Electronic Health Records: What Are the Most Important Barriers?

Save to myBoK

by Haleh Ayatollahi, MSc, PhD; Nader Mirani, MSc; and Hamid Haghani, MSc

Abstract

Introduction: The process of design and adoption of electronic health records may face a number of barriers. This study aimed to compare the importance of the main barriers from the experts' point of views in Iran.

Methods: This survey study was completed in 2011. The potential participants (62 experts) included faculty members who worked in departments of health information technology and individuals who worked in the Ministry of Health in Iran and were in charge of the development and adoption of electronic health records. No sampling method was used in this study. Data were collected using a Likert-scale questionnaire ranging from 1 to 5. The validity of the questionnaire was established using content and face validity methods, and the reliability was calculated using Cronbach's alpha coefficient.

Results: The response rate was 51.6 percent. The participants' perspectives showed that the most important barriers in the process of design and adoption of electronic health records were technical barriers (mean = 3.84). Financial and ethical-legal barriers, with the mean value of 3.80 were other important barriers, and individual and organizational barriers, with the mean values of 3.59 and 3.50 were found to be less important than other barriers from the experts' perspectives.

Conclusion: Strategic planning for the creation and adoption of electronic health records in the country, creating a team of experts to assess the potential barriers and develop strategies to eliminate them, and allocating financial resources can help to overcome most important barriers to the adoption of electronic health records.

Keywords: electronic health records, health information technology, health information system, medical informatics

Introduction

In recent years, healthcare organizations have aimed to provide more customer-oriented services.[1] To achieve this goal, the quality of care needs to be improved, which, in turn, requires timely access to high-quality information.[2,3] However, because of the limitations of paper-based records, the required data may not be available to the healthcare providers at the point of need.[4] To resolve this problem, health information systems have been in development for the past 30 years, and the ultimate goal is the adoption of electronic health records (EHRs).[5]

An EHR system is an information system that helps to collect individuals' health information from birth to death so that it can be registered, certified, and shared in different places by healthcare providers.[6] The main goal of implementing EHRs is improving the quality of care by reducing medical errors, providing an effective means of communication, sharing information between healthcare providers, and collecting health information for educational and research purposes.[7-9]

EHR systems help to facilitate use of e-health and are the most important and most complex type of health information system.[10] In terms of the availability, accessibility, and accuracy of data, EHR systems are highly dependent on other information systems in the field of healthcare. Obviously, standardization of other systems will accelerate the process of integration and creation of EHRs.[11,12] The process of creating and using EHRs is not an easy job and involves a number of barriers that make achieving predetermined goals difficult.[13] Before adoption, therefore, technical and nontechnical issues must be identified and resolved.[14] According to the literature, the main barriers to the development and adoption of EHRs are a lack of national standards for information exchange, a lack of human and technical resources, concerns about the change of processes, a lack of integration between health information systems, a lack of local databases, and concerns about maintaining

the confidentiality of health information.[15] Generally, barriers to the adoption of EHRs can be categorized as technical, organizational, personal, financial, and legal.[16] However, studies show that technical and individual barriers (such as resistance to change) are more important than other barriers.[17,18]

Iran is a developing country in which the use of clinical information systems was begun 30 years ago. The first systems were used in laboratory departments, and admission/discharge/transfer systems were the second type of system introduced in healthcare organizations. Gradually, hospital information systems were developed by private information technology (IT) companies. However, these systems were not consistent, and different vendors' products could be found in the market.[19,20]

Since 2000, e-health and EHRs have received particular attention in Iran and are considered two important priorities in the strategic plan for health IT. To lead the projects and prevent duplication across the country, the Ministry of Health's statistics and IT management center was selected to be responsible for designing and implementing EHRs. To achieve this goal, a number of private IT companies were requested to get involved in the process of standard development and defining system specifications.[21] The governing body supports the development of EHRs by issuing rules in the areas of healthcare, national information security and confidentiality, and medical malpractice. Therefore, the Health Insurance Portability and Accountability Act (HIPAA) and Health Information Technology for Economic and Clinical Health (HITECH) Act rules are not applicable in Iran. In 2007, a prototype EHR was developed, and currently, the Iranian EHR system is in the process of development and implementation to integrate Iranian citizens' health records across the country.[22] Although a number of projects have been completed so far, technical and nontechnical barriers have affected the process of system design. This study aimed to compare the importance of these barriers from the experts' points of view.

