and anion gap, alkaline phosphatase, glucose, BUN, creatinine, total rotein, cholesterol, C-reactive protein), imaging studies (ultrasound investigation and nonenhanced spiral CT scan of abdomen and pelvis).
3. Initial treatment: diet (adjustment of dietary oxalate), potassium citrate, pyridoxine (vitamin B6). Second-line treatment: neutral phosphate, magnesium. Avoid intake of synthetic vitamin C (oxalate precursors).

High fluid intake (including alkaline mineral water), that should be continued at night (the child should get up at least once at night to urinate and drink more water). Exclusion of products with high concentration of oxalate (tea, coffee, cocoa, chocolate, spinach, beans cultures, radish and rhubarb). Some products increase oxalate elimination (pear, apple, grapes, and black currants, citrus fruits, prunes, fresh and dried apricots, and raisins). Products with low concentration of oxalate: squash, potatoes, cabbage, egg-plants, pumpkin, peaches and bananas, melon and watermelon, dairy produce, fish, grains, nuts, vegetable oil.

Pathology of the musculoskeletal system and connective tissue

№44

A 16-year old female complains of 2 month anamnesis of pain and swelling in her wrists, fatigue and facial rash, sensitive to sunlight. Family history is positive for mother's thyroid disease. Examination: T 38,3°C, HR 88, RR 20 per min, BP 115/70 mm Hg. Skin: areas of the thin hair over the front scalp (alopecia), an erythematous maculopapular rash over malar areas spanning the bridge of the nose (see fig.), erythema of the hard palate and few gingival

ulcers. Joints: mild swelling and tenderness to palpation and range of motion in the proximal interphalangeal joints of the fingers of both wrists. Lung, abdomen and neurological examinations are within normal limits. Ultrasound of the heart: pericardial effusion (see fig.). CBC: Hb 100 g/l, platelets 108 G/l, WBC 2,3 G/l, neutrophiles: 82% segs, 12% lymphs, 4% monos, 2% basophils, ESR 45 mm/hour. Antinuclear antibodies: 1280. Urinalysis: protein 0,066 g/l, no cellular casts, red or white cells.

Fig. 20. Facial rash.

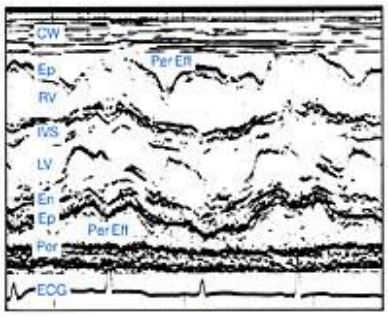


Fig. 21. Pericardial effusion in heart ultrasound.

1. What is the clinical diagnosis? What are the diagnostic criteria of this disease?
2. What other conditions should this disease be differentiated with? What drugs may induce facial malar "butterfly" rash like in lupus erythematosus?
3. What drugs are used for the treatment?

Correct answer:

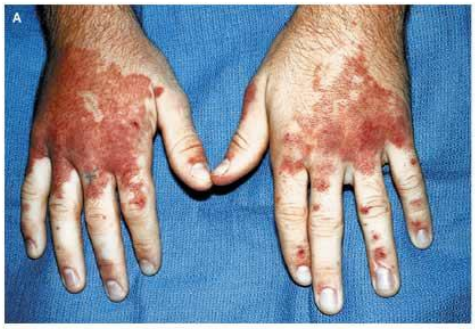
1. Systemic lupus erythematosus. Malar rash, discoid rash, photosensitivity, oral ulcers (oral or nasopharyngeal ulceration), arthritis, serositis (pleuritis or pericarditis), renal disorder (persistent proteinuria, cellular casts), neurologic disorder (seizures or psychosis), hematologic disorder (hemolytic anemia, leukopenia, lymphopenia or thrombocytopenia), immunologic disorder (positive LE cell preparation, anti-DNA antibodies, anti-Sm antibodies or false positive serologic test for syphilis) and antinuclear antibody.
2. Drugs such as hydralazine, isoniazid, sulfonamides, penicillin, beta-agonists and anticonvulsants have been associated with "drug-induced" lupus which is dependent upon the presence of the drug.
3. Corticosteroids, NSAIDs, hydroxychloroquine, cyclophosphamide, azathioprine, methotrexate, cyclosporine.

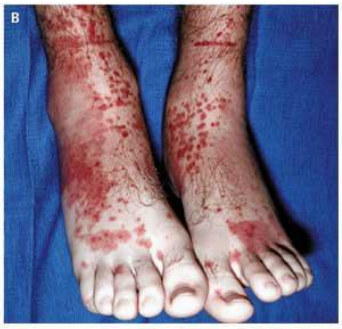
№45

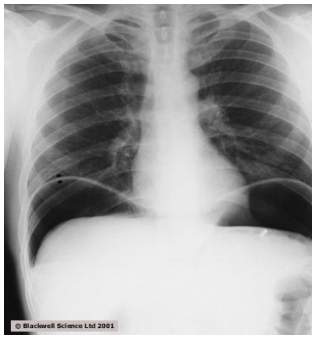
A 6-year old girl has been hospitalized with complaints of the rash on the extremities and pain of the knee and ankle joints. Examination: T 37,8°C, the skin of the extensor surface of the upper and lower extremities, buttocks are covered by multiple symmetrical hemorrhagic red papular and petechial rash (see fig.). HR 115, RR 18 per min., borders of relative heart dullness are

normal; clean, rhythmic sounds. Above the lungs - a clear percussion sound, harsh breathing. A soft abdomen, moderate pain in the periumbilical area, liver +2 cm below the costal arch on medioclavicular line. Arthritis of the both knee and right ankle joints (swelling, erythema, tenderness, pain-on-motion and limitation-of-motion). On the second day of hospitalization bloody diarrhea and crampy intensive abdominal pain appeared. CBC: Hb 112 g/l, RBC – 3,5 T/l, reticulocytes – 1%, platelets - 420 G/l, WBC – 16,5 G/l, neutrophils: stabs - 10%, segmented - 67%, eosinophils - 7%, lymphocytes - 14%, monocytes - 2%, ESR - 27 mm/hour. Urinalysis: cloudy; specific gravity 1028, blood 3+, protein 2+, RBC casts 2-3 and granular casts 1-2 per field of view. CRP - +++. Stool guaiac 3+. Coagulogram: no any pathological abnormalities were found. Skin biopsy: leukocytoclastic vasculitis on light microscopy and IgA staining of the vascular endothelium on fluorescent microscopy.

1. What is the preliminary diagnosis? What complication has developed in the child (see X-ray fig.)? What is the tetrad of Henoch-Schonlein purpura (HSP)?
2. Name connective tissue diseases of childhood, which are complicated by vasculitis. What histopathological term is used to describe the light microscopic findings in the skin biopsy of HSP?
3. Principles of therapy.







Correct answer:

1. Henoch-Schönlein Purpura (anaphylactoid purpura, hemorrhagic vasculitis), combined (skin-joint-abdominal) form, acute clinical course, II-III level of activity. On X-ray – intestinal perforation with pneumoperitoneum. Purpura, arthritis, abdominal pain and glomerulonephritis.
2. JRA, SLE, dermatomyositis, scleroderma and Behcet's disease. Leukocytoclastic vasculitis.
3. Intestinal complication must be managed by emergency surgical care. Symptomatic treatment: adequate hydration, diet and pain control with NSAID (acetaminophen), short course of corticosteroids is provided for complaints of arthritis, edema, fever, and malaise.

№46

A 3-year old female has fever up to 38-39ºC, intermittent skin rash on the abdomen, swollen knee joints and interphalangeal joints of the hands and the restriction of active and passive movements for several weeks. She does not want to walk in the morning, but seems fine later in the morning and the rest of the day. Examination: T 38,4°C, HR 132, RR 28 per min., swelling of the knees, flexion contracture, swelling of the interphalangeal joints of the hands, no increased heat upon joints. Ultrasound exam: pleural effusion, pericarditis. CBC: Hb – 94 g/l, WBC 14,6 G/l, \neutrophils: stabs - 10%, segmented - 47%, eosinophils - 4%, lymphocytes - 35%, monocytes - 4%, ESR - 29 mm/hour. Rheumatoid factor positive. X-ray of wrists: see fig.

1. Your preliminary diagnosis. What is the classification of the disease?
2. What is the child's most likely option clinical course of the disease? What subtype of JRA iridocyclitis is most specific for? What HLA type is more specific for the pauci-articular JRA of the late childhood onset?
3. What medication as the drug of choice means the basic treatment of this variant of the disease? What are the criteria for effective therapy?

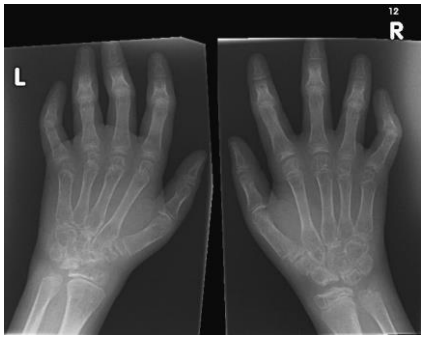


Fig. 22. X-ray of wrists.

Correct answer:

1. Juvenile rheumatoid arthritis (JRA). The ILAR classification of JRA includes the following: systemic onset, persistent or extended oligoarthritis, rheumatoid factor (RF)–positive polyarthritis, RF-negative polyarthritis, psoriatic arthritis, enthesitis, others: the disease does not meet criteria for any of the other subgroups, or it meets more than 1 criterion (and therefore could be classified in a number of subgroups).
2. JRA with systemic manifestations. Iridocyclitis/uveitis may be present in all subtypes of JRA, but especially in the pauci-articular disease of early childhood. The late childhood onset subgroup of pauci-articular JRA is associated with HLA B27 and development of enthesitis and sacroiliitis.
3. Methotrexate. Morning stiffness less than 15 min, no weakness, no pain in the joints, lack of joint pain on palpation or movement, no swelling of the soft tissues around joints or tendon sheaths, reducing the number of painful and swollen joints by 20%, 50 %, 70%, improvement of at least three of these indicators by 20%, 50%, 70%, ESR, CRP, overall assessment of the disease

severity by physician and by patient, assessment of pain by patients, the rate of functional failure.

№47

A male newborn V. with weight of 3,9 kg was born to mother (gravidity 2 labor 1) through vaginal delivery. Previous pregnancy: a male neonate with birth weight of 2,8 kg was delivered by normal uneventful vaginal delivery. The newborn V. had shoulder dystocia and was delivered using special maneuver, with Apgar score of 6/8/8 at 1, 5 and 10 min respectively. The mother during labor was under regular monitoring with continuous cardiotocography. Examination: the newborn had paucity of movements of left upper limb with normal movements of right upper limbs. Baby's left upper limb was adducted and internally rotated, extended and pronated at the elbow joint (see fig.). There was simultaneous movement of the right upper limb with the neonate able to do movement against gravity of the right limb. Moro's, bicep and radial reflexes were absent on the left side but grasp reflex was present. X-ray: no any fractures of clavicles. Baby's weakness gradually improved and physiotherapy started 7 days later. On follow-up, there was no weakness and adequate movement of the left limb was present.

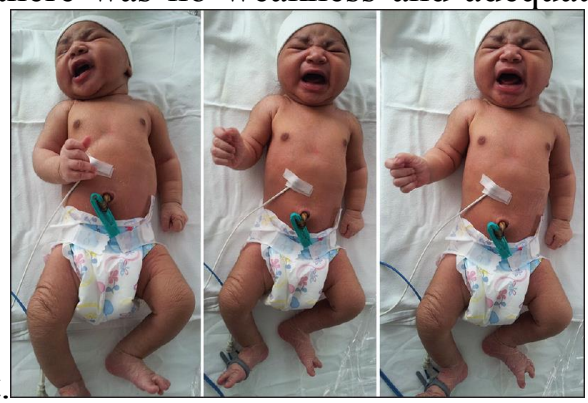


Fig. 23. Patient with birth trauma.

1. What is the diagnosis? What are the risk factors?
2. What should the disease be differentiated from?
3. What are the principles of treatment?

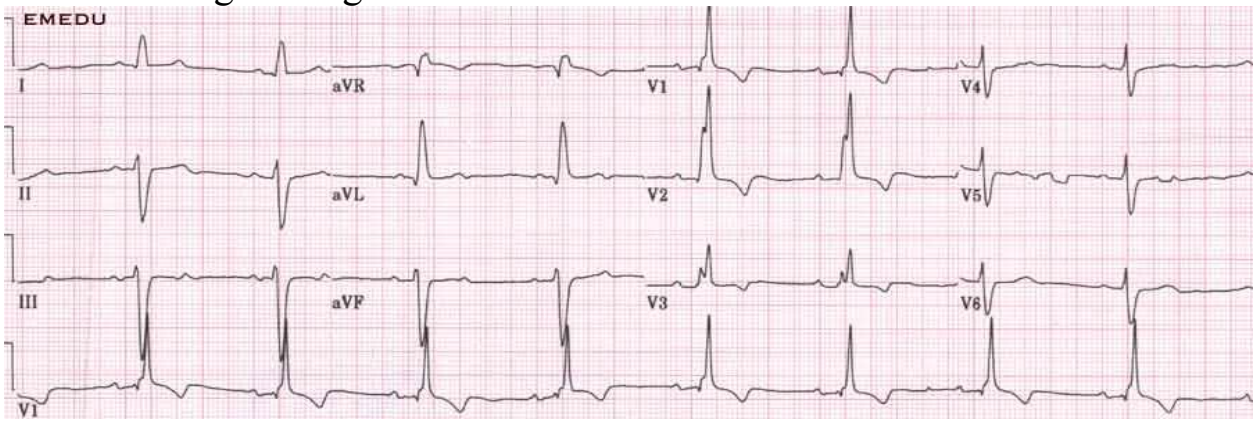
Correct answer:

1. Duchenne-Erb's palsy due to birth trauma. Erb's palsy involves the upper trunk (C5, C6 and occasionally C7) and is the most common type of brachial plexus injury, accounting of approximately 90% of cases. The cause of brachial plexus injury is excessive traction of the head, neck, and arm during birth. Risk factors: macrosomia, shoulder dystocia, malpresentation, instrumented deliveries, obstetrical brachial plexus palsy, Kaiser Wilhelm syndrome, uterine malformation, familial congenital brachial plexus palsy,

congenital varicella syndrome, humeral or vertebral osteomyelitis, exostosis of the first rib, tumors, hemangioma.
2. Differential diagnosis includes: Klumpke's paralysis, cerebral injury, clavicle fracture, humerus fracture, lower cervical injury.
3. Conservative management. Physiotherapy and exercise to prevent contracture are started on the 7-10 days after injury.

№48

15-year old female has a syncopal episode after standing for 2 hours at a crowded outdoor musical concert on a hot, humid day. She regains consciousness shortly after falling to the ground and is taken to a nearby hospital. On questioning, the patient reports having had 2 similar episodes, she typically feels nauseous and diaphoretic just prior to fainting, girl reported a prodrom of diaphoresis, nausea, vomiting and dyspnea, aggravating factors that commonly trigger syncope were postprandial state, exertion in a warm environment, a prolonged upright posture, use of diuretics, dehydration, and emotional or stressful situations. Physical examination revealed a normal-appearing female, HR 62/min, regular. BP 110/70 mm Hg, heart sounds were normal, specifically no murmurs were auscultated. Neurological examination was normal. There was no family history of heart disease or sudden cardiac death. She took no medications.She denied recent illness, chest pain, palpitations, head trauma, or seizure activity. She has no history of previous cardiac problems. The 12-lead electrocardiogram is given below.



1. What is the emergency condition of the child? What is the etiology of such syncope?
2. Identify tactics of the further examination of the child. Comment ECG.
3. What first aid should be given to the child? Prevention of such states.

Correct answer:

1. Syncope, probably vasovagal. Neurocardiogenic syncope, also known as vasovagal syncope, is the most common cause of syncope in young persons and results from a maladaptive neurocardiovascular reaction to the

assumption of an upright posture for prolonged periods. Paradoxical vasodilation (vasodepressor response), combined with bradycardic (ie, cardioinhibitory) response, leads to hypotension, cerebral hypoperfusion, and eventual syncope.

2. History taking, monitoring of heart rate, blood pressure, blood biochemistry and electrolytes, ultrasound of the heart, thyroid gland, internal organs, EEG. The diagnosis is usually made based on the clinical manifestation. If necessary, a head-up tilt-table test can be used to confirm the diagnosis. ECG: RBBB.

3. Provide fresh air, give to inhale ammonia, lift up the lower extremities, sprinkle face with cold water. Treatment typically includes avoidance of triggering factors, sufficient intake of fluids and salt, and (occasionally) the use of fluorocortisone. Cardiac pacing should be reserved for patients with documented prolonged symptomatic bradycardia. In case of the prodrome of the syncope some orthostatic techniques that improve venous return and prevent the development of fainting are recommended. Syncope usually does not develop when patients cross-legged stay tiptoe with straining muscles of the legs, or perform isometric tension of arms.

№49

A 15-year old female complains of the onset of brownish-purple spots up to 10 cm on the skin of wrists, legs, and shoulders during last 2 years. She complains of marked proximal skeletal muscles weakness, inability to stand, comb the hair, swelling of the face, skin bruises of the eyelids, erythematous rash in the wrists and legs, choking while taking liquid food. Examination: discrete facial heliotrope erythema, multiple hyperkeratotic, erythematous, flat papules with central atrophy were present on the dorsum of the metacarpophalangeal and interphalangeal joints. Laboratory evaluation revealed an elevated level of creatine kinase (290 U/l; normal value, <190 U/l). Skin-biopsy specimen showed acanthosis, hyperkeratosis with focal vacuolar alteration of the basal-cell layer, and perivascular inflammatory infiltrates, findings that were consistent with Gottron's papules. Treatment with prednisolone was started.

1. Preliminary diagnosis. What are the criteria for verification of the diagnosis?

2. What diseases should it be differentiated with? What laboratory changes are typical for the disease?

3. What is the treatment?

Correct answer:

1. Juvenile dermatomyositis (JDM), subacute, activity II, with damage to muscles, skin. Diagnosis of JDM has been based on the following 5 criteria

(by Bohan and Peter): characteristic skin rash, proximal muscle weakness, elevated muscle enzymes, myopathic changes on electromyography, abnormal muscle biopsy findings. Expanded criteria have been proposed: typical findings on muscle MRI and ultrasonography, nailfold capillaroscopy abnormalities, calcinosis, dysphonia.

2. Differential diagnosis: mitochondrial myopathies, as well as various forms of myositis: drug-induced, eosinophilic, graft-versus-host myositis, granulomatosis, overlap, pyomyositis, viral myositis. Rheumatologic and dermatologic disorders: Raynaud phenomenon, lupus erythematosus, juvenile idiopathic arthritis, scleroderma, morphea, psoriasis, eczema, tinea corporis, urticaria, congenital myopathies, dystrophinopathies, eosinophilia-myalgia syndrome, facioscapulohumeral dystrophy, hypothyroid myopathy, inclusion body myositis, juvenile primary fibromyalgia syndrome, mixed connective-tissue disease, muscular dystrophy, polymyositis. Laboratory studies: ESR; muscle enzyme levels (elevated aspartate aminotransferase, lactate dehydrogenase, creatine kinase, and aldolase); lupus profile (ie, antinuclear antibody [ANA], (an elevated ANA level may be seen in approximately half of patients), extractable nuclear antigens [ENA]); and myositis-specific antibody assays such as antibodies against the aminoacyl t-RNA synthetases (ie, anti-Jo-1 antibody), antisignal recognition particle (anti-SRP antibody), and nuclear helicase (anti-Mi-2 antibody). Muscle biopsy, magnetic resonance imaging (MRI), muscle ultrasonography, electromyography (EMG) reveals a reduction of the motor unit action potentials in the proximal muscles and fibrillation potentials suggestive of fiber splitting, necrosis, and vacuolization.

3. Oral corticosteroids are the main agents of treatment. Second-line agents are routinely added for steroid-sparing effects and for recalcitrant or refractory disease. Cyclophosphamide in the dose of 0.5-1 g/m^2 may be given with bladder protection on monthly basis and adjusted to leukopenia for patients with significant morbidity.

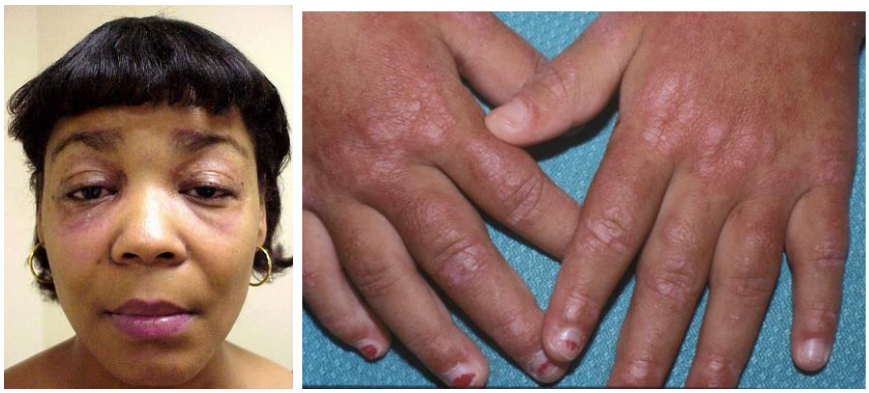


Fig. 24. Skin changes in a child (violaceous rash over the eyelids with periorbital edema, Gottron papules).

№50

A 12-year old female patient complains of stiff hands and difficulty in lifting her fingers. Medical history was non-specific. Examination: mild weight deficiency, HR 84 per min, BP 95/65 mmHg. The stiffness in the palms and fingers of both hands were confirmed. Her lips were tense, and she had difficulty in opening her mouth. The patient did not have difficulty in swallowing liquid or solid food without retrosternal burn, stomachache, diarrhea, or constipation. CBC, blood biochemistry, urinanalysis: normal. ECG and echocardiographic results were unremarkable. Esophagography and gastroesophageal reflux scintigraphy, respiratory function test, and high-resolution computed tomography, abdominal ultrasonography results were also normal. Antinuclear antibodies (ANA) indicated to scleroderma with 1/320 positive thin granularity. Magnetic resonance imaging of the hands showed inflammation of the flexor and extensor tendon. Dermal biopsy demonstrated increased connective tissues under the sweat glands.

1. Preliminary diagnosis. What are the criteria to confirm the diagnosis?
2. What laboratory changes are typical for the disease?
3. What are the complications? What is the principle of the treatment?

Correct answer:

1. Systemic scleroderma, diffuse cutaneous form of slowly-progressive course, the stage of generalization. Skin thickening of the fingers of both hands extending proximally to the metacarpophalangeal joints; skin thickening of the fingers: puffy fingers, sclerodactyly (distal to the metacarpophalangeal joints but proximal to the proximal interphalangeal joints); fingertip lesions: digital tip ulcers or fingertip pitting scars; telangiectasia; abnormal nailfold capillaries; pulmonary arterial hypertension and/or interstitial lung disease; Raynaud phenomenon; systemic sclerosis–related autoantibodies: anticentromere, anti–topoisomerase I, anti–RNA polymerase III.
2. Findings of laboratory examinations: rapid increase in serum creatinine levels, microangiopathic hematologic signs and thrombocytopenia may precede renal crisis, serum levels of muscle enzymes (creatine kinase, aldolase) are elevated in patients with inflammatory myopathy, antiangiogesis cytokine CXCL4 in serum, elevated serum levels of N-terminal pro-brain natriuretic peptide (NT-proBNP) may correlate with early pulmonary hypertension, ESR is almost always normal; however, an elevated ESR is associated with poor outcome, anemia (microcytic) resulting from chronic blood loss is frequent and is often associated with iron deficiency. Autoantibodies: antinuclear antibodies are present in about 90%-95% of affected patients, usually with a speckled or centromere pattern, topoisomerase I antibodies (also known as Scl-70) are present in

approximately 30% of patients with diffuse disease (absent in limited disease), anticentromere antibodies are present in about 45%-50% of patients with limited disease, anti-RNA polymerase I and III antibodies are present in 15%-20% of patients with diffuse disease and correlate with rapid cutaneous involvement and high frequency of renal crisis.

3. Complications of systemic sclerosis include the following: digital infarctions, pulmonary hypertension, myositis, renal failure, wound infection. Current treatment of systemic sclerosis is directed toward managing complications and providing symptomatic relief.

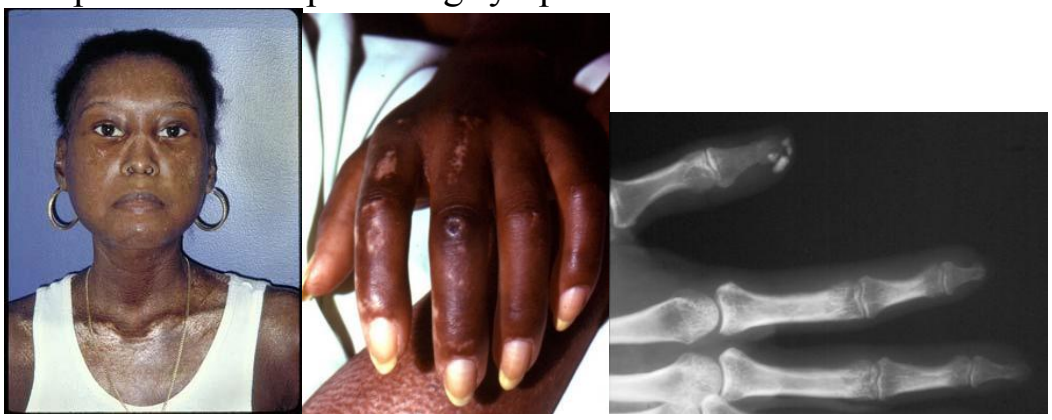


Fig. 25.

1. Tightening of the skin in the face, with a characteristic beaklike facies and paucity of wrinkles.
2. Sclerodactyly with digital ulceration, loss of skin creases, joint contractures.
3. Radiograph of the fingers demonstrating calcinosis and distal phalanx reabsorption (acral osteolysis).

№51

A 16-year old male had a syncope while playing football a day before and experienced multiple episodes of syncope in the past year. He has a known family history of sudden cardiac death. The patient complains of exertional chest pain, dyspnea, palpitation, general weakness, transient dizziness. Examination: BP 135/75 mm Hg, HR 96, RR 18 per min. The first heart sound is normal, the second heart sound is split; the apical precordial impulse is displaced laterally, forceful and enlarged. Loud systolic ejection crescendo-decrescendo murmur over heart is heard best between the apex and left sternal border; it radiates to the suprasternal notch, left heart border – 2 cm to the left in the 5-th intercostal space on the l.medioclavicularis sinistra, liver +1 cm below costal margin, no any swelling was revealed. 2-dimensional echocardiography: ejection fraction 91%, hypertrophy of myocardium of the posterior wall of the left ventricle, marked septal hypertrophy (interventricular septum thickness 24 mm), the mitral valve is

drawn toward the septum, left ventricular outflow tract gradient of 68 mm Hg, left ventricular outlet obstruction was worsened by prior administration of amyl nitrate, which decreases preload. ECG: signs of left ventricular hypertrophy, hypertrophy and left atrial overload, T waves inversion, pathological Q waves in $V_{4\text{-}6}$. 24-hour Holter monitoring shows frequent premature ventricular contractions.

1. What is the diagnosis and the origin? What are the risk factors?
2. What diseases it should be differentiated with? What are the complications?
3. What are the principles of treatment?

Correct answer:

1. Hypertrophic obstructive cardiomyopathy. It results from known or suspected genetic defects in sarcomeric proteins of the cardiac myocyte and is thought to be inherited in an autosomal dominant fashion with variable penetrance and variable expressivity. Hypertrophy frequently involves the interventricular septum, which can result in outflow tract obstruction. It causes syncope and sudden cardiac death by the way of ventricular tachyarrhythmias (less often brady-) and myocardial ischemia. Persons at highest risk: survivors of cardiac arrest, high-risk genotypes, a significant family history of sudden cardiac death, massive hypertrophy (wall thickness > 35 mm), and ventricular tachycardia.
2. Differential diagnosis: essential blood hypertension, myocardial infarction, aortic stenosis, coarctation of the aorta, rheumatic mitral insufficiency, Fabry disease, glycogen-storage disease type I, II (Pompe disease), infant of diabetic mother, restrictive cardiomyopathy, ventricular fibrillation. Complications: congestive heart failure, arrhythmia, infective mitral endocarditis, atrial fibrillation with mural thrombosis formation, sudden death.
3. Standard treatment: beta-blockers or calcium-channel blockers, although this therapy may not prevent sudden death. Prevention of sudden death can be achieved by improving hemodynamics, surgery, anticoagulant and antiplatelet therapy. High-risk patients should undergo placement of an implantable cardioverter defibrillator, with optional administration of amiodarone. Surgical treatment: septal myoectomy, prosthetic mitral valve.

