

Health Informatics Opportunities and Challenges: Preliminary Study in the Cooperation Council for the Arab States of the Gulf

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Abstract: Health informatics can be broadly described as a multidisciplinary field seeking to enhance the utilizations of information and communication technology in manipulating medical data and knowledge in order to increase the quality and safety of the delivery of medical services by healthcare professionals. The countries of the Gulf Cooperation Council, namely Bahrain, Oman, Kuwait, Qatar, the United Arab Emirates and Saudi Arabia, are newcomers in the area of health informatics and are deficient in many areas recognized as necessary in coping with advanced practices in this regard. In order to address the gap in knowledge in terms of the opportunities and challenges facing health informatics in such countries, a qualitative approach has been carried out. For this preliminary study, only three countries have been selected to form as a starting point; these include Bahrain, UAE and SA. In this regards, various related documentation and studies undertaken in these countries have been reviewed, and one key person in the area of health informatics in each country have been interviewed. Main opportunities include the development of sustainable healthcare systems through the utilization of advanced medical technologies, and the control of epidemic diseases and chronic. The key challenges include the interoperability and the lack of coordination and cooperation and authority of regulation; more important are the ethical issues surrounding the privacy and confidentiality of medical information. The results of this preliminary study can be used by authorities in the respective countries to create effective interventions to enhance advanced practices in health informatics.

Keywords. Health informatics, Gulf Cooperation Council, Drivers, Initiatives, Opportunities, Challenges

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Introduction

The pursuit of medical services efficiency has led to significant changes in the management of medical information.¹⁻³ The healthcare sector is the most information-intensive sector, and therefore, it must rely on technologies to overcome the variations between what is possible with modern healthcare and what is actually delivered to patients.⁴ For example, by providing the management of the health sector with timely and accurate information, resources can be allocated more effectively, and epidemic and chronic diseases can be monitored and controlled appropriately.⁵ However, the fragmentation of health information systems in most developing countries aggravates the complexity of managing medical information, which in turn has led to duplications in funding, wasted resources, and a lack of coordination in terms of managerial control between healthcare providers and entities in those countries.⁵⁻⁸ Obtaining meaningful insights into the medical information through the provision of accurate statistics and reports is somewhat limited due to the insufficiency of the data; therefore, producing medical statistics and reports, such as mortality data, concerning the health situation in such developing countries is, in general, a real concern.⁷⁻⁹

The countries of the Gulf Cooperation Council (GCC) are not exempt since they consist of various and fragmented healthcare systems, the quality of care of which varies considerably between their diverse and scattered regions. Health sectors in GCC are also still lagging behind such developed or developing countries in terms of the utilization of advanced health information systems.¹⁰ Recently, owing to the increase in economic wealth, a gradual change has been taking place, with growing recognition by GCC authorities to invest more in the IT systems in health sectors, and to accordingly update the scientific efficiency of national personnel and accordingly encourage them to gain specialist skills in the different health informatics disciplines.¹¹⁻¹²

In this paper, the different drivers and main initiatives undertaken by GCC governments and in particular in Bahrain, the United Arab Emirates (UAE) and Saudi Arabia (SA) towards the development of health informatics are considered. Based on a qualitative approach, the key opportunities and challenges are analyzed and discussed in order to address the gap in knowledge within the current status of health informatics in GCC. In so doing, the remainder of this paper is structured as follows: the next two sections provide a discussion of the main drivers and initiatives undertaken by governments for the development of health informatics in GCC; the research methods are then described, and the key opportunities and challenges to the development of health informatics in GCC are analyzed and examined. The authors conclude by presenting various recommendations for the development of health informatics in GCC and areas for further study.

