

## Research Article

# Management Information System in Healthcare and Welfare Units the Case of such a system in an Emergency Department

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**Abstract: Introduction:** The health discipline is very important for maintaining the health and living standards of the population. Health unit management is one of the factors contributing to the quality of health services provided, increasing both citizens' and job satisfaction. **Purpose:** The purpose of this review study is to present a high-tech management information system in a healthcare unit; and in particular, a hospital emergency department. It will also present the functional and non-fictional needs of the system, its possible solutions and its evaluation. **Methodology:** Greek and international scientific databases were reviewed. The study material consisted of articles on the topic found in Greek and international databases such as: Google Scholar, Mednet, Pubmed, Medline and the Hellenic Academic Libraries Association (HEAL-Link). **Results:** The major difficulties commonly encountered in health units are patient management and quality of health services provided. In particular, the health discipline is particularly sensitive and it is characterized by diversity. There are also many specialties in that sector that require cooperation amongst doctors, nurses, administration officials, providers and other specialties. Problems such as reduction in health expenditure have recently led to a reduction in available resources and staff in health facilities. **Conclusions:** There are many information systems that can be used in a hospital department that should be studied by both specialists and staff.

**Keywords:** Information system, hospital, emergency department, functional needs non-functional needs.

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## INTRODUCTION

The health discipline is vital for maintaining health and the standard of living of the population. Health unit management is one of the factors contributing to the quality of health services provided, increasing citizen satisfaction and increasing job satisfaction. (Davis, 2002) Indeed, in times of the crisis, the effective management of public health organizations is very important as the workload is particularly high. Citizens do not have the income available to solicit for private health facilities and there is therefore, a high demand for public health structures. A high-tech health system should include the right information systems and use of new technologies and innovations to improve processes (Sullivan, 2007).

New information and communication technologies provide many opportunities for health organizations such as the implementation of e-health, which includes the immediate and better prevention, diagnosis, treatment and management of the health of the citizens of the country. It is remarkable that in most countries and health systems, e-health is promoted, which is about the combined use of information and

communication technologies (ICT) in the health sector. (Liuch, 2011) Also, the use of digital health data is very important in all health units and health departments as they contribute to the storage, transmission and immediate electronic retrieval of medical personnel locally or even remotely. Indeed, it is worth noting that the use of e-Health and the use of information systems contribute to clinical, managerial and educational purposes. (WHO, 2015)

## PURPOSE

The purpose of this prospective study is to present a state-of-the-art information management system in a health unit, and in particular a hospital emergency department. It will also present the functional and non-operational needs of the system, its possible solutions and evaluation.

## RESEARCH METHODOLOGY

Greek and international scientific databases were reviewed. The study material consisted of articles on the topic found in Greek and international databases such as: Google Scholar, Mednet, Pubmed, Medline and

the Hellenic Academic Libraries Association (HEAL-Link). The keywords used were: Information system, hospital, emergency department, functional needs non-functional needs. The exclusion criterion for the articles was the language, except for Greek and English. Mostly, articles and studies accessible to authors were used.

### **Information Systems for Problem Solving In Health Units**

The main problems commonly encountered in health units are patient management and the quality of health services provided. In particular, the health sector is particularly sensitive and is characterized by diversity. There are also many specialties in the health industry such as doctors, nurses, management, providers and other specialties that need to cooperate with one another. Problems such as expenditure reduction in health have recently led to a reduction in available resources and staff in health units. (Anastasiadis, 2001) Thus, most hospitals have mismanagement, increased costs, reduced quality of service, and reduced satisfaction for health users and staff. Thus, more efforts are being made to address the above problems by health units (Karasoulas, 2014).

Information Communication Technologies (ICTs) enable the exchange of information directly between health units and health professionals. In addition, patient records and examinations diagrams are usually electronic all available. Other systems allow for the provision of telemedicine services, patient monitoring and the management of medical supplies and health costs (Apostolakis, 2007).

Particularly, in the case of the Emergency Department there is an increased workload and a particularly increased flow of patients. Indeed, there are many difficulties in patient management, waiting time while simultaneously, the efficiency and productivity of medical, nursing and other staff is significantly reduced. (Tsaloglidou *et al.*, 2015 & Papathanasiou *et al.*, 2015) Therefore, the administration of each health department should understand that there are a lot of serious problems that are constantly increasing and exacerbated by the increasing need of citizens for health services. As there are reductions in hospital budgets and severe staff shortages, these problems become even greater. Increased workload leads to increased stress and anxiety of the staff in health units, reduced job satisfaction, performance and there are mistakes that are likely cost human lives. (Tachtsoglou *et al.*, 2018 & Lera *et al.*, 2019) Thus, there is reduced quality of health services provided; and in particular, in the hospital emergency department.

