

Technical and Human Challenges of Implementing Hospital Information Systems in Saudi Arabia

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Abstract. Hospital information systems (HIS) have been in use for decades worldwide and for many years now in the area of the Middle East. Many hospitals in Saudi Arabia started to adopt HIS, where this adoption process is still facing challenges from different aspects. On top of these come the technical and the human challenges which might complicate the implementation of HIS as well as the training of healthcare professionals on using such systems. The main objective of this study was to identify, analyze and evaluate technical and human challenges perceived by healthcare professionals to the adoption of HIS in order to provide system implementers with suggestions on proper actions. The study used a questionnaire to collect data from a random sample of different healthcare professionals at two Saudi hospitals known for their experience implementing HIS; one private and the other is governmental, and then analyzed the results to identify, describe and evaluate various challenges. The study identified more than 50 challenges; 18 technical and 17 human challenges were validated and selected then used in the questionnaire to collect data about the participants' experiences regarding each item of these challenges. The study sorted challenges from the most to the least important. The governmental hospital users had more complains and concerns than the private hospital regarding the human challenges, related to awareness, training and usability of systems as well as the technical challenges, related to hardware and software of HIS. The study recommended increasing the awareness, training resources and adding hospital information system training to the undergraduate and postgraduate medical and nursing education. The study also recommended improving the condition of hardware and software used through more frequent updating of the devices, computers and their installed systems in addition to enhancing the usability of systems through different approaches.

Keywords. Hospital Information Systems, Technical Challenges, Human Challenges, Saudi Arabia, Hospitals.

1. Introduction

Hospital information systems are currently considered a major part of the healthcare system, on which the processes of care delivery - in hospitals and different types of healthcare organizations - depend [1]. The importance of these systems emerges from the importance of their role in managing all patient data and information including key personal data about the patient and other comprehensive medical data;

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documenting all medical services that have been provided to the patient such as investigations, diagnoses, treatments, follow up reports and important medical decisions [2]. Despite all the described advantages and potential benefits, the implementation of hospital information systems in most developing countries is still facing many challenges and barriers that are completely different than challenges faced in developed countries [3]. Despite the evidence that hospital information systems can improve quality, safety and reduce costs; implementation of hospital information systems in developing countries is still not as successful as planned [4]. The level and extent of usage of hospital information systems in Saudi Arabia is still poor and far less than expected [5, 6]. The delay in adopting and implementing hospital information systems in Saudi Arabia hospitals in addition to the lack of a national health information system actually represents a major challenge for the whole Saudi health care system [7] and despite the potential benefits that hospital information systems offer to the healthcare industry, the failure rates in health IT-related projects are extremely high in Saudi Arabia [8]. Together, these factors were the main motivation for conducting a research study that addresses the challenges in implementing hospital information systems in Saudi Arabia.

Many published studies considered even highly regarded, industry-leading hospital information systems implemented in Saudi Arabia and different world countries to be challenging to use because of the multiplicity of screens, options, and navigational aids. Problems with hospital information systems usability – especially when physicians have inadequate computer skills as the case in Saudi Arabia and many other developing countries – caused physicians to spend extra work time to learn effective ways to use the hospital information systems [5,9]. These substantial initial time costs are considered an important barrier to obtaining benefits, as greater burdens on physicians' time decrease their use of hospital information systems and increase their resistance, which lowers the potential for achieving quality improvement [10].

Although vendors in Saudi Arabia are slowly improving hospital information systems usability, most vendor analysis studies doubted that any newly innovated technology, such as voice recognition, tablet computers, or mobile hand-held devices, will dramatically simplify hospital information systems usage. Designing user friendly software for information and knowledge professionals is a challenge that spans the software industry beyond health care [11]. Inadequate electronic data exchange and weak integration between different Saudi hospital information systems modules and between hospital information systems and other electronic systems were defined as another barrier to hospital information systems implementation and use, such as the lack of integration between the hospital information systems and other clinical data systems as lab, radiology or referral systems. Working with both electronic and paper based systems in parallel, usually forces healthcare professionals to switch during their work tasks between these systems, thereby slowing workflow, requiring more time to manually enter data from external systems, and increasing healthcare professionals' resistance to hospital information systems use [12].

