

Report

Supporting the Saudi e-health initiative: the Master of Health Informatics programme at KSAU-HS

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دعم المبادرة السعودية للصحة الإلكترونية: برنامج درجة الماجستير في المعلومات الصحية في جامعة الملك سعود للعلوم الصحية

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الخلاصة: أحرز القطاع الصحي في السعودية تقدماً ملحوظاً في العقود الأخيرة حيث تلقت بعض المستشفيات اعترافاً دولياً. إلا أن هذا التقدم لم يصاحبه تقدم في مجال المعلومات الصحية، الضرورية للمستشفيات كي تحقق أهدافها المحددة مثل الارتقاء بجودة الرعاية الصحية، والحد من وقت وتكاليف إيتاء الرعاية الصحية. وفي هذا الورقة العلمية يصف الباحث حالة الصحة الإلكترونية في السعودية، ويستعرض بعض المبادرات الوطنية للصحة الإلكترونية مثل إنشاء البرنامج الجديد لدرجة الماجستير في المعلومات الصحية والجمعية السعودية للمعلومات الصحية. كما ناقش مقترحاً لخطة الصحة الإلكترونية في السعودية.

ABSTRACT The health sector in Saudi Arabia has made significant progress in recent decades with some hospitals receiving international recognition. However, this has not been accompanied by advancements in the field of health informatics, which are necessary for hospitals to achieve certain objectives such as enhancing the quality of health care and reducing the time and cost of health care delivery. In this paper we describe the status of e-health in Saudi Arabia, along with some of the national e-health initiatives such the establishment of a new Master of Health Informatics degree programme and the Saudi Association for Health Informatics. A proposal for an e-health plan in Saudi Arabia is also discussed.

Promotion de l'initiative saoudienne en matière de cybersanté : le programme de master en informatique médicale de la Faculté de médecine de l'université des sciences de la santé Roi Saoud ben Abdelaziz

RÉSUMÉ Le secteur de la santé en Arabie saoudite a fait d'importants progrès au cours des dernières décennies et plusieurs hôpitaux ont acquis une reconnaissance internationale. Pour autant, ces progrès ne se sont pas accompagnés d'avancées dans le domaine de l'informatique médicale, sans lesquelles les hôpitaux ne sauraient atteindre des objectifs tels que l'amélioration de la qualité des soins et la diminution des délais et des coûts de la prestation de soins de santé. Dans cet article, nous décrivons la situation de la cybersanté en Arabie saoudite, ainsi que certaines des initiatives nationales menées dans ce domaine, par exemple la création d'un programme de master en informatique médicale et de la *Saudi Association for Health Informatics* [Association saoudienne d'informatique médicale]. Une proposition de plan pour la cybersanté en Arabie saoudite est également examinée.

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Introduction

The health care industry has become increasingly reliant upon information and communication technology (ICT). This has resulted in a significant technology gap between those professionals entrusted to provide clinical care and those who are in charge of managing the complex information systems required to operate modern health care systems. Such a gap threatens the effective and efficient management of health care information. The need to use ICT in health care has resulted in a new science called health informatics which is a socio-technical discipline concerned with the use of ICT to support the delivery of health care [1]. Health informatics is a broad discipline which includes many subjects such as bio-informatics, electronic patient records, telemedicine and clinical decision-making support [2].

The International Medical Informatics Association (IMIA) has made significant efforts to promote and enhance health informatics education worldwide. IMIA suggested that proper education is essential for health care professionals to meet the increasing demand for health informatics or e-health [3]. Such education would enable health professionals to take full advantage of ICT. A special issue of the *International journal of medical informatics* (volume 73, 2004) was dedicated to health informatics education and comprised papers presented at the 2003 meeting of the IMIA working group on education which was attended by 80 educators from all over the world.

The aim of the current paper is to introduce the status of e-health initiatives in Saudi Arabia, including the new Master of Health Informatics degree programme at King Saud bin Abdulaziz University for Health Sciences (KSAU-HS). The programme was designed following the recommendations presented by IMIA [3]. It was established in 2005 as the first programme in health

informatics in Saudi Arabia. No known programme in health informatics is available in neighbouring countries. This paper also introduces other e-health initiatives in Saudi Arabia, including the establishment of the Saudi Association for Health Informatics (SAHI) which organized the first e-health conference in Riyadh 2006. A proposal for a master e-health plan in Saudi Arabia is presented.

