

Dental Patient Safety: Become a Challenge for the Dentist (Systematic Review)

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Abstract

Delivering top-notch dental care starts with ensuring the safety of the patient. The first stage in a dental patient safety strategy is intended to lower adverse events across the profession by identifying errors and the causes of dental adverse events.

This review aimed to identify the categories of dental-related occurrences documented in the literature. PubMed, Science Direct, and Proquest were the primary search engines for the literature study. Based on CASP techniques, quality evaluations of the listed studies were done. After preliminary qualitative synthesis and abstract screening, 12 studies were determined to match the inclusion requirements.

The most frequent adverse effects are in implant procedures, endodontics, and oral surgery. Applications of digital health technology have tremendous promise in preventing medical errors. The number of incorrect dental extractions decreased due to surgical safety checklists. Findings revealed favorable beliefs, enhanced knowledge, and improved abilities for dentistry quality improvement.

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Introduction

Making sure the patient is safe is the first step in providing high-quality dental care. Dental professionals pledge to offer safe, quick, efficient, fair, and patient-centered care.¹⁻³ Errors are common in dentistry but also play a significant role in healthcare.⁴

The idea of patient safety is described as "the reduction of the danger of needless injury related to health care to an acceptable minimum." Discussion of patient safety is complete by considering all human elements and healthcare providers' influences. Four critical areas for increasing patient safety are recognizing hazards to patient safety through incident reporting, reviewing occurrences to develop best practices, patient safety education

and communication, and constructing a safety.^{5,6}

Healthcare quality comprises multiple aspects: equity, patient-centeredness, timeliness, efficiency, and efficacy.⁷ The methods upgraded to enhance patient safety must be adjusted and customized for various healthcare settings to be appropriate for the patients and staff there. There needs to be more knowledge of the basic epidemiology of patient safety in dentistry, as well as disagreements about the definition of the concept and patient viewpoints. Even the existence of a patient safety issue in dentistry is unknown.^{8,9}

The terms adverse events, patient safety occurrences, and patient safety incidents have been developed. Additionally, the profession has evolved from determining the severity of the harm to addressing the underlying causes and, more recently, developing strategies to mitigate the impact. Particularly in dentistry, there are more restrictions on how primary care can develop.¹⁰

The major problem influencing dental patient safety is ignorance. Small dental offices frequently offer "unstructured" and dispersed dental care. Most dental adverse event data is lost, making it impossible to conduct a complete investigation. Although tooth loss is the most

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frequent side effect of adverse events, more severe sequelae have also been reported, including persistent sinus damage, irreparable nerve trunk damage, significant bone loss, and even patient death. In five cases, the presence of sequelae belonging to one of two groups was considered.¹¹

There is a small degree of risk involved with routine dental procedures. To organize efforts to lessen patient damage, dental professionals must acknowledge that dental patient safety incidents are a worldwide phenomenon. Dental professionals require a place where they are able to document adverse events and near-misses of varying degrees of severity efficiently. In addition, case reports for case studies on dental patient safety need to be followed by a root cause assay.¹²

Materials and methods

The population, exposure, and outcome paradigm were used to search for publications in this research as part of a systematic review process (PEO). Patient safety, risk management, and high-quality services are the results. Population: incident, incident reporting/incident report, adverse event/adverse events; exposure: dental care, dental treatment, dentistry, dental clinic, dental setting. We have reported this manuscript in compliance with PRISMA recommendations (Figure 1). Proquest, Science Direct, and PubMed were used to conduct the search. The evaluation covered studies using various designs, including descriptive, observational, and experimental approaches. Additionally, we searched for guidelines and systematic reviews. A systematic assessment of patient safety in primary medical care served as the basis for the Medical Subject Heading (MeSH) terms used for the literature search and modified for dentistry. Table 1 provides the thorough search plan for each database. The inclusion criteria for the article selection were as follows: publications published between 2012 and 2022, all English review studies, no duplicate research, and for humans.

Mendeley Reference Manager is the Research Data Management (RDM) tool that will be used to handle the records and data during the review. Identification, screening (excluded, retrieved), eligibility, and inclusion make up the review process. The electronic search produced

all the titles and abstracts downloaded into a reference management database. Entries that were duplicates were found and eliminated. At least two review authors independently reviewed the titles and abstracts retrieved from the initial electronic searches. A quality evaluation of each included study was completed using the various CASP tools available for critical evaluation.