Saudi hospital information systems usually need a lot of difficult complementary changes and support during the process of customization and final tuning. Hospital information systems hardware and software cannot simply be used "out of the box". Instead, physicians and other healthcare professionals must carry out many complex and time consuming activities to customize, adjust and complement the hospital information systems product before being able to generate benefits from this new technology [13]. Hospital information systems need a lot of technical support from the

various software, hardware, networking, and service vendors when technical problems appear, such as poor user software interfaces, slow computer machines or networks or difficult data entry and retrieval especially when the hardware is old. Moreover, physicians had to redesign their workflow (how they worked in the exam room) and office workflow (who did what tasks; such as data entry). As a general rule, larger hospitals could implement complementary changes and request better support from vendors more easily than smaller hospitals because they tend to have stronger organizational resources such as management experience with past process changes, financial resources, leadership, and information systems support staff [14].

Active research on hospital information systems development and implementation in Saudi Arabia and in many developing countries has been trying to explain the delay or unsuccessful implementation of such systems and link this problem to the acceptance or resistance of healthcare professionals' towards these systems [15]. The effect of information technology knowledge, experience and skills of healthcare professionals, current status and level of automation in hospitals, and professionals' attitudes, in terms of their positive or negative beliefs about computerized systems and information systems in the healthcare environment are considered among the major human challenges to the successful implementation and use of such systems. This is why planned training of healthcare professionals is needed to foster positive attitudes about hospital information systems, and build confidence in the benefits of these systems [16].

Strategies for the successful management of hospital information systems implementation should include engaging physicians and other healthcare professionals and providing strong organizational support to them before and during the implementation activities. These two factors could eliminate major resistance and negative attitudes frequently reported and in the same time increase level of acceptance of hospital information systems by physicians and healthcare professionals [17].

Saudi studies also reported that physicians using hospital information systems spent more time per patient for a period of months after successful systems' implementation [18]. The increased time and effort consumed resulted in longer workdays or fewer patients seen, or both, especially during that initial period of hospital information systems implementation. This is adding more work load, decreasing productivity and slowing down performance [19]. Hospital information systems use could be encouraged through financial rewards for quality improvement and for achievement of quality performance. Yet few studies reported any financial incentives for quality improvement or achievement of quality performance [10].

Effective physician-patient communication and interaction is associated with improved health outcomes, treatment adherence and patient satisfaction. Some studies tried to measure the quality of verbal and nonverbal physician-patient communication during hospital information systems based consultation visits. One study measured the level of keyboarding, doctor's computer screen gaze, and doctor's eye contact with patient and doctor's body lean. Researchers concluded that hospital information systems use during office visits adds to the complexity of the physician-patient interaction and might negatively affect patient-centered communication. Consequently, hospital information systems use can undermine patient-centered care and result in poor patient and physician satisfaction [20].

While the majority of research focus is related to the enhancement and modernization of electronic medical records in developed countries which already have gone long path into implementing hospital information systems, many developing

countries are still progressing from paper-based systems to electronic systems. The requirements and challenges of their hospital information systems are totally different from those of the developed world [21]. The developing world faces a series of health crises that threaten the lives of millions of people, where lack of technical infrastructure and trained, experienced healthcare professional staffs are considered important challenges to scaling up treatment for diseases and improve healthcare, this is why it is very crucial to identify and manage such challenges according to their priorities [22].

The main objective of this study is to identify, analyze and evaluate the most important technical and human challenges perceived by healthcare professionals to the successful adoption of hospital information systems in Saudi Arabia and in developing countries generally in order to provide system implementers and policy makers with suggestions on proper plans and actions to overcome implementation problems.

