UDC 355.511.512+614.2+347.157+616.1/.4-053.2-036.12+371.71+004.01
DOI: 10.56871/CmN-W.2024.98.73.002

MODERN DIGITAL TECHNOLOGIES FOR ASSESSING "CHILDREN'S SPACE" IN HEALTH AND DISEASE

© Anatoly S. Simakhodsky[1], Valentin V. Shapovalov[2], Natalya V. Petrova[3], Ludmila D. Sevostyanova[4], Irina A. Leonova[5], Oleg A. Simakhodsky[6]

[1] Research Institute of Pediatric Surgery and Pediatrics, Pavlov First Saint Petersburg State Medical University. 6–8 L'va Tolstogo str., Saint Petersburg 197022 Russian Federation
[2] Saint Petersburg State Electrotechnical University named after V.I. Ulyanov (Lenin). 5 letter F Professor Popov str., Saint Petersburg 197022 Russian Federation
[3] Pavlov First Saint Petersburg State Medical University. 6–8 L'va Tolstogo str., Saint Petersburg 197022 Russian Federation
[4] Organizational and methodological center for analysis and prognosis of maternal and child health of the Health Committee of Saint Petersburg. 6 Gorokhovaya str., Saint Petersburg 191186 Russian Federation
[5] V.A. Almazov National Medical Research Centre. 2 Akkuratov str., Saint Petersburg 197341 Russian Federation
[6] Limited Liability Company "Tenderfood". 64 building 1 lit. D assistant 4-H emb. Obvodny Canal Saint Petersburg 190000 Russian Federation

Contact information:
Anatoly S. Simakhodsky — Doctor of Medical Sciences, Professor, Deputy Director for Research, Research Institute of Pediatric Surgery and Pediatrics. E-mail: simanat@inbox.ru ORCID: http://orcid.org/0000-0002-4766-116X SPIN: 5282-8111

For citation: Simakhodsky AS, Shapovalov VV, Petrova NV, Sevostyanova LD, Leonova IA, Simakhodsky OA. Modern digital technologies for assessing "children's space" in health and disease. Children's Medicine of the North-West. 2024;12(3):7–17. DOI: https://doi.org/10.56871/CmN-W.2024.98.73.002

Received: 22.05.2024 **Revised: 28.06.2024** **Accepted: 10.09.2024**

Abstract. *Introduction.* Global and Russian phenomena lead to a deterioration in the health of the child population. Evidence is stable levels of morbidity, the torpidity of its structure, the growth of painful diseases, the increase in negative dynamics in the development of reproductive functions and the increase in disability. These processes occur against the background of depopulation processes. The current situation was carefully reviewed at the XXIV Congress of Pediatricians in 2023. *The purpose of the study* is to take a broader look at the medical and social factors that shape health by determining the health indicators of the child population using digital technologies. In recent years 2010–2022. An improvement to the automated systems is the new "children's space" scheme, which demonstrates the level of compliance. *Materials and methods.* The study used data provided by the organizational and methodological center for analysis and prognosis of maternal and child health in the field of health care in St. Petersburg and the Petrostat association. The database was compiled according to Rosstat forms: N 030/u, forms N 12 for children's clinics and N 14 for children's hospitals, forms N 30-PO/o-12, N 30-PO/o-17 based on the results of preventive examinations. The research and mathematical processing were carried out using a telemedicine system (TMS) on the platform of the AKDO APK version, registration certificate N FSR 2009/95279, certified HIMSS Analytics consultant, state certificate N RZN 2019/9419, methods of variation statistics. *Research results.* A multi-level system has been methodologically formed, justifying the concept of "children's space", based on external and internal factors with the child's body. Based on this, the fundamental factors within the country were identified, embedded in the comparative characteristics of the standard of a healthy child and wary. The method of visualization of priority factors (third level) was selected. Completion of the fourth level of preparation for the conducted research. The final (technological) one showed a clear picture of the child's health status, that is, the health of the group.

Keywords: *preventive examinations, incidence of chronic non-infectious diseases (CNCDs), health formation factors, "children's space", rehabilitation (habilitation) of premature infants, digital technologies*

СОВРЕМЕННЫЕ ЦИФРОВЫЕ ТЕХНОЛОГИИ ОЦЕНКИ «ДЕТСКОГО ПРОСТРАНСТВА» В НОРМЕ И ПРИ ПАТОЛОГИИ

© Анатолий Семенович Симаходский[1], Валентин Викторович Шаповалов[2], Наталья Викторовна Петрова[3], Людмила Дмитриевна Севостьянова[4], Ирина Александровна Леонова[5], Олег Анатольевич Симаходский[6]

ISSN 2221-2582

[1] Научно-исследовательский институт детской хирургии и педиатрии ФГБОУ ВО «Первый Санкт-Петербургский государственный медицинский университет им. акад. И.П. Павлова» Минздрава России. 197022, г. Санкт-Петербург, ул. Льва Толстого, д. 6–8
[2] Санкт-Петербургский государственный электротехнический университет им. В.И. Ульянова (Ленина). 197022, г. Санкт-Петербург, ул. Профессора Попова, д. 5, лит. Ф
[3] Первый Санкт-Петербургский государственный медицинский университет имени академика И.П. Павлова. 197022, г. Санкт-Петербург, ул. Льва Толстого, д. 6–8
[4] Организационно-методический центр анализа и прогноза здоровья матери и ребенка Комитета по здравоохранению Санкт-Петербурга. 191186, г. Санкт-Петербург, ул. Гороховая, д. 6
[5] Национальный медицинский исследовательский центр имени В.А. Алмазова. 197341, г. Санкт-Петербург, ул. Аккуратова, д. 2
[6] Общество с ограниченной ответственностью «Тендерфуд». 190000, г. Санкт-Петербург, наб. Обводного канала, д. 64, к. 1, лит. Д, пом. 4-Н

