

Decision Support System in Dental Practice. Evaluation of Dental Professionals Acceptance Level

Ghiga Dana¹, Petrișor M², Haifa B², Bacărea V¹, Șchiopu A³

¹ Department of Research Methodology, University of Medicine and Pharmacy, Tîrgu Mureș, Romania

² Department of Medical Informatics and Biostatistics, University of Medicine and Pharmacy, Tîrgu Mureș, Romania

³ Department of Physiopathology, University of Medicine and Pharmacy, Tîrgu Mureș, Romania

Objective: The aim of this study is to assess the level of acceptance by the dental practitioners to implement a software application that allows a presumptive diagnosis of the systemic diseases based on the oral manifestations.

Methods: First we developed a questionnaire to assess the degree of acceptance for the implementation of a dental patient's management information system. The initial questionnaire was applied to a number of 54 dentists from several cities. The questionnaire contains 6 questions evolving from simple to complex. The final evaluation was made after the presentation of the dental patients management software application, and respondents were asked to complete an evaluation questionnaire regarding the application submitted and its applicability in the dental office.

Results: We compared the scores average from the final questionnaire, for the groups formed after evaluating the first questionnaire results.

Conclusions: Most of the respondents found this computer based decision support system to be easy to use, scientifically well documented and enables accurate and quality documentation of patient data.

Keywords: decision support system, dental practice, acceptance, oral manifestations

Introduction

Possible benefits of information technology (IT) and Internet in health care are acknowledged, but not yet widely used. Reminder systems, online prescribing and telemedicine applications are just a few areas where IT has already a major impact on the quality and delivery of health care.

Previous studies [1–4] revealed that using a decision support system can result in improved patient outcomes and in more effective clinical services.

Health information technology implemented new solutions in the medical field in the last decade and will continue to do so in the future [5,6]. Dental information technology, while sharing common features with medical information technology, has its own distinctive characteristics that set this domain apart [7–9]. In a certain way, dental information technology needs for its development aid more than other medical practices. Unfortunately, IT solutions developed for dental use are relatively underdeveloped compared to those available to the wider medical field.

The aim of this study is to assess the level of acceptance by the dental practitioners to implement a software application that allows a presumptive diagnosis of the systemic diseases based on the oral manifestations.

Material and methods

First we developed a questionnaire to assess the degree of acceptance for the implementation of a dental patient's management information system.

Data collection was by sampling using "cluster" samples.

The initial questionnaire was applied to a number of 54 dentists from several cities (Tîrgu Mureș, Timișoara, and Constanța). Physicians surveyed were aged between 30 and 60 years, both female and male.

Thus, by processing the results of the initial questionnaire was intended to obtain answers to three problems:

- Level of computer use in the dental office;
- The level of knowledge and use of a computerized system in dental patient management;
- The level of interest in implementing a dental patient management system that allows also a presumptive diagnosis of systemic diseases based on the oral manifestations.

The questionnaire contains 6 questions evolving from simple to complex. In this way we obtained data regarding the need to develop and implement a management information system for patients in the dental office which includes a module that enables the presumptive diagnosis of systemic diseases.

The questions were elaborated so that the questionnaire evaluation can be made based on scores. In practical terms it is a measurement based on this scores:

1. How often do you use a computer in the dental office?
 - a) Never (0 points)
 - b) Sometimes (2 points)
 - c) Frequently (3 points)
 - d) Always (4 points)
2. The role of a computer in your work in the dental office is:
 - a) Minor (1 point)
 - b) Medium (2 points)
 - c) Important (3 points)
 - d) Essential (4 points)

3. For what purpose you use the computer in the dental office (tick the option closest to your level of knowledge)?
 - a) E-mail (1 point)
 - b) Web browsing (2 points)
 - c) Online documentation (3 points)
 - d) The use of dental patient management software (4 points)
4. The need for an informatic dental patient management system is:
 - a) Minor (1 point)
 - b) Medium (2 points)
 - c) Important (3 points)
 - d) Essential (4 points)
5. If you use a computer for patient management, which programs do you use?
 - a) MS Excel (2 points)
 - b) Structured databases (3 points)
 - c) Software applications (4 points)
 - d) Other ways for patient management (1 point)
6. Do you consider implementing a patient management system that allows a presumptive diagnosis of the systemic diseases to be:
 - a) Beneficial (1 point)
 - b) Important (2 points)
 - c) Necessary (3 points)
 - d) Essential (4 points)

We used the collected data from the questionnaire as follows:

- A. From the first, second and third questions will result the establishment of a "low users" group of the computer in the dental office, and a "regular users" group. Score threshold required for us to differentiate the two groups is 9, value included in the group of "regular users".
- B. The fourth and fifth questions will assess the extent to which medical data are collected using computer technology. For establishing study groups we used a threshold of 5:
 - a. Respondents with scores below 5 are those who don't use or have never used a software application for medical records and patient data management. They will represent the "non-processors" group.
 - b. Respondents with a score equal or greater than 5 will be considered to have knowledge in the use of computers in record keeping and data management and will represent the "processors" group.
- C. The last question will establish the level of acceptance of an informatic system enabling the dental patient management and the presumptive diagnosis of systemic diseases.

