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e-Health System Assessment, Framework, and Overview in Jordan

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ABSTRACT

Background: This overview of the Ministry of Health's governance structure and the Health Information System (HIS) activities covers the current HIS situation. **Purpose:** This study describes the e-HIS in Jordan, whether it is standardized across health facilities, how information is used, and the resources needed for such systems to work efficiently. **Methods:** Accessible electronic reports and publications on the e-HIS in Jordan were reviewed from 2000 to 2022. Data was retrieved from the Ministry of Health of Jordan, the Department of Statistics, the Higher Health Council, and through PubMed, ERIC, and Google Scholar databases. **Results:** e-Health systems must connect hospitals, pharmacies, primary care providers, in-home patients, and administrative entities, such as insurers or the government. However, the standardization of e-Health is inherently complex. The health industry is heavily governed by national authorities. The risk of non-compliance with standards may increase as a result of technological advances. However, there are still unanswered questions regarding whether some of these programs are in competition or conflict and whether healthcare providers will appropriately apply standards. **Conclusion:** To achieve the goals of strengthening the health system, the HIS must, whenever possible, eliminate parallel reporting systems, enable single reporting routes, and ensure that data and analysis feedback are effectively shared. **Implications for Nursing:** This study can provide a launching point for further studies investigating the Health Information System (HIS) in Jordan and shed light on the strengths, weaknesses, and opportunities of effectively employing the Health Information System (HIS) by nurses and other healthcare providers in Jordan.

Keywords: Standardization, e-Health system, Jordan.

What does this paper add?

1. This study is one of the most recent interpretive analyses of e-Health in Jordan. It sheds light on Jordan's health system, electronic patient records in hospitals, and how health policies improve the system.
2. The challenges of the national consensus process for standards as well as the challenges facing Jordan's e-Health sector are analyzed.

Introduction

Electronic health (e-Health) methods have been proven to have enormous potential for expanding the global availability of medical care and health informatics, especially in developing nations (Shaikh et al., 2023). The World Health Organization (WHO) defines e-Health as "the cost-effective and secure use of information and communications technology to assist health and health-related disciplines, such as healthcare services, health surveillance, health publications, and health education, knowledge, and research" (World

Health Organization [WHO], n.d., para. 1). Because of technological advancements in remotely delivered medicine, a variety of medical services may now be offered virtually via audiovisual transmission, including counseling, distant diagnostic imaging, specialized investigations, and even remote procedures. Standardized electronic health records are being developed to facilitate the digital exchange of patient information between the patient's primary care physician and other healthcare professionals. (Rasi-Heikkinen & Airola, 2023). The aggregated, anonymized data produced by these electronic records can potentially improve the quality of medical research (Haverinen et al., 2022). By informing patients about their diseases and accessible therapies, financing innovative research at medical colleges in underprivileged regions, and keeping policymakers informed of the newest developments in the field, e-Health informatics and online medical scholarship enhance healthcare delivery (Papastavrou & Efthymiou, 2023). Lack of global standardization for e-Health and bureaucratic obstacles to technological infrastructure, especially in developing nations, are among the technical barriers limiting the promise of e-Health systems (Nagasubramanian et al., 2020).

Increasing e-Health's technical standards can overcome many of these barriers (Kip et al., 2020). To enable widespread adoption and solve specific privacy, security, and patient identification issues, interoperability amongst healthcare systems is essential; standards provide this, decrease risks associated with new technology progress, and avoid reliance on a single vendor (Stefanicka-Wojtas & Kurpas, 2022).

Health Information System (HIS) is employed for several reasons in Jordan, as in most other nations. The purpose of this study is to describe the health system in Jordan, the availability of electronic patient records in Jordanian hospitals, and how the health policies advance the healthcare system. Moreover, it will discuss some of the difficulties that are associated with the national consensus process that is associated with standards, and highlight the successes that have been made and the primary actors on a national scale. This paper is significant for numerous reasons. Firstly, it is one of the most recent interpretive studies investigating the obstacles to e-Health in Jordan. It also explores the determinants of e-Health development in Jordan and focuses on the challenges facing it. Thirdly, the paper

endeavors to fill a gap in the existing literature by examining the main issues affecting the advancement of e-Health in Jordan.

