The Effect of Medical Information System on reducing Preventable Medical Errors
A case study in Sample of Jordanian Private Hospitals

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Abstract

In this paper we will discuss the effect of medical information system on reducing preventable medical errors in a sample of Jordanian private hospitals. Special focus will be in the preventable medical errors, which it is likely can effect by medical information system. Results demonstrate that the processing and flow of information plays an important role in how errors occur, and the four main types of preventable medical errors effected by effectively use of medical information system. We recommend alternative approaches in which the Jordanian health care organizations can work to reduce preventable medical errors.

Keywords: Preventable medical errors, Medical information system.

الملخص:

سوف نناقش في هذه الورقة تأثير نظام المعلومات الطبية على الحد من الأخطاء الطبية التي يمكن الوقاية منها. إستندت الدراسة على عينة من المستشفيات الاردنية الخاصة. ولقد تم التركيز بشكل خاص على الأخطاء الطبية التي يمكن الوقاية منها، والتي من المرجح أن يساهم نظام المعلومات الطبية في التقليل منها. تظهر نتائج الدراسة أن طريقة معالجة وتدفق المعلومات الطبية تلعب دورا هاما في معرفة كيفية حدوث الأخطاء. إن الاستخدام الفعال لنظام المعلومات الطبية يسمح بالوقاية من أربعة أنواع رئيسية من الأخطاء الطبية. توصي الدراسة المنظمات الصحية الأردنية بتعميم الإستخدام الفعال لنظم المعلومات الطبية من أجل الحد من الأخطاء الطبية التي يمكن الوقاية منها.

الكلمات المفتاحية : الوقاية من الأخطاء الطبية ، نظام المعلومات الطبية.

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 1- **Introduction**

Medical care is "people taking care of people, one patient at a time -- and as long as we have human beings doing that .. the potential is going to be there for human beings to make mistakes," said the Vice President of the American Hospital Association Rick Ward.[1].

The "Institute of Medicine" said tens of thousands of people die in hospitals alone each year as the result of medical errors. It cited one study that put the number of such deaths at 44,000 annually and another that more than doubled that figure.

"Even using the lower estimate," it said, "more people die from medical mistakes each year than from highway accidents, breast cancer or AIDS." It said medication errors that take place both in and out of hospitals total more than 7,000, exceeding those from workplace injuries.

"These stunningly high rates of medical errors -- resulting in deaths, permanent disability and unnecessary suffering -- are simply unacceptable in a medical system that promises first to 'do no harm,'" said William Richardson, chairman of the committee that wrote the report and chief executive officer of the W.K. Kellogg Foundation of Battle Creek, Michigan. [2].

However, there are two major categories, which can be separates: 'mistakes' and 'slips'. Norman defines a mistake as "an error in the intention" and a slip as "an error in carrying out the intention". The Medical Information System that we are going to study will deal with both kinds of errors, e.g. how to prevent mistakes like false diagnoses or slips like misunderstandings due to a doctor's unreadable handwriting. However, slips from a technical point of view (e.g. forgetting to remove surgery instruments before closing the body) are not in the scope of this research and mistakes will be in the focus of our work.

Even if there occur lots of errors in medicine, they are still not always harmful. We will call those, which result in injury, preventable adverse events. "An adverse event is an injury resulting from a medical intervention, or in other words, it is not due to the underlying condition of the patient. While all adverse events result from medical management, not all are preventable (i.e., not all are attributable to errors). For example, if a patient

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has surgery and dies from pneumonia he or she got postoperatively, it is an adverse event. If analysis of the case reveals that the patient got pneumonia because of poor hand washing or instrument cleaning techniques by staff, the adverse event was preventable (attributable to an error of execution). But the analysis may conclude that no error occurred and the patient would be presumed to have had a difficult surgery and recovery (not a preventable adverse event)."

