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INTELLECTUAL SYSTEMS IN THE MANAGEMENT OF MEDICAL TECHNOLOGIES AND QUALITY OF LIFE

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Ключові слова: *медичний технологічний процес, інтелектуальні системи, штучний інтелект, якість життя, комплекс медичний експертний*

Abstract. Intellectual systems in the management of medical technologies and quality of life. Kizhaev S.O., Petrenko V.O., Mazur N.V., Belitsky V.V., Mazur A.V., Dudnikova O.I. *The article is devoted to the development and use of intelligent systems in the management of medical technological processes and health-related quality of life (HRQOL). The relevance of the work is due to the need for effective use of intellectual systems in healthcare. The purpose of this work is to study the possibilities and prospects of using information technologies and artificial intelligence systems in clinical medicine to improve the efficiency of providing medical care to the population. Information retrieval method; theoretical analysis of legislative and regulatory documents, literary sources, Internet resources, research results; spectral-dynamic and mathematical analysis of the current state and assessment of the*

quality of life of an individual using the artificial intelligence system Complex Medical Expert (CME). The paper analyzes the development trends of information technologies and artificial intelligence systems, as well as the features of their use in medical technological processes. As an example, the technological capabilities of the intelligent system CME are briefly described.

Реферат. Интеллектуальные системы в управлении медицинскими технологиями и качеством жизни. Кижаев С.А, Петренко В.А., Мазур Н.В., Белецкий В.В., Мазур А.В., Дудникова Е.И. *Статья посвящена развитию и использованию интеллектуальных систем в управлении медицинскими технологическими процессами и качеством жизни, связанным со здоровьем (HRQOL). Актуальность работы обусловлена необходимостью эффективного использования интеллектуальных систем в здравоохранении. Цель данной работы – исследование возможностей и перспектив применения информационных технологий и систем искусственного интеллекта в клинической медицине для повышения эффективности оказания медицинской помощи населению. Использованы: информационно-поисковый метод; теоретический анализ законодательно-нормативных документов, литературных источников, интернет-ресурсов, результатов научно-исследовательских работ; спектрально-динамический и математический анализ актуального состояния и оценка качества жизни индивидуума при помощи системы искусственного интеллекта «КМЭ». В работе проанализированы тенденции развития информационных технологий и систем искусственного интеллекта, а также особенности их использования в медицинских технологических процессах. В качестве примера кратко описаны технологические возможности интеллектуальной системы Комплекс Медицинский Экспертный.*

Worldwide, according to the WHO, more than 400 million people have various diseases and need treatment [44]. Among the main causes of morbidity and mortality of the population are acute vascular disorders in the circulatory system: stroke, myocardial infarction, internal bleeding [36]. Approximately 10% of patient deaths are due to diagnostic errors [12].

The main task of the health care system is to reduce morbidity and mortality, and the ultimate goal of any health initiative today should be considered to achieve a better quality of life for patients while maintaining their ability to work and well-being [27, 44].

In this regard, the problem of optimizing resource provision and improving the efficiency of management of medical technological processes to achieve higher performance in the health of the population is becoming increasingly important.

Modern medicine is developing very dynamically. This is due to its social aspect and the huge impact on the quality of life of the population [6]. Most countries around the world are trying to reform their health care systems to meet the expectations of the population and ensure the structural efficiency of health care. Integration into the European Union contributes to the reform of health care in Ukraine [1], which should be carried out using innovative medical and management technologies focused on the development of innovations in the industry [24].

Due to the introduction of medical reform, health care institutions in Ukraine began to compete with each other on medical technologies and the quality of services that the patient can assess on certain grounds: availability, efficiency, uniqueness, speed of service, etc. [42].

The state, for its part, promotes the development of research in the field of health care and the implementation of their results in the activities of institutions and the work of healthcare professionals (Article 20 "Fundamentals of Ukrainian legislation on healthcare") [29].

Development and implementation of modern information and communication technologies and robotics for quality medical care and treatment is one of the most important strategic priorities (Article 4 of the Law of Ukraine "On priority areas of innovation in Ukraine") [33].

Improving the efficiency of the health care system is largely determined by the effectiveness of the main components of medical technology. The introduction of knowledge-intensive medical technologies involves the following: improving the technological base, the use of medical information technology (IT); technical re-equipment of treatment and prevention institutions and training of personnel who will be able to professionally use new technological opportunities [11, 41]. The urgency of the work is due to the need for effective use of intelligent systems in healthcare.

The purpose of this work is to study the possibilities and prospects of application of information technologies and intelligent systems in the management of medical technological processes and quality of life.

MATERIALS AND METHODS OF RESEARCH

Information-search method and theoretical analysis of legislative and normative documents, literature sources, Internet resources, results of research works. Empirical analysis of the current condition of the patient using the artificial intelligence system "CME".

RESULTS AND DISCUSSION

Medical technological process (MTP) is a system of interconnected measures, the implementation of which enables to complete the most rational treatment course and ensure the achievement of maximum compliance of scientifically predicted results with real minimization of costs. In clinical medicine it is a process of management of an organism (change of structure and functions) which is realized in space and time for the purpose of improvement of its condition. The object of research and management is the patient's body and the external environment in relation to him, and the subject of management - the doctor. Lineament of the management process includes four stages: 1) collection and processing of information about the state of the control object; 2) diagnostics; 3) decision-making on the impact on the object; 4) implementation of the decision [20, 22].

Changes in patients are traditionally determined by laboratory or clinical studies. However, they do not take into account a person's personal and social context and cannot give a doctor a complete picture of the disease, as the disease affects not only a person's physical condition but also his behavior, emotional reactions, often changing his place and role in social life [10, 50].

Satisfaction of patients with treatment is a rather acute medical and social problem, associated not only with the quality of care provided, but also the adherence of patients to treatment [49]. The treatment process, despite the established standards, is always individual (personalized), and management is considered as a sequence of actions (operations) of the attending physician and is based on the patient's condition, treatment standards, analysis of knowledge bases regarding treatment, i.e. precedents. The main criterion for assessing MTP is the patient's condition, which is often not quantifiable and requires, for example, the use of fuzzy logic methods. Improving MTP management processes requires new and more advanced methods based on automated acquisition and generalization of knowledge, the involvement of intelligent technologies and methods to support decision-making [26].

Therefore, the assessment of quality of life, which is one of the most pressing problems of modern society and medicine in different countries [3, 46, 50, 52], has become increasingly important in world medical practice recently.