Контактная информация:
Анатолий Семенович Симаходский — д.м.н., профессор, заместитель директора по научной работе НИИ детской хирургии и педиатрии. E-mail: simanat@inbox.ru ORCID: http://orcid.org/0000-0002-4766-116X SPIN: 5282-8111

Для цитирования: Симаходский А.С., Шаповалов В.В., Петрова Н.В., Севостьянова Л.Д., Леонова И.А., Симаходский О.А. Современные цифровые технологии оценки «детского пространства» в норме и при патологии // Children's Medicine of the North-West. 2024. Т. 12. № 3. С. 7–17. DOI: https://doi.org/10.56871/CmN-W.2024.98.73.002

Поступила: 22.05.2024 **Одобрена: 28.06.2024** **Принята к печати: 10.09.2024**

Резюме. *Введение*. Общемировые и российские тенденции свидетельствуют об ухудшении здоровья детского населения. Доказательствами служат стабильные уровни хронической заболеваемости, торпидность ее структуры, рост психических заболеваний, нарастание отрицательной динамики в становлении репродуктивных функций и рост инвалидности. Указанные процессы протекают на фоне депопуляционных процессов. Сложившаяся ситуация была детально рассмотрена на XXIV Конгрессе педиатров в 2023 году. *Цель исследования.* На основании динамических показателей здоровья детского населения с использованием цифровых технологий шире взглянуть на медико-социальные факторы, формирующие здоровье. За годы наблюдений с 2010 по 2022 с совершенствованием автоматизированных систем предлагается схема «детского пространства», которая свидетельствует об уровне влияния исследуемых факторов. *Материалы и методы*. В исследовании использованы данные, предоставленные Организационно-методическим центром анализа и прогноза здоровья матери и ребенка Комитета по здравоохранению Санкт-Петербурга и объединением «Петростат». База данных сформирована по формам Росстата: № 030/у, формам № 12 по детским поликлиникам и № 14 по детским стационарам, формам № 30-ПО/о-12, № 30-ПО/о-17 по результатам профилактических осмотров. Исследование и математическая обработка проводились с использованием телемедицинской системы (ТМС) на платформе версии АПК «АКДО», регистрационное удостоверение № ФСР 2009/95279, сертифицированный консультант HIMSS Analytics, регистрационное удостоверение № РЗН 2019/9419, методами вариационной статистики. *Результаты исследования.* Методологически сформирована многоуровневая система обоснования концепции «детского пространства», основанная на взаимодействии внешних и внутренних факторов с организмом ребенка. Исходя из этого, были выделены основополагающие факторы влияния, заложенные в сравнительные характеристики эталона здорового ребенка и конкретного пациента. Выбран метод визуализации приоритетных факторов (третий уровень). Четвертый уровень отражает заключение по проведенному исследованию. Завершающий (технологический) уровень показал визуальную картину состояния здоровья ребенка, то есть группу здоровья.

Ключевые слова: *профилактические осмотры, заболеваемость хроническими неинфекционными заболеваниями, факторы формирования здоровья, «детское пространство», реабилитация (абилитация) недоношенных, цифровые технологии*

INTRODUCTION

Over the past five years, negative trends in children's health have been noted at the annual conferences with international participation "Actual problems of paediatrics" [1]. In the last decade, in St. Petersburg, there is an increase in morbidity and disability, persistent nature of its structure, the deterioration of not only somatic but also reproductive health. There is also a high level of mental disorders and deviant behaviour. Organization of prevention and detection of diseases, and control over the implementation of treatment and rehabilitation measures leaves much to be desired. In our opinion, in reforming primary paediatric care, little attention is paid to the introduction of modern digital technologies and parental participation. The developed automated systems help to reduce labour and financial costs, objectify risk

factors in health formation, and specify treatment and preventive measures.

AIM

Based on negative dynamics of most medical and demographic indicators of the child population of St. Petersburg over a period of more than 10 years, to demonstrate the possibilities of a comprehensive assessment of the formation of children's health using digital systems.

MATERIALS AND METHODS

The material for the study was analysis of Rosstat reporting forms N 19 for children's clinics, N 14 for children's hospitals, N 030/u "Control card for dispensary observation". In the study, materials of the meeting of the Coordination Council under the President of the Russian Federation dated 15.11.2016, and the document of Government instructions to ministries and departments dated 21.12.2016 were used. Statistical data were obtained from the Petrostat association and the Organizational and methodological centre for analysis and prognosis of maternal and child health of the Health Committee. Statistical processing was done using methods of variation statistics (Pearson criterion, Fisher's angular transformation criterion).

RESULTS

Historically, in practical and theoretical paediatrics, there are attempts to comprehensively assess health status and development dynamics of both the child population as a whole and a specific child. Specialists accepted certain criteria for examination: genetic characteristics, perinatal and postnatal factors, quality of care, education, medical and social assistance and the environment. These general concepts are realized in the form of regularities of genetic code, physical development (acceleration and retardation), features of intellectual development, aggregate health characteristics (health group), constitutional variants (diathesis) and adaptation to society [2–5]. We have tried to examine dynamical series of certain medical and social indicators both to confirm negative trends and to explore the possibility of developing an unconventional assessment of children's health. The results are presented in Table 1.

Negative trends in the child population are confirmed by the situation in the field of mental and reproductive health ($p < 0.01$), torpid morbidity rates and a significant increase ($p < 0.01$) in disability. An increase in birth rate ($p < 0,01$) since 2018 sharply changes the vector towards negative patterns. The results obtained almost completely correspond to all-Russian trends [6].

Numerous attempts at comprehensive understanding of the processes of health formation have given rise to a significant number of terms: "comfort zone", "childhood territory", "children's space", "illness-health zone" [7, 8]. The subject of consideration is relevant, since in paediatrics it is directly related to growth and development [9, 10]. "Paediatrics as a medical subject is radically different from adult medicine, because paediatrics is a combination of medicine of illnesses and medicine of development. The essence of paediatrics as a science of development can be concentrate in four major parts: protection, provision, adequate stimulation, control and early correction of developmental deviations. Only in paediatrics of development there are keys to prevention of chronic diseases in adults…" (Vorontsov I.M., 2006) [11].