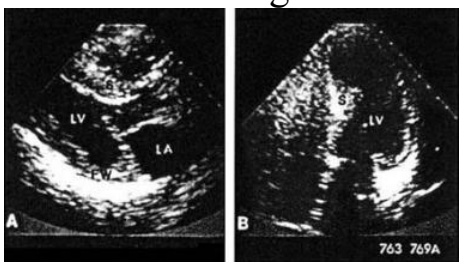


Fig. 26. Hypertrophic cardiomyopathy. Image courtesy of Michael E. Zevitz, MD

Two-dimensional echocardiography is the main diagnostic tool for evaluating patients with suspected HCM. The septum in individuals with hypertrophic cardiomyopathy is relatively thicker than the posterior wall. The left ventricular diameter is at the lower limit that of normal or smaller than normal. The left atrium may be enlarged as a result of left ventricular noncompliance.

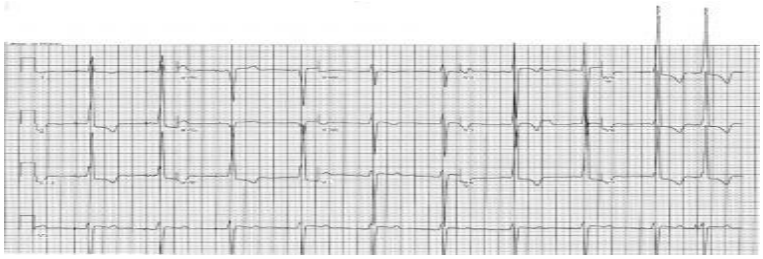


Fig. 27. ECG.

Left ventricular hypertrophy pattern and "pseudo-preexcitation". Uncommon findings include abnormal and prominent Q wave in the anterior precordial and lateral limb leads, short PR interval with QRS suggestive of preexcitation, atrial fibrillation (a poor prognostic sign), and P-wave abnormalities (including left atrial enlargement).

№52

An 11-year old male was diagnosed with rheumatic fever 4 years ago, preventive treatment was not received. The patient complains of fatigue, shortness of breath, retarded physical development. Examination: mild retardation in physical development. RR 28 per min, a clear lung sounds on percussion, coarse breathing on auscultation. HR 98 per min, BP 95/45 mm Hg. The heart borders: the left border lies on l. axillaris anterior, right border – 1-1.5 cm to the right from l. parasternalis dextra. Apical loud systolic murmur on heart auscultation.

1. What is the diagnosis?
2. What diseases it should be differentiated with?
3. What prophylactic therapy is indicated?

Correct answer:

1. Rheumatic heart disease, acquired mitral insufficiency.
2. Differential diagnoses: sarcoidosis, bicuspid aortic valve, carnitine deficiency, dilated cardiomyopathy, Kawasaki disease, bacterial endocarditis, cardiac tumors, viral myocarditis, systemic lupus erythematosus.
3. Preventive and prophylactic therapy is indicated after rheumatic fever and acute rheumatic heart disease to prevent further damage to valves. Primary prophylaxis (initial course of antibiotics administered to eradicate the

streptococcal infection) also serves as the first course of secondary prophylaxis (prevention of recurrent rheumatic fever and rheumatic heart disease). The injection of 0,6-1,2 million UN of benzathine penicillin G intramuscularly every 4 weeks is the recommended regimen for secondary prophylaxis. The American Heart Association currently recommends that patients with rheumatic fever without carditis receive prophylactic antibiotics for 5 years or until aged 21. Patients with rheumatic fever and carditis but no valve disease should receive prophylactic antibiotics for 10 years or well into adulthood. Finally, patients with rheumatic fever with carditis and valve disease should receive antibiotics for at least 10 years or until the age of 40. If treatment is ineffective, surgery to decrease valve insufficiency may be life-saving.

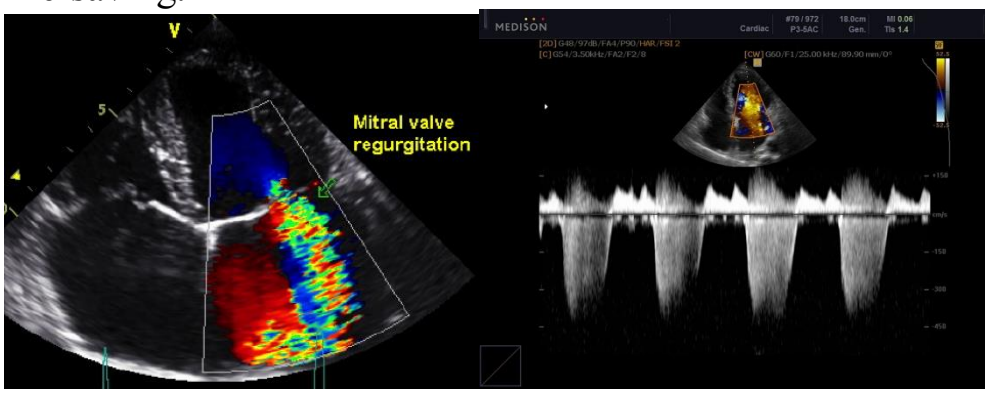


Fig. 28. Doppler-echocardiogram. Mitral valve insufficiency and ventricular dysfunction.

№53

A 12-year old boy complains of overweight, increased appetite, fatigue. Boy's parents and sister are overweight. The family take a lot of sweet, fat, baked products. Child's birth weight was 4000 g, body length 52 cm. Examination: height 142 cm, weight 60 kg. HR 86 per min, RR 22 per min, BP 110/70 mmHg. Skin color is normal, subcutaneous fat layer is overdeveloped with preferential deposition on the chest and abdomen. Cardiac sounds are muffled, rhythmic, clean, clear lung percussion sounds, auscultatory – pulmonary breath. Abdomen is soft, distended. Liver +2 cm lower the costal edge, painless, spleen is not palpable. CBC: Hb 110 g/l, RBC 4.2 T/l, leucocytes 8 G/l, neutrophils: stabs 8%, segmented 45%, eosinophils 1%, lymphocytes 34%, monocytes 12%, ESR 4 mm/h. Biochemical analysis of blood: glucose – 5,2 mM/l, sodium -137 mM/l, potassium - 5 mM/l, total protein - 65 g/l, cholesterol - 7.6 mM/l.

1. What is the most likely diagnosis in this patient? Evaluate the physical development of the child.

2. What additional tests are necessary to confirm the diagnosis? What should the disease be differentiated with?
3. What are the complications of obesity? What are the main principles of treatment for this patient?

Correct answer:

1. Alimentary-constitutional obesity of III degree, uncomplicated, stable course. Physical development: body mass index (BMI) kg/m^2 = 60 / 1,422 = 30, which is > 95th percentile. Height 130 + 5 cm x 3 = 145 cm, weight 19 + 3 kg x 6 = 37 kg. 60 - 37 = 23 kg - excess weight that is 62% of the excess.
2. Assessment of the level of growth hormone (deficiency => obesity), determination of C-peptide fasting, the study of the eye fundus, if needed – brain CT. With hypothalamic (diencephalic) obesity, Cushing's syndrome (determination of cortisol in daily urine).
3. Type 2 diabetes, metabolic syndrome, high cholesterol and high blood pressure, asthma, sleep disorders, obstructive sleep apnea, nonalcoholic fatty liver disease, early puberty or menstruation, low self-esteem and bullying, behavior and learning problems, depression. Diet (decrease daily calorie content, mainly due to carbohydrates and fats that are easily digested, balanced diet), exercise, water treatment procedures.

Infectious and parasitic diseases

№54

The parents of a 5-year old child consulted the doctor on the 2nd day of their child's disease with complaints of the appearance of rash on the body, fever up to 38,5°C. From anamnesis it is known that the disease began with the appearance of some elements of rash on the scalp, fever to 38°C, general malaise. Objectively: moderate intoxication, body temperature - 37,5°C. Different elements of rash, spots, papules, vesicles with the diameter of 3 - 5 mm, filled with transparent liquid are on the face, trunk, and extremities. The same rash elements occur on the scalp. On examination, oral mucosa on the cheeks, tongue, soft palate has some vesicles and ulcers. The child attends a kindergarten, such manifestations of the disease are reported in two children groups. The child is vaccinated according to age.
1. What is the preliminary diagnosis?
2. What complication that often occurs in this disease?
3. Which drug of ethiotropic therapy can be used in severe generalized form of the disease?

Correct answer:

1. Chickenpox typical form, moderate course.
2. Encephalitis
3. Acyclovir

№55

Child is 1 year and 2 months. Acutely became ill, mother complains of fever to 38,8°C, observed shortness of nasal breathing. 2 days later the rash appeared on the lips and face. OBJECTIVE: severe condition, due to the symptoms of intoxication. Child is flabby, appetite decreased. On the face, around the mouth, lips, nose wings, front of the neck - groups of vesicles with serous content, located on hyperemic and infiltrated skin area. Slight redness of the tonsils, arches, posterior pharyngeal wall is in the throat. Nasal breathing is difficult, the discharge of mucus. Submandibular and occipital lymph nodes increased to 1 cm. Pathological changes in the cardiovascular and respiratory systems not found. Abdomen is soft, painless on palpation. Stool and urination is normal.

1. What disease can be suspected in the child, its etiology?
2. What forms of the disease are distinguished?
3. What complication most often develops in this condition?

Correct answers:

1. Herpes virus infection, herpes simplex virus (HSV) types 1 and 2.
2. Localized and generalized form. Generalized form includes the visceral form (hepatitis, pneumonia, nephritis) and nervous system (encephalitis, meningitis, myelitis).
3. Encephalitis and meningoencephalitis.

№56

A 9-year old child is sick for 7 days. Similar cases are reported at the school attended by the boy. At the onset of the disease complaints of fever to 37,8°C, malaise were noticed. Currently, complaints about loss of appetite, discomfort in the right upper quadrant, yellowish sclera, skin, urine has become the color of beer, feces becomes colorless. After the appearance of jaundice child's condition slightly improved, body temperature returned to normal. OBJECTIVE: yellow sclera, skin, liver is 5 cm below the costal arch, liver edge is sensitive to palpation. Biochemical analysis of blood: total bilirubin – 58,2 mmol/L, direct bilirubin - 36 mmol/L, indirect bilirubin – 22,2 mmol/L, ALT – 3,4 mmol/L, AST – 2,6 mmol/L, thymol test – 7,0 units, prothrombin index - 96%.

1. What kind of the disease should first be suspected? Tell about the agent of this disease?
2. What are the periods of the diseases and their duration?
3. What are the mechanisms of transmission of this disease?

Correct answers:

1. Viral hepatitis A. Hepatitis A virus (HAV)

2. Incubation (10 - 45 days), prodromal (2 - 6 days), icteric -7 - 14 days posticteric (until normalization of liver size and liver function tests), convalescence (recovery) - 2 - 3 months
3. Fecal-oral.

№57

Baby M., 3 months, admitted to the infectious department, mother complaints on irritability, poor sleep, refusal of breast milk, fever to 37,8°C, yellowing of the skin. On admission the child's condition is of moderate severity due to intoxication syndrome. Child is flabby, body temperature subfebrile, observed jaundice skin on trunk, face, upper extremities, hepatosplenomegaly, urine is dark yellow, discolored feces. Biochemical analysis of blood: total bilirubin – 72,1 mmol/l, direct – 46,2 mmol/l, indirect - 24 mmol/L, ALT – 2,6 mmol/L, AsAT – 3,4 mmol/L, prothrombin index - 68%. Test on HBsAg - positive. At the age of 1 month baby suffered from hemolytic disease after blood transfusion.
1. What is the preliminary diagnosis, what is the causative agent of the disease?
2. What additional methods are necessary to be conducted to confirm this diagnosis?
3. What diseases should it be differentiated with?

Correct answers:

1. Viral hepatitis B. Hepatitis B virus (HBV).
2. Serological studies.
3. Hemolytic jaundice, acute respiratory syndrome, Gilbert-Rotor syndrome, salmonellosis.

№58

Baby A., 1 year, was treated at the somatic department of Regional Children's Hospital concerning pneumonia. At home the child’s intestinal dysfunction was observed in the form of diarrhea. On the fourth day in hospital the child's condition deteriorated, the child became capricious, constantly crying, asking to be held in arms, body temperature rose to 39,5°C, repeated vomiting, frequent bowel movements up to 5 - 6 times a day, liquid, watery, with great of mucus, remains undigested food,"bog slime" colour, stinky were observed. On examination, the child is flabby, skin is pale, tissue turgor reduced. Tongue is white coated. Abdomen is swollen, painful on palpation, the liver is 3 cm below the costal arch.
1. What is the disease of the patient?
2. What is gastrointestinal pathogen of the disease?
3. What complications can develop?

Correct answers:

1. Salmonellosis.
2. Pathogen found in the small intestine.
3. Infectious-toxic shock, acute brain edema, cardiovascular failure, adrenal insufficiency, renal failure, pneumonia, otitis, urinary tract infection.

№59

A child, 2 years old. In the evening acutely became ill, body temperature rose to 39,8°C, repeated vomiting was observed up to 6 times a day, abdominal pain of spastic character. Stool is liquid with mucus and blood traces. On the 2nd day the temperature was within 37,6-37,6°C, vomiting repeated twice, frequent defecation. The baby is admitted to the hospital in severe condition. Consciousness is saved, the child is flabby, skin is pale. Lips are dry, tongue coated white. Auscultation of the lungs – vesicular breathing. Pulse is 100 beats per minute, rhythmic. Cardiac sounds are rhythmic, slightly muted. Abdomen is slightly retracted. Sigmoid is spasmodic, painful on palpation, there is rumbling along the colon. Stool is liquid with mucus and blood traces.

1. What is the disease in the patient? Indicate the most likely route of transmission of the disease in case two children in one family fall ill?
2. What part of the gastrointestinal tract is this pathogen found?
3. What complications can develop?

Correct answers:

1. Acute dysentery, moderate course. Contact route.
2. The distal colon.
3. Infectious-toxic shock, intestinal perforation, peritonitis, intussusceptions and intestinal paresis, hemorrhoids, rectum mucosal prolapse.

№60

A child, 3 years old, fell ill acutely. The disease began with the rise of temperature to 40°C, dry cough, the appearance of mucous secretions from the nose. From anamnesis it is known that all family members had similar symptoms. OBJECTIVE: child's condition disturbed due to intoxication syndrome, child is flabby, complains of headache, aches in the whole body, muscle pain, eye pain. Appetite is greatly reduced. On examination, hyperemia of the throat and palatine arches, the wall of the pharynx is hyperemic, relief pattern looks like paving stones. Nasal breathing is difficult. Skin is pale, clean, on the limbs there is a "marble" image. Respiration rate is 32 per min., Heart rate is 160 bpm. per min., heart sounds slightly muted.

1. What is your preliminary diagnosis?

2. What diseases must differential diagnosis be made with?
3. What are the indications for hospitalization in case of this disease?

Correct answers:

1. Influenza, moderate course, nasopharyngitis.
2. Other ARVI, acute appendicitis, acute meningitis.
3. Children under of 1 year, patients with severe forms and the presence of chronic bacterial infections.

№61

A child, 3 years old, fell ill acutely, with fever to 38,8°C, the appearance of dry cough, mucous discharge from the nose, photophobia. Objectively - the child is flabby, the condition is disturbed due to intoxication syndrome, body temperature 38,5°C, catarrhal conjunctivitis, rhinitis, with abundant serous discharge. On examination: throat congestion, hypertrophy of the tonsils and posterior pharyngeal wall follicles. Submandibular and postcervical lymph nodes are enlarged. Mother notes stool becomes twice as liquid. Similar manifestation of the disease is noticed in the elder brother.

1. What disease probably developed in the patient?
2. What organs and systems is the agent of the disease tropic to?
3. What is the most frequent symptom in this disease?

Correct answers:

1. ARVI, clinically - adenoviral etiology, catarrhal conjunctivitis, pharyngitis.
2. Upper respiratory tract, conjunctiva of the eyes, intestine, lymph nodes.
3. Pharyngitis, conjunctivitis, fever, lymphadenopathy.

№62

A patient, 10 years, hospitalized in infectious department on the 4th day of illness. The disease started with fever to 39,5°C, general malaise, headache. The next day sore throat while swallowing disturbed. The last 2 days the temperature did not decrease – 39 - 40°C, repeated vomiting. Objectively: patient with fatigue, pale skin and nasal voice, hyperemia of throat mucosa and swelling of the tonsils, palatine arches, uvula, soft palate. Tonsils enlarged, with dense dirty-grey coat, not removed with a tampon and goes beyond the limits of the tonsils. Regional lymph nodes are enlarged to 1,5 cm thick, painful on palpation. Severe swelling of the subcutaneous tissue to the middle of the neck, sweet breath is felt. HR 120 per min, BP 90/60 mm Hg. Vaccination status is unknown. Blood test: leukocytosis, thrombocytopenia, ESR is 20 mm/h.

1. What disease can be suspected?
2. What main factors of aggression does the agent of the disease release?

3. What are the most frequent complications of this disease?

Correct answers:

1. Toxic diphtheria of tonsils, typical form, severe course.
2. Diphtheria corynebacteria exotoxin.
3. Diphtherial cardiomyopathy, myocarditis, toxic neuropathy, metabolic encephalopathy, cerebral edema, toxic/immunocomplex nephritis.

№63

The patient, 10 years, on 4th day of the disease complains of general weakness, pain in the throat during swallowing, shortness of nasal breathing, especially at night, increased body temperature to 39 - 40°C. Objectively: the patient's general condition is moderate due to intoxication, skin is pale, clean, observed swelling of the face, swelling of the eyelids, nasal breathing is difficult, significantly enlarged cervical lymph nodes, less – submandibular, axillary, inguinal ones. On examination of the throat hyperemic oropharyngeal mucosa is observed, tonsils are hypertrophied, covered with continuous white patches, which can be easily removed, the posterior wall of the pharynx is edematous, hyperemic, with enlarged follicles (granulose pharyngitis), covered with dense mucus. The liver is 3 cm from the costal arch, spleen – 2,5 cm. The general analysis of blood - WBC – 15,6x10^9/L, eos - 3%, stabs - 4%, segm. - 15%, lymph - 45%, mon. - 10%, atypical mononuclears - 23%.

1. What is your preliminary diagnosis?
2. What system is the causative agent tropic to?
3. What preparation and its analogues are contraindicated in this condition?

Correct answers:

1. Infectious mononucleosis, typical form, medium severe course.
2. To lymphoid system.
3. Ampicillin and ampicillin derivatives.

№64

A child, 5 years old. Mother complains of dry coughing attacks, which appeared 8 days ago and fever to 37,8°C. Pediatrician diagnosed acute pharyngitis of a mixed etiology, moderate course, and prescribe treatment: warm drinks, gargles with decoction of chamomile, furacilin solution. However, the effect of this treatment was not observed, coughing intensified day by day, more and more, becoming of paroxysmal character, more than 20 attacks per day. The child often suffers from ARVI. Vaccinations in the past 4 years were not carried. The child does not attend kindergarten. During examination there was a dry paroxysmal cough, accompanied by vomiting, redness of the face, with short-term (1 - 2 sec.) stops of breathing.

1. What disease can be suspected?
2. What are the criteria of diagnosis?
3. Indicate complications peculiar to most infants?

Correct answers:

1. Pertussis, typical form, moderate course, complicated apnea.
2. Dry paroxysmal cough, accompanied by vomiting, redness of the face, short sleep, the child is not vaccinated.
3. In infants attacks of coughing may be accompanied by apnea.

№65

The patient, 5 years old, attends kindergarten, hospitalized in the infectious department with complaints of anxiety, headache, fever up to 38,5°C, poor sleep at night, pain and redness of the eyes, skin rash. The disease began gradually, for three days before the appearance of rash there was dry cough and photophobia. After the appearance of rash body temperature rose to 38,5°C. OBJECTIVELY: the general condition is moderate due to intoxication syndrome. Skin rash is macular-papular, first appeared on the face, behind the ears, gradually during 2 - 3 days spread to the neck, trunk, limbs. On examination spotted elements are located throughout the body, sometimes merging, especially on the back. In the clinical blood test: leukopenia, neutropenia, monocytosis.

1. What disease has the child?
2. What pathogen causes the disease?
3. What groups of patients should be hospitalized in case of this disease?

Correct answers:

1. Measles, typical form, rash period, moderate course.
2. Morbillivirus.
3. Children of the first year, patients with severe complications, or due to the epidemic indications.

№66

The patient, 5 years old, attends kindergarten, hospitalized in the infectious department on the 3rd day of illness. The disease started acutely, with fever to 38,5°C, general malaise, and cough. OBJECTIVE: small macular rash, unchanged skin, pale pink rash is mainly on the extensor surfaces of the extremities, buttocks and back; oropharyngeal slight hyperemia, running nose, and enlargement of the occipital and posterior cervical lymph nodes. Objectively – enlargement of the posterior cervical lymph nodes, heart rate of 108 bpm., BP 100/60 mm Hg. Heart sounds are rhythmic. Vesicular breathing. In the clinical blood test: leucopenia, lymphocytosis, reduced number of eosinophils, monocytes, ESR 20 mm/h.

1. What is the preliminary diagnosis?
2. What is the early sign of the disease?
3. What season(s) is(are) typical for this disease?

Correct answers:

1. Rubella, typical form, moderate course.
2. Enlargement and pain of posterior neck and occipital lymph nodes.
3. Winter-spring

№67

A child, 2 months, admitted to Children's Hospital on the 2nd day of the disease in severe condition. From anamnesis it is known that the disease started acutely, with fever to 39,2°C. The child was flabby alternated with motor restlessness, "fountain" vomiting. 12 hours later the disease onset on the skin of the trunk, lower limbs, buttocks bluish-red star-shaped rash of 0,3 – 0,5 - 1 cm appeared, sometimes with necrosis in the center. OBJECTIVE: stiffness of the neck, positive Lesage symptom, elevated big fontanel. Blood test: leukocytosis, neutrophilia with a left shift, increased ESR. Cerebral spinal puncture - milk color of cerebrospinal fluid, flowing stream, a protein - 8000 mg/l, cytosis - 1235 cells, 100% neutrophils.

1. What is the preliminary diagnosis?
2. What express method can confirm the disease?
3. What antibiotic is necessary to administer to the child at the hospital stage?

Correct answers:

1. Meningococcal infection. Meningococcemia, purulent meningitis.
2. The method of "thick blood film".
3. Antibiotic cephotaxime 75 mg/kg or cephtriaxone 50 mg/kg.

№68

The child is 8 years old. He is ill for the second day. Complaints about pain during chewing and opening the mouth, fever up to 38,2°C. OBJECTIVE: general condition is moderate, swelling is found in the area of the right parotid glands, ears are protruding. On palpation the swelling is moderately painful, dense, skin over it is stretched, the normal unchanged color. On examination the opening of the salivary gland duct is dry, infiltrated, enlarged and hyperemic. The child is not vaccinated. CBC: HB-118 g/l, RBC – 3,7 T/L, CI – 0,9, WBC – 4,6 G/l, eos - 3%, stabs - 8%, segm. - 32%, lymph. - 51%, mon. - 6%, ESR - 8 mm/hr.

1. What is the preliminary diagnosis?
2. What are the diagnostic criteria of the disease?
3. What treatment is indicated?

Correct answers:

1. Mumps infection. Mumps, typical form, moderate course.
2. Swelling of the parotid gland, dense, increase and infiltration of outlet aperture of the parotid gland duct with hyperemia rim - Murson symptom, fever.
3. Symptomatic treatment.

№69

The boy is 4 years. Acutely became ill 4 days ago. The disease started with fever up to 38°C, running nose, cough. Currently the mother complains about the fever up to 37,5°C, anxiety, pain in the limbs, in the morning the child could not get on his feet, sweating. OBJECTIVELY: the general condition of the child is moderate, moist skin, slightly hyperemic pharynx, tonsils are enlarged. Tongue is clean and moist. Cardio-vascular system without changes. Abdomen is soft, painless to palpation. The liver and spleen are not enlarged. There are transient disturbances of stool (diarrhea twice). Consciousness is clear, sometimes restless child. The child does not move his lower limb himself, passively raised legs fall down without support. Muscle tonus and power are reduced, especially in the lower extremities, skin folds of the lower extremities are smoothing. Skin and tendon reflexes on the the legs are not stimulated, the sensitivity is saved. The boy sits with support, leaning on his hands in front or behind him. Vaccinations were not given due to mother's rejection.
1. What is the preliminary diagnosis?
2. What are the routes of transmission of this disease?
3. What form of the disease can have lethal outcome?

Correct answers:
1. Poliomyelitis, paralytic, spinal form, moderate course.
2. Fecal-oral, rarely – air-droplet.
3. Bulbar.

№70

A child, 5 years, became ill in the kindergarten. Mother complains of pain in the throat while swallowing, headache, fever up to 38,7°C, vomiting twice, skin rash. OBJECTIVE: child's general condition disturbed due to intoxication syndrome, body temperature is 38,5°C, child is slightly flabby, small pointed pink rash, mainly on the flexor surfaces, on pale pink skin, rash is absent in the nasolabial triangle area. Limited hyperemia is in the throat, bright red tonsils, uvula, arches, hypertrophic tonsils covered with yellow-white patches. Tongue is dry with yellow-white patches; hypertrophied papillae are on the tip of the tongue. Submandibular lymph nodes are enlarged 2x2 cm, painful on palpation. Heart rate is 128 bpm., heart sounds

rhythmic somewhat muted. In blood RBC – 3,6 T/l; Hb - 120 g/l; WBC – 23,0 G/l; eos - 6%; stabs - 15%; segm. - 57%; lymp. - 20%; mon. - 2%; ESR - 35 mm/h.

1. What is the causative agent of the disease?
2. What are the most frequent complications of this disease?
3. What is the drug of choice in case of a mild form of the disease?

Correct answers:

1. Beta-hemolytic streptococcus, group A.
2. Complications divided into early (toxic) and late (septic and allergic). Septic complications include lymphadenitis, otitis media, sinusitis, mastoiditis, etc., and to allergic - myocarditis, arthritis, nephritis.
3. Penicillin (100-150 thousand IU/kg/day) or macrolides (azithromycin - 10 mg/kg/day), of antibiotic treatment - 10-14 days.

№71

Girl, 16 years, came to the family doctor's clinic complaining of weakness, significant weight loss (over 10 kg), fever up to 37,1°C in the last 3 months, periodic diarrhea. From history we know that she lives sexual life since 14 years. Objective examination: body temperature 37,5°C, lack of body weight, skin and visible mucous membranes pale, slightly dry, tongue coated with white patches, enlargement of inguinal and cervical lymph nodes. Abdomen is soft, sensitive to palpation in the right subcostal area. The liver is 3 cm from the costal arch, spleen – 2,5 - 3 cm. Stool is watery with undigested food additives, 3 - 4 times a day. In CBC - RBC 3,2 T/l, Hb - 100 g/l, CI - 0.85, WBC – 28,0 G/l, eos - 6%, stabs - 25%, segm. - 47%, lymph. - 19%, mon. - 3% ESR - 35 mm/h.

1. What disease should be excluded in the first place?
2. What cell lesion is leading in pathogenesis of the disease?
3. What examination should be carried out first?

Correct answers:

1. HIV – infection.
2. T-helper.
3. Determination of antibodies to HIV.

CHAPTER 4
PROVIDING EMERGENCY AID TO CHILDREN
4.1 INTRODUCTION

Angioedema (Quincke's oedema)

It's one of the variant of acute urticaria. The immunopathologic and pseudoallergic reactions with biologically active substation release are in the

background of this process. Clinical manifestation includes local hyperemia, edema, pain syndrome, itching etc.

