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THE USE OF TELECOMMUNICATION TECHNOLOGIES IN MEDICINE DURING A PANDEMIC. INTEGRATION OF MEDICAL RESOURCES

Abstract. *Currently telecommunication technologies are one of the active directions of the development of modern science. Information systems affect various spheres of people's lives, including medicine. Remote monitoring of vital signs by doctors can speed up patient care. The risk of various infections is also reduced, especially during the coronavirus pandemic. In the age of telecommunications, it is possible to integrate various medical resources into global systems [1].*

Keywords: *Telecommunication technologies, Remote monitoring, Coronavirus pandemic, Integration of medical resources, Data acquisition.*

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ПРИМЕНЕНИЕ ТЕЛЕКОММУНИКАЦИОННЫХ ТЕХНОЛОГИЙ В МЕДИЦИНЕ В ПЕРИОД ПАНДЕМИИ. ИНТЕГРИРОВАНИЕ МЕДИЦИНСКИХ РЕСУРСОВ

Аннотация. *В настоящее время телекоммуникационные технологии являются одним из активных направлений развития современной науки. Информационные системы затрагивают различные сферы жизни людей, не пропуская в том числе и медицину. Дистанционное наблюдение докторами за жизненными показателями может ускорить оказание помощи пациентам. Так же снижается риск заражения различными заболеваниями, особенно актуально в период коронавирусной пандемии. В век телекоммуникации появляется возможность интегрирования различных медицинских ресурсов в глобальные системы.*

Ключевые слова: *Телекоммуникационные технологии, Дистанционное наблюдение, Коронавирусная пандемия, Интегрирование медицинских ресурсов*.

Introduction

Telemedicine is a branch of medicine based on the use of computer and telecommunication technologies for the exchange of medical information between specialists with the aim of improving the quality of diagnosis and treatment of specific patients. In the age of telecommunications, it becomes possible to integrate various medical resources into global systems. However, this is not an easy task due to its cross-platform nature, a variety of architectures, and various data storage formats.

Components for the successful functioning of telemedicine systems

For the successful functioning of telemedicine systems, as a rule, the following components are required:

- Specialized equipment capable of receiving, transformation and transmitting medical data
- Availability of a network between supplier and consumer
- Software that connects the constituent elements into a whole system
- Availability of specialists able to provide professional and technical support for the complex, its effective use in solving medical problems [2].

Standards in modern medical information systems

In addition to the internal LAN (Local Area Network), data can be exchanged with external systems. This will provide communication between medical institutions of different levels (see figure 1).

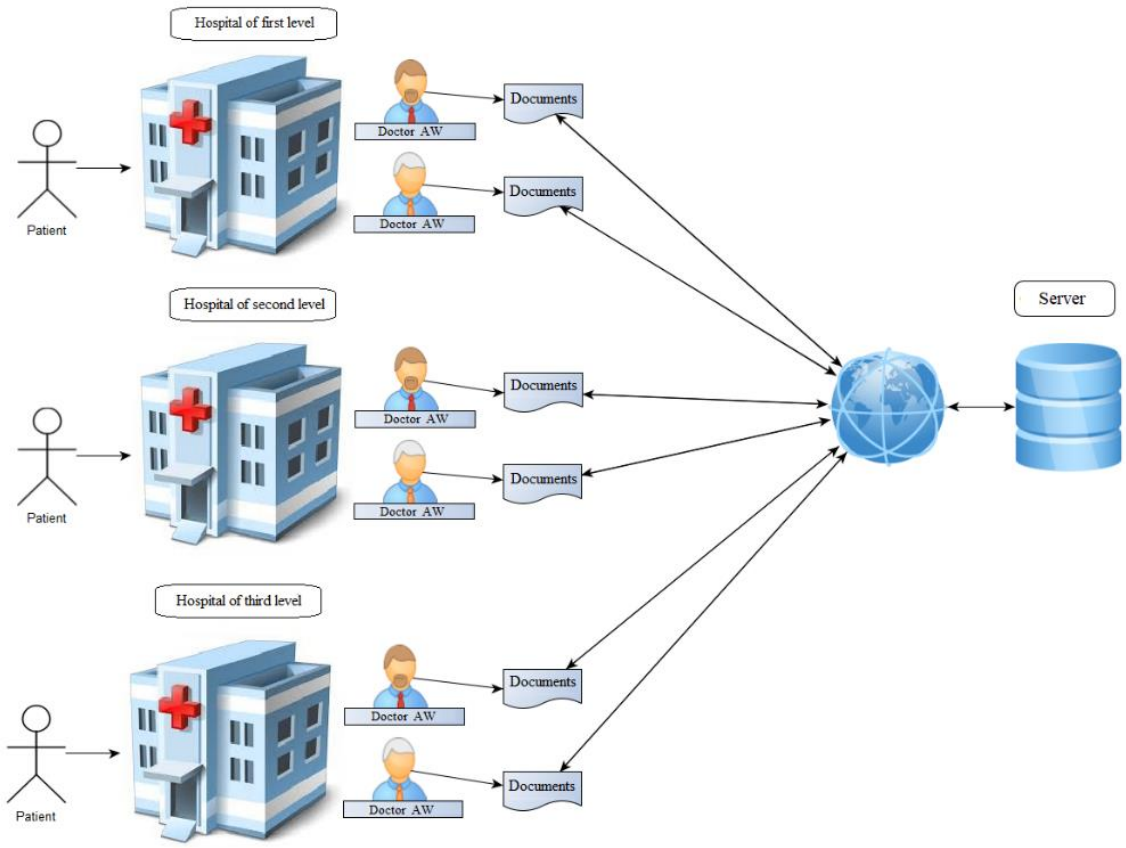

Fig. 1 – Remote Monitoring Information System (AW – automated workspace).