The development of society in the 21st century is associated with the awareness of changes in political and economic systems, a number of problems in education, health care, culture and upbringing. The century of digital technologies allowed medical science and practice to take a broader look at assessing the situation by introducing automated systems for diagnosing disease profiles, compiling prognostic maps, and various therapeutic and rehabilitation schemes. Serious significance is devoted to social and cultural area of a child as an important element of conscious influence on the process of personality formation, which will create the basis for subsequent adaptation to society.

Nowadays, in conditions of globalization, a threat to the world of childhood is significantly increased. And although the Declaration of the Rights of the Child N 1386 published by the United Nations refers to 20.11.1959, children in current global world are not assessed as a prosperous group of the population. There is a lack of positive dynamics, their lives are threatened by various social, political and economic risks. Hunger against the background of abundance, degradation against the background of high cultural achievements, illness and death in the context of rapid scientific, technological and medical progress are observed. The task of rethinking the so-called global childhood, its risks, threats, basic values and status seems extremely

Table 1. Dynamics of some medical and social indicators of the child population of St. Petersburg

Таблица 1. Динамика некоторых медико-социальных показателей детского населения Санкт-Петербурга

№ п/п	Показатели / Indicators	Годы / Years							
		2010	2012	2014	2016	2018	2021	2022	2023
1.	Количество детского населения 0–17 лет (абс.) / Child population 0–17 years old (abs.)	666 200	715 300	781 435	821 979	924 044	947 039	963 262	934 465
2.	Количество детей-инвалидов 0–17 лет, состоящих на учете детских поликлиник / The number of disabled children 0–17 years old registered in children's clinics	15 009	14 830	15 563	16 064	17 143	18 510	19 360	21 014
3.	Общая заболеваемость детей 0–17 лет по данным формы №12 Росстата / General morbidity of children aged 0–17 years according to Rosstat forms N 12	3085,9	3034,5	2931,7	3242,8	3090,8	2838,5	3299,5	3362,5
4.	Уровень психических расстройств и девиантного поведения в структуре инвалидности 0–17 лет (%) / The level of mental disorders and deviant behavior in the structure of disability 0–17 years (%)	3927 (26,2)	4116 (27,8)	4566 (29,3)	5274 (32,8)	5904 (34,4)	6485 (38,0)	6900 (35,6)	7687 (36,6)
5.	Заболеваемость репродуктивной системы детей 0–17 лет / Reproductive system morbidity in children 0–17 years old	16,7	15,5	14,3	23,3	23,4	26,6	26,7	26,9
6.	Коэффициент рождаемости* / Fertility rate*	11,4	12,6	13,1	13,9	11,9	10,3	9,9	9,0
7.	Коэффициент младенческой смертности* / Infant mortality rate*	4,7	4,6	4,3	3,9	3,8	3,4	3,7	4,1

* * Rosstat data. / Данные Росстата.

urgent [12]. A philosophical research on childhood shows the dehumanization of the child's social and cultural space and its living environment. In the International Convention on the Rights of the Child (1989), the child's right to life was recorded. A type of attitude towards the area of childhood and the process of growing up should not be negative, just as it cannot be indifferent. A methodological basis of an examination should scrupulously assess factors that determine the health of a child, which will be the key to more accurate diagnostics and the development of recommendations for treatment and rehabilitation at the technological level [13, 14].

In 2015, the XXII International Conference "Territory of Childhood with Special Educational Needs" identified a high dependence of children on social networks and drug addiction. If the beginning is determined by pampering and the thought "I will definitely quit when I want to," then in the future this bad habit develops into an addiction. Also, a family and friends play an important role. With proper upbringing of a child and parental control, the state of the internal environment and worldview is reinforced, and over time is completely replaced by a person's self-control [15]. Due to this fact, childhood can be viewed as a living archive of previous experience and a fertile field for the emergence of new relationships, concepts and interpersonal connections. The children's environment is represented by the most powerful energy of rela-

tionships and the formation of each child's own worldview [2].

Modern views of paediatrics and developmental psychology on the formation of children's health base on objective approach to assessment of health, personality in its subjective qualities and, above all, as a subject of its own environment, space and relationships with external factors. The concept of "life space" of the individual is correlated with the categories of "life world", "life space", "image of the world", "semiosphere", etc. The relevance of the problem of child's development in social, psychological, and others areas is in the main patterns of the modern concept of "children's space", and also concepts created by psychology of the environment [16].

The European Child and Adolescent Health Strategy 2015–2020, developed by the World Health Organization (WHO), also believes that every child should have an opportunity to live a healthy and fulfilling life. To realise the opportunity, WHO Regional Office for Europe countries have adopted a new strategy, Investing in children: The European child and adolescent health strategy 2015–2020[1].

Moving on to the study of terminology, the most understandable is the term "comfort zone". This term means the life area, which gives feeling of comfort and safety. As a rule, the comfort zone is determined by habitual patterns of behaviour: what you are used to is what you are comfortable with. Simply put, it is a state in which you feel "at ease". What is wrong with comfort and safety? Nothing, except that they make it very difficult to develop and learn new things. Every type of development, education, and formation of resilience is associated with going beyond the boundaries of your comfort zone. Beyond the comfort zone is the risk zone. Reasonable exit beyond the comfort zone into the risk zone is a necessary condition for personal development. As a rule, the younger a person is, the easier and more willing human is to expand the comfort zone [17]. Also, such exit to a certain extent limited by fluctuations in permissible values. This is accepted in paediatrics in the form of centiles, sigma deviations, etc.

In the Russian Federation, in practical children's health care, priority attention is paid to preventive methods at all steps of its development. Systems of early detection of diseases, based on strictly formalized approaches, a long time ago have proven their effectiveness and are widely used in practice. Moreover, one of the first systems of artificial intelligence in the world (Automated complex of dispensary examination systems (ACDES) for multidisciplinary assessment of children's health were created in Russia. To solve problems of such complexity, a special mathematical and software apparatus was created, on the basis of which software packages were built, verified, and demonstrated to be highly medically and economically efficient. Implementation into practice was carried out both under state programs and at the initiative of the heads of medical and preventive institutions (MPI) and regional structures.