2. Research Methodologies

2.1. Developing the Research Questionnaire

This research study depended on the use of survey methods, through the development and application of a questionnaire to collect data and information directly from different categories of healthcare professionals including doctors, nurses, technicians and administrative staff of Saudi hospitals, mainly two selected hospitals as mentioned above; one private and the other one is governmental and then analyze the results of these answered questionnaires using the statistical analysis functions of the SPSS software to determine the statistical relevance of the various factors mentioned with the challenges of the implementation of hospital information systems and determine the order and rank of these challenges.

The research questionnaire was designed to include four sections of questions. The first section was about the participant, with some demographic information so as to discover any possible relation of these factors to the experience about technical and human challenges of implementing hospital information systems. The second section was designed to collect some data about the type and extent of the implemented hospital information system. The third section of the questionnaire was designed to collect data about the technical challenges – related to the information technology and computer's hardware and software – that might contribute to the delay or unsuccessful implementation of hospital information systems – such as poor interfaces or usability, difficult data entry or retrieval, insufficient hardware in terms of numbers or old and slow machines in addition to lack of support and training [23]. The fourth section of the questionnaire was designed to collect data about the human challenges.

It is common for user resistance to challenge implementation efforts. Enhancing the acceptance of hospital information systems is necessary to get the benefits of medical error reduction, improved quality of care, and decreased healthcare costs. Physician satisfaction and increased usability can increase the chances of success for hospital information systems implementation [24]. Human factors includes; awareness of the importance and benefits of using HIS, knowledge and experience of using computer applications in general and HIS specifically, beliefs and impressions about HIS and the ability to use them. In one study, researchers could identify three main human challenges facing the adoption of hospital information systems which include shortage of health professional faculty who are familiar with hospital information

systems and related technologies, shortage of health informatics specialists who can implement these technologies, and poor acceptance of hospital information systems software [25]. The nature of the healthcare professions could also contribute to the delay or unsuccessful implementation of hospital information systems. The lack of time allowed learning and training on using hospital information systems is one of the major problems, this is why educating healthcare professionals about hospital information systems could help a lot in removing the barriers to adoption [25]. The lack of motivation, lack of healthcare professionals' support also is a problem. Studies show that hospital information systems adds more work, needs more time and effort, they may slow down work or decrease productivity in other times, may also add more responsibilities [26].

2.2. Research Population and Research Sample

The research study population included four categories of healthcare professionals; physicians, nurses, technicians and administrators, who are working in two of the major Saudi hospitals and are in contact with some type of hospital information systems fully or partially implemented in their hospitals and departments. For the purpose of studying this large population, a representative sample was planned; a group of participating healthcare professionals were recruited to answer the questionnaire. The researcher selected these two hospitals based on their history in developing and implementing hospital information systems.

The researcher approached the hospitals selected for the study through formal channels, meeting with seniors in the hospitals' management, to get the approval for accessing and contacting healthcare professionals at the hospital during their working hours. Research ethics forms and related committees were consulted for their consents and the researcher got their approval before starting data collection.

The challenge was in the process of selecting and recruiting healthcare professionals as participants in the study. The researcher started with studying the two hospitals in terms of working staff and decided to take participation from the major four categories of professionals; doctors, nurses, technicians as well as administrators. The researcher aimed to include 5% of the professionals' population in the two hospitals as a sample for the research. The researcher used systemic random methods for the selection of participating healthcare professionals. The researcher tried to make sure that each category of professionals is proportionally represented in the sample of the study.

2.3. Data Collection Process

A pilot study was conducted using the preliminary research questionnaire on a limited number of different healthcare professionals, from both hospitals, to get their feedback on the questions used and to help the researcher in developing better formulae for the questions and clearer sentences, eliminate irrelevant or repeated questions and rearrange some questions to fit better in the sequence. The final questionnaire was used to collect data directly from the selected healthcare professionals. The questionnaire was administrated in two versions; English and Arabic. Study data were collected over six months; from March, 2012 to September 2012 and included 153 valid responses from both hospitals. The whole study was completed and results reported by the end of October 2012.