The term "quality of life" was officially recognized in medicine in 1977, and at the beginning of the XXI century this concept was redefined - "health related quality of life " (HRQOL) – the degree of human comfort both within oneself and within one's society [3].

HRQOL is recognized as an integral part of a comprehensive analysis of new methods of diagnosis, treatment, prevention, quality of treatment and medical care. This is not a criterion for the severity of the disease, but an indicator of the general condition of the patient, the effectiveness of treatment and rehabilitation measures, prognostic criterion for the end of the disease, an important pharmaco-economic criterion for creating and testing new medical technologies

HRQOL assessment makes it possible to more accurately identify disorders in the patient's health, more clearly present the essence of his clinical problem, determine the most rational method of treatment, as well as assess expected results by parameters that are at the intersection of scientific approach and subjective point vision of the patient. HRQOL indicators can be used to identify problems and benefits, facilitate communication, track changes or reactions to treatment, staff training, clinical audit and clinical practice management, i.e. problems beyond common competence of medical care can be identified. The use of HRQOL indicators in clinical practice ensures that treatment is focused on the patient and not on the disease [3, 10, 46, 50, 52].

The most important thing is the assessment of medical aspects of HRQOL in patients with chronic diseases, because the goal of therapy for most of them is not to treat as such, but to improve their functioning by reducing symptoms or limiting disease progression, which allows to determine factors that contribute to the improvement of life and life meaning [3, 21, 27, 52].

WHO has developed criteria for assessing the quality of life due to health: physical (strength, energy, fatigue, pain, discomfort, sleep, rest); psychological (positive emotions, thinking, learning, remembering, concentration, self-esteem, appearance, negative experiences); level of independence (daily activity, ability to work, dependence on drugs and treatment); social life (personal relationships, social value of the subject, sexual activity); environment (well-being, safety, life, availability and quality of medical and social security, availability of information, opportunity for training, advanced training, leisure, ecology); spirituality (religion, personal beliefs) [21, 51]. HRQOL can be measured by interviewing the patient or using various instruments. Instrumental research methods are more sensitive to assess the dynamics of the condition, the therapeutic potential of the treatment, the probability of recurrence at different stages of remission [40].

The main tool for "quantifying" HRQOL is questionnaires: general, narrowly focused, specialized. General – aimed at assessing the health of the population as a whole, regardless of pathology (for example, the questionnaire "MOS SF-36"). Special – used to assess the effectiveness of a particular method of managing a particular disease and focused on a specific nosology and its treatment. With their help one certain category of HRQOL (physical or mental condition) is assessed, or specific disease, or certain types of treatment is performed. They allow us to notice changes in the HRQOL of patients that occurred in a relatively short period of time [27].

In the world medical practice there are several problems that affect the preservation of health and improve the quality of life [8, 34, 38]:

- due to the increase in life expectancy and aging population, the proportion of age-related chronic diseases, non-infectious or caused by unhealthy lifestyle;
- an increase in the number of medical errors that lead to negative consequences for the patient;
- an increase in the general shortage of qualified personnel in the industry.

Comprehensive solutions to these problems are concentrated in the field of information technology (IT), the use of universal and specialized computer technology, development and practical application of cognitive intelligent systems capable of performing professional functions at the level of human intelligence.

Many healthcare projects (e. g., electronic patient health card software, mobile diagnostic devices, medical programs, biochips-implants) belong to the category of IT technologies and are able to provide a breakthrough in the field of public health. Their implementation allows you to: reduce the cost of medical care; to increase the profitability of medical institutions, the quality of patient care, performance appraisal of medical staff. The most promising are considered to be IT technologies with large amounts of information and the creation of mobile diagnostic devices. Mass introduction of IT technologies has led to the emergence of a scientific field - medical informatics [6].

IT technologies cover a wide class – system, virtual, multimedia, telecommunication, Internet technologies, monitoring systems and technologies. Management of innovative IT technologies and projects enables to provide [5, 15, 25, 30]:

- telemedicine services, thanks to which doctors can remotely provide counseling;
- quick access to databases and the ability to obtain the necessary data on medical history, make quick decisions about care;
- access to online education;
- the possibility of holding online symposia;
- use of information in mobile applications on the correct drug taking.

The development of IT technologies enables to automate tasks that require human perception skills, such as handwriting recognition or identification, and tasks that require cognitive skills, such as planning, reasoning based on partial or uncertain information and learning. Cognitive technology is a product of a field of research known as artificial intelligence (AI). Research in the field of AI is based on the ability of the biological nervous system to learn and correct own mistakes [54].

The use of applied intelligent systems in the management of MTP can improve the quality of medical care and ultimately – the quality of life of the patient as a criterion for its effectiveness [13, 19, 37, 54].

Artificial Intelligence (AI) is a science and technology of creating intelligent machines and intelligent computer programs, which is part of the computer science, and the technologies created on its basis belong to IT technologies [35, 48]. Conventionally, AI systems are divided into two classes – strong (general, universal) and weak (applied) ones. Strong AI can be compared to human, it can learn as people do, and is not inferior to the level of development of most people. All other AI systems are applied, as they can do only one thing, for example, diagnose a specific disease, search the Internet, etc. [35]. AI systems are a set of software and hardware that use in their operation the knowledge laid down by experts and allow them to perform the functions inherent in these experts. These include expert systems, intelligent information retrieval systems and intelligent decision support systems [16, 23].

AI systems use technologies: modeling of intellectual behavior with minimal human intervention; presentation of knowledge, their acquisition and further manipulation of them. Unlike rigid algorithms, AI is self-learning. AI includes various software systems and methods and algorithms used in them [12, 35, 48].

AI combines five groups of technologies [9]: machine vision; natural language; virtual assistants; robotic process automation; advanced machine learning.

In the 1970s, expert systems began to be developed – specialized software that can partially replace an expert, and which, based on knowledge bases, help the doctor in making decisions in diagnosing, predicting, choosing strategies and treatment tactics, and also give the chance to address to the computer for consultation in difficult

diagnostic cases. The general principle underlying the formation of medical expert systems is the inclusion in the knowledge base of syndromes that reflect the state of all major organ systems [2, 7, 53].

In the 1980s, scientists tried to combine and encode all knowledge into a system of rules and teach AI common sense. Then the methods of self-learning of machines became important, intellectual educational systems appeared, machines began to be programmed so that they independently obtained patterns from a large data volume [2, 7, 53].