Nowadays, automated systems are widely used in conducting preventive examinations and are closely linked with advisory systems on issues of predicting the subsequent condition of each patient. B.A. Kobrinskiy, as an example, cites ACDES in St. Petersburg and DIDENAS in Moscow, which, having a set of programs, are defined as a screening diagnostics system. The formation of groups of varying degrees of risk of developing diseases involved taking into account the degrees of threat and the probable nature of manifestations by type of pathology [18].

Internal logic of these systems is based on the use of a number of constants (heart rate (HR), respiratory rate (RR), body temperature, consciousness, complaints, level of neuropsychic development, etc.) that determine the age group. In threat measurement systems, these are more specific indicators, the violation of which will indicate the degree of risk. Systems of preventive examinations mainly indicate cardinal complaints, significant anamnestic information, deviations in status, and a number of laboratory and instrumental data. By summing up the scores, a profile of pathologies is determined that require further specialized interpretation. The system provides high reliability of information and diagnostic support for children over 5 years of age. This is due not only to the possibility of assessing intellectual development, but also to the degree of adaptation of a child to the children's environment [19].

Many systems of digital criteria for assessing children's health can be built depending on the set goals. The most adequate means of description,

[1] 2020 The European Child and Adolescent Health Strategy 2015–2020 and the European Action Plan to Prevent Child Maltreatment 2015–2020. 20.08.2020. Meeting Report. Available at: https://whodc.mednet.ru/ru/component/attachments/download/119.html (accessed: 17.03.2024).

 ISSN 2221-2582

in our opinion, are the methods of fuzzy logic, close and understandable to medical logic. To use this approach, as is known, it is necessary to specify membership functions corresponding to the required pathology profiles describing the "children's space". The issues of constructing membership functions and digital methods for assessing "children's space" have a number of features, since each membership function characterizes the degree of expression of a certain diagnostic feature (symptom). From a formal point of view, if we have Vj numbers of features that are significant for the PF profile, then these features are formed by medical experts. In this case, the primary formula for certain entry of the corresponding profile looks like this: $PF_j = \otimes A_k$, $k \epsilon V_j$. The operation formula $\otimes$, is used, which allows to accumulate small contributions of individual operands. At the same time, unlike conventional addition, the additivity effect is manifested here to a limited extent, i.e. the result never exceeds 1. Such a simple approach allows us to construct various sets of digital criteria for the "children's space".

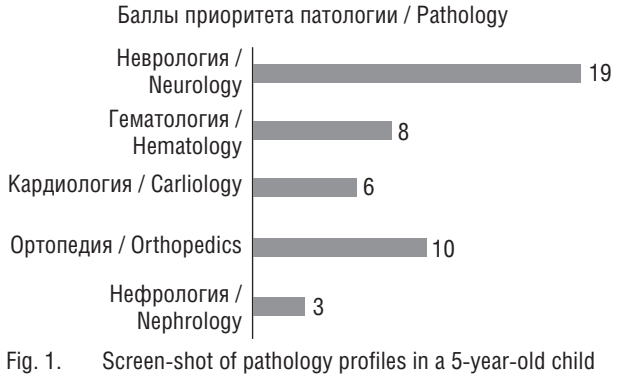

Fig. 1. Screen-shot of pathology profiles in a 5-year-old child

Рис. 1. Скриншот профилей патологии у ребенка 5 лет

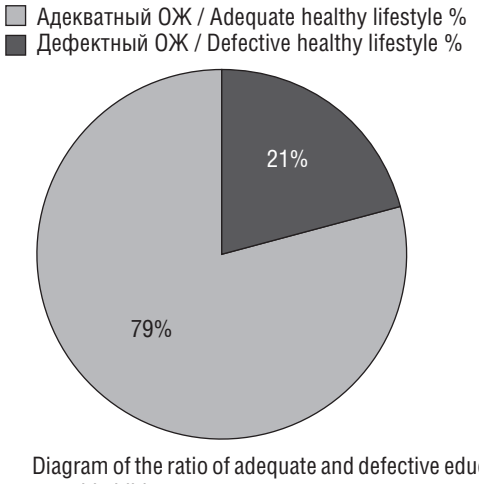

Fig. 2. Diagram of the ratio of adequate and defective educational life in a 5 year old child

Рис. 2. Диаграмма соотношения адекватного и дефектного образов жизни (ОЖ) у ребенка 5 лет

As an example, Figures 1 and 2 show examples of the conclusion of an effective remote screening system, demonstrating individual risks of chronic non-communicable diseases (CNCDs), the effectiveness of a healthy lifestyle (HLS) in the form of a screenshot and a pie chart.

In order to create a planar system for assessing threatening conditions (profiles), we can build rating scales based on the example of the Glasgow Coma Scale: 15–14 points — clear consciousness; 13–12 points — stupor; 9–11 points — sopor; 3–8 points — coma. We will assess the child's condition in a similar way: 14 points — satisfactory; 12 points — moderate; 9 points — severe; 8 and below — extremely severe.

Among functional parameters for a 5-year-old child, we highlight the temperature of 36.9 °C; pulse rate of 100 beats per minute, respiratory rate of 25 per minute; saturation of 95%, leukocytosis of 9.0×10^9 — 4 points; 10.0×109 — 6 points; 12×10^9 — 8 points; 14.0×109 — 10 points. Figure 3 shows a planimetric system of a threatening condition. Visualization allows for clear and objective monitoring of the condition of a sick child at any time of day and at any distance. Archiving the presented diagrams is the main evidentiary element of adequate management tactics.