- Creation of medical applications regardless of device manufacturers.
- Simplification of the implementation of information technology in the medical field

Receiving medical device data and integration of devices with external systems

The medical devices are connected to a server with special central monitoring system software. This product receives signals from devices using internal protocols and translates them into the universal format suitable for integrators.

Physical communication lines are two twisted-pair cables that connect devices and a backplane (HUB - a machine that connects several computers together) that in turn connects to a computer.

The devices send a UDP (User Datagram Protocol) broadcast packet to the network with their MAC (Media Access Control) address, the station responds with a UDP broadcast packet with assigned IP (Internet Protocol) addresses for itself and the device, then the device receives the station's MAC address upon request. After connection, the server receives numerical indicators (pulse rate, respiration rate, saturation), wave indicators (electrocardiogram curve, photoplethysmogram, capnogram), alarm flags (see figure 2) [3]. The server receives data from devices and converts them into a universal format suitable for integrators [4]. MIS (Medical Information System) can use the FHIR/HL7 standard for exchange between hospitals.

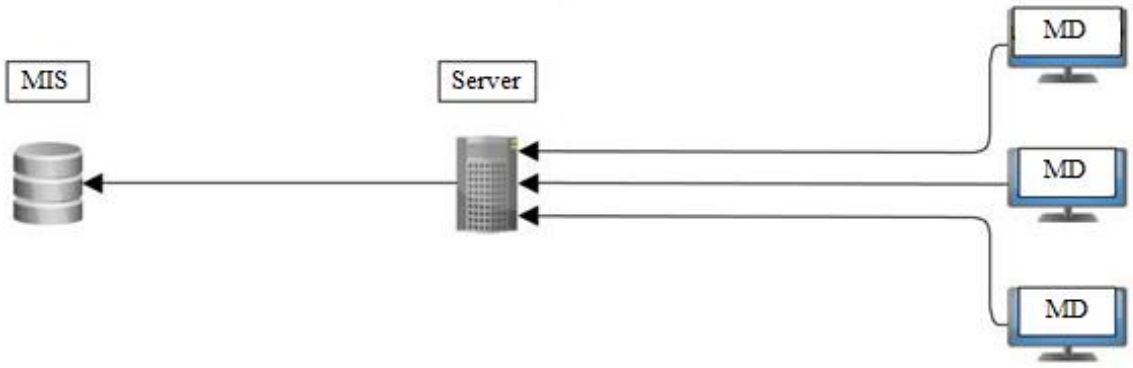

Fig. 2 – Integration of devices with external systems (MIS – medical information system, MD – medical device)

FHIR/HL7 Standard Description

FHIR (Fast Healthcare Interoperability Resources) is a healthcare data exchange standard published by HL7. The FHIR specification defines a common «form template» for each type of clinical information.

FHIR is intended for the exchange of medical information. It includes clinical data as well as administrative data related to health care, public health and research. It includes both medicine and veterinary medicine and is intended for the use around the world in a wide variety of contexts including inpatient, outpatient, emergency care, long-term care, community care, allied health care, and more.

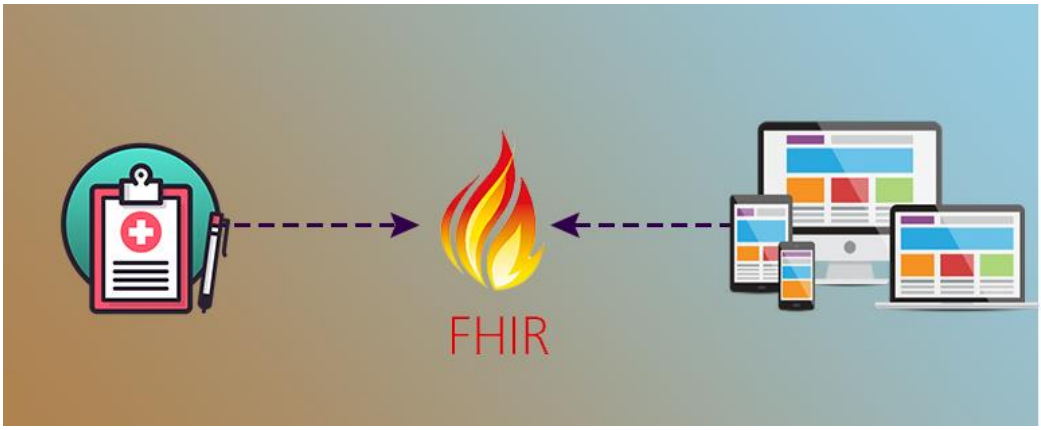

Fig. 3 – Fast Healthcare Interoperability Resources Integration.

FHIR/HL7 Structure

FHIR is based on «Resources», which are common building blocks for all exchanges. From a clinical perspective, the most important parts of the FHIR specification for understanding are resources. Resources are an instance-level representation of a healthcare organization. All resources have the following features in common:

- The URL that identifies the resource
- General metadata
- A human-readable summary of XHTML
- A set of specific data items - a separate set for each type of resource
- Extensibility Platform to Support Diversity in Health Care

Resource instances are represented as XML, JSON or RDF, and there are currently 145 different resource types defined in the FHIR specification.

This specification describes a set of resources, that is, a set of resource types that describe a set of resource instances that can actually be exchanged [5].

Conclusion

For remote monitoring of the vital signs of patients, it is necessary to organize working personnel, the necessary equipment, software, network configuration, etc. During the coronavirus pandemic, this is a relevant and necessary implementation in medicine.

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