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Medical Management in the Context of Digital Transformation: Challenges for Institutional Leaders

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ABSTRACT

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The relevance of this study is due to the fact that medical institutions are now forced to quickly adapt to large-scale digital transformation. This process has a profound impact on the healthcare management system and poses new challenges for managers. The article aims to identify the management challenges that medical institution managers face when implementing digital technologies, as well as to identify approaches that can help effectively overcome these difficulties. The methodological basis of the study includes systemic, structural-functional, comparative and analytical methods, which made it possible to comprehensively analyze the organizational, personnel and technological aspects of digitalization. In the course of the work, it was found that digital transformation actually forms a new management paradigm for managers, in which they have to simultaneously think strategically, understand technologies and work with personnel development. The study made it possible to identify key barriers to digitalization: insufficient digital literacy of employees, limited resources and the complexity of integrating new information solutions into already established processes. The level of readiness of medical institutions for digital changes turned out to be heterogeneous and largely depends on the type of institution and its resource capacity. Special attention is paid to the analysis of management models that contribute to successful digital transformation, in particular, change management models and the practice of forming interdisciplinary teams. The practical value of the study lies in the possibility of using its conclusions to form strategies for the digital development of medical institutions, improve management decisions, train managers to introduce innovations and increase the efficiency of organizational processes. The results obtained allow us to consider digitalization not only as a technological process, but as a complex management transformation.

KEYWORDS

information systems, management solutions, new interaction formats, organizational conditions, changes in the external environment, personalized offers.



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Медичний менеджмент в умовах цифрової трансформації: виклики для керівників установ

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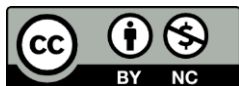
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Актуальність цього дослідження пов'язана з тим, що медичні установи нині змушені швидко адаптуватися до масштабної цифрової трансформації. Цей процес глибоко впливає на систему управління в охороні здоров'я та ставить перед керівниками нові завдання. Метою статті є виявлення управлінських викликів, з якими стикаються керівники медичних закладів під час впровадження цифрових технологій, а також визначення підходів, що можуть допомогти ефективно подолати ці труднощі. Методологічна база дослідження охоплює системний, структурно-функціональний, порівняльний та аналітичний методи, що дало змогу комплексно проаналізувати організаційні, кадрові та технологічні аспекти цифровізації. У ході роботи з'ясовано, що цифрова трансформація фактично формує для керівників нову управлінську парадигму, у якій доводиться одночасно мислити стратегічно, розумітися на технологіях та працювати із розвитком персоналу. Дослідження дало можливість виокремити ключові бар'єри цифровізації: недостатню цифрову грамотність працівників, обмеженість ресурсів та складність інтеграції нових інформаційних рішень у вже налагоджені процеси. Рівень готовності медичних установ до цифрових змін виявився неоднорідним і значною мірою залежить від типу закладу та його ресурсної спроможності. Окрему увагу приділено аналізу управлінських моделей, які сприяють успішній цифровій трансформації, зокрема моделей управління змінами та практики формування міждисциплінарних команд. Практична цінність дослідження полягає у можливості використання його висновків для формування стратегій цифрового розвитку медичних закладів, вдосконалення управлінських рішень, підготовки керівників до запровадження інновацій та підвищення ефективності організаційних процесів. Отримані результати дозволяють розглядати цифровізацію не лише як технологічний процес, а як комплексну управлінську трансформацію.

КЛЮЧОВІ СЛОВА

інформаційні системи, управлінські рішення, нові формати взаємодії, організаційні умови, зміни зовнішнього середовища, персоналізовані пропозиції.

1. Introduction

The healthcare system today is undergoing a deep digital transformation, which is due to the development of information technologies. At the same time, the transition to digital models of work has revealed a number of managerial contradictions that require a thorough analysis from the standpoint of modern medical management. The problem is that the heads of medical institutions are forced to simultaneously change traditional approaches to management, implement digital solutions and ensure the adaptation of personnel to new ones interaction formats. This is manifested in the lack of digital development strategies, the low level of digital skills of staff, as well as in the difficulties of integrating new systems into existing management and clinical processes. All this necessitates a deeper understanding of the managerial challenges faced by the heads of medical institutions in the process of digital transformation, and the search for practical mechanisms that can ensure the efficiency and sustainability of this process.