Today, the business and information technology strategies must be closely aligned if hospitals outcomes are to be achieved. It is fundamentally important that medical information system core competencies facilitate rather than erode the hospitals strategic positioning in the marketplace. For this reason, time invested in designing and selecting the "right" medical information system is time well spent. Nowhere is this truer than in the area of medical management, where payers, regulators and accrediting bodies closely monitor service costs and provision and service outcomes. The right system can catapult a hospital to the head of the pack, whereas the wrong system can effectively strangle forward movement, especially when we consider a wide variety of human errors occurs, in medicine.

2-Background

2-1 The term 'Medical Informatics' ('Informatique Medicale') was created in France and it was already at the end of the 1960s when university departments under that title were established in France, Belgium and Holland. In the 1970s similar research units and the term 'Medical Informatics' appeared in Germany, Poland and the USA (as 'Medizinische Informatik', 'Informatiyki Medycznej' and 'Medical Informatics' respectively). [3]. In other hand, as early **"**Hospital information systems" (HIS) date back to the 1970s, modern more comprehensive approaches are sometimes labelled differently (Clinical information system, CIS, Health-care information system, HCIS, Electronic Medical Record (EMR). Electronic Patient Record), but definitions are not precise.[4]. In fact, medical information system composes an interesting mix of different disciplines. However medical information systems encompass a wide range of applications from many disciplines including medicine, computer science, management science, statistics, biomedical engineering etc. Practitioners and researchers in this multidisciplinary area are examining a range of potential applications from artificial intelligence to total

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management principles to health care. [5]. So a number of definitions have been applied to medical information system:

- An information system that provide Information of interest to the patient as well as medical professionals and also includes information on maintaining medically, disease prevention, treatment and decision-making related to medical and medical care. It also includes the information needed to make decisions about medical products, medical services, which may be in the form of texts written or audio or video clips.

- An Electronic medical record, that documenting patient care. The record of the patient consisted of basic data on the first record, followed by the structural called (SOAP) for each problem, and this record contains three sections Data source (corresponding to-date clinical examination…Etc.), Diagnosis, treatment.

- An information system that combines a computer-based patient record with other modules that support clinical workflow.

 2-2- Preventable adverse events.

A number of definitions have been applied to medical errors and patient safety. In To Err is Human, the IOM adopted the following definition: [6]

- An error is defined as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim.

- In an effort to thoroughly consider all of the relevant issues related to medical errors, the QuIC expanded of the IOM definition, as follows:

An error is defined as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim. Errors can include problems in practice, products, procedures, and systems.

- A medication error is "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer," according to the National Coordinating Council for Medication Error Reporting and Prevention. The council, a group of more than 20 national organizations, including the FDA, examines and evaluates medication errors and

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recommends   strategies   for   error   prevention.   [7]
- Medical errors happen when something that was planned as a part of
medical care doesn't work out, or when the wrong plan was used in the first
place. Medical errors can occur anywhere in the health care system:
Hospitals, Clinics, Outpatient Surgery Centres, Doctors' Offices, Nursing
Homes, Pharmacies, and Patients' Homes. [8]

Several studies have been published in order to estimate the dimension of
preventable medical errors. A 1992 study from Utah and Colorado estimates
about 44,000 preventable deaths per year, a 1984 New York State study
ends up with a number as large as 98,000 preventable deaths per year; the
total numbers of preventable errors were estimated by more than 500,000
and more than 700,000 respectively.. The Zhan and Miller study published
in the Journal of the American Medical Association (JAMA) in October of
2003. Supported the Institute of Medicine's (IOM) 1999 report conclusion,
which found that medical errors caused up to 98,000 deaths annually and
should be considered a national epidemic. The Health Grades study finds
nearly double the number of deaths from medical errors found by the 1999
IOM report "To Err is Human," with an associated cost of more than $6
billion per year. Whereas the IOM study extrapolated national findings
based on data from three states, and the Zhan and Miller study looked at 7.5
million patient records from 28 states over one year, Health Grades looked
at three years of Medicare data in all 50 states and D.C. This Medicare
population represented approximately 45 percent of all hospital admissions
(excluding   obstetric   patients)   in   the   U.S.   from   2000   to   2002.
"The   Health   Grades   study   shows   that   the   IOM   report   may   have
underestimated the number of deaths due to medical errors, and, moreover,
that there is little evidence that patient safety has improved in the last five
years," said Dr. Samantha Collier, Health Grades' vice president of medical
affairs. "The equivalent of 390 jumbo jets full of people is dying each year
due to likely preventable, in-hospital medical errors, making this one of the
leading killers in the U.S." [9]. Even though those numbers have a high
uncertainty and are based on very vague estimates, they clearly show that
there is lots of room for improvement.

