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DEVELOPMENT OF AUTOMATED MEDICAL INFORMATION SYSTEMS IN HEALTHCARE

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Abstract. The article discusses the rapid development of automated medical information systems (AMIS) in the healthcare sector, emphasizing their importance for optimizing services in health care institutions (HCI). The article discusses trends in the implementation of AMIS aimed at reducing queues, increasing throughput, reducing costs and improving the quality of medical services. It also focuses on the need to integrate systems with state information bases and standardize electronic medical records (EMR).

Keywords: *automated medical information systems, electronic medical record, telemedicine, remote monitoring, health care institutions, process automation*

INTRODUCTION

In recent years, there has been a significant development of information systems in the field of healthcare, which is due to the growing need for automation of processes and improvement of the quality of medical services. Automated medical information systems (AMIS) are becoming necessary to optimize the work of medical institutions (MPI), improve patient care and reduce costs. It is important to note that with the growth of the implementation of such systems, there is a need for integration with common information bases and the creation of a single standard of electronic medical records (EMR).

The last decade has seen rapid development of information systems and automated service delivery systems. It is difficult to overestimate the importance of using such systems in such a critical area as medical care and public health protection. Trends in recent years indicate a demand for the development and implementation of automated medical information systems (AMIS) to provide services to patients of public sector medical institutions, as well as a demand for the development of telemedicine and remote health monitoring. The goals of modern AMIS for health care institutions (HCI) are mainly to reduce the number of queues and increase the capacity of the institution, reduce staff and reduce overall costs, provide a convenient and modern service, provide a system for accounting for payments for medical services and reporting, and maintain a common client base. At the same time, issues remain open or not fully resolved regarding the integration of such systems with common information bases within the state, the formation of a single standard for the patient's electronic medical record (EMR). Addressing these issues can also contribute to the development of telemedicine and remote monitoring of public health, which in turn will expand coverage and improve the quality of health services among elderly patients, patients living in remote areas, and, importantly, in situations related to epidemics or pandemics. [1,2]

METHODS

Below we consider an option for implementing such an AMIS for medical institutions in the public sector.

The automated medical information system should allow solving the main tasks described in detail below.

Registration of patients in a healthcare facility implies actions to issue a standardized EHR of the patient or registration of a patient's request to a healthcare facility with a selection of EMR data from the general information base of healthcare facilities. Having a registered EMR is a mandatory condition for the provision of any medical services, including laboratory and diagnostic research. In turn, we consider it necessary to link the registered EMR with the identification data of the citizen. The latter can be the PINFL, the assignment of which from birth was planned to be introduced in 2021.

Organizing a patient's reception includes procedures for specializing the direction based on the nature of the patient's visit to the healthcare facility (primary complaints about health, repeated or preventive examination by a specific specialist), determining the specialist's workload and his/her work schedule, and placing the patient in a queue. Organizing the delivery of tests and diagnostic examinations also includes organizing queues and distributing the workload among diagnostic rooms (for example, if there are several ultrasound rooms, it is absolutely necessary to evenly distribute the workload among these rooms, taking into account the influx of patients).

The work of any healthcare institution is inextricably linked with the organization of the work of medical personnel. Organizational measures include hiring a specialist in accordance with labor legislation, drawing up a work schedule, recording actual working hours, determining the effectiveness of the work of medical personnel.

Medical and preventive services necessarily include laboratory tests, the high-quality and timely performance of which effectively influences the assessment of health status, diagnosis of diseases, and treatment. Each healthcare institution has its own laboratories, which cannot be excluded from the entire process of automation of the healthcare institution. As already noted, laboratory tests should not be performed " impersonally ", the results of each laboratory test should be recorded with reference to the patient's EMR.

Perhaps the main information process of any medical institution is recording the history of the course of the disease, the conduct of research and treatment and preventive procedures. Automation of these processes is inextricably linked with the maintenance of an electronic medical record (EMR), which allows for paperless technology for the accumulation, storage and issuance of data on patients, laboratory and diagnostic studies, automation of data entry from medical reference books and the formation of a list of drugs and treatment and preventive procedures.

It is necessary to take into account the secure entry of new data into the EIB, for which the system provides for logging of any changes with a link to the personalized accounts of the medical personnel making these changes.

