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INFORMATION TECHNOLOGY IN MEDICINE

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This work examines modern information technologies used in medicine, in particular electronic medical records (EMR), telemedicine platforms, and medical imaging systems, which are widely used for educational and research purposes. A comparative analysis of the capabilities of these technologies, their features, and the limits of their application is conducted. The article provides recommendations on choosing an information system depending on the specific tasks of the user. The use of information technologies in medical education plays an important role, as they allow students and researchers to acquire practical skills in conditions close to real life, without the need to use physical patients in the early stages of training. This is especially important when studying complex medical systems where mistakes can be costly or even dangerous. Information systems provide the opportunity to experiment with different scenarios, develop and test diagnostic algorithms, which significantly speeds up the learning process.

Problem Statement.

Rapid advances in information systems, automation, and digitization are creating new demands for the training of qualified medical professionals [1-7]. Technology-based learning methods are becoming an important tool in the process of mastering complex medical procedures, as they provide students with the opportunity to learn in an interactive environment that simulates real clinical situations [8, 9]. Such methods often include simulations, virtual laboratories, and digital platforms where students can work with virtual models of patients and medical systems.

Given that the digitization of medicine is becoming increasingly relevant in today's world, where information technology is being introduced into various areas of healthcare, the topic of technological training is becoming particularly important. Effective training of future specialists in working with medical information systems is a key factor in ensuring their successful integration into real clinical processes and other areas of activity.

This work focuses on medical information technology. Medical information modeling is the process of creating virtual models of medical systems and their environments for simulation and testing. It is an important tool in modern medical education, allowing students, doctors, and researchers to develop, test, and optimize medical information systems without the need for physical prototyping in the early stages of development.

The aim of the work is to analyze systems such as electronic medical records (EMR), telemedicine platforms, and medical imaging systems, followed by the identification of all the features of such tools. So, the plan is as follows:

- overview of the characteristics of electronic medical records, telemedicine platforms, and medical imaging systems;
- detailed analysis of the capabilities of information systems;
- overview of the limitations of EMRs, telemedicine platforms, and imaging systems.

This comparison will help users choose the most suitable system for their specific tasks, whether for educational purposes, research projects, or clinical practice. Understanding the strengths and weaknesses of each system will help optimize workflow, increase efficiency, and ensure more accurate results.

Essence of study.

Let's start with the fact that electronic medical records (EMR) are a powerful and versatile medical information management system that has become widespread since the early 2000s. EMR provides a digital environment for storing and managing patient medical data, including medical history, test results, prescriptions, and other clinically relevant information. The system supports various data exchange standards, such as HL7 and FHIR, making it a flexible tool for healthcare institutions of various profiles.

Modern EMRs integrate with laboratory information systems (LIS), radiology information systems (RIS), and other specialized modules. They support clinical decision-making through built-in algorithms and knowledge bases, allowing physicians to quickly access up-to-date patient information.

Next, we will look at telemedicine platforms, which have seen particularly rapid development over the last decade. These systems have quickly gained popularity due to their ability to provide remote access to medical services. Telemedicine platforms are distinguished by their ability to conduct video consultations, remotely monitor patient conditions, and exchange medical information between specialists.

Modern telemedicine solutions include artificial intelligence features for preliminary diagnosis, integration with wearable devices for continuous health monitoring, and secure communication channels to ensure the confidentiality of medical data.

The third important area is medical imaging systems. These are specialized information systems designed to process, store, and analyze medical images. Originally created to work with X-ray images, modern imaging systems support a variety of modalities: CT, MRI, ultrasound, PET, and others.

Medical imaging systems, such as PACS (Picture Archiving and Communication System), provide centralized storage of images and access to them from anywhere in a medical facility. Modern solutions include AI-based tools for automatic detection of pathologies, 3D reconstruction, and quantitative image analysis.

EMC, telemedicine platforms, and medical imaging systems are powerful tools in the field of medical information technology, each with its own history of development and unique characteristics, which are presented in Table 1.

Table 1 – Comparison of key characteristics

Platform/feature	Electronic medical records (EMR)	Telemedicine platforms	Medical imaging systems
Supported operating systems	Windows, macOS, Linux, web browsers	Windows, macOS, Linux, iOS, Android	Windows, Linux, specialized workstations
Main functions	Patient data storage, medical record management, integration with HIS/RIS	Video consultations, remote monitoring, data exchange	Image storage, processing, analysis, 3D visualization
Standards and protocols	HL7, FHIR, ICD-10, SNOMED CT	WebRTC, HL7, secure communication protocols	DICOM, HL7, IHE
Licensing	Commercial solutions, some open-source options	Commercial and free versions	Commercial versions, some open-source (e.g., Orthanc)
Ease of use	Medium entry threshold, training of medical staff required	High-quality, intuitive interface for patients and doctors	High entry threshold, specialized training required
Community support	Active professional community, extensive documentation	Fast-growing community, lots of resources	Specialized community of radiologists and engineers
Extensibility	High, support for modules and integrations	High, API for integration with other systems	Medium, plugin support for analysis

Table 1 includes a point of integration with medical information exchange standards, which are widely used in healthcare to ensure compatibility between different systems and secure exchange of patient data.

Conclusions

This work provides an in-depth analysis of three important categories of medical information technologies: electronic medical records (EMRs), telemedicine platforms, and medical imaging systems.

Analysis of various medical information technology platforms has shown that each has its own unique features that should be considered when selecting a tool for educational and research purposes.

EMR are a versatile and flexible tool with powerful medical data management capabilities, making them suitable for a wide range of tasks in clinical practice, but they have a moderate entry threshold, which can be challenging for novice users.

Telemedicine platforms, which have seen particular development in recent years, are distinguished by their accessibility and ease of use, making them an ideal choice for users who need to interact remotely with patients and colleagues. They are particularly important in the context of expanding access to healthcare in remote regions.

Medical imaging systems, with their specialized image processing and analysis capabilities and support for the DICOM standard, are the best choice for radiologists and researchers working in this field. Modern systems with integrated artificial intelligence open up new possibilities for automated diagnostics.

Therefore, the choice of an information system should be based on the specific needs of the user, taking into account factors such as supported operating systems, functionality requirements, data exchange standards, licensing terms, ease of use, and community support. Choosing the right tool will optimize the workflow, reduce costs, and improve patient outcomes.

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РОЗРОБЛЕННЯ ПРОГРАМНО-АПАРАТНОЇ СИСТЕМИ ДЛЯ МОНІТОРИНГУ СТАНУ ЛЮДИНИ

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В тезах розглядається процес створення системи моніторингу людини, визначено основні компоненти складові системи, їх взаємодію між собою та обґрунтовано їх вибі. Наведено також принципову та електричну схеми систем моніторингу.