This paper is a descriptive literature review. We have reviewed the academic literature for articles on the Jordanian healthcare system; we believe that this is the most effective way to provide an overview of that system. This analysis details the Jordanian healthcare system's historical evolution and current structure. A particular emphasis has been given to the public health sector that is operated by the MOH, including the key opportunities and challenges facing it. In addition, Jordan's changing demographics and the economic climate of Jordan are discussed in relation to the Jordanian healthcare system.

Jordan's Geography and Socio-demographics

The general area of Jordan is 89 342 square kilometers, divided into 12 governorates. It is a country with an income in the top middle class (Bank, 2021; Mansur et al., 2019a). The Human Development Index for Jordan in 2018 was 0.723, according to the 2019 Human Development Report (UNDP, 2019), ranking it in the category of high human development and 102 out of 189 nations and territories. There was a 4.5-year rise in Jordan's life expectancy at birth between 1990 and 2018, while the *per capita* gross national income climbed by around 40.6%. The Department of Statistics estimates Jordan's population to be approximately 11 million people (Mansur et al., 2019a).

To determine the dependence ratio, the ratio of the population that is 65 or older is used, peaked at 71% in 2003, decreased to 61.4% in 2019, and is projected to decline steadily to 33% by 2050 (High Health Council, 2016). In 2019, it was estimated that 3.7% of the population were 65 and up. By 2050, this percentage is expected to rise to 10.3% (MoPIC., 2020). After ten years of conflict, about 5,6 million Syrian refugees have sought asylum in Jordan and neighboring countries. Around 1.36 million Syrians have sought refuge in Jordan since 2011, the vast majority settling in host communities across the country, especially in Amman and the northern border regions. Over 18% have opted for life in camps. "The United Nations High Commissioner for Refugees" has registered 670,412 of the 1.36 million Syrian refugees (UNHCR). The number of Syrian refugees in Jordan is predicted to increase by 3% annually (Ghadbian, 2021). Jordan has taken in over two million Palestinians and

around ninety thousand Iraqi refugees. The International Labor Organization estimated that 1.2 million migrants lived in Jordan in 2017. The COVID-19 pandemic has increased the drop in the jobless rate (Khrais et al., 2022). Despite this, reducing poverty in Jordan is a top priority not just as a basic human right, but also as a security and peace challenge, mainly because of the war and the country's instability.

Nonetheless, the percentage of families living below the national poverty line has increased from 14.4% in 2010 to 15.5% in 2017, with approximately one million Jordanians living in poverty. This rises from the previous low point of 14.4% in 2010 (UNICEF, 2020). Like the rest of the world, the COVID-19 epidemic has drastically halted Jordan's economic growth (Aryan & Ahmad, 2022). In the first three quarters of 2020, Jordan's gross domestic product (GDP) fell by 1.5 %. Beginning in August 2020, the increase in instances increased the economic pressures, with a predicted drop in GDP growth, which had significant financial ramifications, resulting in simultaneous contractions of demand and supply. According to recent forecasts, the GDP growth rate declined by 3% in 2020 and the decline reduced 2.5 % in 2021 (Mansur et al., 2019b). This is expected to exacerbate the long-term impact on the Jordanian economy, increasing concerns about poverty and social inclusion. Government employment and salary protection regulations aided in mitigating COVID-19's adverse effects on workers.

The Jordanian Healthcare System: An Overview

The primary sectors of the Jordanian healthcare system are International organizations, charities, the private sector, and the public sector. The public sector includes the Ministry of Health (MoH), the Royal Medical Services (RMS), two educational hospitals affiliated with universities, and the national center for endocrinology, genetics, and diabetes. There are 121 hospitals with 13,732 beds in Jordan. In Jordan, 121 hospitals serve both Jordanian and international patients. There are 71 private hospitals, 33 public hospitals, 15 military hospitals, and two university hospitals. The public hospitals provide most of these beds (67%), and the private hospitals offer the rest. There are about 18 hospital beds for every 10,000 people in Jordan, which is more than the average for the region, but less than the average for the whole world. The present bed rate is judged unsatisfactory given Jordan's recent population

expansion and massive intake of refugees (High Health Council, 2015).