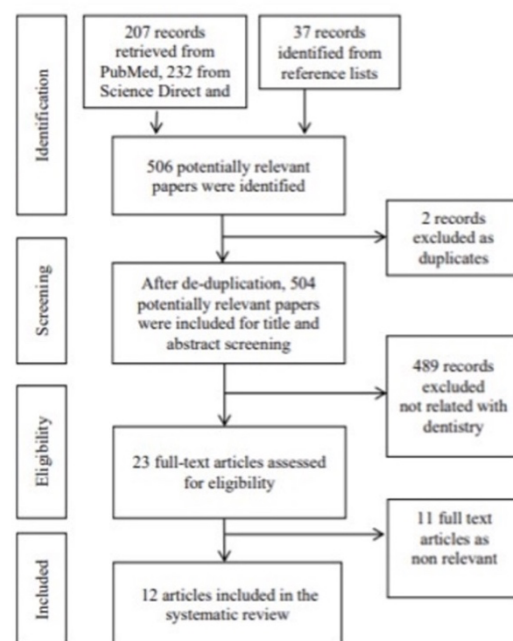


Figure 1. PRISMA flow diagram.

Portal		
PubMed	Science Direct	ProQuest
Incident* OR ("Incident reporting*") OR ("Adverse event*") AND ("Dental treatment*") OR ("Dental care*") OR ("Dental clinic*") OR ("Dental setting*") OR (Dentistry) OR ("Comprehensive dental care*") OR ("Dental health services*") OR ("Dental practices*") AND ("Patient safety*") OR ("Dental investigation*") OR ("Dental audit*") AND ((y_10[Filter]) AND (ffrt[Filter]) AND (humans[Filter]) AND (english[Filter])) AND ((y_10[Filter]) AND (ffrt[Filter]) AND (humans[Filter]) AND (english[Filter]))	Incident AND "Dentistry" AND "Patient safety" PUBYEAR > 2012 AND PUBYEAR < 2020 AND (LIMIT-TO (LANGUAGE, "English"))	(Incident AND "Dental treatment" AND "Patient safety") AND (at.exact("Report" OR "Article" OR "Book" OR "Evidence Based Healthcare" OR "Conference") AND la.exact("ENG") AND stype.exact("Scholarly Journals") AND pd(20120627-20220627))

Table 1. Library search strategy.

Results

Following abstract screening and initial qualitative synthesis, twelve studies were found to meet the inclusion criteria for the primary purpose (Table 2) and six studies for secondary purpose (Table 3)

Discussion

The initial stage in a dental patient safety strategy proposed to lower adverse events across the profession by identifying errors and the causes of dental adverse events. Utilizing the Dental Adverse Event Severity Scale, they classified harm according to its severity and the required intervention to comprehend the magnitude of harm experienced by the patients. (Table 4).^{12,20}

Category A	Situations or events that may cause errors
Category B	Error that did not reach the patient
Category C	Error that reached the patient but did not cause harm
Category D	Errors that need to be watched for or corrected in order to ensure that the patient is not harmed (FDA Medical Device Type 1: patients treated with contaminated water in the operating room - no evidence of injury after F/U. expired materials or pharmaceuticals, for example).
Category E1	The patient will experience the least amount of short-term (reversible or transitory) harm possible, and the least amount of intervention is required (FDA Medical Device Type 2: Necessary procedures that cure or repair without leaving behind lasting deficits or disabilities). stable and unmovable)
Category E2	Requiring considerable intervention and being temporary (reversible or transient) with little patient harm (FDA Device Type 2: Necessary interventions that cure or correct without leaving behind permanent deficits or disabilities). stable and unmovable)
Category E3	Significant patient injury that is temporary (reversible or transient) and only requires minimum intervention (FDA Device Type 2: Necessary actions that cure or rectify without leaving behind permanent defects or disabilities). stable and unmovable)
Category E4	Patient suffers temporary serious damage that necessitates substantial intervention (FDA Medical Device Type 2: It requires treatment but can be treated or resolved without leaving a lasting deficiency or disability).
Category F	Temporary patient injury and the need for hospitalization or transfer to the emergency room
Category G1	(FDA Medical Device Type 3: necessary intervention, cured with permanent deformity or impairment, steady and stationary) Permanent Minimal Patient Harm Requiring Minimal Intervention
Category G2	(FDA Device Type 3: requiring intervention, permanent flaw or impairment healed, steady and stationary) Permanent Minimal Patient Harm Requiring Substantial Intervention for instance; tooth loss brought on by improper tooth extraction and iatrogenic pulp damage
Category G3	Patient harm that is permanent and requires little intervention (FDA Device Type 3: necessary intervention, cured with permanent defect or disability, stable and stationary)
Category G4	Substantial patient injury that requires major intervention and is permanent (FDA Device Type 3: necessary intervention, permanent defect or disability cured, stable and stationary). for instance. iatrogenic pulp injury needing root canal therapy; tooth loss brought on by faulty extraction, requiring an implant or expert replacement
Category H	Types of Interventions Required to Maintain Life
Category I	Patient death (FDA medical device type 4)

