

The Effect Of Information Systems On Healthcare Management And Diagnostic Services

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ABSTRACT: *Health sector management in the information environment can be considered a positive environment because of the ability that computing technologies acquire in support of health care workers, and the more consistency in information systems, the more efficient the services provided. On the other hand, the Corona epidemic was a strong indication of the need to raise the capabilities of the health administration, and the main point here is the process of integrating information systems, applications, computers and networks that contain them, as well as data exchange and successful administrative work in managing this data by modern means. The integration of information systems into the health management environment leads to more efficient services and provides the health sector with valuable data for improving services, diagnosis, archiving and assessment of communicable and non-communicable diseases. This paper contributes to presenting a study as a prior review as well as an overview of the literature related to this field. Methods: Based on the literature review, the structure of the main problem of information systems in the health sector will be reviewed during the IT assessment, as well as the reasons that led to the results and some solutions to overcome these obstacles. Many problems can be analyzed and evaluated as part of a large-scale IT assessment, and it can be seen that the IT assessment in healthcare is an important issue to overcome and address these problems. This framework should assist in providing appropriate methods and tools and their reasonable application.*

KEYWORDS: *electronic health information system, data sharing, big data, diagnosis, treatment, clinic decision.*

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I. INTRODUCTION

The digital age, along with innovations in information and communication technology, information technology has played a leading role in influencing all aspects of medical and health services. The adaption of information technology applications led to a radical change in the chain of medical services and administrative processes within medical services institutions. These impacts include (1) the pattern of use of medical services and (2) the relationship between medical service providers and consumers (Šumak, B., Štumpfl, M., & Pušnik, M., 2015). The goal of using information technology in the field of health care falls in the following areas: field and geographical expansion to provide health care services, increasing communication between the client and health care providers, increasing the efficiency and speed of disease diagnosis, improving data management and protecting customer information (Makanga, P. T., Schuurman, N. et al., (2016), Kyriacou, E., Pavlopoulos, S. et al., (2003), Cohen, G.; Goldsmith, J. (2012)). Information technology systems have shown that their utility is comparable to electronic health information systems (EHIS), where researches indicate that both of them increase efficiency of disease diagnosis and treatment worldwide (Muller-Staub, M. (2007), Hunt, D. L., Haynes, R. B., Hanna, S. E., & Smith, K. (1998)).

It can be said that EHIS is the digital version of the paper patient chart, as it can store health data and review it when needed from specialists, for example, the results of medical analyses and treatments. It can also be said that these systems are designed to manage time by making patient' records available to authorized users only (Brook, C. What is a Health Information System?, 2020). The process of integrating the various components and the coordination of operations depend to a large extent on the technical tools and means. With

the rapid development of information computing, the advent of the Internet, and the increase in integration with the mobile Internet, cloud computing, data science, and the internet of things, it is becoming increasingly clear that information and communication technology (ICT) has a leadership par excellence in data integration leading to the rapid transfer of information (Heart, T., Ben-Assuli, O., & Shabtai, I., 2017).

Information can be transferred easily between systems in the form of voice, text, or even visual display via optical fibers as a modern communication infrastructure that speeds up the transmission of information (Maher, E. R., Iselius et al., (1991), Wyse, J. E., & Higgins, C. A., (1993)), and can be defined as information that is shared over networks and accessed for legal use (Barki, H., & Pinsonneault, A., 2005). To operate efficiently and in an integrated manner, the use of e-health systems is required. The E-Health Information System can be likened to three interconnected electronic records (Tier.Net), as it can facilitate the transfer of data and information between programs (Osler, M., Hilderbrand, K. et al., 2014). Tier.Net is used to store, manage and share electronic patient medical and health records and reports to improve patient care and scientific research (Elgujja, A. A., 2020).

The main purpose of this review is to contribute to providing an overview of the literature on the characteristics of EHIS to improve disease prognosis and to develop treatment methods based on the information systems environment. Nowadays, medical care can be classified alongside information technology as a modern trend because it contributes to a pioneering and distinguished role to improve hospital operations and administrative procedures such as identifying medical consultations, inquiring about medical examination results, and online payment. The level of information technology, to some extent, allows different organizations to share a unified database to coordinate their efforts and reach maximum amount of correct data, hence, leading to increase the efficiency of healthcare services. With this in mind, this paper reviewed the literature on information systems and their integration with the health sector.