Since the late 90's, machine learning has been developing – a set of algorithms and methods that allow you to teach computers to draw conclusions based on available data. Artificial neural systems are created that are able to make decisions based on the hidden patterns they have discovered in multi-dimensional data that simulate the work of the human brain and are able to self-learn based on previous experience. Since 2012, deep learning methods based on reinforced learning and neural networks have been developed. Today, most advances in AI relate to deep learning and the deep neural networks that implement it, which have become the standard in image, speech, and video processing [2, 7, 44, 45, 53].

In the field of medical services, AI has a huge potential, and this area of health is one of the most dynamic and fast-growing markets in the world. AI systems provide the opportunity to effectively solve industry problems, which also does not require significant human influence [8]. Modern medicine faces the problem of obtaining, analyzing and applying a large data volume needed to solve complex clinical problems. Diagnosis, treatment and prediction of results in many clinical situations depend on the complex interaction of many clinical, biological and pathological variables. Therefore, there is a growing need for analytical tools, such as artificial intelligent systems, which can exploit the complex relationships between these variables [18, 47].

The relevance of the use of AI in medical forecasting is so high that a number of authors propose to refuse to patent AI algorithms and make them open and widely available [32, 55]. For example, for the Python language, these capabilities are provided through the open machine learning software library TensorFlow, the open neural network library Keras and some other sources [32].

In clinical and preventive medicine, AI systems can be used to support medical decision-making based on the processing of patient health indicators to monitor health status: patients with any chronic diseases, the elderly, people in dangerous and responsible occupations, in order to clarification of the diagnosis, for disease prevention, assessment and improvement of quality of life [17, 23]. According to analysts, the most promising are automatic detection of deviations in diagnosis, early detection and prediction of epidemics and pandemics, prevention and reduction of risks, image analysis [8].

The effectiveness of AI methods is clinically proven, and they are integrated into wearable devices, medical equipment, telemedicine, medical information systems, electronic medical records, etc. AI is widely and legally used in the commitment to a healthy lifestyle, prevention, examination and treatment of patients as a reliable digital assistant for the patient and the doctor, certified on the criteria of safety and effectiveness [43].

AI-based devices are able to accumulate a "digital footprint" from a variety of patient databases, including: a complete medical history, test data for all years of treatment, and the current state of the body. These data can be used to preserve health, predict risks, prevent the development of diseases and develop methods of analysis of large amounts of data [12, 31, 43].

AI systems can learn, collect, analyze and structure large amounts of information, as well as make decisions independently. This saves time, money and increases the efficiency of patient care [31]. AI reduces the number of medical errors and the burden on the doctor, which helps to increase life expectancy, reduce morbidity and mortality, personalize preservation of health [43].

One of the significant problems in the use of AI in medicine is the preparation of correct medical data for the training of algorithms, as this requires a large amount of time of specialists of a narrow profile. A possible solution may be to create a unified platform for medical data storage, where doctors will be able to prepare data for the use of AI in their specialty [48].

AI technologies and systems in medicine allow improving work processes in the conditions of multitasking, carrying out more exact manipulations, differential diagnostics, reducing decision-making time, automation treatment process, collecting and analyzing a large amount of necessary information. They became the basis for the creation of new methods of treatment (microneurosurgery, neuroendoscopy, radiosurgery, endovascular neurosurgery, robotics, neuromodulation, navigation technologies) [39]. Intelligent performance monitoring systems tailored to a specific person can effectively show the condition of a patient at a long distance in real time [44].

AI can make a diagnosis based on hundreds of signs, unlike a doctor who relies on personal

experience. Automatic intelligent systems of diagnostics, robotic care of bedridden patients, systems of control of functioning of an organism, artificial substitutes of human bodies, exoskeletons, robots-surgeons who carry out cavity operations, works which perform operations on implantation of teeth - these and other systems are very in demand [44].

There are many examples of using AI systems in medicine. AI systems help to increase the accuracy and efficiency of diagnostics in various specialties. They can: scan images from MRI, CT scanners and X-rays, providing accurate analysis and non-invasive visibility of the internal workings of the human body; collect and analyze patient data from multiple sources; can be used for control of cardiovascular diseases; detection of skin, lung and breast cancer; recognition of malignant tissues at a level comparable to the level of qualified physicians [14].

Large enterprises such as Microsoft, Apple, Google, and IBM are working to create products using AI for health care [53]. At the heart of all research on AI is the idea of modeling human thinking processes using a computer [7].

For example, IBM Watson Health is used for automated analysis of medical images, which allows physicians to instantly analyze information, draw conclusions, and make the correct diagnosis. By comparing the patient's data with other medical histories, the system can identify potential problems with the vascular system, the tendency to form blood clots, recognize cancer, predict the likelihood of diabetes and some other chronic diseases. Developed by Google - DeepMind Health is able to process all the information and formulate a conclusion about human health, helping the doctor to make the correct diagnosis. Systems like Ada can communicate directly with a person and give him/her recommendations. The program based on II Sense.ly monitors the condition of patients with chronic diseases and during rehabilitation. Genetic analysis systems, such as Sophia Genetics, can detect a patient's susceptibility to various diseases [18]. Implanted multi-electrode multi-electrode implants – "brain-machine" Neuralink allow reading the signals of neurons and as a result to refuse operations on the open brain [39]. The machine-based DreaMed system allows you to develop an optimal insulin therapy plan for diabetics based on data collected from glucometers, fitness trackers and other measuring devices over time, and the DeepMind II system can diagnose eye diseases by imaging. optical tomography and perform automated diagnosis of kidney disease [14].

AI systems can be used to diagnose various parameters of the human body, such as blood test results, X-rays, lymph node status, etc. The main purpose of applications related to human health is to analyze the relationship between methods of prevention or treatment and results.

Most AI systems use different options for visualizing processes in the human body. This approach, along with the undeniable advantages (detection of the clinical picture of pathology) has a significant disadvantage - the observed process is already under development. Methods of energy information medicine allow to study the emerging pathologies at the preclinical stage, as well as to correct the condition of the body, preventing the development of the disease.

Among the developments that are actively advancing in domestic medicine and currently have undeniable functional advantages, as an example, let us consider the Complex Medical Expert (CME). This system of AI works on the principle of holistic medicine and provides ample opportunities to determine the current state of a human being on the basic parameters that characterize his quality of life associated with health. The application of the technology of spectral-dynamic analysis and screening of individual characteristics allows structuring the obtained data by comparison on the basis of mathematical analysis [28].