2-3 The effect of medical information systems on medical errors

The information revolution is affecting every aspect of health and medicine(Riegelman, Richard & Persily, Nancy Alfred, Health information systems and health communications: Narrowband and broadband technologies as core public health competencies, American journal of public health, Aug. 2001, Vol. 91, Issue 8, P. 1179) Planning and management of economical and strategic issues became crucial in health care that were before seen, especially by decision makers and clinical staff, as something that will never fit in health care. As a consequence of several changes health care Providers are predicted to face an unprecedented era of competition and cost pressures. Therefore they are exploring information technology as an opportunity in reducing costs of service delivery while improving quality. [10]..Future health care leaders will have to become more technology-savvy; they will have to know the fight questions to ask, as well as the potential for future applications. In this rapidly changing health care environment, the use of multidisciplinary teams comfortable with technology to institute a broader application of medical information system will be crucial. [11]. Because of these pressures and also because of new possibilities provided by the dynamic area of information technology, adoption of Medical information system in health care has been fast. In the end of 90's medical information systems in health care were said to be some 10-15 years behind sectors such as banking or the airline and manufacturing industries. [12] , . that perception is however changing rapidly. So many hospitals and health care organizations have implemented new, integrated information systems that capture data upon initial patient contact and make that information available to all departments on a real- time, on-line basis [13]. Since the beginning of the 1990s the health care sector has significantly increased its investments in Medical information system. As such, major spending on Medical information system is not exceptional – e.g. 40 % of European industrial and commercial investments are directed to ICTs. However in other areas the development has been gradual during 30-40 years opposed to health care where an almost equal development has been realized in ten years. The obverse of rapid increase of health care Medical information system is that since the 1950's health care systems have gradually developed from decision support systems based on Bayesian statistics and decision theories to kinds of ERP systems like integrated electronic patient records (EPR) or electronic medical record(EMR), including a wide range of different sub-systems in the 1990's [14]

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. Although the development has started some 40-years ago, the fast development of Hospital information system (HIS) in last 10-15 years has lead to the introduction and wide use of (EPRs) or (EMRs). EMRs were the final boost for the area since they pulled together a large amount of health information and created an integrated system.

To significantly reduce the tens of thousands of deaths and injuries caused by medical errors every year, health care organizations must adopt information technology systems that are capable of collecting and sharing essential health information on patients and their care, says a new report by the Institute of Medicine of the National Academies. "when a patient is treated by several practitioners, they often do not have complete information about the medicines prescribed or the patient's illnesses." [15]

These systems should operate seamlessly as part of a national network of health information that is accessible by all health care organizations and that includes electronic records of patients' care, secure platforms for the exchange of information among providers and patients, and data standards that will make health information uniform and understandable to all. "When it comes to safety, the health care industry needs to borrow a page from the airline industry," said committee chair Paul Tang, chief medical information officer, Palo Alto Medical Foundation, Palo Alto, Calif.." [16]

According to the various studies cited in To Err is Human, the adverse events which occur most frequently include: Medication errors, surgical injuries, Hospital-acquired infections, Accidents, Pressure wounds, Restraint-related injuries. From the point of view of a Medical Information System the prevention of medication errors is the main focus of the aforementioned list. Adverse events occur most frequently in emergency departments, operating rooms, and intensive care units where high risk patients are found and rapid, precise action are required. This topic can well be addressed by a Medical Information System which supports a quick and reliable diagnosis and provides the physician with patient background information that might otherwise be missing. For the purpose of this research, adverse events that are caused by errors that might be prevented by a Medical Information System include the following: [17]