There is edema of subcutaneous tissue, larynx edema and abdominal variant.

Emergency aid:

1. Providing the patency of airways.
2. Antihistamines, I^{st} generation (chloropyramine, diphenhydramine, clemastine), parenteral administration. Their combined administration with H_2-blockers of histamine receptors (ranitidine, famotidine) could increase therapeutic effect.
3. Systemic steroids (prednisoloni, dexamethasoni) in medium dose IM or IV in case of no effect.
4. Additional therapy: enterosorbents, desintoxication therapy.

Seizure syndrome

Seizure are defined as transient, involuntary attacks of tonic-clonic contractions of the skeletal muscles, frequently accompanied by disorders of consciousness caused by an excessive rate and hypersynchrony of impulses from a group of cerebral neurons.

Causes of seizure: infectious, metabolic, vascular, toxicologic, oncologic, endocrine, traumatic, hypoxic, epileptic, idiopathic.

Emergency aid:

1. Prevention of injuries from falling down.
2. Providing the patency of airways.
3. 100% oxygen inhalation.
4. Anticonvulsant therapy: Diazepam (Valium) – per rectum (dose 0,5-1,0 mg/kg) or IV (dose 0,2-0,4 mg/kg). Repeat the one after 10-15 min if seizures are persistent.

If no effect afet initial treatment – continue therapy like in case with status epilepticus.

Status epilepticus

Status epilepticus is the condition of prolonged seizure activity (more than 5 minutes) or persistent, repetitive seizure activity without recovery of consciousness in between episodes.

Refractory status epilepticus persists more than 30 min against the background of anticonvulsant drugs.

Emergency aid:

1. Provide the potency of airways, provide 100% O2 and support ventilation.
2. Evaluation of vital signs.

3. Ensure IV access: blood sampling to detect glucose level, electrolytes, urea, calcium, magnesium content.
4. Persistent seizures after diasepam therapy require prescription of phenytoin (or phosphenytoin) in the dose of 15-20 mg/lg IV or phenobarbital in the dose 20 mg/kg IV or IM (two divided doses).
5. In case of refractory status epilepticus – intubation with general anesthesia, hypothermia, high dose of barbiturates.

Paroxysmal tachycardia

It is the condition with sudden increase of heart rate to 150-250 beats/min (in infants to 200-320 beats/min).

According to localization there are supraventricular and ventricular paroxysmal tachycardia. These episodes may occur with stable or unstable hemodynamics.

Emergency aid:

Therapy of supraventricular paroxysmal tachycardia (SVPT) with stable hemodynamics:

- Children who have only moderate, mild, or no hemodynamic impairment can be treated successfully with maneuvers increasing the tonus of the vagus (pressing the root of the tongue with a spatula, rectal stimulation, cold rubdown etc.) or adenosine (initial dose – 100 mcg/kg IV, increase by 100 mcg/kg every 2 min to 400 mcg/kg or 12 mg/kg maximal dose).
- If adenosine is not successful or SVPT continues to return after conversion to sinus rhythm amiodarone (3-5 mg/kg IV over 20-60 min) may be used.
- Alternative (to adolescents): verapamil (0,1-0,15 mg/kg IV) or propranolol (0,1 mg/kg IV).

Treatment of ventricular paroxysmal tachycardia (VPT) with stable hemodynamics:

Lidocaine (0,5-1,0 mg/kg IV slowly).
If lidocaine is not successful procainamide (5-15 mg/kg IV over 30-60 min) may be used.
Alternative: amiodarone (3-5 mg/kg IV over 20-60 min), ajmalini (1 mg/kg IV or 1-3 mg/kg PO) or propafenone (5-15 mg/kg/day PO).

Treatment of SVPT and VPT with unstable hemodynamics:

Premedication: Diazepam or sodium oxybutyras IV.
Cardioversion in the dosage of 0,2 J/kg. In case effect is absent the cardioversion may be repeated (0,4 J/kg).
If cardioversion is not successful cardiopulmonary resuscitation should be performed.

Acute congestive heart failure

It is a syndrome when the heart cannot maintain anadequate level of tissue perfusion to ensure metabolic requirements of the body.

There are four primary determinants of normal cardiac function, each of them may relate to the development of congestive heart failure. The first is *preload*, caused by filling the ventricles at the end of diastole. Within the norm its enlargement increases stroke volume, and thus, cardiac output. The second, *afterload*, reflecting resistance of the vessels and is defined as the opposing force to ventricular ejection. The third determinant is contractility of cardiac muscle. The fourth determinant is heart rate (HR).

Emergency aid:

Primary stabilization by the rules of ABC-resuscitation.
Elevated position of the head and shoulders at 30^0 angle.
Adequate feeding with some fluid restriction and sodium excluding.
Hydration in physiological volume (30-50 ml/kd/day).
Use diuretics (Furosemide (Lasix) – dose 1 mg/kg IV) to reduce preload.
Dopamine (2,0-15,0 mcg/kg x min) to increase myocardium contractility.
If dopamine is not successful dobutamine (2,5-10,0 mcg/kg x min) or digoxin (0,04-0,08 mg/kg/day for a neonate, 0,03-0,06 mg/kg/day for children 1-12 months) may be used.
Peripheral vasodilators: captopril (0,5-1,0 mg/kg every 8 hours).

Diffuse Brain Swelling

Diffuse Brain Swelling (DBS) is probably a final, common manifestation of brain injury caused by a number of different mechanisms with clinical signs of unconscious and seizures.

According to pathophysiology there are vasogenic, cytotoxic, osmotic and hydrostatic cerebral edema.

Emergency aid:

Maintain the potency of airways.
Intubation and artificial ventilation.
Elevated position of the head and shoulders at 30^0 angle.
Mannit (0,5-1,0 g/kg/day IV over 10-20 min every 8-12 hours).
Phenobarbital in the dose of 20 mg/kg IV or IM (two divided doses) to reduce metabolic requirements of the brain, to eliminate seizures.
Dexamethasone (0,5 mg/kg every 6 hours) is effective in the therapy of vasogenic brain edema.
Symptomatic treatment of seizures, pain syndrome.

Acute liver failure

This condition is characterized by failure of the liver functions, including the development of coagulopathy, hypoglycemia, hyperbilirubinemia, hypoproteinemia, and encephalopathy. The causes of liver failure are diverse and include infectious processes (e.g., viral hepatitis), metabolic diseases (e.g., Wilson's disease), pharmacologic agents, ischemia, and malignancy.

The pathogenesis of fulminant liver failure requires the progression of several key steps that lead to irreversible hepatocyte injury.

There are three stages of acute liver failure: Ist (euphoria, excitation, sleep inversion), IInd (sopor, precoma) and IIIrd (precoma, coma).

Emergency aid:

Ist stage. Oxygenotherapy. Infusion therapy (1,0-1,5 of physiological daily volume). Feeding (tube or parenteral) in the volume of 50-75% of age requirements.

Lactulose – 60-80 ml/day PO.

IInd stage. Add antibiotics (aminoglycosides – PO).

Symptomatic therapy.

IIIrd stage. If no effect after previous steps, intubation and artificial ventilation should be used. Systemic glucocorticosteroids (prednisolone 1-2 mg/kg/day IV every 6-8 hours).

Acute renal failure

Acute renal failure (ARF) is defined as an abrupt decrease in glomerular filtration rate with impairment of nitrogenous waste product excretion.

ARF may be classified as prerenal, intrinsic renal, and postrenal.

Prerenal ARF often due to gastrointestinal loss (dehydration). A detailed history of fluid balance should be obtained, and the physical exam should assess hydration status and perfusion.

Therapy of *postrenal ARF* includes surgical correction of urinary tract obstruction.

Treatment of intrinsic renal ARF:

Patients with a relatively normal intravascular volume should initially be limited to 400 mL/m^2/24 hr (insensible loss) plus an amount of fluid equal to the urine output for that day.

Nutrition is of critical importance in children who develop ARF. In most cases, sodium, potassium, and phosphorus should be restricted. Protein intake should be restricted moderately while maximizing caloric intake to minimize the accumulation of nitrogenous wastes. In critically ill patients with ARF,

parenteral hyperalimentation with essential amino acids should be considered.
The following agents should be administered to reduce hyperkalemia:
Calcium gluconate 10% solution (1,0 mL/kg IV, over 3–5 min);
Regular insulin (0,1 U/kg) with glucose 20% solution (4-5 mL/kg, over 1 hr).
For metabolic acidosis correction with sodium bicarbonate (1–2 mEq/kg IV, over 5–10 min).
Long-acting agents such as calcium channel blockers (amlodipine 0,1–0.6 mg/kg/day) or β-blockers (propranolol, 0,5–8,0 mg/kg/24 hr; labetalol, 4–40 mg/kg/24 hr) may be helpful in maintaining control of blood pressure.
Indications for dialysis in ARF include the following:
- anuria or oliguria;
- persistent hyperkalemia (>6,5mmol/l);
- severe metabolic acidosis unresponsive to medical management (pH<7,1);
- blood urea greater than 30 mmol/L, rapidly rising of serum creatinine >120 mcmol/24 hr.

Acute urinary retention

Urinary retention (iscshuria) is stoppage or reduction in the flow of urine either from blockage of a passage with resulting retention in the bladder or from disease of the kidneys

Causes of acute urinary retention include bilateral ureteral obstruction (stones, masses), unilateral obstruction in a solitary kidney, functional or anatomic bladder outlet obstruction, urinary tract infection (phimosis, cystitis).

Emergency aid:

Bladder catheterization or suprapubic epicystostomy.
After elimination an urgent conditions examination and treatment of the underlying disease.

Acute respiratory failure

Acute respiratory failure (ARF) is indicative of inability of the respiratory system to provide sufficient oxygen for metabolic requirements or to excrete CO_2 produced by the body. The former can be further categorized as hypoxemic respiratory failure and the latter as ventilatory failure.

Emergency aid of hypoxemic ARF:

1. High flow supplemental oxygen (e.g., nonrebreather mask), titrate for cyanosis, or by pulse oxymetry or PaO_2.
2. Use continuous positive airway pressure to further improvement of oxygenation.

3. Consider endotracheal intubation when persistent hypoxemia on FIO_2 > 0.6 or when decreased lung compliance and FIO_2 > 0.4.
4. Treat underlying cause.

Emergency aid of ventilatory ARF:

Supplemental oxygen (as above).
Support ventilation (oral/nasal pharyngeal tube or endotracheal intubation).
Monitor carefully for side effects of ventilation.
Adjunctive therapy:
Intravenous fluid to achieve normal vascular volume (less fluid for a child with interstitial lung disease).
Diuretics such as furosemide (1 mg/kg) for acute pulmonary edema or fluid overload.
Sedatives/analgesics: morphine sulfate (0,1-0,2 mg/kg) every 1–2 h intravenously; midazolam (0,1–0,2 mg/kg every 2-4 h intravenously).
Muscle relaxants: vecuronium bromide, starting with 0,1 mg/kg every 1–2 h or alternative 0,1–0,2 mg/kg/h drip.

Hypertensive crisis

Hypertensive crisis is hypertension (high blood pressure) with acute impairment of one or more organ systems (especially the central nervous system, cardiovascular system and/or the renal system) that can result in irreversible organ damage.

For the treatment of hypertensive emergencies, it is recommended that an intravenous antihypertensive formulation be used because of its more predictable pharmacokinetic profile and ease of titration. The choice of drugs depends on the severity of the patient's hypertension, the patient's current medications, underlying medical conditions, the suspected cause of the hypertension, and the organs involved. Ideal medications for the treatment of hypertensive emergencies have a rapid onset of action and short half-life, allowing for the easy titration necessary for controlled blood pressure reduction.

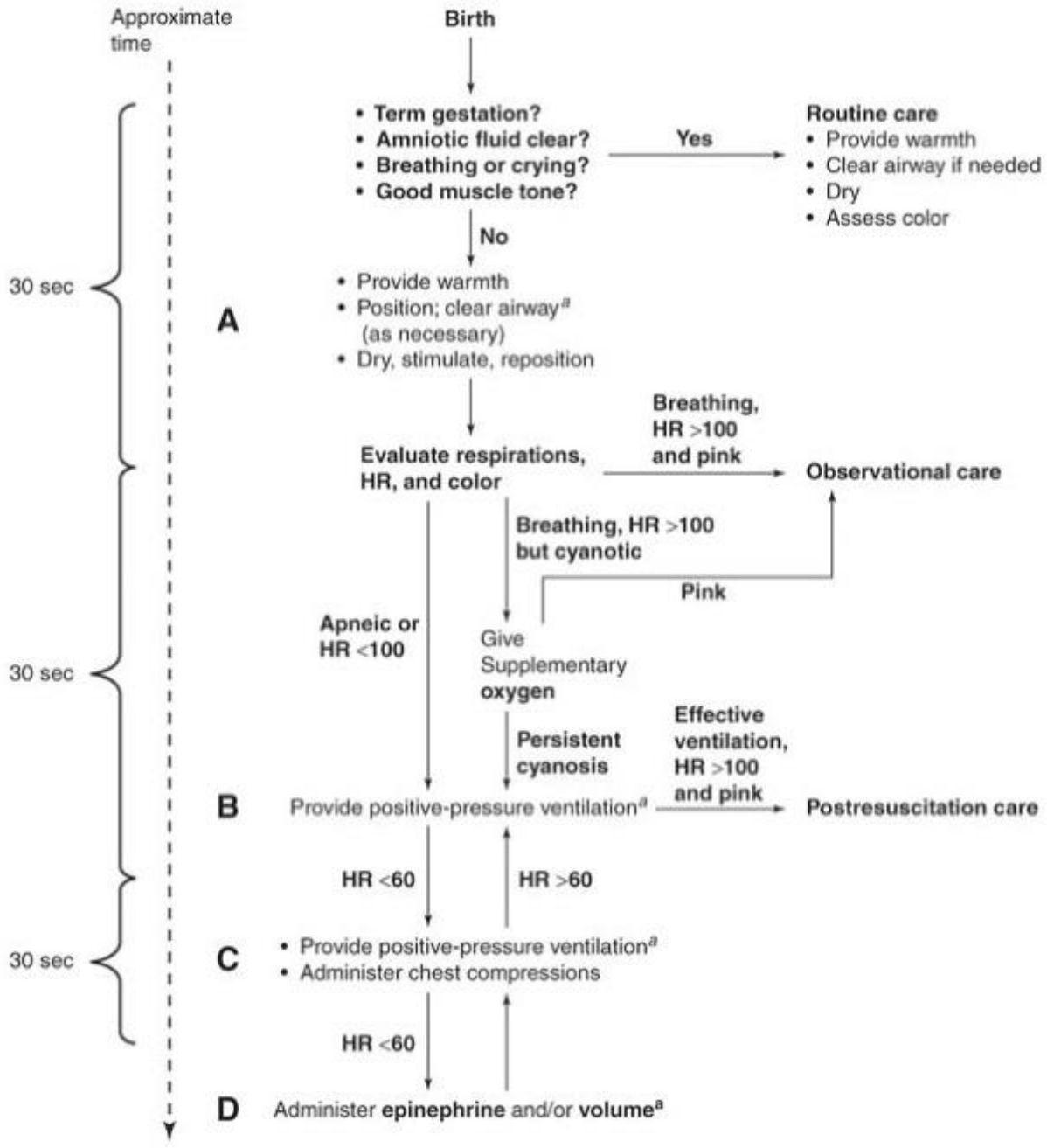
The most commonly used agents for hypertensive emergencies include:
- vasodilators (nitroprusside sodium (0,25-10 mcg/kg/min IV drip), nitroglycerine (50-100 mcg/kg/min IV drip), nomodipine (15 mcg/kg/hr IV drip);
- antiadrenergic agents (labetalol – bolus dose 20-80 mg IV over 10-30 min, propranolol – 2-5 mg over 20-60 min;

Adjunctive therapy (furosemide – bolus dose 40-80 mg IV; 25% sol. magnesii sulfatis – 5-20 ml IV, bolus dose).

Newborn asphyxia

Asphyxia is defined as the failure to provide the cell with oxygen and remove carbon dioxide, resulting in metabolic acidemia. Both ventilation and circulation are essential to avoid asphyxia. Multiple stimuli at birth initiate respirations and alter the prenatal circulation.

Algorithm of neonatal resuscitation



Overview of neonatal resuscitation. (Adapted from Kattwinkel J, Short J, Boyle D, et al. Textbook of neonatal resuscitation. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics and American Heart Association, 2006.)

Acute adrenal insufficiency

Acute adrenal insufficiency occurs when the adrenal cortex fails to produce enough glucocorticoid and mineralocorticoid in response to stress.

Common causes of primary adrenal insufficiency are meningococcal septicemia, tuberculosis, adrenal hemorrhage, adrenoleukodystrophy (x-linked), congenital adrenal hyperplasia, autoimmunity.

Common causes of secondary adrenal insufficiency are suppression of adrenocorticotropic hormone by pharmacologic doses of glucocorticoid administration, pituitary or hypothalamic tumors, central nervous system surgery or irradiation, structural abnormalities (septooptic dysplasia), congenital hypopituitarism.

Treatment of adrenal crisis is based on rapid volume expansion and the administration of glucocorticoids. Immediate management consists of 50 to 100 mg of hydrocortisone intravenously. Subsequent management is hydrocortisone 50 mg per m^2 per 24 hours given intravenously continuously or divided every 6 hours. Volume expansion is accomplished with normal saline (20 mL per kg) in the first hour, followed by fluids appropriate for maintenance and replacement. Additional Na^+ may be needed in primary adrenal insufficiency because of ongoing urinary Na^+ loss. These fluids should contain 10% dextrose and should not contain potassium until the serum potassium is within the normal range.

Mineralocorticoid therapy is rarely important in the acute phase, provided fluid therapy is adequate; however, patients with primary adrenal insufficiency may need replacement with a mineralocorticoid for long-term management.

Laryngotracheobronchitis (Croup)

Croup, or laryngotracheobronchitis, is a viral infection that involves the larynx and may extend into the trachea and bronchi.

Therapy depends on the severity of illness.

Mild severity: patients require only instructions for antipyresis, oral hydration, and observation at home.

Patients with mild to moderate croup may be managed with an initial trial of mist, which has never been shown to have any efficacy, and either oral or intramuscular dexamethasone (initial dose 0,6-1,0 mg/kg IM).

For children with *moderately severe* croup, while hospitalization is being arranged, should also receive epinephrine by nebulization and parenteral (intramuscular or IV) or oral dexamethasone therapy.

Patients who have upper airway obstruction should receive prompt therapy with epinephrine by nebulization and parenteral dexamethasone at 0,6 mg/kg (maximum 10 mg). In rare cases with inadequate gas exchange,

management of the airway, at times with endotracheal intubation, precedence occurs; tracheal edema may make passage of a tube with the usual diameter impossible, and the physician should be prepared with one size smaller than typically expected.

Dehydration

Dehydration is a physiologic disturbance caused by the reduction or translocation of body fluids.

Dehydration is often categorized by the serum osmolarity and severity (degree of fluid deficit), which is helpful in determining fluid therapy.

Based on the initial serum sodium, most children have isonatremic dehydration (also referred to as isotonic dehydration, serum sodium 130 to 150 mEq per L), whereas others have hypernatremic dehydration (hypertonic dehydration, serum sodium greater than 150 mEq per L) or hyponatremic dehydration (hypotonic dehydration, serum sodium less than 130 mEq per L). Severity is assessed by the amount of body fluid lost or the percentage of weight loss.

Mild (<5% in an infant; <3% in an older child or adult): normal or increased pulse; decreased urine output; thirsty; normal physical findings.

Moderate (5–10% in an infant; 3–6% in an older child or adult): tachycardia; little or no urine output; irritable/lethargic; sunken eyes and fontanel; decreased tears; dry mucous membranes; mild delay in elasticity (skin turgor); delayed capillary refill (>1.5 sec); cool and pale.

Severe (>10% in an infant; >6% in an older child or adult): rapid and weak or absent peripheral pulses; decreased blood pressure; no urine output; very sunken eyes and fontanel; no tears; parched mucous membranes; delayed elasticity (poor skin turgor); very delayed capillary refill (>3 sec); cold and mottled; limp, depressed consciousness

Treatment aims to restore of body fluids.

Oral Rehydration Therapy

If the child is determined to be mildly or moderately dehydrated, then oral rehydration therapy (ORT) is the therapeutic option of choice. ORT is the frequent administration of small volumes of an appropriate rehydration solution. An appropriate rehydration solution has the correct balance of glucose and sodium. Optimal solutions have a 1:1 or a 2:1 glucose: sodium ratio.

The amount of fluid to be administered depend on the degree of dehydration. Mild dehydration reflects up to 5% weight loss, so 5% of the child's body weight (30-50 mL per kg) should be administered as small-volume frequent feeds. Likewise, moderate dehydration represents up to 10% weight loss, so 10% of the child's weight (60-100 mL per kg) should be administered. As the

child tolerates the feeds, the volume can be increased as well as the frequency. Rehydration should be completed over a 4-hour time frame.
When rehydration is complete, maintenance therapy should be started. Patients with mild exicosis usually can then be treated with 100 mL of ORS/kg/24 hr. The volume of ORS ingested should equal the volume of vomiting and/or stool loss. If stool volume cannot be measured, an intake of 10–15 mL of ORS/kg/hr is appropriate.

Parenteral rehydration therapy (PRT)

PRT is prescribed in case of severe exicosis, persistent vomiting, high stool outputs or inability to cooperate.
To perform a PRT you need to calculate:
1. Daily fluid requirement (Holiday-Segar method).

Body mass	Daily fluid requirement
3,5–10 kg	100 mL/kg/day
11–20 kg	1,000 mL + 50 mL/kg (for each kg >10), maximum 1,500 mL/day
>20 kg	1,500 mL + 20 mL/kg (for each kg >20), typical maximum 2,400 mL/day

2. The serum osmolarity. Isonatremic dehydration needs to prescribe IV infusion of 5% glucose : 0,9% NaCl = 2:1, hypernatremic dehydration - 5% glucose : 0,9% NaCl = 3:1, hyponatremic dehydration - 5% glucose : 0,9% NaCl = 1:1.
3. Dehydration severity. 1% of body mass loss needs to prescribe additional amount of solutions in the dose of 10 ml/kg.
4. Replace ongoing loss as they occur (10 ml/kg/24 hr in case of hyperthermia, 20 ml/kg/24 hr if vomiting is present, 25-75 ml/kg/24 hr if diarrhea is present).
Traditional schemes of replacing one half of the remaining deficiency over the first 8 hours and the remainder over the next 16 hours for isotonic hypovolemia and replacing about two thirds of the deficiency in the first 24 hours for isonatremic hypovolemia may be applied.

Acute blood loss syndrome

Trauma is the leading cause of major hemorrhage in children. Vital signs should be measured frequently to detect early signs of hypovolemic shock.

Emergency aid:

If bleeding has led to hypovolemic shock but tissue oxygenation is not critically affected, intravascular volume should be supported with crystalloid or colloid solutions until a cross-match has been performed and compatible donor blood is available. Only when bleeding is life-threatening should

noncross-matched group O, Rh-negative blood be administered. The aim of blood transfusion is increasing the level of hematocrit up 0,35-0,4%.

External bleeding

External bleeding refers to blood coming from an open wound.

External bleeding can be classified into three types according to the type of blood vessel that is damaged: an artery, vein or capilarry.

External bleeding can be classified according to severity:

Class I (< 15% of blood loss): clinical manifestations are minimal.

Class II (15-30% of blood loss): look for tachycardia and orthostatic changes but with the knowledge that they are unreliable manifestations of blood loss.

Class III (30-40% of blood loss): there is some evidence that the tachycardia-vasoconstrictor response can be lost by this point. However, if blood pressure drops in supine patients, you know you're at least Class III

Class IV (> 40% of blood loss): circulatory collapse impending.

Therapy for hemorrhage consists of the following:

- providing hemostasis when possible (controllable hemorrhage can be stopped by ligation of vessels, cautery, pressure bandages, manual pressure, the application of topical procoagulants or a combination of these therapy).
- increasing cardiac output with fluid resuscitation.
- increasing oxygen-carrying capacity by providing hemoglobin in the form of blood products.

Comas

Coma is a deep inhibition of functions of the CNS with unconsciousness, absence of reflexes, disorders of vital functions.

Etiology of acute-onset of coma: metabolic abnormalities (hypo-, hyperglycemia), drugs intoxications, hypoxia, brain trauma, infection (meningitis, encephalitis), seizures etc.

Glasgow scale used to evaluate coma severity.

Glasgow Coma Scale

Symptom	Point
Eye Opening	
Spontaneous	4
To speech	3
To pain	2
None	1

Best Motor Response	
Obeys verbal command	6
Localizes to painful stimulus	5
Flexion withdrawal	4
Flexion decorticate	3
Extension decerebrate	2
No response	1
Best Verbal Response*	
Oriented, converses	5
Disoriented, converses	4
Inappropriate words	3
Incomprehensible sounds	2
No response	1

*Preverbal children should receive full verbal score for crying with stimulation.

Initial treatment includes CPR, examination to find etiological factors, prescribing specific therapy.

Collapse

Cardiovascular collapse is a term used by clinicians to describe a sudden and marked drop in blood pressure and as a result the inability of the cardiovascular system to maintain adequate perfusion pressure to key organ systems, especially the brain.

Algorithm of emergency aid:

1. Horizontal position and elevate the lower extremities.
2. Monitoring of vital signs.
3. Rehydration therapy.

Shocks

Shock is an acute, dramatic syndrome, characterized by inadequate circulatory provision of oxygen, so that the metabolic requirements of vital organs and tissues are not met. Insufficient oxygen is available to support aerobic cellular metabolism.

If inadequate tissue perfusion continues, various adverse endocrine, vascular, inflammatory, metabolic, cellular, and systemic responses occur, and the patient becomes more physiologically unstable. Shock is a

progressive process because of the continued presence of the initiating factor plus exaggerated and potentially harmful neurohumoral, inflammatory and cellular responses.

An initial insult triggers shock, thus disrupting blood flow to end-organs, leading to inadequate tissue perfusion. The body's compensatory mechanisms are initiated to maintain perfusion to vital organs, leading to compensated shock. If treatment is not introduced during this period of compensated shock, decompensated shock develops, causing tissue damage that leads to multisystem organ dysfunction and death.

There are 5 major types of shock: hypovolemic, septic, cardiogenic, distributive and obstructive.

Principles of treatment:

ABC-resuscitation (airway, breathing and circulation).

Infusion: an initial fluid bolus of 20 mL/kg of normal saline or lactated Ringer solution should be given rapidly (5-10 min). If it is not possible to insert an intravenous catheter into a peripheral vein within 90 sec or within 3 attempts, an intraosseous needle should be inserted to administer fluids. If cardiogenic shock is a concern, the fluid bolus should be held or a smaller volume given over a longer period to avoid exacerbating heart failure.

If, after appropriate fluid resuscitation, the patient continues to show poor perfusion and shock, vasoactive agents are needed (dopamine, dobutamine).

Coagulation disorders are frequently found in severe shock and should be corrected, particularly if the patient is experiencing active bleeding.

Adequate infection therapy should also be provided for patients with septic shock; abscesses should be drained and appropriate bacteriocidal antibiotic therapy (usually 2 antibiotics) should be started.

Acute poisoning

Poisoning is pathological condition due to swallowing, inhaling, touching or injecting various drugs, chemicals, venoms or gases.

According to clinical features there are cardiac, lung, nervous, liver, renal, blood, gastro-intestinal poisons.

Emergency aid:

PCR.

Evaluation of consciences level (Glasgow scale).

3. Glucose (5%, 10% in dose 0,25-1,0g/kg); oxygen supplement, naloxone (10 mg/kg).

Decontamination of poisons from the skin, mucous membrane.

Dilution may be indicated only when the toxicant produces local irritation or corrosion. Water or milk is an acceptable diluent.

Specific antidotal therapy (if poison is identified).
Supportive treatment.

Heat stroke

Heat stroke is a severe illness manifested by central nervous system disturbances and potential tissue damage.

Treatment includes moving to a cool environment, cooling the body with fans, removing excess clothing and placing ice over the groin and axillae.

CPR

Rehydration. If a patient is not able to tolerate oral rehydration, IV fluids (glucose-sodium solutions) are indicated.