Why e-health?

Over the past 4 decades, Saudi Arabia has spent billions of dollars in improving the quality of its health care and in expanding its scope and coverage in the country. Due to this rapid expansion, the range of health care providers in Saudi Arabia is diverse. While the Ministry of Health provides around 60% of the health care services, the remaining portion is provided by other government bodies such as the National Guard, the Ministry of Defence and Aviation, the Ministry of Interior and university hospitals plus the rapidly growing private sector. This variation in health service providers has led to variations in the way health care facilities are administered and managed, with significant variation in the information systems used.

As a result, patient information records have become scattered in different health care facilities with no one provider having the complete patient record, except in very rare cases where the patient chooses to receive health care from one provider at all times. One additional negative impact of varied health care systems is the great waste of effort and money resulting from treating patients repeatedly for the same health problems in several medical centres. Patients may at times be asked to repeat X-rays and other laboratory tests and may be given different medications which may compromise patient safety.

In the year 2000, the government of Saudi Arabia formed a health reform committee to conduct a comprehensive review of the health care services provided to its citizens. The committee highlighted that a lack of proper health informatics applications was one of the top challenges facing the Saudi health sector, in addition to health services financing, health services management and health service distribution. As a result of the health reform committee's recommendations, a special taskforce was formed in 2002 to develop an information technology (IT) strategic plan for health care in Saudi Arabia. The main objective of the strategic plan was to build a national electronic health record. The highest priority recommendations made by the taskforce were as follows (Figure 1):

- To build cadres specialized in the field of health informatics.
- To establish an association or society for health informatics in Saudi Arabia.
- To establish centres of excellence in health informatics in Saudi Arabia.
- To design the specifications of the electronic health records.
- To expand the telemedicine network in the country.

Health informatics is of particular importance in Saudi Arabia for the following reasons:

- Most hospitals and medical centres in Saudi Arabia still rely on paper records.
- The amount of health information is increasing. However, different health sectors use disparate systems with little interoperability between these systems, thus creating unconnected islands of information.
- Most of the existing information systems are administrative in nature rather than patient-care focused.
- There is a serious lack of people qualified in health informatics in Saudi

Arabia and neighbouring countries which means that many health organizations find it difficult to identify and recruit health informatics professionals. As a consequence, many organizations invest unproductively in ICT.

- Some literature has shown that taking advantage of ICT in health care will have significant economic benefits and will enhance quality and patient safety [4].
- The growth rate of the Saudi population is one of the highest in the world, which dictates the need for proper utilizations of resources. The use of ICT is essential to achieve that objective.

Master of Health Informatics at KSAU-HS

As a result of the e-health needs assessment, KSAU-HS developed a Master of Health Informatics degree in order to provide advanced health informatics education and to prepare health informatics specialists who would be able to participate in research and in the advancement of the health informatics field. The programme provides graduates with the technical, human and practical skills in health informatics to meet the increasing demand on ICT use in health care.

The 2-year programme was designed following the recommendations of the IMIA on education in health and medical informatics [3]. However, the emphasis is on applied health informatics which highlights the need for health informatics specialists to deploy ICT to support health systems.

The programme started in September 2005 with a group of 25 students (16 female and 9 male students). The students came from different education backgrounds, including medicine, health, IT and biomedical engineering, and from different health organizations

such as the National Guard, the Ministry of Defence and Aviation, the Ministry of Interior, university hospitals and private hospitals. Twenty more students were accepted the following year.

About KSAU-HS

KSAU-HS is a newly founded university, established in early 2004, specializing in health sciences. It is housed within King Abdulaziz Medical City of the National Guard Health Affairs, a large health organization which provides modern medical care to National Guard employees and their dependents, as well as to Saudi Arabian nationals. Under the umbrella of the National Guard Health Affairs, there are 4 hospitals and 60 primary and secondary health centres around Saudi Arabia having 2000 inpatient beds in total. The University comprises the Colleges of Medicine, Nursing, Allied Medical Sciences and Public Health and Health Informatics.