Table 4. Dental adverse event severity scale.

Types of incidents

Type of unfavorable event, containing the phrases: 1. Complication: abnormal results of a process following proper treatment; 2. Error: failure in planning, execution, or patient follow-up because of ability or attitude inadequacy on the part of healthcare professionals; 3. Accident: an unanticipated event that occurs during treatment or the patient's stay at a healthcare facility. The

most frequent adverse effects occur after oral surgery, endodontics, and implant treatments.^{11,15} Allergies, infections, inadequate or delayed diagnosis, and technical errors were the most frequent adverse effects. The need for better communication, promoting reporting, and looking for tools to help care management are highlighted by measures to reduce issues.⁷

Dental adverse event type of harm classification

A dental patient safety classification system will facilitate us to talk about mistakes and unfavorable dental events in a consistent manner. There is a category of harm established through a consensual process:^{12,18} aspiration of a foreign body; delayed appropriate treatment/disease progression; unnecessary treatment linked to a misdiagnosis; foreign body response/rejection; hard-tissue damage; harm not otherwise specified; ingestion of a foreign body; nerve damage or injury; ocular damage; orofacial infection; additional orofacial complications; additional systemic complications (adverse device/material/procedure reactions); additional wrongs/unnecessary treatment; subpar aesthetic results following dental treatment; poor hemostasis/prolonged bleeding; procedure on the wrong patient; procedure on the wrong site; psychological distress/disorder (suicidal ideation); retention of a foreign object(s) in a patient with sequela (e); soft tissue injury/inflammation; systemic infection; and toxicity).

The actualization of dental patient safety

Checklists effectively reduce incidents in some articles but not in others. According to a systematic review, surgical safety checklists were the only incident-reduction strategy that reduced adverse events in dentistry.^{16,17}

The primary goal of patient safety is to prevent avoidable adverse events. The path has been illuminated by safety science are:¹² creating methods for reporting incidents without consequences and performing exhaustive root cause analysis when unfortunate events happen; creating protocols, checklists, and automated decision tools to lessen reliance on memory; the usage of electronic dental records for accessing patient data or test results; applying forcing functions to reduce the likelihood of errors when they could result in unintended harm (i.e., a system that warns the dentist when a patient has

prescribed a drug to which they are allergic); utilizing a combination of didactic and simulation system; regular safety training for employees; and standardized operating procedures to limit variability, which emphasizes collaboration and working together in emergencies.

To ensure that risk management is used in clinical dentistry, the authors of a different publication by the same team that published the checklists offer seven measures for enhancing patient safety, including:⁸ encouragement of a patient safety culture in dental treatment, establishing a mechanism for the risk management associated with dental treatment; creating instruments for the detection, analysis, and evaluation of dental treatment-related risks; enlarging lines of communication for adverse events, devising strategies for reducing or eliminating healthcare risks, continuing professional education on patient safety, and conducting investigation in the area of dental patient safety.

In a patient's medical record, a trigger is a specific, easily recognizable thing that can be utilized to identify an adverse event. When examining the medical record to establish in case an unfavorable event happens, triggers might be used as guidance. Dental trigger tools, also known as "Outpatient Adverse Event Trigger Tools," were adjusted for use in dental offices. The development of infections, failure of complicated operations (such as implant failures), seven or more completed appointments during the six-month assessment period, and patients necessitating referrals to other specialists were defined as the dental trigger tools. It is significant to note that contributing factors include the patient, healthcare professionals, and the workplace. Motor and/or intellectual limitations, as well as features of youngsters and the elderly, are linked to patient characteristics. Agitated work environments that encourage distractions, a high patient turnover rate, a lack of training-related skills, and inadequate visibility and communication are all factors that affect working conditions for healthcare professionals.⁷