1-   Diagnostic

1-1 Error or delay in diagnosis

1-2   Failure to employ indicated tests

1-3 Use of outmoded tests or therapy

1-4 Failure to act on results of monitoring or testing

2-   Treatment

2-1 Error in administering the treatment

2-2 Error in the dose or method of using a drug

2-3 Avoidable delay in treatment or in responding to an abnormal test

2-4 Inappropriate care

3- Preventative

3-1 Failure to provide prophylactic treatment

3-2 Inadequate monitoring or follow-up or treatment

4- Other

4-1 Failure of communication.

4-2 Equipment failure.

4-3 Other system failure.

3-Problem Statement

Theoretically the introduction of information systems in hospitals and

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other medical facilities is not only driven by the wish to improve management of patient-related data for the patient's benefit, but also by the fiscal necessity to improve efficiency of medical services. The safety, effectiveness, impact, and risks of medical information systems have received little attention from clinical investigators in pediatrics. Despite their increasing presence, relatively little effort has been undertaken to systematically gather evidence on the safety and efficacy of medical information used with pediatric patients.[18]

Physicians often fail to embrace a complex information system, may not see its relevance to their practices, and are characteristically reluctant to invest the time and energy to be trained in its use .[19] . (Brenner & Logan) examined the lack of acceptance of computerized patient and medical records systems by medical community in the United States. On the other hand the promises of medical information systems are significant. Indeed, one of the more important stated goals of medical information system is enhancing patient care and reduces medical errors. [20]

Attention to medical errors escalated over five years ago with the release of a study from the Institute of Medicine (IOM), To Err is Human, which found that between 44,000 and 98,000 Americans die each year in U.S. hospitals due to preventable medical errors. Hospital errors rank between the fifth and eighth leading cause of death, killing more Americans than breast cancer, traffic accidents or AIDS. Serious medication errors occur in the cases of five to 10 percent of patients admitted to hospitals. These numbers may understate the problem because they do not include preventable deaths due to medical treatments outside of hospitals. [21].

An efficient information system should be able to reduce a majority of these wrong medicament treatment errors.

Research funded by AHRQ and others has been important in identifying the extent and causes of errors. Now, additional research is needed to develop and test better ways to prevent errors, often by reducing the reliance on human memory. Some areas of past research that have shown promise in helping to reduce errors include computerized ADE monitoring, computer-generated reminders for follow up testing, and standardized protocols. **[22]**

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Empirically; In spite of private hospital's leaders awareness that the real purpose of medical information system in medical management is to identify problems short-falls, trends and variations in care that will help improve the performance of these hospitals , and also long term period has been past of the construction these hospitals and medical information systems are established mainly to serve current purposes, even if there occur lots of medical errors(Jordanian Medical Associations), they are still not considering numerous needs for always study has been done to determine the effect of medical information systems on reducing medical errors in these hospitals. Although there is no estimation about the people died or harmed each year in Jordanian hospitals due to preventable medical errors for different reasons, but the Front-page articles in newspapers, television exposes, and cover stories in magazine have provided the stark details of the latest and most dramatic examples of medical errors [23] [24]. Until recently, the perception of medical errors among health care providers and the public has been shaped by these anecdotes, and remedies have focused on fixing blame on individual providers, including health plans, hospitals, doctors, pharmacists, nurses, and other caregivers. That approach, however, has proven ineffective in addressing patient safety, as documented by the ongoing problems noted in the IOM report. The IOM's recommended alternative approaches and other ways in which the Federal agencies can work to reduce medical errors are described in this report.

Research question

The proposed research tries to answer the following questions:

- Do the sampled hospital's leaders know the real purpose of such a system, especially; in medical errors   ?

-           To what extent is medical information system in Jordanian private hospitals can reduce preventable medical errors.

In the context of considering these questions, the effect of medical information system on reducing preventable medical errors in Jordanian private hospitals is explored.