CME consists of a laptop with the original computer program ERI ™, a sensor for recording the signal of the electric-field strength of the studied biological object, which includes an analog-to-digital reversible converter. The AI CKME system belongs to the class of applications. The CME database has a set of digital characteristics of the electric field of average statistical states ("markers") of processes in the human body. The standard method of CME application is the use of auto-algorithms for analysis and assessment of the current state of the human body, determination of methods and techniques for correction of the existing condition. Additional constructions of dominants allow estimating various hierarchical levels of a condition of an organism and its systems. The auto-algorithm in the automatic system reviews the most active changes in physiology and psychosomatics in each of the systems and indicates why and for what reason the changes occurred. The AI CME system allows not only to detect a pathological process in any of the organ systems, but also to track sequential and parallel connections with other systems and organs, helping the doctor to determine the cause of this process and the condition that led to the disease [28]. A comprehensive analysis of the causal relationships of the body allows you to get

to the deepest cause, which caused changes in a number of chains [28].

In CME the functional possibilities are laid down: carrying out the analysis in a manual mode according to the algorithm of the user, habitual and applied by him in daily practice; correction of psychosomatic markers of the studied object in its current state according to the indicators of quality of life assessment [28].

CONCLUSIONS

The development and use of IT technologies and AI systems in the management of medical technological processes can significantly increase the efficiency of medical care. Both large foreign companies and startups are working intensively in this direction. Reforming the health care system in Ukraine contributes to the introduction of IT technologies in practical medicine, but the deterrent is the human factor and the lack of necessary financial resources.

Conflict of interest. The authors declare no conflict of interest.

REFERENCES

1. Alekseev VA, Borisov KN. [International practice of globalization in the healthcare system]. MID (Modernization. Innovation. Development). 2015;1(21):98-102. Russian.

2. [Analysis of 16 625 scientific papers from the archive showed trends in the development of artificial intelligence]. Russian.
Available from: https://22century.ru/popular-science-publications/ai-development-historical-trends

3. Asanova AA. [Quality of life related to the health of patients with depressive disorders]. Bulletin of Psychiatry and Psychopharmacotherapy. 2008;2(14):82-85. Russian.

4. Aphanasieva EV. [Assessment of health-related quality of life]. Good clinical practice. 2010;1:36-38. Russian. Available from:
https://www.clinvest.ru/jour/article/view/126?locale=ru_RU

5. Baieva OV. [Management of technological process in the field of health care]. Management of the field of health care. 2008;640. Russian. Available from: http://uchebnikirus.com/medecina/menedzhment_u_galuzi_ohoroni_zdorovya_bayeva_ov/upravlinnya_tehnologichnimi_protsesami_galuzi_ohoroni_zdorovya.html

6. Bolbat G. [Modern innovative technologies in medicine]; 2016. Russian. Available from: http://www.inteeu.com/2016/08/15/sovremennye-innovatsionnye-tehnologii-v-meditsine

7. Gusev AV. [Market overview of complex information systems. Information Systems]. 2009;6:4-17. Russian.

8. Gusev A. [Market of artificial intelligence for health: a review of forecasts]; 2018. Russian. Available from: https://webiomed.ai/blog/rynok-iskusstvennogo-intellekta-dlia-zdravookhraneniia-obzor-prognozov/

9. Dadyshev ZF, Ustinova NG. [The impact of artificial intelligence on the economy]. Age of Science. 2019;18:53-57. Russian.
doi: https://doi.org/10.24411/2409-3203-2018-11812

10. Zhukova OA, Krom IL. [Quality of life as a multifactorial criterion for assessing the state of patients with schizophrenia]. Bulletin of Medical Internet Conferences. 2011;1(7):35-37. Russian. Available from: https://cyberleninka.ru/article/n/kachestvo-zhizni-kak-mnogofaktornyy-kriteriy-otsenki-sostoyaniya-bolnyh-shizofreniey/viewer

11. Zarubina TV. [Medical informatics: textbook]. Zarubina TV, Kobrin BA, editors. Moskva: GEOTAR-Media; 2016. p. 512 Russian. Available from: https://sci.house/tehnologii-meditsine-informatsionnyie-scibook/osnovnyie-sostavlyayuschie-lechebno-83489.html/

12. [Artificial intelligence in project management]. [Internet]; 2019. Russian. Available from: https://ddintsis.com/2019/11/16/ai-in-pm/

13. [Artificial Intelligence (AI) as a key factor in the digitalization of the global economy]. [Internet]; 2017. Russian. Available from:
https://www.crn.ru/news/detail.php?ID=117544

14. [How artificial intelligence is transforming the future of healthcare?]. [Internet]; 2020. Russian. Available from: https://www.zfort.com.ua/blog/kak-iskusstvennyi-intellekt-transformiruet-budushee-zdravookhraneniya

15. Karamyshev DV, Nemchenko AS. [Implementation and evaluation of the effectiveness of innovative projects in the health care system]. Economy and State. 2006;2:86-88. Ukrainian.

16. Karpov OE, Klimenko GS, Lebedev GS. [Application of intelligent systems in healthcare]. Modern high technologies. 2016;7-1:38-43. Russian. Available from: http://top-technologies.ru/ru/article/view?id=3605.

17. Kizhaev SA, Mazur NV. [Determination and correction of the current condition of the patient using KME-technologies]. International scientific conference "Modern methods for diagnostics and treatment: experience of EU countries": Conference proceedings; 2019 December 27-28; Lublin: Baltiya Publishing. 2019. p. 216-20. Ukrainian.

18. Kizhaev SA, Mazur NV. [Artificial intelligence in medicine: functional capabilities of the Medical Expert]. Medicine Complex of the 21st century: promising and priority direct scientific reports: Collection of materials of international scientific and practical conferences; 2020 April 24-25; Dnipro. Dnipro: Organization of scientific medical research «Salutem», 2020. p. 68-77. Russian.

19. Kizhaev SA, Petrenko VA. [Cognitive artificial intelligence technologies in project management Enterprise Economics: Modern Problems of Theory and Practice: Proceedings of the IX International Scientific and Practical Conference. Odessa: Atlantis; 2020. p. 52-53. Russian.