1. Characteristics of electronic health information systems

Optimizing EHIS performance is essential for health service delivery due to its many benefits, including raising the quality of healthcare service delivery, reducing costs spent on healthcare, as well as reducing the level of unintended risks (Bowman, S., 2013). The misapplication of the electronic health records system may lead to errors related to the electronic health records that may threaten the security of the information contained in the electronic health records. Such mistakes may lead to the emergence of serious errors that may endanger the safety of the patient and compromise the quality of healthcare services (Bowman, S., 2013). There are major components to consider for an EHIS function to function efficiently which are as follows: patient diagnosis management, clinical care management, pharmacy management, laboratory management, radiology information system management, and billing system are major components that govern the efficiency of EHIS functions.

2. Realizing the integration and impact of health sector regulation in the era of big data

Contemporary management decisions have become primarily data-driven because many industries have become interested in big data (Batarseh, F. A., & Latif, E. A., 2016). Big data has three characteristics: a. Size b. Speed and c. Miscellaneous (Ramesh, D., Suraj, P., & Saini, L., 2016). The United States Department of Health and Human Services (HHS) recently issued a license to use Electronic Health Records (EHRs). It is possible to display medical materials that were in paper form and work on applying them on a large scale to various electronic equipments and devices in electronic data format. The rapid spread of medical and health information systems, with all their diagnostic equipment, has resulted in the generation of a huge amount of medical data such as clinical/laboratory, personal health management / social affairs network data, medical expenses / medical insurance fund data, etc.) (Heart, T., Ben-Assuli, O., & Shabtai, I., 2017). The efficiency of healthcare systems depends on three main components: accessibility, quality, and cost. To increase the capacity of the health sector, it is imperative to reduce costs while maintaining the quality of the medical services provided or working to improve them (Abedjan, Z., Boujemaa, N., Campbell, S., et al., 2019). The fastest and most cost-effective way to do this is to make the most of the important information that is overwhelmed by the vast amount of medical data. Modern information and communication technology contributes to the development of new and arguably innovative methods to achieve the idea of disseminating and exchanging information among all institutions (Ying B, Rong Z, Xiao J, 2007).

Hospitals and medical centers are good places for large data warehouses such as patient records, test reports, medical images, etc. It is also important to integrate information into a medical information system as a milestone upon to reduce medical costs and work to increase the reliability and efficiency of these systems, and support patients. By the best treatment. A medical information system typically includes a hospital information system (HIS), electronic medical record (EHR), laboratory information system (LIS), radiology information systems (RIS), and image archiving and communication system (PACS) (Ying B, Rong Z, Xiao J, 2007). High-quality care (QoC) requires processing information with users but from multifunctional groups (e. g. pharmacists, physicians, experts, and even patients) (Baird, A., Furukawa, M. F., & Raghu, T. S., 2012). Despite

this, these groups with different and multiple functions are only partially connected in a highly decentralized network and need IS integration to achieve integrated planning. Even though there is data inflation, the data is fragmented and scattered among systems in incompatible formats and stored in isolated islands (Zhang, Y., Wang, S., & Ji, G., 2015). At present, society has become characterized as a digital society in a very dynamic way, and also the business integration between science, technology, and medicine has led to the emergence of applications for data in new and contemporary formats that are characterized by a lot of flexibility and protection. Advanced information technologies such as cloud computing, data analytics, and the Internet of things will enable the integration of complex data such as electronic medical records, genetic databases, social media, and wireless mobile medical devices.

Various medical institutions can work on exchanging and sharing medical information, and hospitals' internal departments can manage this information in the best way possible in order to break break down the information isolation barrier and work to gradually integrate information as a service for health care, thus improving the entire medical system (Bhavnani, S. P., Muñoz, D., & Bagai, A., 2016). Picture Archiving and Communication Systems (PACS) represents an integral part of the healthcare delivery system. These systems, which are characterized by electronic archiving and sending images to medical organizations with all their components, allow them to obtain all medical images in the electronic copy easily and also work on storing, displaying, and sharing them. Through these systems, medical institutions and radiologists can penetrate the isolation of information by exchanging images Such as x-rays, MRIs, and CT scans. This results in improving the efficiency and quality of the patient's diagnosis and treatment (Šumak, B., Štumpfl, M., & Pušnik, M., 2015). According to the study of the effect of PACS technology on the quality of diagnosis and treatment of 2256 cases in US hospitals, the results showed that the PACS system had a significant impact on hospital efficiency and patient experience (Šumak, B., Štumpfl, M., & Pušnik, M., 2015).