Methods

Two groups of experts participated in this survey study. The first group included faculty members who worked in the departments of health information technology and medical informatics across the country, and the second group included staff who worked in the Ministry of Health and were in charge of the development and adoption of EHRs.

In total, 62 experts were invited to participate in the study (55 faculty members and seven experts in the Ministry of Health). Because of the limited number of the study population, no sampling method was used. To collect data, a five-point Likert-scale questionnaire (ranging from 1 for "very low" to 5 for "very high") was designed on the basis of a literature review.[23-33] The questionnaire consisted of 35 questions in six parts: personal information (five questions), technical barriers (nine questions), organizational barriers (nine questions), individual barriers (five questions), financial barriers (three questions), and ethical-legal barriers (four questions). The content validity and face validity of the questionnaire were confirmed by experts in the field of health IT and medical informatics. To check the reliability, the internal consistency was calculated using Cronbach's alpha coefficient (? = 0.945).

To collect data, a list of potential participants with their e-mail addresses, the addresses of their workplaces, and their phone numbers was obtained. The questionnaires were distributed either by visiting the participants or by e-mail, especially when visiting individuals was not possible because of the geographical distances. After two weeks, a reminder letter was sent to the individuals who had not completed the questionnaire. All data were collected and analyzed on a confidential basis. Ethical principles were considered in all stages of study, for example, by providing the participants with information about the research and gaining their informed consent to complete the questionnaire. Before the research was conducted, the university ethics committee approved the study.

Results

As mentioned above, the potential participants included 62 experts. However, despite the reminders that were sent, only 32 questionnaires (51.6 percent) were completed and returned. The average age of the participants was 35.8 years. Half of the respondents had a PhD degree; 25 participants (78.1 percent) worked in the medical universities, and 7 participants (21.9 percent) worked in the Ministry of Health. The average length of work experience was 8.5 years.

The results showed that the most important barriers to the development and adoption of EHRs were technical barriers (see Table 1). Financial and ethical-legal barriers, with mean values of 3.80 were also of high importance, whereas individual and organizational barriers, with mean values of 3.59 and 3.50 were of less importance (see Table 1). Among technical barriers,

the highest mean value (4.06) was related to a lack of efficient hospital information systems and a lack of national standards for data exchange (see Table 2).

Table 1: Importance of Barriers to the Development and Adoption of Electronic Health Records from the Experts' Point of View

Barriers	Very Low	Low	Medium	High	Very High	Mean ± SD
Technical barriers	3.1	3.1	21.9	34.4	37.5	3.84±1.46
Financial barriers	3.1	3.1	28.1	28.1	37.5	3.80±0.58
Ethical and legal barriers	0	9.4	21.9	37.5	31.3	3.80±0.64
Individual barriers	3.1	12.5	37.5	18.8	28.1	3.59±0.87
Organizational barriers	0	6.3	46.9	28.1	18.8	3.50±1.23

The numbers reported in the above table are the percentage of respondents who had the same idea about the importance of each group of barriers.

Table 2: Importance of Technical Barriers to the Creation and Adoption of Electronic Health Records (EHRs) from the Experts' Point of View

Technical Barriers	Very High	High	Medium	Low	Very Low	Mean±SD
Lack of a national health information network	37.5	25.0	18.8	12.5	6.3	3.75±1.27
Lack of efficient hospital information systems	50.0	21.9	15.6	9.4	3.1	4.06±1.16
Lack of proper equipment and hardware necessary to implement EHRs	34.4	34.4	15.6	12.5	3.1	3.84±1.14
Programming and providing software according to needs	21.9	31.3	31.3	12.5	3.1	3.56±1.07
Lack of facilities for quick and easy access to the Internet	28.1	18.8	31.3	21.9	0	3.53±1.13
Lack of appropriate infrastructure for integration of EHRs with other existing information systems	31.3	37.5	25.0	6.3	0	3.94±0.83
Lack of a national standard terminology for EHRs	34.4	31.3	28.1	3.1	3.1	3.91±1.27
Lack of national standards for data exchange	37.5	34.4	25.0	3.1	0	4.06±0.77
Incompatibility of information systems in terms of structure, content, and function	18.8	25.0	27.5	15.6	3.1	3.91±1.31
Importance degree of technical barriers based on rating	37.5	34.4	21.9	3.1	3.1	3.84±1.46