IMIA recommendations for health and medical informatics education

The IMIA has made significant efforts to promote and enhance health informatics education worldwide. IMIA has proposed a set of recommendations on education [3], which provide an excellent foundation for health informatics education. They have evolved from 7 conferences organized by the working group for health and medical informatics education. Such recommendations are not only important in providing an education framework but also as a basis for establishing international collaboration

which enables international exchange of standards and teachers.

The IMIA recommendations identified 2 learning objectives:

- Enabling health care professionals to become good IT users.
- Preparing graduates to become health and medical informatics specialists.

The recommendations identified the level of knowledge and skills required for each learning outcome. The knowledge and skills are classified into 3 domains:

- Health informatics.
- Medicine, health, and health services management.
- Informatics, mathematics and biometry.

As per the IMIA recommendations, the Master of Health Informatics degree should be at least 1 year full-time corresponding to at least 60 credits as defined by the European credit transfer system (ECTS [5]) (Table 1).

Programme mission

The mission of the programme is to advance the quality and efficiency of the Saudi health care system through improved information management.

Programme objectives and target students

The programme aims to provide a scientific education that includes theory, specialized knowledge, and practical skills. Graduates should be able to: apply practice-oriented methods and tools

Table 1 Recommended student workload in European credit transfer system (ECTS) for the Master of Health Informatics degree at King Saud bin Abdulaziz University for Health Sciences

Knowledge and skills area	ECTS workload (credit hours)
Health and medical informatics	40
Medicine, health and health systems organization	10
Informatics, computer science, mathematics, and biometry	10
Total ECTS workload	60

from health and medical informatics; and participate in research and in methodological advancement within the field of health and medical informatics.

As per the IMIA recommendations, the master degree programme accepts students with a bachelor degree in health information management, in medicine or health sciences or in computer science.

Programme infrastructure

The programme depends on the following infrastructure: a Centre for Health Informatics and director with strong academic credibility in health informatics; faculty members with a clear vision and philosophy; and effective collaborations with internal and external academic institutions. Some of these will be able to provide part-time teaching, research and project mentoring opportunities.

Programme structure

The Master of Health Informatics is a dedicated full-time 2-year programme. It is organized in modules (courses) consisting of 3 hours of lectures per week, excluding the time spent for exercises, seminars and practicums. It requires a minimum of 14 courses totalling 42 semester credit hours (a credit hour is equivalent to 1-hour lecture per week for a semester of 16 weeks, i.e. 3 semester credit hours may be equivalent to 6 ECTS of course work [5]). The programme of study includes a variety of graduate level foundation and required health informatics courses as well as elective health management courses. The master degree is conferred upon the successful completion of 42-semester credits towards the degree. Students must complete 2 foundation courses (which depend on the student's background); 7 courses from the health informatics knowledge area; 2 courses from the knowledge area of medical, health sciences, and health sys-

tem organization; and 3 courses from informatics knowledge (Table 2).

Students' evaluation of the programme

In order to verify whether KASU-HS succeeded in fulfilling the aims we set in developing the master degree programme, an evaluation was conducted in using a questionnaire survey sent to the first group of graduates of the programme. The 23 graduates who graduated in May 2007 were 15 female students and 8 male students. The questionnaire was returned by 22 students, a response rate of 96%.

The evaluation was concerned with student's personal opinions of the Master programme. Students were asked about their opinion about the overall programme, faculty and staff, topics and knowledge, teaching environment, library, student group coherence, educational tools, interrelation of subjects and the significance of the programme to government and private health sectors. A rating scale of 1–5 was used from: (1) totally disagree to (5) totally agree. Table 3 shows the students' mean scores. The students were satisfied with the outcomes of the programme in general, and believed that the programme was important for both government and private health sectors. The students

Table 2 Master of Health Informatics degree at King Saud bin Abdulaziz University for Health Sciences: structure of courses (each course is 3 semester credit hours)

Study core areas and course titles
Required foundation courses (6 credit hours) <i>Students are required to complete 2 courses from the following:</i>
Foundation of medicine & medical terminology ^a
Introduction to information technology ^b
Statistical analysis
Health informatics courses (21 credit hours) <i>Students are required to complete the following 6 courses:</i>
Introduction to health informatics
Health information systems
Electronic health records & standards
Legal, ethical, and social aspects of health informatics
Decision support in health care & knowledge management
Health informatics project
<i>Students are required to select 1 course from the following:</i>
Topics in health informatics
Directed study in health informatics
Health sciences courses (6 credit hours) <i>Students are required to take research methodologies and select 1 course from the other courses:</i>
Research methodologies in health care
Health services administration
International health systems
Financial management of health organization
Organizational behaviour in health care
Informatics courses (9 credit hours) <i>Students are required to complete the following 3 courses:</i>
Web technology
Database design & management
Information technology project management in health care

^aRequired course for students from non-health sciences background.