Inotropic support.

If diuresis is less than 1 ml/kg/hr diuretics (furosemide, mannitol) are indicated.

Hypothermia

Cold injury may produce either local tissue damage, with the injury pattern depending on exposure to damp cold (frostnip, immersion foot, or trench foot), dry cold (which leads to local frostbite) or generalized systemic effects (hypothermia).

Hypothermia occurs when the body can no longer sustain normal core temperature by physiologic mechanisms, such as vasoconstriction, shivering, muscle contraction, and nonshivering thermogenesis.

Initial Management

Provide oxygen supply.

Cardiopulmonary resuscitation for asystole, ventricular fibrillation

Laboratory examinations

Arterial blood gas analysis corrected for temperature

Complete blood cell count, platelet count

Prothrombin time, partial thromboplastin time

Electrolytes, blood urea nitrogen, creatinine

Glucose, amylase

Urine drug screen

Monitoring

Heart rate, electrocardiogram, respiratory rate, blood pressure

Temperature

Consider central venous pressure

Treatment

Correct hypoxemia, hypercarbia

Correct hypokalemia

Correct hypoglycemia, 20% glucose 1 g/kg IV
Tolerate hyperglycemia
Temperature
≥32°C: passive rewarming or simple external rewarming
<32°C (acute): external or core rewarming
<32°C (chronic): core rewarming
Fluid replacement
(acute) 5% dextrose in normal saline at maintenance rates
(chronic) normal saline, 5% albumin, and/or fresh-frozen plasma to maintain blood pressure.
AED, automated external defibrillator; VF, ventricular fibrillation; VT, ventricular tachycardia. *(From American Heart Association: ECC guidelines. Part 8: Advanced challenges in resuscitation. Section 3: Special challenges in ECC. Circulation 2002;102: 1229.)*

Electrical injury

The spectrum of electrical injury is enormous, ranging from low-voltage household accidents to million-volt lightning strikes. Appropriate management requires understanding of the basic physical aspects of electricity, the physiologic responses to injury, and the potential for immediate and delayed damage.

The severity of electrical injury depends on six factors: the resistance of skin, mucosa, and internal structures; the type of current (alternating or direct); the frequency of the current; the intensity; the duration of contact and the pathway taken by the current. Precise separation of the effect of these factors, which are interrelated, is impossible. Together, they produce either heat or current, and a variety of injuries result.

Management of Electrical Injuries

Initial Management

Remove the source of current.
Cardiopulmonary resuscitation as required.
Provide mechanical ventilation until spontaneous ventilation is adequate.
Immobilize neck and spine.
Analgetics (tramadol in the dose of 1-2mg/kg, promedole - 0,01 mg/kg).

Clinical Assessment

Neurologic examination.
Peripheral pulses and perfusion.
Oral burns/edema.
Chest wall injury.
Abdominal distension.
Eye or ear trauma.

Cutaneous burns or bruises.
Laboratory examinations
Complete blood cell count.
Blood urea nitrogen, creatinine.
Electrolytes.
Electrocardiogram.
Monitoring
Heart rate, ECG, respiratory rate, blood pressure.
Management
Maintenance fluids: 5% glucose in normal saline. Volume expansion in presence of thermal burns or extensive deep-tissue injury: 0.9% sodium chloride, lactated Ringer's solution, or 5% albumin.
Fluid restriction for central nervous system injury
Maintain urine output >1 mL/kg/h
Treat arrhythmia
Treat seizures
Tetanus toxoid; consider penicillin/other antibiotics
Consider general, oral or plastic surgical consultation.

Drowning

Drowning is the process of experiencing respiratory impairment from asphyxia due to penetration of liquid into the airways, laryngospasm, or reflex cardiac arrest in water.

Pulmonary aspiration occurs in the majority of drowning victims, but the amount aspirated is usually small. Nonaspirating victims may acutely succumb from laryngospasm and the consequences of hypoxia. The amount and composition of aspirated material can affect the patient's clinical course: gastric contents, water salinity, pathogenic organisms, toxic chemicals, and other foreign matter can injure the lung or cause airway obstruction.

Clinical management is not significantly different in seawater or freshwater aspiration. Seawater is hypertonic (approximately 3% normal saline), establishing an osmotic gradient that draws interstitial and intravascular fluid into the alveoli; furthermore, seawater inactivates surfactant, increasing alveolar surface tension, making the alveolus unstable and prone to atelectasis. Hypotonic freshwater aspiration washes out surfactant, also causing alveolar instability and collapse. In either case, hypoxemia and pulmonary insufficiency result from ventilation-perfusion mismatch, increased intrapulmonary shunting, decreased lung compliance, and increased small airway resistance.

Emergency aid:

Once submersion has occurred, immediate institution of cardiopulmonary resuscitative efforts at the scene is imperative. Initial resuscitation must focus on rapidly restoring oxygenation, ventilation and adequate circulation.

All pediatric submersion victims probably should be hospitalized or observed for at least 6–12 hr, even if they are asymptomatic on presentation to the hospital. As a minimum, serial monitoring of vital signs (respiratory rate, heart rate, blood pressure, and temperature), repeated careful pulmonary examination and neurologic assessment, chest radiography, and assessment of oxygenation by arterial blood gas or pulse oxymetry should be performed on all submersion victims. Other studies may also be warranted, depending on the specific circumstances (possible traumatic injuries or suspected intoxication).

Cardiopulmonary resuscitation

Pediatric emergencies are of various types: respiratory, cardiac, endocrine, traumatic, and infectious. Most pediatric arrests are respiratory.

The goal in pediatric resuscitation is to maintain adequate oxygenation and perfusion of blood throughout the body while steps are taken to stabilize the child and establish long-term homeostasis. The sequence of events should be instituted, beginning with the ABC: airway, breathing and circulation.

Airway

Assessment includes opening the airway (head-tilt/chin-lift or jaw-thrust, if the cervical spine is unstable); looking for the rise and fall of the chest, listening to the nose and mouth for breathing, and feeling air passing through the child's airways. This should be done in <10 sec.

Breathing

Rescue of breathing should be done by mouth-to-mouth or mouth-to-nose breathing, a mask over the patient's nose and mouth and mouth-to-mask breathing, or bag-mask respirations. Successful rescue of breathing will provide good chest motion and relief of deep cyanosis.

Amount of breathe 6-7 ml/kg. Exhalation is passive. Inhalation:exhalation – 1:2.

As resuscitation proceeds and ventilation is accomplished, support of the circulation should be provided to sustain adequate blood flow to deliver oxygen to the tissues.

The effectiveness of chest compressions is determined by the presence of a palpable pulse. The rate of chest compressions varies with age and size.

Chest Compression: Ventilation Relationships

	NEONATE	1–8 YR	>8 YR
Compression rate	120	At least 100	100
Compression-ventilation ratio	3 : 1	5 : 1	15 : 2
Pulse check	Umbilical artery	Brachial	Carotid

Chest compressions in small infants and newborns may be performed by placing 2 thumbs on the midsternum with the hands encircling the thorax, by placing 2 fingers over the midsternum and compressing, or by holding the child in the supine posture on one's lap.

Drugs of Resuscitation

Appropriate drug doses, fluid therapy, and equipment size vary depending on the size of the child in need of resuscitation.

Epinephrine is the primary drug for pediatric cardiopulmonary arrest because the rhythms most commonly encountered are asystole or bradycardia. Dose: IV: Use 1:10,000 0.01 mg/kg or 0.1 mL/kg, max 1 mg 0.1-1 μg/kg/min infusion; endotracheal: Use 1:1000 0.1 mg/kg or 0.1 mL/kg, max 10 mg.

Dopamine (2,0-15,0 mcg/kg x min).

Atropine is recommended for the treatment of bradycardia that is known to be vagally mediated. The recommended dose is 0.02 mg per kg, with the minimum dose of 0.1 mg, and the maximum dose of 0.5 mg in a child and 1.0 mg in adolescents. The dose may be repeated every 5 minutes to the maximum of 1 mg in a child and 2 mg in an adolescent.

Other drugs: glucose, calcium etc.

4.2 TASKS

№1. A boy born after cesarean section during his first seconds of life remains still. Objectively: cyanotic skin, unrhythmical breathing which does not improve after oxygen therapy; HR – 50 bpm; generalized hypotonia.

1. What is the most reliable cause of these symptoms?
2. Tactica of giving emergency aid.

Correct answers:

1. Asphyxia of a newborn (postnatal asphyxia)
2. Emergency measures are directed to restore airways, support of gas exchange, blood circulation, they are performed according to the requirements of cardiac-pulmonary resuscitation (CPR). In case hypovolemia

signs occur – 0,9% NaCl (dose – 10 ml/kg); expected metabolic acidosis requires injection of sodium hydrocarbonate.
Assessment of HR, RR and colour of the skin is conducted every 30 seconds. Resuscitation may be stopped 15 minutes after heart activity is not renewed.

№2. A 7-year old girl suddenly fell under water of a mountain river. In 3 minutes the child was pulled out from the water. On examination: pale skin, no spontaneous respiration, no pulse on the carotid artery, dilated pupils without reaction to light.
1. Name the type of drowning.
2. Give emergency aid.

Correct answers:
1. Syncopal drowning.
2. Primary cardiac-pulmonary resuscitation (CPR). Hospital aid after the condition is stabilized includes oxygen therapy (intubation in case of necessity), restriction of liquid intake, diuretics, administration of antibiotics.

№3. A 3-year old boy became suddenly sick with the onset of "barking" cough, moderate discharge from the nose, temperature 38,0°C. In the first day of the illness he woke up at night because of bad cough, dyspnea of an inspiratory type occurring both during excitation and at rest. Perioral cyanosis, paleness, tachycardia.
1. What complication occurred?
2. Give emergency aid.

Correct answers:
1. Laryngeal stenosis (false croup) II-III degree.
2. Glucocorticoids: prednisolone in the initial dose of 2 mg/kg, followed by every 6-8 hours – 1 mg/kg; inhalation with moistened and warmed oxygen; hydration within physiological requirements; inhalations with 0,9% NaCl.

№4. A 7-month infant became suddenly and acutely sick with the onset of temperature to 39,0°C, frequent vomiting, liquid stools, anxiety, mild catarrhal signs. Stool is watery, colourless, feces-free, every hour. Liquid loss is 7% of the body weight.
1. Determine the degree of dehydration.
2. Give emergency aid.

Correct answers:
1. Toxic exicosis II degree.
2. Sufficient rehydration therapy is performed in two stages.
1st stage – rehydration therapy during 4-6 hours to restore the volume of liquid lost. In case of moderate loss it is 60 -100 ml/kg of the body weight. The rate of oral liquid intake is 5 ml/kg/hour.
2nd stage – supporting therapy conducted depending on the liquid loss accompanied by vomiting and stools.

№5. A 6,5-month baby became acutely sick: the temperature rises to 38ºC, the child is flabby and does not eat. Anamnesis: the leder child in this family had ARVI. Objectively: severe condition, shortness of breath 60 /min. of a mixed character, mild perioral cyanosis. Bandbox resonance over the lung surface, small bubbling rales are heard.

1. Make provisional diagnosis, name complications.
2. Give emergency aid.

Correct answers:

1. ARVI, influenza bronchiolitis, severe course. Respiratory failure II-III.
2. Oxygenation, ventilation support.

№6. A 7-year old girl. Severe condition, lifeless, pale, perioral cyanosis. Expiratory dyspnea. Additional muscles participate in breathing. Percussion detects bandbox resonance over the lungs. Respiration is sharply weak. Dry whistling rales. RR – 40 per minute. Heart sounds are dull. HR – 120 bpm.

1. What is the cause of this severe condition?
2. Give emergency aid.

Correct answers:

1. Acute respiratory failure III degree due to severe exacerbation of bronchial asthma.
2. Fast-acting selective bronchial spasmolytics (three times with 15 minutes interval), systemic glucocorticoids. Additional oxygenation, ventilation support.

№7. A 2-year old child. Thick hemorrhagic-necrotic rash on the skin of the lower limbs appeared after hyperthermia. In 1 hour the body temperature began to drop dramatically, BP - 20/0 mm Mercury, RR - 44 /min., pulse – thread-like, 200 /min.

1. Make provisional diagnosis, name complications.
2. Principles of emergency therapy.

Correct answers:

1. Fulminant meningococcemia, Waterhouse-Friderichsen syndrome.
2. Urgent therapy is directed to quick elimination of hypovolemia and administration of glucocorticoids. Hydrocortisone is the drug of choice, prescribed in bolus-dose 50 - 100 mg i/v followed by decrease – to 50 mg/m^2/day. The dose is divided into four intakes every 6 hours. Infusion therapy: glucose-saline NaCl solutions, in case of hyperkaliemia 10% glucose is preferable. Considering Na^+ ions loss with urine, correction of hyponatriemia should be conducted (under ionogram control). Therapy with mineral-corticoids is reasonable for a long course in case of non-infectious causes of primary adrenal failure.

№8. A 3-year old child was left for several minutes alone in the room

where electric system was being repaired. The parents found their child on the floor unconsciouss. Spontaneous breathing absent, convulsions, arrhythmia present.

1. What factors influence on the severity of electric injury?
2. Give emergency aid.

Correct answers:

1. Resistance of the skin, mucous and internal organs, type of current (alternative or direct), frequency and intensity of current, duration of contact and the way of conduction of electric impulse through the body.
2. Free the victim from the source of electric current keeping to the rules of individual safety. Primary CPR. ECG-control. Analgesia: tramadol (1 - 2 mg/kg), promedol (0,01 mg/kg). Aseptic bandages applied on the places of burns. The patient must be transported to the burn of resuscitation unit.

№9. A 6-year old child was taken out from a burning building unconscious. The skin is clean, pink, without burns. Superficial pulse is 136 per minute. Heart sounds are rhythmical. Respiration is difficult, RR is 50/min., rough whistling rales are heard over the lungs against harsh breathing.

1. What is the cause of unconsciousness?
2. Give emergency aid.

Correct answers:

1. CO intoxication.
2. Oxygen therapy with 100% O_2, hyperbaric oxygenation.

№10. A 16-year old child is taken to the hospital by an ambulance. Objectively: unconscious, hyporeflexia. Pale skin. Superficial and frequent breathing. Pungent smell of alcohol from the mouth.

1. Provisional diagnosis.
2. Give emergency aid.

Correct answers:

1. Intoxication with alcohol substitutes. Alcoholic coma.
2. Primary CPR. Checking the level of consciousness (Glasgo scale). Medicines: glucose (5%, 10% at the rate 0,25-1,0 g/kg); oxygen; naloxone (10 mg/kg).

№11. A teenager who has bronchial asthma (remission) is given intracutaneous allergy tests. In 10 minutes the child complains of lack of air, strangulation sensation round the neck. Objectively: expiratory dyspnea, wheezing, BP– 50/20 mm Mercury.

1. Make provisional diagnosis.
2. Tactics of treatment.

Correct answers:

1. Anaphylactic shock.

2. Primary examination and support of vital functions with the accent to ensure adequate potency of the airways, ventilation and circulation. Inhalations with 100% oxygen at the rate of 0,5 - 5 L/min., followed by decreased oxygen concentration in the mixture to 40%, considering clinical signs of pulsoxymetry results (SaO_2 > 92%). Epinephrine 0,1% solution subcutaneously (0,5 ml). In case a clear effect is absent this dose should be repeated in 5 minutes. The drug may be administered subcutaneously, sublingually, intraosseously, endotracheally (in 1-2 ml of NaCl isotonic solution). Intramuscular injcetions of antihistamines (dimedrol (diphenhydramine hydrochloride, benadryl): 10 - 12 mg). In case a clear effect is absent venous access should be assured (within 90 seconds) with the insertion of a large diameter catheter. In case venous access is impossible to ensure, intraosseous one is used. Quick infusion is given in the volume 20 ml/kg (crystalloids are better: 0,9% NaCl solution, Ringer lactate solution). In the absence of effect the infusion is repeated. Glucocorticoids are administered intramuscularly or slowly intravenously (hydrocortisone – 100 - 500 mg; dexasone – 0,3 mg/kg). In case of bronchial spasm (in spite of epinephrine injection) euphylline (aminophylline) in the dose of 5 mg/kg is injected i/v slowly in 10,0 - 20,0 ml of NaCl isotonic solution. In case of wheezing – salbutamol inhalations (by means of a nebulizer – 2-4 inspirations). In case of necessity infusion therapy is continued in a maintaining volume, according to indications – with dopamine. Usually treatment with antihistamines and glucocorticoids lasts 2-5 days.

№12. A 15-year old girl found her bloody friend on the floor. A knife was nearby. Objectively: pale skin, superficial respiration, thread-like pulse 110 bpm.

1. Name the kinds of bleeding.
2. Give emergency aid in case of external bleeding.

Correct answers:

1. Depending on the type of vessels injured there are arterial, venous and capillary bleedings.
2. To stop bleeding (arterial – mechanical compression of the vessel above the place of its injury; venous – applying compression bandage lower the place of injury, cold on the place of injury; capillary – application of a hemostatic sponge, or sterile pad, or compressive dressing). With the signs of hypovolemic shock – restoration of blood volume.

№13. A 10-year old child is brought to the resuscitation unit with polytrauma after a road accident. The condition is severe, the child is conscious. Pale skin, mucous membranes are dry. Skin tugor is reduced, “white spot” symptom is longer than 2 seconds. Pulse 120 bpm., weak. BP = 50/20 mm Mercury.

1. What complication developed?
2. Principles of emergency aid.

Correct answers:

1. Hemorrhagic shock.
2. Oxygen supply, assessment of vital functions. Assure venous access, taking necessary analyses. Infusion therapy and assessment of its efficacy. Usually shock is treated with quick 15-20 minutes injection of crystalloid solutions (0,9% NaCl solution, Ringer lactate solution) at the rate of 15 - 20 ml/kg of the body weight. In case effect is absent injection of these solutions should be repeated with the same rate. In case a clear effect is absent (repeated assessment of peripheral perfusion, HR, level of consciousness) colloid solutions are injected at the rate of 10 - 20 ml/kg of the body weight. In case of uneffective above measures – administration of vasoconstrictors (dopamine, dobutamine, epinephrine). Erythromass is used to increase oxygen content in the blood and improvement of tissue oxygenation. In this case a compatible with Rh-factor erythrocyte mass is used (in urgent cases – Rh (-) – erythrocyte mass of a universal donor 0 (I) group) to increase blood hematocrit to 0,35 - 0,4 l/L.

№14. A 2-year old child afflicted with ARVI against high temperature (39,5^{o}C) developed the episode of tonic-clonic spasms.

1. What is the cause of spasms?
2. Your tactics of treatment.

Correct answers:

1. Hyperthermia (so called febrile spasms).
2. To take precautions against injuries while falling down. Ensure potency of the airways. 100% oxygen inhalations (nasal catheter, mask, intubation). Assessment of vital signs. Antipyretics (paracetamol, ibuprofen, analgin).

№15. A 4-year old boy got a bee sting while walking. Objectively: severe condition at the expense of respiratory failure (inspiration dyspnea), swelling of the subcutaneous tissues of the neck, swelling of the tongue.

1. Make provisional diagnosis.
2. Urgent therapy.

Correct answers:

1. Quincke's edema.
2. Provide potency of the airways. Antihistamines of the I generation (suprastin, tevagyl, diphenhydramin) parenteral administration. In case the effect is absent – systemic glucocorticosteroids (prednisolone, dexamethasone) in the mean therapeutic dose i/v or i/m. according to indications: diuretics (furosemide), enterosorbents, disintoxication therapy.

№16. A child from an asocial family stayed for several hours out of doors in a frosty weather. The child was in light clothes, and without a hat on.

The staff members of the board of guardians took the child to the first-aid center. Objective physical examination found: consciousness, pale skin, tremor. The thumb on the right foot was swollen.
1. Initial diagnosis.
2. Emergency therapy.

Correct answers:

1. Cold (freezing) injury.
2. The child should be placed into a warm room, frozen boots must be removed; the afflicted limb must be placed into a bath with the water temperature of +17-18°C, and warm water should be added during an hour gradually reaching the temperature of 35-36 °C (but not higher!); at the same time a slight massage should be performed continuously along the lymph outflow direction. After that the skin of the injured leg should be treated with some alcohol.

№17. A two-year-old boy being examined by a surge on for phimosis become sanxious, his mother noticed anuria during the last 24 hours.
1. Make the initial diagnosis.
2. Tactics of treatment.

Correct answers:

1. Acute anuria.
2. Single or continuous catheterization of the urinary bladder till complete renewal of its functions. In case catheterization is not possible, epicystostomia should be performed over the pubis. After the acute condition is eliminated, the child must be examined and the underlying disease must be treated.

№18. A 4-year old child has epilepsy. The child is taken to the resuscitation unit by an ambulance team with the signs of tonic-clonic cramps lasting for about 30 minutes and they did not stop after Sibazon injection.
1. What pathological condition developed?
2. Tactics of treatment.

Correct answers:

1. Epileptic status.
2. Cramps that continue after two-time injection of benzodiazepine medicines require administration of other groups of anti-convulsive drugs: parenteral use of phenytoin (phosphenytoin) or barbiturates (phenobarbital). In case of refractor epileptic status intubation with general anaesthesia, hypothermia, high doses of barbiturates are indicated to achieve barbiturate coma (sodium thiopental).

№19. A 12-yearoldboy was playing in the yard for a long time in a sunny weather. Suddenly he felt general weakness and blackout. Hefeltunconscious. Objectiveexamination: hotdryskin.

1. Initial diagnosis.
2. Emergency therapy.

Correct answers:

1. Heatstroke.
2. Emergency measures include active cooling (transporting the child into a cool place, removal of clothes). Cardiac-pulmonary resuscitation is performed in case of necessity.

Rehydration (glucose-salt solutions) is further performed in physiological requirements. Additional injection of electrolytic solutions should be performed under the control of ionogram. Due to indications ionotropic support may be conducted by means of dopamine.

№20. A 14-year old boy who is treated in the hospital for acute viral hepatitis B revealed unpleasant breath and jaundice. Objectively: the boy is disoriented, his replies to questions are slow.

1. Name complication.
2. Emergency therapy.

Correct answers:

1. Acute liver failure.
2. Oxygen therapy. Infusion therapy (1 - 1,5 of the volume of physiological requirements). Feeding through the tube or parenteral in the volume of 50 - 75% of the age needs, proteins should be restricted. Lactulose is indicated in the dose of 60 - 80 ml/day. Antibiotic therapy includes aminoglycosides (peros). In case bleeding occurs vicasol and fresh-frozen plasma every 6-8 hours are indicated, as well as sedative and anti-convulsive therapy.

№21. A 10-year old girl suddenly felt unconscious during the break at school. Objectively: pale skin, cyanotic lips, superficial breathing. Pulse wave is weakened, tachycardia. BPis 80 - 40 mm Mercury.

1. Initial diagnosis.
2. Emergency therapy.

Correct answers:

1. Collapse.
2. The patient must be placed horizontally on the back with lower limbs upward. Clothes should be removed, fresh air available. Vital functions are monitored, in case of their disorders cardiac-pulmonary resuscitation is performed. Rehydration therapy is indicated (i/v droplet injection of large-molecular plasma substitutes such as refortan in the dose of 10 ml/kg; glucose-salt solutions).

№22. A 7-year old child is brought to casualty department with complaints on tremor, sweating, nausea. Heart auscultation found HR of 150 beats per minute. ECG findings: P wave of various shape, QRS complex is not changed.

1. Initial diagnosis.
2. Emergency therapy.

Correct answers:

1. Paroxysmal supraventricular tachycardia.
2. The measures directed to increasing the tonus of the nervusvagus are performed: pressing the root of the tongue with a spatula, cold water rubdown, rectal stimulation; for children older than 3-4 years Ashner test, Valsava maneuver, Hering test are performed. ATP (adenosin) i/v bolus injection. In case it is not effective – amiodarone.

№23. A 6-year old child who received anti-bacterial therapy for pneumonia (cephalosporins + aminoglycosides) developed swelling on the legs, headache, nausea. The mother admits reduced daily urination.

1. What kind of condition occurred?
2. Emergency therapy.

Correct answers:

1. Acute renal failure.
2. Diet with intensified calories intake (120-140 kilocalories/kg/day), parenteral feeding. Hydrobalanceshould be maintained. The body weight is controlled. Hyperkaliemia is corrected (K > 6,0mmol/L): 10% calcium gluconate solution 20 mg/kg i/v slowly (5 min), it should be repeated in case of necessity 6-8 hours later; 20% glucose solution (4 – 5 ml/kg) with insulin (1 UN per 5 g of glucose). Metabolic acidosis is corrected: 2% sodium bicarbonate solution – gastric lavage and internally (0,12g/kg/day of dry substance) fractionally; 4% sodium bicarbonate solution i/v droplet. Anemia is corrected (erythropoietin), arterial hypertension is controlled (APP inhibitors, Ca agonists, b-adrenoblockers).

Indications for dialysis therapy:

- anuria or oliguria;
-hyperkaliemia (> 6,5 mmol/L);
- decompensated metabolic acidosis (pH < 7,1);
-azotemia (urea> 30 mmol/L, increased plasma creatinine > 120 mcmol/day).

№24. A 10-year old unconscious child is delivered to the hospital. Physical examination found deep “noisy” breathing, lowered tonus of the eyeballs, acetone breath, dull heart sounds, arrhythmia. Blood sugaris 20 mmol/L.

1. Initial diagnosis, complication.
2. Emergency therapy tactics.

Correct answers:

1. Type I diabetes mellitus. Ketoacidosis coma.
2. Rehydration (0,9% NaCl solution, after blood glucose level decreases to12 - 15 mmol/L is otonic glucose-salt solutions are indicated). Insulin deficiency

is removed. It should be initiated after the beginning of rehydration and injection of potassium containing solutions. Insulin (short action) is injected in the regimen of small doses i/v droplet (0,1UN/kg/hour). After glucose level is lowered to 13 - 14 mmol/L insulin dose is reduced to 0,05 UN/kg/hour (i/v droplet). With glucose level of 10 – 11mmol/L insulin therapy in the dose of 0,1 - 0,2 UN/kg is performed every 3-4 hours (subcutaneously) till glucose level is normal. The rate of glycemia reduction should be no quicker than 4-5 mmol/L/hour. Acid-alkali balance should be restored. Severe ketoacidosis is the basis to inject bicarbonate (pH< 7,0). Treatment and prevention: disseminated intravascular clotting (DIC), infectious complications, iatrogenic hypoglycemia, intoxication, cerebral swelling etc.

№25. A 13-year old girl with diabetes mellitus during 3 years suddenly becomes unconscious, her skin becomes pale, moist, cold; superficial breathing, muscular tonus increased, tremor, focal cramps.

1. Initial diagnosis, complication.
2. Emergency therapy tactics.

Correct answers:

1. Type I diabetes mellitus. Hypoglycemic coma.
2. To ensure permeability of the respiratory tract. Glucagon (i/v, s/c) is injected. In case of no effect 10-15 minutes later blood sugar level should be checked and 20% glucose solution injected in the dose of 1 ml/kg i/v, followed by 10% glucose solution in the dose of 2 - 4 ml/kg till restoration of consciousness. Glycemia should be checked every 30 minutes.

№26. A girl, teen-ager, visited the doctor complaining of headache, tremor, heat beat, sensation of fever. Objective examination finds HR of 100 beats per minute, BP – 150/90 mm Mercury.

1. Initial diagnosis.
2. Emergency therapy tactics.

Correct answers:

1. Hypertension crisis.
2. Anti-hypertensive drugs are indicated (usually internal use): clonidine, niphedipine, captopril, prasozine, propranolol, dibazol, pyroxan, diazepam, furosemide.

№27. A child with congenital heart defect admits sudden deterioration of her condition. The child is anxious and has fear feelings. Objective examination finds mixed shortness of breath at rest, fine bubble moist wheezing is heard over the lungs. Heart sounds are dull, rhythmic.

1. Initial diagnosis.
2. Emergency therapy tactics.

Correct answers:

1. Acute heart failure.
2. Primary stabilization according to the rule of ABC-resuscitation. Upward position of the trunk at the angle of 30°. Further the following medicines are indicated: diuretic (furosemide/lasix) – 1 mg/kg i/v; adrenergic (dopamine, dobutamine). In case of ineffectiveness – cardiac glycosides (digoxin) are indicated; peripheral vasodilators (captopress, captopril); oxygen therapy; sedatives. Adequate nutrition is provided (energy value of the food increases, Na is excluded from the diet), liquids are restricted (30-50 ml/kg per day).