2. Literature Review

In the available scientific array, the topic of digital transformation of healthcare is mostly considered through the prism of macro-level processes – finance, cybersecurity, legal frameworks and social effects, while management mechanisms at the level of specific medical institutions are described in fragments. That is why the generalization of previous results allows us to outline the gaps that this article is designed to fill – the lack of applied models and indicators for heads of institutions coordinated with national digitalization trends. The work of Petrukha et al. [1] demonstrates that the digitalization of the economy and public finances is shifting the focus of fiscal policy towards data-centric approaches and real-time accountability. The authors show that the introduction of digital services creates measurable efficiency effects (reduction of transaction costs, acceleration of the decision-making cycle), as well as forms a demand for new competencies of managers.

In continuation of the financial and institutional logic of Petrukha et al. [2] in the study on cybersecurity, the economy and public finance prove that the resilience of digital transformations is determined not so much by the number of implemented IT solutions as by the quality of the security model (threat classification, access segmentation, continuous monitoring). It is concluded that without built-in cyber protection mechanisms, digital financial processes reproduce old risks on a new scale.

Melnyk et al. [3] record that in wartime, legal guarantees of occupational safety and personnel management become a critical component of the overall sustainability of socio-economic systems. The authors prove the importance of the formation of normatively validated risk management procedures for personnel processes and communications.

In the work of Petrukha et al. [4] The social imperatives of public finance in the war and post-war periods are emphasized: cost prioritization, transparency, targeted support, and accountability. The researchers conclude that the principles of post-war recovery should be embedded in management decisions at the stage of current adaptation.

Kvitka and Myrhorodska [5] link the digital transformation of the healthcare system with indicators of the quality of life of the population and conclude that the effects of digitalization materialize due to the availability of services, data security, and user competence. The authors outline that it is the combination of infrastructure, digital literacy, and process standardization that ensures a sustainable improvement in well-being.

Muzyka-Stefanchuk et al. [6] digitalization in connection with the reform of the financing of the industry and show that the discrepancy between model requirements and the real capabilities of institutions creates gaps in the quality of services. The key result is the need to synchronize financial mechanisms with the patient's digital routes (payment for the result, stimulation of data integration, support for telemedicine services).

In the works of Kyrychenko [7], digital transformation is understood through the prism of adaptive development strategies, where special attention is paid to the ability of heads of medical institutions to respond to the instability of the environment, combining a long-term vision with flexible management tools. The author emphasizes that digital changes exacerbate the requirements for the

strategic competence of managers and reveal the limitations of traditional hierarchical management models in the face of rapid technological changes.

Expanding this approach, Kukhta [8] analyzes the digital transformation of management systems in a broader intersectoral context, emphasizing its ambivalent nature. Although the study focuses mainly on the business environment, its findings are also relevant for the healthcare sector, where management decisions directly affect the quality and availability of medical services.

An important contribution to the understanding of the personnel dimension of digital transformation was made by Bohuslavskaya and Chubenko [9], who consider the integration of digital technologies into the mechanisms for managing the development of personnel of medical institutions. The authors demonstrate that digitalization changes not only the tools of personnel management, but also the very logic of working with personnel, actualizing the need for continuous learning, the development of digital and interdisciplinary competencies, as well as the formation of new models of employee motivation.

Special attention is paid to the managerial dimension of digitalization of health care institutions by Gurzhiy [10], who analyzes the practical use of digital technologies in the management process. In his research, digital tools are considered as a means of increasing the efficiency of planning, control and coordination of the activities of medical institutions. At the same time, the author draws attention to the fragmentation of the implementation of digital solutions and the lack of a holistic management approach, which often leads to a discrepancy between technological capabilities and real management practices.

However, there is a lack of management models for heads of medical institutions in the scientific field. It is currently unclear how to build a hospital data architecture. It is necessary to clarify which KPIs to apply to digital services. It is important to develop mechanisms that will help integrate cybersecurity into daily processes. Filling these gaps is the subject of the current study.

3. Problem Statement

The article is aimed at studying the managerial challenges that arise for the heads of medical institutions in the process of introducing digital technologies.

4. Methods and Materials

The methodological logic of this study is based on the understanding of digital transformation not only as a technological renewal of the infrastructure of medical institutions, but as a complex management process that changes decision-making, the distribution of responsibilities and the nature of interaction between managers, staff and patients. Therefore, the study was built on a combination of qualitative and analytical approaches, which made it possible to cover both institutional and behavioral aspects of management in healthcare in the context of digitalization.

The empirical and analytical basis of the work was scientific publications, analytical reports of international organizations, regulations in the field of health care and digital governance, as well as the results of previous research on the transformation of management models in the public sector. The selection of sources was carried out taking into account their relevance, interdisciplinary nature and relevance to the problems of managing medical institutions in the context of the introduction of digital technologies.