It is much more difficult to form and create logical series in the comprehensive assessment of medical, social, environmental, psychological, national, spiritual and economic factors. We will conditionally express the gradation in points: 15 points — sufficient level, good; 10 points — questionable; 5 points — harmful, negative. The lines of research will be: hereditary background, negative factors of the perinatal period, the course of labour, family relationships, housing conditions, diseases of infancy, deviations in physical development, the dynamics of neuropsychic development, vaccination, the quality of preventive observation, attendance at kindergarten, the frequency of acute diseases, the performance of psychological tests, behaviour in a children's group, health group, the state of the environment. The results are shown in Figure 4.

The obtained results indicate serious, multifactorial negative influences on the development of a child's health. In this case, we can talk about the "narrowing of children's space." The constructed methodological chain has its own justification.

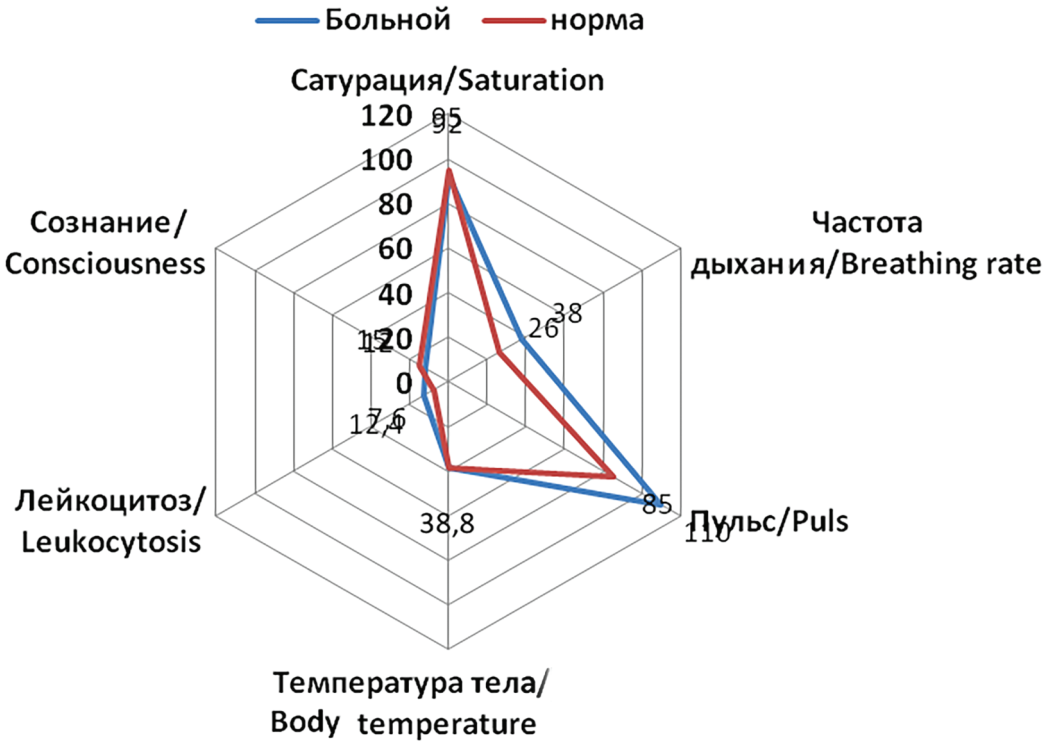

Fig. 3. Threat scheme of infectious-toxic shock

Рис. 3. Угрозометрическая схема инфекционно-токсического шока

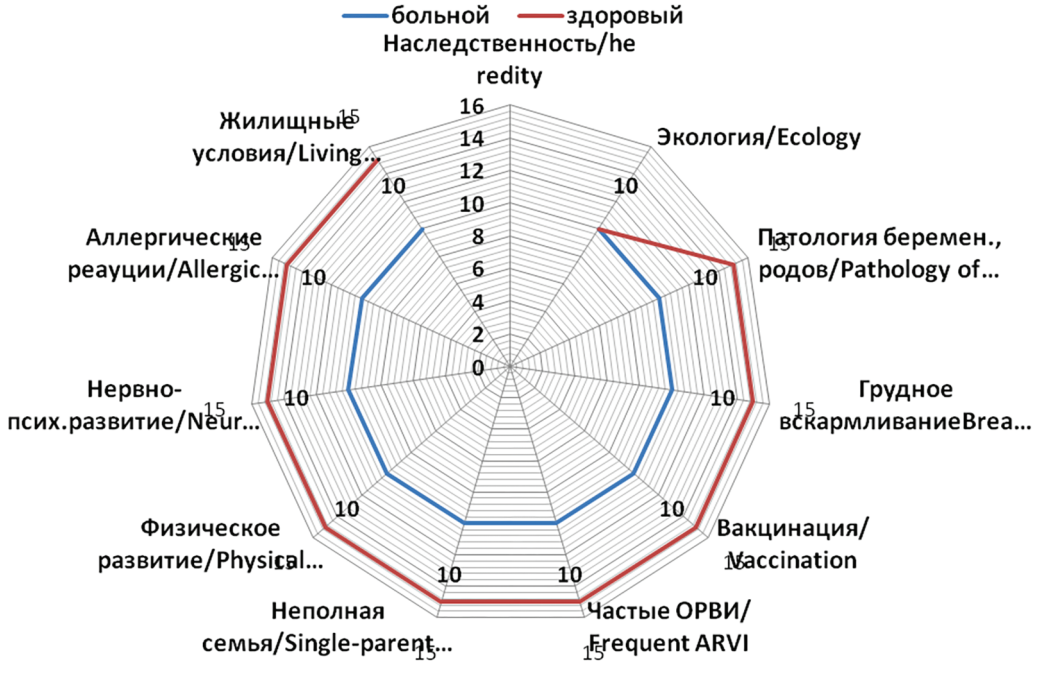

Fig. 4. Summary diagram of the health assessment ("children's space") of a 5 year old child

Рис. 4. Сводная диаграмма оценки здоровья («детского пространства») ребенка 5 лет

 ISSN 2221-2582

The presented material has already become firmly established in paediatric practice and is a tool for many scientific studies. This refers to the interaction of damaging factors and target organs, which can remain hidden for a long time. I.M. Vorontsov (2006) called this latent period the "ontogenetic interval". In this regard, it is necessary to ensure the earliest possible start of providing assistance, even at the resuscitation stage [20].