The results also showed that organizational barriers had a moderate degree of importance from the respondents' perspectives (46.9 percent). Among these barriers, a lack of efficient planning for developing EHRs in the private sector (59.4 percent), a lack of skilled manpower in the field of health information technology, specifically EHRs (46.9 percent), and limitations related to training courses for healthcare professionals to acquire new skills (46.9 percent) were of moderate importance compared with other organizational barriers. Similarly, the importance of individual barriers was assessed at a moderate level (see Table 1). Among the individual barriers, a lack of healthcare providers' willingness to learn new skills, such as the use of computers in their workplace (46.9 percent) and healthcare providers' limited awareness of the benefits of EHRs (40.6 percent) were of moderate importance compared with other individual barriers (see Table 3).

Table 3: Importance of Individual Barriers to the Development and Adoption of Electronic Health Records (EHRs) from the Experts' Point of View

Indivual Barriers	Very High	High	Medium	Low	Very Low	Mean±SD
Unwillingness of physicians and other clinical staff to use EHRs	31.3	31.3	28.1	6.3	3.1	3.81±1.06
Healthcare providers' lack of awareness of the benefits of EHRs	25.0	21.9	40.6	9.4	3.1	3.56±1.07
Reluctance of healthcare providers to gain new skills such as using computers in work	15.6	18.8	46.9	15.6	3.1	3.28±1.02
Increased workloads for healthcare providers because of the time spent on data entry	28.1	12.5	37.5	15.6	6.3	3.41±1.24
Lack of healthcare providers' involvement in the design and implementation of EHRs	40.6	25.0	21.9	9.4	3.1	3.91±1.14
Importance degree of individual barriers based on rating	28.1	18.8	37.5	12.5	3.1	3.59±0.87

The numbers reported in the above table are the percentage of respondents who had the same idea about the importance of individual barriers.

The findings indicated that from the participants' point of view, financial barriers were the second group of important barriers (37.5 percent; mean ± SD = 3.80+0.58). In this category, the shortage of funds for the design, development, and use of EHRs (40.6 percent) and a lack of strategic planning in the field of EHRs and related budgeting activities (37.5 percent) were found to be the most important issues. Research findings about the ethical and legal barriers indicated that from the respondents' perspectives, these barriers had great importance (37.5 percent; mean ± SD = 3.80 ± 0.64). Among the ethical and legal barriers, the respondents rated unauthorized access to patient information (46.1 percent), computer system security (43.8 percent), and the security of health data exchange (37.5 percent) of great importance. Less than half of the respondents (43.8 percent) believed that the lack of an appropriate legal framework for the adoption of EHRs was of moderate importance.

Discussion

EHRs are a complex part of the field of e-health.[34] Despite their potential benefits, creating and using EHRs may present some barriers.[35] The findings of this study showed that from the experts' perspective, technical barriers were the most important barriers to the development and adoption of EHRs. Among the technical barriers, a lack of efficient hospital information systems and a lack of national standards for data exchange were the most important barriers. Similarly, in a survey conducted by a New York healthcare network, the results showed that hardware infrastructure, networks, and information systems were among the most important factors influencing the adoption of EHRs.[36] In another study, Thakkar and Davis mentioned technical problems as the most important barriers to EHR adoption. Their findings showed that one of the major barriers to EHR adoption is associated with the exchange of information among different systems.[37] The findings of the current study are consistent with the results of other studies[38-40] that have emphasized the importance of technical barriers in the creation and adoption of EHRs. Therefore, it is essential to assess the technical infrastructure, equipment, and standards prior to the adoption of the system to prevent potential failures.

Several studies have mentioned financial issues as the major barriers to EHR adoption.[41-45] The results of the present study confirm that financial issues remain a major concern in the development and adoption of information systems such as EHR systems. The most important financial issues were the lack of strategic planning for budgeting activities and the shortage of funds for the design, development, and adoption of EHRs. These findings are consistent with the results of a study conducted by the Medical Records Institute of America in 2005, which indicated that the lack of financial resources has been one of the main issues influencing system design and development.[46] Technical and financial issues are still the main concerns related to developing and implementing EHRs even in developed countries such as the United States.[47] Therefore, e-health policy makers should find solutions for allocating adequate financial resources.

