Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231– 6345 (Online)
An Open Access, Online International Journal Available at www.cibtech.org/sp.ed/jls/2015/04/jls.htm
2015 Vol. 5 (S4), pp. 948-955/Gozali et al.
Research Article

ASSESSING OF ELECTRONIC MEDICAL RECORDS STATUS IN HOSPITALS AFFILIATED TO THE URMIA UNIVERSITY OF MEDICAL SCIENCES

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ABSTRACT
This study aimed to investigate the possibility of establishing electronic medical records in educational hospitals affiliated to Urmia University of medical sciences considering technical, organizational and legal factors. This study was conducted using a descriptive cross-sectional research method in 2013. The study population consisted of 98 senior and junior managers who worked in the hospitals under this study. A questionnaire including two sections was used for data collection. Result of the five hospitals under investigation, awareness of participants was in moderate level. In terms of requirements, there was a statistically significant difference between the mean score of hospital "D" ($p = 0.000$) and the rest. It is highly recommended that efforts should be made to establish electronic medical records in the three hospitals which are ready for its deployment.

Keywords: *Electronic Medical Records, Educational Hospitals, Health Services*

INTRODUCTION
Achieving the required improvement in the level of the services provided to the public seems possible, provided that the authorities have technical and practical plans and road map in accordance to the 20-year vision declaration of Islamic Republic of Iran. In this regard, health care and new technologies, including information technology, admittedly have vital roles to play in achieving this invaluable goal.
The application of new technologies is a practical way to make the most out of the available resources in health care system. Accordingly, the use of information technology in the field of health is growing day by day. The development occurring in health care systems and the shift from patient-oriented to holistic health-oriented, along with significant advances in information technology have led to the usage of technology in order to improve the quality of health services (Mirani, 2011). Moreover, effective developments seem to be attainable in health information applying periodic data assessment and information systems. It should be noted that improving quantitative and qualitative data, data integration, data standardization, the use of statistical classification system of diseases and medical procedures are important factors in approaching the formerly mentioned goals (Ammenwerth *et al.,* 2004). The use of information technology in the health care system of a given country is among the assessment criteria considered by the World Health Organization (Dorenfest, 2000).
Development in information technology and health care system can bring about many benefits among which shortening physical distance, rapid information exchange, having access to precise and adequate information, improvements in strategies, helping to make rational decisions, and improvement in efficiency can be mentioned. In addition, quality information can lead to better decision making and it can also reduce the expenditure in any health care system. Patient satisfaction concerning health care services provided by hospitals is considered as one of the most important indicators in quality services in different compartments of a given hospital (Deutsch *et al.,* 2010; Imani and Usefi, 2008). In this regard, there is a general consensus claiming that computer-based electronic medical records have the potential to improve the quality of health care in addition to minimizing the expenses of the service provided in the hospitals (Goodman *et al.,* 2012).

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The fledgling industry of health information technology comprises a variety of disciplines from clinical decision support systems and data warehouse systems to electronic medical records. Electronic medical record plays a crucial role in increasing the quality of health care services. It can act as, reminder and reviewer of the interpretation, predictor, examiner, mover and also includes electronic prescription of physician's orders (Carter-Jerome, 2005).

Electronic medical records have some beneficial features such as decision support, giving access to academic resources, acting as reminders and alarms. It is also a form of electronic medical records for the purpose of providing basic health care services available through a network of computers (Farzandipour *et al.,* 2006). As a result, all units of a hospital such as examination room, conference room, emergency units, and patients care units, nursing stations, operating rooms, recovery units, laboratory, radiology, pharmacy and medical records should have full access to such functional network (Paul, 1994). There are numerous benefits of networking all units in a hospital, such as improved quality of care provided to patients, better organization of information in the process of improving the timeliness, accuracy and completeness of documentation, patients' access to the electronic version of their files, prevention in medication errors and allergies, reduction of physicians' errors, immediate access to information when and where needed, a clinical decision support system and work process improvement (Miller and Sim, 2004).