5. Results and Discussion

The digital transformation of the healthcare system forms a fundamentally new management paradigm, in which the head of a medical institution becomes not only an administrator but also a leader in digital innovations. Modern digital diagnostic platforms such as RFID systems, barcoding, remote patient monitoring, and others (Table 1) create opportunities to improve the accuracy of diagnosis, the efficiency of clinical decision-making and patient safety. standards, introduction of digital clinical routes and data quality control [5, p. 16]. Automation of logistics processes using robotic systems (drug transportation, asset control, sample handling) significantly reduces the likelihood of human error,

optimizes the use of resources, and reduces costs. At the same time, it requires managers to have new competencies in the field of cybersecurity, technical audit, and personnel change management.

The dynamic development of eHealth solutions contributes to increasing the transparency of processes and the integration of clinical data at all stages of treatment. The introduction of mobile applications for chronic patients, rehabilitation platforms, medical chatbots expands the boundaries of medical services beyond the hospital and contributes to the formation of a patient-centered model focused on the patient's active participation in treatment [6, p. 364].

Table 1. Digital Innovations in the Medical Field and Management Challenges for Executives

Digital Technology Group	Examples	Opportunities to improve the effectiveness of medical management	Key challenges for heads of medical institutions	Examples of medical information system
Remote and automated diagnostics	Barcodes to identify medicines and patients; RFID tracking of equipment; Remote monitoring in the intensive care unit	Reduction of medical errors; optimization of resources; Quick access to data	High cost of implementation; The need for standardization and cyber protection	Medstar, Open MRS
Robotics-based hospital logistics	Robots for transporting medical supplies; automation of routine processes	Reducing the workload on personnel; Increasing the speed and accuracy of logistics	Resistance of personnel to change; Need for training in robotic systems	SAP Healthcare
Electronic medical services and document management	Electronic referrals; Transfer of tests and clinical data	Increasing the availability of information; reduction of patient service time	Integration with national systems (eHealth); Confidentiality of personal data	Doctor Eleks, Health24
Dashboards and software to manage patient flows	Dashboards, analytics, digital planning systems	Optimization of the load on the department; support for data-driven management decisions	Ensuring data accuracy; Unification of management processes	Clinica Web
Personalized medicine	Genetic testing, proteomic data for individual treatment plans	Improving the effectiveness of treatment and prevention	The need for high investments; Shortage of medical bioinformatics specialists	Medics, Open MRS
Digital tools for the treatment of chronic diseases	Diabetes Control Apps, Online Rehabilitation, Connected Sensors, and Heart Rate Monitors	Improving adherence to treatment; continuous monitoring of patients' condition	The need for digital literacy of patients; Technical support of services	Medstar, Doctor Eleks
AI solutions in communication with patients	Medical chatbots for pre-consultation and navigation	Unloading of doctors; Quick response to common queries	Quality control of AI responses; Legal and ethical standards	Health24, Clinica Web
Tools for disease prevention	Mobile apps, fitness trackers, activity trackers	Formation of a responsible attitude to health; Community-based prevention	The need to motivate patients; Risks of incorrect self-interpretation of data	Medics, Accemedin

Source: compiled based on [5; 6; 11–15].

The transition of medical institutions to the status of communal non-profit enterprises has changed not only their legal form, but also the financing model. In the new conditions, managers must independently ensure the efficiency of the institution, the rational use of resources and its competitiveness. For this purpose, strategic analysis, assessment of the state of the institution, research of patient needs and the market of medical services are used. Management decision-making should be based on data, risk forecasting, and a willingness to change. Successful implementation of the strategy involves constant monitoring, correction of actions and openness to innovations, in particular to digital transformation technologies – information systems, telemedicine, automation of services [7, p. 163].

The formation of a single hospital information space allows managers to make decisions based on accurate and transparent data [11]. The rejection of disparate electronic systems and paper archives

eliminates contradictions between departments and makes it possible to consider data as a strategic asset that works for the quality of medical services and patient safety (Table 2).