Ethical and legal barriers formed the third category of important barriers. Concerns about the security of computer systems and data confidentiality were identified as the most important items in this area. Similarly, the results of the study conducted by Thakkar and Davis showed that the concern of breaching the confidentiality of health data and a lack of control of unauthorized access were the main barriers in this area.[48] Other studies have also emphasized the importance of the

confidentiality of health data when computerized systems are used.[49-54] However, in another study, Moody et al. stated that the possibility of unauthorized access to health information in electronic records was less than in paper-based records.[55] Before an EHR system is adopted, issues such as access to health data, legal frameworks, and access permission should be taken into account, and practical solutions should be in place.

According to the results of this study, the category of individual barriers was less important than the technical, financial, and ethical-legal barriers from the experts' point of view. In this category, a lack of healthcare providers' involvement in the process of design and adoption of EHRs was considered the most important item. This finding was consistent with the findings reported by Thakkar and Davis, who mentioned the lack of healthcare providers' involvement as the most important barrier in the adoption of EHRs.[56] Similarly, in a Delphi study conducted in Canada, the results showed that the participation of end users in the implementation strategy was among the 10 key factors of EHR implementation, and this finding gained strong consensus among user groups.[57] Amatayakul stated that prior to the creation and adoption of EHRs, organizational culture should be taken into account because it may prevent healthcare providers from participating in the process of system design. The readiness of employees should be assessed prior to system implementation because they may not be ready to accept the change and the new system. In this case, organizational culture may work as the most important barrier to the adoption of the system.[58,59] In many studies, training the healthcare providers to enhance their readiness has been emphasized.[60,61]

The findings also showed that organizational barriers to the creation and adoption of EHRs had the least importance compared to other categories. Among these barriers, insufficient senior management support of the creation and adoption of EHRs was found to be the most important factor. In other studies, the full support of senior managers has been reported as the most important factor in accelerating the implementation of EHRs.[62] Among the organizational issues, the complexity of activities with the use of EHRs was of least importance because respondents expected that the use of EHRs would facilitate organizational tasks. Similarly, other studies have found EHRs to be a workflow facilitator, not a hindrance.[63-65] Therefore, most healthcare workers seem to be aware of the benefits of using EHRs in healthcare organizations.

To eliminate current barriers, strategic planning for the creation and adoption of EHRs in the country, creating a team of experts to assess potential barriers and to develop strategies to eliminate the barriers, and clarifying the objectives and benefits of EHRs for all senior managers, users, and healthcare providers are suggested.

Limitations of the Study

Because of the geographic dispersion of potential participants, the data collection process was accompanied by some problems. Despite the efforts made by the researchers, only half of the potential participants completed the questionnaire. Nonresponders' reasons for not completing the questionnaire were not investigated; however, their individual interests or their workload might have prevented them from completing the questionnaire. Therefore, the study findings are not likely to be generalizable. It is also notable that the participants who answered the questionnaires had different backgrounds; some worked in the Ministry of Health, and others worked in medical universities across the country.

Research Implications

The findings have implications for policy makers, system developers, those who are involved in the process of EHR implementation, and researchers. Policy makers may use the results as objective evidence to plan for the future and allocate resources on the basis of priorities and the level of importance. System developers should be aware of the technical and financial challenges and choose appropriate solutions. The results may help people who are involved in the process of EHR implementation to understand the barriers that may hinder the process of system implementation. Finally, this study presents an opportunity for the researchers to conduct similar studies elsewhere and compare the results to recognize how perceptions of EHR barriers might differ in other countries.

Conclusion

Although the use of EHRs is recommended to improve the quality of healthcare by making healthcare data accessible and available at the point of need, a number of barriers may influence successful implementation of such a system. Therefore, it is necessary to identify and eliminate these barriers before designing and implementing systems. The study findings showed that

in Iran, technical barriers were the most important, and organizational barriers were of least importance. Therefore, strategic planning for national infrastructure, encouraging private sector companies to invest more, and recruiting a team of experts to lead related projects are suggested to overcome the main technical barriers.

Acknowledgment

Haleh Ayatollahi, MSc, PhD, is an assistant professor of medical informatics in the Department of Health Information Management at Iran University of Medical Sciences in Tehran, Iran.

Nader Mirani, MSc, is a PhD student in the School of Health Management and Information Sciences at Iran University of Medical Sciences in Tehran, Iran.

