ACTA INFORM MED. 2013 Mar; 21(1): 36-41

doi: 10.5455/aim.2012.21.36-41
Received: 25 December 2012
Accepted: 20 February 2013

ASSESSMENT OF MEDICAL RECORDS MODULE OF HEALTH INFORMATION SYSTEM ACCORDING TO ISO 9241-10

Asghar Ehteshami[1], Farahnaz Sadoughi[2], Saeed Saeedbakhsh[3], Mahtab Kasaei Isfahani[4]
Department of Health Information Technology Management, School of Health Management and Information Sciences, Isfahan University of Medical Sciences, Isfahan, Iran[1]
Department of Health Information Management, School of Health Management and Information Sciences, Tehran University of Medical Sciences, Tehran, Iran[2]
Department of Computer Sciences, School of Health Management and Information Sciences, Isfahan University of Medical Sciences, Isfahan, Iran[3]
School of Advances Medical Technologies, Isfahan University of Medical Sciences, Isfahan, Iran[4]

Corresponding author: Farahnaz Sadoughi, Associate professor, Health Information Management, Department of Health Information Management, School of Health Management and Information Sciences, Tehran University of Medical Sciences, Tehran, Iran. E-mail: f-sadoughi@tums.ac.ir

Original paper
ABSTRACT
Introduction: Hospital managers and personnel need to Hospital Information System (HIS) to increase the efficiency and effectiveness in their organization. Accurate, appropriate, precise, timely, valid information, and Suitable Information system for their tasks is required and the basis for decision making in various levels of the hospital management, since, this study was conducted to Assess of Selected HIS in Isfahan University of Medical Science Hospitals According to ISO 9241-10. **Methods:** This paper obtained from an applied, descriptive cross sectional study, in which the medical records module of IUMS selected HIS in Isfahan University of Medical Science affiliated seven hospitals were assessed with ISO 9241-10 questionnaire contained 7 principles and 74 items. The obtained data were analyzed with SPSS software and descriptive statistics were used to examine measures of central tendencies. **Results:** The analysis of data revealed the following about the software: Suitability for user tasks, self descriptiveness, controllability by user, Conformity with user expectations, error tolerance, suitability for individualization, and suitability for user learning, respectively, was 68, 67, 70, 74, 69, 53, and 68 percent. Total compliance with ISO 9241-10 was 67 percent. **Conclusion:** Information is the basis for policy and decision making in various levels of the hospital management. Consequently, it seems that HIS developers should decrease HIS errors and increase its suitability for tasks, self descriptiveness, controllability, conformity with user expectations, error tolerance, suitability for individualization, suitability for user learning.
Key words: Hospital Information System, Standard; Medical Records, Software, Assessment, ISO 9241..

1. INTRODUCTION

Today, the management is one of the pillars of development and excellence of health care organizations and powerful, effective, and efficient management system lead to the organization growth, dynamics and survival. So, health care managers and providers should have a good understanding of health information systems Management and take advantage of accurate, timely and reliable data of the systems in decision-making and policy planning (1, 2). Several hospital complex functions need access to information. Hospital information systems, mirrored to reflect the image of the hospital to executive and clinical managers and greater transparency in this mirror makes transparency in the visible image of the hospital (1). Strengthen and improvement in the capabilities and value added of HIS, is the starting point for improving hospital management abilities and has outcomes such as improvement quality of care, scientific management of hospital, health economy improvement, cost saving, growth of Medical Research, Reform policies, facilitating HIS management, documentation, avoiding parallel efforts and medical education development (3-8).

Several factors affect the amount of employee engagement, such as, the utility and flexibility of HIS for the users and the quantity and quality of information, method of data entry, enhanced levels of hardware and its amount (9). So, HIS impact on improving care activities requires an inner desire and commitment for having effective and efficient system in hospital (10). HIS continuous evaluation is necessary to determine the achievement of its goals (11) and will result in appropriate and timely actions in the assessment of the health (5). Due to the multiplicity of objectives, the number of users and complex functions of HIS, its evaluation framework will require comprehensive and realistic criteria (12).