The usage of electronic notes by dentists has been tested in the past. According to a recent review, using IT in healthcare increases efficiency, quality, and safety.⁶ Applications of digital health technology hold significant promise for reducing medical errors. More research

should be done on their best use across all medical specialties.¹¹

Studies on surgical procedure safety were highlighted, perhaps because of how invasive they are. As a result of improved communication, healthcare professionals created a display chart where they documented dangerous incidents during routine dental care. This chart was used as a starting point for team talks about quality improvement regularly. A highly skilled staff and proper monitoring were crucial elements in enhancing anaesthetic safety. Checklists were thought to help streamline operations, enhance communication, and lower anxiety during operations. A plan was suggested in addition to a checklist for endodontic treatment to reduce the frequency of occurrences involving ultrasonic energy and the usage of rubber dams.⁵

Gathering many incident reports efficiently is essential. The need for feedback on medical safety to be distributed to all hospital medical staff, particularly young medical staff, is frequently brought up during routine meetings with other hospitals regarding medical safety. Future considerations are given to this matter.¹⁶⁻¹⁸

Conclusions

According to this systematic research, the most significant frequencies of adverse events are observed in implant treatments, endodontics, and oral surgery. Diagnostic and examination, treatment planning, communication, and procedural mistakes all occurred. Applications of digital health technology have tremendous promise in preventing medical errors. The number of incorrect dental extractions decreased due to surgical safety checklists. Findings revealed favorable beliefs, enhanced knowledge, and improved abilities for dentistry quality improvement.

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Declaration of Interest

The authors report no conflict of interest.

N o.	Authors, Year	Research design	Objectives	Research findings
1.	Perea-Pérez et al. (2014) ¹¹	Study and analysis of 4,149 judicial and extrajudicial dental malpractice claims made in Spain between 2000 and 2010.	Determine the characteristics of adverse dental treatment-related events, categorize them, pinpoint their causes and effects, and determine the conditions that make them likely to occur.	This series' most frequent adverse effects were seen in implantology, endodontics, and oral surgery (25.5%, 20.7%, and 20.4%, respectively). Similar findings indicated that errors or complications could account for up to 44.3% of adverse outcomes.
2.	Dang et al. (2015) ¹³	Oral trauma and injury were assessed retrospectively from 2009 to 2012. Chi-square analysis and Fisher's exact analysis are examples of statistical analysis.	Analyze the prevalence, trends, and causes of dental trauma patients looking for emergency care in dental offices	There were 88,610 new emergency procedures, 3,642 (4.1%) of whom were found to be new dental trauma cases among 3,574 patients.
3.	Obadan et al. (2015) ¹²	Retrospective review of dental adverse events.	Detecting errors before resulting in undesirable occurrences and reducing the effect of undesirable events when they occur.	The most significant documented damage was unnecessary treatment or delayed disease progression following a misdiagnosis. The adverse incident caused the patient in question to pass away.
4.	Enseldo et al. (2021) ¹⁰	Systematic scoping review using MEDLINE and EMBASE.	The frequency of the incidents in outpatient dentistry to provide a thorough analysis.	Errors occurred concerning diagnosis and testing, treatment planning, communication, procedures, and the absorption or inhalation of foreign bodies.
5.	Teoh et al. (2022) ⁹	Key concepts about narrative reviews, causes of medication errors, and types of prescribing errors are presented.	Summarize drug safety, medication, and prescription errors in dental practice.	Prescription mistakes are frequent in dental practice. Dental systems must be addressed, and crucial components like prescribing tools must be included, in order to reduce drug and prescription errors.
6.	Bailey et al. (2015) ⁸	Systematic qualitative review. The CASP tool was used to evaluate the quality of the included studies.	Identify and analyze dental practice tools or interventions used for maintaining and increasing patient safety.	wo surgical safety checklists reveal a decrease in incorrect tooth extractions, and the identified tools may be used to measure and enhance patient safety in dentistry.
7.	Kimura et al. (2021) ¹⁴	Investigation into incident reports.	Understand the characteristics of interdental gaps.	Various types of incidents occurred in dental clinics and dental stations.
N o.	Authors, Year	Research design	Objectives	Research findings
8.	Bailey and Dunganwalla (2021) ⁵	Reports Study	Understand contemporary concepts related to patient safety, acquire examples of top techniques that can be incorporated into standard patient care, and learn about the resources available to practitioners to support their personal growth.	Primary dental care, which accounts for 95% of dental care, requires more professional study.
9.	Jerrold and Danoff-rudick (2022) ¹⁵	A modified Delphi protocol	Determine if an event is never present in the orthodontic clinical setting.	Promote the creation and use of uniform safety measures to improve the well-being and safety of patients, doctors, staff, and practices.
10.	Anzai et al. (2020) ¹⁶	The incidence of accidents in the OMFS department from the Fukuoka Dental University Medical and Dental Hospital accident reporting system database	Analysis of incidents at the Oral and Maxillofacial Surgery (OMFS) Department and compared to all hospital incidents, including other dental specialties.	More than 60% of incident-related causes might be attributed to insufficient confirmation by subpar abilities. X-ray errors, injuries sustained during treatment, missing or damaged equipment, tooth remnants, and swallowing dental artifacts were frequent occurrences.
11.	Remiszewski and Bidra (2019) ¹⁷	Surgical safety checklists from 120 dental implant procedures were used.	Utilize the Surgical Safety Checklist for Dental Implant Surgery to assess patient compliance	The Surgical Safety Checklist is a simple way for prosthetic residents to train in dental implant surgery to help their patients receive consistent, excellent, and safe care.
12.	Pemberton (2019) ¹⁸	Ascertain the number of unreported incidents, the number of surgeries carried out in the incorrect location, and the number of reported dentures/removed teeth from 2015-2019	Report on defined "never happens" directly related to patient safety.	1. During the study period, there was no reduction in the frequency of dentures or extractions. 2. Primary care dental offices report denture/extraction incidents, but most reports come from hospitals or community services.