3. Research Results

The researcher used the SPSS software to conduct a multi-level statistical analysis and started by calculating the reliability coefficient for the eighteen technical challenges and the seventeen human challenges before conducting more descriptive or inferential statistical analysis. A very high Cronbach's Alpha coefficient (0.924) for technical challenges and (0.853) for human challenges resulted from this reliability testing, which was a good sign for the reliability of the results.

Descriptive statistics were conducted and reported for the general variables, these are the demographic data of the study participants, as well as for the data about the implemented health information system in the hospital. Technical and human challenges data were also analyzed using both descriptive as well as inferential statistics to detect the possible relations or associations between demographic data as well as data on hospital information systems implemented with different technical and human challenges perceived by different healthcare professionals. Frequency analysis for technical and human barriers sorted them according to the answers of the participants from the most important to the least.

Both males and females were equally represented in the research sample and respondents, the study had nearly the same percentage for both of them and this is a good sign for the participation of females in the healthcare field in a country such as Saudi Arabia. This is not unexpected, because the healthcare field in general is one of the most mature business fields in Saudi Arabia and it is very balanced in terms of hiring males and females with no gender discrimination which is consistent and proved by the results of a local research study [7].

Table 1. Gender Distribution of Respondents

Value	Frequency	Percentage
Male	75	49.0
Female	78	51.0
Total	153	100.0

Regarding the age groups with the most participation, most of the participants (about 85%) were from the two middle groups, between 26 and 50 years of age and this is also expected, because people who are younger than 25 years and those who are older than 50 years are already less in the healthcare field in Saudi Arabia. Another point is that people over 50 years might have less interest in research participation, especially when it comes to sophisticated information technology.

Table 2. Age Group Distribution of Respondents

Value	Frequency	Percentage
Less than 25 years	11	7.2
26 - 35 years	68	44.4
36 - 50 years	62	40.5
Over 50 years	12	7.8
Total	153	100.0

Regarding qualification of participants, and as a general concept, most of the healthcare professionals are either college graduates or post graduate qualified with Masters and PhD degrees; this is why these two categories were the largest among the participants. While total years of experience varied.

Table 3. Qualifications Distribution of Respondents

Value	Frequency	Percentage
Higher education	75	49.0
College degree	71	46.4
Associate degree	4	2.6
High school	3	2.0

Regarding the profession distribution, it was expected that nurses would be the largest group participating in the research because, by nature, they are the largest working force in hospitals, but it seems that they were always busy and overloaded with much work tasks, so they simply have limited time to spend participating in such research as long as it is a voluntary participation. Doctors were more responsive and they took the largest portion of participation, this could be explained by the physicians nature of resistance, such as conclusions presented by some researchers in their study about barriers to the acceptance of electronic medical records by physicians [27].

Table 4. Profession Distribution of Respondents

Value	Frequency	Percentage
Doctor staff	93	60.8
Nursing staff	12	7.8
Technician Staff	27	17.6
Employee/Administrator	21	13.7
Total	153	100.0

There were twice as many participants from the private hospital as from the government hospital. Private hospitals working healthcare professionals might be more motivated to participate in healthcare research. They feel that their voice is heard and that they can change things around them easily. In Saudi Arabia, and in most Middle East countries, the private healthcare section is usually more advanced than the government, except for the very specialized or independent government hospitals. Private hospitals and healthcare organizations are selecting professionals usually in a more effective way and despite professionals are working for longer hours and with bigger load of tasks, they are still more motivated by the competitive nature of work. These assumptions and explanations are still consistent with a local research study [7].

Regarding the extent of implementing HIS in hospitals, 40% of participants said they are working on a fully implemented HIS system and 60% reported that they are working on a partially implemented system. These figures are very similar to what has been reported by one local study in Saudi Arabia [6], describing the Saudi healthcare sector, which witnessed significant progress in the recent decades without equivalent advancement of the electronic health field. A noticeable fact is that 100% of the participants are already using HIS and most of them are using the systems in all or most of their job tasks. This clears out the generally good experience of most of the participants in using hospital information systems and consequently their ability to judge and evaluate the challenges of implementing and using such systems.