In Jordan, primary care clinics provide prompt access to medical care, vaccines, maternity and childcare, and management of chronic diseases. They may be found in urban and rural regions, and their size and number of clinics vary significantly according to the area and people they serve (UNDP, 2019).

The majority of Jordanians (about 70%) and the majority of the kingdom's people (55%), respectively, had health insurance according to the most recent census (UNDP, 2019). Nonetheless, there is a significant disparity in where insured people live. Over 80% of Jordanians are covered by the public sector, while private insurance, UNRWA or other sources cover the remaining 20%. Public health insurance is available to everyone aged 60 and over and all children younger than six (Ayasrah et al., 2022).

In Jordan, only the private sector provides effective home healthcare. Home care services are not covered by either public or private health insurance in Jordan; hence, most patients cannot afford them (Al-Dweik & Ahmad, 2020). As a result, patients in Jordan are forced to stay in emergency rooms for much longer than is ideal. As the population of Jordan ages, there will be a greater demand for home healthcare and long-term care facilities to reduce the load on emergency rooms and hospitals (Ayasrah et al., 2018).

The United Nations and non-profit humanitarian organizations contribute significantly to healthcare in Jordan. Since 1950, the United Nations Relief and Works Agency (UNRWA) has supplied Palestinian refugees with medical care. UNRWA helps refugees who require hospital treatment by contracting beds at public and private hospitals or partially reimbursing inpatient care expenses (UNRWA, 2016). Over a half of the estimated 2.1 million Palestinian refugees are treated at UNRWA hospitals and clinics yearly.

Over the past many years, the United Nations High Commissioner for Refugees (UNHCR) and the Jordanian Ministry of Health have provided medical care to Syrian refugees living in camps. However, most refugees outside camps do not receive adequate medical care (Murshidi et al., 2013). Until late 2014, the Jordanian Ministry of Health offered free medical care to all Syrian refugees registered with the UNHCR. Due to the severe demand put as a result on the healthcare system, free healthcare became no longer available. The

result is that Syrians outside the camps have the exact out-of-pocket costs as uninsured Jordanians. Although public institutions are heavily subsidized, the cost of education can be prohibitive for many low-income families. Due to the high cost, these households may put off medical care, especially for chronic problems that aren't considered urgent (Doocy et al., 2016).

The Electronic Health System in Use

Jordan has no national electronic health record system, and the healthcare sector operates independently. In Jordanian hospitals, using electronic prescriptions and accessing electronic patient information represent a standard practice. However, the government initiated a project in October 2009 to set up Hakeem, a nationwide e-Health system. The Hakeem program is the product of Jordan's first national effort to computerize the public healthcare system. Hakeem, founded under the patronage of His Majesty King Abdullah II, aims to facilitate efficient, high-quality healthcare in Jordan by implementing an electronic health record system nationally. Inside participating health institutions, doctors, pharmacists, and medical technologists can access patients' electronic medical records *via* Hakeem by inputting the patient's national ID number. Accessible electronic medical records include a thorough medical and surgical history, physical examinations, procedural and surgical reports, current medications, allergies, and clinic visit notes for inpatient and outpatient care. The technology also provides digital radiology tests, electrocardiograms, endoscopic biopsies, ophthalmology evaluations, and films of echocardiograms and angiograms for online viewing (Organization, 2019). Hakeem is built on the VistA system, a large-scale information system used in the U.S. Department of Veterans Affairs medical system. It is used in about 200 facilities. Hakeem's goal is to make the Jordanian healthcare system the best in the country and the region regarding patient care and other outcomes. In Jordan, significant progress is being made toward the widespread use of (EHRs) in healthcare facilities (Jalghoum and Khasawneh, 2016).

Establishing a national electronic medical library in Jordan, often known as the ELM, was a significant government initiative. ELM is dedicated to advancing evidence-based practice and health research in Jordan, enhancing healthcare quality (ELM, 2022). ELM provides free access to current, evidence-based

information for Jordanian healthcare professionals and students. It has a multitude of electronic medical publications, journals, and other resources for which expensive yearly memberships are often required.

