

Application of Information Technology by Iranian Dentists: Assessment of Knowledge and Performance

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Abstract

Background and Aim: Advances in medical sciences have increased the volume of medical records and documents. In order to solve this problem, the information technology (IT) is now being applied to improve health care. This study aimed to assess the knowledge of dentists about IT and its application by them.

Materials and Methods: In this analytical cross-sectional study, a validated questionnaire was distributed among 220 dentists participating in the 52nd International Congress of Iranian Dental Association and 120 dentists working in Tehran and included 7 questions about knowledge, 8 questions about background, 10 questions about general use of IT and 3 questions about the professional use of IT. The data were entered into SPSS version 18 software and the statistical analyses were performed by regression modeling.

Results: Of a total of 340 general practitioners, 30.4% were males and 11 dentists (3.6%) stated that they had no access to a personal computer. Some of the most popular sites visited by dentists were Google (94.3%) and Facebook social networking site (69.8%). Among the participants, 64.5% were not familiar with any website related to their special field of work. The mean knowledge score was 5.3 (SD= 2.5). The application of professional IT was more common among men and among those with higher general use of IT.

Conclusion: Most dentists participated in this study had insufficient knowledge about professional IT. The general and professional use of IT was poor by dentists and further instruction and training seem necessary in this respect.

Key Words: Knowledge, Application, Information technology, Dentists

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Introduction

Use of Internet and social networking sites has greatly increased in all fields of science especially medicine [1]. Advances in computer science and Internet have revolutionized the performance of dentists [2]. Patients also benefit from these sources of information. Use of information technology has greatly increased in younger generation patients and physicians [3]. The International Medical Informatics Association has advised the medical staff to enhance their knowledge about infor-

mation technology [4]. Computer as a valuable tool for dental education was first used in 1970s in Kentucky University [5]. Use of Internet in dentistry has numerous advantages such as education of patients and clinicians, cooperation between dentists, Keeping up to date, access to new advancements and products, participation in on-line continuing education programs, dental marketing, managing office costs and patient debts, creating electronic files for patients, etc. [5]. The results of a study conducted in France showed that most

medical universities worldwide use computer networks for instruction in a virtual environment and this method has been recommended to be adopted as the main instruction method [6]. Use of Internet for consultation or educational purposes requires a comprehensive knowledge about its limitations and capabilities. The related advantages and disadvantages can also make its use easier or more difficult [7]. The clinicians using the social networking sites have great responsibility and should be careful not to breach doctor-patient confidentiality by their posts or comments [1]. However, problems such as difference in access to the online information by the users, inadequate expertise to find the desired subject on the Internet, time shortage, busy lines and related costs make the use of Internet difficult [8].

Despite the increasing number of websites in the field of dentistry, the clinicians do not exactly know how to use them. Moreover, controversy exists regarding the efficacy of computer-assisted learning and net-based research. That is why university faculties are not much interested in using these new instruction techniques [9]. However, social networking sites are popular among medical interns [10]. Regardless of the advantages and disadvantages of Internet network and information technology, computers are used in almost all universities, private offices and clinics worldwide [5].

Medical consultation via the Internet has long been performed effectively; but has had less application in dentistry. This method can be greatly effective for diagnosis and treatment planning and can significantly enhance the knowledge of clinicians [11]. In order to keep up with the international accredited dental centers, making fundamental changes in dental education system in Iran and international research by Iranian dentists seem necessary [5]. This study aimed to assess the knowledge and performance of dentists regarding professional use of information technology in Iran.

Materials and Methods

In this descriptive, analytical, cross sectional study, a combination of convenience and randomized sampling was performed. The understudy subjects were selected among dentists participating in the 52nd International Congress of Iranian Dental Association (2012) and dentists working in Tehran.

Based on the pilot study with $P=0.85$ (frequency of variable), $d=0.04$ (accuracy), $\alpha=0.05$ (type 1 error) and using the sample size calculation feature of Minitab software, the required sample size was calculated to be 300 subjects.