The administration of every department is trying to look for solutions to increase the quality of health services and efficient patients' management of patients' prioritizing the risk of their condition. The

waiting time may also be reduced if there is an electronic patient record that is interconnected with all health structures. Therefore, it is essential appropriate solutions be found by the management of hospitals or units of hospital structures (Apostolakis, 2005).

It is noteworthy that according to Mustakas *et al.*, the work stress experienced by health workers is particularly high and affects around 28% of workers. (Moustakas *et al.*, 2010) The management department should consider ways to reduce the work stress of medical staff and provide procedures to facilitate the staff and ensure quality health care services to citizens (Frantzana, 2019 & Georgoudi *et al.*, 2017).

### **Functional and Non-Functional Needs Information System Standards**

In Emergency Departments there are several needs that are to be met at both operational and non-operational levels. For instance, an emergency department include the need to reduce patient waiting times, reduce the time of taking each patient's history, and the need for immediate access to some patient information by physicians so as to reduce medical errors and respond promptly in each patient's needs; all the aforementioned needs are functional ones. (Pavlopoulos, 2004) In addition, there is a need to increase the quality of services provided to patients and their attendants at a functional level. There are also the needs of staff to reduce their workload and facilitate procedures on a daily basis. (Quinn, 1994) For example, there is a need for access to patient information such as earlier examinations, tests and access to their treatments or allergies they may have. It is also important to refer cases promptly to the appropriate medical specialties and serve them as quickly as possible without having just one queue. All the above will greatly contribute to reducing problems in Emergency Departments. At a non-functional level, there is a need to reduce health costs and utilize properly the resources. Also, at a non-functional but administrative level, it is necessary the management have control over staff, recording and comparison of indicators. This will enable the administration of each health department to determine which functions are effective and which ones need improvement. Staff performance will also be monitored and training will be provided to those in need (Joseph, 2005).

Therefore, it is a prerequisite the selected information system for an Emergency Department cover both the functional and administrative needs of the health unit. Particularly, the information system should be able to interface within both the Emergency unit and other health units to record the patient's history. It should also give medical staff access. It is important to make it easy for everyone to process and not take too long to record doctors' comments or upload patient test results. Another important feature should include the

identity of people with access to the information system in order to monitor their performance by the management department. Finally, the system should be able to record statistics on the basis of which indicators, such as quality, mortality reduction, unit speed of service and others can be checked. (Eysenbach, 2001)

### **Possible Solutions**

The use of new technologies is necessary in order the above problems in a hospital unit to be addressed. In particular, technology and information systems may greatly improve the quality of services provided and offer many operational and organizational benefits to the health unit. (Sotiriadou, 2014) Designing the appropriate information basis can enhance the around the clock operation of Emergency Departments and contribute to time planning. In addition, an important benefit is the proper utilization of the available material and human resources. It is worth noting that the use of information systems can lead to better and more direct medical decisions or patient management (Kalogeropoulou, 2011).

Information systems that utilize new technological advances and other applications such as wireless networks, touch-screen computers, voice recognition and other codes contribute to immediate patient service. The interconnection of health units is equally important in order to implement e-Health and to make available patient information to all health units.<sup>5</sup> Each and every Emergency Department function either at operational or administrative levels can greatly be facilitated with the use of various information systems. The benefits are numerous for the patients, the services they receive and for the healthcare professionals since their work is greatly facilitated. In addition, there are benefits to the health system as health costs. In other words, health expenditures are reduced and resources are rationalized while the quality of health services is constantly improving (Sarivougioukas *et al.*, 2008).

Health information systems are available and accessible to health professionals. The latter include those who deal directly with patients, clinicians and public health officials. Health professionals collect data and compose them for healthcare decision-making regarding individual clients, client groups, and the general public. Health information systems include Electronic Medical Record (EMR) and Electronic Health Record (EHR), Practice Management Software, Master Patient Index (MPI), Patient Portals, Remote Patient Monitoring (RPM) and Support Systems Clinical Decision (CDS) (Ashraf, 2019).

The Electronic Medical Record (EMR) and the Electronic Health Record (EHR) help replace the patient's paperwork. Many companies provide such information systems. Medical information for each patient must now be collected and stored electronically. These records will include patients' health information,

test results, doctor and specialist visits, and healthcare treatments (Ersenbach, 2001).

The Practice Management Software assists healthcare facilities and staff with managing the day-to-day operations of the facility. This will include things like patient scheduling and medical service charge. Regardless of their size, all healthcare providers use practice management systems from private doctors to huge multi-centered hospitals. The objective is to automate the administrative tasks performed as part of the business.

Master Patient Index (MPI) aims to link patient files to more than one database. The MPI contains records for each patient registered with a health care organization. MPI, as the name implies, creates an index of all files for every patient. The purpose of MPIs is to reduce duplicate patient records and avoid inaccurate patient information, which could lead to patients' refusal (Ashraf, 2019).