№28. A term infant born after the I pregnancy, I physiological labour in the term of gestation of 41-41 weeks. Amniotic fluid is of greenish-yellowish colour. The skin is cyanotic, breathing is absent, meconium is found in the oral cavity.
1. Initial diagnosis.
2. Suggest emergency therapy for resuscitation of the newborn.

Correct answers:

1. Massive meconium aspiration syndrome.
2. Cardiac-pulmonary resuscitation is performed on the resuscitation table under the source of light heat according to ABCD rules.

№29. A 10-year old patient has bronchial asthma of early onset. Exacerbation is for 3 days. During the last night he used “Salbutamol” for 10 times. Objectively: severe condition, pale skin, acrocyanosis, considerable expiratory dyspnea, stable cough. The chest is filled, auscultation of the lungs detects weakened breathing.
1. Initial diagnosis.
2. Emergency therapy tactics.

Correct answers:

1. Status asthmaticus.
2. Inhalation of moist 100% oxygen. Inhalations ofβ2-agonists, anti-cholinergic drugs (through the nebulizer), 0,1% epinephrine solution in the dose of 0,01 ml/kg for the patients who are not ably for inhalations with short-action broncholytics; systemic glucocorticosteroids (prednisolone, dexamethasone); theophyllins. Rehydration is performed to achieve normal vascular volume.

№30. A 2,5-year old child is afflicted with acute disease: t - 40,1°C, which quickly reduces to 36,2°C, chills, intensive hemorrhagic skin rash of a star-like shape. The limbs are cold, facial features are sharp. BP – 40/0 mm Mercury.
1. Initial diagnosis, complication.
2. Emergency therapy tactics.

Correct answers:

1. Meningococcemia, septic shock.

2. Oxygen supply, assessment of vital functions. Providing venous access, taking all the necessary analyses. Infusion therapy and evaluation of its efficacy. Usually shock is treated with quick injection (15-20 minutes) of crystalloid solutions (0,9% sodium chloride solution or sodium chloride + potassium chloride + calcium chloride dehydrate + sodium lactate solution (Ringer lactate) in the ratio of 15-20 ml/kg of the body weight. Glucocorticosteroids (prednisolone, hydrocortisone). Antibacterial therapy – cephotaxim or cephtriaxon i/v droplet. In case of increased sensitivity to beta-lactam antibiotics laevomycin succinate is injected stream i/v symptomatic therapy (antipyretic, anti-convulsive).

CHAPTER 5
LABORATORY TESTS
INTRODUCTION
Complete blood count

General routine complete blood count includes determining the following parameters: a study of hemoglobin concentration, erythrocyte count of the number and color index; counting the number of white blood cells and determine leukocyte formula, determining the erythrocyte sedimentation rate (ESR).

If it is necessary specific hemostasis values are detected additionally (with appropriate instruction) including: clotting time, bleeding duration, counting the number of reticulocytes and platelets.

Hemoglobin (Hb) - the main component of red blood cells - a complex protein consisting of heme and globin protein. The main function of hemoglobin is transport of gases, particularly oxygen transfer from the lungs to the tissues, removing carbon dioxide from the body, and the regulation of acid-base balance (ABB).

The number of red blood cells is an important quantitative characteristic component of red blood cells. Red blood cell is a nuclear-free blood corpuscle possessing hemohlobin. An average duration of erythrocytes life is 90 - 120 days. Red blood cells enter the blood from the bone marrow as immature cells containing basophilic substance called reticulocytes.

Number of erythrocytes in 13 - 15 years of age depends on the sex: the girls – 4,1 – 5,1 g/l, and the boys – 4,5 – 5,3 g/l.

The average volume of erythrocytes (Mean Cell Volume, MCV) - a quantitative index of red blood cell volume is calculated by the ratio of cell volume sum to the number of red blood cells, measured in femtoliters (fl). The average volume of red blood cell normally depends on the child's age: in infants up to 2 weeks - 88 - 40 fl, 2 month - 84 - 110 fl, in older children up

to 10 years approximately - 70 - 85 fl, teenagers - 75 - 95 fl, adults 81 - 101 fl.

Changes of MCV characterize disorders of water-electrolyte balance, particularly increasing evidence of hypotension and reduction - of hypertensive exycosis character.

The average content of hemoglobin (Mean Corpuscular Hemoglobin, MCH) - determines the average hemoglobin content in erythrocytes and according to the clinical value corresponds to color index. The average content of hemoglobin (MCH) normal in infants is 30 - 73 pg, to 1 month - the upper limit is reduced to 35 pg, in the postnatal period roughly in an average - 24 - 32 pg, teenagers and adults - 26 - 34 pg.

Color index (CI) - an indicator that reflects a relative content of hemoglobin. Clinically CI is similar to MCH and correlated with MCV. According to its value anemia can be divided in hypo (CI < 0,8), normo- (CI 0,85 – 1,05) and hyperchromic (CI > 1,1).

The average concentration of hemoglobin in red blood cells (Mean Cell Hemoglobin Concentration, MCHC) - the average concentration of hemoglobin in a certain volume of red blood cells or hemoglobin mass ratio to the volume of red blood cells. MCHC is normal in infants of six months old between approximately 28 - 37 g/dL, the older - 32 - 36 g/dL.

Hematocrit (Ht) - the ratio of the volume of red blood cells and plasma. Normative values of hematocrit in healthy children in the early neonatal period is 41 - 65%, in late - 33 - 55%, in the postnatal age - 32 - 42%, in teenagers and adults - 34 - 44%.

Reticulocytes - young forms of red blood cells containing granular filamentous substance, which is manifested by a special supravital staining (ribonucleic acid residues). Normally reticulocytes are 0,2 - 1% of red blood cells circulating in the blood, the maximum number of reticulocytes is determined in the blood of the newborn. The age norm is: in newborns 10 - 30 ‰, in infants - 5 - 10 ‰, after 1 year - 2.5 - 5 ‰, which in the absolute number is 30 - 70 x 10^9/L. Time of reticulocytes maturation - 4 - 5 days, including 3 days of their maturation in the peripheral blood, and then they become mature red blood cells.

White blood cells. Leukocytes include granular white blood cells and agranular white blood cells. By the character of staining granulocytes are divided into neutrophilic, eosinophilic and basophilic cells. Agranulocytes are lymphocytes and monocytes. The normal content of leukocytes in the blood of children varies depending on age, in newborns at the first day of life physiological leukocytosis is observed 13 – 38 x 10^9/l, in the early neonatal period upper limit can achieve 20 x 10^9/liter, in early age ranges within 5 – 12 x 10^9/l, senior – 6- 9 x 10^9/l, the level 4-6 x 10^9 should be considered as

boundary, since in practice it is common in case of immunodeficiency diseases. If in children older 3 years leukocyte content is lower than 4 x 10^9, leukopenia is considered, and if it exceeds 9 x 10^9 – leukocytosis is considered.

Neutrophils. It is the most numerous population of white blood cells in school children, teens and adults (35 - 60% of all white blood cells). When interpreting lymphocyte levels in children, physiological crossing-over of blood formula should be considered.

Shifts of neutrophil formula. In normal peripheral blood there are two morphological types od neutrophils: stabs (the younger) in relatively small amounts (1-5%) and segmented (mature) neutrophils.

Eosinophils - granular white blood cells stained with acid dyes, phagocytes and cytotoxic cells, their activity is related to the immune system of mucous membranes and activity of mast cells. Eosinophils specialize in damage of certain pathogens, especially helminths and protozoa. The normal content of eosinophils is 1 - 5% of WBC.

Basophils are involved in immediate type hypersensitivity reactions and delayed-type by means of lymphocytes in case of inflammatory and allergic reactions, in the regulation of vascular wall permeability. Normal content of basophilic granulocytes in the blood is 0,5 – 1,0%. Basophilia is increased content of basophils in the blood > 0,2 x 10^9/l, observed in case of hypersensitivity to foods or medications, reactions to the introduction of a foreign protein, chicken pox, chronic myelogenous leukemia, erythremia, lymphogranulomatosis, treatment with estrogens.

Lymphocytes are immune competent cells able to recognize specifically different pathogens. When interpreting lymphocyte levels in children physiological crossing-over of blood formula should be considered.

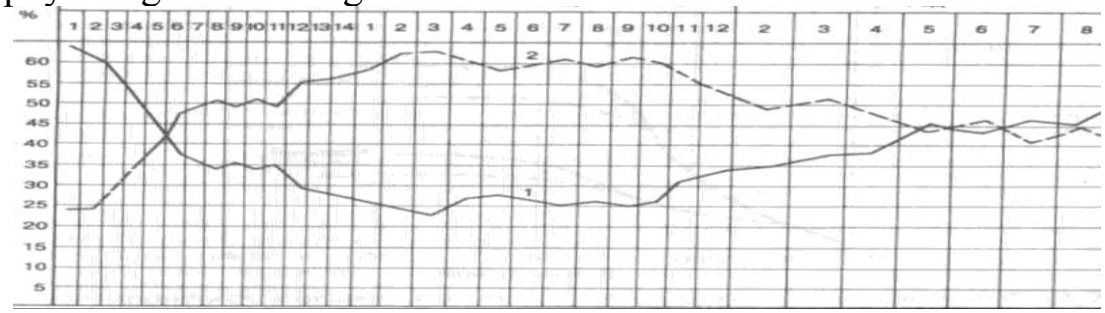


Fig. 29. First and second crossing-overs of neutrophil curves (1) and lymphocytes (2).
By abscissa - age children, the axis of coordinate - content of leukocytes in % to their total amount.

Normal content of lymphocytes of school children and teenagers ranges from 20 - 40%.

Monocytes belong to the mononuclear phagocytic system. Forming in the bone marrow, they circulate in the blood from 35 to 100 hours, then migrate into tissues where they are differentiated into organ- and tissue specific macrophages. Average percentage of monocytes is 2 - 10%. Increased level of monocytes is called monocytosis, and redused one - monocytopenia.

Erythrocyte sedimentation rate (ESR) depends primarily on the ratio of large (immunoglobulins, some acute phase proteins) and relatively small proteins (albumins) in the blood serum.

The value of normal levels of ESR depends on gender and age. In newborns ESR is 0 - 2 mm/h and reaches adult levels already in the first year of life. In healthy adults ESR does not exceed 12 mm/h (men) and 15 mm/h (women).

Platelets are acaryocytes with the diameter of 2 - 4 microns, they are "fragments" of the cytoplasm of megacaryocytes of the bone marrow, performing angiotrophic and adhesive-aggregation functions ensuring retraction of a blood clot being involved in clotting and fibrinolysis. They are able to carry circulating immune complexes on their membranes and support vasospasm. The life span of platelets is 7 - 10 days. The content of platelets in the blood within the norm is in newborns of 1 - 10 days - (100 – 420 x 10^9/l), older than 10 days and adults - (180 – 320 x 10^9/l).

Table 18

Complete Blood Count, Normal Pediatric Values

Age	Red Blood Cells (x 106/µL)	Hemoglobin (g/dL)	Hematocrit (%)	MCV (fL)	MCHC (%)	Reticulocyte Count (%)
Cord blood		14.0-18.8	42-68	96-125	30-34	3-7
Term newborn	5.00-6.30	18.0-21.5	51-68	95-125	30-35	3-7
1-3 days	4.10-6.10	14.0-24.0	43-68	95-125	30-38	1 day: 3-7 2 days: 2-5 3 days: 1-3
4-7 days	4.10-6.10	14.3-22.3	42-62	95-125	30-38	
7-14 days	4.10-6.10	12.9-20.5	39-59	88-115	30-36	
14-60 days	3.80-5.60	10.7-17.3	33-51	80-112	30-35	
2-5 months	3.80-5.20	10.1-14.5	30-40	70-98	32-36	
6 months-1 year	3.80-5.20	10.0-13.2	30-39	70-90	32-36	
1-2 years	3.80-5.20	10.0-13.5	30-40	70-90	30-35	

2-4 years	3.80-5.20	10.5-14.5	32-42	74-94	32-36	
5-7 years	3.80-5.20	10.9-14.9	33-44	76-96	32-36	
8-10 years	3.80-5.20	10.9-14.9	33-44	78-98	32-36	
10-15 years	3.80-5.20	11.4-15.4	34-45	78-98	32-36	

Table 19

Differential White Blood Cell Count, Normal Pediatric Values

Age	White Blood Cells (x 103/µL)	Neutrophils		Lymphocytes		Monocytes
		(%)	(x 103/µL)	(%)	(x 103/µL)	(%)
After birth	9-30	41-81	6-26	26-36	2-11	0.4-3.1
1-3 days	9-38	41-81	6-26	21-41	2-17	
4-7 days	5-21	30-60	1.5-15	31-51	2-17	0.3-2.7
7-14 days	5-20	25-55	1.0-10	33-63	2-17	0.2-2.4
15-60 days	5-20	20-50		41-71		
2-5 months	5.5-18	20-50		44-74		
6 months-1 year	6.0-17.5	15-45	0.5-9.5	47-77	1.4-22	0-2.4
1-3 years	6.0-17.0	15-45		44-74		
3-5 years	5.5-15.5	25-57	1.5-7.5	35-65	1.5-8.5	0-0.8
6-10 years	4.5-14.5	38-68		25-54		
10-15 years	4.5-13.5	40-70	1.5-6.5	28-48	1.5-6.5	
15-20 years	4.5-12.5	42-72	1.5-7.5	25-45	1.5-5.0	0-0.8

Total bilirubin of the blood and its fractions

Bile pigments (bilirubin and urobilin bodies) are the products of breakdown of hemoglobin and other hemocontaining substances - myoglobin, cytochromes, and hemocontainign enzymes. *Bilirubin* is formed from different hemproteids, including 80% of circulating bilirubin is formed of circulating red blood cells, the remaining 15 - 20% - from other sources.

Total bilirubin in older children is 3,4 – 17,1 mmol/l, 75% of which is indirect fraction (3,4 – 13,7 mmol/L), direct: 0 – 3,4 mmol/l. At birth bilirubin level can reach 87,6 mmol/L, the first day - 135 mmol/l, the 3rd day - 205 mmol/l, in preterm infants - to 262 mmol/l.

Blood transaminases

Alanine aminotransferase (ALT) is an enzyme that is primarily found in the liver (hepatic cell level, and located in the cytosol). Within the norm ALT activity does not exceed 55 U/L in children to 1 year of age, in older ones - 40 U/L.

Aspartate aminotransferase (AST) is contained in the heart, liver, skeletal muscle, kidney, pancreas, lungs etc. The activity of AST in children up to 1 year within the norm does not exceed 85 U/L, the older ones - 35 U/L.

Coagulogram

Coagulogram is examination of coagulation hemostasis including the following indices:

- Lee-White blood clotting time (normally 5 - 8 minutes);
- Prothrombin time (PT) - the time required for clotting citrate plasma after addition of tissue coagulation factor (thromboplastin) and calcium (prothrombin index - 93 - 107%);
- Activated partial thromboplastin time (APTT) - the time needed for clotting of pre-incubated with kaolin citrate plasma after the addition of calcium and platelets (normally 25 - 35 seconds);
- Thrombin time (PM) - blood clotting time when thrombin is added to the blood with a standard activity having the ability to initiate the transformation of fibrinogen into fibrin without participation of other clotting factors (normally 15 - 18 sec.);
- Fibrinogen (normally 2 - 4 g/l);
- Fibrin breakdown products (normally less than 10 mg/l) ;.
- Detection of the concentration of clotting factors in plasma.

Total immunological blood profile

Immune status is a set of clinical and laboratory indices characterizing the condition of the immune system at the time of examination.

Immunogram is a comprehensive study of the immune system by analyzing indices in the blood.

Immunogram structure. Indices of immunogram are divided into specific groups, depending on what they characterize immunity. The system of innate resistance characterize the level of neutrophils and monocytes of the blood, phagocytic value of (PV) and phagocytic index (PI), NBT test values, the level of natural killer cells, serum complement titer level of the individual components of complement, lysozyme levels in secretions. Cellular immunity reflects the content of CD3 + T lymphocytes (integral indicator cell level), CD4 + T cells (T-helper), CD8 + T lymphocytes (T-killer cells or cytotoxic T cells), CD16 + - cells (natural killer cells).

Humoral immunity link is characterized by CD19 +, CD20 +, CD21 + i CD22 + -cells (B-lymphocytes in different phases of maturation), and the levels of immunoglobulins of different classes (IgM, IgG, IgE, serum and secretory IgA). Since the synthesis of antibodies is T-dependent process, for proper evaluation of humoral immunity link the level of T-helper cells should be considered (CD4 + T cells), which once again confirms the reasonability of a comprehensive approach to interpret the immunogram.

Acute phase indices, blood protein and its fractions

Analysis of proteinogram. Synthesis of plasma proteins occurs mainly in the liver cells and reticuloendothelial system. The physiological role of blood proteins is to maintain oncotic pressure and acid-base balance of the blood, participate in the immune and blood clotting processes, transport of substances (bilirubin, cholesterol, drugs, cations) in the bloodstream etc. Total protein in the blood serum is an average inex and varies depending on age; in preschool age it is 56 - 85 g/l, and over 6 years - 65 - 85 g/l. The amount of the total protein concentration can be affected by *physiological factors*: changes in body position (from horizontal to vertical) and muscular activity (active physical work).

Albumin (35 - 55 g/l) is the main protein component of blood serum in normal physiological conditions synthesized in the liver.

Haptoglobin (less than 2,7 g/l, 150 - 2000 mg/l) is acute phase protein and hemoglobin carrier into the cells of the reticulo-endothelial system where hemoglobin is destroyed and bilirubin is formed.

Ceruloplasmin (0,15 – 0,60 g/l, 300 - 580 mg/l) is a protein having the properties of an enzyme that oxidizes Fe2 + to Fe3 +.

C-reactive protein (CRP) is synthesized in the liver under the influence of interleukin-6 and other toxins, it is not determined in healthy people by common methods (less than 0,08 mg/dL).

Blood glucose

Glucose is the most important monosaccharide of the blood formed by the metabolism of carbohydrates and convertion of liver glycogen.

The concentration of glucose in the blood of the newborn is similar to maternal amounts, on the 2nd day of life it drops to 2,6 mmol/l, further increasing and ranging from 2,6 to 4,0 mmol/l in newborns and 3,3 – 5,5 mmol/l in adults and older children. Blood glucose begins to rise after 10 - 15 minutes after meals, after 1 hour it reaches 8,9 – 9,9 mmol/l, and in 2 – 2,5 hours it returns to the original level.

Creatinine, blood urea

Creatinine is the final product of creatine breakdown in the muscle tissue. The amount of creatine, which is transformed into creatinine, is maintained at a constant level; creatinine is stable nitrogen component of the

blood; it does not depend on diet, circadian rhythms, or other biological constants. Normative values of creatinine serum depends on age: in infants it is 21,0 – 75,0 mmol/l, in early age – 21,0 – 36,0 mmol/l, aged 3 - 10 years – 27,0 – 53,0 mmol/l, in children older than 10 years – 34,0 – 77,0 mmol/l, in adolescents 44 - 88 mmol/l.

Urea is the final product of protein breakdown in the body (2,5 – 8,3 mmol/l). The main place of urea formation is the liver, the majority of urea is eliminated by glomerular filtration; about half of it is absorbed back into the flow.

Electrolytes of blood

Sodium (135 - 145 mg/dl) is the main cation of extracellular fluid.

Chlorine (95 - 110 mg/dl) is the main extracellular anion found predominantly in the ionized state due to the dissociation of sodium, potassium, calcium, magnesium salts and plays an important role in maintaining acid-base balance, osmotic balance, water balance in the body, activates amylase and takes part in the formation of gastric juice HCl.

Calcium (total calcium 2 – 2,5 mmol/l, ionized calcium 1,0 – 1,3 mmol/l) plays a role in reducing the permeability of tissue membranes, participates in the construction and skeletal system homeostasis and in neuromuscular activity.

Potassium (3,6 – 5,4 mmol/l) is the major electrolyte (cation) and a component of the intracellular buffer system, 90% of potassium is inside cells, only small amounts are present in the bones and blood.

Blood uric acid

Uric acid (children – 0,12 – 0,32 mmol/l) is the final product of purine metabolism - components of DNA.

Alkaline blood phosphatase

Alkaline phosphatase (ALP) is an enzyme that catalyzes the splitting-off of phosphoric acid from its organic compounds, located on the cell membrane in the lining of the intestine, osteoblasts, the walls of the liver bile ducts. In children, the activity of alkaline phosphatase depends on age: the newborns - 35 - 106 IU/l for 1 month - 71 - 213 IU/l to 3 years - 71 - 142 IU/l to 10 years - 106 - 213 IU/l.

Blood Serum Chemistry

Table 19

Blood Serum Chemistry - Normal Values	
Constituent	**Typical Normal Range**
Electrolytes	
Bicarbonate (total)	18-30 mEq/L

Calcium (total)	9-11 mg/dL; 4.5-5.5 mEq/L
Chloride	98-106 mEq/L
Magnesium	1.8-3.6 mg/dL; 1.5-3.0 mEq/L
Phosphorus	4-6.5 mg/dL; 2.3-3.8 mEq/L (children)
Potassium	3.5-5.5 mEq/L
Sodium	135-147 mEq/L
Enzymes*	
Alkaline Phosphatase	50-160 U/L
Amylase	53-123 U/L
Creatine Kinase (CK, CPK)	38-174 U/L (males)
	96-140 U/L (females)
Lipase	10-150 U/L
ALT (GPT)	0-30 U/L
AST (GOT)	0-40 U/L
Others	
Albumin	3.5-5.5 g/dL
Bilirubin	<1.0 mg/dL total
<0.4 mg/dL direct (glucuronide- or sulfate-conjugated)	
Cholesterol	<225 mg/dL (depends on age)
Creatinine	1.0-2.0 mg/dL
Globulin	1.5-3.5 g/dL
Glucose	80-120 mg/dL
Protein (Total)	6.3-8.0 g/dL
Triglycerides	40-200 mg/dL
Urea	20-40 mg/dL
Uric Acid	2.0-4.0 mg/dL

Notes: The normal ranges in each laboratory depend on the local population, test methodology and conditions of assay, units, and a variety of additional circumstances. ***** The units for enzyme activities are especially sensitive to such circumstances. The normal ranges above are typical, but the normal ranges established for each laboratory should be used for most purposes. The units g/dL (grams per deciliter) and mg/dL are sometimes expressed as g% and mg%, or g/100 mL and mg/100 mL.

Serological tests in case of infectious diseases

Serum (immunological) methods are based on the specific interaction between antigens and antibodies, used for the laboratory diagnosis of infectious and parasitic diseases, identification of persons who previously suffered infection, detection of intensity of immunity, tissue and tumor antigens, species belonging of protein, recognition of allergies and autoimmune disease, and hormonal disorders.

IgM - the "earliest" antibodies as they are produced in the early stages of infection.

IgG plays a major role in the humoral immune response in infectious diseases causing death pathogen involving complement.

IgA exists in two forms: the secretory and serum. It does not penetrate throung the placenta.

IgE - its half-life is 3 days in serum and 14 days on the membranes of mast cells and basophils.

Assessment of urinalysis

For qualitative urinalysis usuall a portion is taken, usually the first morning one (middle portion with free urination). In girls urine is prefered which is obtained by means of a catheter. Urinalysis includes macro and microscopy, chemical and physical examination.

The color of urine. The intensity of the color depends on the concentration of urinary pigments. The color of urine to certain extent differs in different age periods. On the first day of life it is colorless, in the next two-four days – dark red (uric acid infarction from uric acid excretion), in future – different shades of yellow.

Transparency. Normally fresh urine is clear.

The reaction of urine depends on the child's age and characteristics of its diet. Newborn urine is of weakly acidic reaction (pH 5.5 - 6), further during breastfeeding it has slightly alkaline reaction mostly, in children on artificial feeding - weakly acidic, and in children after 1 year it is usually slightly acidic.

The acidity of urine is closely related to renal function keeping RFK - reabsorption and excretion of bicarbonate ions and active secretion of hydrogen ions.

There are two types: alkaline urine (pH>8,0) and acidic urine (pH<6,5).

The relative density. The relative density of urine depends on the concentration of dissolved osmotically active substances in it. In children after 2 years the relative density of urine varies in a considerable range (from 1,010 to 1,025).

Glucose. Glycosuria occurs when the amount of glucose filtered exceeds the capacity of tubules to reabsorb it (serum glucose > 10 mmol/l) or when the function of the proximal tubules changes (Fanconi syndrome).

Protein. Typically, protein in the urine is absent, however, 0,033 ‰ of it is acceptable, the appearance of protein in the urine is called proteinuria (PU). Somewhat arbitrarily, there are three versions of PU: prerenal, renal, postrenal.

Urinary sediment. The main method of examination of urinary sediment is microscopic study of native drugs with assessment of its qualitative and quantitative composition. Elements of urinary sediment are divided into organic (cellular elements, cylinders, bacteria, fungi, parasites)

and nonorganic (salts). Cellular elements include epithelial cells, erythrocytes and leukocytes.

Hematuria. Hematuria is defined as the presence of blood or red blood cells in the urine. Three or more red blood cells in the visual field of the microscope at high magnification should be considered pathology.

Leukocyturia. The normal content of leukocytes in urine - 1 - 3 in the visual field for boys (allowed 5) and 10 for girls.

Cylinderuria. Among all the components of urinary sediment only cylinders are of exclusively renal origin and represent a cast resembling a tubule by its shape.

Urinary salts. In normal urine calcium oxalate, calcium phosphate or uric acid crystals can be found.

Normal values are as follows:

Color – Yellow (light/pale to dark/deep amber)
Clarity/turbidity – Clear or cloudy
pH – 4.5-8
Specific gravity – 1.005-1.025
Glucose - ≤130 mg/d
Ketones – None
Nitrites – Negative
Leukocyte esterase – Negative
Bilirubin – Negative
Urobilirubin – Small amount (0.5-1 mg/dL)
Blood - ≤3 RBCs
Protein - ≤150 mg/d
RBCs - ≤2 RBCs/hpf
WBCs - ≤2-5 WBCs/hpf
Squamous epithelial cells - ≤15-20 squamous epithelial cells/hpf
Casts – 0-5 hyaline casts/lpf
Crystals – Occasionally
Bacteria – None
Yeast - None

Zimnitsky Analysis of Urine

Very important test to assess renal osmoregulatory function is to determine the changes in the relative density of urine over a certain period of observation (more often daily). For this analysis the samples are collected in 8 portions of urine with 3-hour intervals.

In a healthy person daily diuresis always prevails over night (2 – 2,5: 1); the range of relative density varies from 1,002 to 1,030 (at least 7 units).

Nechyporenko Analysis of Urine

Nechyporenko test is indicated in case of presence of formed blood elements in urinary sediment (erythrocytes - 3 - 5 in sight, leukocytes - 5 - 6 in sight), and cylinders. This test determines the content of red blood cells, white blood cells and cylinders in 1 ml (or 1 liter) of urine.

Normal values of formed blood elements in 1 liter of urine sample according to Nechyporenko test are: leukocytes - up to 2 x 10^6, erythrocytes – 1,0 x 10^6 cylinders (hyaline) - up to 1,0 x 10^5.

Assessment of urine diastase

Diastase or alpha-amylase is a digestive enzyme that is synthesized predominantly in the pancreas and salivary glands in humans.

Normal rates vary between 16 - 64 units.

General feces analysis

Clinical analysis of feces (coprogram) includes a definition of its physical and chemical properties and microscopy.

Amount of feces in children under 1 month is 10 - 20 g/day, from 1 month to 6 months of breastfeeding 40 – 50 g/day, in case of formula feeding – 30 - 40 g/day.

The shape and texture of stool depends largely on the water content. The consistency of the stool depends on the age and nature of feeding, so in breastfed children it is viscous and pasty.

The color of feces in a healthy person has different shades of brown, depending on the availability of stercobilin.

The smell of feces in breastfed children is sour, formuka fed - putrid, and in older age - fecal not pungent.