Improvement of technologies in the field of mobile and wearable electronics, wireless communications has led to the logical development of telemedicine. Currently, mobile medicine is effectively used in the treatment and prevention of infectious and non-infectious diseases, monitoring of chronic diseases, care for the elderly and people with limited mobility, and protection of maternal health. The positive effects of using telemedicine are a wider coverage of medical services for the population living far from health care facilities, the absence of time and money spent on visiting specialists, and acceleration of decision-making on treatment or preventive procedures. [3]

Remote monitoring of the population's health status allows for the automation of data collection using specialized devices for various indicators, such as temperature, heart rate, blood pressure, and blood glucose levels. Automatic collection of such data via wireless communications (e.g., via mobile Internet) allows a specialist to promptly respond to changes in indicators, view long-term history, conduct high-quality treatment analysis, or conduct statistical research.

Accounting for the specialist's working time together with the number of patients served allows optimizing the work of the healthcare facility, assessing and improving the efficiency of the medical staff. Keeping statistics on diseases provides an opportunity to analyze the health status of the population and improve the quality of life. A comprehensive analysis of statistical studies based on health indicator data collected using remote monitoring devices allows predicting and identifying the risks of deterioration in the health of people in certain risk groups, preventing the development of epidemics, and ensuring a healthy lifestyle.

As in any information system, AMIS involves various computer equipment, software, technical means of communication, stationary and mobile medical equipment, and wearable medical devices. This entire complex cannot exist without competent administration and maintenance. Administration includes not only the maintenance of computer equipment and network communications, but also the support of information databases in working order, ensuring the safety and security of personal data of both employees and patients of the medical institution. Also, the administration of the system includes the registration in the system of any medical equipment and devices intended for the automation of laboratory and diagnostic research processes, remote monitoring, as well as their maintenance.

To jointly solve the assigned tasks, AMIS is divided into modules, each of which provides access to a specific functionality of the system, strictly limited by the framework of professional competencies of the healthcare facility personnel.

ANALYSIS AND RESULTS

Each AMIS module can be installed on a separate automated workstation (AWS) of the LPI personnel. Access to the functionality of the modules is provided only to the registered personnel of the given LPI, and is carried out by entering an individual login-password pair issued by the system administrator, or by means of biometric (or other) identification.[4-7]

The authorization process and existing AMIS user roles are shown in Figure 1.

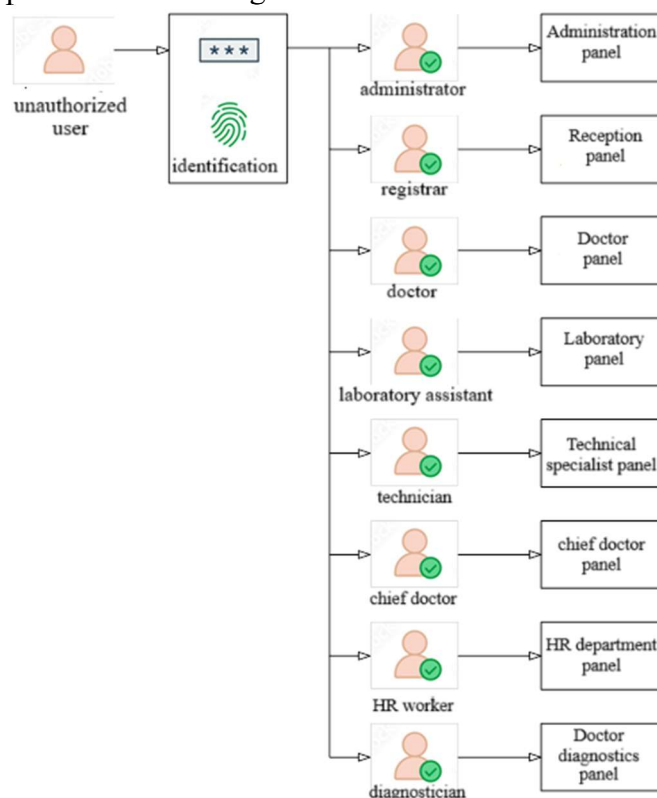


Figure 1 Roles of AMIS users

The reception of patients in the designed AMIS occurs in the stages shown in Figure 2.