According Ahmadi et al, ISO 9241 standard was proper for evalu-

ating user interaction with HIS (5). Alipour and colleagues assessed ISO 9241 standard the appropriate for HIS in terms of users in children's hospital of Bandar Abbas, Iran (10). Saeedbakhsh and colleagues in their assessment of HIS also came to a similar conclusion (13). According to FarahBakhsh, planning and decision making are two main categories of information deemed HIS (14). Ebadi Azar and colleagues showed that less than half of the clinical staff is partially satisfied of HIS impact on patient care activities. Because, HIS incompatibility with user tasks resulted in not meet the expectations of users and their indifference towards HIS (15, 16). Kimiyafar et al assessed inappropriate quality of HIS's data in Mashhad academic hospitals and otherwise comply with the requirements of the users (17). Habibi and colleagues assessed Golestan University of Medical Sciences academic hospitals managers' knowledge about applicant of HIS in average degree (18). According to Kimiyafar, Causes of low levels of user satisfaction of HIS include problems such as non-matching functions, duties and HIS data quality with needs of users (19). Moradi and colleagues showed that using HIS leads to a significant reduction in hospital length of stay and improves the performance of hospital (20) and to realize the maximum benefits of HIS, it must be evaluated by certain criteria (21). Hamborg and his colleagues showed that in HIS evaluation in large organizations, isometric is the valid technique to support HIS usability scrutiny (22).

Ergonomics refers to the design of a product for a user population; But according to individual differences and complexity of product design for the whole population, standard to be considered for 90% of the medial population. Designing software products Such as HIS must meet the user's needs and expectations and insure his efficiency, effectiveness and satisfaction. ISO 9241 standard has been developed by International Organization for Standardization and contains questionnaire of criteria about software adjustment with its users needs (23).

The part tenth of this standard provides questionnaire for organizing and evaluating of user interfaces (5). The list of questionnaire principles include: suitability for the task, self-descriptiveness, controllability, conformity with the user expectations, error tolerance, suitability for individualization and suitability for learning (24).

Isfahan University of Medical Sciences (IUMS) to implement appropriate HIS in affiliated hospitals, reviewed several HIS software and ran a trial version of them. In this regard, we assessed medical records Module of selected HIS with ISO 9241/10 criteria.

2. METHODS

This paper obtained from an applied, descriptive cross sectional study, in which the medical records module of IUMS selected HIS in Isfahan University of Medical Science affiliated seven hospitals were assessed with ISO 9241-10 questionnaire contained 7 principles and 74 items. The obtained data were analyzed with SPSS software and descriptive statistics were used to examine measures of central tendencies.

3. RESULTS

According to Table 1, the mean score of compliance with ISO 9241-10 principles in the Medical Records module of IUMS selected HIS was 67.5%. The most score of compliance was related to conformity with the user expectations (74.4%) and the least score of compliance was related to suitability for individualization (53.8%).

The mean score of compliance with ISO 9241-10 in the Medical Records module of IUMS selected HIS in following principles were in the range between these two: Suitability for the task (68.6%), self-descriptiveness (67.8%), controllability (70%), error tolerance (69.4%) and suitability for learning (68.8%).

According to the findings in Table 2, in the suitability of software for the user task principle, the most score of compliance with ISO 9241-10 was belonged to full understanding of the user from fields on the screen (87%) and the mean score of compliance was related to find all the information user need on the screen (51.8%). Findings also appeared that, in the self-descriptive principle, the most and the least score of compliance was respectively related to immediate understanding of the messages displayed on the screen by the user (81.2%) and general description and examples with real images show the user if the user needs points (51.2%). In the Controllability principle, the most and the least score of compliance was related to the easy to move the user to previous and next pages (85.8%) and the possible actions for tasks requested by the user (58.8%), respectively. Also, In the Conformity with the user expectations principle, the most and the least score of compliance was respectively related to possibility of predicting next screen by user (89.4%) and difficult tasks by user due to instability in software engineering (62.6%). In addition to, In the Error tolerance principle, the most and the least score of compliance was related to the asking the user to confirm destructive actions (such as deleting data) with 87% and no occurring system errors (e.g. crashes) when user works with the software (49%), respectively. Further, In the Suitability for individualization principle, the most and the least score of compliance was respectively related to easy to adjust to suit the user's level of knowledge and skills (64.8%) and lets user adapt formes, screens and menus to suit his individual preferences (42.4%). Also, In the Suitability for learning principle, the most and the least score of compliance was respectively related to user easy relearn how to use the

Compliance (%)	Principle
68.6	Suitability for the task
67.8	Self-descriptiveness
70	Controllability
74.4	Conformity with the user expectations
69.4	Error tolerance
53.8	Suitability for individualization
68.8	Suitability for learning
67.5	The mean Score of compliance

Table 1. Mean score of compliance with ISO 9241-10 in Medical Records Module of IUMS selected HIS according to the principles

software after a lengthy interruption (85.8%) and the user needed a long time to learn how to use the software (48.2%).