According to the experiences of leading countries with regard to the use of such a technology and the needs identified in the community to solve related problems, improvement in the quality of healthcare systems as well as based on emphasizes given by Ministry of Health and Medical Education, there should be a comprehensive planning and an efficient management for effective implementation of electronic medical records. Hence, this study was conducted with the aim to assess the status of technical, organizational and legal aspects of hospitals under investigation to deploy electronic medical records as well as to appraise the knowledge of the directors and supervisors of teaching hospitals affiliated to Urmia University of Medical Sciences.

MATERIALS AND METHODS

In this study, descriptive cross-sectional research method was employed, followed by functional analysis that was done, in five educational hospitals affiliated to Urmia University of Medical Sciences - Iran in 2013. The population under the study consisted of 98 senior and junior managers of educational hospitals, including hospital directors, office of nursing, supervisors of academic and clinical departments, staff and administrative personnel, IT professionals responsible for medical records, the authorities responsible for surveillance and diagnostics of all units such as laboratory, radiology, pharmacy. In this study population census method was used and it was regarded as the research sample. Considering ethical issues in the study, names of the hospitals were not revealed, but abbreviation was used. Following a review of related research works done and consulting some experts in the field, the researchers developed a questionnaire, which was adopted and localized in accordance with the qualification of local hospitals. The finalized questionnaire consisted of two parts to appraise the knowledge of both senior and junior managers of the hospitals under the study about electronic medical records and to assess the status of the standards required for the implementation of electronic medical records with respect to technical, organizational and legal aspects.

The first part of the questionnaire consisted of questions relating demographic features of the participants (gender, age, years of service, type of employment, education and work experience) and the second part contained 35 questions, among which 13 questions (1 to 13) using 5 point Likert's scale (65 points) to measure the awareness of the study population about electronic medical records and 22 questions (questions 14-35) with three response options (44 Points) to obtain data relating to technical, organizational and legal standard requirements for the implementation of electronic medical records. Content validity of the questionnaire was done by consulting experts in the field. Furthermore, to determine the reliability of the questionnaire, test-retest reliability was employed. Subsequently, the questionnaire was distributed twice within ten days among 30 out of original sample.

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Applying paired t-tests, comparison of pre-test and post-test scores revealed that there is no significant difference between pre-test and post-test scores. Additionally, overall reliability (correlation score) 0.98 was obtained, indicating a good reliability of questionnaire in order to achieve the research objectives.
Moreover, the internal consistency was checked by using a Cronbach's alpha and it was found to be 0.92. The data gathered was analyzed using descriptive statistics such as frequency, mean, standard deviation, median, percentage and analysis (comparing the scores of hospitals) by SPSS version 20 software.

