

MEDICAL INFORMATION TECHNOLOGY FOR DECISION-MAKING TAKING INTO ACCOUNT THE NORMS OF CIVIL LAW

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Abstract: The task of this study is the design of medical information technology for decision-making taking into account the norms of civil law. The proposed medical information technology ensures the support when making medical decisions about the opportunity of reproductive technologies use (in vitro fertilization, surrogate motherhood), about the opportunity of transplantation and donation, about the opportunity of providing general medical services, about the opportunity of providing therapeutic services, about the opportunity of providing dental services, about the opportunity of vaccination. In addition, the designed information technology automates medical decision-making, minimizes the impact on medical decision-making, takes into account the norms of civil law when making medical decisions.

Key words: Medical information technology, decision-making, criteria for decision-making, principles of design and functioning of information technology.

1. INTRODUCTION

The modern period of the society development is characterized by a strong influence on it of information technologies, which ensure the spread of information flows in society, forming a global information space. They quickly turned into a vital stimulus for the development of not only the world economy, but also all spheres of our activity.

According to Deloitte auditors, global spending on digitization of the healthcare industry reached \$10.059 trillion in 2022 [1]. Digitization of medicine is currently necessary, since making a correct diagnosis is grounded on the analysis of a huge amount of the data accumulated during the diagnosis and treatment of millions of patients, and modern medical equipment is complex hardware and software complexes that require specialized software [2].

Medicine is one of the most progressive industries in terms of information technology (IT) implementation. Medical practice is accompanied by serving a large number of patients, conducting many complex diagnostic examinations, processing a significant amount of information. Therefore, it is difficult to provide high-quality medical care without the use of computer systems. Widespread use of IT in medicine in the process of diagnosis and treatment and intensive integration into the global information space are important tasks in the reformation of domestic medicine [3].

Digitization significantly improves the work of the health care system, makes medicine accessible to the population, and the process of providing medical services makes effective. This is possible due to changes in the organizational issues of the system, which increase the quality of medical services while simultaneously reducing financial costs for their provision. At the same time, information technologies in medicine contribute to the improvement of the work of all components of the health care industry: they allow simplifying the registration of patients, organizing and reducing the working time of specialists, keeping automatic records of the beds-fund, controlling the prescription of drugs, simplifying the introduction and obtaining of statistical data [4].

World Health Organization's directive A58/21 states that electronic health care "opens up a unique opportunity for the development of public health care". Electronic health care (eHealth) allows you to effectively solve the health care tasks with help of information and communication technologies, regardless of the geographic location of the doctor and patient. The world experience in the information technologies' design and use testifies to the unlimited potential of this field in solving social problems of society [5].

Modern information technologies in medicine are a set of methods and means for processing medical data in integrated technological systems for the creation, use, storage, transmission and protection of an information product. Medical information technology is a tool that allows you to determine and plan all the resources of a medical institution with the help of specialized software, computer equipment, necessary medical equipment, communication tools and supports medical and diagnostic, financial, administrative and economic, accounting and service activities institutions for providing quality medical services to patients.

Therefore, *the urgent task today* is the use of information technologies in medicine, which make it possible to provide universal management of the provision of medical care to the population, to introduce the latest methods of diagnosis and treatment into the activities of doctors and medical personnel, and to organize consultations of doctors remotely.

2. SURVEY OF RESEARCH IN THE FIELD

The use of new information technologies in modern medical centers makes it easy to keep a complete record of all services provided, tests performed, and prescriptions issued. When automating a medical institution, electronic outpatient charts and medical histories are filled out, reports are compiled, and medical statistics are kept. The use of information technologies in the work of polyclinics or inpatients significantly simplifies a number of work processes and increases their effectiveness in providing medical care to residents of our region. In addition, information technologies are especially important when making medical decisions.

From the point of view of decision-making by medical information technologies, considering the civil law norms, the following criteria are important [6, 7]: 1) does medical IT provide solutions about the opportunity of reproductive technologies use (surrogate motherhood, in vitro fertilization); 2) does medical IT provide solutions about the opportunity of donation and transplantation; 3) does medical IT provide solutions about the opportunity of providing general medical services; 4) does medical IT provide solutions about the opportunity of providing therapeutic services; 5) does medical IT provide solutions about the opportunity of providing dental services; 6) does medical IT provide solutions about the opportunity of vaccination. Let's conduct the survey of research in this field on the subject of satisfaction of the defined 6 criteria by them – Table 1.