4. DISCUSSION

In the suitability of medical records module of IUMS selected HIS for the user task principle, compliance with ISO 9241-10 criteria was desirable**.** According to Alipour, in HIS of Children's Hospital, System suitability to perform user task was 72.7% (10). Hamburg and his colleagues in Germany calculated it 8/76% (22)**.** Also, Lee's study showed the users satisfaction 72.4**%** and revealed that users' satisfaction with their perceptions of the system impact on productivity was related (25). The findings of these studies confirmed the present study**.** So, it can be noted that medical records module of IUMS selected HIS is relatively suitable for users task. But, HIS development team should pay more attention to the following criteria in the software development life cycle:

- The software should not force user to perform tasks that are not related to his actual work.
- The functions implemented in the software should better support user in performing his work.
- Too many different steps must not need to be performed to deal with a given task.
- The software should well suit to the requirements of user work.
- In a given screen, user should find all of the information he need in that situation.
- The software should provide user with a repeat function for work steps that must be performed several times in succession
- The important commands required to perform use work should be easy to find.
- User should be able to adjust the presentation of results (on the screen, to printer, plotter etc.) to his various work requirements.

In the present study, the self-descriptiveness of the medical records module of IUMS selected HIS compliance with ISO 9241-10 criteria was

Compliance (%)	Criteria	Principle
61.2	The software forces me to perform tasks that are not related to my actual work.	Suitability for the task
73	The software lets me completely perform entire work routines	
65.8	The functions implemented in the software support me in performing my work.	
73	The way in which data is entered is suited to the tasks I want to perform with the software.	
87	I perceive the arrangement of the fields on-screen as sensible for the work I do with the software.	
60	Too many different steps need to be performed to deal with a given task.	
80	The way in which data is output is suited to the tasks I want to perform with the software.	
67	The software is well suited to the requirements of my work.	
51.8	In a given screen, I find all of the information I need in that situation.	
75.2	The terminology used in the software reflects that of my work environment.	
65.4	The software provides me with a repeat function for work steps that must be performed several times in succession.	
75	I can easily adapt the software for performing new tasks.	
57.6	The important commands required to perform my work are easy to find.	
62.4	I am able to adjust the presentation of results (on the screen, to printer, plotter etc.) to my various work requirements.	
74.2	The presentation of the information on the screen supports me in performing my work.	
51.8	I can call up specific explanations for the use of the system, if necessary.	Self-descriptiveness
81.2	I understand immediately what is meant by the messages displayed by the software.	
65	It is easy to retrieve information about a certain entry field.	
73.4	When menu items are not available in certain situations, this fact is visually communicated to me.	
51.2	If I want, the software will display not only general explanations but also concrete examples to illustrate points.	
60	The explanations the software gives me clearly refer to the specific situations in which they are output.	
64	If I want, the software displays basic information about conceptual aspects of the program.	
77.2	The software provides me with enough information about which entries are permitted in a particular situation.	
69.4	I can tell straight away which functions are invoked by the various menu items.	
76.4	The terms and concepts used in the software are clear and unambiguous.	
71.2	The software always visually marks the current entry location (e.g. by a highlight, a contrasting color, a blinking cursor, etc.).	
76.2	I can easily tell the difference among feedback messages, requests to confirm inputs or commands, warnings, and error messages.	
67.6	The possibilities for navigating within the software are adequate.	Controllability
80	The software makes it easy for me to switch between different menu levels.	
77.6	The software let me return directly to the main menu from any screen.	
68.8	I can interrupt any dialog at any time.	
58.8	It is always easy for me to evoke those system procedures that are necessary for my actual work.	
85.8	It is easy for me to move back and forth between different screens.	
62.6	The software allows me to interrupt functions at any point, even if it is waiting for me to male an entry.	
62.6	The navigation facilities of the software support optimal usage of the system functionality.	
77.6	In order to perform my tasks, the software requires me to perform a fixed sequence of steps.	
62.4	When selecting menu items, I can speed things up by directly entering a letter or a command code.	
65.4	It is always possible to abort a running procedure manually.	

