CSP CADERNOS DE SAÚDE PÚBLICA
REPORTS IN PUBLIC HEALTH

REVISÃO
REVIEW

Patient safety in dental care: an integrative review

Segurança do paciente no cuidado odontológico: revisão integrativa

Seguridad del paciente en el cuidado odontológico: revisión integradora

Claudia Dolores Trierweiler Sampaio de Oliveira Corrêa [1]
Paulo Sousa [1,2]
Claudia Tartaglia Reis [3]

doi: 10.1590/0102-311X00197819

Abstract

Adverse events pose a serious problem for quality of healthcare. Dental practice is eminently invasive and involves close and routine contact with secretions; as such, it is potentially prone to the occurrence of adverse events. Various patient safety studies have been developed in the last two decades, but mostly in the hospital setting due to the organizational complexity, severity of the cases, and diversity and specificity of the procedures. The objective was to identify and explore studies on patient safety in Dentistry. An integrative literature review was performed in MEDLINE via PubMed, Scopus via Portal Capes, and the Regional Portal of the Virtual Health Library, using the terms patient safety *and* dentistry *in English, Spanish, and Portuguese, starting in 2000. The research cycle in patient safety was used, as proposed by the World Health Organization to classify studies. We analyzed 91 articles. The most common adverse events were allergies, infections, diagnostic delay or failure, and technical error. Measures to mitigate the problem highlight the need to improve communications, encourage reporting, and search for tools to assist the management of care. The authors found a lack of studies on implementation and assessment of the impact of proposals for improvement. Dentistry has made progress in patient safety but still needs to transpose the results into practice, where efforts are crucial to prevent adverse events.*

Patient Safety; Dentistry; Quality of Health Care; Adverse Event

Correspondence
C. D. T. S. O. Corrêa
Rua Desembargador João Manoel de Carvalho 190, apto. 1001, Vitória, ES 29057-630, Brasil.
cautrier1@gmail.com

[1] Escola Nacional de Saúde Pública, Universidade NOVA de Lisboa, Lisboa, Portugal.
[2] Comprehensive Health Research Centre, Universidade NOVA de Lisboa, Lisboa, Portugal.
[3] Secretaria Municipal de Saúde de Cataguases, Cataguases, Brasil.

Introduction

The World Health Organization (WHO) defines patient safety as *"the reduction of risk of unnecessary harms related to healthcare to an acceptable minimum"* [1] (p. 21). The focus is on the prevention of adverse events (AE), defined as harms to the patient resulting from the care rather than the underlying disease [1].

The theme of patient safety and quality of care has been with us for some time [2]. However, it was not until the publications *To Err is Human: Building a Safer Health System* [3] and *Crossing the Quality Chasm: A New Health System for the 21st Century* [4] by the U.S. Institute of Medicine that the problem's magnitude and its clinical, economic, and social dimensions were exposed more clearly, underscoring the gap between the promised quality and the quality actually delivered.

Since then, under the leadership of international organizations, especially the WHO, patient safety has gained its own body of scientific knowledge [5]. Studies have grown and are proving essential for: (i) producing knowledge in the area; (ii) disseminating information; (iii) supporting decisions; (iv) promoting evidence-based practices; and (v) monitoring and assessing the impact of measures aimed at increasing patient safety and improving the quality of patient care [6].

Most of the studies have been conducted in the hospital setting, probably due to its organizational complexity, severity of the cases, diversity, and specificity of procedures [7]. Although dentists' work is mostly in the outpatient setting, the provision of dental care is prone to the occurrence of AE. Dental practice is eminently invasive, involves close and routine contact with secretions such as saliva and blood [8]; depends on the professional's skill, and entails constant exposure to possible medical emergencies [9,10].

Meanwhile, major technological progress in recent decades led to greater ease and precision in diagnoses and treatments [11], while adding greater complexity to the care and thus increasing the risk of dental AE [12].

Given this scenario, the article aimed to identify and explore studies focused on patient safety in Dentistry. It is essential to explore the contents of these publications to highlight possible contributions to practice and identify potential points of departure for continuity, indispensable for understanding the problem and seeking improvements in quality of care and patient safety in this context.

Method

This was an integrative literature review oriented by the following question: "What research developments have occurred in the field of patient safety in Dentistry, and what contributions have the studies made to the safety of care?". To answer this question, we conducted searches in the databases MEDLINE via PubMed, VHL Regional, and Scopus via Portal Capes, since these contain most of the publications in the health field. We used the terms from the MeSH terms (*Medical Subject Headings*; https://www.ncbi.nlm.nih.gov/mesh/) in English: patient safety and dentistry in the title and/or abstract (Box 1).

The inclusion criteria were: scientific articles in English, Spanish, or Portuguese, by authors' convenience, and representing the great majority of publications in this area; that prioritized patient safety in Dentistry, that included quantitative, qualitative, evaluative, intervention, reflection, document analysis, and literature review methodologies; published since January 1, 2000 – the year of publication of the report *To Err is Human: Building a Safer Health System* – until June 30, 2019.

