

The Evaluation of SEPAS National Project Based on Electronic Health Record System (EHRS) Coordinates in Iran

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ABSTRACT

Background: Electronic Health Records (EHRs) are secure private lifetime records that can be shared by using interoperability standards between different organizations and units. These records are created by the productive system that is called EHR system. Implementing EHR systems has a number of advantages such as facilitating access to medical records, supporting patient care, and improving the quality of care and health care decisions. The project of electronic health record system in Iran, which is the goal of this study, is called SEPAS. With respect to the importance of EHR and EHR systems the researchers investigated the project from two perspectives: determining the coordinates of the project and how it evolved, and incorporating the coordinates of EHR system in this project. **Methods:** In this study two evaluation tools, a checklist and a questionnaire, were developed based on texts and reliable documentation. The questionnaire and the checklist were validated using content validity by receiving the experts' comments and the questionnaire's reliability was estimated through Test-retest ($r = 87\%$). Data were collected through study, observation, and interviews with experts and specialists of SEPAS project. **Results:** This research showed that SEPAS project, like any other project, could be evaluated. It has some aims; steps, operational phases and certain start and end time, but all the resources and required facilities for the project have not been considered. Therefore it could not satisfy its specified objective and the useful and unique changes which are the other characteristics of any project have not been achieved. In addition, the findings of EHR system coordinates can be determined in 4 categories as Standards and rules, Telecommunication-Communication facilities, Computer equipment and facilities and Stakeholders. **Conclusions:** The findings indicated that SEPAS has the ability to use all standards of medical terminology and health classification systems in the case of Maksa approval (The reference health coding of Iran). ISO13606 was used as the main standard in this project. Regarding the telecommunication-communication facilities of the project, the findings showed that its link is restricted to health care centers which does not cover other institutions and organizations involved in public health. The final result showed that SEPAS is in the early stages of execution. And the full implementation of EHR needs the provision of the infrastructure of the National Health Information Network that is the same as EHR system.

Key words: Project evaluation, SEPAS project, Electronic Health Records (EHR), Electronic Health Records System (EHRS).

1. INTRODUCTION

Electronic Health Records (EHRs) are secure and private lifetime records that describe a person's health history and care. They are made up of information from a variety of sources, including hospitals, clinics, doctors, pharmacies, and laboratories. This information is critical for treatment and is accessible to health care professionals (1). It contains retrospective, concurrent, and prospective information and its primary purpose is to support continuing, efficient and quality integrated health (2,

3). According to Munoz quoting based on the National Alliance for Health Information Technology: an electronic health record is an electronic record of health related information of an individual that conforms to nationally recognized interoperability standards and can be created, managed, and consulted by authorized clinicians and staff across more than one health care organization (4). EHR Electronic Health Records is considered as the output of the Electronic Health Records system (5). Lehmann says that EHR systems (EHR-S)

are defined as “the set of components that form the mechanism by which EHRs are created, used (accessed, edited, and amended), stored and retrieved; including people, data, rules and procedures, processing and storage devices, and communication and support facilities (6). EHR system facilitates access to patients’ medical records, improves the quality of care and the accuracy of treatment decisions, achieves cost savings, promotes clinical research (7), provides a better communication between primary and secondary care providers, and improves timely access to care (8). EHR systems also provide doctors with sophisticated decision support tools, which will raise the public expectations concerning the quality of medical treatments (7). The Ministry of Health in Iran in 2007 approved the national project as electronic health records system (SEPAS) in order to create a national network of health information and implement the health information records (9) and since then, the Management Centre of Statistics and Information Technology of this ministry has taken the responsibility to perform it (10). According to Higher Health Council Resolution of 29 January 2008, the Ministry of Health in Iran should develop the operational plan and administrative regulations for implementation and development of electronic health records (Citizens Health Information System) within a year. To this end, the Ministry of Health should collaborate with the Ministry of Welfare and Social Security, Communications and Information Technology, the country’s Supreme Council of Information and Technology, the Supreme Council of Informatics and Legal Medicine Organization. This operational plan should be pursued in a 10-year period (11). SEPAS project is designed to create EHR with the aim of making one (or several) center to concentrate on all individuals’ health information in the country. Considering the fact that a project is a unified set of shared activities with definite start and endpoint undertaken by an individual or organization to meet specific objectives within a defined schedule, cost and performance parameters (12). One of the most important things is that the project must solve a concrete problem in a concrete area. Also, it is important that the concrete problem is solvable in the context of your project (13). Due to the crucial role of EHR and EHR system in improving the quality of care and its effectiveness and considering that SEPAS project is an EHR system, a careful evaluation is required to ensure its proper implementation. Therefore in this research, SEPAS project was investigated from two aspects: firstly it was examined to see if the project coordinates and its completion process were in accordance with the specified plan or not. And second, to see if the project coordinates are in accordance with an EHR system. The results can be beneficial for policy makers, managers and health care providers, because they provide access to the information and create a valuable source for identifying obstacles and defects and also opportunities and strengths. This causes the project to run in the right direction with fewer human and financial resources which leads to the improvement of efficiency and the quality promotion of health system services.

