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# Exploring the utilization of management information systems in public hospitals: Challenges, limitations and future trends innovations

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***Abstract*---**The utilization of management information systems in public hospitals is a significant factor in healthcare management, quality, and operations improvement. It has created significant new opportunities; however, with every benefit that MIS can bring to the table, its most significant challenges and limitations revolve around issues of privacy, security, and the quality of the data itself. Accurate, reliable, and timely database support management decisions toward the ultimate purpose of improving patient care. It is important, that is to say, to take maximum benefit from all the components of MIS, and hospitals face and overcome the enumerated challenges. There are some futuristic changes in the field of technology adoption by hospitals, like artificial intelligence, the Internet of Things, mechanization, innovative devices and equipment, including robots in the healthcare unit, which are expected to play a pivotal role in hospital management innovations and improvements in the field of healthcare settings through management information systems. Strategic planning and management commitment, investment of resources, and organizational capabilities development are important to the success of management information system implementation in healthcare settings.

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## 1. Introduction

Management Information Systems (MIS) have been utilized in a variety of fields, including healthcare. It is widely acknowledged that public hospitals provide healthcare services to the general public for health stabilization, supplementary, and developmental purposes in a country. Good management is needed to achieve the aims and objectives of public hospitals. Effective public hospital management practices have a direct impact on the health of the people in a country. The proper implementation of MIS has made substantial positive changes in various field operations in both public and private sector services, which could readily reduce some of the unnecessary expenses in the daily activities of hospitals and more likely increase operational efficiency by making significant changes in the field of management practices. Therefore, the present study focuses on the various factors of MIS that would be utilized in public hospitals, managerial challenges, and possible limitations, as well as future innovations.

The study will contribute information and knowledge in the area of MIS development and its applications used in public service, i.e., in the public health sector. The findings not only contribute to researchers but also to system professionals. The Ministry of Public Health in Jordan is attempting to develop MIS to assist decision-makers in managing hospitals smoothly and efficiently. Each public health system or agency has a unique structure and function, as well as a diverse group of end users with unique needs. In hospitals today, healthcare technology is normally intended for healthcare practitioners and healthcare administrators who do not actually provide healthcare. It is, therefore, important that information systems meet both information systems and clinical departmental needs. It is urgent that hospital administration be technically assured so that hospital managerial work becomes very easy. Managers have an interest in MIS primarily to make their managerial work easier. The work does not involve processing for caring for a patient. They are focused on workplace administration in the healthcare area in a way that benefits the organization.

## 2. Management Information Systems (MIS) in Public Hospitals

Management information systems (MIS) refer to data and information systems utilized to help managers in their operations. The MIS concept includes four key elements: management, information, systems, and data. Effective and productive management constitutes a vital factor in the success of a hospital. MIS can aid in reducing guesswork from management processes and encourage information formulation. It can also enhance economic and decision-support mechanisms. For a hospital, MIS performance is highly dependent on effective data gathering, processing, storing, and dissemination. Factors that shape data processing include the raw nature of operational information and multiple sources of data. (Shniekat et al. 2018)(Alotaibi2018)(Luo et al.2018)

MIS in public hospitals is intended to offer a shared information platform to satisfy the requirements and interests of administration, healthcare professionals, managers, and any other participants whose views could contribute to strategic decisions concerning healthcare hospitals. One of the MIS functional applications is to provide patient management services. When a patient is brought in through the casualty division, the admission system extension should be allowed to act, and certain activities should be carried out. At a particular time, it will contain patient details as well as family backgrounds and behaviors. Data about illnesses is also documented there. Hospital management information systems are expected to support administrative activities that facilitate the achievement of organizational strategic goals. Worth mentioning, the nature of involvement in the service sector is in the technology production that supports the services. MIS is associated with information technology and healthcare service delivery systems, as the main product from the hospital itself; therefore, a new patient care system model is needed. MIS should be directly aligned with the hospital's mission objectives and vision to collect and disseminate information, making it effective and efficient for patient services.

