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Механизмы улучшения обслуживания на основе системы цифравизации экстренной медицинской помощи

Гафуров Абдувоиджон Хусейнович

Shoshilinch tibbiy yordamni raqamlashtirish tizimi asosida xizmatlarni takomillashtirish mexanizmlari

Gafurov Abduvoitjon Khuseynovich

Mechanisms for improving service based on the system of digitalization of emergency medical care

Gafurov Abduvoitjon Khuseynovich

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■ **Аннотация:** В данной статье освещены вопросы совершенствования услуг на базе системы автоматизации скорой медицинской помощи. Посредством этой системы предусмотрено создание сети радиосвязи в Службе скорой медицинской помощи, внедрение электронной автоматизированной системы управления экстренной медицинской помощью, создание единого колл-центра - «Колл-центров» для каждого региона, и всех региональных. Целью является прием вызовов только через эти «Колл-центры», обеспечение контроля за движением машин скорой медицинской помощи в режиме онлайн, установка GPS-трекеров и устройств радиосвязи, а также создание электронной автоматизированной системы управления экстренной медицинской помощью.

■ **Ключевые слова:** здравоохранение, неотложная медицинская помощь, цифровые технологии, автоматизированная система управления, электронные медицинские карты.

■ **Annotatsiya:** Ushbu maqola shoshilinch tibbiy yordamni avtomatlashtirish tizimi asosida xizmatlarni takomillashtirish masalalarini o‘z ichiga oladi. Ushbu tizim orqali Shoshilinch tibbiy yordam xizmatida radioaloqa tarmog‘ini yaratish, tez tibbiy yordamni boshqarishning elektron avtomatlashtirilgan tizimini joriy etish, har bir viloyat va butun hudud bo‘yicha yagona call-markaz – “Call-markazlar”ni tashkil etish, qo‘ng‘iroqlarni faqat ushbu “Call-markazlar” orqali qabul qilish, shoshilinch tibbiy yordam avtomashinalarining harakatini nazorat qilishni ta'minlash, GPS-avtotransport vositalarining harakatini onlayn nazorat qilish va elektron aloqa vositalarini o‘rnatish, avtotransport vositalarini o‘rnatish va elektron nazorat qilish tizimini o‘rnatish orqali amalga oshirilmoqda.

■ **Kalit so‘zlar:** sog‘liqni saqlash, shoshilinch tibbiy yordam, raqamli texnologiyalar, avtomatlashtirilgan boshqaruv tizimi, elektron tibbiy yozuvlar.

■ **Abstract:** This article covers the issues of improving services based on the automation system of emergency medical services. Through this system, the creation of a radio communication network in the Emergency Medical Service, the introduction of an electronic automated management system for emergency medical assistance, the establishment

of a single call center - “Call-centers” for each region, and all regional It is aimed at receiving calls only through these “Call-centers”, providing for monitoring the movement of emergency medical vehicles online, installing GPS trackers and radio communication devices, and establishing an electronic automated management system for emergency medical care.

- **Key words:** health care, emergency medical care, digital technologies, automated management system, electronic medical records.

INTRODUCTION

A unified system has been created in the Republic of Uzbekistan to provide free emergency highly qualified medical care to the population, which includes the Republican Emergency Center, its regional branches and departments of district medical associations, which meets the highest requirements and international standards of emergency medical services.

In the context of platformization of economic development of organizations and enterprises in the service sector, it is relevant to systematically study the prerequisites for increasing the efficiency of the introduction of end-to-end digital technologies in the processes of interaction between stakeholders in the digital environment, represented by many multilevel ecosystems. Ambulances are playing an increasingly important role in providing needs-based emergency care to patients.

Prospects for further development of the healthcare sector are inextricably linked with innovative and modernization processes designed to ensure accessibility of medical care, achieving maximum efficiency and improving the quality of medical services provided based on promising achievements of medical science and their practical implementation in the activities of healthcare institutions. The creation and use of innovations in the health care system, both in the field of prevention and treatment of diseases, and in the field of socio-economic development of health care institutions, their organizational and management activities, is especially relevant in terms of orienting public policy in the field of health care towards an integrated approach to protecting public health, expansion of the range of medical services and their fundamentally qualitative improvement in order to increase the life expectancy of citizens, strengthen their health, increase efficiency, and, consequently, improve the quality of work.