RESULTS AND DISCUSSION

Results

The results of the study revealed that the mean score of awareness about Electronic Medical Records in hospitals was 55.91 (SD=1.25). The minimum and maximum level of community awareness of electronic medical records were 23.08 and 82.69 respectively which means that there was no significant difference between the awareness of electronic medical records of sample population in hospitals (P> 0.05).
Hence, the public awareness of the hospitals under investigation was assessed as moderate (Figure1). There was no significant relationship between demographic factors and knowledge of electronic medical records except for "age" (P = 0.035).
The results about implications regarding the technical standards for the implementation of electronic medical records showed that the mean for studied hospitals conditions for the deployment of electronic medical records was technically equivalent to 49.49 (SD = 2.28). The minimum score of status of the hospitals for implementation of electronic medical records was zero and the maximum score was 100 from a technical point.
The significant difference between the mean scores of the electronic medical records about technical requirements was found for hospital "D" compared with other hospitals and also for hospital "A" and hospital "B". Thus, hospital "A" was more favorable in terms of the requirements of the technical standards (Figure 2). For requirements related to organizational standards, the results showed that the mean of the studied hospitals to deploy electronic medical records was 41.07 (SD = 1.82). Moreover, the minimum score of studied hospitals status for deployment of electronic medical records was 5 and maximum score was 100.
Statistically, there was no significant difference between the scores of electronic medical records regarding organizational requirements among the hospitals (p>0.05). However, it is noteworthy that hospitals "F", "A" and "C" are more prepared than hospitals "B" and "D" for the implementation of electronic medical records in terms of organizational requirements.
For requirements relating to the legal standards, the results showed that the mean of the studied hospitals to deploy electronic medical records legally was equal to 46.43 (SD=3.28). The minimum score of hospitals status for implementation of electronic medical records legally was zero and maximum score was 100. Statistical significant difference was found between the mean score of electronic medical records in term of the legal requirements between studied hospitals.
Accordingly, hospitals "A" and "B" are eligible hospitals and hospitals "C" and "F" are in the middle level, whereas hospital "D" has legally unfavorable conditions for the implementation of electronic medical records (Figure 3).
Mean score of the studied hospitals' status for implementation of electronic medical records in all three variables (the requirements of technical, organizational and legal establishment of electronic medical records) was 47.44 (SD = 1.76). The results showed that the least rated score for hospital to the deployment of electronic medical records of all three variables was 9.11 and maximum was 84.24. This shows a meaningful difference among the hospitals mean scores for implementation of the electronic medical records of all three variables just for hospital "D" (P<0.05), while others do not have significant difference (Figure 4).

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Figure 1: Distribution of mean score for population awareness about electronic medical records in studied hospitals separately

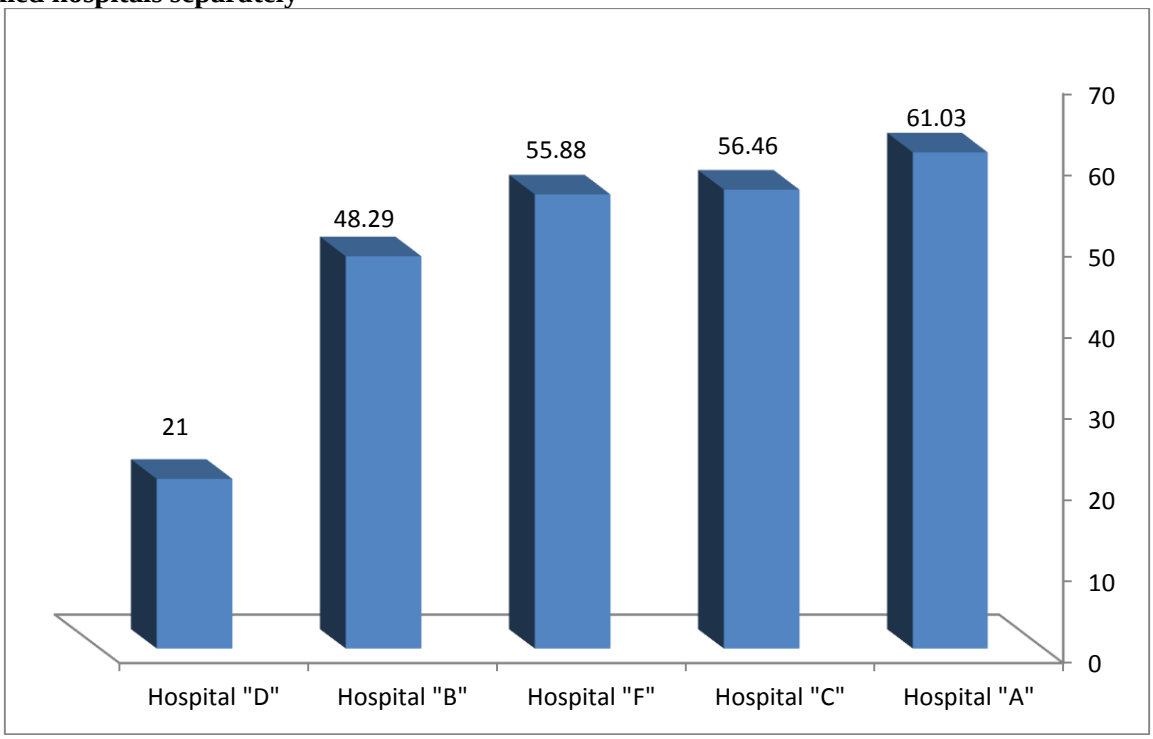

Figure 2: Distribution of mean score for implementing of electronic medical records in studied hospitals in terms of technical requirements