20. Kyselev AP. [mHealth: From high technology to clinical practice]. Clitsinist 2015;6:10-12. Russian. Available from: https://www.researchgate.net/publication/307644293_mHealth_from_high-end_technologies_in_clinical_practice/fulltext/57db5cc708aeea195932bbde/mhealth-from-high-end-technologies-in-clinical-practice.pdf

21. Kots YaI, Libis RA. [Quality of life in patients with cardiovascular disease]. Cardiology. 1993;5:66-72. Russian.

22. Kuzminov OM, Sotnikova EV, Lokinskaya IV. [Model of organization and processing of clinical information for the examination of the quality of the treatment and diagnostic process]. IT and quality of care. 2014;2: 57-66. Russian.

23. Lebedev GS, Shaderkin IA, Fomina IV, Lisnnko AA, Riabkiv IV, Kachkovskiy SV, Melaev DV. [Evolution of Internet technologies in the healthcare system]. Telemedicine and eHealth Journal. 2017;2:63-78. Russian. Available from: http://jtelemed.ru/article/evoljucija-internet-tehnologii-v-sisteme-zdravoohranenija

24. Lepskyi VV. [The concept of reforming the medical sector using a project approach]. Bulletin of the National Technical University «Kharkiv Polytechnic Institute» Series: Strategic management, portfolio management, programs and projects. 2016;2:108-12. Ukrainian. doi: https://doi.org/10.20998/2413-3000.2016.1174.24

25. Mygal M. [Introduction of information technologies in modern medicine]. [Internet]; 2019. Ukrainian. Available from: https://tribuna.pl.ua/news/vprovadzhennya-informatsijnyh-tehnologij-u-suchasnu-medytsynu/

26. Molodchenkov AI, Khachumov MV, Yashyna LP. [Approaches to the analysis of deviations of medical technological processes]. Proceedings of the ISA RAS. 2016;66(2):74-84. Russian. Available from: http://www.isa.ru/proceedings/images/documents/2016-66-2/t-16-2_74-84.pdf]

27. Novik AA, Matveev SA, Ionova TI. [Assessment of the patient's quality of life in medicine]. Clinical medicine. 2000;2:10-13. Russian.

28. Orzhelskyi IV, Kuznetsov AN. [Theoretical foundations of physical and mathematical medicine]. Moskva: LLC "Media M"; 2016. p. 54. Russian.

29. [Law of Ukraine "On Fundamentals of the Legislation of Ukraine on Health Care" (Bulletin of the Verkhovna Rada of Ukraine, 1993, No 4, page 19)]. Ukrainian. Available from: https://zakon.rada.gov.ua/laws/show/2801-12

30. Petrenko VO, Dudnikova OI, Kizhaev SO, Mazur NV. [Innovation management in the context of medical reform in Ukraine]. International scientific conference "Modern methods for diagnostics and treatment: experience of EU countries": Conference proceedings; 2019 Dec. 27-28; Lublin: Baltiya Publishing; 2019. p. 191-195. Ukrainian.

31. [The use of artificial intelligence in medicine: effective diagnostics and the creation of new drugs. How artificial intelligence works in medicine in 2018]. Al conference; 2018 Nov. 14; Kyiv. Russian. Available from: https://aiconference.com.ua/ru/news/primenenie-iskusstvennogo-intellekta-v-meditsine-effektivnaya-diagnostika-i-sozdanie-novih-lekarstv-92604

32. Kharitonov SV, Lyamina NP, Zaitsev VP, Samsonova GO, Golubev MV. [Application of artificial intelligence for predicting patient satisfaction with medical care in the specialized clinic for rehabilitation]. Journal of Telemedicine and eHealth. 2020;3:15-23. Russian. doi: https://doi.org/10.29188/2542-2413-2020-6-3-15-23

33. [Law of Ukraine "On Priority Areas of Innovation Activity in Ukraine" (Bulletin of the Verkhovna Rada of Ukraine, 2012, No 19-20, Art. 166). As amended in accordance with Law N 5460-VI as of October 16, 2012, BVR, 2014;2-3:41]. Ukrainian. Available from: https://zakon.rada.gov.ua/laws/show/3715-17

34. [Life expectancy of people in different eras]. Telegraph. Russian. Available from: https://telegraf.com.ua/zhizn/zdorove/1336638-prodolzhitelnost-zhizni-lyudey-v-raznyie-epohi-foto.html

35. Proidakov EM. [Modern state of artificial intelligence]. J. of Computer and Information Sciences. 2018;129-54. Russian. Available from: https://cyberleninka.ru/article/n/sovremennoe-sostoyanie-iskusstvennogo-intellekta /

36. Prokhorov NL, Shvein AA, Znaiko GG, Krasovskyi VE. [Development of a design and technological platform for managing the processes of creating medical equipment]. [Internet]; 2013. Russian. Available from: http://www.ineum.ru/razvite-proektnotekhnologicheskoj-platformy-dlya-upravleniya-processami-sozdaniya-medicinskoj-tekhniki

37. Prokhorov NL, Shvein AA, Znaiko GG, Krasovskyi VE. [Development of a design and technological platform for managing the processes of creating medical equipment]. [Internet]; 2019. Russian. Available from: http://www.ineum.ru/razvite-proektnotekhnologicheskoj-platformy-dlya-upravleniya-processami-sozdaniya-medicinskoj-tekhniki

38. [Rating of countries in the world in terms of life expectancy. Humanities Encyclopedia: Research [Internet]. Center for Humanitarian Technologies. 2006-2021. Russian. Available from: https://gtmarket.ru/ratings/life-expectancy-index

39. Sayfiddinova ES, Begicheva OL, Ananyina LG. [Prospects for the development of artificial intelligence in neurosurgery and neurorehabilitation]. Step into the future: artificial intelligence and digital economy: materials of the 1st International Scientific and Practical Conference; 2017, No. 4; State University of Management. Moskva: Publishing House of the State University of Management; 2017. p. 91-97. Russian. Available from: https://guu.ru/wp-content/uploads/Conference-published-materials-issue-4.pdf

40. Sofronov AG, Nikolkina YuA. [Assessment of indicators of the quality of life and social functioning in

women with alcohol dependence, who are on dispensary observation]. Review of psychiatry and medical psychology. 2012;1:43-47. Russian.