The conducted survey of research in this field showed that each IT-solution is intended to satisfy one of the six criteria defined, but no IT-solution satisfies all six criteria at the same time. In addition, all considered solutions are not based on a comprehensive study of the object, are not based on a single methodological approach, that is, now systematic medical information technology for decision-making taking into account the norms of civil law is absent. Therefore, *the task of this study* will be the design of medical information technology for decision-making taking into account the norms of civil law, which will satisfy all six defined criteria at the same time.

Table 1. Survey of research

<i>Criterion(1)</i>	<i>Criterion(2)</i>	<i>Criterion(3)</i>	<i>Criterion(4)</i>	<i>Criterion(5)</i>	<i>Criterion(6)</i>
<i>Decision support system for predicting the results of the application of reproductive technologies [8]</i>	<i>Decision support system on exchange and distribution of kidneys [10]</i>	<i>Exemplary data-based clinical decision support system [12]</i>	<i>Collaborative Recommender and Demographic-based Recommender approaches for facilitating the support of therapeutic decision [14]</i>	<i>Decision support system for creating and managing the pathology database and for modeling oral pathology diagnoses [16]</i>	<i>Digital platform for a pilot study of factors related to readiness for vaccination [18]</i>
<i>Tool for solving problems of medical decision-making regarding the use of reproductive technologies [9]</i>	<i>End-to-end transplantation and donation and system based on Ethereum blockchain [11]</i>	<i>ArdoCare architecture of the medical decision support system [13]</i>	<i>Tools for helping the patients to make decisions [15]</i>	<i>Artificial intelligence-based method for assessing the quality of services, and decision support system in the sector of dental prosthetics [17]</i>	<i>Shared decision-making method for vaccination [19]</i>

3. MEDICAL INFORMATION TECHNOLOGY FOR DECISION-MAKING TAKING INTO ACCOUNT THE NORMS OF CIVIL LAW

The concept underlying medical information technology for decision-making taking into account the norms of civil law is making medical decisions considering the civil law norms.

The principles of designing and functioning of information technology are: the principle of development (taking into account the possibility of adding and updating the functions and composition of information technology without disrupting its functioning); the principle of compatibility (the presence of information interfaces, thanks to which information technology can interact with other technologies and systems according to established rules); the principle of efficiency (achieving the maximum effect while minimizing information technology costs); the principle of systematicity (the creation of information technology is based on a comprehensive study of the object, on a single methodological approach that makes it possible to consider the studied object as a whole); the principle of automating the processing

of information flows (complex use of technical tools at all stages of the passage of information from the moment of its registration to the receipt of resultative indicators and the formation of decisions); the principle of legality (the need to strictly comply with the requirements of Ukraine Laws, in particular, Ukrainian civil norms); the principle of adaptability to new tasks (use of information technology not only to solve traditional tasks, but also its restructuring in accordance with the need to solve new tasks); principle of phasing (possibility of gradual and consistent development of the technology); the principle of openness of information (ensuring the veracity, truthfulness, regularity, operativity and reliability of information for further use).

In [6, 7], the authors conducted an analysis of the subject field of medical law in relation to six defined criteria, and also developed methods and rules for support when making medical decisions about the opportunity of reproductive technologies use (in vitro fertilization, surrogate motherhood), about the opportunity of transplantation and donation, about the opportunity of providing general medical services, about the opportunity of providing therapeutic services, about the opportunity of providing dental services, about the opportunity of vaccination.

Then let's design medical information technology for decision-making taking into account the norms of civil law. *The structure of the formation of medical information technology for decision-making taking into account the norms of civil law* is presented in Figure 1.