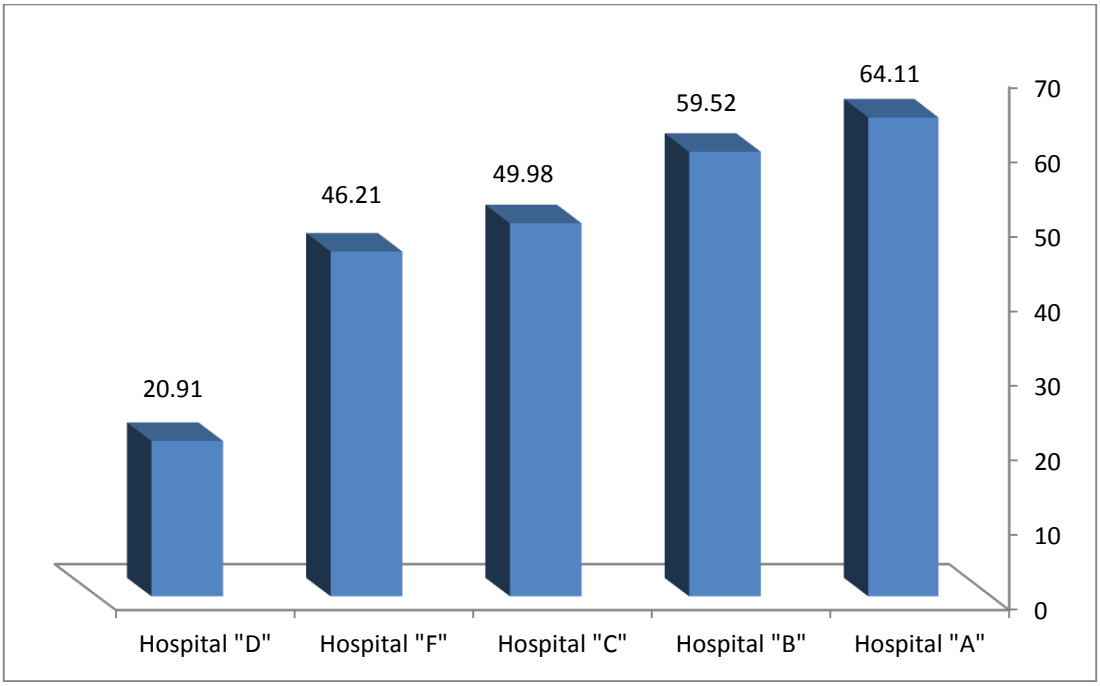

Figure 3: Distribution of mean score for implementing of electronic medical records in studied hospitals in terms of legal requirements