It should be noted that the regulation of medical care, including issues of the narrow application of this technology in medicine, has been repeatedly raised in foreign scientific literature, and both broad theoretical issues of the use of medical care in various relations in the field of health care, as well as more practical and specialized developments have been considered , which can be used in the applied activities of medical organizations and in the management of public health authorities. The issue related to medicine is especially acute in the context of digitalization of healthcare, in which only part of the issue has been developed regarding the safety of the use of medical care in which technology is used.

An important element of the operational work of emergency medical care is equipping ambulance stations with an automated control system for receiving and processing calls. At the same time, in the emergency medical service, many issues remain unresolved related to increasing the level of provision of qualified medical personnel, specialized vehicles, and the discrepancy between the material and technical condition of emergency medical facilities and modern requirements.

In accordance with international requirements, the main indicators of the effectiveness of the emergency medical service are the availability, timeliness and rationality of its activities. In the world, the development of this service as a whole is characterized by the reform of all classical models in order to achieve a timely response to an emergency call, immediate medical care for patients and effective interaction between mobile ambulance teams and hospitals.

Today, the operation of single Call-centers has been launched in the organization of emergency medical services. A special medical consultation service was organized for them, consisting of doctors and call-takers. In addition, a system for directing medical teams to calls based on the patient’s condition, type of illness, and severity was introduced through sorting. In addition, regardless of the border of the district (city) or the territory of the ambulance, the medical brigade is directed depending on the proximity of the distance to the patient. Reception rooms of Central district (city) hospitals are being adapted to emergency services and installation of high-tech medical equipment. Ambulance vehicles were equipped with radio communication devices and GPS trackers, and ambulance crews were provided with tablets. It is necessary to set the following tasks when creating and putting into use the automated system of the emergency medical department in the regions with the following capabilities:

1) reception and registration of public calls, automatic designation of calls to be served in order of priority;

2) dedicated traffic management, including monitoring of traffic using GPS navigation, with a gradual transition to

digital radio communication later;
3) automatic determination of the location of persons requesting emergency medical assistance through telephone (mobile) communication;
4) calling emergency medical assistance teams using mobile applications, including for persons with disabilities;
5) accounting for used drugs and medical supplies and integration of ministries, agencies and other organizations with information systems of emergency services;
6) citizens evaluate the effectiveness of emergency medical stations and maintain their rating.