2. METHODS

In order to evaluate SEPAS project, first the EHR system coordinates were determined through study, literature review and accredited documentation and it was used as a cri-

terion for evaluation. Then, SEPAS project coordinates were identified using a questionnaire and checklist that was based on the specified criteria mentioned above, through observations and interviews. The interviewees were specialists and experts who were selected from 3 main groups including: those who have started SEPAS project in the Research and Development Assistance in Management Center of Statistics and Information Technology of Ministry of Health, Naji Research and Development company that is depending on the Police Cooperation Foundation of the Islamic Republic of Iran, Medical Sciences Universities (Iran, Tehran, Shahid Beheshti, and Urmia Universities of Medical Sciences). The collected data were analyzed based on the objective of the research. The validity of the questionnaire and the checklist was determined through content validity by the experts and questionnaire reliability was confirmed through test-retest, in a process in which the questionnaire was given to eleven members of SEPAS project specialists and experts and the responses were collected. Then, two weeks later this questionnaire was presented to the same individuals and correlation coefficient between relevant responses ($r = 87\%$) was determined.

3. RESULTS

3.1. Positive features of SEPAS project:

- Having start and end time,
- Having a certain objective,
- Being evaluative,
- Having implementable phases and steps.

But despite these mentioned features, other requirements of the project are not met. These requirements include:

- Failure to achieve project objectives.
- Failure to use the entire set of resources and facilities needed,
- Failure to make beneficial changes so far,
- Non-conformity between performed operations and specified implementable steps of the project.

3.2. EHR system coordinates and SEPAS project

EHR Terminology and Health classification systems standards and SEPAS projects

Research findings argue that EHR uses different standards as CPT (Current Procedural Terminology), ICD (International Classification of diseases), DRG (Diagnosis Related Groups), LOINC (Logical Observation Identifiers Names and Codes), SNOMED (Systematized Nomenclature of Medicine) for Coding and naming existing expressions and terminologies. In SEPAS project, there is also the possibility to use all the classification and nomenclature systems because of the existence of the type of data-coded text, at the middle ware of SEPAS, based on the approval of Maksa Committee (The reference health coding of Iran). This committee is formed at the Statistics and Information Technology Unit of the Ministry of Health, Medical and Education, and it determines the required priorities about the mentioned Standards based on the international system.

EHR data exchange standards and SEPAS project

According to the findings, data exchange standards used in EHR include standards such as HL7, ISO/EN 13606, DICOM (Digital Imaging and Communications in Medicine), ASTM1381, CENENV12539. Since interoperability is

based upon data exchange, SEPAS project used the fifth part of the ISO13606 standard for data exchange.

EHR structure and content standards and SEPAS project

The findings indicate that different organizations are active in developing the EHR structure and content standards (such as ISO/TS18308, CENEN13606EHR.com, OPEN EHR, ASTM1384, ISO/TR.20514), among which ISO13606 (parts: 1, 2, 3), ISO/TS18308, OPEN EHR, ISO/TR.20514 were used by SEPAS.

EHR data confidentiality and privacy standards, rules and SEPAS project

Different standards and rules such as Family ISO/IEC27000, CENENV13608, Health Insurance Portability and Accountability Act (HIPAA), and the Federal Information Security Management Act (FISMA) exist to observe the confidentiality and security of EHR data. The data security and confidentiality standards of SEPAS project is the fourth part of ISO13606 except which no special security and confidentiality rule has been considered.