The main methodological approaches to organizing assistance are:

- the earliest possible start of providing assistance with an assessment of rehabilitation potential;
- implementation of inclusion and rehabilitation measures in full accordance with the level of biological maturity of a child;
- continuity between stages;
- development and implementation of an automated system for monitoring patients participating in the follow-up program with an assessment of the prognosis and effectiveness of the measures taken;
- three-stage nature of assistance with allocation of a follow-up centre (activities in intensive care unit, then neonatal pathology unit and follow-up unit);
- family-centred approach, involvement of relatives in rehabilitation process and creation of accessible psychological environment for the child's relatives;
- interdisciplinary team approach and professional training of medical and teaching staff for long-term work with the family.

DISCUSSION

Considering the methodology as a multi-level system, at the first philosophical level we substantiated the concept of "children's space", based on the interaction of external and internal factors with the child's body. At the second, most general level of the methodology, the fundamental factors of influence embedded in the comparative characteristics of the healthy child standard and a specific patient were identified (Fig. 4). Next, the method of visualization of priority factors was selected (third level). The fourth level determined the preparation of a conclusion on the conducted study, and the fifth (technological) confirmed the possibility of using this method in paediatrics [21, 22].

Thus, the introduction of digital technologies in paediatrics significantly expands our capabilities for implementing preventive measures and creates a program of action for parents and paediatricians for both healthy and sick children [23, 24].

In assessing the results of the study, it is necessary to dwell on some comprehensive definitions of modern problems related to childhood [16, 25]. The collection, published in 1996, characterizes the period of reforms as "a critical period of transition from ideological forms of modernization to "generally civilized" ones." Reference is made to "unprecedented situations requiring non-standard solutions", "decline in the educational level of the majority of children", and "the criminalization of the children's environment". Problems of demography, health, family relations, accessibility of the social and cultural environment, etc. have become sharply more acute. How could one comprehensively characterize the numerous factors that determine children's development? In our opinion, the term "children's space" has allowed us to incorporate the maximum number of dominant factors that influence children's health. We do not claim priority in terminology, but we consider it appropriate to use the term in the context of a comprehensive assessment. At the same time, the change in assessment can range from "narrowing" to "expanding" and "age-appropriate" children's space. We are not discussing the issue of controversy regarding the term, but are raising the question of a comprehensive assessment of the maximum number of factors that determine health of the child population. However, when a difficult situation was noted, the approach to assessing children's health remained traditional [26, 27]. Moreover, the introduction by S.M. Grombach of four criteria for determining a health group has now resulted in the presence or absence of chronic diseases.

When using digital technologies and evaluating graphic images, the terms must be clear and reflect the relationship between the reference and actual area of the "children's space". As with any value, in paediatrics within an age group there may be fluctuations, which can be assessed in centiles, sigma deviations, etc. The main task, which in our opinion is solvable, is to approach the most complete and structured assessment of the development of child's health, its monitoring and correction. We would like to believe that the V International Practical "Infoforum" for teachers will consider new approaches to the comprehensive assessment of children's health not only in medical but also in pedagogical terms [28].

CONCLUSION

The presented material does not claim to be a complete work, but shows the possibility of using digital technologies in attempts to comprehensively assess health of children for the purpose of monitoring and timely correction. The results obtained from preventive examinations conducted in accordance with the order of the Ministry of Health of the Russian Federation N 514n dated 10.08.2017 do not provide a complete picture in assessing pathogenic factors. Parents and health workers do not receive specific information about cause-and-effect relationships, which, in our opinion, limits the ability of children's medical and educational institutions and legal representatives to carry out both prescribed treatment and preventive measures and to monitor the health status.

Similarly, when assessing the "children's space" using a multi-stage method in rehabilitation, a patient's trajectory (routing) is formed in accordance with the order of the Ministry of Health of the Russian Federation dated November 23, 2019 N 878n "On approval of the Procedure for organizing medical rehabilitation of children".

ADDITIONAL INFORMATION

Author contribution. Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study.

Competing interests. The authors declare that they have no competing interests.

Funding source. This study was not supported by any external sources of funding.

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией.

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

REFERENCES

1. Rezolyutsiya KHKHIV Kongressa pediatrov Rossii s mezhdunarodnym uchastiyem "Aktual'nyye problemy pediatrii" 3–5 marta 2023 g. Moskva. Rossiyskiy pediatricheskiy zhurnal. 2023;4(3):94–96. DOI: 10.15690/rpj.v4i3.2595. (In Russian).
2. Baranov A.A., Albitsky V.Yu., Ustinova N.V. Status and tasks of improving medical and social assistance to the child population. Voprosy sovremennoj pediatrii. 2020;19(3):184–9. DOI: 10.15690/vsp.v19i3.2112. (In Russian).
3. Gundobin N.P. Features of childhood. Saint Petersburg: Prakticheskaya meditsina; 1906. (In Russian).
4. Borodulina T.V., Sannikova N.E., Levchuk L.V. et al. Fundamentals of the health of children and adolescents. Comprehensive assessment of the health of children and adolescents. Part I. Ekaterinburg: USMU; 2017. (In Russian).
5. Krasnov M.V., Borovkova M.G., Nikolaeva L.A. et al. Comprehensive assessment of the health status of children. Textbook. Cheboksary: Chuvash Publishing House. Univ.; 2019. (In Russian).
6. Baranov A.A., Albitsky V.Yu., Namazova-Baranova L.S., Terletskaya R.N. The contemporary state of children health in Russia. 2nd ed., Supplement. Moscow; 2020. (In Russian).
7. Gurkin Yu.A. Environmental issues of reproduction. In: Proceedings of the All-Russian scientific conference 22–24.11.1994. Saint Petersburg; 1994:42. (In Russian).
8. Simakhodsky A.S. Methodology for assessing the children's health]. DSc thesis. Saint Petersburg; 1998. (In Russian).
9. Vorontsov I.M. The "health-disease" space and the problem of diagnosis in pediatrics. Scientific-practical conference of pediatricians and pediatric surgeons: tez. dokl. Saint Petersburg; 1997:7–8. (In Russian).
10. Simahodsky A.S., ed. Methodological approaches to different chapters of pediatrics for high-quality training of pediatricians. Saint Petersburg; 2019. (In Russian).
11. Vorontsov I.M. Assembly speech. 2006. Available at: https://ru.wikipedia.org/wiki/%D0%92%D0%BE%D1%80%D0%BE%D0%BD%D1%86%D0%BE%D0%B2,_%D0%98%D0%B3%D0%BE%D1%80%D1%8C_%D0%9C%D0%B8%D1%85%D0%B0%D0%B9%D0%BB%D0%BE%D0%B2%D0%B8%D1%87 (accessed: 24.11.2021). (In Russian).
12. The State of the World's Children 2021. Published by UNICEF Office of Global Insight and Policy 3 United Nations Plaza, New York, NY 10017. Available