75% of the participants already used hospital information systems even before they joined their current job, and only 25% of the research participants were using the hospital information systems for the first time at their current job. But maybe some of them have been here in the current job for years, so they still have good experience. The most commonly used IT tools were communication, email & voice mail in

addition to the hospital information system's applications. This is also similar to the findings of the referred study [6].

Table 5. Technical challenges sorted from the most to the least, according to participants' experience

Item	Mean	Opinion
There are no manuals or guidelines for using HIS	4.08	Agree
Computers and networks have a lot of maintenance problems	4.01	Agree
Communication networks are slow	3.95	Agree
The computer terminals are slow	3.94	Agree
HIS modules are not fully integrated	3.93	Agree
HIS are not satisfying different users' needs	3.80	Agree
The main difficulty with HIS is data entry	3.77	Agree
Communication networks are old	3.70	Agree
The computer terminals are old	3.65	Agree
There are not enough computer terminals	3.63	Agree
The system's interface design is not user friendly/understandable	3.61	Agree
There is no maintenance/technical support for hardware/software	3.53	Agree
There are no standards for data entry and/or retrieval	3.50	Agree
The main difficulty with HIS is data retrieval	3.38	Neutral
The user interface language is difficult or not clear	3.29	Neutral
It is difficult to train users to use HIS	3.28	Neutral
HIS are difficult to use because they are very complicated	3.22	Neutral
HIS are difficult to access	2.50	Disagree

Table 6. Human challenges sorted from the most to the least, according to participants' experience

Item	Mean	Opinion
Lack of awareness of the importance and benefits of using HIS	4.11	Agree
Lack of knowledge of using HIS	4.09	Agree
Lack of healthcare professionals' support to HIS	4.08	Agree
Lack of experience using HIS	4.07	Agree
Lack of motivation to learn and train on using HIS	4.06	Agree
Lack of time allowed to learn and train on using HIS	4.00	Agree
HIS add more professional responsibilities	3.98	Agree
Low numbers of health informatics specialists	3.88	Agree
Lack of experience of computer applications	3.85	Agree
HIS add more work/need more time/effort	3.50	Agree
Negative beliefs about their ability to use HIS	3.42	Agree
Negative beliefs and impressions about HIS	3.35	Neutral
HIS decrease interaction between doctors and patients	3.34	Neutral
Using HIS creates legal problems for users	3.12	Neutral
Using HIS creates administrative problems for users	3.07	Neutral
Using HIS creates clinical problems for users	2.98	Neutral
HIS slow down work/decreases productivity	2.91	Neutral

The analysis of the challenges shows the ranking of these challenges according to their importance from the perspective and experience of the healthcare professionals. This part of the analysis should help hospital information systems' developers and implementers to address important challenges first, which would support successful implementation of such systems in Saudi Arabia and other developing countries.

4. Discussion and Conclusions

In the analysis of the technical challenges, participants confirmed that computer hardware and software needed maintenance and upgrade because of being old and slow, but they disagreed regarding information accessibility difficulty. In our study, the slowness of systems in addition to hardware and software recurrent maintenance problems came on top of the technical challenges which is very similar to the findings of other research work published in 2004 which found that systems response time is the parameter most highly valued by clinical users, where healthcare professionals do not consider suffering of slow or old systems as a part of their job, they don't care as much about beautiful screen design, features, advice, warnings, or alerts [28]. Since hospital information systems are high technology systems and include complex hardware and software, a certain level of computer skills is required for users. There are still some technical problems with hospital information systems, which lead to complaints from users, and they need to be improved. These technical challenges that existed are related to the technical issues of the systems, the technical capabilities of the users and of the suppliers. This is very much consistent with many published researches [27]