Hamid Haghani, MSc, is a lecturer in mathematics and statistics in the Department of Mathematics and Statistics in the School of Health at Iran University of Medical Sciences in Tehran, Iran.

Notes

[1] American Health Information Management Association (AHIMA). "HIM Functions in Healthcare Quality and Patient Safety." *Journal of AHIMA* 82, no. 8 (2011): 42–45.

[2] AHIMA. "Embracing the Future: New Times, New Opportunities for Health Information Management: Summary Findings from the HIM Workforce Study." 2005. (accessed June 25, 2011).

[3] Sittig, D. F., and H. Singh. "Defining Health Information Technology-related Errors: : New Developments since *To Err Is Human*." *Archives of Internal Medicine* 171, no. 14 (2011): 1281–84.

[4] Mindy, L. "The Evaluation and Effectiveness of an Interdisciplinary Course in Electronic Health Record (EHR) Technology for Health and Rehabilitation Professionals." MSc thesis, Robert Morris University, 2006.

[5] Gartee, R. *Electronic Health Records: Understanding and Using Computerized Medical Records*. Upper Saddle River, NJ: Pearson Prentice Hall, 2007.

[6] Ahmadi, M., P. Rezaee, and L. Shahmoradi. *Electronic Health Records: Structure, Content and Evaluation*. Tehran, Iran: Jafari, 2008.

[7] Amatayakul, M. "EHR? Assess Readiness First." *Healthcare Financial Management* 59, no. 5 (2005): 112–13.

[8] Miller, R., and I. Sim. "Physicians' Use of Electronic Medical Records: Barriers and Solutions." *Health Affairs* 23, no. 2 (2004): 116–26.

[9] Valdes, I., D. Kibbe, G. Tolleson, M. E. Kunik, and L. A. Petersen. "Barriers to Proliferation of Electronic Medical Records." *Informatics in Primary Care* 12, no. 1 (2004): 3–9.

[10] Statistics and Information Technology Management Centre. *Electronic Health Records Prototype: A Report (version 1.0)*. Tehran, Iran: Ministry of Health and Medical Education, 2007. Available at http://it.behdasht.gov.ir/index.aspx?siteid=101&pageid (accessed March 15, 2011).

[11] Ibid.

[12] Majlis Research Centre, New Technology and Communication Studies Office. *A Study of E-health in Iran*. Tehran, Iran: Majlis Research Centre, 2009. Available at http://www.majlis.ir/pdf/Reports/9907.pdf (accessed December 22, 2010).

[13] Torabi, M., and R. Safdari. *Electronic Health Records*. Tehran, Iran: Behineh, 2004.

[14] Morton, M. E., and S. Wiedenbeck. "A Framework for Predicting EHR Adoption Attitudes: A Physician Survey." *Perspectives in Health Information Management* (Fall (2009).

[15] Healthcare Financial Management Association. "Overcoming Barriers to EHR Adoption." 2006. Available at http://www.hfma.org/Content.aspx?id=2942 (accessed August 8, 2014).

[16] Sadoughi, F., B. Delgoshaei, S. Foozonkhah, S. Tofighi, and N. Khalesi. "Designing an Object-oriented Model for Some Key Messages to Support the Electronic Health Record." *Journal of Health Administration* 9, no. 25 (2006): 21–30.

[17] Amatayakul, M. "EHR? Assess Readiness First."

[18] Miller, R., and I. Sim. "Physicians' Use of Electronic Medical Records: Barriers and Solutions."

[19] Statistics and Information Technology Management Centre. *Electronic Health Records Prototype: A Report (version 1.0).*

[20] Majlis Research Centre, New Technology and Communication Studies Office. *A Study of E-health in Iran.*

[21] Ibid.

[22] Statistics and Information Technology Management Centre. *Electronic Health Records Prototype: A Report (version 1.0).*

[23] Ahmadi, M., P. Rezaee, and L. Shahmoradi. *Electronic Health Records: Structure, Content and Evaluation.*

[24] Amatayakul, M. "EHR? Assess Readiness First."

[25] Miller, R., and I. Sim. "Physicians' Use of Electronic Medical Records: Barriers and Solutions."