### 2.1. Definition and Components of MIS

Management Information Systems in Public Hospitals: Definition and Structure
Management Information Systems (MIS) can be defined as a system that focuses on providing information needed for hospital functional decision-making. It is primarily structured for the operational and management staff inside the public hospital. Inside the MIS, transactions are summarized and relied upon for functional information. In practice, the MIS is quite distinct and differs from health informatics, which focuses on appropriate systems, mainly the electronic and computer systems that clinicians utilize to structure their clinical narratives and produce records of data from which they generate their decisions. The MIS package mainly emphasizes a quantitative approach to decision-making. This concept can be found mainly in the use of systems that utilize information or data to reach a decision and analyze alternative scenarios. It allows managers to have an analytical look at the system.

The main concerns of the system are hardware, software, databases, procedures, and personnel. All these components affect each other and function as a single integrated part of a system. When this system is implemented as part of the public hospital, it facilitates the functioning of managerial activities both up and down the organization. All the specified components play a major role that can be manipulated to solve the administrative problems that doctors face. A Management Information System (MIS) is designed to provide executives with beneficial material required for making advantageous decisions in order to resolve difficulties and improve effectiveness. In order to be effective, operational, and societal, open hospital establishments need an outlook into the projected costs of inpatient charges, which represent national supervisory establishments, and reveal project prices distributed by payers and hospitals. This chapter presents a description of the MIS system mechanism, its perspective in the printed track record, some of the advantages of implementing it in the public hospital agenda, and challenges in the development of open distribution. (Alzoubi et al. 2018)

### 2.2. Benefits of MIS Implementation

The implementation of Management Information Systems (MIS) in public hospitals brings a number of operational efficiencies. The role of MIS is to simplify and automate internal processes through computerized procedures and to provide low-cost access to timely and accurate data. Active computerized systems would help facilitate the speedy recovery of data. A well-designed MIS aids hospital managers in decision-making, determining practical and strategic information requirements. In today's era of accountability and health care reform, some even say that the use of MIS is no longer optional for a single hospital. With the help of MIS, healthcare stakeholders can track patient information, manage administration and account billing, and order software and departmental audits, results reporting, and image archiving. The effort can lead to better patient outcomes, streamline operations, and improve patient care and satisfaction. Lastly, under the ever-decreasing budget, hospital managers are forced to find ways to maximize efficiency in their hospitals, and MIS is seen as a means of accomplishing these goals.

The utilization of MIS in hospitals brings an array of benefits including: 1. Operational efficiency 2. Improved decision-making 3. Improved patient care 4. Cost savings 5. Better reporting 6. Improved compliance. The first aspect of the benefits lies in the areas of operational efficiency. A timely flow of precise data enables people to make informed long-term decisions based on reports. MIS is seen as an approach to reducing financial administration costs, such as the tracking of investment ownership, using revenues with expenditures, drawing funding and payroll records in a timely manner, and facilitating normal cost accounting by pulling data from various sources. In terms of patient care, the various studies also included advantages ranging from physicians reading CBC results from their clinics to a quicker preventive responsiveness to result archiving and sharing of results among specialties. MIS can be utilized in other arenas to improve patient care, such as in supply management where doctors can obtain supplies instantly after they run out. MIS would thus ensure stock is available when needed, but a significant reduction in inventory costs can be accomplished when specialized inventory management systems within hospitals are installed. In such clinical laboratories, MIS also affects capacity management to reduce the plight of utilization. Finally, the use of MIS is seen as a way to reduce costs and increase hospital productivity. (Adere, 2018)(Rinty et al., 2018)

## 3. Challenges and Limitations of MIS in Public Hospitals

Management Information Systems (MIS) can be a major driver of public hospital performance if used appropriately. However, to rule out any possible misconceptions, a number of highlighted challenges and limitations have resulted from the application of MIS within hospital settings. There are integrations of Management Information Systems (MIS), electronic health records (EHRs), electronic data warehouses (EDWs), and clinical data repositories (CDRs). However, healthcare managers still need technologies and techniques to convert data efficiently into information. There are issues of data sharing and system interoperability. Healthcare organizations have few links that are needed for efficient exchange regarding healthcare information.