3. Information technology problems in health care and their consequences

There are a set of challenges in the surrounding environment facing health information system operations that may hinder proper implementation as well as expansion processes. Among these topics is the difficulty of intervention, lack of consensus on technical opinions, scarcity of human resources, poor leadership skills, lack of funding, employee resistance, poor management, weak organizational capacity, and insufficient awareness of the use of techniques (Yamey, G., 2012). The E-Health Information Systems assessment will focus not only on hardware and software but also on the information processing process, that is, the interaction between information technology and its beneficiaries in a given environment. Evaluating these systems not only does require an understanding of computer technology, but also requires an understanding of the social processes, the behavioral consequences that they follow, and the impact of technology on them. The success of information technology depends, for example, on its compatibility with the clinical workflow, the appropriate mechanism of how this technology is introduced into the organization, the level of efficiency of the information derived from these systems, as well as the training, support, level of use and user encouragement (Berg, M., 1999). Accordingly, it can be said that the objective of evaluation usually takes a broader curve.

4.1. Difficulty to intervene and technical lack of consensus

The difficulty to intervene and the lack of technical consensus are some of the most complex challenges of EHIS because it affects the process of implementation in general and poses serious difficulties to the technical issues in particular (Yamey, G., 2012).

4.2. Scarcity of Human Resources

The scarcity of human resources represents a real obstacle to the performance of EHIS tasks. The migration of professional cadres to higher-paying non-governmental organizations or institutions is a factor that contributes to the capacity of human resources (Botha, M., Botha, A., & Herselman, M., 2014), especially when migration occurs outside the home country.

4.3. Poor leadership skills

Unsupervised administrative processes that contain many inconsistent procedures leads to poor management and weak EHS oversight, which is a major challenge, especially in countries with limited capabilities (Asangansi, I., Macleod, B., et al., (2013), Qazi, M. S., & Ali, M., (2009)). Among its causes are the delay in providing health data and the lack of feedback from specialists or supervisors (Kapadia-Kundu, N., Sullivan, T. M., 2012).

4.4. Lack of funding

Implementation of an Environmental Health Information System (EHIS) requires high-cost and continuous financial support for the provision of hardware and software, as well as the need for maintenance, training, and continuous development of human resources, which will lead to high costs (Oluoch, T., & de

Keizer, N. F., 2016). Unstable electrical power supplies and a scarcity of IT equipment are also contributing factors to impeding the successful implementation of EHS.

4.5. Insufficient capacity of health systems

Continuous changes in regulations negatively affect the overall healthcare system and create obstacles to the successful implementation of EHS (Ghia, C. J., Patil, A. S., Ved, J. K., & Jha, R. K., 2013). Challenges facing the health system were noted about expanding health in South Africa where the IT environment was weak and the capacity to implement communications was low (Leon, N., Schneider, H., & Daviaud, E., 2012). Barriers to improving the public health sector in South Africa were discovered through the E-Health Strategy, and in particular through the ERM system integration. Inequality, red tape, and the remedial structure are the main obstacles (Katu, S., 2016).

4.6. Weak application of diffusion techniques

Lack of skills in handling information technology is disincentive to implement EHS (Dornan, L., Pinyopornpanish, K. et al., 2019). For example, in Iran, there has been a decrease of users in dealing with information technology, which is an important obstacle (Ahmadian, L., Khajouei, R. et al., 2014). In many cases, poor skills in dealing with technology, or so-called computer literacy, and low morale for using the system contribute to negatively impact on implementation (Yamey, G., 2012).

