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Original Article

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Retrospective Evaluation of Common Dentistry Errors in Selected Dental Clinics of the Armed Forces, Iran

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Abstract

***Background & Aims*:** The occurrence of errors in dental practice is an inevitable factor resulting in a reduction in the quality of medical services. These errors can prompt adverse complications, weaken the patient's trust in the dentist, and induce financial losses to the health care system. The purpose of this study was to investigate the common overt and covert errors that can be detected from medical records in selected clinics of the Armed Forces, Iran.

***Materials & Methods*:** In this study, we evaluated 3248 dental records, documented in seven selected dental clinics of the Armed Forces, Iran. The dental files were reviewed to detect flaws in the process of documentation, treatment protocols, and results. The patient and practitioner demographics were also extracted for further statistical analyses.

***Results*:** Among the studied documents, 14% of the dental records were incomplete and 17% of dental treatments showed at least one deviation from the standard treatment protocols. Also, there was a significant relationship between the occurrence of these errors and some demographic variables such as the dentist's age, academic degree, and work experience. The prevalence of dental errors was 14%, 20%, and 30% in 1st, 2nd, and 3rd-grade dental clinics, respectively.

***Conclusion*:** Deficiencies in completing medical records and errors in the treatment process are common in Armed Forces clinics, Iran. Many of these errors can be identified through periodic evaluations and review of medical records to reduce the likelihood of recurrence.

***Keywords*:** Dentistry, Medical Errors, Medical Records

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Introduction

Medical error refers to an unintended and preventable adverse phenomenon in the field of health-related treatments (1). These errors can be visible, hidden, damaging, or harmless, and impose many small and large costs on patients, health care providers, and centers. Patient safety and medical errors have always been a common debated topic among health professionals, but since the publication of a study entitled "To err is human" in 1999 by the American Medical Services Quality Committee, this issue has been a top priority for healthcare providers and decision makers (2). The Comprehensive International Study of Medical Errors in Primary Care (PCISME) is the first international study on medical errors to provide a correct taxonomy of the frequency of medical errors, with only 20% of medical errors related to the knowledge and skills of medical staff, while 80% of medical errors are process based (errors in admission, collection of information, communication, payment, and management of the medical centers). Medical error can include inaccurate diagnosis or treatment in the face of a disease, and can even be seen in preventive and health-promoting measures (3). Medical errors can be seen in hospitals, private centers and offices, laboratories, pharmacies, and the patient's home. The occurrence of these errors has been seen in the field of dental procedures, and in the centers providing these services (4). From a clinical point of view, dental errors are divided into four areas. The first area is inefficient diagnosis in which can include error in correct diagnosis, delay in diagnosis, inadequate and inefficient diagnostic tests, failure in proper performance based on diagnostic test results, and incorrect referral of the patient when a definitive diagnosis is not possible. The second area is in the field of treatment, which includes errors in the implementation of the clinical process of treatment according to standard instructions, delays in treatment that lead to deterioration of the patient's health, and ineffective treatment. The third area is in the field of prevention, which includes failure to apply timely and effective preventive treatments and failure to prevent treatment complications. The fourth area is related to the improper operation of equipment and systems, as well as the lack of proper communication between the patient and the staff of the medical center (5). Solutions to reduce the incidence of these errors include periodic inspections, the use of safety checklists, regular reporting and recording of errors, ongoing training, the establishment of error-related databases, and studies related to the frequency and cause of errors (6).

In the military-based healthcare structures of some countries, the reporting of medical and dental errors is part of the military record-keeping system and is carefully controlled. Plus, the difference in the structure of the Armed Forces insurance system with other health insurance companies, sets the stage for differences in the frequency of medical errors between the armed forces and other organizations. As a result, the results of other studies cannot be accurately generalized to the statistical population of the Armed Forces. Therefore, in this study, we examined the common errors in the dental clinic of the Armed Forces, Iran.

Materials & Methods

In this study, information gathering and sampling were done in a stratified manner. Initially, an information checklist was prepared to record general and specific information separately for each department. In order to prepare a checklist of medical errors in each field, at least two specialists in that medical field expressed their opinion on the errors that can be counted from the files. Then, the selected clinics of the Armed Forces, Iran, from different classes were selected and the necessary coordination was done to access the clinic files with the relevant officials. Then, using the pre-designed forms, the information contained in the clinic files and archives were extracted in a systematic manner (including demographic characteristics of healthcare providers e.g., sex, age, work experience, and degree). In the third stage, the information obtained, including cases of non-compliance or deviation from existing treatment standards, was categorized based on the type and the frequency. This categorized information was used for statistical analysis and reporting of results, and

finally, according to the extracted information, an attempt was made to analyze the cause of errors.