4- Statement of the research objective

Based on the background of the problem statement this research aim at identify several objectives, there are:

1- The proposed research aim at identifying the concepts of medical information system and preventable medical errors.

2-Examines the effect of medical information systems on reducing medical errors, and interpret the importance of these systems.

3-Stimulate sampled hospital's decision makers and other health care organization's leaders to take care and consider the importance of these systems in the future.

4- Stimulate other researchers to prepare researches on this important subject.

5- Methodology

5-1- Participants

The unstructured interviews results with chief information officers and their assistants in three of private Jordanian hospitals (Al- Estklal hospital, Al- Esra hospital, Jordan hospital) indicated there is medical information system in these hospitals. The reasons for choosing these Jordanian hospitals are:

1-These hospitals are counted as a big health care establishment in Jordan.

2-They have medical information system units in their organizational structure.

3- They try to minimize medical errors and improve the performance of healthcare.

4-Not less than 10 years have passed to establish them.

5-2 Data collection plan:

For the sake of releasing the aims of research, the research   based on a selected sample in a Jordanian hospitals to obtain accurate data. The sample was not randomly selected, since the questionnaire concerned perceptions, it took considerable time to complete, and most participants were contacted personally in order to ensure that they would, in fact, complete the questionnaire. The (112) subjects were from three sampled hospitals

Data regarding the two research's variables (preventable medical errors and medical information system) were collected by using a questionnaire (appendix 1), The effect of medical information systems analysis presented here is limited to responses to (23) questions from the questionnaire .These questions are the most relevant for this purpose. Data analysis consisted of coding the responses of participations and then conducting both a qualitative and quantities analysis of the data and the information contained on the returned questionnaires, each decision maker in sampled hospitals received the questionnaire, (150) questionnaires were distributed, and (112)were returned .The questionnaire contained closed –ended questions designed for constrained responses, where respondents was asked to rank listed options (5 points Likert type scales   ratings ranging form " 1 ,"limited or no effect, to "5", strong effect for the dependent variable and " 1 ,"not agree, to "5", strongly agree for the independent variable).

5-3 Variables

Dependent Variable. The dependent variable includes major Errors **that are to be addressed by a Medical Information System** for sampled firms. Adverse events that are caused by errors that might be prevented by a Medical Information System include the following:

1- Diagnostic (Error or delay in diagnosis, Failure to employ indicated tests, Use of outmoded tests or therapy, Failure to act on results of monitoring or testing).

2- Treatment (Error in administering the treatment, Error in the dose or method of using a drug, Avoidable delay in treatment or in

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responding to an abnormal test, inappropriate care).

3- Preventative (Failure to provide prophylactic treatment, Inadequate monitoring or follow-up or treatment).

4- Other (Failure of communication, Equipment failure and other system failure).

Independent Variables. This research will investigate the effect of medical information system on preventable medical errors; the processing and flow of information that plays an important role in how can reduce errors occur; represent independent variables that were included in the analysis:
1-Ability to obtain information to make correct decisions.

2-Availiblity of information when the decision was made.

3- Information was obtained and available and was used in making the decision.

4- Information not lost or garbled in transfer.

5- Patient was properly identified so key information was available or correct.

6- Enough time was available to use information in complex calculations or check of errors.

7- Sufficient data was available for the provider to see information patterns required for decision-making.

8- Complex processes were overseen or integrated (having the big picture).

9- Past errors were recognized, recorded, analyzed, and used to improve.

10- Processes, include information flows, were standardized.

5-4 Hypotheses:

1- Medical Information System, intended to reduce a significant part of the medical errors.

2-Medical information system will positively affect the medical errors.

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5-5 Data Analysis

To examine the significant effect of the medical information system on preventable medical error all data generated in this research were analyzed using a multiple regression model, (SPSS) statistical package used to analyze collected data. Descriptive statistic measures, "Chrunbach's "alpha tests.

6- Findings and conclusions:

Inspection of table (1) indicates that medical information system
Had strong role in providing required information to hospital management, patients and doctors in order to reduce medical errors.