Stool acidity (pH) in breastfed children is acidic (4,8 – 5,8), formula fed - slightly acidic (6,8 – 7,5), in older children - neutral (7,0 – 7,5).

Mucus in the stool normally is seen only in breastfed children in small amounts in the form of inclusions.

Blood in the stool of healthy children is not found, it usually appears in case of injured mucosa of the gastrointestinal tract and is a disturbing sign because usually the cause is a very serious disease.

Muscle fibers in the stool is a product of the processing of food of animal origin.

Connective fibers are nothing but the remains of food of animal origin, not overcooked. Normally they should be absent in the stool, the reasons for their appearance are similar to previous ones.

Starch belongs to carbohydrates and is found in large amounts in vegetables, fruits and cereals. Normally, the starch in the stool should be absent.

Fat and the products of its breaking down. Normally, a moderate amount of fat that enters the body, is completely absorbed (90 - 95%), so the stool can contain a small amount of soaps in the absence of neutral fat.

Neutral fats (or triglycerides) in stool are normally absent, as they are a major source of energy for the cells of the child's body.

Fatty acids are the product of the transformation of neutral fats.

Soaps are the remains of digestion of fats. Normally they should be present in stool in small amounts.

White blood cells in stool are found as single cell elements, it is normal and has no diagnostic value.

General analysis of sputum

Sputum is pathological secretion of the upper and lower respiratory tract (larynx, trachea, bronchi, bronchioles) and lungs (acini), discharged during coughing or expectoration.

Clinical examination of sputum includes macroscopic, microscopic, including cytology, bacterioscopic and bacteriological examination.

Macroscopic examination includes: the nature of sputum, quantity, color, odor, consistency, presence of various impurities.

Microscopic examination of sputum is conducted to identify and differentiate its morphological elements: a causative agent, nature of disease, the stage of disease, differential diagnostics of similar clinical conditions, to analyze the effectiveness of preventive measures.

Bacterioscopic examination: Gram staining of a tentative value to identify gram-positive and gram-negative microorganisms.

Microbiological examination of biological fluids and secretions

Microbiological diagnostics contains several basic methods of laboratory studies of infectious diseases: microscopic; bacteriological; molecular-genetic; allergic (method of skin-allergic tests); biological.

Microscopic method. Depending on the species belonging of a pathogen microscopic method is divided into bacterioscopic, virusoscopic, microscopic, parasitological.

Bacteriological method. Using the bacteriological method we can identify a causative agent in pure culture and accurately identify its belonging.

Molecular-genetic method is polymerase chain reaction. Currently, molecular-genetic diagnostic methods develop quicker, their purpose is to identify the fragments of DNA / RNA of microorganisms in the material examined.

Skin and allergic diagnostic tests. In case of many infectious diseases the condition of hypersensitivity to repeated penetration of pathogen, or the products of its life occurs. Skin and allergic diagnostic tests are used to

diagnose tuberculosis, actinomycosis, aspergillosis, ornithosis, brucellosis, tularemia, listeriosis, Q fever, anthrax.

The biological method. The biological method is used to identify the pathogen and toxin infection by means of infecting laboratory animals. The use of biological methods is appropriate for: rapid multiplication and accumulation of pathogens and their subsequent study (plague, tularemia); determine the type of toxin - neutralization reaction (botulism); obtaining specific inflammatory response in certain types of laboratory animals (rickettsiosis); study the effectiveness of chemotherapy.

Analysis of cerebrospinal fluid

CSF (cerebrospinal or spinal fluid, CSF) is a biological fluid, necessary for normal functioning of the central nervous system, formed in the vascular plexuses of the brain ventricles continuously at a rate of 0,2 – 0,8 ml/min, depending on intracranial pressure. CSF is obtained by puncture of the spinal canal, often - lumbar being done in accordance with the method, using at least three tubes: for general clinical, biochemical and bacteriological studies.

Proper laboratory test of CSF includes the following steps: macroscopic analysis - assessment of physicochemical properties (volume, color, transparency); cytology; microscopy of a native drug and cytological examination of stained preparation; biochemical examination; microbiological examination.

Normal CSF is colorless and transparent.

CSF pressure. In normal CSF pressure ranges from 10 to 100 mm.wat.col. in young children, and 60 - 200 mm. wat.col. aged 8 years and older.

The relative density of cerebrospinal fluid obtained by lumbar puncture is 1,006 – 1,007.

Protein in the cerebrospinal fluid. More than 80% protein enters the CSF from the plasma by ultrafiltration. The protein content is normal in different portions: the ventricular – 0,05 – 0,15 g/l, cysternal – 0,15 – 0,25 g/l lumbar – 0,15 – 0,35 g/l.

Glucose in cerebrospinal fluid. For correct assessment of glucose in liquor it is recommended simultaneously determine its level in the blood, where it is normally twice as higher.

Chlorides in cerebrospinal fluid are within 18 - 132 mg/dl.

Liquor cytogram. In the analysis of CSF it is important to evaluate the ratio of protein and cellular elements (dissociation).

Microbiological examination by liquor. One of the most common diseases of the central nervous system is purulent meningitis. In such cases microbiological examination is especially important. It includes a reference test - drugs bacterioscopy and classical cultural techniques.

Total volume: 150 mL
Color: Colorless, clear, like water
Opening pressure - 90-180 mm H_2O (with patient lying in lateral position)
Osmolarity at 37°C: 281 mOsm/L
Specific gravity: 1,006 to 1,008
Acid-base balance:
pH: 7,28-7,32
Pco_2: 47,9 mm Hg
HCO_3-: 22,9 mEq/L
Sodium: 135-150 mmol/L
Potassium: 2,7-3,9 mmol/L
Chloride: 116-127 mmol/L
Calcium: 2,0-2,5 mEq/L (4,0 to 5,0 mg/dL)
Magnesium: 2,0-2,5 mEq/L (2,4 to 3,1 mg/dL)
Lactic acid: 1,1-2.8 mmol/L
Lactate dehydrogenase: Absolute activity depends on testing method; approximately 10% of serum value
Glucose: 45-80 mg/dL
Glutamine - 8-18 mg/dL
Lactate dehydrogenase (LDH) - <2,0-7,2 U/mL
Proteins: 20-40 mg/dL
At different levels of spinal parts:
Lumbar: 20-40 mg/dL
Cysternal: 15-25 mg/dL
Ventricular: 15-10 mg/dL
Normal CSF proteins concentration in children:
Up to 6 days of age: 70 mg/dL
Up to 4 years of age: 24 mg/dL
Electrophoretic separation of spinal fluid proteins (% of total protein concentrations)
Prealbumin: 2-7%
Albumin: 56-76%
a_1-Globulin: 2-7%
a_2-Globulin: 3,5-12%
b-and g-globulin: 8-18%
g-Globulin: 7-12%
Oligoclonal stabs - absent
Immunoglobulins
IgG: 10-40 mg/L
IgA: 0-0,2 mg/L
IgM: 0-0,6 mg/L

k/l ratio: 1
Erythrocyte count:
Newborn: 0-675/mm^3
Adult: 0-10/mm^3
Leukocyte count:
Children:
Younger than 1 year: 0-30/mm^3
Age 1-4 years: 0-20/mm^3
Age 5 years to puberty: 0-10/mm^3
Antibodies, viral DNA – None
Bacteria (Gram stain, culture, VDRL) – Negative
Cancerous cells – None
Cryptococcal antigen – None

Analysis of pleural fluid

Normally the pleural space contains about 1 ml of fluid, and pleural effusion is suspected when there is an accumulation of at least 10 - 20 ml of fluid.

Normally pleural fluid has the following characteristics: clear ultrafiltrate of blood plasma pH 7,60 - 7,64, protein content of less than 2% (10 - 20 g/l), less than 1000 white blood cells/mm; sugar content is similar to blood plasma level, lactate dehydrogenase level is 50% lees of that in the blood plasma, levels of sodium, potassium and calcium similar to interstitial fluid.

Analysis of ascitic fluid

Ascites is an excessive accumulation of fluid in the abdominal cavity. The causes are heart failure, liver cirrhosis, nephrotic syndrome, peritonitis, tuberculosis etc.

Uninfected ascites is sterile transudate with a relative density below 1015, low in protein (less than 20 - 30 g/l). The number of white blood cells is less than 0,25 x 10^9/l, of which about 15% - neutrophils

Analysis of sternal punctate

Morphological study of the bone marrow is conducted to verify the diagnosis and quantitative assessment of the function of bone marrow hematopoiesis in patients with various forms of hemoblasts, anemia and several other diseases, and to monitor the effectiveness of therapy.

Table 20

Myelogram of healthy children (according to E. J. Malakhowsky) and adults (according to G.A. Alekseev),%

Cellular shapes	Age				
	3-7 months	1 year	2 year	3 year	adults
Reticular cells	0,14 - 1,38	0,45 - 2,03	0,44 - 1,84	0,05 - 1,43	0,1 - 1,0
Undifferentiated blasts	0,59 - 3,51	0,86 - 4,03	1,59 - 3,39	1,31 - 2,69	0,1 - 1,0
Myeloblasts	0,71 - 2,75	1,47 - 2,65	1,62 - 2,98	0,75 - 3,25	0,25 - 0,4
Neutrophil promyelocytes	4,2 - 7,5	4,47 - 6,53	2,33 - 4,05	2,84 - 5,78	0,5 - 8,0
Neutrophil myelocytes	6,94 - 11,46	9,13 - 14,47	7,21 - 11,33	8,46 - 11,86	4,5 - 16,8
Neutrophil methamyelocytes	4,61 - 7,73	6,8 - 10,2	5,45 - 8,47	7,11 - 8,97	9,0 - 21,6
Stabs neutrophils	13,12 - 19,8	7,64 - 20,16	14,76 - 22,44	13,98 - 25,42	14,0 - 33,0
Segmented neutrophils	6,06 - 9,88	8,37 - 16,23	9,75 - 20,45	13,27 - 22,53	13,0 - 27,0
Promyelocyte eosinophilic	0	0 - 0,13	0	0 - 0,13	0 - 0,5
Myelocyte eosinophilic	0,05 - 0,75	0,09 - 0,73	0,68 - 1,12	0,09 - 0,85	0,5 - 4,0
Methamyelocyte eosinophilic	0,08 - 0,78	0,36 - 0,96	0,67 - 1,35	0,66 - 1,54	0,3 - 4,0
Stabs eosinophilic	0,04 - 0,80	0,08 - 0,56	0,06 - 0,66	0,24 - 0,74	0,5 - 3,2
Segmented eosinophilic	1,00 - 2,14	1,22 - 2,26	1,84 - 3,24	1,77 - 3,31	1,0 - 3,75
Segmented basophilic	0 - 0,22	0 - 0,09	0 - 0,21	0 - 0,13	0 - 0,25
Erythroblasts	1,70 - 3,08	0,91 - 2,39	0,99 - 1,93	0,75 - 1,97	0,5 - 6,0
Normoblasts basophilic	2,07 - 4,62	1,73 - 3,47	1,33 - 2,41	1,44 - 3,44	16,0 - 32,5
Normoblasts polychromatophilic	8,75 - 15,05	7,69 - 10,65	8,18 - 10,78	7,49 - 11,21	16,0 - 32,5
Normoblasts oxophilic	3,23 - 8,95	4,93 - 8,17	5,92 - 8,76	5,51 - 7,29	16,0 - 32,5
Lymphoblasts	0,05 - 2,11	0 - 1,72	0,05 - 1,21	0,04 - 1,08	1,2 - 11,5
Lymphocytes	16,30 - 25,25	10,21 - 16,39	12,15 - 17,85	6,68 - 13,52	1,2 - 11,5
Plasma cells	0 - 0,28	0 - 0,22	0 - 0,33	0 - 0,33	0,1 - 1,0
Monocytes	0 - 0,26	0 - 0,12	0,03 - 0,25	0 - 0,17	0,26 - 2,00
Leucoerythroblastic ratio	2,68 - 4,32	3,38 - 4,50	3,29 - 4,51	3,2 - 5,0	3,0 - 4,0
Number of megakaryocytes, $x10^9/L$	64,8 - 216,2	77,6 - 161,4	81,6 - 99,2	53,8 - 113,8	-
Number of myelokaryocytes, $x\ 10^9/L$	1,95-3,33	2,45-3,62	1,93-3,13	1,71-2,97	-

CHAPTER 6
INSTRUMENTAL STUDY
INTRODUCTION
ALGORITHM OF PRACTICAL SKILLS

Chest X-Ray Interpretation

You have probably seen chest X-ray (chest radiogram), or might even have had one taken. Have you ever wondered how to read a chest X-ray? Here is a quick and easy approach by following these simple steps and using the mnemonic “A,B,C,D,E,F,G,H,I”.

Before starting X-ray assessment:

1. Check the patient's name. In addition, make sure you are looking at the right chest X-ray first.

2. Read the date of the chest radiogram.

3. Note the type of film (estimate the type of chest X-ray image you are looking at: a plain film, CT, angiogram, MRI, etc.) For chest X-ray, there are several views as follows:

The standard view of the chest is the posterior-anterior radiogram or “PA chest”. Posterio-anterior refers to the direction of the X-ray transilluminating the patient from posterior to anterior side. This film is taken with the patient upright, in full inspiration (breathed in all the way), and the X-ray beam radiating horizontally 6 feet away from the film.

The anterio-posterior (AP) chest radiograph is obtained with the X-ray transilluminating the patient from anterior to posterior, usually obtained with a portable X-ray machine from very sick patients, those unable to stand, and infants. Because portable X-ray units tend to be less powerful than regular units, AP radiographs are generally taken at shorter distance from the film as compared to PA radiographs. The lateral chest radiograph is taken with the patient's left side of chest turned against the X-ray cassette (left instead of right to make the heart appear sharper and less magnified, since the heart is closer to the left side). It is taken with the beam at 6 feet away, as in the PA view.

An oblique view is a rotated view in between the standard front view and the lateral view. It is useful in localizing lesions and eliminating superimposed structures.

4. Note the technical quality of film. Exposure: overexposed films look darker than normal, making fine details harder to see; underexposed films look whiter than normal, and cause appearance of areas of opacification. Look for intervertebral bodies in a properly penetrated chest X-ray. An under-penetrated chest X-ray cannot differentiate the vertebral bodies from

the intervertebral spaces, while an over-penetrated film shows the intervertebral spaces very distinctly.

To assess exposure, look at the vertebral column behind the heart on the frontal view. If detailed spine and pulmonary vessels are seen behind the heart, the exposure is correct. If only the spine is visible, but not the pulmonary vessels, the film is too dark (overexposed). If the spine is not visible, the film is too white (underexposed).

Motion: Motion appears as blurred areas. It is hard to find a subtle pneumothorax if there is significant motion.

Rotation: Rotation means that the patient was not positioned flat on the X-ray film, with one plane of the chest rotated compared to the plane of the film. It causes distortion because it can make the lungs look asymmetrical and the cardiac silhouette disoriented. Look for the right and left lung fields having nearly the same diameter, and the heads of the ribs (end of the calcified section of each rib) at the same location to the chest wall, which indicate absence of significant rotation. If there is significant rotation, the side that has been lifted appears narrower and denser (whiter) and the cardiac silhouette appears more in the opposite lung field.

Airway: Check to see if the airway is patent and midline. For example, in a tension pneumothorax, the airway is deviated away from the affected side. Look for the carina, where the trachea bifurcates (divides) into the right and left main stem of the bronchi.

Bones: Check the bones for any fractures, lesions, or defects. Note the overall size, shape, and contour of each bone, density or mineralization (osteopenic bones look thin and less opaque), cortical thickness in comparison to medullary cavity, trabecular pattern, presence of any erosions, fractures, lytic or blastic areas. Look for lucent and sclerotic lesions. A lucent bone lesion is an area of bone with a decreased density (appearing darker); it may appear punched out as compared to surrounding bone. A sclerotic bone lesion is an area of bone with an increased density (appearing whiter). At joints, look for joint spaces narrowing, widening, calcification in the cartilages, air in the joint space, etc.

Cardiac silhouette: Look at the size of the cardiac silhouette (white space representing the heart, situated between the lungs). A normal cardiac silhouette occupies less than half the chest width.

Diaphragms: Look for a flat or raised diaphragm. A flattened diaphragm may indicate emphysema. A raised diaphragm may indicate area of airspace consolidation (as in pneumonia) making the lower lung field indistinguishable in tissue density as compared to the abdomen. The right diaphragm is normally higher than the left one, due to the presence of the liver below the right diaphragm. Also look at the costophrenic angle (which

should be sharp) for any blunting, which may indicate effusion (as fluid settles down). It takes about 300-500 ml of fluid to blunt the costophrenic angle.

Borders of the heart; **External soft tissues**: Check the borders of the heart for the silhouette sign: a radioopacity obscuring the heart border, in the right middle lobar and left lobar pneumonia, for example. Also, look at the external soft tissues for any abnormalities. Note the lymph nodes, look for subcutaneous emphysema (air density below the skin), and other lesions.

Fields of the lungs: Look for symmetry, vascularity, presence of any mass, nodules, infiltration, fluid, bronchial cuffing, etc. If fluid, blood, mucous, or tumor, etc. fills the air sacs, the lungs will appear radiodense (bright), with less visible interstitial marks.

Gastric bubble: Look for the presence of gastric bubbles, just below the heart; note whether it is obscured or absent. Assess the amount of gas and location of gastric bubbles. Normal gas bubbles may also be seen in the hepatic and splenic flexures of the colon.

Hila: Look for nodes and masses in the hila of both lungs. On the frontal view, most of the hilar shadows represent the left and right pulmonary arteries. The left pulmonary artery is always more superior than the right one, making the left hilum higher. Look for calcified lymph nodes in the hila, which may be caused by an old tuberculosis infection.

Instruments: Look for any tubes (e.g. tracheal nasogastric), IV lines, ECG leads, pacemaker, surgical clips, drains, prostheses, etc.

Some tips

A good rule for reading chest X-rays is to go from general observations to specific details.

Practice promotes achieving perfect results. Study and read numerous chest X-rays to become proficient therein.

Follow a systematic approach to read chest X-ray to make sure that you do not miss anything.

Always compare with previous X-rays whenever available. They will help you detect new disease and evaluate possible changes.

The cardiac size should be < 50% the diameter of the chest on PA film.

Rotation: look at the clavicular heads in relation to the spinous processes - they should be equidistant.

Blood pressure measurement and assessment in children

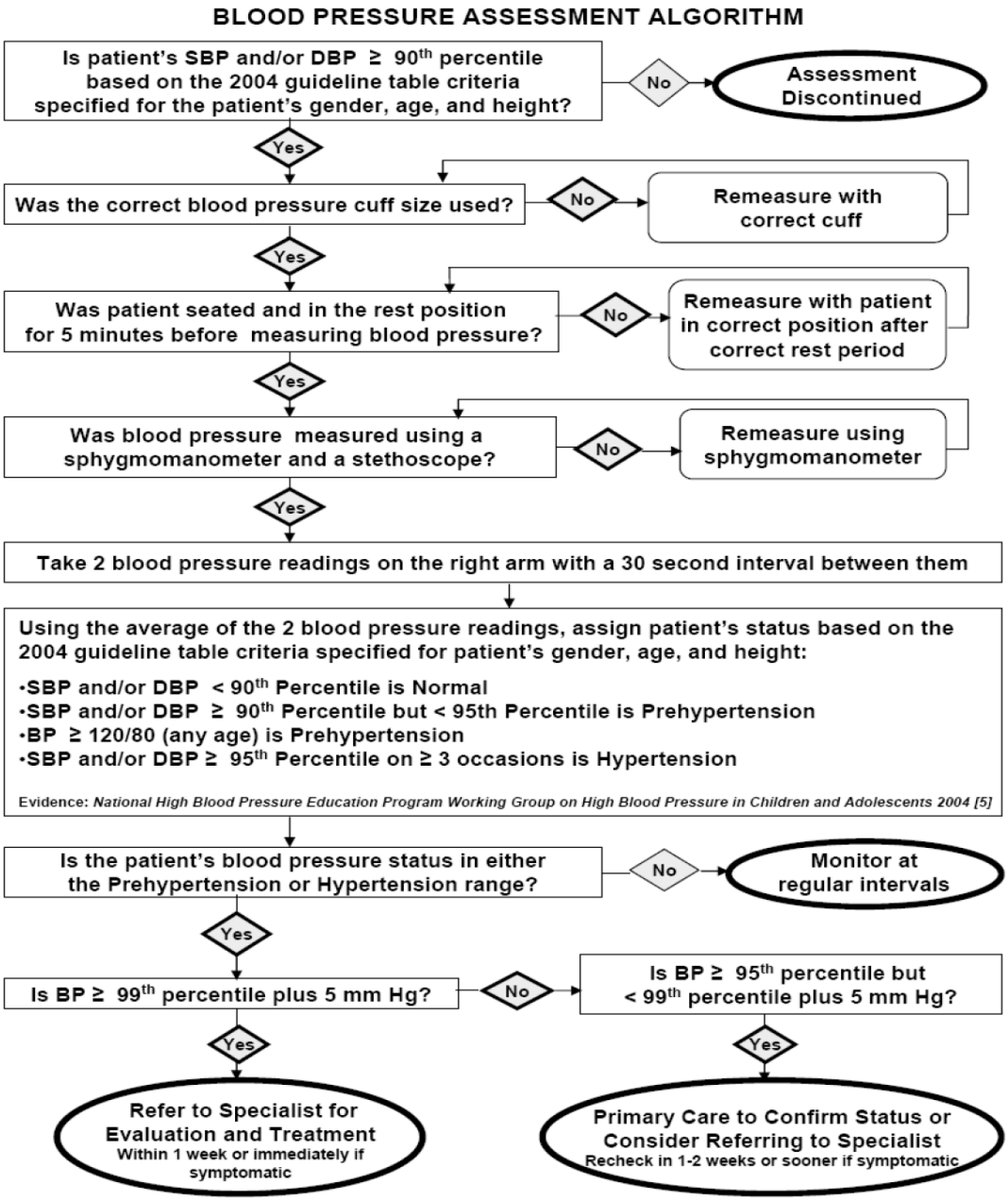


Table: Classification of Hypertension in Children and Adults with Measurement Frequency

	SBP* or DBP** Percentile	Frequency of BP Measurement
Normal	< 90th percentile	Recheck at next scheduled physical examination.
Prehypertension	90th to < 95th percentiles or ≥ 120/80 at any age	Recheck in 6 months.
Stage 1 hypertension	> 95th and < 99th percentile plus 5 mmHg	Recheck in 1-2 weeks or sooner if patient is symptomatic. If persistently elevated on 2 additional occasions, evaluate or refer to hypertension specialist within 1 month
Stage 2 hypertension	> 99th percentile plus 5 mmHg	Evaluate or refer to pediatric hypertension specialist (e.g pediatric nephrology or pediatric cardiology) within 1 week or immediately if symptomatic

*Systolic blood pressure **Diastolic blood pressure

Source: *(National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents 2004*

Measuring height in children and adolescents

Measuring Infants

Recumbent length refers to stature taken while lying down. Recumbent length is used to measure infants and children less than two years of age. Recumbent length can also be used for children two to three years of age who have great difficulty standing on their own; these children must be measured lying down and the measurement should be recorded as recumbent length. Two people must be involved to measure recumbent length. The infant should be wearing only a clean disposable diaper and undershirt. A child over the age of one should be wearing only light clothes. Shoes, sweaters, coats, etc. should be removed.

Procedure for Taking the Recumbent Length

Measurer: Cover the board with table paper.

Assistant: Ask the Assistant to remove hats, barrettes, shoes and socks. "High" hairstyles will need to be flattened as much as possible. If hair or barrettes interfere with placing the child's head directly against the measuring board, make a note of this on the questionnaire. (Do not attempt to adjust the measurement.)

Measurer: Provide a brief training to the Assistant on how to hold the child's head.

Measurer: Place the sliding foot piece at the end of the measuring board and check to see that it is sliding freely.

Assistant: Ask the Assistant to lay the child down on his/her back on the measuring board and stand directly behind the child's head. If it is not possible for the Assistant to stand behind the child's head, he/she may stand beside it.

Measurer: Position yourself on the right side of the child so you can hold the foot piece with your right hand.

Note: While the infant is on the measuring board, you must hold and control the child so that he/she will not roll off or hit his/her head on the board.

Measurer: Hold the child carefully at the waist while the Assistant positions the head.

Assistant: Ask the Assistant to cup his/her hands over the child's ears. The Assistant's arms should be straight if possible and he/she should hold the child safely yet comfortably. Make sure that the Assistant is cupping his/her hands. His/her hands should not be flat against the child's head and his/her thumbs should not be touching the child's shoulders.

Measurer: Ask the Assistant to place the child's head against the headpiece.

Measurer: If the head is not against the headpiece, hold the child at the waist and lift or slide the child towards the headpiece. The Assistant should hold the child's head all the time and guide the head into position.

Assistant: Check to be sure that the child's head is in the correct position. The line from the hole in the ear to the bottom of the eye socket (Frankfort Plane) should be perpendicular to the board or table.

Assistant: Ask the Assistant to place his/her head directly above the child's head and watch the position of the child during the entire measurement. Ask him/her to make certain that the child's chin is not tucked in against his/her chest or stretched too far back.

Measurer: Position the child's body so that the shoulders, back and buttocks are flat along the center of the board.

Measurer: Place your left hand on the child's knees. Hold the movable foot piece with your right hand and firmly place it against the child's heels. Child's legs and feet can be strong enough to offer resistance. You may have to straighten them with your hands.

Measurer: Check the child's position: head against the headpiece with eyes looking straight up, body and legs straight and flat in the center of the measuring board, heels and feet firmly against the foot piece.

Measurer: When the child's position is correct, read and call out the length measurement to the nearest 1/8". Continue to call out the measurement until the measurement is recorded.

Measurer: Record the measurement on the data collection sheet under "Recumbent Length". Check to make sure it is accurate and legible.

Note: It is acceptable to take two measurements that agree within 1/8" and use either one of those measurements.

Common Errors in Measuring Recumbent Length

Improper equipment used.

Hat, hair barrettes or big hairdos not removed.

Shoes, sandals, socks are not removed.
Child's head is not in correct position.
Child's head is not against headpiece.
Legs are not straightened or properly positioned.
Heels are not flat against the footboard.
Heels or legs are not flat against the recumbent board.
Only one leg is extended rather than both legs.

Child Guidelines

Standing height is used to measure children who are more than two years old and can stand without assistance.

Procedures for Taking Standing Height

Two people are required to take the standing height of a child under the age of six. The directions below can also be followed for older children except that the child can be instructed on how to position the body and head and does not require anyone to hold the knees and ankles. Children should be measured without shoes and heavy outer clothing such as sweaters and coats.

Ask the Assistant to remove socks and shoes from the child and remove or push aside any barrettes, braids, or hairstyles that might interfere with the measurement. High hairstyles will need to be flattened as much as possible.

Measurer: Provide a brief training to the Assistant on how to hold the child's knees and feet.

Assistant: Ask the Assistant to walk the child to the board and kneel on the right side of the child.

Measurer: Place the data collection sheet and pen/pencil on the floor near you and kneel on the left side of the child. Place the child's feet flat and either the knees or feet together in the center of the measuring board.

Assistant: Ask the Assistant to place her/his right hand just above the child's ankles on the shins and place her left hand on the child's knees and push against the board. Make sure that the child's legs are straight.

The position of the legs is important. The line that bisects the body from the side is called the "mid-axillary line." Make sure the mid-axillary line is perpendicular to the base of the board. This may mean that the child's feet may not touch the back of the measuring board, particularly in overweight or obese children.

Measurer: Tell the child to look straight ahead. Make sure the child's line of sight (Frankfort Plane) is on the level with the floor. The line from the hole in the ear to the bottom of the eye socket (Frankfort Plane) should be perpendicular to the board or table. In overweight, obese and older children, when the head is placed in proper position, according to the Frankfort Plane, there will be a space between the back of the child's head and the back of the measuring board. Do not judge the position of the child's head by looking at

the top of the head, use Frankfort Plane. Place your open left hand on the child's chin. Gradually close your hand. Do not cover the child's mouth or ears. Do not rest your left hand on the child's chest. Make sure that the shoulders are levelled (Arrow 10), the hands are at the child's side and the head, shoulder blades and buttocks are against the board, if appropriate. With your right hand, lower the headpiece on top of the child's head. Make sure that you push through the child's hair.