Results

In this study, selected clinics were divided into three distinct classes (Clinics of "Armed Forces" are usually categorized based on their equipment and facilities, presence of subspecialized services, and their allocated budgets in three classes from A to C, according to their superiority). The cases were examined in four clinics of class A, two clinics of class B, and one clinic of class C. A total of 3247 cases were reviewed. In class A and B clinics, nine special departments were available for data gathering (maxillofacial surgery, periodontics, dental implant surgery, restorative dentistry, prosthodontics, endodontics, orthodontics, pediatric dentistry, and oral disease and diagnosis). Among the dental treatments in all cases, 1733 treatments were provided by male dentists (53.4%) and 1514 treatments were provided by female dentists (46.6%).

Statistical analyses showed that about 17% of the treatments provided in selected clinics of the Armed Forces, Iran, showed at least one deviation from standard clinical procedures and ideal treatment results. Results indicated that only in prosthodontics and endodontics departments, significant differences were found in the prevalence of errors between class A, B, and C clinics, with the least prevalence belonging to class A ($P < 0.05$) (Table 1).

Table 1. Relationship between error prevalence and clinic

Department	Class of clinics	Treatment without error (%)	Treatment with error (%)	
Maxillofacial surgery	A	89.2	10.8	P= 0.225
	B	87	13	
	C	81.4	18.6	
Periodontics	A	93.6	6.4	P= 0.8
	B	93	7	
Endodontics	A	76.4	23.6	P= 009
	B	67.2	32.8	
	C	58.6	41.4	
Restorative dentistry	A	76.6	23.4	P=0.459
	B	72.8	27.2	
	C	70	30	
Prosthodontics	A	81.8	18.2	P= 0.001
	B	65.4	34.6	
Pediatric dentistry	A	90.5	9.5	P=0.054
	B	83	17	
Orthodontics	A	95.7	4.3	P=0.308
	B	93	7	
Implant surgery	A	87.6	12.4	P=0.119
	B	81	19	
Oral and dental disease	A	82.6	17.4	P=0.250
	B	77.2	22.8	

The most dental errors could be found in endodontic and restorative departments (23-40% and 23-30% of treatments, respectively). The highest percentage of recorded errors in treatment was for the patients in the group of 21 to 30 years old and the lowest recorded errors was for the treatment of patients under 10 years. This difference was statistically significant (P< 0.05). Pearson Chi-square statistical test showed that the incidence of occurred error was significantly less in the dentists over 40 years than the dentists under 40 years (P= 0.022). A similar statistical analysis showed that dentists with 11 to 20 years of work experience made the least mistakes in treating patients, while the highest percentage of errors was related to 0 to 5 years of work experience (P=0.03) (Table 2).

Table 2. The relationship between age and work experience with the incidence of errors in dental treatments

		Treatment without error (%)	**Treatment with error (%)**	
Dentist's age	Under 40	81.3	18.7	P= 0.012
	Over 40	84.3	15.7	
Dentist's work experience (years)	0-5	78.8	21.2	P=0.031
	6-10	82.3	17.7	
	11-20	84.8	15.2	
	>20	81.9	18.1	

In orthodontics, periodontics, and dental implant departments only specialist dentists were employed. In the other departments, both doctors of dental dentistry (D.D.S) and specialists were available for dental treatments. Statistical analysis showed that there is no significant difference between the incidence of error and dentist's degree in oral disease and diagnosis department, but in other departments, dental treatments provided by dental specialists had less errors than treatments by D.D.S (P< 0.05) (Table 3).

Table 3. the relationship between the therapist's degree and the incidence of error

Department	**Dentist's degree**	**Treatment without error (%)**	**Treatment with error (%)**	
Maxillofacial surgery	D.D.S	84.1	15.9	P= 0.005
	Specialist	93.7	6.3	
Endodontics	D.D.S	68.1	31.9	P=0.003
	Specialist	85.5	14.5	
Restorative dentistry	D.D.S	72.1	27.9	P=0.006
	Specialist	87	13	
Prosthodontics	D.D.S	72.6	27.4	P=0.034
	Specialist	82.8	17.2	
Pediatric dentistry	D.D.S	81.9	18.1	P=0.001
	Specialist	93.6	6.4	
Oral and dental disease	D.D.S	95	5	P=0.940
	Specialist	95.8	4.2	

Statistical analyses also showed that the sex of the patient and the therapist had no effect on the incidence of errors (P< 0.05) (Table 4).

Table 4. The relationship between patient and therapist gender and the incidence of error

	Sex	Treatment without error (%)	Treatment with error (%)	
Patient	Male	82.8	17.2	P=0.868
	Female	83.0	17	
Dentist	Male	82.4	17.6	P=0.357
	Female	83.7	16.3	

In dental records of surgery departments, the most prevalent error was the existence of the remaining root apices after extraction (2% of the extraction cases). In periodontics, prosthodontics, implant surgery, and restorative departments the most prevalent errors were related to the lack of proper dental photographs obtainment according to standard guidelines. In pediatric dentistry department, the most common error was inadvertence in space maintainer installment after extraction of deciduous teeth (8% of extraction cases). In orthodontic department, about 14% of the orthodontic treatments were finished without the ideal line of occlusion for both dental arches, which was considered the most common error. In endodontics department, 10% of root canal treatments were under filled and about 5% were overfilled in root canal obturation.