Any patient's visit to a healthcare facility begins with the reception desk. The receptionist identifies the patient (or creates a new EHR) and directs him or her according to one of the scenarios: to the queue for an appointment with a specialist ; to the queue for a diagnostic test; to the queue for a laboratory test.

An appointment with a specialist doctor is accompanied by either opening a new medical history or entering new information into an already opened medical history. Also, a specialist doctor can prescribe a laboratory or diagnostic test, which can be accompanied by placing the patient in the appropriate queue. The results of the tests are entered by laboratory technicians and/or diagnostic doctors from their automated workplaces. Then either a follow-up appointment with this specialist doctor is scheduled, or the patient is referred to another specialist.

A patient may sign up for laboratory or diagnostic tests without visiting a specialist doctor in the following cases: a specialist doctor has not put the patient on the waiting list for urgent tests with a recommendation for a follow-up appointment after receiving the test results; the tests were initiated by the patient. In this scenario, the receptionist has the opportunity to put the patient on the waiting list for tests, but after mandatory identification of the patient to avoid cases of "anonymization" of the test results.[8-13]

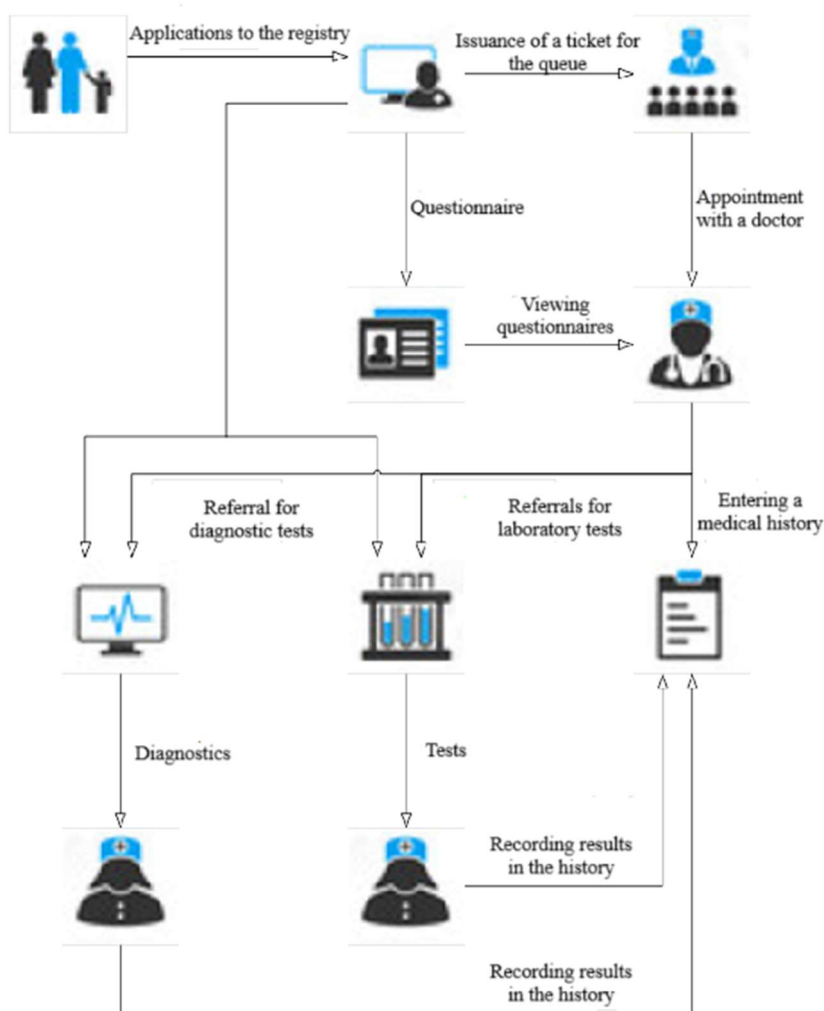


Figure 2. Patient admission process

CONCLUSION

The development and implementation of AMIS in public sector medical institutions is an important step towards improving the quality of medical care. Such systems help reduce queues,

optimize the work of medical personnel and effectively manage resources. However, to achieve maximum efficiency, it is necessary to solve the problems of integration with state information systems and standardization of EHR. Solving these problems will significantly improve the availability and quality of medical services, especially for vulnerable groups of the population, such as the elderly and residents of remote areas.

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