Participants agreed that many human challenges are facing implementation of hospital information systems. Our study identified knowledge, experience, motivation and training of healthcare professionals on using hospital information systems as main challenges while other comparable studies identified the lack of human resource development in the context of systems use and the problem of convincing individuals to accept new technologies as major challenges [29]. One similar study about implementation difficulties of hospital information systems showed that the potential sources of difficulties were related to poor integration of different systems, inconsistency among different workflows of different departments and training issues whereas there was no major implementation problem related to hardware or software support [30]. The importance of training healthcare professionals on using hospital information systems and its direct impact on the success of systems implementation has been focused in many research works [31, 32]

The lack of health informatics specialists and the lack of experienced healthcare professionals in computer applications were among the human challenges highlighted by our study and are consistent with the results published by other research work [25] which, as mentioned above, could identify three major human challenges facing the adoption of hospital information systems, including shortage of health professional faculty who are familiar with hospital information systems and related technologies, shortage of health informatics specialists who can implement these technologies, and poor acceptance of hospital information systems software. In addition time constraints and lack of motivation of users were also reported. The physicians use, attitude and challenges facing implementing hospital information systems in Saudi Arabia were discussed in some earlier research work and physicians experiences reported were very similar to our study results [18].

Some research focused on the organizational challenges of implementing hospital information systems, considering this project as a transformation or a change management project, where the hospital policies and procedures play an important role in the success of systems implementation [33]. Another study focusing on the determinants of hospital information systems successful adoption used a completely different set of challenges; the researchers associated the successful implementation of systems to environmental uncertainty, type of system affiliation, size, and urban-ness

of hospitals and considered hospital information systems adoption an organizational survival strategy for hospitals to improve quality and efficiency. [34]

When we come to the analysis of differences and associations, through the section of the inferential statistics, we find that female participants considered technical challenges more important than human challenges, compared to male participants. When we compare responses from participants in the private hospital to their peers of participants in the government hospitals we also find many differences that have statistical significance. Government hospital participants complained of time constraints and work overload that prevent them from learning how to use the hospital information systems, in addition to the problem of old, slow and few in number computer machines and outdated software which were not reported the same level from the private hospital participants. In some studies conducted on government hospitals, study participants felt that the existing hospital information systems was old which resulted in longer time for OPD consultation and delay in investigation results [35].

Previous experience with HIS could also make a difference in the opinions of the participants. Participants with previous hospital information systems experience could identify negative beliefs and impressions about hospital information systems as a challenge, since they do find such wrong beliefs very influential in learning and using hospital information systems [36]. They complained that using hospital information systems adds more work and needs more time and effort and might sometimes slow down work and decreases productivity. This might be due to their negative experience with legacy systems, outdated software solutions and old computer machines. They also identified that HIS usually do not satisfy different users' needs, which would necessitate that system designers take this into consideration.

The age factor could affect the participants' opinion regarding the allowed time for training and learning. Some younger participants believe that computer terminals are old and slow while older participants feel that machines are fine. In one study, which confirmed similar results, researchers found that younger clinicians reported different attitudes than senior clinicians, but this might be related more to age and previous experience with computers [37]. Another study confirmed that younger physicians tended to consider using computer systems easy when compared to older physicians, since these young physicians use computers more frequently and are more used to access the Internet [9]. The profession nature of the participants, being doctors, nurses or technicians could affect their opinions about many technical factors. Qualification factor of participants could also affect their opinions regarding many of the technical challenges. People who use hospital information systems in all and most of their job tasks reported that there are not enough computer terminals in the hospital. This might be due to their increased need to use computers more often.

As a conclusion and summary, human challenges; those related to the healthcare professionals and their beliefs, nature of work and time constraints as well as technical challenges; those related to software and hardware of hospital information systems are the major barriers and challenges in the way of successful implementation of these systems in Saudi Arabia. Government hospitals had more complains and concerns than private hospitals, where systems are old and not satisfying the increased needs and in the same time the hospital doesn't have the experience to go with hospital information systems implementation in terms of technical infrastructure and maintenance. This study could identify, define and sort the detailed human and technical challenges that should be managed to achieve successful implementation of hospital information systems in Saudi Arabia and in developing countries generally.