METHODOLOGY OF RESEARCH

The theoretical and methodological foundations of the economic development of the medical services sector are presented in the works of R.N. Almakaeva, D.A. Artemenko, P.A. Gerasimova, G.I. Gumerova, Yu.V. Evstafieva, I.E. Esaulenko, O.K. Korobkova, O.G. Krestyaninova, T.N. Petrova, S.K. Sagidova, A.A. Sokolova, M.P. Stashevskoy, O.V. Sudakova, O.V. Khodakova and others.
Research in the field of implementation of breakthrough digital technologies in the provision of medical services is reflected in the works of A.V. Bedenkova, T.G. Maksimova, N.A. Simchenko, N.I. Suvorova, L.A. Tsvetkova, L.S. Chernyak, O.V. Cherchenko, as well as in other publications.
The history of the formation and development of emergency medical care includes more than 100 years of time, and today a great deal of experience has been accumulated in the ways of organizing it in the state and non-state commercial, private medical institutions in the world (Vertkin A.L., 2003; Petersen JA, et al., 2008). Nevertheless, there is no universal form of high-level emergency medical care in world medicine. In most developing and developed countries, great importance is attached to improving the forms of emergency medical care for the population, actively working to find new directions in which the use of modern telecommunication tools, internet, video monitoring, paging systems, which combine the traditional forms of direct participation of a medical worker with indirect urgent consultations (Starodubov V.I., 2009).
The timeliness or response of the emergency medical service according to international requirements must comply with the principles of the “golden hour”, when the time before the arrival of the mobile team to the patient or victim should be less than 20 minutes. In the USA this time is 8-12 minutes, in France - up to 15 minutes, in the UK - up to 19 minutes. For this purpose, on the roads of the world, the legislation first of all determines priority for the movement of red vehicles (emergency response vehicles and fire trucks), then yellow vehicles (reanimation vehicles and other specialized vehicles), lower priority is given to white vehicles (general ambulances).
But all countries have now implemented a system of a unified single dial-up number, for example 911 (USA), or 112 (Europe), 110 (Japan), etc. In the Republic of Uzbekistan, there are separate short numbers for calling emergency services: fire service - 101, ambulance - 103, emergency services brigade - 1050, gas service - 104 and police - 102. The advantage of this system is a radical reduction in response time, strict standards for service activities, streamlined and unified work of dispatchers and the effective use of all modern types of communication (radio, GPS, telephone, etc.). Dispatch centers of the unified emergency coordination system at the present stage are organized by state communications agencies, and employees who carry out protocol call dispatching are educated in the relevant emergency response services (full course of study in the USA and Europe 24 months).
In most countries, the dispatch and sorting process should take no more than 3 minutes, after which the ambulance should go to the call address. The time it takes to reach the recipient of the call depends on its nature, which is determined by strict standards. When calling for emergencies, red ambulances must be on site within 10 minutes, ambulances - up to 20 minutes, and emergency services - within 40 minutes after the caller’s call. Therefore, the dispatch protocol must necessarily differentiate the call, and from the legal side, when giving false information according to the protocol, it is regarded as a false call. Thus, the population is warned by the protocol about the responsibility for providing incorrect information. In the structural reform of the healthcare industry, the improvement of emergency medical services is of utmost importance.
An analysis of the international experience of the ambulance service shows that three models of mobile medical care have historically developed in the world, including pre-hospital (Anglo-American - paramedics), medical (emergency doctors) and mixed (modern French-German step-by-step pre-hospital care).
In the United States, there are more than 48 thousand ambulances of 3 classes of vehicles (A, B and C), with the help of which in 80% of cases emergency prehospital care is provided by paramedics as part of the fire or police service and the private medical system of the AMR (American medical respondent), and in 20% of cases assistance is provided by a qualified emergency response team. Every year, in more than 60 million cases, Americans call 911 for emergency medical issues, of which in 40 million cases, a pre-hospital Emergency Medical Services team (paramedics) responds.
The direct applicability of information technologies in healthcare was studied by scientists I. C. Marques and J. J. Ferreira. Having reviewed the scientific literature on digitalization in

healthcare, they propose to identify seven main areas:

1) integrated management of information technology in healthcare;

2) medical images;

3) electronic medical records;

4) information technology and portable devices in healthcare;

5) access to e-health;

6) telemedicine;

7) medical privacy [14]

With the completion of the formation of a unified state information system in the healthcare sector over the next four years, electronic patient records, central archives of medical images and unified laboratory systems should become available to all medical institutions in the country. All government medical institutions will be required to provide citizens with access to their electronic medical documents through the Unified Government Services Portal.

"MedData 103" electronic platform was developed for digitalization of emergency medical services. The MedData 103 user interface provides information support for the activities of the system operator. The management determines the procedure for registering and servicing emergency medical calls, as well as the procedure for generating reports.

1) To work in the system, you must launch a browser. In the browser, enter the domain name assigned to the system.

2) Log in to the System using your username and password. Details about logging in are described in Section 2 "Getting Started". If problems arise, please contact technical support.

3) The employee responsible for the formation of work orders must:

- go to the "formation of orders" and check the correctness of the previously formed orders of the operational department and teams for the current date;
- make sure that the data entered into the operations department is correct, the duration of the shift and the correct linking of telephone numbers to workplaces (in case of using the integration functionality with telephony);
- if the orders have not been formed or replacements have occurred, then it is necessary to add the missing employees to the order or update the information in previously generated orders;
- check information about the teams working on shift, the duration of their assignments and the composition of employees, make sure that the vehicles assigned to the teams are correct;
- form missing orders for brigades in case of their absence;
- during the shift, form squads of the operational department and teams for the next shift.

During a study by international consultants of the IT infrastructure of emergency medical care, the maturity of existing solutions was generally assessed at the initial level of development. Various information systems of different levels of complexity and maturity are not connected with each other or are poorly connected, there is a large share of paperwork in office work, most business processes are not described or not automated, new systems are being introduced, which, as a rule, are local in nature - their integration with others complexes are poorly developed. This level of automation does not allow building unified or end-to-end business processes, collecting operational analytics with the necessary detail, providing a unified approach to the service process and its departments, managing the processes of dispatch, garage, maintenance, accounting for fuel and lubricants, accounting for medicines, accounting for free beds and a decision-making system based on strategic goals, training and retraining of personnel, document flow. As a result, there are significant shortcomings in medical care due to unoptimized processes in both individual structural organizations and in the process of joint management and provision of medical care services. At the same time, emergency medical care units have information systems that are not integrated and not in a single loop.