at: https://www.unicef.org/reports/state-worlds-children-2021 (accessed: 13.08.2024).
13. Grombach S.M., ed. Guide to children's and adolescents' hygiene. Moscow: Meditsina; 1964. (In Russian).
14. Kapirenkova O.N., Novikova S.P. The personality psychological space development in infants using art therapy. In: Mental developmental disorders in children-an interdisciplinary problem. Smolensk; 2014:88–94. (In Russian).
15. Nazarov I.V. The methodology of science state and structure. Rossijskij gumanitarnyj zhurnal; 2015;4(5):339. DOI: 10.15643/libartrus-2015.5.2. (In Russian).
16. Yakovleva E.V. Territory of childhood as the basis of personality. Territory of childhood of a child with special educational needs. Materialy XXII Mezhdunarodnoj konferencii «Rebenok v sovremennom mire. Territorija detstva», 21–23 oktjabrja 2015 g.: tez. dokl. Saint Petersburg, 2015: 195–8. (In Russian).
17. Grigoreva A.A. What is a comfort zone and why leave it? Available at: https://trends.rbc.ru/trends/social/62d7ba469a79474f0d5f17c5 (accessed: 16.03.2024). (In Russian).
18. Kobrinsky B.A. Automated diagnostic and information-analytical systems in pediatrics. RMZh; 1999;4:5–10. (In Russian).
19. Shapovalov V.V., Matalygina O.A., Vorontsov I.M. Evolution of an automated system for preventive examinations of children in an automated complex for dispensary examinations. Medicinskaja tehnika. 2005;3:18–21. (In Russian).
20. Prinjatie objazatel'stv po osushhestvleniju Global'noj strategii ohrany zdorov'ja zhenshhin, detej i podrostkov (2016–2030 gg.). Doklad General'nogo direktora VOZ A74/14 Punkt 16 predvaritel'noj povestki dnja 28 aprelja 2021 g. Available at: https://apps.who.int/gb/ebwha/ pdf_files/WHA74/A74_14-ru.pdf (accessed: 04.02.2024). (In Russian).
21. Kovtun O.P., Davydova N.S., Mukhametshin R.F. Disease severity scoring systems in emergency neonatology. Advantages and disadvantages of scales. Vestnik anesteziologii i reanimatologii. 2019;16(3):74–83. DOI: 10.21292/2078-5658-2019-16-3-74-83. (In Russian).
22. Tsybulkin E.K., Meshalkin L.D. Threat scales. Computer technologies in medicine. 1997;2:49–57. (In Russian).
23. Shilova N.A., Chasha T.V., Ananyeva M.A. Comprehensive assessment of the health status of 3-year old children born extremely premature. Pediatria G.N. Speransky. 2020;99(1):76–80. (In Russian).
24. Mironenko I.I., Kolesnikova O.I., Seroklinov V.N., Gorobchenko V.M. Comprehensive health assessment of children after COVID infection based on children's health center data. Russian Pediatric Journal. 2022;3(1):200. (In Russian).
25. Shulaev A.V., Mirolyubova D.B., Sadykov M.M., Shavaliev R.F. To the issue of predicting morbidity rate of children based on the assessment of medical and social factors and the examination of the quality of preventive examinations. Obshhestvennoe zdorov'e i zdravoohranenie. 2022;1:23–27. (In Russian).
26. Shabalina N.V. Comprehensive assessment of children's health status. Ponrosy Internet Education. 2011;103. Available at: http://vio.uchim.info/Vio_103/cd_site/ articles/art_4_4.htm (accessed: 26.03.2024). (In Russian).
27. Kozlovsky A.A., Timoshchenko E.N., Gribanov A.V. Health assessment of school-aged children. Russian Pediatric Journal. 2022;3(1):153. (In Russian).
28. V Mezhdunarodnyj prakticheskij "Infoforum" dlja pedagogov «Pedagogicheskij Infoforum 2024: vsjo, chto volnuet pedagogov» 20.04.2024. Available at: https://infourok.ru/kompleksnaya-ocenka-sostoyaniya-zdorovya-detej-gruppy-zdorovya-4767604.html (accessed: 26.03.2024). (In Russian).