5. Recommendations

5.1. Overcoming Technical Challenges

- To ensure that HIS vendors and commercial providers are supplying hospitals with the proper system documentations, user manuals and guidelines for using and troubleshooting HIS.
- We have to make sure that computers and networks are working fine – in terms of hardware – and that they have less maintenance problems, so that we can guarantee that the software will consequently work better. Hardware maintenance and technical support is essential.
- We might need to upgrade computer machines and communication networks for new ones, update their operating systems to enhance their performance.
- Technically, HIS should be satisfying different users' needs, this can be achieved – as we mentioned above – by performing requirements analysis thoroughly before the design phase is started and much before the implementation phase starts.
- Overcoming data entry difficulties through implementing new innovations in both software and hardware. For the software innovations, the system should be designed to support structured data entry rather than unstructured, drop down list fields more than text fields, dictation and voice recognition techniques. For the hardware innovations, we can implement touch screens, hand-held devices and tablet PCs so as to minimize the gap between the acquisition of data and the process of recording them and provide every user with a computer device so as to make information accessibility easier.
- Outsourcing some electronic processing tasks, such as medical transcription of the dictated voice files, could also eliminate the overload on the health information technology and management staff.
- It is essential, for the healthcare professionals as users, to make the system's interface design more friendly and understandable, it is essential to make such systems less complicated and convenient for the daily use of the regular or standard user not for the super or knowledgeable users.
- Using data standards is an essential step in validating data on the systems and consequently important for the quality, accuracy and reliability of such source.
- Increase the number of computer terminals at the point of care.

5.2. Overcoming Human Challenges

- Improving the awareness of the importance and benefits of using HIS by focusing on the topic through a multi-phase approach. Starting from the level of medical schools and colleges – the undergraduate level – and through different levels of post-graduate medical education. The importance of HIS and their applications should be an integral part of the medical education programs
- Improving the knowledge of using HIS through formal training during different levels of medical education and training.

- The researcher suggests that teaching and training on HIS should be developed and implemented as a course or a subject of the formal undergraduate as well as post graduate medical education programs.
- Short courses for healthcare professionals and continuous medical education programs should be provided on the subjects of HIS and health information management. These programs should be implemented by the ministry of health and its formal channels for all healthcare professionals at all types of hospitals and healthcare organizations. We need also to develop and enhance our taught computer science courses in medical schools, nursing education and post-graduate training.
- Increasing the numbers of health informatics technicians and specialists through developing both undergraduate as well as post graduate specialized programs in “Health Informatics”, Health Information Management” and “Health Information Technology”. This way we could establish a new generation of professionals specialized in this new discipline. Undergraduate programs would deliver health information technicians and basic level professionals, while post graduate programs would deliver leaders, consultants and specialists in the field.
- The researcher suggests developing an in-house hospital orientation and training programs on HIS – especially for newly appointed staff – to overcome the negative beliefs and impressions about HIS.
- Improving healthcare professionals’ support to HIS through increasing their participation and involvement in the stages of systems development, systems implementation and deployment. Healthcare professionals support would be much better if developers and implementers of HIS took into account their different needs during the stages of requirements analysis and before implementation.
- Improving motivation of healthcare professionals to learn and train on using HIS by providing them with direct and indirect incentives, including overtime payments, bonuses and rewards for the hospital sections and departments successfully implementing HIS. Departments that achieved well should also be recognized.
- We should also provide the enough time suitable and convenient for healthcare professionals to learn and train on using HIS.
- Conducting training programs for healthcare professionals to educate them on how to take new HIS responsibilities and accountabilities, so they would better understand their part of the process.
- When healthcare professionals are overloaded with HIS tasks and functions, we should look for workflow redesign of processes so that they could minimize or completely eliminate some unnecessary processes, provide help in some complicated tasks and assign more help to super busy users.

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