Data were collected using a questionnaire designed according to previous accredited questionnaires [12-14] and some questions suggested by the authors. The questionnaire included 7 yes/no/no comment knowledge questions regarding "recommending a dental reference website to the general audience", "familiarity with a professional dental website", "decreasing financial or executive mistakes by using office management software programs", "benefits of setting up a personal website to provide dental consultation and attract patients", "efficacy of smart health cards for an easy access to the accurate dental history of patients", "improving doctor-patient relationship by setting up Internet-based reminders like email and instant messaging", and "efficacy of social networking websites for professional cooperation among dentists". The total knowledge score was calculated as such with a minimum of zero and maximum of 14. There were 8 demographic questions including age, sex, attended university, graduation year, having an email address, having a weblog or a personal website, having a personal computer or a place to access Internet. The questionnaire also contained 10 questions about general use of information technology including "the frequency of using email, chatting, Internet games, web browsing, online shopping, image, movie, etc. download, social networking sites like Facebook etc. There were 3 questions about professional use of IT including "visiting professional sites during the past month", "downloading educational films or documents during the past month" and "use of office management software programs". The content validity of the questionnaire was first evaluated by three oral medicine and community dental health professors of Tehran University, School of Dentistry and one epidemiologist. The questionnaire was then administered among senior dental students and 10 dentists twice with a 2-week interval to assess its reliability. The inter-rater agreement was calculated to be over 0.7 (Kappa and weighted Kappa). Next, the questionnaire was distributed among 220 dentists participating in the 52nd International Congress of Iranian

Dental Association using convenience sampling. Due to the inadequate sample size, 120 dentists working in Tehran were randomly selected using the phone number list of dentists working in Tehran (obtained from the Medical Council of Iran). The researchers made sure that the selected dentists had not filled out the questionnaire before. The questionnaires were filled out anonymously and voluntarily. Thus, there were no ethical restrictions. For scoring the questions, first the questions in the sections regarding general and professional use of IT were scored by 3 instructors based on the importance of the questions; and then based on an agreement between 2 of 3 instructors, the questions were allocated a score of 1 or 2 (online shopping, downloading a file, use of social networking websites and use of 3 or more websites were allocated a score of 2 and having an email address, chatting, Internet games, web browsing, visiting one or two websites and any use of Internet were given a score of 1. Based on the mentioned scoring system, the minimum and maximum achievable scores for general use of IT were zero and 14, respectively. The minimum and maximum scores for the professional use of IT were zero and 3, respectively. Statistical analysis was carried out using the regression model.

Results

A total of 340 dentists responded to the questionnaires (220 at the congress and 120 dentists working in Tehran); out of which, 30.4% were males. Of all participants, 83% were in the age range of 29-50 yrs. and 83.7% had graduated between 4-21 years ago; 40.6% had been graduated from Tehran University of Medical Sciences.

In general, 178 (58.7%) were working in Tehran; 11 subjects (3.6%) stated that they did not have a personal computer while 292 (96.4%) had one. Of the participants, 38 (12.5%) did not and 265 (87.5%) did have an email address. Of 303 subjects, 253 (83.5%) did not and 50 (16.5%) did have a personal website or a weblog. Regarding the location of accessing Internet, 267 (88.1%) were using Internet at home, 99 (32.7%) at the office, 42 (13.9%) in coffee nets and 79 (26.1%) were accessing the net through their smart phones.

Knowledge of dentists about the professional use of IT:

In terms of the knowledge score of dentists regarding the professional use of IT, the minimum score was 7 and the maximum was 21. Table 1 shows the frequency distribution of responses to knowledge questions.

In this regard, 71% stated that they did know a dental reference website to recommend to their patients. Improving the doctor-patient relationship by using Internet-based reminders such as email and instant messaging ranked next in terms of getting the highest positive responses (55.1%) followed by having a personal website for consultation and attracting patients (50.2%).

General and professional use of IT:

In terms of the general use of IT, the minimum score obtained was 0.8 and the maximum was 14. The mean score gained was 7.3 ± 2.2 . In terms of the professional use of IT, the minimum score gained was 0.75 and the maximum was 2.95; the mean score was 1.4 ± 0.45 . The frequency distribution of using Internet for different purposes is shown in Table 2. The most popular sites visited by dentists were Google (94.3%), Facebook (69.8%), Gmail (63.3%), domestic or international news websites (63%), PubMed (51.4%) and Yahoo (35.6%) (Diagram 1).

Overall, 2.6% of dentists mentioned visiting only one website, 7.6% two websites, 8.9% three, 13.9% four, 16.5% five, 21.1% six, 14.5% seven and 14.9% eight websites. Regarding providing consultation over the net, 195 (64%) had never done that, 93 (30.7%) had done it occasionally, 14 (4.6%) most of the time and one (0.3%) always. Regarding recommending a reference dental website to patients, 215 (71%) reported that they knew some websites suitable for this purpose and 88 (29%) said that they did not know any. Regarding familiarity with a dental professional website for personal use, 195 (64.5%) did not know any while 108 (35.6%) knew some.