Telecommunication-Communication facilities of EHR systems and SEPAS project

The findings of this study suggest that in order to establish an EHR system, the health care computer networks should be linked together at 2 levels. First, the health care computer networks of medical centers in each province must be linked together. Second, these connected centers should be linked to other centers at different provinces to make a national network.

In SEPAS project, this mentioned link among health care computer networks is partially established at province level. This means that in SEPAS project all centers and institutions that deal with health care services are not connected with each other and as a result, the national health information network has not been established yet.

Computer equipment and facilities of EHR system and SEPAS project

EHR system uses several hardware and software equipment to expedite and facilitate the collection of required data, due to its extension. SEPAS Project also uses hardware equipment (such as HIS server in the hospitals, application servers and database deployed in the Universities of Medical Sciences, SEPAS servers deployed in Ministry of Health, computers, switches, routers, ADSL and software facilities (such as Hospital Information Systems (HIS), Laboratory Information Systems (LIS), Pharmacy Information Systems, SEPAS middle ware, Software for special services like registration of heart attacks, flu, mortality, etc., Software for exchanging and sending information from HISs to SEPAS middle ware, monitoring system, archetype editor, base of data management, operating system each of which covers one dimension of program implementation.

EHR stakeholders and SEPAS project

The findings show that EHR can be useful for the public, patients or their representatives, health professionals and managers, health policy makers, scholars and researchers, insurance agencies, law enforcement, public health and behavioral centers in urban and rural areas.

The stakeholders of SEPAS project include citizens, health service providers, organizations involved in the health system

management, census organization, legal organizations, insurance organizations, health care providers, teachers and medical students and researchers.

4. DISCUSSION

Projects have become a new way of accomplishing and managing business activities that usually involve various activities which produce quantified and qualified activities that achieve the overall objective when combined together (14). A key indicator of a project's success is its start and end time (15), because time is the most valuable resource in a project and without proper time management, a project can head towards serious problems (16). The timing schedule for SEPAS project began in 2007 and it is supposed to be completed in 2017. Another feature of any project is having objectives which help frame the project by determining the requirements of achieving the objectives. This helps you identify the risks and allows you to provide estimates on effort, duration and cost (17). The objective of SEPAS project was to create EHR which includes all the health information before birth and after death. This objective is achieved only when the information of all organizations and centers directly or indirectly involved in health care services are linked together under a national health information network.

However, in SEPAS project the creation of a national network of health information is not achieved because the required link for creating a national health information network which enables data exchange is only partially made amongst some health care units. Even this exchange is not complete, because of the lack of facilities such as unavailability of ways to some regions and failure to establish links with other organizations that are somehow involved in the public health (Insurance companies and health research centers). Any project should also have resources, facilities, components and equipment required to complete the project and to achieve the objectives (18, 19). These sources can include people, software, hardware, and other components needed and the integration of the components for the implementation of the project (20). In SEPAS project in order to create EHR system and interoperability HER (21), the use of interoperability standards (22), the existence of networking communication infrastructure, technological infrastructure including software and hardware and other equipment for processing and storage are necessary to provide the basic information to create a broad national dialogue for electronic health information (23, 24, 25). Moreover, to cooperate in implementing EHR and to support its productive system, stakeholders should be aware of its benefits that lead to the creation of an integrated care system (26, 27). These benefits provide expanded access to the safety health care information, improve health care and reduce the risks and medical complications, prevent the repetition of information, reduce waiting lists, improve the effectiveness of health and education, support management and medical decision-making processes and adopt policies for future (26, 28). As an EHR system, SEPAS has a variety of standards for the structure, content, health terminology and classification, data exchange, security and confidentiality to provide interoperability uses. However, the application of all these standards in SEPAS is restricted to a limited number of health care centers which makes a barrier for achieving a national health infor-

mation network.

On the other hand, SEPAS middle ware uses security methods to maintain the confidentiality of patients' information and to exchange information with all available information exchange services. Yet, no specific security rule is provided. As in America HIPPA establishes a national set of minimum security standards for protecting all electronic patient health information. The Security Rule contains the administrative, physical, and technical safeguards.

All stakeholders, users and administrators have access to the information records with respect to their position and benefit to conduct health and medical missions and related planning. Because the Electronic Health Records system is citizen-based and comprised of the citizens' health information, the health service provider centers and the health care providers which are the basic servers with a direct impact on citizens' health information, can be considered as the main and key beneficiary of EHR system. Organizations such as the centers for management and planning, education and research centers, health care monitoring and control centers, judicial legal centers and policy centers that are effective in improving the quality of health care, should also be considered as stakeholders of SEPAS.