Patient Portals allow patients to be informed about their health data. They are able to access appointment information, medications they may receive and their lab results via the Internet. Some of these patient portals also make it easier for patients to keep in touch with healthcare professionals, including physicians, pharmacists, on prescription requests and scheduling appointments (Frantzana, 2019).

Remote Patient Monitoring (RPM), or what is known as telemedicine, provides medical sensors that are capable of transmitting patient data to healthcare professionals who could very well be halfway across the world. For example, RPMs can monitor blood glucose levels and blood pressure. It is especially useful for patients with chronic conditions such as type 2 diabetes, hypertension or heart disease. Data collected and transmitted through PRM can be used by a health professional or health team to detect medical events such as a stroke or heart attack that require immediate and aggressive medical intervention. The data collected can be used as a part of a health research program or study. RPM is a system very important for patients in remote areas who cannot gain access to health care units (Anastasiadis, 2001 & Apostolakis, 2007).

Finally, Clinical Decision Support Information Systems (CDS) analyze data from clinical and administrative systems. The goal is to help healthcare providers make informed clinical decisions Available data can provide information to medical professionals who are preparing diagnoses or anticipating medical conditions such as drug interactions and reactions. CDS tools filter information to help healthcare professionals take care of individual clients. Essentially, one of the most important developments in medical practice and health care is the incorporation of decision support systems (DSS) into such practices to assist healthcare

personnel. The use of CDSS in hospitals is increasing. It has been shown that incorporating CDSS can significantly improve health outcome indicators. It is important to have quality control standards and systems for evaluating and integrating CDSS development and implementation processes (Shahavarani *et al.*, 2015).

### Evaluation and Optimum Choice

Proper use of clinical information is particularly important in an effort to make right clinical decisions and provide quality health services. A range of information is combined by health professionals who arrive at clinical conclusions. These decisions are based on information once acquired, further processed by the cognitive skills of health professionals, such as differential diagnosis. The combination of clinical information and cognition is therefore crucial for clinicians. (Bodenheimer, 2010) A particularly emerging focus of medical information technology is improvement of care for hospitalized patients by developing data-driven and patient-centered decision support systems. The development of such systems is a very demanding and interdisciplinary task that requires the integration of knowledge from the clinical field and decision science to adapt CDSS to hospital practice and clinical workflows (Zikos, 2018).

CDSS can be defined as a software tool that can support clinicians, patients, and other health stakeholders, and in particular the clinical decision-making process, in a way that makes the process easier, more direct and more accurate. Using this information system, professionals receive patient information that they need to enter into the system, and thus, interact with stored knowledge and information available to the patient and make patient health care suggestions. (Frantzana, 2019) A clinical decision support system can be programmed through electronic health records, hospital information systems or any other hospital information system available to reduce patient information retrieval and increase the effectiveness of error-free patient treatments. (Al-Gambi, 2014) Clinical Decision Support Systems (CDSS) provide clinicians with timely knowledge and help improve health and health care. They can even be seen as an effective way to improve patient safety while significantly reducing errors. (Al-Gambi, 2014) Therefore, the information provided by CDSS must reflect the decision-making process and allow for interaction with clinicians taking into account the temporal nature of health and disease. Successful CDSS design requires collaboration with field experts who have knowledge of the clinical features required for use together due to therapeutic or diagnostic criteria. (Sarivougioukas *et al.*, 2008).

### Clinical Decisions Include:

- Selection of appropriate diagnostic tests
- The patient's diagnosis;
- Selection of optimal therapies; and
- Patient's prognosis.

Such systems will provide evidence-based recommendations for clinicians to improve their competence and knowledge in an effort to achieve high quality and safe service, adding value to health organizations (Al-Gambi, 2014 & Infera, 2019 & Sulley, 2018).

The use of decision support systems (CDSS) as part of electronic health systems is an urgent need to achieve the goal of reaching the patient and delivering quality care. Moreover, such systems help improve outcomes and facilitate research to continually improve care approaches. Another critical aspect of health care is increasing administrative costs that directly and indirectly affect the affordability of the patient. Decision support systems can help eliminate some of these costs as well as prevent graphic errors within the healthcare system (Lera *et al.*, 2020).

## CONCLUSION

It is clear, based on the above analysis that there are specific needs in Emergency Departments of health units. Thus, specific changes to information systems that are up-to-date and meet the needs of the unit should be implemented. In particular, both functional and non-functional needs arising should be met. Thus, appropriate systems should be designed to cover all needs. There are many information systems that can be used. One of the most appropriate one that would help reduce errors and simultaneously provide immediate patient care is the Decision Support System (CDSS) which offers many opportunities and benefits to medical and nursing staff and can reduce patient waiting time and improve the quality of health services provided.

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