Of all dentists, 255 (84.2%) were not using any office management software while 48 (15.8%) reported using it.

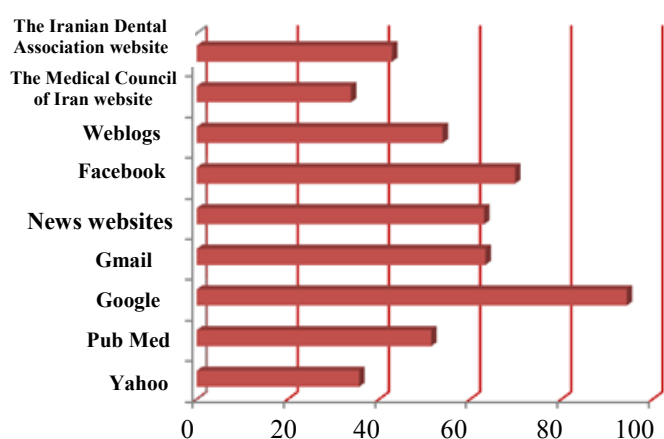
Linear regression analysis was used to assess the correlation of professional use of IT with its gener-

Table 1. The frequency distribution of responses to knowledge questions

Question	Yes	No	No comment
I am familiar with a dental website to recommend to patients	215(%71)	88(%29)	
I am familiar with a professional dental website	108(%36)	195(%64)	
Office management software programs decrease financial and executive mistakes	150(%50)	37(%12)	116(%39)
Having a personal website is beneficial for consultation and attracting patients	152(%50.5)	43(%14)	108(%35.5)
Health smart cards are useful for safe access to patients' accurate dental record	152(%50.5)	37(%12)	114(%38.5)
Using Internet-based reminder systems like email and instant messaging improves the doctor-patient relationship	167 (%55)	49(%15)	87(%29)
Social networking sites are not beneficial for scientific and professional cooperation among dentists	63(%21)	100(%33)	139(%46)

Table 2. The frequency distribution of dentists' usage of Internet services

Title	Never	Once a month	Once a week	Several times a week	Once a day	Several times a day
Email	15.8	16.5	14.9	17.2	14.2	21.5
Chat	37.3	23.8	19.1	10.6	2.3	6.9
Internet games	62.4	16.2	7.3	5.9	5.6	2.6
Professional websites	15.8	38.9	19.1	16.8	5	3.4
Browsing	26.1	20.5	16.2	21.2	7.9	8.3
Online shopping	46.9	26.1	9.2	7.9	5.6	3.4
Downloading an image, game, movie, animation, software, document, etc. (entertainment)	26.1	26.1	17.2	16.8	7.3	6.6
Downloading educational documents or films (scientific)	21.5	29	19.8	14.5	8.9	6.3
Visiting online social networking sites such as Facebook, Google Plus, etc.	25.1	18.2	23.1	12.2	8.6	12.9
Other uses	35.3	22.8	17.8	10.2	6.9	
Use of Internet in general	5	16.8	16.8	25.4	8.3	27.7

**Diagram 1.** The frequency distribution of the most popular websites visited by dentists

al use, knowledge, gender and experience of dentists (years of work experience after graduation) and showed that the professional use of IT was correlated with its general use and gender of dentists. Professional use of IT was more common among male dentists and those with greater general use of IT ($p < 0.05$).

Discussion

Based on the global health perspectives for the year 2020, health care systems must be effectively promoted to enhance the knowledge of people and governments. Article 16 of the specific targets of this document emphasizes on increasing the use of IT among the general populations [15].

This study evaluated the knowledge of dentists regarding general and professional use of IT. The results of our study revealed inadequate knowledge and use of these systems by the dentists. In terms of the knowledge score, understudy dentists obtained a mean score of 5.3 out of 14. In terms of the general use of IT, understudy subjects gained 7.3 out of 14. In terms of the professional use of IT, the means score of 1.4 out of 3 was obtained. The gained scores were all average. Since no similar study was found, we had to compare our obtained results with previous studies conducted on physicians. Maleki et al. [5] reported a relatively positive attitude towards the use of Internet by students and instructors; whereas, in a study by Fayaz Bakhsh et al, 74% of students believed that using Internet is harmful for health [16].