The resistance of healthcare professionals is directed toward TQM models. Some prominent obstacles related to healthcare professionals include data resistance and organizational policies, such as fear of technology, loss of control and profit, suspected priorities, attempts at domination, and intellectual intimidation. In addition to the aforementioned obstacles, there are other serious challenges in the MIS application that include security issues. Information security plays a significant role in cases of non-acceptance. People who are interested in submitting or using the system are involved in different ways, including users, patients, health workers, system developers, and community members. Potential issues related to security include confidentiality, data privacy, and integrity. Data that relates to individual patients raises concerns about privacy. Financial limitations, such as costs and resources, are also addressed. An electronic medical record (EMR) process requires a considerable budget for investment. Lack of financing and resource constraints have led to many large computerization projects that are still rare. For healthcare providers, the existing costs constitute clinical requirements, which limit financial resources for research operations. Time can also contribute to poor resistance among employees. MIS has limited time that can be spent in terms of staff testing for educators and organizations. MIS is not supported by the existing management system. Bureaucratic policies strongly regulate public healthcare. These regulations that affect public healthcare must be obeyed by any financial institution that comes from any application system. Segmentation between agencies has prevented the interconnection between the public. The staff has undergone a continuous education process. Most clinical results have only recently improved. A lack of efficient infrastructure implementations has been identified. It is possible that computer solutions are available, but many other institutions do not cooperate effectively in inter-institutional information.

### 3.1. Data Security and Privacy Concerns

Data security and privacy concerns are often cited issues that public hospitals face in operating Management Information Systems and Electronic Medical Records systems. This is because, in a healthcare context, it is extremely important to ensure that patient files and personal health information are secure, given the extreme sensitivity of the data. There are also legal requirements that set standards for protecting sensitive patient data. The sharing of information in part of the MIS system can be a risk if not secured in terms of data accuracy, data availability, and data confidentiality. The risk of data loss and cyberattacks is on the rise, and security measures are required to nullify these risks. Misuse of the system is another factor that public hospitals have to take care of.

These security and privacy concerns cannot be eliminated; however, they can be reduced with the proper design, implementation, and training of MIS systems and staff. In addition, it is important for every hospital to have a disaster recovery plan for the event that this data is lost in order to continue functioning and providing quality care. The implementation and access to an updated backup service and firewall system are very important to prevent unauthorized access. Access rights for each system should be built on the 'least privilege' basis to ensure the security of the system, such as a benefit management system that can only be accessed by a few employees, such as managers and directors. The organization must store data in an encrypted format to ensure the data cannot be viewed by unauthorized users.

When the security of the data is compromised, it can lead to a loss of patient trust in the hospital and also the inability to audit or be reimbursed for these types of records, which are also important from a financial perspective for the sustainability of public hospitals.

### 3.2. Cost and Resource Constraints

3.2.1 Constraints to Implement MIS

Costs are perhaps the most critical obstacle to developing and maintaining an effective MIS. In the initial phase of systems deployment in the institution, a significant portion of the budget is often dedicated to the acquisition of computer hardware and the necessary software that will be used. For this reason, large one-time and continuous costs for system updates are associated with the establishment and running of MISs, and these costs are often prohibitively high in developing countries with limited resources. Most public health care institutions have very tight budgets for operation and maintenance expenses, and although these systems help capture essential data that can measure the performance of organizations, many health care institutions and hospitals cannot afford non-healthcare items and supplies.