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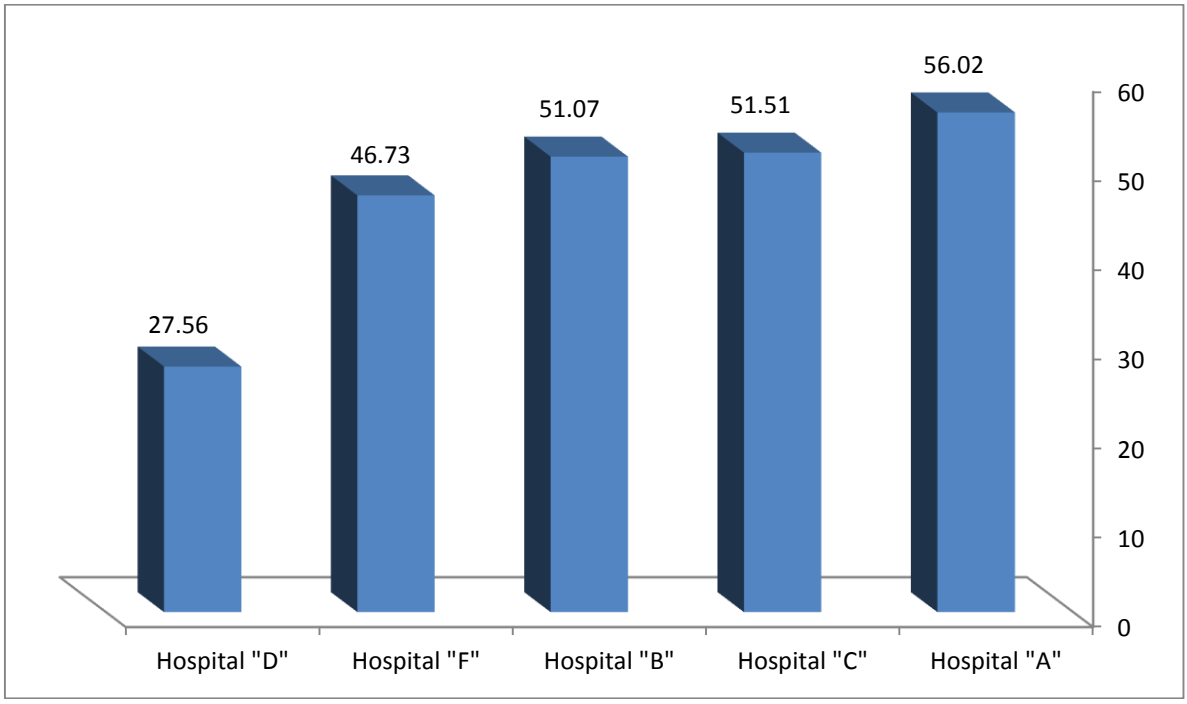

Figure 4: Distribution of mean score for implementing of electronic medical records in studied hospitals in terms of requirements

Discussion

The significance of the present study lies on the specification of the variables being investigated. So far almost all studies considered only one of the factors considered in the present study, such as knowledge or requirements, while the present study focused on both of the abovementioned aspects. Alipour *et al.,* in their study concluded that physicians and practitioners should be involved in planning such projects in order to facilitate the objectives of HER (Alipour *et al.,* 2012). Jabraeili found that the focus on attitude and treatment is the most important hurdle in the implementation of electronic medical records (Jabraeily *et al.,* 2012). Studies on the level of the awareness of the health service providers, such as present research, determines that the knowledge of health care providers about electronic medical records is one of the important factors to implement EMR. The results of the present study are in line with the finding of Jabraeili claiming that the mean score of the awareness of the respondents is Medium to high (Jabraeily *et al.*, 2010).

Moreover, in the study it was found that there is no meaningful association between demographic factors and the level of EMR awareness except for the age of the participants. In other similar studies, there was no meaningful relationship between demographic factors and EMR awareness. Hence, our findings can support such inspections since we found no relationship between demographic factors and the main variable. Howard and Warner argued that simplicity in application and benefits involved for the physicians, nurses and other clinicians working in the field are the key elements in utilizing electronic medical record. If the software is user friendly and beneficial enough in health care services, physicians become motivated to apply EMR (Bleich and Slack, 2010). Terry *et al.,* pointed that the readiness of health care providers is related to the skills and computer knowledge about electronic records. So the stronger the knowledge or skills the clinicians have, the more they enjoy the implementation of EMR. Likewise, the awareness of advantages and positives of EMR on work process can help to decrease the opposition (Terry *et al.,* 2008). Arshi and Shafiee (2005) in their research noted that elimination of physical barriers and increasing the flexibility of the system can result in an increase in the capacity of information exchange in health sector networking and it will also be managed effectively. In their study, Ajami *et al.*, highlighted that the assessment of the preparedness for the application of electronic health is