Current processes in emergency medical services are driven by large amounts of manual work and duplicative functions and information. In particular, this is due to the imperfection of existing business processes and the need for their constant development. Below are the main disadvantages of current processes.

- duration of decision-making on routine operations;
- unreasonably "long" standard processes, including a large number of involved workers, regardless of the details of a specific process;
- generation of process results on paper in an arbitrary, non-standardized form;
- the need to verify the correctness of data at each stage of the process;
- ambiguous distribution of responsibility for the result of the process;
- inability to track key indicators of process execution in general and by groups; it is impossible to transform the organization's key strategic goals into key process indicators for adequate assessment of the organization's performance;
- no tool for recording/logging the current process state in real time.

An integral part of creating a unified information space is the organization of unified event-oriented data exchange between systems based on a single integration base.

The current integration framework has the following disadvantages:

Table 1

Disadvantages of existing information systems

№	EXISTING DISADVANTAGES	RESULTING PROBLEMS	TARGET INDICATOR
1	Point integration is built for a specific task	Complex, messy point-to-point integration	Implementation of a unified integration environment based on specialized industrial products
		Making changes to one system may cause problems in other systems.	Development of an integration methodology and its implementation in the form of a single regulation; Creation of a specialized integration department and identification of responsible persons for integration; Logging of all integrations (creation, modification, etc.)
2	Lack of a unified integration regulation.	In practice, no changes are made to the integration process due to the high risk of system failures. Developers implement integration tasks in the most convenient way for themselves. Taking into account the high turnover of IT personnel, if it is necessary to make changes to the integration process in order to minimize the risk of system failure, developers resort to independently building point integration for a specific task.	
3	Slow responsiveness of the integration environment	Large delays in package delivery	Offloading systems from unnecessary integration points to reduce the load on systems
4	High risk of system incompatibility for integration	Systems are different, communication formats are different, systems may not support each other's formats	Implementation of a unified integration environment based on specialized industrial products that supports all known types of protocols and formats

To overcome these obstacles, it is proposed to switch to Microservice architecture. The architecture provides for the design and implementation of distributed systems with a high level of flexibility. It emphasizes the reuse of existing IT resources and effective managed integration as a fundamental concept for system interoperability.

Microservice architecture involves the creation of systems in which the structures of the business sphere are closely related to the components of the IT sphere. Due to this connection, Microservice architecture facilitates the use of software directly related to specific activities within a business process.

The mandatory use of Microservice architecture when developing the complex is due to the fact that this architecture:

- Allows reuse of existing resources in new systems;
- Expands system flexibility through logical isolation;
- Supports simplified integration of new resources with existing resources;
- Enables more integrated process development using common services and standards.
- At the same time, to implement integration interaction between systems, it is planned to use ESB and ETL class systems or their combination.

Illustrates an integrated view of the EMS Continuum of Care based on the above review. The actions surrounding the circle represent key patient-centered activities carried out by EMS in the process of responding to and caring for patients, taking into consideration the traditional emergency model as well as non-emergency practices that have become more prevalent in Mobile Integrated Health and Community Paramedicine systems. At the center of the circle is an information ecosystem that securely collects, integrates, analyzes, and shares data when and how it is needed across the continuum. On the outside of the circle, the model also includes example high level activities that EMS is often responsible for, and for which data are essential to carry out effectively. Data that are generated during patient-centered care activities are used to feed and enable effective system planning, quality improvement, medical direction, public health surveillance, and all other major EMS activities. (Figure 1)