Table (1)

Frequency table for medical information system role in providing required information

Items	strongly agree(rated 4-5)	No Agree(rated 1-2)
Ability to obtain information to make correct decisions.	95.4	4.6
Availability of information when the decision was made.	88.2	11.8
Information was obtained and available and was used in making the decision.	96.8	3.2
Information not lost or garbled in transfer.	80.5	19.5
Patient was properly identified so key information was available or correct.	81.3	19.7
Enough time was available to use information in complex calculations or check of errors.	92.0	8.0
Sufficient data was available for the provider to see information patterns required for decision-making.	87.7	13.3
Complex processes were overseen or integrated (having the big picture) .	85.0	15.0
Past errors were recognized, recorded, analyzed, and used to improve.	96.2	3.8
Processes, include information flows, were standardized.	89.4	10.6

All items were contributed strongly in providing required information with more than (80) percent. It is clear that medical information system play a

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significant role in providing required information.

Table (2) explains the opinion of respondents about the medical information system effect on preventable medical errors

Table (2)
Frequency table for medical information system effect on preventable medical errors

Types of preventable medical errors	Strong effect (rated 4-5)	Limited or No effect (rated 1-2)
Error or delay in diagnosis	9o.1	9.9
Failure to employ indicated tests	92.0	8.0
Use of outmoded tests or therapy	96.5	3.5
Failure to act on results of monitoring or testing.	89.3	10.7
Error in administering the treatment	87.7	12.3
Error in the dose or method of using a drug	90.4	9.6
Avoidable delay in treatment or in responding to an abnormal test	93.3	6.7
inappropriate care	88.8	11.2
Failure to provide prophylactic treatment	96.9	3.1
Inadequate monitoring or follow-up or treatment	93.7	6.3
Failure of communication	87.1	12.9
Equipment failure	85.8	14.2
Other system failure	90.0	10.0

Table (3) explains the results of regression analysis for research variables.

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Table (3)
Regression analysis

Dependent Variables	Diagnostic Errors		Treatment Errors		Preventative Errors		Other Errors	
Analysis	B	t	B	t	B	t	B	t
Ability to obtain information to make correct decisions.	0.44	*3.4	0.23	*2.4	0.26	*3.0	0.27	*3.1
Availability of information when the decision was made.	0.34	*3.4	0.17	*1.9	0.33	*3.6	0.23	*2.1
Information was obtained and available and was used in making the decision.	0.22	*1.7	0.45	*4.3	0.18	*1.7	0.48	*6.6
Information not lost or garbled in transfer.	0.25	*2.6	0.22	*2.1	0.31	*2.8	0.41	*4.3
Patient was properly identified so key information was available or correct.	0.33	*3.6	0.28	*3.3	0.14	*1.5	0.37	*4.6
Enough time was available to use information in complex calculations or check of errors.	0.28	*3.4	0.21	*2.7	0.19	*2.1	0.37	*4.6
Sufficient data was available for the provider to see information patterns required for decision-making.	0.47	*6.1	0.43	*4.2	0.35	*3.3	0.35	*3.6
Complex processes were overseen or integrated (having the big picture).	0.68	*8.4	0.34	*3.4	0.22	*2.4	0.29	*3.3
Past errors were recognized, recorded, analyzed, and used to improve.	0.18	*1.7	0.13	*1.1	0.27	*3.1	0.21	*1.9

(*) Non significant at P<=0.05, freedom degree (110), (t) Table value =1.67.

