

Analysis of strengths, weaknesses, opportunities, and threats of electronic dental and oral records in clinics of School of Dentistry, Tehran University of Medical Sciences, Iran: A qualitative study

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Original Article

Abstract

BACKGROUND AND AIM: The high-quality data are essential for good patient care, optimal management of oral and dental diseases, and policy-making. Electronic dental and oral records have a key role in managing data in health care organizations. Aim of this article is analyzing strengths, weaknesses, opportunities, and threats (SWOT) of electronic dental and oral record implementation in clinics of School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran, from stakeholder perspectives.

METHODS: A qualitative interpretive case study was conducted at clinics of School of Dentistry in Tehran University of Medical Sciences in 2016. Data were collected through semi-structured interviews. Interviews involved asking questions and getting answers from 15 participants. They were informed about SWOT of electronic dental and oral records. Data were gathered by two researchers during two months. After fulfilling all interviews, all participants were asked to review the transcript and confirm its accuracy. All raw data and recorded interviews were transcribed, coded, and analyzed by two researchers.

RESULTS: The main features in SWOT analysis of electronic dental and oral records were respectively transparency of project implementation stages, absence of mandatory rules and standard business processes, expert and motivated specialists, and finally lack of cultural infrastructure.

CONCLUSION: Use of electronic dental and oral records can help to improve quality of information and ultimately leads to improvement in quality of care. SWOT analysis is an optimal technique for understanding SWOT of electronic dental and oral records.

KEYWORDS: Electronic Health Records; Dental Records; Strengths, Weaknesses, Opportunities, and Threats Analysis; Qualitative Research

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Oral and dental hygiene is very crucial in promotion of community health and quality of life.^{1,2} The 80/20 phenomenon that is an example of it was started in 1989 to promote oral health in Japan. It means retaining of at least 20 natural teeth in the mouth at 80 years

of age.³ Oral diseases are one of the most common chronic diseases and their treatment imposes high costs on individual and community. The report of World Health Organization (WHO) showed that 60-90 percent of school-aged children had dental carries. Also, most adults have same problem

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in most industrialized countries.⁴

Because of the high prevalence of oral diseases (and cancers) and recurrent cumulative nature of caries and periodontal diseases,⁵ the high-quality data are essential for good patient care, optimal management of these diseases, and suitable policy-makings.^{6,7} The Oral Health Assessment and Review Guidelines Scottish Dental Clinical Effectiveness Programme (SDCEP) stated that dental record should be accurate, dated, confidential, secure, contemporaneous, comprehensive, and legible.⁷ High-quality clinical data can be applied to improve quality of care assessment, research, communication between healthcare providers, the defense of malpractice claims, forensic identification of victims, and education and effectiveness of patient care.^{2,6,8} Data have a critical role in decision-making in the health system.⁹ Paper records are not appropriate to achieve these goals in excellent level.¹⁰ Also, WHO proposes to establish oral health information systems for data collection and analysis and better access to global information.¹¹

Electronic health record (EHR) facilitates healthcare professional's access to health information and also improves delivery of healthcare.¹² Like other areas of health, the use of electronic records in this area can help to achieve these goals.¹³ One of the main challenges in dentistry is to access integrated clinical evidence based on information needs and respond to the information needs of dentists for informed diagnoses and treatment.¹⁴ An integrated system in orthodontic clinics makes it possible to connect treatment content and diagnostic records and reduce retrieving and analyzing time. Main features of integrated system are efficient administration of patients, integration of image processing, and harmonization of heterogeneous medical and dental data resources.^{15,16} Integrated information systems provide uniform access interface for users.¹⁷

Electronic dental and oral records collect patients' dental and oral health-related

information electronically with high-quality information helping to make effective decisions based on the signs and symptoms of disease for specialists. It can be used for quality assurance and research.^{18,19} This electronic record can be applied for dental students' education.^{20,21} In recent years, the use of the electronic dental and oral records has grown significantly.²² This record allows providers to access and analyze patients' dental conditions quickly and easily and show their diagnosis to the patients. Implementing EHR requires different infrastructures, software, hardware, system configuration, documentation, user training and support, report writing, and maintenance of the new system.²³ Due to high cost of implementing information technology (IT) projects, it is important to consider the planning and reviewing of existing infrastructure and implementation priorities.^{23,24}