Measurer: When the child's position is correct, read and call out the measurement to 1/8 inch. Continue calling out the measurement.

Measurer: Record the measurement on the data collection sheet under "Standing Height". Check to make sure it is accurate and legible.

Measurer: If there were any unusual problems such as braids in the way or difficulty measuring the child, record this next to the measurement on the sheet.

Note: It is acceptable to take two measurements that agree within ¼" and use either one of those measurements.

Common Measurement Errors

Improper equipment used.

Equipment is not properly installed.

Footwear, heavy outer clothing, hats or hair barrettes are not removed.

Feet are not flat on the floor.

Knees are bent.

Head is not in a proper position.

Measurement is not read at eye level.

Procedure of weighing infants/children

Weighing Infants

Procedure of Weighing Infants/Children using the Beam Balance Scale

Cover scale with paper.

Place both the pound and the ounce sliding beam weights directly over their respective zeroes.

Loosen the screw on the adjustable zeroing weight or counter weight. Move it until the beam balances, then tighten the screw on the counter-weight.

Ask the Assistant to remove the infant's clothing except a dry diaper. A child over one year of age should have shoes and heavy outer garments such as sweaters and coats removed.

Ask the Assistant to place the child on his/her back or sitting on the tray of the scale. Make sure the child is centered in the tray and is not touching anything off of the scale tray including other parts of the scale.

Move the pound weight until you find the first notch where the beam falls, then move the weight back one notch.

Slowly push the ounce weight across the beam until it is balanced. You may need to move it back and forth in small increments several times to reach balance.

If the beam continues to move (e.g. when the child moves), steady the beam with your hand. It may be difficult to get the beam as steady as you would like; be patient and as careful as possible.

Read and call out the measurement to the nearest 1 ounce or 1/16 pound. Call out the weight repeatedly until it is recorded.

Record the weight on the data collection sheet. Make sure it is accurate and legible.

Have the Assistant remove the child from the tray of the scale and return the weights on the beam to zero in preparation for the next measurement.

Note: It is acceptable to take two measurements that agree within 4 oz and use either one of those measurements.

Procedure for Weighing Infants/Children Using a Digital Infant Scale

Cover scale with paper.

Activate the scale by turning it on. Zeroes will appear on the display panel. Make sure the scale is on "lb" rather than "kg".

Ask the Assistant to remove the child's clothing to undergarments.

Ask the Assistant to place the child on his/her back or sitting on the tray of the scale.

Make sure that the infant or child is not touching anything off of the scale.

The weight will appear on the display panel. If the weight changes (e.g. from 15lb 4oz to 15lb 5oz), record either number. Read and call out the weight to the nearest 1 ounce repeatedly until it is recorded.

Record the weight on the data collection sheet. Check it for accuracy and legibility.

Note: It is acceptable to take two measurements that agree within 4 oz and use either one of those measurements.

Common Errors in Measuring Weight of Infants/Children

Improper equipment is being used.

The scale is not properly zeroed or balanced.

Necessary clothing is not removed.

Child is not placed in center of scale tray.

Assistant is touching infant/child.

Infant/child is touching something off the scale or the scale itself.

Weighing Children and Adolescents

Procedure for Taking the Weight of Children and Adolescents Using a Beam Balance Scale

Place both sliding beam weights directly over their respective zeroes.

Loosen the screw on the adjustable zeroing weight or counter weight. Move it until the beam balances, then tighten the screw on the counter-weight.

Ask the child or Assistant to remove shoes and any heavy clothing such as jackets, sweatshirts, sweaters, etc.

Ask the child to step onto the scale. Make sure the child is centered on the platform and the arms are at his/her side.

Move the large 50-pound weight until you find the first notch where the beam falls, then move the weight back one notch.

Slowly push the small pound weight across the beam until it is balanced. You may need to move it back and forth in small increments several times to reach balance.

Read and call out the measurement to the nearest 1/4 pound. Call out the weight repeatedly until it is recorded. (Out of respect for children's privacy, call out weight so other children are not able to hear.)

Record the weight on the data collection sheet. Make sure it is accurate and legible.

Have the child step off of the scale and return the weights on the beam to zero in preparation for the next measurement.

Note: It is acceptable to take two measurements that agree within ¼ lb and use either one of those measurements.

Procedure for Taking the Weight of Children and Adolescents Using a Digital Scale

Activate the scale by turning it on. Zeroes will appear on the display panel. Make sure the scale is on "lb" rather than "kg".

Ask the Assistant or child to remove shoes and any heavy clothing such as jackets, sweatshirts, sweaters, etc.

Ask the child to step onto the scale. Make sure the child is centered on the platform and the arms are at his/her side.

The weight will appear on the display panel. If the weight changes (e.g. from 22,1 lb to 22,2 lb), record either number. Call out the weight to the nearest ¼ lb repeatedly until it is recorded. (In respect of children's privacy, call out weight so other children are not able to hear.)

Record the weight on the data collection sheet. Make sure it is accurate and legible.

Note: It is acceptable to take two measurements that agree within ¼ lb and use either one of those measurements.

Common Errors

Improper equipment is used.
Scale is not properly zeroed or balanced.
Footwear and heavy outer clothing are not removed.
Individual is not properly centered on scale platform.
Child is holding onto Assistant or scale.
Child is not remaining still on the scale.

Analyzing ECG in children

Analyzing ECG Rhythms in 5 Easy Steps

Step 1: Determine the Regularity of R Waves

Measure the interval between the first two R waves, and then measure each successive RR Interval, noting any variation in the rhythm – more than 0.12 seconds (3 small squares) means the rhythm is irregular. All of the QRS complexes should look the same. Any variation (in the rhythm or individual ectopic beats) must be noted.

Step 2: Calculate Heart Rate

- ***for Irregular Rhythms*:** Count the number of QRS complexes on a 6-second strip and multiply by 10. **This will be an estimate only.**

- ***for Regular Rhythms*:** Count the number of small squares between two consecutive R waves and divide 1500 by that number. (The Heart Rate Conversion Table can be used to quickly estimate the heart rate from the number of small boxes counted).

Step 3: Identify and Examine P Waves

Normal P waves are *present*, *upright*, *rounded*, and *regular* (*PURRS*). All of the P waves should look the same and the interval between successive sets of P waves should be the same. Inverted P waves indicate an impulse generated in the AV node; missing P waves represent impulses generated in the AV node or the ventricles (see Step 5, below). P waves of different shapes/orientation in a rhythm strip are indicative of atrial arrhythmia.

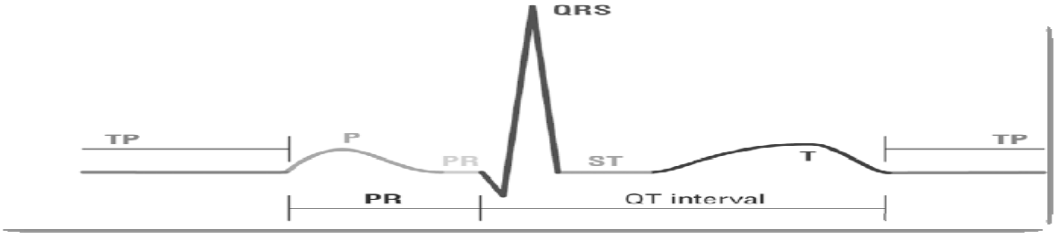
Step 4: Measure PR Interval

Measure the interval between the beginning of P wave and the first deflection of QRS complex. The interval should be between 0.12 and 0.20 seconds (3-5 small squares). PRI longer than 0.20 seconds is indicative of heart block.

Step 5: Measure QRS Complex

Measure the interval between the first deflection of QRS complex and the return to the isoelectric line. In aberrant complexes measure to the first identification of the T wave. The duration should be less than 0.12 seconds (3 small squares). QRS duration of longer than 0.12 seconds indicates an

impulse that has originated in the ventricles and/or has had delayed conduction through the ventricles.



P Wave:
The first deflection in the cardiac cycle represents Atrial depolarization. Normal P waves are small, upright, rounded, and regular (i.e., there should be one P wave for each QRS complex).

QRS Complex:
Represents the time in which depolarization of the ventricles occurs. Normal QRS complexes do not have a Q wave (or have only a very small deflection), are narrow, have the same shape (morphology), and are regular (i.e., there is one QRS complex for every P wave and the RR Interval is always the same). Normal duration is less than .12 seconds or less.

T Wave:
Represents the later phase in repolarization of the ventricles. Normal T waves are rounded and upright. T waves are usually larger than the P wave and smaller than the QRS complex.

U Wave:
An aberrant wave which follows the T wave in patients with electrolyte disturbances.

PR Interval:
The distance from the start of the P wave to the first deflection of the QRS complex is the PR Interval (PRI). The PRI represents the time required for the impulse to leave the SA node and travel through the atria. It should be between .12 and .20 seconds.

QT Interval:
Beings at the onset of the QRS complex and ends at the end of the T wave.

RR Interval:
The distance between the peaks of two consecutive R waves. The RR interval is used to measure the heart rate, and should be consistent from complex to complex.

ST Segment:
Represent the early phase of repolarization (absolute refractory period) of the right and left ventricles. The ST Segment should be along the isoelectric line, not elevated (above) or depressed (below) it.

TP Segment:
The segment between the T and P waves. Also known as the isoelectric line.

Heart Rate Quick Reference Chart

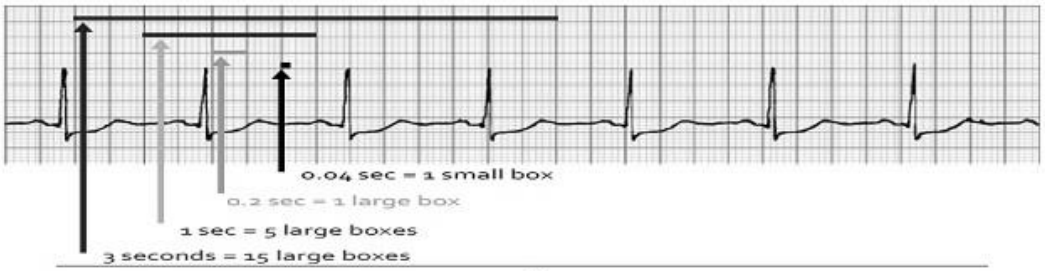
To calculate the heart rate of a *regular* rhythm, count the number of small boxes between the peaks of two adjacent R complexes then cross-reference on the chart below

Number of Small Boxes	Heart Rate
4	375
5	300
6	250
7	214
8	188
9	167
10	150
11	136
12	125
13	115
14	107
15	100
16	94
17	88
18	83
19	79
20	75
21	71
22	68
23	65
24	63
25	60

Number of Small Boxes	Heart Rate
26	58
27	56
28	54
29	52
30	50
31	48
32	47
33	45
34	44
35	43
36	42
37	40
38	39
39	38
40	38
41	37
42	36
43	35
44	34
45	33
46	33
47	32

Number of Small Boxes	Heart Rate
48	31
49	31
50	30
52	29
54	28
56	27
58	26
60	25
62	24
65	23
68	22
72	21
75	20
79	19
83	18
88	17
94	16
100	15
107	14
115	13
120	13
125	12

Graph Paper



CHAPTER 7
ORGANIZATION OF ANTI-EPIDEMIC MEASURES, DIAGNOSTICS AND THERAPEUTIC TACTICS OF CHILDHOOD INFECTIOUS DISEASES

7.1 INTRODUCTION

Symptoms of Dehydration

	Minimal Dehydration	Mild to Moderate Dehydration	Severe Dehydration
Weight loss (child older 3 years old)	less than 3 percent	3 to 9 percent	greater than 9 percent
Weight loss (child younger 3 years old)	less than 5 percent	5 to 9 percent	greater than 9 percent
General condition (consciousness)	anxiety	anxiety or drowsiness	lethargy, drowsiness
Capillary refill*	normal (less than 2 sec)	greater than 2 seconds	very prolonged or minimal
Mouth and tongue	moist	dry	parched
Lacrimation	saved	reduced	crying without tears
Eyes and/or fontanel in a baby	not sunken	slightly sunken	deeply sunken
Skin turgor test**	instant recoil	in less than 2 seconds	more than 2 seconds
Diuresis	saved 2-4 ml/kg/h	reduced 1-2 ml/kg/h	significantly reduced 1 ml/kg/h
Extremities	warm	cool	cool, mottled
Heart rate	normal	normal to increased	increased
Pulses	normal	normal to increased	weak
Breathing	normal	normal to fast	deep

*briefly press on your child's nail bed so that it blanches or turns white, and see how long it takes to return to normal

**gently pinch your child's skin on their abdomen, hold it for a few seconds and then let it go to see how long it takes to return to the normal position

Summary of Treatment Based on Degree of Dehydration

Degree of dehydration	Rehydration therapy	Replacement of losses	Nutrition
Minimal or no dehydration	Not applicable	**<10 kg body weight:** 60–120 mL oral rehydration solution (ORS) for each diarrheal stool or vomiting episode; **>10 kg body weight:** 120–240 mL ORS for each diarrheal stool or vomiting episode	Continue breast-feeding, or resume age-appropriate normal diet after initial hydration, including adequate caloric intake for maintenance
Mild to moderate dehydration	ORS, 50–100 mL/kg body weight over 3–4 hr	Same	Same
Severe dehydration	Lactate Ringer solution or normal saline in 20 mL/kg body weight intravenous amounts until perfusion and mental status improve; then administer 100 mL/kg body weight ORS over 4 hr or 5% dextrose ½ normal saline intravenously at twice maintenance fluid rates	Same; if unable to drink, administer through nasogastric tube or administer 5% dextrose ¼ normal saline with 20 mEq/L potassium chloride intravenously	Same

Differential diagnosis of croup

Signs	Diphtherial laryngeal foreign body	Viral laryngotracheitis	Epiglotitis	Foreign body	Congenital stridor
age	older than 2 years	less than 2 years	older than 2 years	2-5 years	from birth to 3y
etiology	Leffler's bacilli (C. diphtheria)	Viruses	bacteria (often - Haemophilus influenzae)		
local changes	fibrous inflammation with the formation of membranes	inflammation of the ligaments and subglottic area	inflammation of the epiglottis	overlapping of airways	congenital transient features airway
background	defective of vaccination	ARVI	sore throat, stomatitis	when eating, playing small parts	healthy
common symptoms	inspiratory dyspnea				
onset of disease	gradual	acute	acute	suddenly	from birth
general condition	severe	broken	severe (septic)	no intoxication	no intoxication
position	half-sitting, sitting	normal	«smelling» tilt forward	different	normal
cough	voice hoarseness to aphonia	"Barking"	blind, painful	obtrusive	no
vote	voice hoarseness to aphonia	voice hoarseness	quiet	call /voice hoarseness	sonorous
swallowing	disturbed	normal	disturbed	disturbed	normal
salivation	rarely	no	often	possible	no
fever	subfebrile	febrile	febrile	no	no
obstruction	gradual and consistent increase	fast progressive	fast, increases with head movements	suddenly	growing lying down, with waves

The term **croup** refers to a heterogeneous group of mainly acute and infectious processes that are characterized by a barklike or brassy cough and may be associated with hoarseness, inspiratory stridor, and respiratory distress.
Stridor is a harsh, high-pitched respiratory sound, which is usually inspiratory but it can be biphasic and is produced by turbulent airflow; it is not a diagnosis but a sign of upper airway obstruction

Differential diagnosis of viral hepatitis

Diagnostic signs	**Transmissible transmission**			**Fecal-oral transmission**	
	VHC	**VHB**	**VHD**	**VHA**	**VHE**
incubation	2 weeks - 3 months	2-6 months	2 weeks – 3 months	up to 45 days	up to 45 days
onset	gradual	gradual	suddenly	suddenly	suddenly
clinical variants before jaundice	Arthralgia, flu-like, mixed			dyspeptic	mixed
toxicosis before jaundice	small	small	significant	significant	significant
toxicosis in the appearance of icterus	no / small	significant	significant	decrease	significant
allergic rash	possible			no	
icteric period	≈ 2 weeks	3-5 weeks	2-8 weeks	2 weeks	2-3 weeks
transformation in chronic	often			no	
serological markers	anti – HCV anti - RNA HCV	HBsAg, HBeAg, anti -HBc-IgM, ДНК HBV	RNA – HDV, anti – HDV Ig M,	anti - HAV-Ig M	anti - HEV -Ig M

Differential diagnostic signs of ARVI

	Flu	Parainfluenza	Adenovirus infection	Rhinovirus infection	Respiratory Syncitial Virus infection
Primary localization	tracheitis	laryngitis	pharyngo-conjunctivitis	rhinitis	bronchiolitis
Onset of disease	sudden, with fever	acute	acute	acute	acute
General appearance	hyperemia of the face	inspiratory dyspnea	conjunctivitis	rhinorrhea	pale face
Intoxication	marked	moderate	moderate	small	moderate
Catarrhal syndrome	small	expressed, "Barking cough"	expressed	rhinorrhea	moderate
The body temperature	high	moderate	high, prolonged	normal	moderate
Other characteristic manifestations	headache muscle aches	voice hoarseness	possible diarrhea, lymphadenopathy, hepatomegaly		respiratory failure

Differential diagnostic signs of exanthema

Disease	Pathogen	Incubation period	The characteristic of exanthema			Other typical signs of disease	Isolation of patient	Quarantine to contact person
			Typical initial morphological elements	Typical localization	Other characteristic signs of rash			

Measles	Morbilli-virus	9-17 (21) d	Spotted (macula) - papular	diffusely	- turning (3 days) - merges - leaving pigmentation	Catarrhal period: - conjunctivitis - toxemia - airway inflammation - enantema on oral mucosa	Up to 5 days from appearance of rash	Non-immunized persons – 17 (21) days
Varicella	Herpes virus type III – Varicella zoster	11-21 d	vesicles (false polymorp hism)	diffusely	-simultaneous - rash repeated 2-5 times - itching - rash on mucous membranes		Up to 5 days after the last time of rash	Non-immunized persons – up to 7 years old – 21 days
Rubella	Rubivirus	11-21 d	Small spotted (at least - spotted-papular)	Extensor surfaces of extremities	- simultaneous - briefly	1-2 days before rash - posterior-cervical and occipital lymphadenopathy	Up to 5 days from appearance of rash	Non-immunized persons – 21 days
Scarlet fever	Hemolitic streptococc cus	1-7 d	Finely-point	Flexor surfaces of extremities, natural folds (s-m Pastia)	- simultaneous - hyperemia of skin - nasolabial triangle without rash - keeps peeling	- tonsillitis - toxemia - "Face Filatov" - "Raspberry" tongue	22 day from the onset of disease	7 days, in regular contact - 17 days

Differential diagnosis of tonsillitis

Disease	Hyperthermia	Pain when swallowing	Hyperemia and edema in the oropharynx	Membranes in the oropharynx perilacunar	Cervical lymph nodes	
Diphtheria of oropharynx	Moderate, severe cases – hyperpyrexia	Mild	perifocal edema	Membranes gray-white, two-sided, not removed, spreading beyond the tonsillar	Moderate increase; in severe cases - significantly, swelling of the subcutaneous tissue of the neck	Bacteriology - C. diphtheriae
Streptococcal tonsillitis	Moderate / significant	Moderate / severe	Hyperemia	White-yellow, single-duplex, within the tonsils	increased morbidity	Bacteriology – Strept.gr.B
Paratonsilar abscess	Moderate / significant	very expressive	infiltration on one side	White-yellow	increase and sharp pain	Difficulty opening the mouth (trismus) abscess formation
Vincent's tonsillitis	Moderate / mild	different	Moderate, one-sided	Ulcer on one of the tonsils with grayish-brown brittle necrosis	Moderate increase and tenderness of the lesions	Bacterioscopy - rods and spirochetes
Infectious mononucleosis	Moderate / significant	Moderate / mild	Moderate / significant	Brittle, white, yellow and white	Generalized descending lymphadenopathy	Hepatosplenomegaly, In blood test – mononuclears

Typical Cerebrospinal Fluid Findings in Various Types of Meningitis

Test	Normal	Bacterial	Viral	Fungal	Tubercular
Opening pressure	100-180	Elevated	Usually normal	Variable	Variable
White blood cell count, per mm^3	< 10	≥1000	<100 (100-1000)	Variable	Variable
Cell, differential	lymphocytes	Predominance of polymorpho-nucleocytes.	Predominance of lymphocytes	Predominance of lymphocytes	Predominance of lymphocytes
Protein, g/l	0,15-0,33	Mild to marked elevation	Normal to elevated	Elevated	Elevated
CSF-to-serum glucose ratio mmol/l	1/2	Normal to marked decrease	Usually normal	Low	Low

7.2 TASKS

№1. Child L, 3 years old, attends kindergarten, has hepatitis A. When a new child can join this group?

Correct answers: After 45 days after the last case registered in the group.

№2. The two-year boy, unvaccinated against measles. Yesterday he was in contact with a patient with measles while walking. How can we prevent the development of the disease in a contact child?

Correct answers: Introduce measles vaccine no later than 72 hours from the moment of contact in the absence of contraindications.

№3. The child became ill with chicken pox. Last rash appeared a week ago. When can the child go to visit a classmate who did not suffer from chicken pox?

Correct answers: Not earlier than5 days after the last appearance of the rash.

№4. Baby L, 3 years old, attends kindergarten. Yesterday he was in contact with a neighbour boy suffering from chicken pox. When can the contacted child attend kindergarten?

Correct answers: Not earlier than 21 days after contact.

№5. Child, 2 years old, suffering from whooping cough during month. Can a sick child visit a playground, where other children are playing?

Correct answers: Yes. Isolation of patients with pertussis is held 25 day since the disease onset.

№6. Child, 6 months, 3 days ago was in contact with a patient with measles. What preventive measures should be taken to prevent disease in the contact child?

Correct answers: To introduce measles human immunoglobulin not later than 5 day after the contact.

№7. Boy is sick for 5 days with mumps. When can a mother with a child go to the doctor in a children's polyclinic?

Correct answers: Not earlier than 9 days after the disease onset.

№8. Today a child with the younger group of kindergarten is hospitalized with the diagnosis of scarlet fever. When can the group accept the new baby?

Correct answers: After 7 days the last case is registered in the group.

№9. Boy, 2 years old, unvaccinated against measles. He was in contact with a child who is sick with measles (catarrhal period). The contact child was introduced to immunoglobulin. During which time can the contact child become ill?

Correct answers: 21 days.

№10. There is a case of meningococcal disease (generalized form - meningococcemia) in the boarding school. What are preventive measures among the contacted persons?

Correct answers: Observation for 10 days, taking smears from noso- and oropharynx, rifampicin, chemoprophylaxis.

№11. Child, 7 months, is sick with congenital rubella. He has intestinal invagination. Urgent surgical intervention is required. Where should this child be hospitalized for medical care?

Correct answers: Isolator of surgical department.

№12. Child 2 years, HIV-infected. What are preventive measures to child against polio?

Correct answers: IPV vaccination.

№13. Child has severe course of measles, complicated by pneumonia. When can relatives visit the patient with a child who has not had measles?

Correct answers: Not earlier than 10 days after the appearance of rash.

№14. The patient with localized form of oropharynx diphtheria was found in kindergarten. What are the measures to contact children in this group?

Correct answers: Observation for 10 days, daily temperature and oropharyngeal examination, taking smears from the oropharynx for Corynebacterium diphtheria, chemoprophylaxis – macrolides (erythromycin).

Prescription

Title	Form releases	Dose
Aciclovir	Flac. 0,25 g; Pills. 200 mg; ung. 3%; cream 5%	10-30 mg/kg/day
Adrenaline	Amp. 0,18% - 1 ml	s/c, i/m, i/v – 0,01-0,2 mkg/kg
Albendazole	Pills 200; 400 mg	10 mg/kg (max 400 mg) per os
Aminocapronic acid	Flac. 5% - 100 ml	100 mg/kg i/v, next - 30 mg/kg/hour. Profil.: 70 mg/kg
Amiodaronum	Pills 0,2 g; amp. 5% - 3 ml (150 mg)	Begin. dose 8-10 mg/kg, dose after 2,5-5 mg/kg
Amoxicillin	Caps and pills - 250 mg, 500 mg	20-50 mg/kg/day per os
Ampicillin	Pills 0,25 g, 0,5 g	10-25 mg/kg i/v, i/m, per os
Atropini sulfatis	Amp. 0,1% - 1 ml; Flac. 1% - 5 ml (eye drops)	0,02 mg/kg (max 0,6 mg) i/v, i/m, after – 0,01 mg/kg through 4-6 hours
Azithromycin	Caps. 250; 500 mg	5-12 mg/kg in first day, days after – 7,5 mg/kg
Beclometasoni dipropionas	Spray 200 doses (1 dose – 50 mkg); spray nas. 120 doses (1 dose – 50 mkg)	Aer. ingal. 100-200 мкg (< 8 years), 150-500 мкg (> 8 years) 2-4 time on day, i/n: every 12 hour (50-100 мкg)
Benzylpenicillin	1 000 000 AU in flac.	100 000 – 500 000 AU/day i/m, i/v
Bromhexini hydrochloridum	Pills. 4; 8 mg; Syrup 5 ml; Flac. 100 ml;	0,3 mg/kg - 0,15 mg/kg
Budesonide	Aeros. 200 doses (1 dose – 0,05 mg); aeros. forte 200 доз (1 dose – 0,2 mg);	100-600 mkg of ing.
Captopril	Pills 50 mg, 25 mg, 12,5 mg	0,1 mg/kg (older 12 years 5 mg) every 8 hours, max 1 mg/kg (adult 50 mg) every 8 hours
Cefaclor monohydrati	Caps. 0,5 g; Susp. 125 mg – 5 ml	10-15 mg/kg (adult 250-500 mg) per os
Cefadroxil	Caps. 500 mg	15-25 mg/kg (adult 0,5-1 g) per os
Cefalexin	Caps. 250 mg; Susp. 2,5 g	10-25 mg/kg (adult 0,25-1 g) per os
Cefazolin	Flac. 0,5 g, 1 g, 2 g	10-15 mg/kg (adult 0,5 g) i/m, i/v (max 50 mg/kg)
Cefepime hydrochloridum	500 mg in flac.	25 mg/kg (adult 1 g) every 12 hours i/m, i/v
Ceftazidime penhydrat	500 mg, 1000 mg, 2000 mg in flac.	15-75 mg/kg (adult 0,5-1 g) every 8 hours i/v, i/m
Cefuroxim	Flac. 250 mg, 750 mg, 1500 mg	Per os 10-15 mg/kg (older 12 years 250-500 mg) every 12 hours; i/v 25 mg/kg (adult 1 g) every 8 hours

Cetirizine	Pills 100 mg; flac. drops on 10 ml	0,2 mg/kg (adult 10 mg) per os
Cefixime	Pills 400 mg	5 mg/kg (adult 200 mg) every 12-24 hours
Cefotaxime	Flac. 0,5 g, 1 g, 2 g	50-200 mg/kg/day (adult 1 g)
Cefpodoxime	Pills 100 mg, 200 mg; Susp. 50 mg - 5 ml; Flac. 50 ml	5 mg/kg (adult 100-200 mg) every 12 hours per os
Ceftazidime penhydrat	500 mg, 1000 mg, 2000 mg in flac.	15-75 mg/kg (adult 0,5-1 g) every 8 hours i/v, i/m
Dexamethason	Pills 0,5 mg; Amp. 4 mg - 1 ml;	0,3-0,5 mg/kg i/m, i/v
Diazepamum	Pills 5 mg, 10 mg	0,1-0,4 mg/kg (older 12 years 10-20 mg) i/v, 0,04-0,2 mg/kg (older 12 years 2-10 mg) through 8-12 hours per os
Diclofenac	Amp. 3 ml; Pills 25 mg	1 mg/kg (older 12 years 50 mg) through 8-12 hours per os
Digoxin	Pills 0,00025 mg	1-2 years - 0,04-0,08 mg/kg/day; 2-10 years – 0,03-0,06 mg/kg/day; older 12 years - 0,001-0,012 mg/kg
Dobutaminum	Flac. 20 ml (250 mg); Amp. 5% - 5ml	1-20 mkg/kg/min i/v
Dopamine	Amp. 25 mg, 50 mg, 100 mg, 200 mg – 5 ml	1-20 mkg/kg/min i/v
Enalapril	Pills 0,005 g, 0,01 g, 0,02 g	0,1-1,0 mg/kg per os
Euphyuinum	Pills 0,15 g; Amp. 2% - 5 ml; 24% - 1 ml, 2,4% - 10 ml	2-7 mg/kg (max 500 mg) i/v
Fenoterolum	Aeros. 15 ml (300 doses); Pills 0,005 g; Amp. 0,5 mg	Per os 0,1 mg/kg. Ingal.: 0,5-1 mg/ml. Aeros. 200 mkg/spr. every 4-8 hours
Fluconazole	Caps. 50; 100; 150 mg	3-12 mg/kg per os, i/v
Fluticasone propionate	Spr. nos. 60 doses, 120 doses (50 мkg/dose; 125 мkg/dose; 250 мkg/dose); Ung. 0,005% in 15 mg	100-200 mkg (< 8 years), 100-500 mkg (> 8 years)
Furosemiduin	Pills 0,04 g; amp. 1% - 2 ml	0,1-1 mg/kg (adult 20-40 mg) through 6-24 hours per os, i/m, i/v
Gentamicini sulfas	Flac. 0,08 g; amp. 4% - 1 ml, 2 ml; Ung. 0,1%; eyedrops 0,3%	4-8 mg/kg/day i/v, i/m
Heparinum	Flac. 5 ml (5000 AU, 10 000 AU, 20 000 AU - 1 ml); Amp. 0,1 ml	1 mg=100 AU, 10-200 AU/kg/hour