Main Drivers

GCC countries exhibit many similarities in their social, political and economic characteristics. Owing to the solid nature of the national economy, these GCC countries have demonstrated major improvements over the past 40 years within all fields in terms of socio-economic development. Substantial investments in health sectors have been also made, including building hospitals and clinics, and promoting a more modern approach to tackling infectious diseases. Despite these improvements, the GCC region continues to experience the type of health problems prevalent in high-income cultures

due to the changes of life pattern and style ^[13]. For example, increased population growth, aging, and unique health-risk factors such as diabetes, obesity and hypertension are health problems to which the GCC has had to adapt. As a result, GCC countries are expected to face unprecedented rise in demand for medical services and resources over the next two decades ^[14]. GCC governments need to realign the healthcare systems to be able to treat the disorders of affluence. Amongst other aspects, the utilizations of advanced technologies towards the development of health information infrastructures has been seen as a key solution with the capacity to contribute significantly to addressing delivery problems with regards to the health services.¹⁰ Nevertheless, the bulleted list below summarizes the different issues contributing dramatically to the increase in the importance of health information management systems in GCC countries.

- **Financial issues:** GCC countries allocate almost 10% of their annual budgets to healthcare; GCC governments bear approximately 80% of the costs of health services provided to the citizens. The healthcare authorities seek ways of reducing the expenditure of health services through the optimum utilization of resources and the increased investment in health information systems.¹⁵
- **Decline of quality of care:** the citizens remain unsatisfied with the availability and quality of medical services provided, where medical errors become a threat to their lives. This has led to a loss of trust amongst patients in the healthcare systems. Governmental healthcare providers seem to lack managerial skills and control needed to run healthcare facilities.¹⁰
- **Inequities of medical services:** the inequities between rural and urban regions with regards to medical services, where the most advanced healthcare providers in terms of quality of care are centered in major cities.⁷⁻⁸
- **Lack of manpower:** the shortage of professionals in medical disciplines and related science is considered one of the most important challenges facing the countries of GCC. The high-salary incomes and cash incentives alone have not been adequate in terms of attracting specialists and encouraging citizens to gain specialist skills in the different health and medical fields.^{7-8, 14}
- **Population growth:** the annual population increase in the countries of the GCC is approximately 3%, which is regarded as being one of the highest in the world. As a result, the total GCC population in 2025 is expected to be twice the size of that of today.¹⁴

Main Initiatives

Recently, there has been growing recognition by GCC governments towards the development of robust health information networks and infrastructures to tackle the delivery issues facing medical services. This can be seen in several initiatives and programs that have been launched in this regard. For example, a project named I-Seha has established in Bahrain to promote the national health information system in the country. Part of this project is the national Electronic Health Records (EHR). The EHR aims to provide individual lifetime health information from Birth to Death as well as providing curative and preventive health services (Mother and Child care, student immunization, pre-employment examination) to all Bahraini residents.¹⁶ Similarly, the Ministry of Health (MoH) in UAE has sponsored an eHealth Strategy to provide an

efficient, world class healthcare system that is accessible to all healthcare entities through a mixture of public and private delivery channels.¹⁷ Part of this project is to define the required data terms and dictionaries, standards and specification and to establish a national governance plan for managing healthcare information. One of the main recent initiatives undertaken in this regards is the eClaim project. This project aims to establish a unified standard healthcare language communicated across the country.¹⁸⁻²⁰

In Saudi Arabia, a gradual change has been also taking place. For example, the government allocated 4 Billion Saudi Riyals (1.1 billion USD) towards the development of the national EHR in the next coming years [²¹]. In addition, Different universities have been working in recent times in designing health informatics programs and to update their curriculums in the field of medical education to address the barrier of the lack of national professionals. Saudi Association for Health Informatics (SAHI) was also established in 2005 to promote scientific thinking in the field of health informatics in Saudi Arabia. One of the main initiatives undertaken by SAHI is the Saudi e-Health conference. This was established in 2006, since when it has been held at roughly 2-yearly intervals in the capital, Riyadh.¹⁰