Strengths, weaknesses, opportunities, and threats (SWOT) analysis as a powerful approach is used for identifying and evaluating strengths and weaknesses as well as opportunities and threats that may exist in a specific business process.^{25,26}

The technical, organizational, and financial factors are involved in EHR implementation, which naturally vary across organizations. Therefore, the successful implementation of this system in one organization does not guarantee its successful implementation in another organization. Accordingly, we need to explore the opportunities, challenges, threats, and strengths of the existing system for more comprehensive planning.²⁷ For example, a study was conducted in Portuguese for SWOT analysis of EHR. Results showed that the system had many strength points such as high security, high accessibility, ease of use, and ability to remotely access the system. The weaknesses were limited including old hardware, insufficient professional education, and inappropriate interface.²⁸

This article explores major threats, opportunities, benefits, and barriers for

implementation of electronic dental and oral records. The result of study can provide the basic strategies for successful implementation of electronic dental and oral records according to the current business conditions and situations, utilizing strengths and opportunities, reducing weaknesses, and eliminating threats.

Methods

This study was approved by Ethics Committee of Tehran University of Medical Sciences, Tehran, Iran. A qualitative interpretive case study was conducted at clinics of School of Dentistry, Tehran University of Medical Sciences in 2016. In the first phase, scientific resources were studied to identify the SWOT of implementing the electronic dental and oral records. In literature review, all books, articles, projects, theses, guidelines, manuals, and reports about subject of study were searched in search engines including Google Scholar, PubMed, ProQuest, ScienceDirect, Web of Science, Cochrane, and Embase. Then, an open-ended questionnaire including SWOT was designed.

The interviewer was a member of research team and informed about interview methods. Interviewer met the participants before interview and set the time for interview. In this meeting, participants received information about the study, research goals, and details of the interview. Also, they became aware about reasons why were selected for interview. Participants were selected through a purposeful sampling. All 15 participants were included in the study. 5 of them were female and 10 of them were male and age range was from 25 to 70 years. This sample provided sufficient numbers to ensure exploration of the fields, and data saturation was reached by the final interviews. These participants were working as employer, resident, and assistant/associate/full professor in their respective departments. All participants who were approached co-operated with the interview and none dropped out. The interviews were conducted

in a single session at the participant's workplace. The researcher explained the purpose of the study and confidentiality of information for participants. Also, researcher asked for consent to audio-record the interviews. Interview duration ranged between 30 and 45 minutes. Interviews were recorded in two separate sources and field notes were taken during the sessions. Interviews involved asking questions and getting answers from participants. They were informed about SWOT of electronic dental and oral records. Participants were asked about SWOT of electronic dental and oral records implementation. Data were gathered by two researchers during two months. After the interviews, all participants were asked to review the transcript and confirm its accuracy. All raw data and recorded interviews were transcribed, coded, and analyzed by two researchers.

Results

A total of 15 participants were interviewed and their transcription time was almost 150 hours. Team members read line by line of all transcripts. In this study, 10 persons (67%) were male and age range was 25-70 years. Frequency distribution of the experts' position is presented in figure 1.

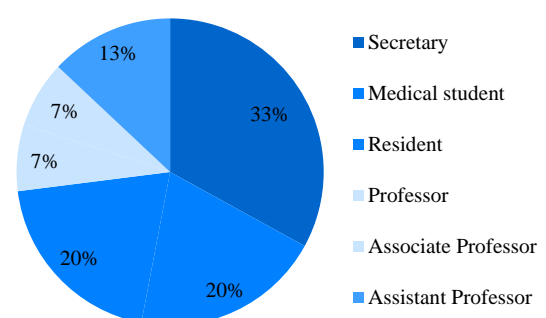


Figure 1. Frequency distribution of the experts' position

In this section, the results of the interviews are presented in four dimensions including SWOT in 4 separate tables (Tables 1-4). The strengths indicate strong aspects of electronic dental and oral records (Table 1).