89.4	I can anticipate which screen will appear next in a processing sequence.	Conformity with the user expectations
65.8	I have no difficulty in predicting how long the software will need to perform a given task.	
64.6	The designations are used consistently in all parts of the software I am familiar with.	
82.8	I find that the same function keys are used throughout the program for the same functions.	
67.2	When executing functions, I have the feeling that the results are predictable.	
78.6	My impression is that the same possibilities are consistently available for moving within and between different parts of the software.	
77.6	The messages output by the software always appear in the same screen location.	
62.6	The software is inconsistently designed, thus making it more difficult for me to do my work.	
82.4	When working with the software, even small mistakes have sometimes had serious consequences.	Error tolerance
63.6	Even if I make a mistake, the information (e.g. data, text, and graphics) which I have just entered is not lost.	
80	If I make a mistake while completing a form, I can easily restore everything to its previous state.	
87	When I attempt to perform a destructive operation (e.g. deletion of data etc.), I am always first prompted to confirm the action.	
69.4	My impression is that very little effort is involved in correcting mistakes.	
64.8	When I make entries, they are first checked for correctness before further processing is initiated.	
49	No system errors (e.g. crashes) occur when I work with the software.	
76.4	If I make a mistake while performing a task, I can easily undo the last operation.	
72	I have never made an entry that caused a software error (e.g. a system/program crash or an undefined dialog state).	
57	The software includes safety features to help prevent unintended actions (e.g. critical keys spaced well apart, highlights, designations that are not easily confused).	
68.2	The software provides me with useful information on how to recover from error situations.	
73	I perceive the error messages as helpful.	
58.6	In some situations the software waits too long before calling attention to wrong entries.	
61.4	The software warns me about potential problem situations	
64.2	The software lets me keep the original data even after it has been changed.	
42.4	The software lets me adapt formes, screens and menus to suit my individual preferences.	Suitability for individualization
68.2	The software can be easily adapted to suit my own level of knowledge and skill.	
50.6	I am able to adjust the amount of information (data, text, graphics, etc.) displayed on-screen to my needs.	
45.8	The software lets me change the name of commands, objects and actions to suit my personal vocabulary.	
63.8	I can adjust the attributes (e.g. speed) of the input devices (e.g. mouse, keyboard) to suit my individual needs.	
48.2	I needed a long time to learn how to use the software.	Suitability for learning
85.8	It is easy for me to relearn how to use the software after a lengthy interruption.	
68	The explanations provided help me understand the software so that I become more and more skilled at using it.	
78.8	So far I have not had any problems in learning the rules for communicating with the software, i.e. data entry.	
60	I was able to use the software right from the beginning by myself, without having to ask coworkers for help.	
73.4	I feel encouraged by the software to try out new system functions by trial and error.	
56.4	In order to use the software properly, I must remember a great many details.	
80	I find it easy to use the commands.	

Table 2. Mean score of compliance with ISO 9241-10 in Medical Records Module of IUMS selected HIS according to the criteria

relatively desirable. Hamburg and Alipour, in their studies reached the same results in this field (10, 22). It can be said that, regarding self-descriptiveness, the medical records module of IUMS selected HIS software, has the ability to meet the Users needs. But, HIS development team should pay more attention to the following criteria in the software development life cycle:

He should be able to call up specific explanations for the use of the system, if necessary.

It should be easy to retrieve information about a certain entry field.

If user wants, the software must display not only general explanations but also concrete examples to illustrate points.

The explanations the software gives user should clearly refer to the specific situations in which they are output.

If user wants, the software must display basic information about conceptual aspects of the program.