Methods

A qualitative approach has been conducted in this preliminary study to investigate the key opportunities and challenges facing the development for health informatics in GCC countries. This was accomplished through three main qualitative data sources, including the related normative literature undertaken in GCC countries, the formal published documentation, and semi-structured interviews with one expert in the area of health informatics in each country. The number of participants totaled 3 persons, all of whom are representative of such health informatics initiatives in their countries. The goal of this preliminary study is to review through formal published papers the health informatics in GCC countries, and also to develop a strategy roadmap for this big research project with one key person in the area of health informatics in GCC countries. So, the participant must meet three main criteria. First, the participant must be a PhD holder in area of health informatics. Second, he/she have a good CV as a researcher in the area of health informatics. Third, the participant has led at least one national health informatics initiative undertaken in his country.

This would help the researchers to propose some valuable questions to be asked and investigated in the next stages in this research and also important to better drafting the strategic plan and roadmap for this big project. So, the authors acknowledged the participants' role in this preliminary study in leading the authors in the next stages of this project. Three general questions were posed to participants, including the general initiatives taken in their respective country towards the development of health informatics, and the key opportunities and challenges reported therein. A thematic approach was implemented for the analysis of the data. The data were reviewed and analyzed several times by each one of the authors in order to enhance the overall validity and reliability of the results, and to accordingly generate all possible and initial themes. A brainstorming session was facilitated by the authors so as to elicit the key themes generated by the review phase. The initial list of themes was also reported to participants in order to garner feedback. Once the minor comments from participants were addressed, the final list of the main themes of opportunities and challenges in

relation to the development of health informatics in GCC countries was ready to be produced.

Key Opportunities

Through the analysis process of the qualitative data, the authors identified three key opportunities in the context of development for health informatics in GCC countries. These are noted as follows:

- **Sustainable healthcare system:** By reducing health expenditures whilst simultaneously increasing the quality and safety of medical service, blocks can be built towards sustainable health services. One of the major characteristics of a sustainable healthcare system is to promote a patient-centered approach. The healthcare system must be designed and delivered around the needs of patients with full access to the medical services rather than those of NHS institutions. This requires, amongst other things, a robust health information infrastructure in order to capture and transmit medical information at any point of care.
- **Supporting public health initiatives:** Three main areas can be enhanced through the development of health informatics; these are health awareness, medical research, and the control of epidemic and chronic diseases. For example, by capturing the accurate data at the right time and place, health awareness programs and campaigns can be designed and launched effectively and efficiently. The GCC countries still lack the accurate information regarding, for example, the mortality data at certain times, which in turn has led to less effective and credible awareness programs. Accordingly, accurate medical information is needed in order to support medical universities and research centers to conduct research, as well as opportunities to participate in industry and community service programs in the health field. The institutions of health and medical research rely on such information to help to promote exceptional healthcare, the continuous development of diagnostic approaches, methods for the treatment and prevention of diseases, and the control of epidemic and chronic diseases in GCC countries.
- **Enhancing the use of advanced information technology systems:** Information is the first step for the development of best practices in a healthcare environment, fuelling everything concerning patient care. The GCC are hesitant in adopting such certain advanced systems because of the concept of health informatics still being in its infancy. The modern advanced technologies require a robust information infrastructure in order to be implemented successfully. For example, medical information is most likely built based on proprietary format. GCC countries still also lack methods at the level of how data are, for example, predefined, characterized, structured, stored, exchanged, integrated, accessed and governed. Further, there are no clear policies and procedures with regard to how medical services are, for example, managed, operated, structured and provided to patients. Once the important role of health informatics is acknowledged formally, this will push the development process of different advanced systems and projects, such as national shared EHR, national health information network (NHIN),

Telemedicine and e-health. The EHR will support the access of full patient information at any point of care. The NHIN gives way to deduce personal and public health information and provide information to support medical research and awareness programs and the control of epidemic and chronic diseases or for decision-making and performance quality. The applications of different advanced technologies, such as data-mining, business intelligence, knowledge management, and clinical decision support systems will also help in terms of acquiring meaningful insights from the data by carrying out accurate statistical analysis, excluding any human bias.