4.7. Personnel Resistance

A study was conducted in South Africa where it was observed that there is a real difficulty in implementing EHS, due to physicians' resistance to the use of EHS and their preference for the paper system (Oluabunwa, E. C., Sun, J. et al., 2016). In Iran, too, negative attitudes of staff regarding the order and lack of receptivity were among the obvious obstacles to the successful implementation of EHS in hospitals (Ahmadian, L., Khajouei, R. et al., 2014). Although all required information was available at EHS in South Africa, hospital staff showed reluctance and lack of actual response due to resistance to the use of EHS in treating patients as well as about prescriptions (Marutha, N. S., & Ngulube, P., 2012).

5. Consequences

- Providing health sectors with information technology takes a short time. It's not enough to apply technology and then measure the effects right away! Users and health professionals alike need to spend a lot of time learning about new tools, using them correctly, and getting the desired benefit (Butler, M. A., & Bender, A. D., 1999). There may be changes or modifications to the devices or programs that have been made for improvement, for example, there is a study indicating that it was observed during the study of assessing the quality of nursing documents, after the introduction of information technology, and the emergence of significant changes in several quality-related indicators after 3 and 9 months of use (Mahler, C., Ammenwerth, E. et al., 2003). In some cases, he may have to wait more than 9 months for a final evaluation.
- Even after the application period, the assessment is likely to change (Moehr, J. R., 2002). For example, the use of information technology may be affected by new administrative procedures or any changes in work organization, or personnel (Butler, M. A., & Bender, A. D., 1999). Thus, after the study is completed, there is a real possibility that the environment has changed compared to the beginning of the study, which may render the results useless and outdated. This makes the evaluation results mainly dependent on the period in which the evaluation was conducted (Ammenwerth, E., Mansmann, U. et al., 2003).
- Each information system in our definition is unique as many evaluation studies are valid only for specific institutions that have their information system. For example, it was found that the evaluation of document quality as well as the acceptance of beneficiaries after the introduction of the nursing documentation system had different results and were not identical in many study wards such as differences in workflow, computer knowledge of users, or support for the organization process for beneficiaries. These factors cannot be controlled so easily (Lorenzi, N. M., & Riley, R. T., 2000).

6. Possible solutions

To solve the problem of external validity, we need to define the information technology as well as the surrounding environment that will be evaluated in detail before starting the study. Not only will we describe programs and computers, but we will also describe the number of users along with their experiences, as well as the drivers and methodology used to provide information technology, the ways it is used, and the infrastructure related to others. Computer hardware (such as data protection networks and devices) and any other aspects that may affect the use of information technology. To address the problem, it is necessary to document all changes

that take place in IT and the interaction of this device with users. We need a lot of care while studying (Butler, M. A., & Bender, A. D., 1999). For example, when documenting changes to the workflow mechanism or hardware and software, work on the methodology of regular evaluation.

This helps clarify differences in the effects that occurred during the study period. Another methodology available to deal with the problem is to choose smaller evaluation units. This will help design assessment questions that adapt to changes in the environment. For example, the Nursing Registration System evaluation began with assessing the time required for documentation during the application process (Ammenwerth, E., Eichstädter, R. et al., 2001), continued to evaluate changes to the document during the first year (Ammenwerth, E., Mansmann, U. et al., 2003), and then moved on to support workflow and user approval after longer use (Ammenwerth, E., Mansmann, U. et al., 2002). Each group answered a question related to a specific stage of information technology. This long-term evaluation usually takes a learning curve as an initial stage in addition to the subsequent changes in the evaluation objective. Concerning the complexities of the subject of the evaluation, it is necessary to pay special attention to unforeseen negative impacts, for example concerning the quality of patient care, such as increased patient stay, higher dropout rate, and rate of participants (Ammenwerth, E., Mansmann, U. et al., 2002).

II. DISCUSSION

This review demonstrates the EHS implementation opportunities. The identification of constraints and challenges that are dealt with during the implementation of the EHS information system must be taken into consideration before implementation to ensure successful implementation. The literature presented indicates the need to provide EHS stakeholders with well-defined tasks to ensure successful implementation. Emphasis must be placed on that information culture needs to be sequenced through a hierarchy within the organization. If this culture disappears, then most likely there will be poor data quality and use (Skiti, V., 2017).