Table 2. Summary of studies on the type of incidents in dental treatment.

No.	Authors, Year	Research design	Objectives	Research findings
1.	Crisan et al. (2021) ¹	Seventy-two sources were examined, and the Context-Intervention-Mechanism-Outcome (CIMO) framework was used to analyze them.	Systematic evaluation of dental practices' quality management initiative (QMI) implementation.	Five mechanisms that explain how dental practices carry out their quality control efforts are identified by this analysis.
2.	Dolores et al. (2020) ⁷	The terms patient safety and dentistry were used in an integrated literature search on MEDLINE from 2000.	Investigating and recognizing the research about patient safety in dentistry.	The most frequent adverse events were allergies, infections, delayed or inaccurate diagnoses, and technical errors.
3.	Cassie et al. (2021) ¹⁹	Supported by the Kirkpatrick model and the theoretical domains framework, multi-method research	National health service guarantees safe, harmless, and patient-centered healthcare as their essential elements.	1. Results showed increased knowledge, skills, and confidence in using QI techniques in practice and favorable beliefs about QI. 2. Time, poor patient-team interaction, communication, and leadership were hindrances. Teamwork, clearly defined duties, strong leadership, training, peer support, and tangible rewards are all part of the facilitator position. 3. The knowledge and abilities of the participants were noted as needing development.
4.	Righolt et al. (2018) ²	A systematic search was performed on PubMed, OVID, and BIREME.	1. Outline existing oral hygiene quality assessment. 2. Evaluation of these quality measures' applicability and scientific soundness.	1. Current status of existing oral hygiene quality assessment. 2. Piloting and testing quality measurements and implementing suitable information systems could be opportunities to enable open and frequent feedback on the caliber of oral healthcare.
5.	Atanasov et al. (2020) ²⁰	Web of Science database	They did a quantitative review of the current scientific article about medical negligence to uncover the latest	The use of digital health technology is projected to prevent medical malpractice and study the optimal application across all medical specialties, with an emphasis on
No.	Authors, Year	Research design	Objectives	Research findings
			information in this crucial field of medical research.	important settings like intensive care units and pediatric wards. The necessity of upcoming studies on preventive interventions is highlighted by the significant prevalence of medical errors documented in the literature today. More work has to be done in this area.
6.	Lee and Gil (2022) ²¹	In-depth interviews and qualitative descriptions.	Investigate the dentists' approach to reducing failures in their daily practice.	All participants had encountered professional setbacks in their dental practices and had employed various coping mechanisms. There were found to be seven strategies. Dental professionals who are concerned about their practice (reflection, learning, and correction), their other professionals (asking, referring), patients (communication), and advancement in dental care (taking over).

Table 3. The implementation of patient safety in dental treatment.

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