In addition to the costs of establishing and interfacing data, there are ongoing costs associated with maintaining and upgrading the system, which, if not continuously accounted for, can negate the effectiveness of the system in the long term. Costs are not limited to the procurement of physical machinery and software; they also include investments in human resources in terms of training. We recommend that any health facility with limited resources periodically consider whether it would be better for patients to channel resources into direct patient care rather than invest them in hardware, software, and staff to maintain an MIS. Human resources are another main consideration when it comes to the successful implementation of MISs, because installing these MISs at the local level requires allocating considerable time and energy of health care delivery service personnel, who are often in short supply. If mining service staff were to become involved in an MIS project, it could potentially have a negative effect on the clinic or other services, which usually cannot afford to go understaffed for significant periods of time.

Another significant concern arises from the concept of financial sustainability. When setting up and maintaining an MIS, many ministries of health or health care institutions face difficulties and may find themselves lacking in terms of funding or support after completion of the initial project. This stems from several reasons. The ministry of health may be part of the government and may not get much priority because of being a line ministry and hence may not have much funding. In addition, the ministry of health is often the most underfunded body and does not receive the same amount of resources as the cabinet level of administration. Inadequacies in funding can also manifest themselves in the program phases after the development and implementation stages, as the funding necessary for further system improvement may not be provided.

## 4. Innovations and Future Trends in MIS for Public Hospitals

MIS stakeholders will find that innovations in technology are expected to contribute to better health and better healthcare delivery. As new systems are implemented, it is essential that stakeholders possess the information necessary to strategically plan for the changes. New developments include these future trends.

Innovations and future trends in information technology have great potential to contribute to healthcare. Particularly, the application of artificial intelligence and machine learning has the potential to make rapid strides in the correlation and prediction of patient care events. Integrating data across a wide variety of systems including EHR, CLSR, LIS, revenue cycle, CPOE, and many others, potentials are increasing as more data is collected. Soon, it will be possible to have information that predicts and correlates some of the other administrative problems faced by public hospitals and healthcare systems. Opportunities for improved predictive modeling extend also to include technology and scheduling problems. As a means of incorporating the data from the various disparate systems, rapid advancements are underway in the area of data warehousing. This allows for the development of predictive analytics projects. Results have been dramatic. As an example, a three-state system was able to reduce ER average wait times by sixty-eight minutes when a project addressed throughput initiatives.

Integrated with new and innovative software systems such as CPOE, opportunities are possible to engage in better predictive modeling with regard to patient care and patient care management. Many of the CPOE systems are facilitating a type of orderless admission ordering wherein specific projects are in place to predict patient care based on previously identified characteristics. Besides administration and patient care predictive modeling, it is further anticipated that primary prevention will also become a priority for public hospitals to remain compliant with evolving healthcare laws. IoT devices are rapidly being integrated within existing EMR systems in hospitals as a predictive indicator to change workflows and processes. Public hospitals and public health information systems currently are showing increased, innovative technology to incorporate the produced data. Several publications are predicting substantially lower operational risk, lower cost, and improved care of inpatients from the devices and large data systems.

### 4.1. Artificial Intelligence and Machine Learning Applications

This new approach is expected to have many applications and effects directly on the MIS in hospitals, especially in public hospitals: Clinical Decision Support Systems: AI and machine learning can have a significant impact on the way healthcare professionals deliver care. Machine learning algorithms improve the system's ability to deliver actionable insights, massively improve early warning systems, and speed up the process. In addition, it made it possible to detect the beginning of the pandemic in a new area, thus giving managers the possibility to predict arrivals in the hospitals and adapt patient management systems and plans. As a result, given its vast dataset, machine learning can help make connections and uncover trends that statistical models and hypotheses could not predict. To this end, the less adaptable algorithms of traditional, rigid clinical systems and their slow rules engines are moving to better dynamic predictive models. In addition