^bRequired course for students from non-information technology background.

Table 3 Students' opinions of the first Master of Health Informatics degree programme at King Saud bin Abdulaziz University for Health Sciences (n = 22)

Question	Mean score	SD
Programme met student's expectation	3.73	0.85
I would recommend the programme to others	4.32	0.64
My colleagues from other fields appreciated health informatics	4.09	0.75
My employer appreciated health informatics	3.95	1.00
Satisfied with the programme staff and faculty	4.04	0.65
Satisfied with topics and knowledge covered in the programme	4.23	0.67
Satisfied with library	3.09	1.11
Satisfied with the group (students coherence)	4.59	0.50
Found the educational tools useful	4.27	0.80
Satisfied with interrelations between subjects	4.18	0.59
I think the programme is significant to the public health sector	4.64	0.65
I think the programme is significant to the private health sector	4.45	0.86
Attained more insight about health informatics	4.90	0.29

SD= standard deviation.

had some concerns regarding the quality of reading materials in the library.

We recommend an evaluation of the future performance of these graduates based on the set of skills and knowledge as suggested by IMIA. We suggest conducting a formal interview with the employers of these graduates to ask them about the changes that have taken place in the skills, knowledge and attitudes of these graduates as a result of their

2-year study programme. If employers, paymasters and possibly peers and colleagues can identify areas of change and improvement in the course, it would be a successful exercise. Another suggestion is to plan a follow-up study with these graduates about career development and change, continuous education, regular meetings and formation of a community of practice and research on their performance.

Saudi Association for Health Informatics

As per the recommendation of the taskforce formed in 2002 (Figure 1), SAHI was established in 2005 under the direct supervision of KSAU-HS. SAHI aims to develop and promote health informatics knowledge by organizing scientific and professional conferences, seminars, workshops and exhibitions. SAHI also aims to provide a forum for the exchange of ideas and experience in health informatics among its members.

One of the most important activities of SAHI is the Saudi e-health conference which was held over 2 days in 2006 in Riyadh, Saudi Arabia. The main topics addressed in the conference were: hospital information systems; picture archiving and communications systems; enterprise resource planning for health care; emerging technologies in health care; and telemedicine and medical e-learning. The main recommendation of the conference emphasized the importance of building a national e-health strategy for the country.

