ORGANIZATION OF HEALTHCARE ENTITY: THE STUDY OF HOSPITAL INFORMATION SYSTEM

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Summary: The paper describes the organization of healthcare unit and shows the features and role of hospital information system (HIS) as an example of integrated information system implemented in healthcare organization. The paper characterized and analyzed the two main classes of HIS: the first class of central modules i.e. the module of hospital patients with the module of ambulatory patients, and medical orders system for clinical with access to the Electronic Patient Record (EPR), and the second class of systems called peripheral systems divided into information systems that support separate modules: Laboratory Information System (LIS), Pharmacy Information System (PIS), Radiology Information System (RIS), Picture Archiving and Communication System (PACS).

Keywords: healthcare organization, healthcare information systems (HCISs), Hospital Information System (HIS)

1. Introduction

The evolution of healthcare information systems (HCISs) has developed a lot of different functional systems. One of them have become known as hospital information system (HIS), which integrate a vary functionality in different modules, even though in most cases it remain quite separate not only in function but in terms of computer hardware, operating systems, and even programming languages. The most important feature is the connectivity among these various systems created significant obstacles to keeping track of where patients were located in a hospital, and more importantly, what kinds of care were being provided and the clinical results of that care. The most important component of HIS focused on delivering patient information from registration systems (Electronic Patient Record) to the ancillary systems and data on specific clinical events (e.g., laboratory tests, radiology exams, medications ordered) from the ancillary systems to the billing system. However, as more information systems were added to the HCIS environment, the challenge of moving data from one system to another became very difficult to manage. The paper presents the two classes of integrated hospital information system which include the first class of the module of hospital patients with the module of ambulatory patients, and medical orders system for clinical with access to the Electronic Patient Record (EPR), and the second class of systems called peripheral systems divided into information systems that support separate modules: Laboratory Information System (LIS), Pharmacy Information System (PIS), Radiology Information System (RIS), Picture Archiving and Communication System (PACS).

2. The concept of healthcare organization

The concept of health units associated with the definition of health. Efforts in an attempt to define the concept of health and illness in a social context or public encounter a lot of complications [1].

According to the World Health Organization (World Health Organization - WHO) health is "a state of complete well-being physical, mental and social well being and not merely the absence of disease or infirmity". Therefore, health tends to be understood as the ability of optimal human functioning possible in its environment and as demonstrated by his will and the ability of biological and social adaptation to the environment in which it expresses its vitality [2].

From the definition of health is related to the concept of health units, otherwise known as healthcare entity. Healthcare units occupy an important place in Polish healthcare system. From an appropriate and proper operation of healthcare facilities depends on the health safety of citizens. The functioning of the healthcare units is governed by numerous legislative acts defining their role in the whole healthcare system [1].

Healthcare unit is a separate organizational team of people and assets, created and maintained for the purpose of providing health services and health promotion. Healthcare unit can also be created and maintained in order to conduct research, research and development, carrying out teaching and research in connection with the provision of health and health promotion. Healthcare institutions conducting scientific research and teaching performing tasks also involved in training people to perform medical professions and education and professional training within these professions. This is based especially on conducting training specialization for doctors, nurses and midwives and various courses of improvement [3].

The term "healthcare entity" is used to separate organizational units providing health services and dealing with health promotion. Given the range of services provided and the form of care specifies the following types of health [4]:

- hospital, care and treatment, nursing care facility, convalescent, preventorium, stationary hospice, another unnamed facility designed for people whose health condition requires you to clock or day health services in a suitably decorated, fixed room,
- clinic, health center, clinic, dispensary,
- ambulance,
- medical diagnostic laboratory.
- prosthetic dentistry and orthodontics.
- rehabilitation facility.
- ambulatory or outpatient clinic of the infirmary of the military unit, the Police, Border Guard, State Fire Service, the State Protection Office, Internal Security Agency and the organizational unit of the Prison Service,
- sanitary - epidemiological stations,
- military preventive medicine center.
- public service organizational unit of blood,
- another facility that meets the conditions set out in the Act.

Healthcare institutions can be divided due to the nature of the entity constituting the plant, it is a public and private healthcare facilities. Public healthcare facility (SPZOZ - Independent public healthcare) is called the health unit set up by the minister or central government authority, provincial governor, the local government unit, public medical school or a public university running teaching and research in the field of medicine, Medical Center of Postgraduate Education. By contrast, private healthcare facility (i.e. NZOZ) is an entity created by the church or religious association, employer, foundation,

union, professional association or association, or other domestic or foreign legal entity or natural person, company without legal personality [5].