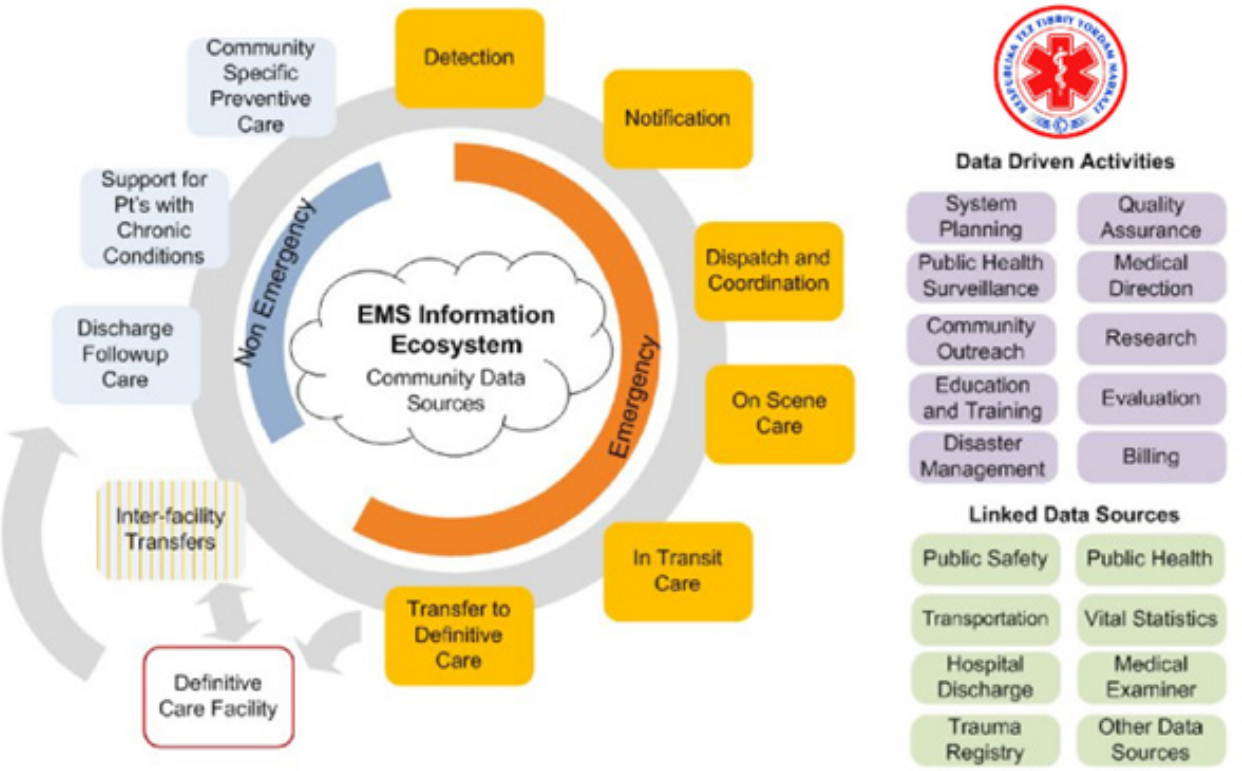

Figure 1. The EMS Continuum of Care

Information systems and the data produced thereby are critical to each of the EMS attributes as described in the EMS Agenda including: Integration of health services, EMS research, legislation and regulation, system finance, human resources, medical direction, education systems, public education, prevention, public access, communication systems, clinical care, evaluation, and information systems themselves.

Data sources external to EMS are also essential for conducting data driven activities and for conducting patient-centered activities, and thus should be closely linked. While the EMS Continuum of Care model is not meant to be comprehensive and inclusive of all possible EMS actions and responsibilities, it provides a common view for discussing technology opportunities and challenges.

CONCLUSION AND SUGGESTIONS

Based on the foregoing:

1. Implementation of modernization of the structure of the pre-hospital stage of emergency medical care through the immediate introduction of modern information technologies and a unified system of dispatch and triage services in order to optimize the organization of functioning and increase the efficiency of rational use of resources of the emergency medical service.

2. Introduction into practice of the emergency medical service of fundamental indicators of its work, including timeliness, rationality and information content.

3. The preparation of a qualified specialist in the specialty of emergency medical care should begin during the period of study at a medical university, where issues of theoretical and practical training and skills development in simulation centers should be actively combined. The curriculum for studying disciplines such as surgery, therapy, and pediatrics should include emergency conditions and methods of care starting from the prehospital stage.

Taken together, these findings and considerations suggest that there is considerable value in launching a new generation a new EMS technology research, testing, and deployment, provided it is aimed at enhancing the performance of EMS across the full Continuum of Care. The promise of continuous improvement in EMS relies heavily upon medical and information technologies, and the opportunity is now for the EMS community to define and engage in designing its future.

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