Statistical analysis showed that the class A clinics had significantly fewer incomplete or missing documentation in medical/dentistry records than the class B and C clinics (P < 0.05) (Table 5).

Table 5. Relationship between dental clinic's ranking and prevalence of incomplete dental records.

Dental clinic's ranking	Complete dental records (%)	Incomplete dental records (%)	
Class A	92.1	7.9	
Class B	77.4	22.6	P= 0.00
Class C	64.8	35.2	

Discussion

Oral health improvement is the main goal of dental healthcare facilities and departments and, as we know, oral health can have direct and indirect impacts on health-related quality of life (7). Errors and adverse events in dental treatments, like treatments in other fields of medical sciences, can commonly occur due to the complexities of this field and the requirement for specialized skills and scientific insight (8, 9). The dental records are an integral part of the treatment process, which firstly ensures the completion of the patient's comprehensive treatment in the best way, secondly provides the possibility of establishing professional communication between colleagues in the field of treatment and multidisciplinary settings, and thirdly they are considered important legal evidence in the case of legal lawsuits (10). Studies have shown that the prevalence of incomplete dental forms and records in public dental clinics is higher than them in private ones (11). A survey conducted by the University of Minnesota by Osborn et al. showed that 85% of dentists think that the dental records documented in their workplace are thorough but according to the criteria of the American Dental Association in dental record gathering, in 8 to 87% of the cases, the information recorded in those files is incomplete (12). In our study, depending on the level of the clinic, the presence of defects in the dental files varies from 8 to 35%. It should be noted that so far, the majority of studies have investigated patient complaints due to the occurrence of

adverse events and accidents in clinical settings (13-18), while the present study examined the errors that occurred in the treatment process (with or without the patient's knowledge). We must know that the majority of the treatment errors do not ultimately lead to complaints but can affect the success of treatment (19). Regarding radiographic errors, our study showed that in the periodontics and oral disease and diagnosis departments, 2% of the errors were due to improper detector placement during radiographic imaging, and in the restorative, endodontics, prosthetics, and orthodontic sections, significant numbers of errors were related to lack of the suitable radiograph obtainment during or after treatment (approximately 2% of errors for each department). It should be noted that the evaluation of radiographs is one of the main ways to evaluate the errors and quality of treatment. Most of the errors recorded in this study are related to the endodontics and restorative departments (each about 27% of treatments). The reason for this is probably the high frequency of these treatments in the dentistry field, compared to others and the availability of dental photographs in these departments. In the study of Yousuf et al., the most common error of endodontic treatments was reported to be the overfilling in obturation of root canal (20), which is consistent with the results of our study. In our study in the restorative and prosthodontics departments, the most common mistake was the lack of using appropriate radiography for diagnosis and treatment procedures, and the second place was related to the restoration overhang which is less prevalent compared to the study of Brunsvold M A. (21) This difference can be related to different methods of observation in these two studies. In the surgery departments, the most common mistakes were related to tooth extraction without appropriate radiographs and fracture of the root during tooth extraction (about 2% each). This observation is consistent with the results of a study done by Nayyar j et al. (22).

Regarding the relationship between the demographic characteristics of the dentists and the occurrence of errors, the first case of data analysis showed that with increasing age and work experience of the therapist, the occurrence of errors decreases, which can be related to the increasing experience related to age. The results of this study are in line with the results of the Jena et al. study (23). Among dentists with D.D.S degree and specialists, the highest incidence of errors was significantly related to general practitioners, the results of which are consistent with the study of Al-Nahedh et al. Studies show that almost no dental treatment procedure can be provided without any errors but identifying the predictive and predisposing factors for occurrence of these errors can be an imperative step in optimization of healthcare systems such as dental clinics. Work experience, age, and degree can be considered as predictors of perceived prevalence of dental errors. Emphasis on the principles of supervision, periodic systematic evaluations, and monitoring could provide the platform from which more comprehensive researches could develop.

Conclusion

Errors in dental treatment in Armed Forces clinics are a common issue related to the healthcare provider's age, work experience, and degree. Also, a significant percentage of the cases examined in these clinics have deficiencies and a lack of medical information, which can affect the quality of medical services provided in these centers.

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No Declared

Conflict of interest

No conflict of interest declaration between the authors.

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Ethical statement

This study was carried out in compliance with the ethical principles of the Declaration of Helsinki and the guidelines of the Armed Forces, Iran. The study protocol was approved by the institutional ethics committee and the relevant authorities of the selected clinics. The informed consent of the patients whose files were used for data extraction was obtained or waived according to the ethical regulations. The confidentiality and

anonymity of the patients and the healthcare providers were ensured throughout the study and the data analysis.

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