3. The Idea of Hospital Information System (HIS)

Hospital Information System (HIS) is a global term used in medical informatics. The key task of HIS is to use computer equipment and transmission to record, store, process and make available to authorized users information relating to the patient's medical service, as well as administrative and financial data. The information should be available at the place and time where they are needed and in the format in which they are expected. The main tasks of the HIS useful in healthcare settings are to promote [6]:

- daily hospital's activities,
- planning and organization of that activity,
- planning and management of the hospital.

Hospital Information System covers the whole organizational environment of the hospital. It integrates and merges in itself all sorts of applications conducive to its current functioning - finance, accounting, human resources, payroll, material management, records of fixed assets, as well as some used to support the patient or clinical systems (Clinical Information System). Hence the frequently used system is separated into a part of the administrative-managerial and clinical [7].

The main advantages of the use by hospitals with Hospital Information Systems include [8]:

- easy access by physicians to data from a variety of sources, including the classification based on demographics, gender, age, etc.
- it helps as a decision support system for the hospital authorities to develop a comprehensive health policy,
- efficient and accurate administration of finance, diet of the patient, specifications, and distribution of medical services,
- helps you see the overall picture of the development of the hospital,
- improved monitoring of medication use and test their effectiveness.
- leads to a reduction in adverse drug interactions.
- increases the integrity of information, reduces errors, and reduces duplication of information entries,
- it eliminates errors caused by traditional paper forms.

4. Hospital Information System as the example of Integrated Information System in healthcare units

The division of information systems, in terms of the criteria for their range of operation, the architecture of the Integrated Information System healthcare units includes two classes of systems. The first class includes central modules included in the Hospital Information System i.e. the module of traffic ill hospital patients (PTM) with the module of ambulatory patients, motion sick outpatients unit, and medical orders system for clinical with access to the electronic patient record (Electronic Patient Record - EPR) [9, 10].

The second class of systems called peripheral systems is divided into information systems that support separate modules. This class includes Laboratory Information System

(LIS), Pharmacy Information System (PIS), Radiology Information System (RIS), Picture Archiving and Communication System (PACS) [9].

4.1. Patients Traffic Module (PTM)

Patients Traffic Module includes support for the patient's hospital (PH), as well as ambulatory patient (PA). Referring to the differences in the organization of work and patient care in the hospital and outpatient, patient management module PA and module PH are considered as two separate modules. This allows the implementation of the ambulatory patient PA independently functioning clinics and module of hospital's patient in hospitals are not providing services clinic [11].

Patients Traffic Module provides inpatient data logging and tracking their stay in the hospital of admission until discharge. Registration for a visit is the act that begins to provide health services. It connects to enforcement procedures for patient identification, i.e. Verification of personal data, as well as in the case of financial benefits from public funds - the fact for it to have health insurance and a possible referral. Register visits can take place without personal contact with the employee of the patient and the required documents, the patient can deliver before the planned visit. There are two registration options from a distance: the telephone and Internet. From the patient's perspective Internet option is the most advantageous because it does not always phone registration comes into effect. In Poland there is the increasing access to Internet tools used for registering online for a visit. If the entity has more advanced Internet tools, online registration is an essential component of such an offer. Online registration function occurs more frequently on sites that previously served as information only [2, 12, 13, 14, 15].

Regardless of the tools that support registration website after logging the patient should have the opportunity to [2]:

- browse the database of physicians, specialties available and the schedule of visits,
- to reserve an appointment and internet consultations
- receive reminders about the visit (SMS, email)
- confirm or cancel the visit.

Traffic Module of ambulatory patient (PA) enables services since its appearance in the registration. After entering the data, the patient is directed to visit the clinic to a particular specialist. After the visit is coded presence and code diagnoses and procedures performed. It is also permissible to cancel the visit or its transfer. In the absence of a doctor, the module should be able to move the entire group of patients to the doctor to replace. Configuration Module PA includes a definition of the term schedule outpatient admissions for particular specialists in different clinics. In addition, they are filled with dictionaries as in the case of the Module PH [11].

4.2. Medical Orders Module (MOM)

Medical Orders Module provides support for medical orders executed in hospitalized patients and outpatients. It allows you to enter the order data and their authorized by a doctor, transfer the order to the laboratory, distribution determined by laboratory testing deadlines. After carrying out the procedure module ensure that the description of the study, its authorization, followed by making the results of the physician.