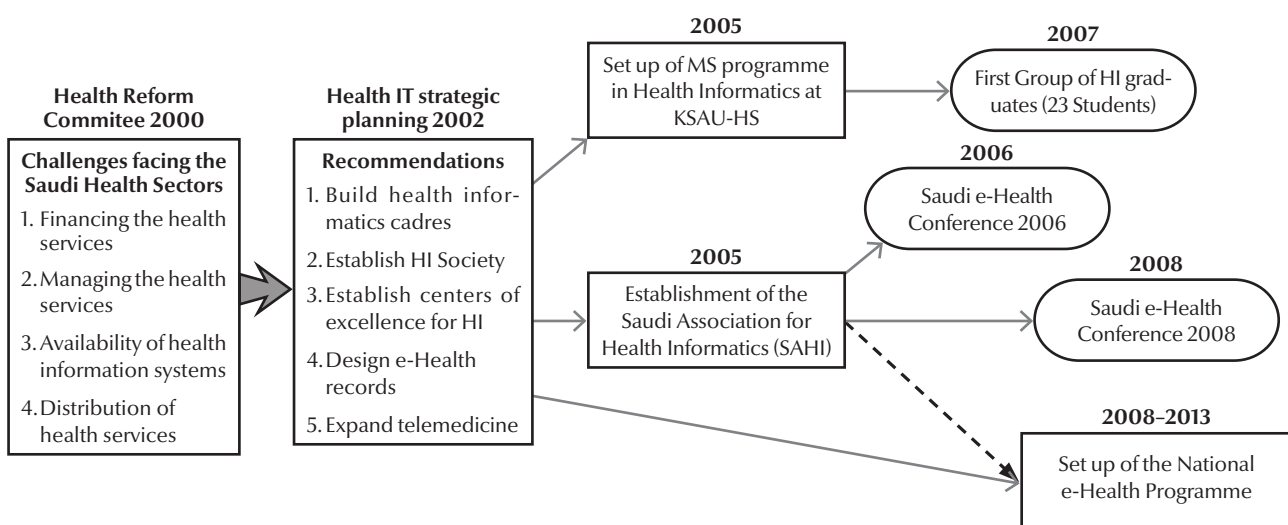


Figure 1 e-health initiatives in Saudi Arabia

Proposed project for e-health in Saudi Arabia

In order to achieve the main recommendation of the Saudi e-health conference in 2006, a new proposal for a master plan for e-health in Saudi Arabia is proposed.

Problem statement

Most health systems are still paper-based, and those that are electronic have poor capability to share information. Hence, communication with the wider health information environment is severely limited, which fragments patient information and results in duplication of procedures and data entry. The lack of integration also has a negative impact on health service planning.

The e-health programme objectives

The main goal of the e-health programme is to develop an e-health strategy for Saudi Arabia which, through better use of ICT, aims to:

- Increase the efficiency and effectiveness of health organizations.
- Help provide better patient care that is continuous, integrated, closer to patient homes and well coordinated.
- Increase the return on investment of health assets and resources.
- Reduce duplicate records.

Project stakeholders

- The Health Services Council: the project sponsor, who will authorize the setting up of the project, secure the necessary funds required and manage the progress of the project.
- Citizens: the main beneficiaries of implementing e-health initiatives.
- The Ministry of Finance: to fund the project.
- The e-government programme: to support the e-health initiatives and recognize this project as an important initiative in e-services.
- Telecommunication companies: to provide the major networking infrastructure that can only be done by major telecommunication companies.
- Major IT companies: to provide the IT infrastructure.
- IT departments in hospitals.
- The SAHI.

Scope of work

The proposed project has 2 main phases:

Phase I: Development of the required strategy, plans, policies, procedures, standards, design and training materials. This phase has a number of sub-phases and sub-tracks as well. The detailed action plan spans 5 years (2008–13) and includes, at least, the following components:

- The Saudi e-health vision.

- The specific goals and priorities for the coming 5 years.
- The e-health projects that must be implemented within the coming 5 years.
- Estimation of the budget required for implementing the proposed detailed action plan.

Phase II: Provide project management services. The services of this phase will start after completion of phase I.

Health organizations need to suggest the team structure, team members and expertise required for these activities. This team must work on a full-time basis.

Conclusion

There are already some initiatives with regard to e-health in Saudi Arabia, such as the establishment of a new Master of Health Informatics degree programme and of the SAHI. Moreover, an e-health conference was organized in 2006 to address e-health topics. The conference presented some recommendations to promote e-health in Saudi Arabia. However the e-health movement is still very slow.

The proposal definition for e-health in Saudi Arabia starts with strategic planning which should tie the projects and programmes resulting from the plan to the national strategies of the country.

References

1. Hovenga EJ. Globalisation of health and medical informatics education—what are the issues? *International journal of medical informatics*, 2004, 73:101–9.
2. *The IMIA vision*. International Medical Informatics Association [website] (<http://www.imia.org>, accessed 14 May 2009).
3. International Medical Informatics Association, Working Group 1: Health and Medical Informatics Education. Recommendations of the International Medical Informatics Association (IMIA) on Education in Health and Medical Informatics. *Methods of information in medicine*, 2000, 39:267–77.
4. Rigby M. Protecting the patient by promoting end-user competence in health informatics systems—moves towards a generic health computer user “driving license”. *International journal of medical informatics*, 2004, 73:151–6.
5. *European Credit Transfer and Accumulation System (ECTS)*. European Commission [website] (http://ec.europa.eu/education/programmes/socrates/ects/index_en.html, accessed 14 May 2009).