Hydrocortisoni natrii succinas	Flac. 100 mg, 500 mg;	0,2-5 mg/kg i/m, i/v, per os, 15-20 mg/m^2
Ibuprofen	Pills 0,2; 0,4 g	5-20 mg/kg/d after 6-8 hour.
Indometacimim	Pills 0,025 g; Amp. 1 ml – 0,03 g	0,5-1 mg/kg (>12 years 25-50 mg) after 8 hour (max 6 hour) per os.
Insulin	100 AU/ml; 5 ml and 10 ml in flac.	0,05-0,2 AU/kg; 0,1 AU/kg/hour
Ipratropium bromide	Aeros. 40 мkg - 200 doses	Liq. ingal. 250 mkg/ml – 0,25-1 ml
Lidocaine	Amp. 2% - 2 ml; 10% - 2 ml	1 mg/kg (0,1 ml/kg 1%), after 15-50 mkg/kg/min i/v
Lincomycin	Caps. 0,25 g	10 mg/kg (max 600 mg) after 8 hour her os, i/m, or i/v more than1 hour. Severe infection: till 20 mg/kg (max 1,2 g) i/v more than 2 hour after 6 hour.
Loratadine	Pills 0,01 g; syrup 5 mg/5 ml	0,2 mg/kg per os
Mannitol	Liq. 15 g – 100 ml	0,25-0,5 g/kg i/v (2-4 ml/kg 12,5%, 1,25-2,5 ml 20%, 1-2 ml/kg 25% through 2 hours)
Meloxicam	Pills 0,015 g; Amp. 15 mg - 1 ml;	0,15-0,3 mg/kg (adult 7,5-15 mg) every day per os
Methylprednisolonum	Pills 4, 8, 16, 32 mg	0,5-1 mg/kg
Metoclopramidum	Pills 10 mg; Amp. 2 ml	0,15-0,4 mg/kg (adult 10-15 mg) through 6 hours i/v, i/m, s/c
Montelucast	Pills 4 mg, 5 mg, 10 mg	5 mg (6-14 years), 10 mg (> 14 years) per os
Nifedipin	Pills 10 mg, 20 mg; Flac. 50 ml	caps. 0,25-0,5 mg/kg (adult 10-20 mg), pills 0,5-1 mg/kg (adult 20-40 mg) per os
Nystatin	Pills 500 000 AU	50 000 – 1,5 mln AU - every 6-8 hours per os
Paracetamolum	Pills and caps. 0,2; 0,325; 0,5 g; Syrup 100 mg - 5 ml	Per os 10 mg/kg, after 15 mg/kg through 4 hours (max 4 g/days)
Phenobarbital	Pills 100 mg, 50 mg	5-30 mg/kg i/m, i/v, per os (max 300 mg)
Phentolaminum	Pills 0,025 g; Amp. 1 ml (10 mg)	0,1 mg/kg, next 5-50 mkg/kg/min i/v
Phytomenadionum	Amp. 1% - 1 ml; Caps. 0,01 g	0,1-0,3 mg/kg (max 10 mg) i/v
Prednisolone	Pills. 5 mg; Amp. 25 mg, 30 mg - 1 ml; Ung. 0,5%	1-4 mg/kg/days

Propranolonum	Pills 10 mg, 40 mg, 80 mg; amp. 0,1% - 5 ml	i/v 0,02 mg/kg (adult 1 mg), next 0,1 mg/kg (adult 5 mg), next 0,1 - 0,3 mg/kg (adult 5-15 mg) through 3 hours. Per os 0,2 - 0,5 mg/kg (adult 10-25 mg) through 6-12 hours, max 1,5 mg/kg (max 80 mg)
Pyracetamum	Pills 0,2 g; Caps. 0,4 g; 20% - 5 ml, 10 ml in amp.	15 mg/kg (max 800 mg) through 8 hours s/c, i/m, i/v
Pyrantel	Susp. 15 ml; Pills 0,25 g	10-20 mg/kg
Rifampicin	Caps. 0,15 g	10-15 mg/kg (max 600 mg) per os, i/v
Roxithromycine	Pills 0,05 g, 0,1 g, 0,15 g, 0,3 g	2,5-4 mg/kg (adult 150 mg) per os
Salbutamolum	Aeros. 100 мkg – 200 doses	0,1-0,15 mg/kg; 100 mkg/spr.; 1-3 times every 20 min., next at necessity
Tobramycin	Amp. 100, 400 mg in 1 ml, 2 ml	2-10 mg/kg/day i/v, i/m
Vancomicin	Flac. 0,5 g, 1 g	10 mg/kg i/v, i/m
Verapamil	Caps. 0,04 g; Amp. 5 mg - 2 ml.	i/v: 0,1 - 0,2 mg/kg, per os 0,001 - 0,003 мkg/kg

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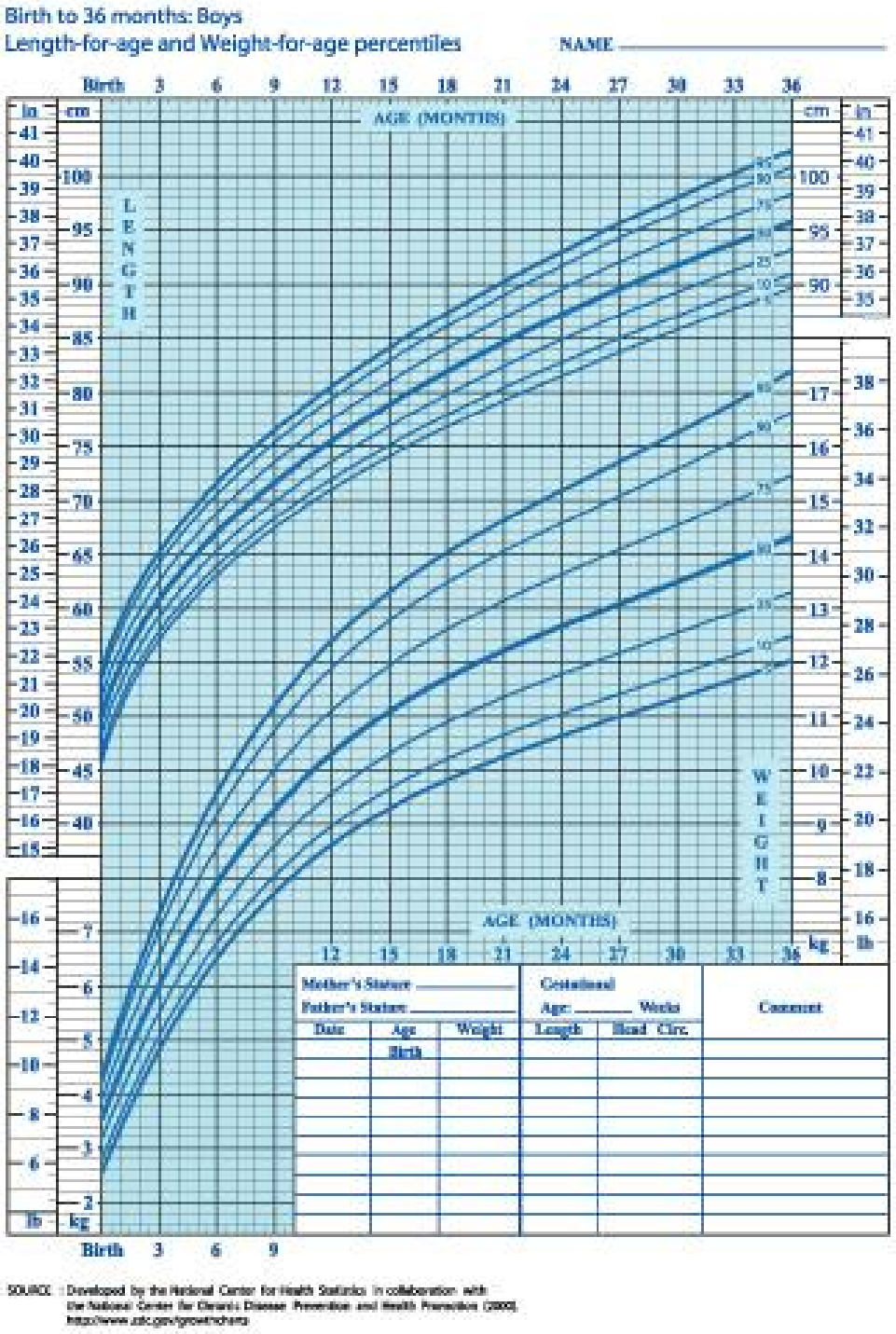
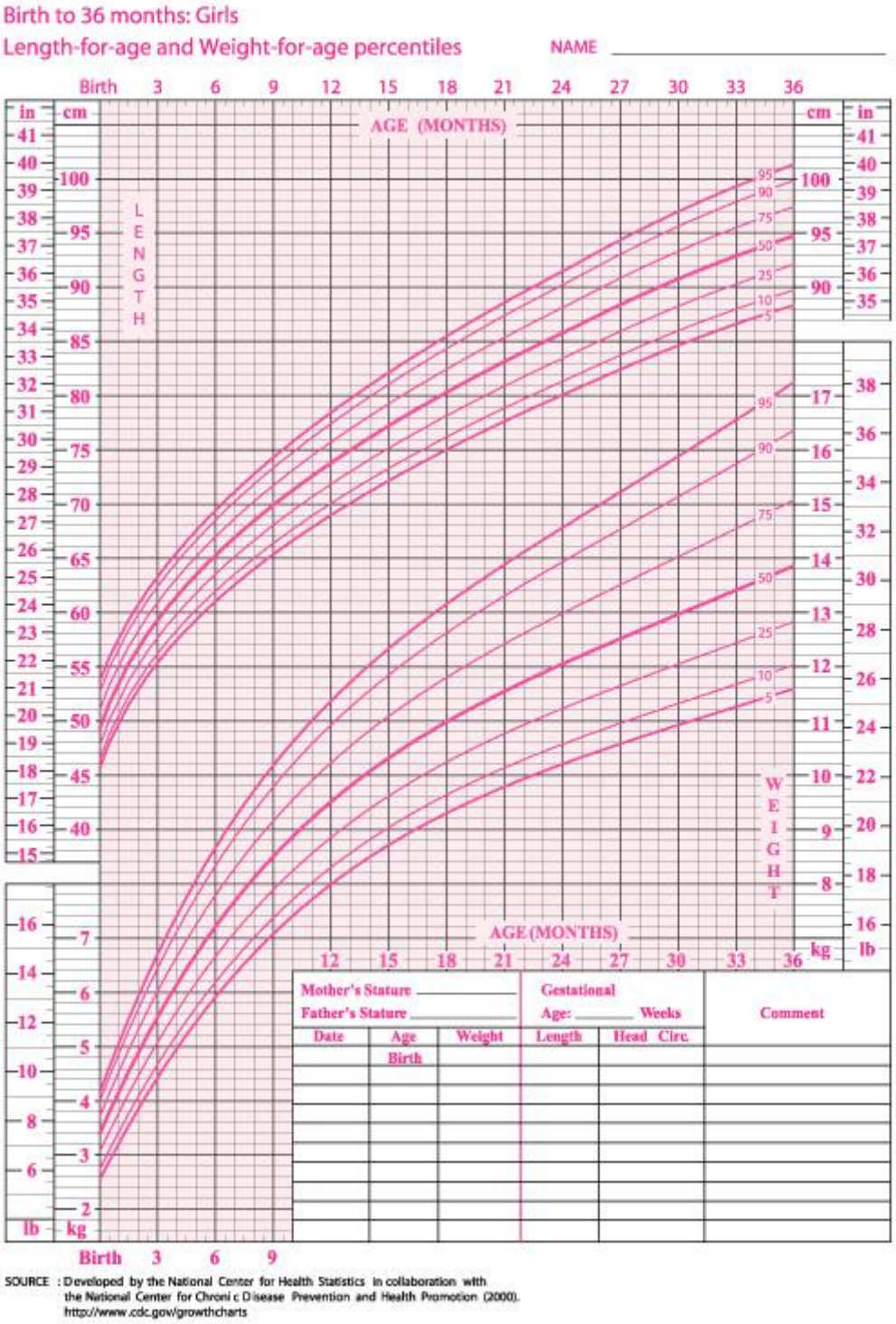
Appendices

Appendix 1. Birth to 36 months: Boys (Length-for-age and weight-for-age percentiles)

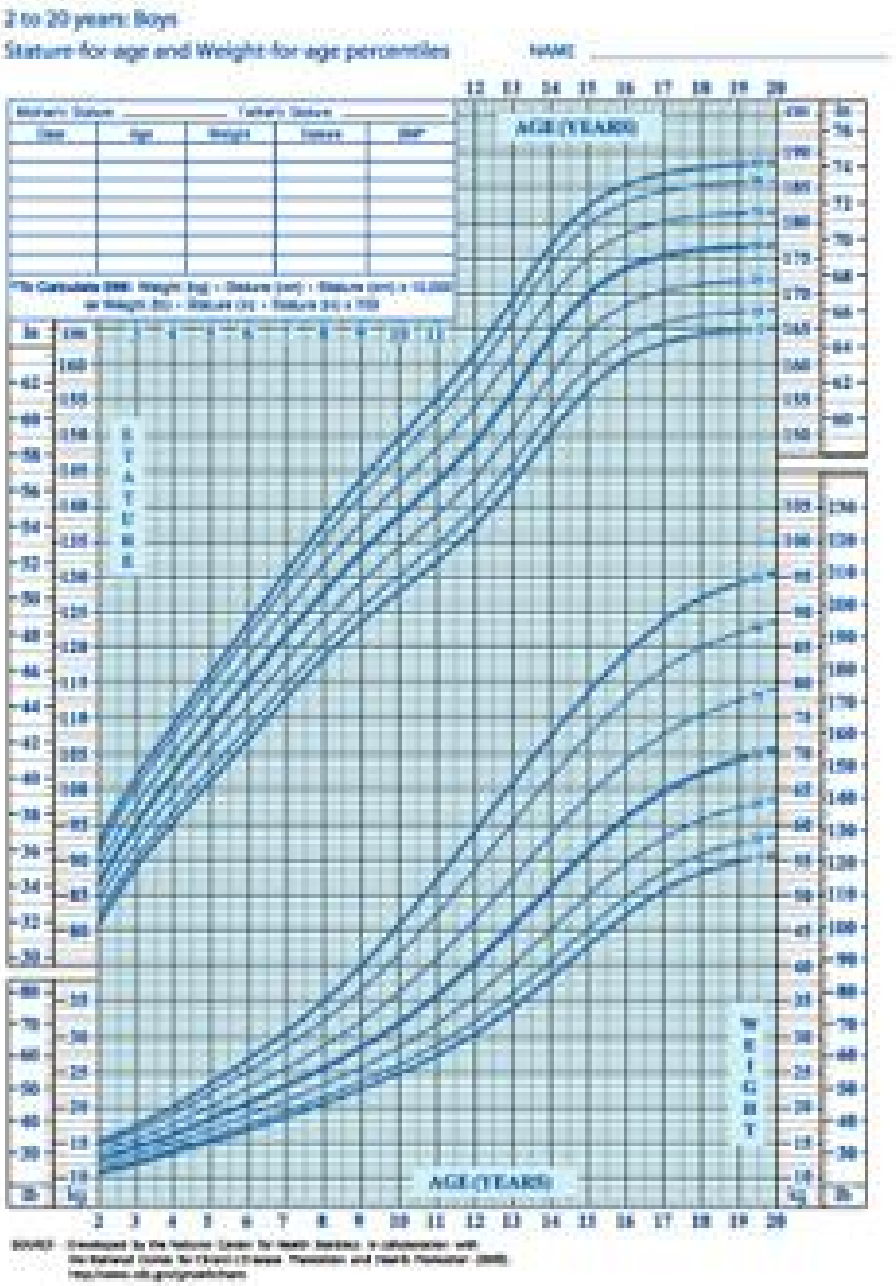


SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000). http://www.cdc.gov/growthcharts

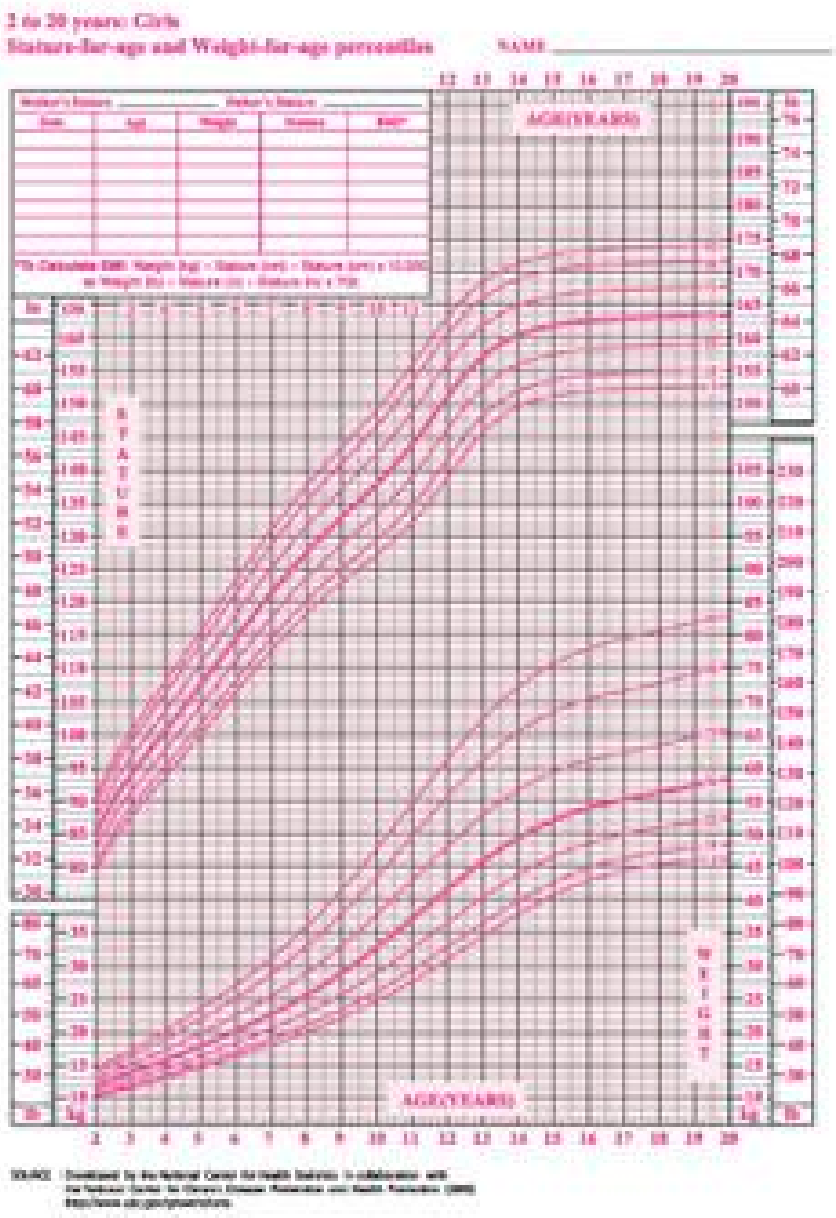
Appendix 2. Birth to 36 months: Girls (Length-for-age and weight-for-age percentiles)



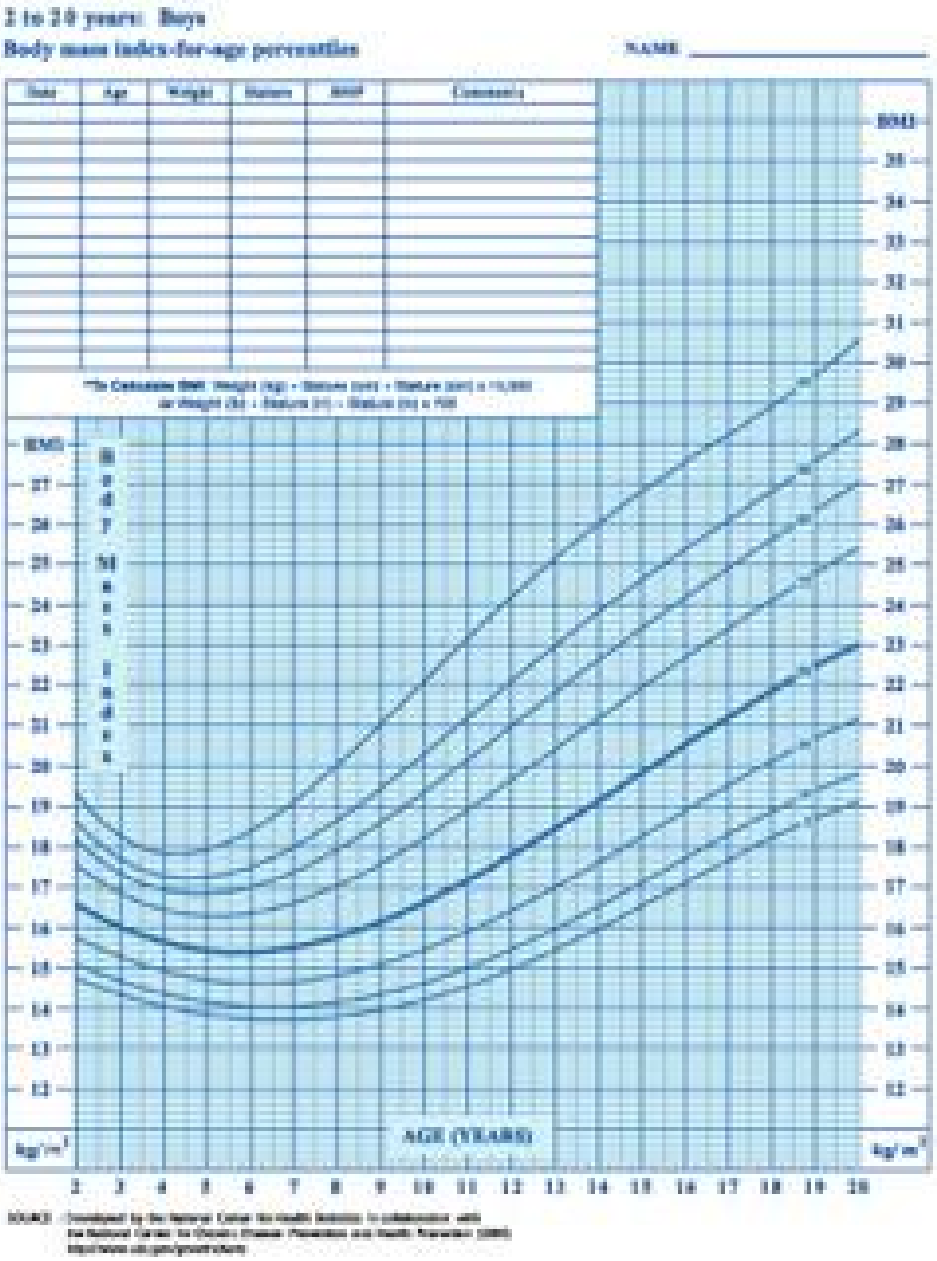
Appendix 3. 2 to 20 years: Boys (Stature-for age and Weight-for-age percentiles)



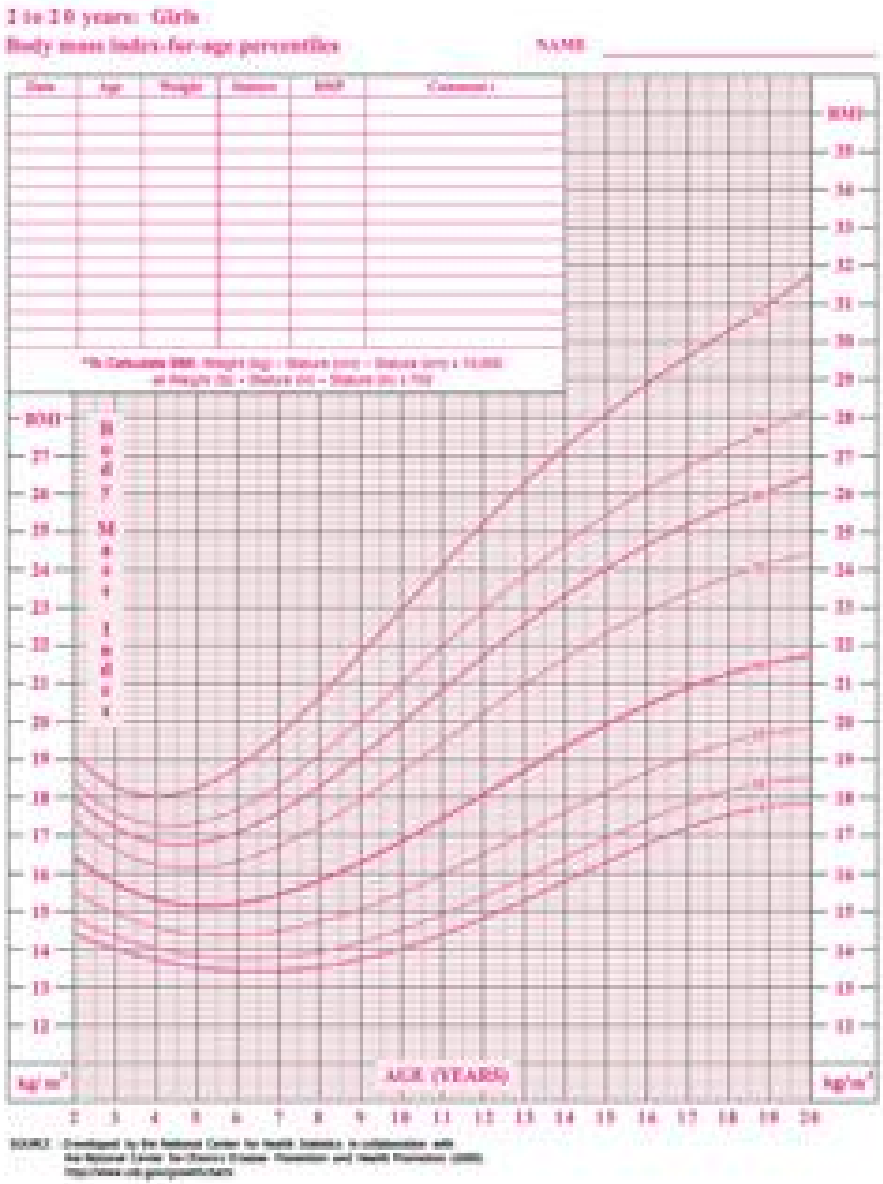
Appendix 4. 2 to 20 years: Girls (Stature-for age and Weight-for-age percentiles)



Appendix 5. 2 to 20 years: Boys (Body mass index-for-age percentiles)



Appendix 6. 2 to 20 years: Girls (Body mass index-for-age percentiles)



Appendix 7. Illustrations to assess individual parameters of puberty for girls and boys Tanner.