The Orders Module types of outsourced medical procedures are determined by the hospital - in relation to the specialty branches. Examples of this imaging procedure (such as

computed tomography, magnetic resonance, classical radiography, angiography, ultrasound) study the signal (e.g. ECG, EEG, EMG), surgery, neurosurgery and cardiac surgery, gynecology, laboratory tests, specialist consultations. During the order process are also entered additional information determined for each type of procedure. These include, among others, name, age of the patient and the patient's stay unit (retrieved from a database), priority (routine, urgent) diagnosis and clinical observations - that the data contained in each order.

4.3. Laboratory Information System (LIS)

Laboratory tests are a key source of information about the state of health of the patient. The test results support the medical diagnosis, and monitoring of therapy. The main task is to perform clinical laboratory testing and verification, interpretation and transmission of test results from the principal investigator or patient. The quality of laboratory services depends not only on the accuracy of the result, but also the waiting time for test execution and access to the results. Laboratory Information System (LIS) supports both data management and laboratory management as an organizational unit. The essential functions of the system's data management should specify the acquisition of test results by connecting to a computer system analyzers, archiving, verification and distribution of results, monitoring, quality control, documentation of procedures performed. In terms of laboratory management system it has the ability to lead the economy reagents, statistics and accounting procedures and economic analysis activities [9].

4.4. Pharmacy Information System (PIS)

The hospital pharmacy is one of the auxiliary departments. Just as laboratory, radiology or other diagnostic laboratories, pharmacy supports the process of treating a patient by performing strictly defined activities. The scope of duties of the pharmacist in the hospital is safe and optimal operation of medicines and functional in terms of costs drug therapy. As a result, the hospital pharmacy work is related to the patient's health service, as well as logistics. Activity pharmacies operating under the care of the patient is essential, realized based on doctor's orders. Their role orders and medicine distribution can be defined as "getting the right drug to the right patient at the right time." To help the hospital pharmacy was founded Pharmacy Information System (PIS). It supports the core business of the hospital pharmacy which include registration and verification of the ordination of drugs, distribution of drugs in the hospital as well as participation in monitoring the patient's drug therapy. Safe and optimal use of drugs and effective in terms of costs, drug therapy are supported by the module inventory management, purchasing module and control modules analysis and management [9].

4.5. Radiological Information System (RIS)

Radiological Information System (RIS) enables IT support procedures implemented within the framework of diagnostic imaging. An important task of the system is the registration of patient data and order data, set a deadline studies, and after its implementation - to ensure the implementation of the study and recording of waste material. When the report will be developed is entered into the system. Integration of System and Transmission Image Archiving enables you to transfer image data to the

diagnostic station, and integration with general Hospital Information System allows the transfer of patient data and order data to the RIS-in and transfer reports to the module medical orders [9].

4.6. Picture Archiving and Communication System (PACS)

Picture Archiving and Communication System (PACS) is a stand-alone system installed regardless of any other system modules of general hospital system. Its key task is to manage the flow of image data on the hospital network as well as their archiving. Integration through Radiological Information System of Orders Module allows you to integrate it into the general hospital system. That is why it is often found in the literature of the English term HIPACS (Integrated Hospital Picture Archiving and Communication System) [11].

5. Conclusions

Implementation of HIS is the process which needs to continually develop information technology and telecommunications, as well as increase public awareness of our solutions and want to take advantage of them by patients and medical staff. The success of the implementation of this concept and solutions for its implementation depends on the development of new technologies, as well as from appropriate investments made in the development of human resources. Factors influencing the development of information system in healthcare include:

- the growing demand for health services due in part to the progressive aging of European societies,
- increasing mobility of people including professionals from the medical industry.
- expectation of citizens to improve the quality and accessibility of health services with limited resources allocated to healthcare,
- new developments in medical technology and treatments a growing number of medical information and emerging expectation of sharing information resources within the healthcare systems in order to facilitate carrying out coordinated healthcare.

The corresponding development of the healthcare system is made possible by the implementation of information systems and the use of modern information and communication technologies in the context of e-health (eHealth or e-Health). Currently, in connection with the development of availability of medical services have put an increasing emphasis on the use of the Internet and Internet technologies or ICT in healthcare [2, 12, 13, 14, 15].

Implementation of hospital information system in healthcare units brings a lot of positive results for both the patient treatment process, and the same unit. It also affects the quality of services, patient satisfaction, and the effective functioning of the unit.

Analyzing the role of implemented HIS in the functioning and organization of hospitals is also important to draw attention to the negative effects associated with the risk of their implementation. The risk is based on implementation of innovative projects and is often associated with insufficient knowledge of HIS implementation. Among the significant risk associated with the implementation of HIS in independent public and private healthcare units may include: insufficient knowledge about the implemented system, the lack of designated persons responsible for the implementation of system, problems associated with the operation of software, equipment failure, and the others.

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