Hua et al. evaluated the attitudes of dental patients towards online searching for relevant dental information and reported that 45% of them had searched information online before showing up for their dental visit; this finding indicates the effect of Internet on changing the attitude of patients towards dental treatments [17]. Moreover, the results of our study showed that dentists were not adequately familiar with professional dental websites and 64.4% did not know such websites. This indicates the poor access of dentists to recent advancements in their field of work.

In our study, 96.4% of the participants had a personal computer and 87.5% had an email address; 88.1% reported using Internet. However, in a study by Walmsley et al, in the UK [9], 53% of dentists and 68% of the university professors had Internet access at home. In a study by Maleki et al [5], 92.8% of students had a computer and 93.4% had Internet access both at home and in the University. In the study by Nieminen and Virtanen [8], 55.3% of students had a computer at home. In our study, only 13.9% reported accessing the Internet in coffee nets; this finding was similar to that of Butali et al [17]. They found that 14.6% of students had access to Internet in Coffee nets; 21.5% (1/5th) of dentists had used email several times a day, 17% several times a week, and 16.5% once a month. In a study by Nieminen and Virtanen in Finland, 60% of students used emails daily and one-third of them visited some websites on a daily basis. Butali et al, in their study in Nigeria showed that 15.1% of stu-

dents used emails every day, 31.1% once a week and 19.3% once a month. However, no study in this respect was done on dentists.

Butali et al. reported that 81.6% of students used computers for multimedia programs and 55.7% for preparing their lectures [18]; which are both considered as the professional use of IT.

Also, Walmsley et al, in their study concluded that 38% of students used Internet for dental purposes and 35% for fun and entertainment [9]. The results showed that 40% of dentists used professional websites related to their field of work once a month, 19% once a week and 17% several times a week. Moreover, 29% downloaded educational movies and scientific documents once a month, 20% once a week and 14.5% several times a week. Considering the relatively low use of scientific websites by dentists in the past month, attempts must be made to encourage dentists to visit websites related to their field of work and keep up to date with the latest developments worldwide. Hua et al, in China reported that 68% of dental patients used Google search engine to obtain their required dental information before showing up for their dental visit [17]. The most popular websites visited by dentists in our study were Google search engine (94%), Facebook (70%) and Gmail (63%). This shows that Google search engine is widely used by dentists to gain information about different fields particularly dental science; 64% of dentists in our study had never offered consultation over the net, 31% offered online consultation occasionally and 7% most of the time. This is concerning indicating the inadequate attention of dentists to the modern consultation methods through weblogs and websites. This method is successfully used in developed countries [18]. Attempts must be made to popularize this method in developing countries like Iran. Furthermore, based on the present study results, only 16% of dentists used office management software programs; which also indicates the need for motivating dentists to use these programs.

In our study, use of professional websites and download of educational movies and scientific documents were higher in males; this finding is in accord with the results of Fayaz Bakhsh et al [16]. They found that 21% of students used Internet for more than 10 hours a week. Also over 10h/week use of internet was more common among male stu-

dents. Similar results were also obtained by Kumar et al [19]. In our study, professional use of Internet was not significantly correlated with age; which is in contrast to the results of Marino et al [18]. They found that use of Internet for educational purposes was significantly affected by age and gender of participants and was less in females; also, most users of Internet for general purposes were of lower age. Nieminen and Virtanen showed that younger students had higher interest and skills for using IT and communication systems [8]. Dentists with more access to Internet and email and general use of Internet reported higher usage in the previous month and more commonly offered consultation over the net; which is in agreement with the results of our study.

Poor cooperation of dentists in filling out the questionnaire was one limitation of this study; which was minimized as much as possible by explaining to them the purpose of study. However, selection of dentists with private offices was much more time consuming and dentists mostly did not have time to fill out the questionnaires and there was a risk of lower accuracy when filling it out. There is an obvious need to motivate dentists to use Internet for general and professional purposes. The lower the familiarity of dentists with IT, the higher the risk of encountering problems in their work. By not using office management software programs, financial and executive errors increase and the doctor-patient relationship sours. By not visiting professional dental websites by dentists, they do not become aware of the latest advancements in their field of work. As the result, they stick to the old treatment methods and do not try the new techniques. Last but not least, access to high speed Internet should be enhanced and clinicians must be trained regarding the use of IT.

Conclusion

Dentists in our study did not have adequate knowledge about professional use of IT and their general use of IT was also weak

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