Key Challenges

Six key challenges to the development of health informatics in GCC countries have been identified through the analysis process of the qualitative data, these are:

- **Interoperability issues:** The problem in GCC countries is that the increased investment of health information systems that are not compatible has led to interoperability issues. Allied with this is the lack of health data standards, which creates further difficulties in regard to transferring and sharing data across systems. At the present time, medical information and clinical notes are generated by many different systems using many different proprietary structure formats. GCC countries are in much need of an authority body to take the lead and accordingly identify and address the interoperability gaps and issues, and to harmonize the development process of standardization for health data.
- **Issues regarding medical information management and ethical and privacy concerns:** The data reveals that GCC countries still lack an official information management roadmap at the level of how data are, for example, predefined, characterized, structured, stored, exchanged, integrated, accessed and governed. Owing to this issue, many concerns are raised, such as the ethical practices with regards to the privacy and confidentiality of patients' information since there is no specific health privacy legislation governing healthcare providers in the countries of the GCC.
- **Shortage of professionals:** This challenge is one of the main factors hindering the development for health informatics in GCC countries. Health informatics is a very complex field necessitating many informed, interdisciplinary and experienced professionals and researchers. GCC countries are newcomers in this area, and the current education and training cannot meet the current manpower demands.
- **Lack of clinicians' engagement:** It has been seen that effective clinical leadership, collaboration, strong communication, and commitment are all essential in developing electronic clinical content in healthcare sectors. The data indicates that there is less interaction amongst clinicians in the countries of the GCC at the level of supporting the development of medical information infrastructures. Such reasons include the fact that clinicians continue to be unaware of the important role of medical information due to a lack of training and awareness programs. In addition, GCC countries still lack adequate policies and procedures that would offer some sort of incentive (and/or inflict

certain punitive measures) to ensure, on a daily basis, the optimal utilization of medical technology and health informatics by clinicians.

- **The complexity of the health ecosystem:** Some GCC countries have a very complex ecosystem comprising several healthcare regulators and funding bodies. This could be ascribed to either the federal system as exemplified in UAE or to a regional system which is the case in SA. In contrast, the small size of Bahrain has created a unique much simpler healthcare system consisting of one main tertiary hospital and 23 primary healthcare centers, and therefore, patient's data and referral can be easily managed.
- **Lack of policies and procedures, and an authority of regulation:** The GCC countries still lack documentation or 'lessons learned', which can enable parties to review the experiences of others with regards to medical IT-adoption and implementation. Every healthcare provider works entirely based on the qualifications of the project team in the implementation process. This has resulted in the loss of a holistic and complementary view of health information systems to achieve leadership in health informatics. There are also substantial variations in the management and provision of medical services between healthcare providers in the countries of the GCC. GCC countries also continue to lack a roadmap of policies and procedures to enable the exchange and interoperability of medical data across the health sectors. Although several government entities and commissions in the countries of the GCC have spoken about the cooperation and coordination between the countries with regards to health informatics, no one has taken the lead to establish an authority of regulation to act as an umbrella to promote the development process of health informatics in GCC countries.

Discussion

The preliminary results indicate different opportunities in regard to the development for health informatics in the countries of the GCC, including enhancing the sustainability of health sectors, the adoption of advanced health information systems and supporting public health initiatives and programs. In previous studies concerning the sustainability of healthcare systems, one major characteristic is the promotion of patient-centered care. However, a better-functioning healthcare system requires, amongst other things, the availability of complete medical information and knowledge at any point and time of care.² In this regard, the adoption of multifunctional health information systems can yield real benefits for nations in terms of aspects such as increased delivery of care based on guidelines, enhanced monitoring and surveillance activities, a reduction in medication errors, decreased rates of potentially redundant or inappropriate care, and reductions in the cost of medical services.²² The interoperable infrastructures were seen to be essential in terms of supporting researchers in the biomedical and clinical fields with large numbers of patients, as well as to provide access to longitudinal clinical information.^{2,23-24} The interoperable information infrastructure is also seen as crucial in enabling integration between a large number of primary and secondary healthcare providers and referred service authorities, and afterwards towards the development of the patient-centric EHR system and NHIN, and the enhancement of clinical-decision support systems' performance.^{2,25}