Another feature of any project is to be evaluative (30). Evaluation can be defined as the decisive assessment of defined objectives, based on a set of criteria to solve a given problem (31). A comprehensive EHR Technology Assessment will help you better understand the current state of your technology and prepare your practice for EHR adoption and future needs. Resulting assessment will outline our findings and provide a prioritized list of recommended actions to take to meet your objectives (32).

Evaluating SEPAS project based on the EHR system coordinates will determine its advantages, opportunities, barriers, and deficiencies until reaching the optimum level. These will lead to optimizing opportunities, eliminating barriers and taking appropriate and timely corrective actions for policy codification and infrastructure needed to create a national health information network. Also, a project must be unique. This means that the final result of the project is a product or a service that did not exist before and is presented for the first time (33). Because projects stem from new ideas, they provide a specific response to a need (problem) in a specific context. They are innovative (30). In Iran, the information systems have operated in a distributed and non-centralized way and are more focused on financial goals. Therefore, it can be said that these characteristics do exist only if SEPAS project could have provided the infrastructure required to develop a national health information network and EHR.

In addition to what mentioned above, each project will usually divide into several project phases to improve project management and provide links to the ongoing operations of the performing organization (34). These phases are determined based on the project requirements (Complexity, size, resources, etc.) which represent achievements and major works that are performed in the project management process (34). In this regard, SEPAS project also include the following operational phases:

a) The first Phase (study and recognition 2007-2008): The activities in this phase are, investigating common health ap-

plications in the country, checking top experiences in the world and international standards in the implementation of health systems especially "Electronic Health Record".

b) The second phase (architecture 2008-2009): In this stage the key dimensions such as the selection of the technology of the electronic health record system, the security of electronic health record and the development of a reference model of electronic health records were examined.

c) The third phase (development and deployment 2009-to present): In this phase, the designed software is used in certain areas (10, 35) in more than 46 universities of medical sciences (11, 36). But the remarkable point is that the administrative steps to develop the EHR system and the national health information network have been designed, but not achieved yet.

Another feature of a project is to lead to beneficial changes. The purpose of a project, typically, is to improve an organization through the implementation of business change (37). If SEPAS project leads to developing the national health information network and EHR, then it can lead to the integration of health information which can be shared at any time and in any place. As a result, the quality of health care services will be increased and beneficial changes will take place in the health care system.

5. CONCLUSION

According to the findings of this research, it can be stated that SEPAS project has some features of a project such as having objectives, being evaluative, having some required resources and having operational phases. A positive feature of this project is that it takes into account the coordinates of EHR system and uses them in accordance with the facilities and the existing requirements. However, it has a number of deficiencies. Firstly, it does not significantly consider the confidentiality and specific security. Secondly, the link is currently limited to the health care centers and other organizations that are involved in some form of public health such as insurance companies and health research centers.

In addition, the link between the health care centers is not complete due to the existence of some barriers such as areas located in distant places and lack of hardware and software equipment coverage in those areas. So this project does not cover all required information related to EHR. Thus, the integrity of the data under the national health information network will be disrupted if all required and adequate infrastructures are not included in the implementation of the project. However, considering the available potentials and the developments made to optimize its performance, it can be said that SEPAS has the ability to develop EHR and an electronic health record for every Iranian which can be reached out in near future.

Therefore, with respect to the importance and necessity of flexible technological infrastructure for the integration of information between the health care centers and the necessity of a national health information network for the continuity of all centers involved in the public health, it is recommended that all stakeholders and policy makers in health field move collaboratively to eliminate the barriers and deficiencies and achieve the desired objective within the prescribed time.

Authorship information

Study concept and design, critical revision of the manu-

script for important intellectual content, study supervision, formulation and revised the manuscript performed by Farkhondeh Asadi. Study content and design, revised and approved the final manuscript performed by Hamid Moghaddasi. Study design, read and approved the final manuscript performed by Reza Rabiei. Read and edit the final manuscript performed by Forough Rahimi. Data gathering and drafting of the manuscript performed by Soheila Jahangiri Mirshekarlou.

CONFLICT OF INTEREST: NONE DECLARED.

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