41. Starchenko IB, Vyshnevetskyi VYu. [Biotechnical and medical technologies: Textbook]. Taganrog: Publishing house of the Southern Federal University; 2010. p. 52. Russian. Available from: http://window.edu.ru/catalog/pdf2txt/707/76707/57900?p_page=1

42. Stephanishina OV. [Medical reform: three vital steps for a new parliament]. Ukrainska Pravda Zhyttia; 2019. Russian. Available from: https://life.pravda.com.ua/columns/2019/07/30/237706/

43. [Strategic session "Artificial Intelligence in Medicine. Digital health care"]. All-Russian council of honored doctors of the Russian Federation Public Health Medicine. Russian. Available from: https://webiomed.ai/media/docs/itogovaia-prezentatsiia-strategicheskoi-sessii-iskusstvennyi-intellekt-v-meditsine-_NyPUSpx.pdf

44. Tokarev BYe, Tokarev RB, Glotova DA. [Market and legal prospects for the implementation of artificial intelligence development]. Step into the future: artificial intelligence and digital economy: materials of the 1st International Scientific and Practical Conference. 2017, No. 4; State University of Management; Moskva: Publishing House of the State University of Management; 2017. p. 197-205. Russian.

45. Filchenkov A, Viatkin V, Shalyto A. [Artificial intelligence in the production of high-tech products]. [Internet]; 2017. Russian. Available from: http://www.up-pro.ru/library/innovations/management/ii-produkciya.html

46. Yagenskyi AV, Sichkaruk IM. [Assessment of the quality of life in modern medical practice. Internet access for medical and pharmaceutical workers. Dedicated portal for healthcare providers]. Professional medical Portal. J. Internal medicine. 2007;3. Russian. Available from: http://www.mif-ua.com/archive/article/418

47. Ramesh AN, Kambhampati C, Monson JRT, Drew PJ. Artificial intelligence in medicine. Ann R Coll Surg Engl. 2004;86:334-8
doi: https://doi.org/10.1308/147870804290

48. Bursov AI. Application of artificial intelligence in medical data analysis. Almanac of Clinical Medicine. 2019;47(7):630-3.
doi: https://doi.org/10.18786/2072-0505-2019-47-071

49. Chiolero A, Burnier M, Santschi V. Improving treatment satisfaction to increase adherence. J Hum Hypertens. 2016 May;30(5):295-6. Epub 2015 Aug 20. PMID: 26290276.
doi: https://doi.org/10.1038/jhh.2015.89

50. Irene J Higginson, Alison J Carr. Using quality of life measures in the clinical setting. BMJ. 2001 May 26;322(7297):1297-300.
doi: https://doi.org/10.1136/bmj.322.7297.1297

51. Kaplan RM., Atkins CJ, Timms R. Validity of a quality of well-being scale as an outcome measure in chronic obstructive pulmonary disease. Journal of Chronic Diseases. 1984;37(2):85-95.
doi: https://doi.org/10.1016/0021-9681(84)90050-X

52. Kosenkova OI, Makarova VI. Problems of quality of life in modern medicine. Human Ecology. 2007;11:29-34.

53. Mihaila V, Enachescu D, Davila C. General Population Norms for Romania using the Short Form 36 Health Survey (SF-36). QL News Letter. 2001;26:17-18.

54. Schatsky D, Muraskin C, Gurumurthy R. Cognitive technologies: The real opportunities for business Deloitte Review. 2015;16. Available from: https://www2.deloitte.com/us/en/insights/deloitte-review/issue-16/cognitive-technologies-business-applications.html

55. Van Calster B, Steyerberg EW, Collins GS. Artificial Intelligence Algorithms for Medical Prediction Should Be Nonproprietary and Readily Available. JAMA Intern Med. 2019 May 1;179(5):731. PMID: 31058938.
doi: https://doi.org/10.1001/jamainternmed.2019.0597

СПИСОК ЛІТЕРАТУРИ

1. Алексеев В. А., Борисов К. Н. Международная практика глобализации в системе здравоохранения. *МИР (Модернизация. Инновации. Развитие).* 2015. Т. 21, № 1. С. 98-102.

2. Анализ 16 625 научных работ из arXiv показал тенденции развития искусственного интеллекта. URL: https://22century.ru/popular-science-publications/ai-development-historical-trends

3. Асанова А. А. Качество жизни, связанное со здоровьем больных депрессивными расстройствами. *Вест. психиатрии и психофармакотерапии*. 2008. Т. 14, № 2. С. 82-85.

4. Афанасьева Е. В. Оценка качества жизни, связанного со здоровьем. *Качественная клиническая практика*. 2010. № 1. С. 36-38.
URL: https://www.clinvest.ru/jour/article/view/126?locale=ru_RU

5. Баєва О. В. Управление технологическим процессом в области здравоохранения. *Менеджмент у галузі охорони здоров'я*. 2008. 640 с. URL: http://uchebnikirus.com/medecina/menedzhment_u_galuzi_ohoroni_zdorovya_bayeva_ov/upravlinnya_tehnologichnimi_protsesami_galuzi_ohoroni_zdorovya.htm.

6. Болбат Г. Современные инновационные технологии медицины.
URL: http://www.inteeu.com/2016/08/15/sovremennye-innovatsionnye-tehnologii-v-meditsine

7. Гусев А. В. Обзор рынка комплексных информационных систем. *Информационные системы.* 2009. № 6. С. 4-17.

8. Гусев А. Рынок искусственного интеллекта для здравоохранения: обзор прогнозов. URL: https://webiomed.ai/blog/rynok-iskusstvennogo-

intellekta-dlia-zdravookhraneniia-obzor-prognozov/ (Дата публикации 20.06.2018).

9. Дадашев З. Ф., Устинова Н. Г. Влияние искусственного интеллекта на экономику. *Эпоха науки*. 2019. № 18. С. 53-57.
DOI: https://doi.org/10.24411/2409-3203-2018-11812

10. Жукова О. А., Кром И. Л. Качество жизни как многофакторный критерий оценки состояния больных шизофренией. *Бюллетень медицинских интернет-конференций*. 2011. Т. 1 № 7. С. 35-37. URL: https://cyberleninka.ru/article/n/kachestvo-zhizni-kak-mnogofaktornyy-kriteriy-otsenki-sostoyaniya-bolnyh-shizofreniey/viewer

11. Зарубина Т. В., Медицинская информатика: учебник / под общ. ред. Т.В. Зарубиной, Б. А. Кобринского. Москва: ГЭОТАР-Медиа, 2016. 512 с. URL: https://sci.house/tehnologii-meditsine-informatsionnyie-scibook/osnovnyie-sostavlyayuschie-lechebno-83489.html

12. Искусственный интеллект в управлении проектами. URL: https://ddintsis.com/2019/11/16/ai-in-pm/ (Дата публикации 16.11.2019).