As exclusion criteria we used the lack in consistency of the responses from the first three questions.

From the total number of 54 respondents included in the study, four questionnaires could not be processed for reasons of discrepancy between the answers.

The final evaluation was made after the presentation of the dental patient management software application, and respondents were asked to complete an evaluation questionnaire regarding the application submitted and its applicability in the dental office.

The questionnaire included statements concerning the:

- Assessment of satisfaction and computer use in patients data management.
- Evaluation of the software application from the technical point of view.
- Software application evaluation in terms of scientific content.
- Evaluation of the software application in terms of patient medical data management and documentation accuracy and quality.
- Evaluation of the practical utility of such applications.

In order to complete the final questionnaire respondents were asked to give a score from 1 to 10 to the statements contained in the questionnaire.

The statements contained in the questionnaire are presented in the following:

1. The system is easy to learn on its own.
2. The application online format was attractive.
3. Application screens design suites the purpose.
4. The application ran without technical difficulties.
5. The scientific content of the database is relevant.
6. Data input is easy to perform.
7. The module that enables a presumptive diagnosis is useful in practice.
8. The system allows patient data management.
9. Enables accurate and quality documentation of patient.
10. Computer assistance in dental office practice is required.

The final questionnaire was applied to the groups of respondents constituted after the initial questionnaire results and the results were obtained by comparing responses to the four groups.

After applying the final questionnaire, no inconsistency between the answers of any of the respondents was reported.

Questions that were used to test the computer use in the dental office and the use of a patient management system, as well as those from the final questionnaire were tested for consistency in answers using the Friedman test (in order to verify whether the results from several samples – questionnaires – from the same population; the test was applied for variables with multiple responses).

For data analysis there were used elements of descriptive and inferential statistics. Central tendency comparison was performed applying Mann Whitney test for unpaired data. We chose the significance level of 0.05. Statistical

Table I. Average scores for “Low users” and “Regular users” groups

	"Low users"	"Regular users"	p value
1 The system is easy to learn on its own.	6.80±1.26	8.97±0.85	p<0.0001
2 The application online format was attractive.	8.60±0.82	9.02±0.70	p>0.05
3 Application screens design suites the purpose.	8.80±0.67	9.28±0.62	p<0.05
4 The application ran without technical difficulties.	9.46±0.63	9.68±0.47	p>0.05
5 The scientific content of the database is relevant.	8.60±0.98	8.80±0.58	p>0.05
6 Data input is easy to perform.	8.26±0.59	8.77±0.73	p<0.05
7 The module that enables a presumptive diagnosis is useful in practice.	8.60±0.91	9.08±0.81	p>0.05
8 The system allows patient data management.	8.66±0.81	8.91±0.81	p>0.05
9 Enables accurate and quality documentation of patient.	8.86±0.83	9.14±0.77	p>0.05
10 Computer assistance in dental office practice is required.	8.46±1.06	9.11±0.83	p<0.05

Table II. Average scores for “Non-processors” and “Processors” groups

	"Low users"	"Regular users"	p value
1 The system is easy to learn on its own.	8.11±1.36	8.78±0.90	p>0.05
2 The application online format was attractive.	8.96±0.80	9.21±0.79	p>0.05
3 Application screens design suites the purpose.	9.03±0.80	9.47±0.59	p<0.05
4 The application ran without technical difficulties.	8.88±0.93	9.34±0.71	p>0.05
5 The scientific content of the database is relevant.	8.88±0.75	9.08±0.66	p>0.05
6 Data input is easy to perform.	8.33±0.73	9.08±0.73	p<0.05
7 The module that enables a presumptive diagnosis is useful in practice.	8.88±0.97	9.26±0.56	p>0.05
8 The system allows patient data management.	8.77±0.84	9.13±0.81	p>0.05
9 Enables accurate and quality documentation of patient.	8.92±0.87	9.17±0.83	p>0.05
10 Computer assistance in dental office practice is required.	8.66±0.91	9.21±0.85	p<0.05

analysis was performed using GraphPad Prism 5 and SPSS Statistics 17.0 for Windows.