The various medical administrative departments with all their institutions and cadres have also witnessed positive changes in medical services, gradually after the intervention of information technology. For example, medical documents deal with medical workers daily, and the reports in electronic form have contributed to reducing the waste of paper resources, worked to improve the efficiency of registration, and contributed to enhancing opportunities for sound medical decision-making. However, the evaluation process indicated several problems. Scientists from Indonesia conducted a study related to the Nursing Management Information System, and the results indicated that after applying electronic records to the nursing process, the nursing staff was satisfied with the nursing process, but to different degrees.

This belief among the nursing staff that electronic medical records for patients it will contribute to improving the evaluation process (Hariyati, R. T. S., Hamid, A. Y. et al., 2018). Through a combination of compulsory and incentive measures, American hospitals have made great strides and made major advances in the interaction of IT tools. It has become natural to use interactive IT tools within US medical institutions (hospital websites, social media tools, etc.) to provide services to patients (Huang, E., Knittle, C., Wantuch, G., & Francis, T., 2020). Dissemination and development of medical information is also a prerequisite for the integration of medical information systems.

Although information technology has played an effective role in the field of medical services, the assessment of medical information technology suffers from many problems indicating that medical informatics still faces many difficulties and challenges. For example, researches shows inconsistency on whether users are truly aware of and mastering the functions of an information system or not to improve the level of work quality and workers' efficiency as one of the main factors that weaken the promotion of medical information technology (Hariyati, R. T. S., Hamid, A. Y. et al., (2018), Owusu Kwateng, K., Appiah, C., & Atiemo, K. A., (2019)). Some hospitals in China have achieved uniform UPID recognition within the hospital, which means an identification number for each patient and detailed files about their medical history linked to a unified database. However; it is difficult to achieve open UPID across regions.

This leads to the emergence of many problems, such as wrong diagnosis, improper treatment, and other emerging issues (Cheng, E. C., Le, Y., Zhou, J., & Lu, Y., 2018). Evaluation is the cornerstone of the development process of the system. However, many problems have been reported with healthcare IT evaluation procedures. Wyatt and Spiegelhalter in 1992 (Wyatt, J., & Spiegelhalter, D., 1991) as well as Grémy and Degoulet in 1993 (Gremy, F., & Degoulet, P., 1993) addressed the topic of motivation and methodological barriers to evaluation. It seems that the problems they dealt with persisting today. Addressing these key issues may aid better prospective evaluation studies and more accurate evaluation results. Some authors have addressed a number of these questions. Vatam guidelines (Vatam, 2003) focus on evaluation based on stakeholder opinions, as well as on potential areas for evaluation (such as IT development, user requirements, and marketing), as well as on describing the information system (a type of application and life cycle.). Some authors focus more on the content of the evaluation protocol (C. Ohmann, G. Belenky, (2003), Eurlings, F., Van Asten et al., (1997)). Hebert (Hebert, M., 2001) discusses IT management in terms of structural criteria or the

quality of IT outcomes, Grant et al. (Grant, A., Plante, I., & Leblanc, F., 2002) Focusing on the level of operational evaluation, Palvia et al. (Palvia, S. C., Sharma, R. S., & Conrath, D. W., 2001) Discuss important technology standards.

III. CONCLUSIONS

The advent of EHIS has revolutionized patient care based on more efficient diagnosis and treatment of illnesses in the healthcare center. EHIS must be supported and strengthened across health globe especially during the current Covid-19 pandemic. For the successful implementation of EHIS, commitment from health leaders is needed to contribute to a positive role in politics, mobilize resources and make evidence-based decisions in order to achieve the required integration of information systems needed to enhance the security of big medical data and support effective participation in real-time and all computing technologies including the use of internet technology, IoT, and cloud computing. By analyzing the literature on information systems integration, it was concluded that working on building an information platform and making it compatible with different systems will contribute positively and decisively to amplifying data and the mechanism of its sharing. Therefore, the work to develop the integration of information systems to provide medical services at all levels deserves to be advocated and promoted. However, there are still many hurdles to overcome. We want to point out that evaluation studies, especially in the field of information technology in the field of healthcare, take a lot of time, knowledge, and resources. There is still debate about what kind of information systems they should look like in healthcare. This framework should help reinforce the work on finding appropriate methods and tools, and work towards rationally applying them.

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