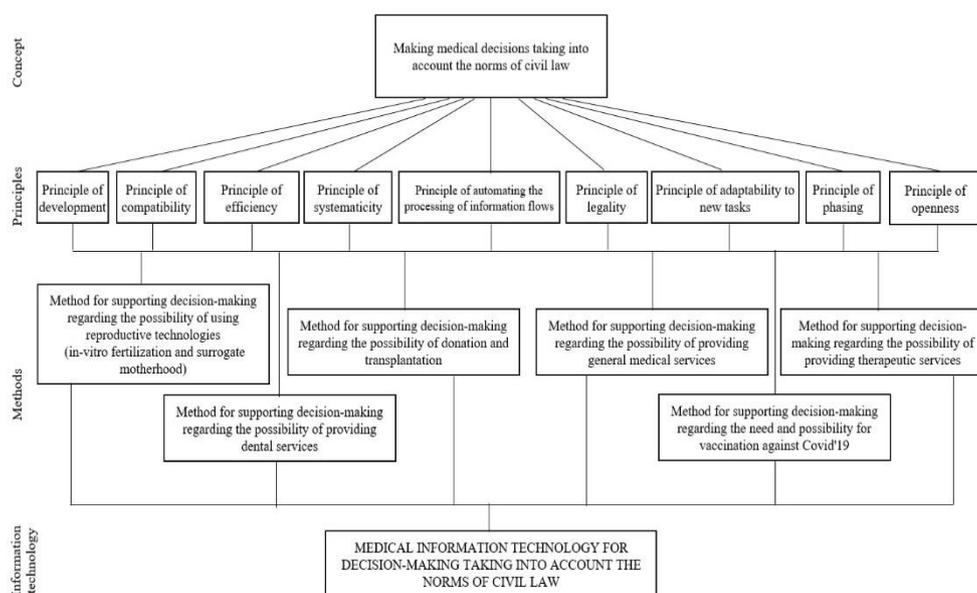


Figure 1. Structure of the formation of medical information technology for decision-making taking into account the norms of civil law

The detailed structure of medical information technology for decision-making taking into account the norms of civil law is presented in Figure 2.