Results

Following the analysis of the initial questionnaire scores, in terms of computer use in dental office, in the “Low users” group there were included 15 respondents (95% CI: 17.9–44.6%), and in the “Regular users” group 35 persons (95% CI: 55.4–82.1%). Regarding the use of patient data management systems, were included 27 respondents in the “Non-processors” group (95% CI: 39.3–68.2%), and 23 persons in the “Processors” group (95% CI: 31.8–60.7%).

In Table I there were compared the average scores obtained for each question in the final questionnaire for the “Low users” and “Regular users” groups.

The scores average obtained for the “Non-processors” and “Processors” groups following the evaluation of the final questionnaire are presented in Table II.

Discussions

Nowadays, most dental offices are equipped with at least a computer system, aspect shown also by our results, specifically the “Low users” group being smaller than the “Regular users” group. In the United States, in dentistry, only 25 percent of all general practitioners used a computer in at least one of their operatories in 2005 [10]. However, not all the dentists that use a computer at the dental office also have patient data management software, the “Non-processors” group being larger than the “Processors”.

An innovative aspect of the studied application is the presence of the module that correlates the oral lesions with

a systemic disease, thus offering the dentist a presumptive diagnosis.

Concerning the online format of the studied application, the fact that it ran without technical problems and the system usability in dental practice allowing patients data management with a high level of accuracy and documentation quality, there were no differences between the average scores of the “Low users” and “Regular users” groups. This could indicate that even the dentists that do not have such a big experience in computing were impressed with the benefits of using a computer based decision support system. Also all the respondents agreed that the database content was accurate and well documented and found the presence of the presumptive diagnosis module to be extremely useful in daily practice, unnoticed a statistical difference between the scores average of the two groups.

The difference in opinion concerning the system’s learning curve, the application’s forms use and its necessity in a dental office could be explained by the lack of experience in computer use of those in the “Low users” group. The same thing could be the cause of some users not understanding the purpose of application’s screens, while the experienced users score average for this feature was close to maximum.

Comparing the scores average for the “Non-processors” and “Processors” groups, we observed a similarity in answers with the “Low users” – “Regular users” groups. This could be explained by the fact that the “Non-processors” group includes most of the persons from the “Low users” group.

Just like other medical fields, this kind of computer based patient's data management software has an increasing number of users. Considering this aspect, these systems could become more valuable for the dental professional, by implementing such presumptive diagnosis modules, besides the data management possibility.

Conclusions

Most of the respondents found this computer based decision support system to be easy to use, scientifically well documented and enables accurate and quality documentation of patient data.

Those respondents with a high level of computing experience consider this application to be required in dental practice.

Acknowledgement

This paper is partly supported by the Sectorial Operational Programme Human Resources Development (SOP HRD), financed from the European Social Fund and by the Romanian Government under the contract number POSDRU 80641.

References

1. Hunt D, Haynes B, Hanna S, Smith K. Effects of computer-based clinical decision support systems on physician performance and patient outcomes: A systematic review. *J Am Med Assoc* 1998;280:1339-46.
2. Garg A, Adhikari N, McDonald H. Effects of computerized clinical decision support systems on practitioner performance and patient outcomes. A systematic review. *J Am Med Assoc* 2005;293:1223-38.
3. Rind D, Safran C, Phillips R, Wang Q, Calkins D, Delbanco T, et al. Effect of computer-based alerts on the treatment and outcomes of hospitalized patients. *Arch Intern Med* 1994;154:1511-7.
4. Evans R, Pestotnik S, Classen D, Clemmer T, Weaver L, Orme J, et al. A computer-assisted management program for antibiotics and other antinfective agents. *N Engl J Med* 1998;338:232-8.
5. Berner ES, Detmer DE, Simborg D. Will the wave finally break? A brief view of the adoption of electronic medical records in the United States. *J Am Med Inform Assoc* 2005;1:3-7.
6. Powell J. NHS national programme for information technology: changes must involve clinicians and show the value to patient care. *BMJ* 2004;328:1029-30.
7. Schleyer T, Spallek H. Dental informatics — a cornerstone of dental practice. *JADA* 2001;132:605-613.
8. Abbey LM. Some comments on the state of dental informatics. *J Dent Educ* 1991;55:647-648.
9. Zimmerman J. Dental informatics: strategic issues for the dental profession. *J Dent Educ* 1990;54:600-601.
10. Schleyer TK, Thyvalikakath TP, Spallek H, Torres-Urquidy MH, Hernandez P, Yuhaniak J. Clinical computing in general dentistry. *J Am Med Inform Assoc* 2006;1:344-352.