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## DIGITALISATION OF HEALTH DATA: IMPACT ON PATIENT-CENTREDNESS AND SAFETY

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### Rezumat.

Articolul examinează efectele digitalizării datelor medicale asupra pacientocentrismului și siguranței informațiilor. Progrese precum dosarele medicale electronice, telemedicina și aplicațiile mobile facilitează accesul la îngrijire și implicarea activă a pacienților în procesul decizional. Cu toate acestea, utilizarea acestor tehnologii ridică provocări privind protecția datelor personale, securitatea cibernetică și etica medicală. Autorii subliniază necesitatea aplicării standardelor internaționale pentru protejarea confidențialității și propun dezvoltarea infrastructurii digitale și instruirea personalului medical pentru a răspunde noilor cerințe tehnologice și juridice.

**Cuvinte-cheie:** digitalizare, pacientocentrism, securitate, standarde internaționale, telemedicină, etică medicală.

### Summary. Digitalisation of Health Data: Impact on Patient-Centredness and Safety.

The article explores the effects of health data digitalisation on patient-centred care and data security. Innovations such as electronic health records, telemedicine, and mobile applications improve accessibility and patient engagement in decision-making. However, these advancements raise concerns about cybersecurity, privacy protection, and ethical issues. The authors emphasise the importance of implementing international standards to safeguard data confidentiality and recommend developing robust digital infrastructures and enhancing the legal literacy of healthcare professionals to address the technological and legal challenges of digitalisation.

**Keywords:** digitalisation, patient-centredness, data security, international standards, telemedicine, medical ethics.

### Резюме. Цифровизация медицинских данных: влияние на пациентов и безопасность.

В статье рассматривается влияние цифровизации медицинских данных на пациентоцентричность здравоохранения и защиту данных. Использование электронных медицинских карт, телемедицины и мобильных приложений облегчает доступ к медицинской помощи и вовлеченность пациентов в процесс лечения. Однако цифровизация также несет в себе риски, связанные с кибербезопасностью, правовыми и этическими аспектами. Авторы предлагают внедрение международных стандартов защиты данных, совершенствование цифровой инфраструктуры и повышение правовой грамотности медицинских работников, чтобы обеспечить безопасность и защиту конфиденциальности данных в новых условиях.

**Ключевые слова:** цифровизация, пациентоцентричность, безопасность данных, международные стандарты, телемедицина, медицинская этика.

### Introduction.

The digitalisation of healthcare is an integral part of modern medical practice, with technology playing a key role in changing the way healthcare information is managed, stored and processed. With the advent of digital technologies such as electronic medical records (EMRs), remote monitoring systems and telemedicine, healthcare is becoming more accessible and efficient. However, along with the many benefits of these technologies come significant challenges, particularly related to data security and privacy protection. The importance of this issue comes to the forefront given that medical data breaches can have catastrophic consequences for patients, including identity theft, financial loss, and even life-threatening consequences [16].

In recent years, particular attention has been paid to the impact of digitalisation on the patient-centredness of health services, i.e. the degree to which patients are involved in their care and solving medical problems. Patient-centredness is becoming a central concept in health care systems that seeks to take into account not only medical indicators, but also patient preferences, expectations and convenience. In the digital health environment, this concept is undergoing significant change as patients are given new tools to actively participate in managing their health, such as mobile apps and self-care platforms.

Digitalisation also directly affects patient safety issues, providing new monitoring and diagnostic tools, but also compromising the protection of sensitive information. The main concerns are not only

cybersecurity, but also the possible legal and ethical implications associated with the use of patients' personal data. In order to effectively address these issues, it is necessary to consider the digitalisation of health data not only from a technological perspective, but also from an organisational, regulatory and ethical perspective [6].

**The purpose of this study** is to provide a comprehensive analysis of how the digitalization of health data affects patient safety and the quality of healthcare services, taking into account current developments in technology.

### **Material and methods.**

This study used current scientific publications and legal documents selected from leading databases such as PubMed, Google Scholar and JSTOR. The material included studies on the topics of digitalisation of medical data, patient-centredness in healthcare and cybersecurity. The study takes into account the authors' own experience to complement the theoretical analysis with practical aspects.

### **Results and discussion.**

#### ***Theoretical aspects of the digitalisation of health data***

The digitalisation of medicine represents a shift from the traditional paper-based approach to the use of modern medical data management technologies. This includes the introduction of electronic medical records (EMR), Picture Archiving and Communication Systems (PACS), telemedicine and mobile applications for patient self-service. Digitalisation covers all aspects of patient interaction with the medical system: from initial registration to chronic disease management [25].

Digitalisation aims to create an integrated healthcare system where patient data is available in real time to healthcare professionals and patients themselves. This speeds up clinical solutions, reduces errors and improves the sharing of information between institutions. Electronic medical records (EMRs) play a key role by structuring data and allowing patients to participate in solving treatment decisions, increasing their responsibility for their own health [13].

However, digitalisation comes with security risks, including cyber attacks and unauthorised access to data. Developing data protection standards is becoming essential to counter these threats [17].