Exclusion criteria were articles that did not address patient safety as the central approach, such as: those focusing mainly on legal aspects, workers' health, and biosafety; articles involving other health professions; editorials, letters, recommendations by agencies/institutions, opinions/commentary, and interviews; duplicate articles; those without abstracts; and non-accessible publications. The titles and abstracts were read by two independent reviewers, and doubts were resolved by consensus between the two.

The included studies were categorized by year, country of publication, method, and main objective. The latter categorization, conducted by the authors, was based on an approach to the components in the research cycle proposed by the WHO [6] (Box 2); descriptive studies that analyzed and discussed patient safety concepts and their application to Dentistry but which did not allow fitting them into the research cycle's components were classified as "others".

Box 1

Search strategy.

PORTAL	SEARCH
MEDLINE	"patient safety"[Title/Abstract] AND dentistry[Title/Abstract] AND (("2000/01/01"[PDAT] : "2019/06/30"[PDAT]) AND (Portuguese[lang] OR Spanish[lang] OR English[lang]))
VHL Regional	(tw:("patient safety")) AND (tw:(dentistry)) AND (instance: "regional") AND db:("LILACS" OR "BBO" OR "IBECS"") AND la:("es" OR "pt" OR "en") AND type:("article")
Scopus	TITLE-ABS-KEY ("patient safety" AND dentistry) AND DOCTYPE (ar OR re) AND PUBYEAR > 1999 AND PUBYEAR < 2020 AND (LIMIT-TO (LANGUAGE, "English") OR LIMIT-TO (LANGUAGE, "Portuguese") OR LIMIT-TO (LANGUAGE, "Spanish")

Source: prepared by the authors.

Box 2

Patient safety research cycle proposed by the World Health Organization (WHO).

Cycle components	Data sources and strategies	Data collection methods
1. MEASURE THE HARM: quantify the number of patients that suffer harm or die each year and the types of adverse events, e.g., medication error, infections associated with the care, surgeries on the wrong site, etc.	Incident reporting systems, administrative data, administrative complaints, malpractice complaints, morbidity and mortality meetings, audits, national/regional surveys, and patient charts	Interviews with professionals, direct observation, and clinical monitoring
2. UNDERSTAND THE CAUSES: identify an adverse event's principal underlying causes	Incident reporting systems; administrative data; administrative complaints; malpractice complaints; morbidity and mortality meetings; audits; national or regional surveys; and patient charts	Root-cause analysis; survey with professionals; analysis of malpractice complaints; analysis of incidents found in incident reporting systems; direct observation
3. IDENTIFY SOLUTIONS: determine effective solutions for making healthcare safer and reducing harm to patients, compared to current standard care	Intervention studies of the "before and after" type; double-blind randomized controlled clinical trials; and cluster randomization	The interventions to test or improve can be in patients (e.g., different treatment), in health professionals (e.g., training to improve team communication), in the workplace (e.g., adaptations to rooms to prevent patient falls), or in the system (changes to an electronic prescription system)
4. ASSESS THE IMPACT: assess the effectiveness of solutions in the health services' reality in terms of impact, acceptability, and supply capacity	Studies that measure the harm's frequency, prevalence during appropriate care, assesses change in practice resulting from learning, and patient safety culture	Studies can be targeted to patients, health professionals, workplace, or system
5. TRANSPOSE EVIDENCE INTO SAFER CARE: understand how research results can be transposed to practice	Summarize the evidence; identify local barriers to implementation; understand the context; measure performance; guarantee that all patients receive the intervention	-

Source: adapted from Caldas et al. [6].

Results

The search in the three databases identified 315 articles: 95 captured by MEDLINE, 21 via VHL Regional, and 199 through Scopus. After excluding 99 articles, 86 duplicates, 7 without an available abstract, and 6 unavailable, 216 articles were selected for reading the title and abstract. Based on the references found, 9 more articles were captured and added to the sample (Figure 1).

The final sample consisted of 91 articles. Countries with the most publications were United States (39.3%; n = 33) and England (31%; n = 28); Brazil, Canada, China, Chile, Scotland, Netherlands, Mexico, Pakistan, Sweden, and Switzerland presented only 1 publication each during the period (Table 1).

Based on the included studies' objectives, categorized by the components of the research cycle proposed by the WHO [6], we found that some studies addressed more than one component. Most were focused on the initial phases: measuring the harm (28.6%; n = 26); understanding the causes

Figure 1

Article selection flow.