[26] Statistics and Information Technology Management Centre. *Cost-Impact Analysis for EHR.* Tehran, Iran: Ministry of Health and Medical Education, 2009. Available at http://cgme.behdasht.gov.ir/uploads/252_788_Cost-Impact%20analysis%20for%20 EHR%20v . 2.2.pdf (accessed November 13, 2010).

[27] Jones, V., and C. Jollie. *eHealth Strategy and Implementation Activities in England.* London, England: eHealth ERA, 2007. Available at http://www.ehealth-era.org/database/documents/ERA_Reports/England_eHealth_ERA_Country_Report_final_07-06-2007.pdf (accessed May 2, 2010).

[28] Hayrinena, K., K. Sarantoa, and P. Nykanen. "Definition, Structure, Content, Use and Impacts of Electronic Health Records: A Review of the Research Literature." *International Journal of Medical Informatics* 77, no. 5 (2008): 291–304.

[29] Jebraeily, M., M. Ahmadi, A. Hajavi, M. R. Gohari, M. Sedghi Jahromi, and Z. Zareh. "Electronic Health Records: Personnel Readiness Assessment." *Journal of Health Administration* 13, no. 39 (2010): 17–24.

[30] Thakkar, M., and D. C. Davis. "Risks, Barriers, and Benefits of Electronic Health Record Systems: A Comparative Study based on Size of Hospital." *Perspectives in Health Information Management* (2006): 1–19.

[31] McGinn, C. A., S. Grenier, J. Duplantie, N. Shaw, C. Sicotte, L. Mathieu, Y. Leduc, F. Légaré, and M. P. Gagnon. "Comparison of User Groups' Perspectives of Barriers and Facilitators to Implementing Electronic Health Records: A Systematic Review." *BMC Medicine* 9, no. 46 (2011).

[32] Medical Records Institute. *Medical Records Institute's Seventh Annual Survey of Electronic Health Record Trends and Usage for 2005.* 2005. http://www.medrecinst.com/files/ehrsurvey05.pdf (accessed October 10, 2010).

[33] Sittig, D. F., and H. Singh. "Legal, Ethical, and Financial Dilemmas in Electronic Health Record Adoption and Use." *Pediatrics* 127, no. 4 (2011): e1042–e1047.

[34] McGinn, C. A., M. P. Gagnon, N. Shaw, C. Sicotte, L. Mathieu, Y. Leduc, S. Grenier, J. Duplantie, A. Ben Abdeljelil, and F. Légaré. "Users' Perspectives of Key Factors to Implementing Electronic Health Records in Canada: A Delphi Study." *BMC Medical Informatics and Decision Making* 12, no. 105 (2012).

[35] AHIMA. "HIM Functions in Healthcare Quality and Patient Safety."

[36] Gartee, R. *Electronic Health Records: Understanding and Using Computerized Medical Records*.

[37] Thakkar, M., and D. C. Davis. "Risks, Barriers, and Benefits of Electronic Health Record Systems: A Comparative Study based on Size of Hospital."

[38] Amatayakul, M. "EHR? Assess Readiness First."

[39] Sadoughi, F., B. Delgoshaei, S. Foozonkhah, S. Tofighi, and N. Khalesi. "Designing an Object-oriented Model for Some Key Messages to Support the Electronic Health Record."

[40] McGinn, C. A., S. Grenier, J. Duplantie, N. Shaw, C. Sicotte, L. Mathieu, Y. Leduc, F. Légaré, and M. P. Gagnon. "Comparison of User Groups' Perspectives of Barriers and Facilitators to Implementing Electronic Health Records: A Systematic Review."

[41] Healthcare Financial Management Association. "Overcoming Barriers to EHR Adoption."

[42] McGinn, C. A., S. Grenier, J. Duplantie, N. Shaw, C. Sicotte, L. Mathieu, Y. Leduc, F. Légaré, and M. P. Gagnon. "Comparison of User Groups' Perspectives of Barriers and Facilitators to Implementing Electronic Health Records: A Systematic Review."

[43] Medical Records Institute. *Medical Records Institute's Seventh Annual Survey of Electronic Health Record Trends and Usage for 2005*.

[44] Sittig, D. F., and H. Singh. "Legal, Ethical, and Financial Dilemmas in Electronic Health Record Adoption and Use."

[45] McGinn, C. A., M. P. Gagnon, N. Shaw, C. Sicotte, L. Mathieu, Y. Leduc, S. Grenier, J. Duplantie, A. Ben Abdeljelil, and F. Légaré. "Users' Perspectives of Key Factors to Implementing Electronic Health Records in Canada: A Delphi Study."