The evolution of data management technologies includes a shift from basic information systems to modern platforms capable of analysing massive amounts of data, including genomic research and data from wearable devices. The integration of data in different formats enables comprehensive health

analysis and the development of personalised treatment approaches. Cloud technologies offer flexible solutions for data storage and processing, providing rapid access in emergency situations, but face cybersecurity challenges and legal restrictions [21].

Advances in artificial intelligence (AI) and machine learning make it possible to analyse massive amounts of data, predict clinical outcomes and optimise diagnosis. AI is already being used to analyse X-rays and CT scans, speeding up diagnosis and improving accuracy [23].

Patient-centredness in the digital age is taking on new forms. Digital health platforms such as mobile applications and telemedicine empower patients to take control of their health and participate in solving treatment decisions.

Self-service systems, including patient portals, provide access to medical records, test results and doctor consultations. These platforms promote better engagement with healthcare institutions, patient satisfaction, and adherence [10].

Digitalisation is thus transforming healthcare into an interactive and accessible structure, improving the quality of care and increasing patient involvement in managing their health.

#### ***Benefits of digitalisation of health data***

The digitalisation of medicine offers new opportunities to improve the quality of health services through fast and accurate access to patient data. Electronic medical records (EMRs) reduce the time needed to collect and process information, standardise it and make it accessible to different specialists, which improves communication between healthcare institutions and diagnostic accuracy [25].

Automating processes reduces human error. For example, electronic medication prescribing systems reduce prescribing errors by 55%, minimising the risk of inappropriate treatment [4].

Decision support systems (CDSS) analyse patient data and suggest possible diagnoses and treatment options, speeding up the diagnostic process and reducing the likelihood of medical errors [5].

Modern technologies such as telemedicine and remote monitoring systems improve access to medical care. Telemedicine allows patients to receive specialist consultations remotely, which is especially important for remote regions. This reduces the burden on clinics, speeds up diagnosis and reduces the number of hospitalisations [18].

Remote monitoring via wearable devices allows patients with chronic diseases, such as diabetes or hypertension, to be monitored in real time. If the condition worsens, the system notifies the doctor, which allows timely correction of treatment [3].

Electronic systems ensure accurate data recording, eliminating errors common to paper-based systems, such as data loss or duplicate records. In addition, patients can access their health information through online platforms and mobile applications, facilitating their active participation in health management.

Digitalisation integrates data from a variety of sources, including laboratory tests, imaging results, and wearable devices, to help doctors make faster, more informed decisions and develop personalised treatment plans.

Digital platforms also improve doctor-patient interactions, including the use of chat rooms, video consultations and automatic reminders. This simplifies communication, increases adherence to treatment and reduces the risk of complications.

In addition, digitalisation promotes transparency and trust between patients and medical staff by providing access to comprehensive health information. Studies show that such platforms increase patient satisfaction and engagement in care.

#### ***The impact of digital technologies on patient-centredness***

The digitalisation of healthcare greatly enhances the personalisation of healthcare services, which is a key aspect of patient-centred medicine. Personalisation involves creating individualised treatment plans based on unique patient characteristics such as genetic information, medical history and lifestyle. Modern technologies, including big data and artificial intelligence (AI), facilitate the processing of this data to generate accurate and personalised recommendations [24].

AI and machine learning are becoming important tools for personalised medicine. These technologies analyse voluminous medical data, including genomic and clinical indicators, and offer patient-specific solutions. For example, in oncology, AI analyses genomic data to select the most effective treatments with minimal side effects, increasing the success of therapy and reducing complications [11].

Personalised medicine also takes into account social and psychological aspects such as stress levels and behavioural factors. Data from wearable devices and mobile apps help create prevention and treatment programmes. For example, activity and sleep monitoring apps allow patients to monitor their condition and identify potential problems early, which improves prevention [22].

Digitalisation is improving patients' access to health information. Whereas in the past access to data was limited to healthcare institutions, today portals and mobile apps allow patients to view test results, medical history and prescriptions, making treatment

transparent and two-way. Patients can actively participate in solving treatment decisions, which increases their confidence and improves their control over their health.

Digital platforms also facilitate communication with doctors. Patients can send requests for consultations or repeat prescriptions through online portals, which reduces waiting times and improves the quality of services. These technologies are especially important for patients with chronic diseases, reducing the frequency of clinic visits.

Telemedicine has become an important tool for improving patient satisfaction and access to health services. It allows for video consultations and remote diagnosis. This is particularly relevant in remote regions or during pandemics. Studies show that telemedicine reduces transport costs, reduces waiting times and increases patient satisfaction [20].

In the COVID-19 pandemic, telemedicine technologies have become a necessity for continuity of care. Remote monitoring programmes have made it possible to monitor patients with mild symptoms at home, relieving the burden on hospitals and ensuring quality of care [9].

Mobile apps integrated with wearable devices help to collect patient health data, including physical activity, sleep and stress levels. This data is used by doctors to assess treatment and adjust therapy, improving outcomes for patients with chronic conditions [2].