Table 1. Strengths analysis of electronic dental and oral records implementation

Strengths	Participants' viewpoints
Strengths analysis of electronic dental and oral records implementation	One clinical professional says: "Executives are aware of electronic systems capabilities and enthusiastically support activities in this area." Senior managers commitment and supporting Potential of providing major parts of hardware Collaboration between clinical experts and technical team Private-sector collaboration for system development Transparency in project management by private sector Staff and users confidence to electronic systems Possibility to conduct training workshops for different groups of users Sufficient equipment and space
Example	One clinical professional says: "Executives are aware of electronic systems capabilities and enthusiastically support activities in this area."

The weaknesses present areas where require improvement, and range from personnel issues to organizational factors (Table 2).

Opportunities analysis focuses on identifying process that lead to enhancement of the organization's promotion and excellence (Table 3).

Threats analysis identifies dimensions that are vulnerable and pose a risk to system implementation (Table 4).

Researchers identified the main features of participants' viewpoints about SWOT of electronic dental and oral records (Figure 2).

During reviewing the transcripts, it was found that some themes were noticeable in all participants' interviews. The main subject that was raised in "strengths" was transparency at every stage of the project and most participants considered it critical for success in the project.

In "weakness" analysis, the important feature was absence of mandatory rules, regulation, and standard business processes, while rules and regulations are the main parts of the requirements that are determined for an information system.

Table 2. Weakness analysis of electronic dental and oral records implementation

Weakness	Participants' viewpoints
Weakness analysis of electronic dental and oral records implementation	Lack of strategic and operational planning for electronic dental and oral records design and implementation Lack of motivated healthcare providers Low computer literacy, especially those responsible for managing and distributing information Lack of integrated databases and high-quality information Lack of human resources, especially in data registration Low organizational culture in acceptance of electronic systems, resistance to change, and resistance to new system acceptance Lack of standard work processes Lack of defined, standardized, and native guidelines Technical problems of web-based systems Lack of interest in health care providers to acquire computer skills Lack of adequate funding in this field by managers Time-consuming data entry and increasing workload of service providers in the early stages of system development Technical concerns of information managers and problems for information transfer from past platform to new platform
Example	One technical expert says: "Due to lack of transparent guidelines, process of converting descriptive data to computer rules has problems. The lack of complete clinical information and database integration creates challenges for system deployment. Sometimes, we encounter duplicate and unnecessary data in manual and computer documentation."

Table 3. Opportunities analysis of electronic dental and oral records implementation

Opportunities	Participants' viewpoints
Opportunities analysis of electronic dental and oral records implementation	User-friendly system High-speed data acquisition and processing in system Writing clean code in software Successful and timely deployment of system Adaption of system with existing business processes Meeting information needs of the user Controlling user access to information Drafting and enforcing laws on the extent and type of access to information Integrating system with other information systems System support services Improving the specialists' performance in diagnosis and management of disease Providing appropriate recommendations by reminders and alerts Criticizing health care orders and suggesting solutions to appropriate treatment plans Improving workflow Improved decision-making by managers and professionals Time saving System support from routine daily tasks Early benefits of system Meeting expectations Reducing operational costs Reducing reworks and errors Better forecasting of business revenues and expenses Reducing the problems of managing high-volume data
Example	One of the experts believes that: "The software should be able to search all records at high speed and match the rules. The software codes can be developed by another person. System should be real-time and entered data should be updated promptly. System integration with clinical decision-support systems is essential."

Standard business processes ensure that all activities in the organization are done in the best way. Lack of these two factors is the major weakness in the implementation of system from participants' viewpoints.