[46] Medical Records Institute. *Medical Records Institute's Seventh Annual Survey of Electronic Health Record Trends and Usage for 2005*.

[47] Ancker, J. S., M. P. Singh, R. Thomas, A. Edwards, A. Snyder, A. Kashyap, and R. Kaushal. "Predictors of Success for Electronic Health Record Implementation in Small Physician Practices." *Applied Clinical Informatics* 4, no. 1 (2013): 12–24.

[48] Thakkar, M., and D. C. Davis. "Risks, Barriers and Benefits of Electronic Health Record Systems: A Comparative Study based on Size of Hospital."

[49] Gartee, R. *Electronic Health Records: Understanding and Using Computerized Medical Records*.

[50] Hayrinena, K., K. Sarantoa, and P. Nykanen. "Definition, Structure, Content, Use and Impacts of Electronic Health Records: A Review of the Research Literature."

[51] McGinn, C. A., S. Grenier, J. Duplantie, N. Shaw, C. Sicotte, L. Mathieu, Y. Leduc, F. Légaré, and M. P. Gagnon. "Comparison of User Groups' Perspectives of Barriers and Facilitators to Implementing Electronic Health Records: A Systematic Review."

[52] McGinn, C. A., M. P. Gagnon, N. Shaw, C. Sicotte, L. Mathieu, Y. Leduc, S. Grenier, J. Duplantie, A. Ben Abdeljelil, and F. Légaré. "Users' Perspectives of Key Factors to Implementing Electronic Health Records in Canada: A Delphi Study."

[53] Riazi, H., and A. Bitaraf. *EHR System in Iran*. Tehran, Iran: Ministry of Health and Medical Education, 2008. Available at http://it.behdasht.gov.ir/index.aspx?siteid=101&pageid=20350 (accessed August 5, 2010).

[54] Kalankesh, L. "Necessary Attributes of Legal Electronic Health Records." *Proceedings of 2nd International Conference on Information Technology and Knowledge*. Tehran Iran: Amirkabir University, 2005.

[55] Moody, L. E., E. Slocumb, B. Berg, and O. Jackson. "Electronic Health Records Documentation in Nursing: Nurses' Perceptions, Attitudes, and Preferences." *Computers, Informatics, Nursing* 22, no. 6 (2004): 337–44.

[56] Thakkar, M., and D. C. Davis. "Risks, Barriers, and Benefits of Electronic Health Record Systems: A Comparative Study based on Size of Hospital."

[57] McGinn, C. A., M. P. Gagnon, N. Shaw, C. Sicotte, L. Mathieu, Y. Leduc, S. Grenier, J. Duplantie, A. Ben Abdeljelil, and F. Légaré. "Users' Perspectives of Key Factors to Implementing Electronic Health Records in Canada: A Delphi Study."

[58] Amatayakul, M. "EHR? Assess Readiness First."

[59] Medical Records Institute. *Medical Records Institute's Seventh Annual Survey of Electronic Health Record Trends and Usage for 2005*.

[60] Terry, A. L., C. F. Thorpe, G. Giles, J. B. Brown, S. B. Harris, G. J. Reid, A. Thind, and M. Stewart. "Implementing Electronic Health Records: Key Factors in Primary Care." *Canadian Family Physician* 54, no. 5 (2008): 730–36.

[61] Richards, H., G. King, M. Reid, S. Selvaraj, I. McNicol, E. Brebner, and D. Godden. "Remote Working: Survey of Attitudes to eHealth of Doctors and Nurses in Rural General Practices in the United Kingdom." *Family Practice* 22, no. 1 (2005): 2–7.

[62] Gartee, R. *Electronic Health Records: Understanding and Using Computerized Medical Records*.

[63] Hayrinena, K., K. Sarantoa, and P. Nykanen. "Definition, Structure, Content, Use and Impacts of Electronic Health Records: A Review of the Research Literature."

[64] Riazi, H., and A. Bitaraf. *EHR System in Iran*.

[65] Hier, D. B., A. Rothschild, A. LeMaistre, and J. Keeler. "Differing Faculty and House Staff Acceptance of an Electronic Health Record." *International Journal of Medical Informatics* 74, nos. 7–8 (2005): 657–62.