13. Искусственный интеллект (ИИ). Artificial Intelligence (AI) как ключевой фактор цифровизации глобальной экономики.
URL: https://www.crn.ru/news/detail.php?ID=117544 (дата публикации 24.12.2017).

14. Как искусственный интеллект трансформирует будущее здравоохранения?
URL: https://www.zfort.com.ua/blog/kak-iskusstvennyi-intellekt-transformiruet-budushee-zdravookhraneniya (Дата публикации 07.05.2020).

15. Карамишев Д. В., Немченко А. С. Реалізація та оцінка ефективності інноваційних проектів у системі охорони здоров'я. *Економіка та держава.* 2006. № 2. С. 86-88.

16. Карпов О. Э., Клименко Г. С., Лебедев Г. С. Применение интеллектуальных систем в здравоохранении. *Совр. наукоемкие технологии*. 2016. № 7-1. С. 38-43.
URL: http://top-technologies.ru/ru/article/view?id=36058 (дата обращения: 16.01.2021).

17. Кіжаєв С. О., Мазур Н. В. Визначення та корекція актуального стану пацієнта з використанням КМЕ-технологій. *International scientific conference "Modern methods for diagnostics and treatment: experience of EU countries"*: conference proceedings. Lublin, Polska, 27-28 December, 2019. Lublin: Izdevnieciba "Baltiya Publishing". P. 216-220.

18. Кижаев С. А., Мазур Н. В. Искусственный интеллект в медицине: функциональные возможности Комплекса Медицинского Экспертного. *Медицина XXI століття: перспективні і пріоритетні напрями наукових досліджень:* збірник матеріалів міжнар. наук.-практ. конф. (Дніпро, 24-25 липня 2020 р.). Дніпро: Організація наукових медичних досліджень «Salutem», 2020. С. 68-77.

19. Кижаев С. А., Петренко В. А. Когнитивные технологии искусственного интеллекта в управлении проектами. *Економіка підприємства: Сучасні проблеми теорії та практики: м*атеріали IX Міжнар. наук.-практичної конференції. Одеса: Атлант, 2020. С. 52-53.

20. Киселев А. Р. mHealth: От наукоемких технологий к клинической практ. *Клиницист*. 2015. Т. 6. С. 10-12. URL: https://www.researchgate.net/publication/307644293_mHealth_FROM_HIGH-END_TECHNOLOGIES_IN_CLINICAL_PRACTICE/fulltext/57db5cc708aeea195932bbde/mHealth-FROM-HIGH-END-TECHNOLOGIES-IN-CLINICAL-PRACTICE.pdf

21. Коц Я. И., Либис Р. А. Качество жизни у больных с сердечно-сосудистыми заболеваниями. *Кардиология*. 1993. № 5. С. 66-72.

22. Кузьминов О. М., Сотникова Е. В., Локинская И. В. Модель организации и обработки клинической информации для экспертизы качества лечебно-диагностического процесса. *ИТ и качество медицинской помощи*. 2014. № 2. С. 57-66.

23. Эволюция интернет-технологий в системе здравоохранения / Г.С. Лебедев и др. *Журнал телемедицины и электронного здравоохранения*. 2017. № 2. С. 63-78. URL: http://jtelemed.ru/article/evoljucija-internet-tehnologii-v-sisteme-zdravoohranenija.

24. Лепський В. В. Концепція реформування медичної галузі з використанням проектного підходу. *Вісник Нац. технічного університету "ХПІ".* Серія: Стратегічне управління, управління портфелями, програмами та проектами. 2016. № 2. С. 108-112. DOI: https://doi.org/10.20998/2413-3000.2016.1174.24

25. Мигаль М. Впровадження інформаційних технологій у сучасну медицину.
URL: https://tribuna.pl.ua/news/vprovadzhennya-informatsijnyh-tehnologij-u-suchasnu-medytsynu/ (Дата публикации 13.11.2019).

26. Молодченков А. И., Хачумов М. В., Яшина Л. П. Подходы к анализу отклонений медицинских технологических процессов / Труды ИСА РАН. 2016. Т. 66, № 2. С. 74-84.
URL: http://www.isa.ru/proceedings/images/documents/2016-T. 66, № 2. С. 74-84.pdf

27. Новик А. А., Матвеев С. А, Ионова Т. И. Оценка качества жизни больного в медицине. *Клин. медицина*. 2000. № 2. С. 10-13.

28. Оржельский И. В., Кузнецов А. Н. Теоретические основы физико-математической медицины. Москва: ООО «Медиа М», 2016. 54 с.

29. Основи законодавства України про охорону здоров'я. Закон України. *Відомості Верховної Ради України (ВВР).* 1993. № 4, С. 19.
URL: https://zakon.rada.gov.ua/laws/show/2801-12

30. Петренко В. О., Дуднікова О. І., Кіжаєв С. О., Мазур Н. В. Управління інноваціями у контексті медичної реформи в Україні. *International scientific conference "Modern methods for diagnostics and treatment: experience of EU countries":* conference proceedings. Lublin, Polska, 27-28 December, 2019. Lublin: Izdevnieciba "Baltiya Publishing, P. 191-195.

31. Применение искусственного интеллекта в медицине: эффективная диагностика и создание новых лекарств. Как работает искусственный интел-

лект в медицине в 2018 году. *Al conference* (Киев, 14 нояб. 2018 г.).
URL: https://aiconference.com.ua/ru/news/primenenie-iskusstvennogo-intellekta-v-meditsine-effektivnaya-diagnostika-i-sozdanie-novih-lekarstv-92604

32. Применение искусственного интеллекта для прогноза удовлетворенности больных медицинской помощью в условиях специализированной клиники восстановительного лечения / С. В. Харитонов и др. *Журнал телемедицины и электронного здравоохранения.* 2020. № 3. С. 15-23.
DOI: https://doi.org/10.29188/2542-2413-2020-6-3-15-23

33. Про пріоритетні напрями інноваційної діяльності в Україні: Закон України. *Відомості Верховної Ради України (ВВР).* 2012. № 19-20. С. 166. (Із змінами, внесеними згідно із Законом № 5460-VI від 16.10.2012, ВВР, 2014. № 2-3. С. 41).
URL: https://zakon.rada.gov.ua/laws/show/3715-17

34. Продолжительность жизни людей в разные эпохи. *Телеграф*.
URL: https://telegraf.com.ua/zhizn/zdorove/1336638-prodolzhitelnost-zhizni-lyudey-v-raznyie-epohi-foto.html

35. Пройдаков Э. М. Современное состояние искусственного интеллекта / *Журнал Компьютерные и информационные науки*. 2018. С. 129-154.
URL: https://cyberleninka.ru/article/n/sovremennoe-sostoyanie-iskusstvennogo-intellekta/

36. Прохоров Н. Л., Швеин А. А., Знайко Г. Г., Красовский В. Е. Развите проектно-технологической платформы для управления процессами создания медицинской техники.
URL: http://www.ineum.ru/razvite-proektnotekhnologicheskoj-platformy-dlya-upravleniya-processami-sozdaniya-medicinskoj-tekhniki
(Дата публикации 07.05.2013).