Health Policy in Jordan

According to Jordan's Law no. 9 of 1999, the High Health Council (HHC) is responsible for developing the country's healthcare policy. "The Secretary General of the High Health Council, the Director of Royal Medical Services, the President of the Private Hospitals Association, and the President of the Jordanian Medical Association are all members of the HHC. Other members include the Ministers of Finance, Planning and International Cooperation, Social Development, Higher Education and Scientific Research, and Labor (MoH, 2017). In accordance with the HHC's enabling legislation, it is the HHC's job to determine the overall direction of the healthcare system, develop a plan to implement that direction and organize and advance of the healthcare system so that all citizens have access to high-quality medical care that makes use of cutting-edge scientific methods and technologies (MoH, 2017). The HHC made the Jordanian National Strategy for the Health Sector (NSHS) for 2016-2020. It has four main strategic goals that are the results of the health system and show how well the health sector is doing. This strategy looked at human resources which represent one of the six main building blocks of the health system, to find the problems and suggest specific solutions and policy directions (HHC, 2015). The NSHS strategy aligns with the aims of the "National Agenda," "We are all Jordan," Jordan Vision 2025, and its Executive Development Program 2016-2019, as well as other health and health-related sub-sector strategies and plans. In 2015, Jordan launched Jordan Vision 2025, a 10-year plan outlining political and social reform priorities. It emphasized the need for structural reforms to boost private investment, employment growth, school and health system improvement, as well as poverty alleviation (HHC, 2015).

Collaboration with International Organizations

WHO commissioned a review of Jordan's health information system (HIS) in October 2016 at the Ministry of Health's (MoH) request to help the MoH upgrade the HIS. Together with a team of foreign consultants, WHO and the Ministry of Health

conducted the assessment. In agreement with the terms of reference for the evaluation, the report was required to describe the HIS. This description was to include the system's overall structure within the Ministry of Health, the Civil Registration Authority/Ministry of Interior, and externally; "information flow, governance, and quality assurance; infrastructure; data management and standards; dissemination and use of data for policy and planning; an analysis of the system's strengths and weaknesses; and recommendations on how to further develop the system (WHO, 2016:1)". The terms of reference also emphasized how important it is to improve HIS in light of the role that HIS plays in Jordan's National Vision and Strategy for 2025.

Data Update on the Healthcare System

Relying on the precision and integration of the HIS, a thorough monitoring and evaluation strategy must be implemented after each change or intervention to the healthcare system. As far as feasible, the HIS should do away with duplicate reporting mechanisms, make it possible for only one reporting path, and ensure that data and analytical feedback are quickly shared. The Directorate of Information and Studies regularly gathers data about Jordan's public and private healthcare systems from the Ministry of Health. Regarding health services and personnel data, the yearly report compiled by the Ministry of Health's Directorate of Information and Studies is the gold standard (MoH, 2017).

Effectivity of Using the Healthcare System by Healthcare Providers

Most hospital departments utilize computer systems for service administration. There is still a need for HIS-specific training, even though more than a half of the personnel have received computer training (Jabareen et al., 2020). Between 58.0 and 73.6 percent of respondents in a study by Jabareen and colleagues to ascertain the need for health informatics training for health workers reported feeling supported in their institutions' operation of HIS systems. Most doctors and other medical workers (86.0%) noted the need to monitor diagnosis and treatment, including providing patients with access to clinical results. Essential skills also included the ability to effectively use telecare services and technology (75.9%), as well as the ability to use medical records for patients for clinical research (83.4%) and to use shared hospital services (85.6%). (Jabareen et al., 2020).

Jordan's Health Information System: SWOT Analysis

The Ministry of Health held specialized work in collaboration with a non-governmental partner (World Health Organization Office in Jordan) to analyze the internal and external factors, including the enabling environment of relevant legislation and legal frameworks, as well as the opportunities and threats facing Jordan Health Information System using SWOT analysis to improve the current situation. The SWOT analysis identified gaps, challenges, and opportunities that help redefine core issues and identify the strategic direction of the Health Information System. The main results of the SWOT analysis are presented in Table 1.