In the present study, the controllability of the medical records module of IUMS selected HIS compliance with ISO 9241-10 criteria was relatively desirable. Alipour and Hamburg, also, in their studies found the same results in this field (10, 22). Although, in the present study controllability criteria in software development processes have somewhat taken part, to increase controllability of medical records module of IUMS selected HIS, the following criteria are essential to promote:

- It should always be easy for user to evoke those system procedures that are necessary for his actual work.
- The software should allow user to interrupt functions at any point, even if it is waiting for him to male an entry.
- The navigation facilities of the software should support optimal usage of the system functionality.
- When selecting menu items, user should be able to speed things up by directly entering a letter or a command code.
- It should always be possible to abort a running procedure manually.

In the present study, the conformity of the medical records module of IUMS selected HIS with the user expectations compliance with ISO 9241-10 criteria was relatively desirable. Alipour and Hamburg in their studies found the same results in this field, too (10, 22). According to Darbyshire, HIS user-friendliness features (its conformity with the user expectations) include: ease of access, access to terminals, trans-

parent computer screens, doctors and nurses use the forms and charts for easy understanding, help users, access to reminders, printing of documents required, speed and the ability to meet user (26). According to Kimiafar and colleagues, 53.2% of users are relatively satisfied with the quality of HIS data (17). Also, EbadiAzar and colleagues Stated that the most important factors for users' satisfaction of the HIS include: easy to learn, easy to use system (independent of the roles and responsibilities of members) and effective maintenance of system. They also, recommended that more financial, human and technical investment requires approaching the expectations and needs of the organization and users (27).

The findings of this study about conformity with the user expectations are better than the three above and Implies that the precision and focus of IUMS selected HIS development team was in compliance with these criteria. We recommend furthering adapting to the needs of software users; the development team considers the following criteria in the software upgrade cycle:

- The user should not have any difficulty in predicting how long the software will need to perform a given task.
- The designations are used consistently in all parts of the software user should familiar with.
- When executing functions, user should have the feeling that the results are predictable.
- The software should consistently design, thus making it easier for user to do his work.

In the present study, the error tolerance of the medical records module of IUMS selected HIS compliance with ISO 9241-10 criteria was relatively desirable (69,4%). The Children's Hospital of BandarAbbas and Hamborg's study in Germany met these criteria 69.6% and 72.6% respectively (10, 22) and have the same results as the present study. Masarat and colleagues in Shohadaye Tajrish Hospital Concluded that in doctors opinion, this system plays a great role in reducing medical errors when entering the orders (10). This finding aligned with the present study. It can be inferred that the medical records module of IUMS selected HIS is relatively error tolerant. To improve the situation, the following criteria will be useful to the development team:

- Even if user makes a mistake, the information (e.g. data, text, and graphics) which he has just entered should not be lost.
- When user makes entries, they should be first checked for correctness before further processing is initiated.
- Any system errors (e.g. crashes) should not be occurring when user works with the software.
- The software should include safety features to help prevent unintended actions (e.g. critical keys spaced well apart, highlights, designations that are not easily confused).
- The software should not wait too long before calling attention to wrong entries.
- The software should warn user about potential problem situation.
- The software should let user keep the original data even after it has been changed.

In the present study, the suitability for individualization in the medical records module of IUMS selected HIS compliance with ISO 9241-10 criteria was moderate (53.8%) that was lower than all of the other ISO 9241-10 criteria. These criteria were in better condition in Children's Hospital of BandarAbbas HIS than the present study was (10). To improve this situation, we recommend that the development team of IUMS' HIS promote the following criteria:

- The software should let user adapt forms, screens and menus to suit his individual preferences.
- User should able to adjust the amount of information (data, text, graphics, etc.) displayed on-screen to his needs.
- The software should let user change the name of commands, objects and actions to suit his personal vocabulary.
- The user should be able to adjust the attributes (e.g. speed) of the input devices (e.g. mouse, keyboard) to suit his individual needs.

Finally, the Suitability for learning in the medical records module of IUMS selected HIS compliance with ISO 9241-10 criteria relatively desirable (68.8%). To improve this situation, we suggest that the HIS development team promotes the following criteria in the software development life cycle:

- User should not be needed a long time to learn how to use the software.
- The user should be able to use the software right from the beginning by him-self, without having to ask coworkers for help.
- In order to use the software properly, the user must not remember a great many details.