ЛИТЕРАТУРА

1. Резолюция XXIV Конгресса педиатров России с международным участием «Актуальные проблемы педиатрии» 3–5 марта 2023 г. Москва. Российский педиатрический журнал. 2023;4(3):94–96. DOI: 10.15690/rpj.v4i3.2595.
2. Баранов А.А., Альбицкий В.Ю., Устинова Н.В. Состояние и задачи совершенствования медико-социальной помощи детскому населению. Вопросы современной педиатрии; 2020;19(3):184–189. DOI: 10.15690/vsp.v19i3.2112.
3. Гундобин Н.П. Особенности детского возраста, СПб.: Практическая медицина; 1906.
4. Бородулина Т.В., Санникова Н.Е., Левчук Л.В. и др. Основы здоровья детей и подростков. Комплексная оценка здоровья детей и подростков. Часть I. Екатеринбург: УГМУ; 2017.
5. Краснов М.В., Боровкова М.Г., Николаева Л.А. и др. Комплексная оценка состояния здоровья детей. Учебное пособие. Чебоксары: Изд-во Чуваш. ун-та: 2019.
6. Баранов А.А., Альбицкий В.Ю., Намазова-Баранова Л.С., Терлецкая Р.С. Состояние здоровья детей современной России. 2-е изд., доп. М.; 2020.
7. Гуркин Ю.А. Экологические проблемы репродукции. В кн.: Материалы Всероссийской научной конференции 22–24.11.1994. СПб.; 1994:42.
8. Симаходский А.С. Методология оценки здоровья детей. Автореф. дис. … д-ра мед. наук. СПб.; 1998.

9. Воронцов И.М. Пространство «здоровье-болезнь» и проблема диагноза в педиатрии. Научно-практическая конференция педиатров и детских хирургов: тез. докл. СПб.; 1997:7–8.
10. Симаходский А.С., ред. Методологические подходы к преподаванию отдельных разделов педиатрии с целью качественной подготовки врачей педиатров. СПб.; 2019.
11. Воронцов И.М. Актовая речь. 2006. Доступно по: https://ru.wikipedia.org/wiki/%D0%92%D0%BE%D1%80%D0%BE%D0%BD% D1%86%D0%BE%D0%B2,_%D0%98%D0%B3%D0%BE%D1%80%D1%8C_%D0%9C%D0%B8%D1%85%D0%B0%D0%B9%D0%BB%D0%BE%D0%B2%D0%B8%D1%87 (дата обращения: 24.11.2021).
12. The State of the World's Children 2021. Published by UNICEF Office of Global Insight and Policy 3 United Nations Plaza, New York, NY 10017. Доступно по: https://www.unicef.org/reports/state-worlds-children-2021 (дата обращения: 13.08.2024).
13. Громбах С.М., ред. Руководство по гигиене детей и подростков. М.: Медицина; 1964.
14. Капиренкова О.Н., Новикова С.П. Формирование психологического пространства личности в раннем возрасте с помощью арт-терапии. В сб.: Нарушения психического развития у детей-междисциплинарная проблема. Смоленск; 2014:88–94.
15. Назаров И.В. Статус и структура методологии науки. Российский гуманитарный журнал. 2015;4(5):339–45. DOI: 10.15643/libartrus-2015.5.2.
16. Яковлева Е.В. Территория детства как основа личности. Территория детства ребенка с особыми образовательными потребностями. Материалы XXII Международной конференции «Ребенок в современном мире. Территория детства», 21–23 октября 2015 г.: тез. докл. СПб.; 2015:195–8.
17. Григорьева А.А. Что такое зона комфорта и зачем из нее выходить? Доступно по: https://trends.rbc.ru/trends/social/62d7ba469a79474f0d5f17c5 (дата обращения: 16.03.2024).
18. Кобринский Б.А. Автоматизированные диагностические и информационно-аналитические системы в педиатрии. РМЖ; 1999;4:5–10.
19. Шаповалов В.В., Маталыгина О.А., Воронцов И.М. Эволюция автоматизированной системы профилактических осмотров детей в автоматизированный комплекс для диспансерных обследований. Медицинская техника. 2005;3:18–21.
20. Принятие обязательств по осуществлению Глобальной стратегии охраны здоровья женщин, детей и подростков (2016–2030 гг.). Доклад Генерального директора ВОЗ A74/14 Пункт 16 предварительной повестки дня 28 апреля 2021 г. Доступно по: https://apps.who.int/gb/ebwha/ pdf_files/WHA74/A74_14-ru.pdf (дата обращения: 04.02.2024).
21. Ковтун О.П., Давыдова Н.С., Мухаметшин Р.Ф. Угрозометрия в неотложной неонатологии. Плюсы и минусы шкал. Вестник анестезиологии и реаниматологии. 2019;16(3):74–83. DOI: 10.21292/2078-5658-2019-16-3-74-83.
22. Цыбулькин Э.К., Мешалкин Л.Д. Угрозометрические шкалы. Компьтерные технологии в медицине. 1997;2:49–57.
23. Шилова Н.А., Чаша Т.В., Ананьева М.А. Комплексная оценка состояния здоровья детей к 3-летнему возрасту, родившихся глубоконедоношенными. Педиатрия им. Г.Н. Сперанского. 2020;99(1):76–80.
24. Мироненко И.И., Колесникова О.И., Сероклинов В.Н., Горобченко В.М. Комплексная оценка состояния здоровья детей после перенесенной COVID-инфекции на базе детского центра здоровья. Российский педиатрический журнал. 2022;3(1):200.
25. Шулаев А.В., Миролюбова Д.Б., Садыков М.М., Шавалиев Р.Ф. К вопросу прогнозирования уровня заболеваемости детей на основе оценки влияния медико-социальных факторов и экспертизы качества профилактических осмотров. Общественное здоровье и здравоохранение. 2022;1:23–27.
26. Шабалина Н.В. Комплексная оценка состояния здоровья детей. Вопросы интернет-образования. 2011;103. Доступно по: http://vio.uchim.info/Vio_103/cd_site/articles/art_4_4.htm (дата обращения: 26.03.2024).
27. Козловский А.А., Тимощенко Е.Н., Грибанов А.В. Оценка здоровья детей школьного возраста. Российский педиатрический журнал. 2022;3(1):153.
28. V Международный практический «Инфофорум» для педагогов «Педагогический Инфофорум 2024: всё, что волнует педагогов» 20.04.2024 Доступно по: https://infourok.ru/kompleksnaya-ocenka-sostoyaniya-zdorovya-detej-gruppy-zdorovya-4767604.html (дата обращения: 26.03.2024).