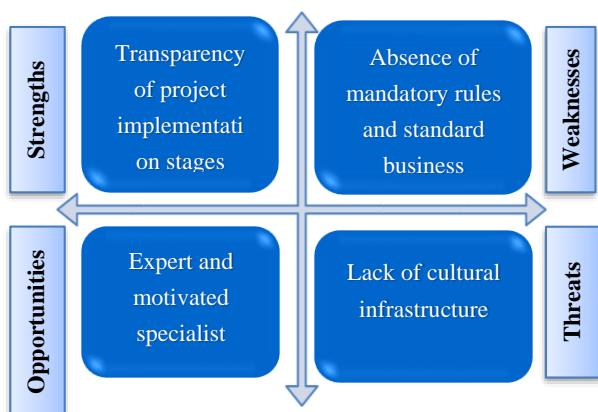


Figure 2. Key points of strengths, weaknesses, opportunities, and threats (SWOT) analysis for electronic dental and oral records implementation

Discussion

The clinical information systems (CISs)

should be developed according to the users' needs and organizational resources.²⁹ The results of SWOT analysis from participants' viewpoint show that system has more opportunities and fewer threats, but the weaknesses are more than strengths that indicates that more effort is needed to eliminate these weaknesses and turn them into strengths, because the strengths of system are one of the main reasons for encouraging investment in IT projects.³⁰ Other strengths to be mentioned include information confidentiality, reducing the possibility of lost records, cost saving, and improving data storage and accessibility.³¹

In this work, weakness points are greater than strengths while in some studies, results show that the system has a lot of strong points and fewer weak ones.²⁸

In our study, there are a lot of opportunities rather than threats while in Kumar and Aldrich study, the threats are greater than opportunities.³²

Table 4. Threats analysis of electronic dental and oral records implementation

Threats	Participants' viewpoints
Threats analysis of electronic dental and oral records implementation	Lack of critical information infrastructure (documents are manual and incomplete) Weak cultural infrastructure and some user resistance Lack of executive laws and regulations for data registration
Example	One expert believes that: "Despite the large amount of dental and oral information, unfortunately, the lack of standards in this area precludes the use of this information; there is no comprehensive database on this issue, and this is one of the concerns of the researchers. Implementing a system without comprehensive information support will definitely bring a lot of problems."

In our study, transparency of project implementation was a salient strength in all participants' interviews. While in the study of Shahmoradi et al., the highest priority in review of strengths from the users' viewpoint was timely and quick access to information.²⁷ Transparency in all phases of project leads to greater cooperation and better understanding of work by team members.^{33,34}

This ultimately will lead to better performance of systems and greater satisfaction of the organization and users.³⁵

The most important issue is the existence of mandatory laws and incentives for successful implementation of system.³² Considering the necessity of having laws, standards, and interoperability at national level, mandatory national law should be enacted for the successful implementation of EHRs.^{36,37}

Lack of infrastructure always has been one of the main challenges in successful implementation of the EHR.³⁸⁻⁴⁰ Lack of organizational culture is one of the most important infrastructures that less attention has been paid to it.⁴¹⁻⁴³ Reforming this culture requires basic and timely work and is one of the factors that can facilitate system implementation. Something that can help solving this challenge can be system design and implementation according to the user needs.^{44,45}

Now, the different incentive programs are used for EHR adoption by users and physicians.⁴⁶ Understanding the benefits of implementing such systems for clinical professionals can be effective in their acceptance and successful implementation.⁴⁷

Because physicians are directly involved with patients and providing care, understanding the amount of quality of care improvement with EHR can have significant impact on their attitude.^{48,49}

Conclusion

The main features in SWOT analysis of electronic dental and oral records were respectively transparency of project implementation stages, absence of mandatory rules and standard business processes, expert and motivated specialists, and finally lack of cultural infrastructure.

The results of various studies prove the importance of dental and oral records. Use of electronic dental and oral records can help to improve quality of information and ultimately leads to an improvement in the quality of care. Also, these data are essential to assess the current situation and take measures to improve. These electronic records have many benefits not only for the healthcare providers but also for the patients. These records can reduce healthcare cost in long term and add new opportunities for organization progress. SWOT analysis improves decision-making and preparedness of organization and informs the organization about forces that could affect the system implementation.

Conflict of Interests

Authors have no conflict of interest.

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