In general, we recommend that IUMS HIS should be revised and promoted in software development life cycle phases. Also, to improve this situation, the following suggestions are offered:

Member representatives participate in the development of HIS, obtain business needs and expectations of their job, and HIS development based on the needs and expectations

Developing and strengthening of HIS team and invited experts of network, telecommunication, hardware, software, health information management, health information technology, health services management, user representatives (as the case), the representatives of stakeholders who will use the system outputs, for active participation in the activities of the HIS development phases (28-32).

HIS Developing in Information Systems Development Life Cycle frameworks and follow their all scientific steps phases and steps.

Taking advantage of national and international interoperability standards between systems to provide flexibility and facilitate the data interchange between disparate systems. With user-friendly graphical user interface, the system will be easy to use by users (Graphics participation in HIS development team can be helpful in this regard).

5. CONCLUSION

In general, the study findings revealed that the medical records module of IUMS selected HIS compliance with ISO 9241-10 criteria was relatively desirable. The following criteria were better: conformity with the user expectations, controllability, error tolerance, suitability for learning, suitability for the task, self-descriptiveness. But, criteria of suitability for individualization were not desirable. HIS should have more of these criteria in order to realize the goals of its existence. Therefore, steps must be done to develop and promote a favorable situation. In selecting or implementing steps for development of the existing HIS, ISO 10/9241 principles meeting will be effective.

Acknowledgment

This study was funded and supported by Isfahan university of medical sciences (IUMS); Grant no. 287144.