The preliminary results also indicate different challenges for the development of health informatics in GCC countries, such as interoperability and lack of standards, ethical issues and privacy and confidentiality concerns regarding patients' information, shortage of professionals, a lack of clinical engagement, the lack of policies and procedures, and the lack of an authority of regulation. This conclusion is in line with prior studies concerning developing countries. For example, the uptake of health data standards still remains frustratingly low in developing countries.⁷ Healthcare systems in developing countries vary immensely between regions and geographic areas; this variation results in inequities and uneven development infrastructures, which causes the integration between the fragmented areas and systems to be more complicated.⁵⁻⁶ One main variation can also be seen in the lack of professionals to lead healthcare systems in urban regions.²⁶⁻²⁷ It has been suggested that a national strategy centered on integration across health domains, together with the development of a minimal set of data standards, are important in developing countries in order at least to reduce some of the challenges facing the delivery of medical services in those countries.⁶ The concerns of clinicians, in terms of information governance controls, access to information, and gaining patients' consent, due to either the lack of medical information policy or legal and ethical concerns (privacy and security), were also seen to be the key challenges in the development of electronic health information in most developing countries.^{1,7,26}

Clinicians' engagement in the development process of health informatics is fundamental because the adoption of health information systems involves many levels of interaction and management of both personnel and systems, representing major organizational change in healthcare providers.²⁵ If medical staff were more knowledgeable surrounding the importance of health informatics, there would be fewer advocator obstacles and less user resistance against the new technologies.²⁸ The engagement of clinical expertise in the process of developing electronic health information infrastructure is also crucial because they can help in creating scenarios for the content, and giving them actors, roles and interactions to facilitate medical data capturing and transition.² The government action towards the development process of health informatics is also essential in terms of maximizing interoperability between health information systems and decreasing the risks associated with the development of health information infrastructure.²⁹⁻³⁰ Any interoperability gaps of health information systems are likely to be difficult to identify before progress is made in the development of medical data exchange and a NHIN.² Also important is the review of the curricula of medical colleges to establish a new education system of health informatics and to incorporate such core knowledge and skills relating to the interoperability and interfaces, and health data standards to overcome the shortage of professionals.³¹

Conclusion

The analysis of qualitative data in this preliminary study indicates different opportunities and challenges to the development process for health informatics in the countries of the GCC. The key opportunities include the development of sustainable healthcare systems, supporting public health and initiatives, and enhancing the adoption and use of advanced medical technologies. The core challenges include the interoperability and lack of health data standards, issues regarding medical information management and ethical and privacy concerns, the lack of clinicians' engagement, the shortage of professionals, the complexity of the health ecosystem, the lack of policies

and procedures, and the lack of an authority of regulation. The results also show that there is a need for the existence of an authority body under the Cooperation Council for the Arab States of the Gulf to take the lead and promote the development process for health informatics in the region. It is also important to foster those change management programs deemed necessary for the development process and to encourage expansion in terms of establishing new education programs of health informatics, and to accordingly set policies and procedures centered on tackling issues regarding the ethical and privacy of medical informatics and medical data exchange. However, this study is a part of a big project that aims to map the landscape of the development process of health informatics in the countries of GCC; thus, more in-depth investigation is required to increase the validity and reliability of the results and to contribute effectively to the knowledge in this area whilst providing health authorities with a deeper understanding of the current status of health informatics in the region.

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