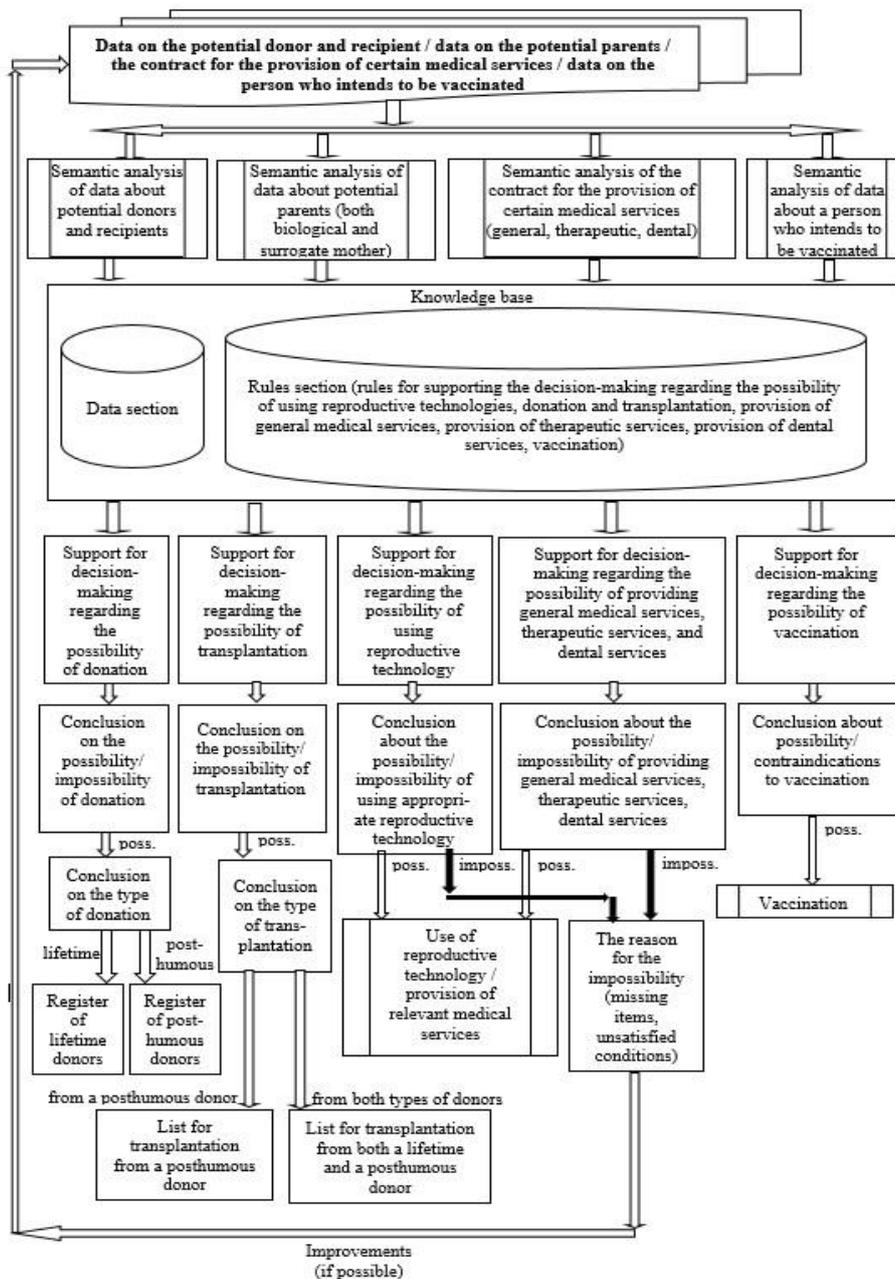


Figure 2. Structure of the medical information technology for decision-making taking into account the norms of civil law

The designed medical information technology for decision-making taking into account the norms of civil law satisfies all six defined criteria at the same time – it ensures the support when making medical decisions about the opportunity of reproductive technologies use (in vitro fertilization, surrogate motherhood), about the opportunity of transplantation and donation, about the opportunity of providing general medical services, about the opportunity of providing therapeutic services, about the opportunity of providing dental services, about the opportunity of vaccination.

4. RESULTS AND DISCUSSION

As an *example* let's consider the data on potential parents who wish to use the in vitro fertilization service: the potential mother is a 17-year-old able-bodied citizen of Ukraine who has no contraindications for carrying a pregnancy, no mental illnesses, no uterine defects, malignant and benign formations, and has passed all necessary tests and analyses; the potential father is a 25-year-old able-bodied citizen of Ukraine who also passed the necessary tests and analyses; the couple gave written consent to in vitro fertilization, but the couple does not need in vitro fertilization for medical reasons. Reproductive medicine clinic in Khmelnytskyi (Ukraine) collected all the necessary information about potential parents and submitted it for processing using the developed information technology.

The obtained medical information was checked by the developed medical information technology for the presence in it of mandatory conditions (signs) for performing in vitro fertilization in accordance with the current norms of civil law. All data on potential parents has been entered in the knowledge base's data section.

The developed medical information technology checked all current norms of civil law with using the rules contained in the knowledge base, and based on them, generated the conclusion about the impossibility of performing the in vitro fertilization procedure, indicating the reason for the impossibility of such a procedure (the potential mother is a minor, and the spouse is not needs in vitro fertilization for medical reasons). It is clear that it is impossible to improve the data on potential parents, to make any changes in them in this case.

Figure 3 presents the role of the designed medical information technology for decision-making taking into account the norms of civil law in comparison with the actual status of the medical decision-making field.

Figure 3 shows, that, as opposed to the actual status of the medical decision-making field, the designed medical information technology for decision-making taking into account the norms of civil law: automates medical decision-making processes, minimizes the human factor, and also takes into account the norms of current legislation

when making medical decisions, thereby allowing not to pay for the services of a hired lawyer.