Table 1. SWOT analysis of Jordan's health information system

Strengths	Weaknesses
➤ It increased administrative assistance for the Health Information System. ➤ A functional Information and Studies Directorate exists within the Ministry of Health. ➤ The system of Hakeem reinforces some public health policies. ➤ Notifiable illnesses surveillance system. ➤ National cancer database. ➤ Center for data storage and retrieval inside the Ministry of Health. ➤ Family planning and reproductive health surveillance. ➤ Nationwide, capacity building is offered. ➤ Access to knowledge management systems.	➤ Not enough material resources. ➤ Insufficient trained and qualified personnel to operate computerized systems. ➤ Nationally, there is an absence of identifying the required information and performance indicators. ➤ Paper-based collection of data. ➤ Delays in healthcare institutions transmitting the required data to the central authorities. ➤ The presence of vertical programs with distinct surveillance requirements and methods impacts the data quality. ➤ The necessity to update electronic information management rules and regulations.

➤ Institutionalizing national health accounts in the National Health Council	➤ Inadequate application of the data.
Opportunities	Threats
➤ Jordan Vision National 2025 Plan for electronic transformation ➤ Programs for quality improvement and accreditation. ➤ Aid to the health sector from foreign agencies and organizations. ➤ Grant for the implementation of e-government. ➤ The King Abdullah II Award for Excellence is presented as a means of inspiration. ➤ Threats' investment in information infrastructure exploitation. ➤ It is possible to support HIS with international standards.	➤ There is pressure to minimize healthcare costs. Opposition to change. ➤ A lack of collaboration between health stakeholders. ➤ Rapid technical progression. ➤ The lack of a full-coverage health insurance plan. ➤ Political and economic threats. ➤ The marketability of sector capabilities. ➤ Local and international investigations yield contradictory outcomes. ➤ Insufficient statistical knowledge among decision-makers.

Implications

This study will expand the knowledge of the Health Information System (HIS) in Jordan and increase nurses' awareness of standardized electronic health records. Moreover, this study can provide a starting point for more research investigating the Health Information System (HIS) in Jordan. Nurse educators can use the valuable data to educate future nurses. In addition, the study explains the benefits and threats of using standardized health records for the healthcare team for improving the care of patients.

Conclusion

Standardization in e-Health has unique challenges. Hospitals, pharmacies, primary care physicians, in-home patients, administrative bodies, health insurers, and government agencies must be linked in e-Health systems. Businesses have their own unique needs when it comes to the technology, data management, and medical equipment they use. The technological difficulty posed by the electronic integration of these entities will be significant. The inherent sensitivity of the material is a second aspect that complicates the landscape of e-Health standards, as it demands a high level of security, quality assurance, and privacy protection. Also, the health industry is heavily controlled by governmental authorities. New technology may increase the danger of non-compliance with specific standards.

In addition, doctors and other healthcare workers may hesitate to try cutting-edge innovations. Many e-Health standardization efforts are already beginning, as was previously mentioned. Nonetheless, there are still

uncertainties surrounding whether some of these programs are in rivalry or conflict, whether healthcare providers will apply standards appropriately, and whether diverse efforts will be compatible. Moreover, e-Health standardization is approached differently in many countries and regions, which might interfere with achieving e-Health standardization efforts and make it harder for device and system makers to implement global adoption strategies. e-Health is unquestionably experiencing a period of fast technical, economic, and social transformation. Innovations in e-Health require international standards spearheaded by industry coalitions or government efforts. Soon, standard digital formats and architectures may ease the interchange of integrated patient information among medical practitioners. Multi-media and messaging standards can continue to enhance remote clinical care, patient monitoring, and diagnostics. They can also minimize the exchange of information and collaboration across many health practitioners and the portability of outcomes, which a patient, for example, may share with a different practitioner in the future. Storing aggregated and anonymized public health data in standard digital forms can aid medical research. In contrast, preserving genetic data can support a more customized approach to patient care.

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Conflict of Interest

No conflict of interest is to be declared by the authors.

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