Table 2. The Transformational Logic of Digital Medical Management

Digital Management Component	Key content	Managerial effects	Tools / Technologies
Focus on creating value for the patient	Moving from administrative logic to a value-centric model, where each process is evaluated through its impact on the patient experience	Increased patient satisfaction; reducing the number of errors; Transparency of management decisions	Patient portals, digital routes, feedback systems
BPM as a “framework” of change	Process management determines the structure of medical services from referral to discharge	Faster coordination of decisions; reduction of duplication of functions; Clarity of standards	BPM systems, process maps, visualization of work flows
Interdisciplinary teams with full responsibility	Teams work on the full cycle of the patient journey	Increased efficiency; Better integration of clinical and administrative solutions	Agile approaches, multidisciplinary groups, digital collaboration platforms
Technological infrastructure as the basis of transformations	Building a single technical environment for transparent data and integrated services	Reduction of operating costs; Accelerating innovation	Clouds, API integrations, ERP/CRM/HRM systems
Automation of routine processes	RPA and low-code solutions minimize manual work and paperwork	Redirecting staff time to work with the patient; Reducing errors	RPA bots, low-code platforms, autoforming documents
Data & AI Governance, DevSecOps, Zero Trust	Building a secure and flexible digital space of a medical institution	The growth of digital security; stability of systems; Data integrity control	Zero Trust architectures, DevSecOps pipelines, data management policies
Analytics and Artificial Intelligence	Load forecasting, optimization of patient routes, increasing the effectiveness of treatment	Reduction of queues; uniform distribution of resources; More accurate clinical solutions	AI forecasting models, analytical platforms, BI systems
Monitoring the effectiveness of digital changes	Evaluating digital transformation through measurable metrics	Transparency of investments; cost optimization; increasing the ROI of digital projects	KPI dashboards, decision monitoring systems, management analytics

Source: compiled based on [5; 7; 16–19].

Natural language processing and computer vision technologies automate quality control, patient support, and expand the hospital’s service capabilities. A separate revolution is taking place thanks to the Internet of Medical Things (IoMT) and digital twins. Real-time feedback medical equipment allows you to predict failures, prevent incidents, monitor resource usage, and provide continuous patient monitoring. Digital twins help to simulate clinical scenarios and select optimal management decisions [8, p. 115]. Therefore, digital transformation transforms medical management into a manageable, transparent and data-centric system that ensures continuous improvement [12]. For managers, this is both a challenge and an opportunity: new competencies, strategic vision, ability to work with innovations are needed, but this is what opens the way to the medicine of the future – effective, patient-oriented and resistant to change (Table 3).

The World Health Organization’s Global Strategy highlights the key role of digital competencies in strengthening health systems (WHO, 2021) [10]. The COVID-19 pandemic has further accelerated the adoption of digital solutions, while exposing digital literacy gaps among healthcare professionals, especially executives. This has made it urgent to integrate digital technologies into medical management curricula to prepare leaders for new challenges and opportunities of digital transformation [13]. Digitalization is changing the role and responsibilities of managers: they now lead digital initiatives, manage complex information systems, ensure data security and privacy, and facilitate organizational change for effective technology implementation. At the same time, traditional administrative and clinical knowledge is no longer sufficient; a modern medical manager needs complex competencies in the field of analytics, AI, telemedicine and digital process management [11, p. 100].

Table 3. Online education platforms for healthcare professionals and their contribution to the development of digital competencies

Educational Platform / Initiative	Course Type and Study Profile	Opportunities for healthcare professionals	Impact on the development of digital competencies
MedEdu	Evidence-based medicine, clinical protocols, healthcare management	Updating professional knowledge; practical analysis; training according to Ukrainian standards	Deepening of work with electronic clinical systems; Digital communication skills
Prometheus	General Medical and Management Courses, Digital Technologies in Medicine	Access to massive open online courses; Study of modern approaches to management	Formation of digital literacy; understanding of the organization of digital processes in medical institutions
Accemedin	Continuing professional development, highly specialized medical courses	Advanced training; access to courses for doctors of various specialties	Consolidation of skills in using electronic platforms and analytical tools
Educational portals of the Ministry of Health of Ukraine	Regulatory, clinical and management courses; Instructions and Trainings	Opportunity to undergo formal training; compliance with state standards	Mastering government electronic systems, including eHealth
Coursera, edX	Public health, digital health, bioethics, global health	Access to courses from leading universities; International approaches to health care	Development of analytics skills, working with data, implementing digital solutions in practice
Médecins Sans Frontières (MSF)	Preparation for work in crisis conditions, emergency medicine	Deepening of practical competencies; training in emergency work standards	Improving the skills of using mobile digital tools in the field

Source: Compiled based on [9, p. 11].

6. Conclusions

The study of the level of organizational, personnel and technological readiness of medical institutions to function in the context of digital transformation showed a significant imbalance between the technological potential and the real capabilities of personnel. and private medical institutions demonstrate better readiness for digital changes compared to municipal and rural ones. Based on the generalization of the results obtained, a number of practical approaches and management models capable of ensuring successful digital transformation have been identified. These include change management models adapted to the medical sector (ADKAR, Kotter), the development of digital competencies of managers and staff, the creation of internal digital transformation teams, the phased implementation of digital solutions taking into account the real needs of the institution, the construction of integrated information systems and the use of indicators for assessing the effectiveness of digital changes. The practical application of these approaches will contribute to increasing the effectiveness of management, reducing risks and improving the quality of medical care.

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