e-Ophthalmology – one solution for innovative health management

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Abstract: Modern information systems are not only technological, but also organizational and human dimensions. They are an integral part of the business organization and a product, consisting of three main components: organization, people and technology.

Medical information systems are designed to automate the activities, associated with diagnosis, treatment and personal health management of patients in hospitals and medical centers.

In Bulgaria there are over 520 medical centers. In the same time, software market for medical health solutions is still gaining experience, although there are companies with approximately 5 years experience. And despite the potential to grow, it happens at a slower place noticeable.

This paper presents a functional software development, specialized for ophthalmic practice in Bulgarian medical environment. The record design is subordinated to the Bulgarian and international medical laws for storing personal and medical information. It allows storing any processing medical data, needed for full eye examination – medical history, visual status, hematological, biochemical and urine examination, attaching ophthalmoscope and etc. images, option to set medical diagnostic term and patient observation data.

On the other hand, in the current dynamic interweaving technological and web situation, patients are expected to participate proactively, regularly coordinating their care among multiple providers, interacting with health information outside the medical center or clinic, and sharing health information with others in their personal and professional lives.

This central role means patients must store, maintain, and retrieve many kinds of personal health information, ranging from medication schedules to information researched online about their conditions, to referrals, to contact information for individual clinicians.

This EHR with telemedical functions is unique for Bulgarian ophthalmic medical practice, because it's the only specialized information system in the area, unlike the other combined software solutions.

Introduction

Taking an active role in personal health improves the quality of self-care; helps ensure appropriate care when patient interacts with the health care system and increases confidence in dealing with family's illness and injuries. It can also decrease expenses and minimize increases in deductibles, co-payments and premiums. Patients who take part in decisions about their health care typically have better outcomes. This model of behavior can be achieved only with the help of Electronic Health Records, generated by Medical Information Systems (MIS). Health management – both personal and at the hospital is impossible without digital data. Independently what type of medical expert must patient visit, it is obligate to assure completeness of his personal health status. In this way, better care and better diagnoses is guaranteed. Only MIS can ensure the following parameters:

- Accuracy: Data are the correct values and are valid.
- Accessibility: Data items are easily obtainable and legal to collect.
- Comprehensiveness: All required data items are included. Ensure that the entire scope of the data is collected and document intentional limitations.
- Consistency: The value of the data is reliable and the same across applications.

This article is focused to development and specific restrictions of a specialized medical information system. In the process of constructing it was used the method of system analysis, in other words - decomposition of complex problems parts in order to solve the task through analyzing their interactions and reconciliation.

The main goal of any MIS in clinical departments is predominantly automatic processing of information in the preliminary work in determining the diagnosis and developing treatment tactics.

Major data sources are documentaries (technology, graphics and data recorder, specifications, price lists), data from medical apparatus, occurring in the workflow expert correspondence and acquired during a conference (telemedicine work model) etc.

Methods

The presented medical information system with telemedical functions is specialized for the needs of ophthalmic cabinet, and considering that, it differs from the already developed information systems as a unique software product in Bulgaria.

Entrance in system is secured by 5 component's protection: username, password, public key, PIN and private key.

The form is a digital representation of regulated paper documents, used in Bulgaria. It is purposefully created to imitate the paper version, in order to ensure the fast and easy adaptation to the software product by the experts. One of the most important conditions for the introduction of new medical information system is the user friendly interface, which hopefully stimulates and attracts the effective use by medical staff.

In any clinic, there is large number of workplaces, or two or more clinics using one system, so Client-Server technology is obligatory because it allows storing data from multiple locations at one place. There are plenty more benefits from using such technology:

- easier administration – the collected data is at one physical location
- centralization – access, resources and data security are controlled by the server
- flexibility – any new technology can be easily integrated into the system
- scalability – any element can be upgraded when needed
- safer backup – everyday easy backup
- higher security – complete security and encryption support for databases

After patient data exists in the server database, the patient case-record can be created. It contains 8 forms:

- Patient data– the system automatically extracts personal data from Patient's register, and doctor begins to enter medical data – where is the patient sent from, is the patient an emergency or planed case, how many days has he spent into the clinic, outcome from hospitalization, etc.
- Condition at admission – contains data about the patient medical condition and any treatment, made through the hospitalization
- Anamnesis - detailed and consistent means of obtained information from patient or relatives, for the nature of disease. The data consists of present complaints, past medical studies, past medical treatments, family medical history, medical study plan and medical treatment plan.
- Visual status 1 – data about eye orbit, eyelids, tear glands and lachrymal pathways, eyeballs, conjunctiva, and cornea for both eyes. There are fields for every symptom, where the ophthalmology specialist can enter data and personal notes.
- Visual status 2 – continues the data about specialized ophthalmology status - anterior chamber of eyeballs, irises, pupils, crystalline lenses,

vitreous bodies, ophthalmoscope test and visual acuity again for both eyes.

- Further examinations – it contains data about further, if necessary, examinations – blood hematological and biochemical, and urine tests. There can be attached multiply tests for one patient case-record, in special form, by clicking "Add new examination" button for additional type of the test. If necessary, edit is also available; but with digital signature required.
- Patient monitoring - the next form of ophthalmic disease history contains chronologically entered information about the patient's condition after treatment.
- Diagnosis - The last window that is filled from the history of ophthalmic disease includes the final diagnosis, additional data for eye status and any patient's ophthalmologic images.

The system allows large number of statistics –patient's and medical data. The most important is generating of Medical conclusion from the case-record and extract it to Microsoft Word by simple click. Every statistic form has buttons for extraction to XLS, DOC or PDF format.

The patient also can access his personal record from distance, by entering username and password in a specially designed web platform. He can initiate a conversation through a specialized messaging board, whenever there are complaints or questions. This simple telemedical function secures the patient that he is always in connection with his doctor and his condition is constantly traced.

Conclusion

The presented software solution is about to be popularized to the medical information systems market in Bulgaria. Its uniqueness, completeness and security are the benefits which are likely to find a place in clinics and medical centers. But on the other hand, still immature market in the country of such technologies and the refusal of doctors to develop their computer skills are obstacles we have to face.

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