37. Прохоров Н. Л., Швеин А. А., Знайко Г. Г., Красовский В.Е. Развите проектно-технологической платформы для управления процессами создания медицинской техники.
URL: http://www.ineum.ru/razvite-proektnotekhnologicheskoj-platformy-dlya-upravleniya-processami-sozdaniya-medicinskoj-tekhniki
(Дата публикации 20.07.2019).

38. Рейтинг стран мира по уровню продолжительности жизни: исследования. Гуманитарная энциклопедия. Центр гуманитарных технологий, 2006-2021 (последняя редакция: 04.01.2021).
URL: https://gtmarket.ru/ratings/life-expectancy-index

39. Сайфиддинова Э. С., Бегичева О. Л., Ананьина Л. Г. Перспективы развития искусственного интеллекта в нейрохирургии и нейрореабилитации / *Шаг в будущее: искусственный интеллект и цифровая экономика*: материалы 1-й Междунар. науч.-практ. конф. Вып. 4 / Государственный университет управления. Москва: Издательский дом ГУУ, 2017. С. 91-97. URL: https://guu.ru/wp-content/uploads/Conference-published-materials-issue-4.pdf.

40. Софронов А. Г., Николкина Ю. А. Оценка показателей качества жизни и социального функционирования у женщин с алкогольной зависимостью, состоящих на диспансерном наблюдении. *Обозрение психиатрии и медицинской психологии*. 2012. № 1. С. 43-47.

41. Старченко И. Б., Вишневецкий В. Ю. Биотехнические и медицинские технологии: учеб. пособие. Таганрог: Изд-во ТТИ ЮФУ, 2010. 52 с.
URL: http://window.edu.ru/catalog/pdf2txt/707/76707/57900?p_page=1

42. Стефанишина О. В. Медична реформа: три життєво важливі кроки для нового парламенту. *Укр. правда Життя*
URL: https://life.pravda.com.ua/columns/2019/07/30/237706/ (Дата публикации 30.07.2019).

43. Стратегическая сессия «Искусственный интеллект в медицине. Цифровое здравоохранение» / Всерос. консилиум заслуженных врачей Российской Федерации. *Медицина народного здоровья*.
URL: https://webiomed.ai/media/docs/itogovaia-prezentatsiia-strategicheskoi-sessii-iskusstvennyi-intellekt-v-meditsine-_NyPUSpx.pdf

44. Токарев Б. Е., Токарев Р. Б., Глотова Д. А. Рыночные и правовые перспективы внедрения разработок искусственного интеллекта. *Шаг в будущее: искусственный интеллект и цифровая экономика*: материалы 1-й Междунар. науч.-практ. конф.. Вып. 4 / Государственный университет управления. Москва: Издательский дом ГУУ, 2017. С. 197-205.

45. Фильченков А., Вяткин В., Шалыто А. Искусственный интеллект в производстве высокотехнологичной продукции.
URL: http://www.up-pro.ru/library/innovations/management/ii-produkciya.html.
(Дата публикации 11.05.2017).

46. Ягенський А. В., Січкарук І. М. Оцінка якості життя у сучасній медичній практиці. Інтернет-видання для медичних та фармацевтичних працівників. Специализированный портал для медработников Professional medical Portal. *Внутренняя медицина*. 2007. № 3. URL: http://www.mif-ua.com/archive/article/418

47. Artificial intelligence in medicine / A. N. Ramesh et al. *PJ* Drew. *Ann R Coll Surg Engl.* 2004. Vol. 86. P. 334-338. DOI: https://doi.org/10.1308/147870804290

48. Bursov A. I. Application of artificial intelligence in medical data analysis. *Almanac of Clinical Medicine.* 2019. Vol. 47, No. 7. P. 630-633.
DOI: https://doi.org/10.18786/2072-0505-2019-47-071

49. Chiolero A., Burnier M., Santschi V. Improving treatmentsatisfaction to increase adherence. *J. Hum Hypertens*. 2016. May. (Vol. 30, No. 5). P. 295-296. Epub 2015 Aug 20. PMID: 26290276.
DOI: https://doi.org/10.1038/jhh.2015.89

50. Irene J. Higginson, Alison J. Carr Using quality of life measures in the clinical setting Использование показателей качества жизни в клинических условиях. *BMJ.* 2001. 26 May. (Vol. 322, No. 7297). P. 1297-1300.
DOI: https://doi.org/10.1136/bmj.322.7297.1297

51. Kaplan R. M., Atkins C. J., Timms R. Validity of a quality of well-being scale as an outcome measure in chronic obstructive pulmonary disease. *Journal of Chronic Diseases.* 1984. Vol. 37, No. 2. P. 85-95.
DOI: https://doi.org/10.1016/0021-9681(84)90050-X

52. Kosenkova O. I., Makarova V. I. Problems of quality of life in modern medicine. *Human Ecology*. 2007. No. 11. P. 29-34.

53. Mihaila V., Enachescu D., Davila C. General Population Norms for Romania using the Short Form 36 Health Survey (SF-36). *QL News Letter* . 2001. No. 26. P. 17-18.

54. Schatsky D., Muraskin C., Gurumurthy R. Cognitive technologies: The real opportunities for business Deloitte Review Issue 16. URL: https://www2.deloitte.com/us/en/insights/deloitte-review/issue-16/cognitive-technologies-business-applications.html. (Дата публикации 27.01.2015).

55. Van Calster B., Steyerberg E. W., Collins G. S. Artificial Intelligence Algorithms for Medical Prediction Should Be Nonproprietary and Readily Available. *JAMA Intern Med*. 2019. 1 May. (Vol. 179, No. 5). P. 731. PMID: 31058938.
DOI: https://doi.org/10.1001/jamainternmed.2019.0597

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