Digitalisation is thus transforming patient-centricity by providing new tools for patients to actively participate in their care. This improves accessibility and quality of care, reduces barriers to communication with doctors and increases patient satisfaction.

#### ***Impact of digital technology on patient safety***

Monitoring and remote patient monitoring systems represent one of the promising areas of digital medicine. These technologies allow healthcare institutions to track patients in real time, which is especially important for patients with chronic diseases such as diabetes, hypertension or cardiovascular disease. For example, wearable devices collect patient health data (heart rate, blood oxygen levels, blood pressure) and transmit it to healthcare institutions. In case of deviations from the norm, the system notifies the doctor, thus preventing exacerbations and reducing the number of hospitalisations [3].

Remote monitoring is effective in rehabilitation and post-operative care. Patients after surgery can be discharged earlier as their condition is monitored remotely, which reduces the risk of infections and speeds up recovery. Studies show that such systems

reduce mortality among patients with chronic diseases by 20-30% [12].

Automation of healthcare processes improves patient safety by reducing human error. Decision support systems (CDSS) help doctors analyse patient data, including medical history and laboratory tests, and suggest diagnostic and treatment options to reduce the risk of diagnosis errors [5].

Electronic prescription systems prevent errors due to illegible handwriting, duplication or incompatibility of medicines. They reduce the likelihood of serious errors by 50-80% [4].

Electronic medical records (EMRs) allow data to be synchronised between healthcare institutions, providing full access to medical history. This eliminates duplication of procedures and speeds up solving problems [13].

AI is becoming an important tool for improving patient safety by analysing large amounts of data to predict complications and detect errors. For example, deep learning algorithms can analyse medical images such as CT scans or X-rays with high accuracy, helping to identify pathologies [23].

AI is also being used to assess the risks of chronic diseases based on a patient's medical history and lifestyle. These algorithms help doctors intervene in a timely manner, which reduces the likelihood of negative outcomes [11].

Automated analysis of medical records can detect errors, such as incorrect dosages or drug incompatibilities. This reduces the workload of staff and minimises the risk of medical errors.

### ***Legal and ethical issues of digitalisation***

Regulation of medical data processing is a critical aspect of the digitalisation of healthcare. The transition to electronic medical records (EMR) and the use of cloud technologies create new legal challenges related to the protection of personal data. Despite the existence of regulations such as GDPR in the European Union, which establishes strict rules for data processing, including mandatory explicit consent for patients, and HIPAA in the US, which defines standards for medical privacy, these regulations need to be regularly reviewed and adapted to new technologies [7].

Difficulties arise in cross-border data transfer, where differences in data protection standards complicate the exchange of health information. The use of cloud services requires clarification of the jurisdiction and legislation applicable to the server where the data are stored. This emphasises the need for international standards to ensure the security of such operations.

Patient-centricity in the digital age requires protection of patients' right to access, correct and delete their data. However, many patients are unaware of their rights or are hampered by legal or technical restrictions. This threatens the principle of patient-centredness and reduces the opportunity for patients to actively participate in the management of their health [15].

The right to informed consent is also becoming an important aspect. Healthcare institutions often use data without fully informing patients about the purposes and methods of data processing. This poses a risk of privacy breaches and raises questions about the need for transparent and clear information mechanisms.

Big data and AI offer opportunities for research, but also raise privacy concerns. Medical data is used not only for medical treatment but also for commercial products, which can cause patient dissatisfaction if patients are not notified of such initiatives. This highlights the importance of implementing data use standards that respect patients' rights.

Digitalisation can create inequalities in access to services. Remote regions and populations with limited access to the internet are disadvantaged. This requires the development of ethical principles to ensure equal access to health services [1].

The use of AI requires attention to issues of fairness and accuracy. For example, algorithms trained on limited data may be inaccurate for certain ethnic or social groups, highlighting the need to incorporate ethical standards into algorithm design [14].

The digitalisation of medicine thus requires a coherent approach that combines data protection, ethics and equal access to technology for all patients.

### **Conclusion.**

The digitalisation of medicine opens new horizons for improving the quality, accessibility and safety of healthcare services. The introduction of electronic health records, telemedicine, cloud technology and artificial intelligence is improving diagnosis, treatment and patient involvement in managing their health, making medicine more personalised and patient-centred.

However, digitalisation presents new challenges: protecting privacy, cybersecurity and equal access to services require the development of robust data protection practices and adherence to security standards. Healthcare organisations must invest in infrastructure security and staff training to prevent data breaches and cyberattacks.

Future research should focus on innovative data protection technologies such as blockchain and AI,



as well as the application of international standards to secure cross-border data transfer. The integration of telemedicine and AI-enabled mobile applications has the potential to improve healthcare efficiency by reducing the workload of staff.

Special attention should be paid to the legal and ethical aspects of big data and AI. It is necessary to develop fair and safe mechanisms for the use of data, guaranteeing equal access to technologies and support for vulnerable groups.

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