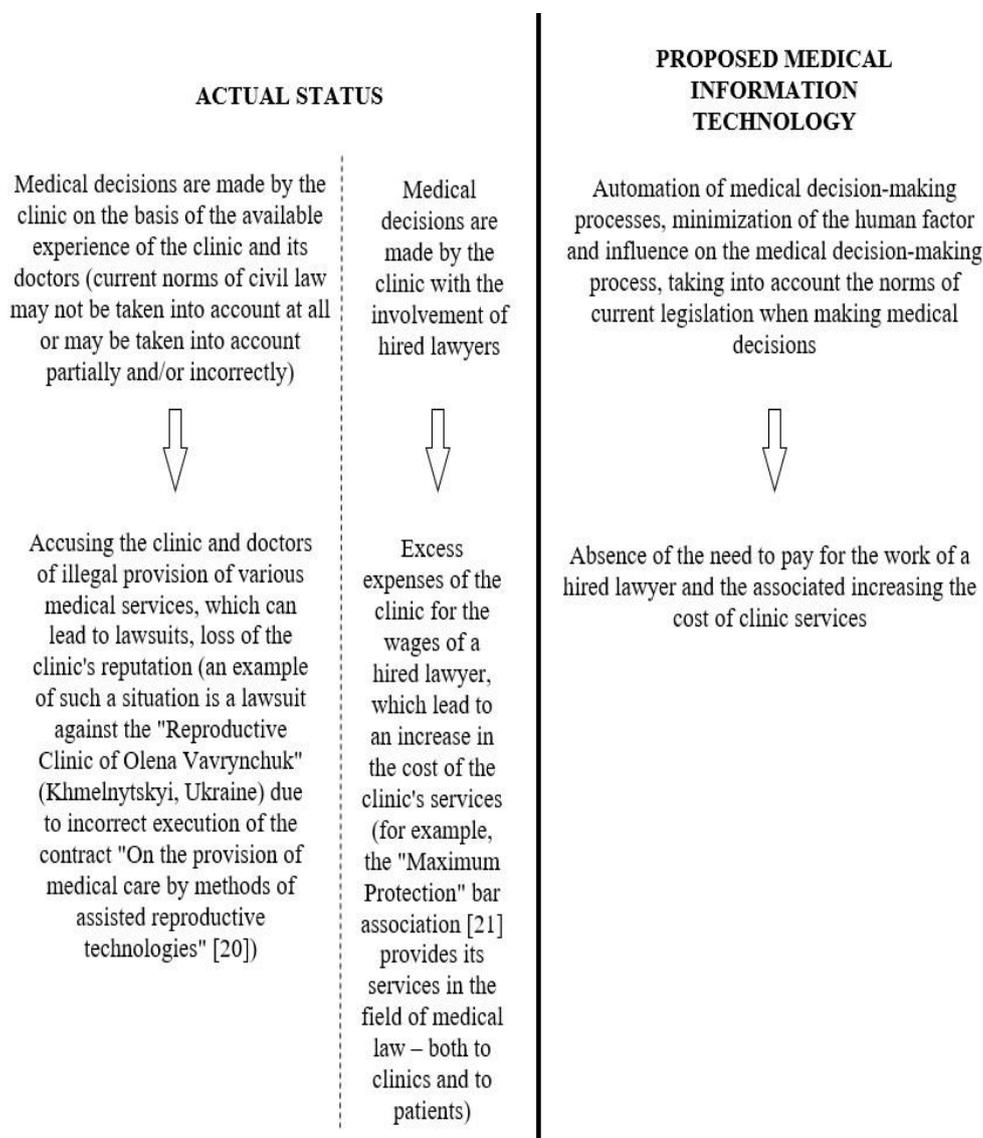


Figure 3. Role of the proposed medical information technology for decision-making taking into account the norms of civil law in comparison with the actual status of the medical decision-making field

5. CONCLUSIONS

Since the moment when high-speed computing on large volumes of data and with the growing share of medical research that relies on mathematical (computer) modeling have become commonplace in clinical practice, it has become clear that information technologies' capabilities are becoming key factors in the field of medicine.

Information technology in the health care field is a vitally important field that must ensure effective, safe and reliable medical care. And this industry is developing most dynamically.

The urgent task today is the use of information technologies in medicine, which make it possible to provide universal management of the provision of medical care to the population, to introduce the latest methods of diagnosis and treatment into the activities of doctors and medical personnel, and to organize consultations of doctors remotely.

The task of this study is the design of medical information technology for decision-making taking into account the norms of civil law, which will satisfy all six defined criteria at the same time.

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As opposed to the actual status of the field of medical decision-making, the designed medical information technology for decision-making taking into account the norms of civil law: automates medical decision-making processes, minimizes the human factor, and also takes into account the norms of current legislation when making medical decisions, thereby allowing not to pay for the services of a hired lawyer.

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