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a part of implementation process and it seems to be a superior and necessary factor for such processes. Furthermore, factors such as resources, technical infrastructure (hardware and software), IT management and IT department's experience of interaction and information exchange are among the most influential elements in planning electronic projects (Ajami *et al.,* 2011). Results of this study show that only about 60% of the studied hospitals have the acceptable readiness regarding technical standards for the implementation of EMR. Above studies emphasize the role of technical standards in the utilization of EMR. To this end, considering the numerous benefits of electronic medical records, the necessary measures have to be taken to provide the required infrastructure for its implementation and to improve the existing facilities in the hospitals.

The researchers found that all the hospitals under investigation do not benefit from required organizational standards, nor are they prepared enough for such standards in terms of organizational requirements such as a comprehensive development for strategic plan, policies, procedures and identified programs, evaluation of redesign organization workflow and changing management, i.e., resistance and opposition against the deployment of electronic medical records. Dargahi noted that organizational structure is a factor affecting the successful implementation and operation of IT (Dargahi and Razavi, 2005).

Lorenz and Rilay (2004) opined that the organizational culture is the biggest problem in implementation of electronic health projects. Most studies have emphasized the importance of organizational requirements in electronic records and confirm the results of this study.

Jalali in his study argued that due to the lack of data protection law in Iran, there is a possibility of misusing patients' personal health information. Moreover, patients' privacy can sometimes be disclosed by the executives and service providers or others (Jalali, 2005). Mahmoodzadeh (2004) in his study reported that exchange of medical records and patients' records between two health care organizations can increase the capacity to access patients' information. Gozali *et al.,* (2015) in his study argued due to confidentiality and privacy of patients is an important issue that must be addressed by health care providers.

Hence, there is a need for increasing confidentiality of information and likewise the recognition of patients' privacy should be respected by health care providers. The results of the present study showed that four hospitals are legally in average condition regarding standard requirements for the utilization of electronic medical records whereas one hospital lacks this requirement. The finding of the present study is in agreement with the previous studies, which emphasized the importance of legal requirements. Considering the obtained mean score for technical, organizational and legal requirements for the establishment of electronic medical records, hospitals "A", "C" and "B" have suitable preparation for the deployment of electronic medical records and the remaining hospitals are not prepared enough for such implementation.

Ajami *et al.*, recommended that a given hospital should have four aspects for the implementation of EMR: (1) Organizational culture, (2) Management and Leadership, (3) Operational readiness and (4) Preparation of technical, all of which are in line with the findings of our study about the awareness of the managers and the hospitals' readiness.

Conclusion

The results of this study showed that, among five hospitals, three hospitals, namely, hospitals "A", "C" and "B" were prepared for the deployment of electronic medical records. Given the variety of benefits and usages of electronic medical records, hospitals must provide the necessary standards and strengthen the existing facilities to work on a proper planning to implement EMR. Overall, the findings of other studies confirm the importance of awareness and the requirements in terms of technical, organizational and legal support to the deployment of electronic medical records and the whole emphasis on the importance of implementing electronic medical records.

Recommendation

Considering the importance of the implementation of electronic medical records, concerned authorities should plan the deployment of EMR in the hospitals, which are prepared to use electronic medical

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records. There are some flaws relating to the application of EMR. Consequently, some practical steps recommended are listed below:

- Comprehensive strategic plans, policies, procedures, and standards for the deployment of electronic medical records in hospitals should be developed
- In service training courses should be held for staff to increase awareness and promote the use of electronic medical records
- Policies relating to confidentiality, privacy and personalization for patients should be prepared
- Managers and supervisors at the hospital should attend seminars and conferences related to electronic medical records; also hospitals require skilled manpower and meet technical, organizational and legal requirements for such a system to be deployed.

ACKNOWLEDGMENT

The authors would like to thank all of the health care providers at Urmia University of Medical Sciences and affiliated health centers that cooperated during this study.

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