These findings suggest that It is time to shift the emphasis of patient safety programs from a strategy of reporting, focused on injuries after they have occurred, to one of prevention aimed at providing safe and effective care in

the first place. Jordanian private hospitals and other health care organizations have hesitated to invest in medical information systems, reasonably so, knowing that their own medical information system might not be able to exchange important patient information with local pharmacies, hospitals, or even other physicians. While all Jordanian private hospitals and other health care organizations have installed computerized medical information systems to manage patient information, a national infrastructure for standardized data collection and exchange is needed because patients often receive services from many different providers. To facilitate the routine use of medical information systems, the health care sector must develop and use standardized formats for these systems, which allow providers to record information about patients' health at the point of care. Routine use of medical information systems would give health care providers and patient's immediate access to complete patient information as well as tools to guide decision-making and help prevent errors. However, without standards for how and what data is collected, the different systems used in various organizations may not be compatible. The lack of data standards is a key obstacle to the adoption of both medical information system and data exchange systems. In addition, uniform formats and data standards for reporting information on near misses -- mishaps that were caught before harm occurred -- as well as events caused by mistakes must be developed and adopted so that the hospitals and health care organizations can learn how to prevent future errors. The private sector can be expected to invest a significant portion of the capital required to build a national system of computerized medical information and data sharing. However, government investments should support the development of critical building blocks of this infrastructure, especially those that are unlikely to receive adequate support from the private sector, such as a secure platform for data exchange. The government also should provide financial incentives to spur private-sector development of medical information systems. Uniform information technology standards for the collection, storage, and dissemination of health information are crucial to the national infrastructure. The Jordanian Health care ministry should take the lead in establishing a public-private partnership to develop and promote national health data standards. Accordingly, we urge Jordanian health care ministry to create a national center for patient safety to:

1- Put error reduction strategies into high gear by re-evaluating and strengthening checks and balances to prevent errors. Set goals for avoiding medical errors, track progress in meting them.

2-Fund research on better ways to determine the causes and prevention of such errors.

3- Enactment of laws requiring hospitals first -- and later clinics, doctor's offices and nursing homes -- to report to state officials any deaths or serious injuries caused by medical errors

4- Outlines a plan to accelerate the development of data standards in three key areas: clinical terminologies, exchange of data among computers, and representation of medical information in computer programs.
5- Establish a culture in which patient safety is a top priority, as part of the effort to achieve an acceptable standard of patient safety. All health care settings must establish comprehensive patient safety programs operated by trained personnel.
6- Stimulate government health care programs to encourage adoption of these national data standards by incorporating them into their contractual and regulatory requirements.

Appendix (1)
Questionnaire
The aim of this research is to explain the effect of medical information system on reducing preventable medical errors , and this questionnaire represent the main tool to obtain necessary data to achieve the above aim. The questionnaire divided in to two sections, the first section related to the types of medical errors that can be reduced by medical information system, the second section describe the processing and flow of information by medical information system that plays an important role in how medical errors can be reduced .each question requires that you chose the alternative that best fits your views. Please fill your completed questionnaire in the enclosed envelope and return it.

Acknowledge:
We will treat your responses in the strictest confidence. Thank you for your cooperation.

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Section (1): I believe that the processing and flow of information by medical information system affect the occurrences of the following medical errors:

Main medical errors	Sub medical errors	1 limited or no effect	2	3	4	5 strong effect
Diagnostic	Error or delay in diagnosis					
	Failure to employ indicated tests					
	Use of outmoded tests or therapy					
	Failure to act on results of monitoring or testing					
Treatment	Error in administering the treatment					
	Error in the dose or method of using a drug					
	Avoidable delay in treatment or in responding to an abnormal test					
	Inappropriate care					
Preventative	Failure to provide prophylactic treatment					
	Inadequate monitoring or follow-up or treatment					
Other	Failure of communication.					
	Equipment failure					
	Other system failure					

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Section (20): Medical information systems can affect on reducing medical errors when characterized with:

N	Medical Information Characteristics	1 not agree	2	3	4	5 strongly agree
1	Ability to obtain information to make correct decisions.					
2	Availability of information when the decision was made.					
3	Information was obtained and available and was used in making the decision.					
4	Information not lost or garbled in transfer.					
5	Patient was properly identified so key information was available or correct.					
6	Enough time was available to use information in complex calculations or check of errors.					
7	Sufficient data was available for the provider to see information patterns required for decision-making.					
8	Complex processes were overseen or integrated (having the big picture) .					
9	Past errors were recognized, recorded, analyzed, and used to improve.					
10	Processes, include information flows, were standardized.					

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