REFERENCES

1. Lippeveld T, Sauerborn R, Bodart C. Design And Implementing of Health Information System.Translation: Farzadfar, Farshad. et al. Tehran, Kelke Deerin Press, 2005: 1-2 [Persian].
2. Heywood A. Rhode J. Using Information for Action. Translation: Zare, Mohammad. Zahravi, Farahnaz. Tehran, Simindokht Press. 2005: 1-4 [Persian].
3. Tabibi J, Ebadi Azar F, Tourani S, Khalesi N. Total Quality Management in Health System. Tehran, Jahan Rayaneh press. 2001 [Persian].
4. Farshid P. Views of Medical Records Department Administrators and Medical Records Faculties Towards the Medical Records Graduated Participation in Hospital Information System development. Master Thesis in Medical Records Education Degree. Iran University of Medical Sciences. Tehran, Iran, 2002 [Persian].
5. Shahmoradi L. Developing a model for Hospital Information System Assessment. Master Thesis in Medical Records Education Degree. Iran University of Medical Sciences. Tehran, Iran, 2004 [Persian].
6. Backker AR, Ehlers CT, Bryant JR, Hammond WE. Hospital information systems: Scope-design-architecture. Amsterdam: B.V. publisher. 1992.
7. Aqajani M. Comparative and analytical Study of Hospital Information Systems. Journal of Teb o Tazkieh. 2002; 47: 29 [Persian].
8. Tanner M, Lengeler C. From the efficacy of disease control tools to community effectiveness. Transactions of the Royal Society of Tropical Medicine and Hygiene, 1993; 87: 518-523.
9. Likourezos A, Chalfin DB, Murphy DG, Sommer B, Darcy K, Davidson SJ. Physician and nurse satisfaction with an Electronic Medical Record system. J Emerg Med. 2004; 27: 419-424.
10. Alipour J, et al. Users Views Aabout Seven Criteria of ISO9241/10 for Implemented HIS in Bandarabas Children's Educational Hospital. Medical Journal of Hormozgan. 2010; 14(2): 140-147 [Persian].
11. Alvarez RC, Zelmaer J. (1998) Standardization in health informatics in Canada. In: Cronholm Stefan, Goldkuhl Goran. Six generic types of information systems evaluation. The 10 th European Conference on Information Technology Evaluation (ECIT-2003), 25-26 September 2003, Madrid. Available from: http://www.ejise.com/volume6-issue2/issue2-art8-cronholm.pdf Accessed March 27, 2004.
12. Friedman C, Wyatt J. Evaluation methods in medical informatics. In: Wyatt Jeremy C., Wyatt Sylvia M. When and how to evaluation health information systems? {serial online}. International Journal of Medical Informatics. 2003 Mar, 69(2-3), PP 251-259. March 27, 2004, Available from: http://Sciencesdirect.com/sciences2ob=articeurl&udi=b617s48pm64w3&u. Accessed April 14, 2004.
13. Saeedbakhsh S, Sadoughi F, Ehteshami A, Kasaei Isfahani M. Assessment of Ability of User Education in Medical Records Module of Selected HIS in Isfahan Univrsity of Medical Sciences. Iranian Journal of Medical Education. 2011; 10(5): 877-885 [Persian].
14. Farahbakhsh M, Fozounkhah S, Hasanzadeh A, Houshian E, Khodaei N, Asemani N. Views of Health Planning Managers and Personnel About Health Information System in Tabriz University of Medical Sciences. Journal of Health System. 2007; 9(26): 15-22 [Persian].
15. Ebadi Azar F, Kahooyi M, Soleimani M, Ghazavi S. Hospital Information Computer network effects on Health Care Quality in Amirolmomenin Hospital's Wards in Semnan University of Medical Sciences. Journal of Health System. 2008; 11(31): 7-16 [Persian].
16. Anderson JG. Clearing the way for physicians' use of clinical information systems. Communications of the ACM.1997: 40; 83-90.
17. Kimiyafar K, Moradi G, Sadooghi F, Sarbaz M. Views of users towards the quality of hospital information system in training hospitals affiliated to Mashhad University of Medical Sciences. Journal of Health Information Management. 2007; 4: 43-50 [Persian].
18. Habibi Koulaei, Hussein pour K, Mobashri E, Behnam pour N. The Hospitals Managers Awareness and Attitude about Hospital Information Systems Usage. Journal of Health Management. 2008; 10(30): 43-50 [Persian].
19. Kimiyafar K. A study on the views of users about the quality of hospital information system in training hospitals in Mashhad University of Medical Sciences. Tehran: Iran University of Medical Sciences and Health Services: 2006; 55 [Persian].
20. Moradi G, Sarbaz M, Kimiyafar K, Shafiei N, Setayesh Y. Hospital Information System Role in Sheikh Hospital Performance Improvement in Mashhad. Journal of Health Information Management. 2008; 5(2): 159-166 [Persian].
21. Abdelhak M, Grostick S, Hanken AM, Jacobs E. Health information: management of a strategic resource. 3rd ed. USA: WB. Saunders, 2007.
22. Hamborg KC, Vehse B, Bludau HB. Questionnaire based usability evaluation of hospital information systems. Electronic Journal of Information Systems Evaluation. 2004; 7: 21-30.
23. Rashid Najafi F. Suitable Design: The Effective System for the All Users. Weekly journal of Standard: Internal Journal of Iranian Institute for Standard and Industrial Research. 2010; 982: 7 [Persian].
24. Maryam A, Rezaei-Hachesoo P, Shahmoradi L. Electronic health record: structure, content, and evaluation. Tehran: Jafari Publication; 2008 [Persian].
25. Lee F, Teich JM, Spurr CD, Bates DW. Implementation of physician order entry: user satisfaction and self-reported usage patterns. J Am Med Inform Assoc. 1996; 3: 42-55.
26. Darbyshire P. User-friendliness of computerized information systems. Comput Nurs. 2000; 18: 93-9.
27. Ebadi Fardazar F, Ansari H, Zohour A, Marashi SS. Study of users' attitudes about the computerized hospital information systems (HIS). Payesh, Journal of The Iranian Institute For Health Sciences Research. 2007; 6: 11-18 [Persian].
28. Toromanovic S, Masic I, Novo A, Kudumovic M, Zunic L. Criteria how to Choose Adequate Methodology and Relevant Variables for Assessment of Quality of Primary Health Care. Med Arh. 2005; 59(1): 23-26.
29. Novo A, Masic I, Toromanovic S, Loncarevic N, Junuzovic Dz, Dizdarevic J. Family Registration Card as Electronic Medical Carrier in Bosnia and Herzegovina. Med Arh. 2004; 58(1, suppl. 1): 37-40.
30. Sabanovic Z, Masic I. Computerized Information System Support in Continous Quality Improvement in Hospital Care. Med Arh. 2001; 55(2): 113-116.
31. Masic I, Niksic D. Quality and Quality Assurance in Health Care. Med Arh. 2003; 57(3): 189-196.
32. Prnjavorac B, Ajanovic E, Masic I. et al. Y2K in Medical Practice. Med Arh. 1999; 53(3, suppl. 3): 13-14.