to supporting and speeding up diagnoses and predictions, machine learning can contribute to the development of new treatment plans and models. This new treatment plan will allow the system to easily configure a specific patient's care plan accordingly. Administrative work: AI applications can provide great facilitation for public hospitals in administrative duties. For example, machine learning algorithms improve the precision of patient scheduling protocols, reduce patient waiting times, and find the right balance between patient care and hospital resources. In addition, advanced AI applications can help each hospital area identify and allocate resources as needed and predict quickly changing schedules, patient admissions, and discharges. Challenges and Limitations: Considering the benefits so far, AI can help public hospitals ensure disease prevention, early detection, early and exact diagnosis, rapid treatment, and rehabilitation. It can also provide a significant contribution to hospital management and administration. However, there are some concerns regarding the clinical requirements, public acceptability, and ethical considerations of AI applications for future hospitals. Public hospitals, which are public institutions financed from public resources, can also take action to address these concerns at the policy-making level. Given this opportunity and facility, these advanced technologies must be adopted in public hospitals. It should be noted that these kinds of mobile applications and technologies are already being used by individuals around the world. The changing code of ethics and the approach to public interest is an important starting point for the development of AI and medicine. The general turnover will bring about significant changes to the physical structure of hospitals, and the form will be different as well. With mobile applications, which are already used globally, the first map brings with it global conceptual and infrastructural implications.

### 4.2. Integration with Internet of Things (IoT)

Integration with the Internet of Things (IoT) With a wide acceptance and usage of IoT in healthcare, public hospitals can integrate Management Information Systems (MIS) with IoT to provide better healthcare facilities. The devices are widely used in hospitals to monitor and track the recovery of patients in or out of healthcare institutions. The continuous tracking of patients can provide improved treatment plans between the allowed or specified examination and evaluation of a hospital. Additionally, operations can be further improved by tracking copies of thousands of items in the storerooms, which are only done manually, and therefore checking to detect and mitigate inventory problems. Moreover, the integration can automate information sharing among various stakeholders using radio-frequency identification technology. The concept further reinforces that IoT connections can be used to gather information and make data-driven decisions, especially important in a hospital environment. This also paves the way to provide personalized care and more patient-centric healthcare services, as not just one person team can manage IoT-based systems with artificial intelligence integration.

It also seeks to review and analyze the interconnectedness of organizational roles or individuals to ensure collaborations. For example, healthcare providers often use sensors to enhance remote monitoring and provide continuous care facilities with real-time data transmission, which can significantly reduce the risk of hospitalization. However, integrating IoT into existing health systems can be challenging as well, but it's more achievable than ever before. One of the first

obstacles requires a review of interoperable devices. Since the application of health gadgets in hospitals must also integrate with modern devices that are often equipped in healthcare and serve patients, MIS is a technology initiative that integrates apart from IoT and is specifically presented in hospitals. A critical component of the successful use of audience data is the ability to ensure privacy, security, and innovative utilization to ensure patient information. The utilization of IoT results in hospitals; the application can also vary. Some of the concepts and examples are presented below.

## 5. Conclusion

In a nutshell, the utilization of management information systems in public hospitals is a significant factor in healthcare management, quality, and operations improvement. It has created significant new opportunities; however, with every benefit that MIS can bring to the table, its most significant challenges and limitations revolve around issues of privacy, security, and the quality of the data itself. Accurate, reliable, and timely database support management decisions toward the ultimate purpose of improving patient care. It is important, that is to say, to take maximum benefit from all the components of MIS, and hospitals face and overcome the enumerated challenges. There are some futuristic changes in the field of technology adoption by hospitals, like artificial intelligence, the Internet of Things, mechanization, innovative devices and equipment, including robots in the healthcare unit, which are expected to play a pivotal role in hospital management innovations and improvements in the field of healthcare settings through management information systems. Strategic planning and management commitment, investment of resources, and organizational capabilities development are important to the success of management information system implementation in healthcare settings.

In the successful implementation of MIS, the most important factors are that nurses and hospital medical professionals should be effectively trained and educated, and continuous education and training are required for professionals to use MIS. In conclusion, research and development in technology and health do not stop abruptly, and as a result, in a rapidly emerging field, technological changes that continually alter the traditional managerial operation of the hospital every day require investigation efforts to explore and solve new problems, anticipated drawbacks, and challenges to patients, and collaborations between healthcare professionals and information system experts are required as well.

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