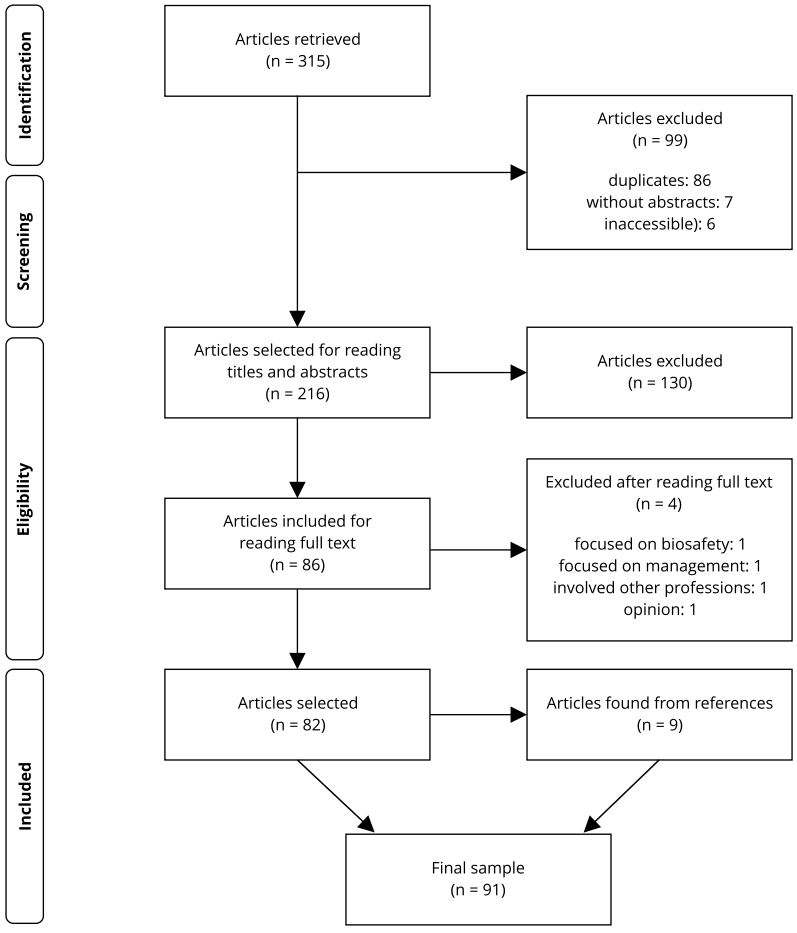

Table 1

Studies by country and year of publication.

Country of publication	2005	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019 *	Total
Argentina								1				1	2
Brazil										1			1
Canada							1						1
Colombia								1		4			5
China												1	1
Chile										1			1
Denmark				1				1					2
Scotland						1							1
Spain			1	2		1	2						6
United States	1	1	1	1		3	4	5	4	4	9		33
Netherlands										1			1
India								1		1			2
England					2	4	4	5	3	3	3	4	28
Mexico									1				1
New Zealand					1			2					3
Pakistan											1		1
Sweden							1						1
Switzerland											1		1
Total	1	1	2	4	3	9	12	16	8	15	14	6	**91**

Source: prepared by the authors.

* Until June.

(56%; n = 51); and identifying solutions (32%; n = 30). Eight studies (11%) aimed to assess the impact, and two studies (2.2%) aimed to transpose the evidence into safer care (Box 3).

Of the 91 studies, 47.3% (n = 43) used quantitative methods, especially cross-sectional designs and retrospective patient chart reviews. Only 8.8% (n = 8) used qualitative designs (Box 3).

Discussion

Focus on patient safety in Dentistry

Publications on patient safety in Dentistry have grown worldwide, although with just minor increases; England and the United States accounted for most of the included studies. A strong primary healthcare (PHC) system, as in England, and pioneering work in institutions dedicated to healthcare quality improvement, as in the United States, may help explain these findings.

The area's specificities may point to reasons for the low number of studies: (i) procedures that are generally less invasive than those of medical surgery and are thus less prone to serious harms; (ii) dental complications are often treated in hospital emergency departments, and the initial attending dentist may thus not learn of the incident; (iii) a large share of the care takes places in the private sector and/or in individual dentists' offices, and fear of losing patients may limit reporting of the harm; and (iv) less familiarity with the issue in private practices than in the hospital setting, which is historically more amenable to campaigns, courses, and greater control of AE [9,13].

However, while some characteristics may explain the lack of contact with patient safety issues, other characteristics raise challenges for professional dental practice that should encourage more studies. We highlight the predominance of surgical procedures and their complications, such as bleed-

Box 3

Characteristics of included studies.

Study (Year)	Country of publication	Objectives categorized according to the WHO proposed research cycle	Method	Principal results/ recommendations
Gluskin et al. [55] (2005)	United States	Identify solutions	Case series study	Formulates and recommends protocol to increase safety in the use of an ultrasound device in endodontic treatment
Leong et al. [66] (2008)	United States	Understand the causes	Quantitative, observational, cross-sectional study	Highlights need for involvement by leadership and suggests implementation of an incident reporting system
Mendonça et al. [50] (2010)	United States	Understand the causes	Descriptive observational study	Shows that the pharmacist's presence and continuing training of dentists contribute to safe prescription
Perea-Pérez et al. [16] (2010)	Spain	Other	Contextual thematic analysis	Describes patient safety and its interaction with Dentistry
Noguerado et al. [94] (2011)	Spain	Identify solutions	Descriptive, observational; retrospective patient chart review	Conducts a review of the most widely used drugs in Dentistry and proposes guidelines for safe prescription for pregnant and breastfeeding women
Tan [58] (2011)	United States	Identify solutions	Quantitative, observational, cross-sectional	Postulates that simulation helps the professional to better manage crisis situations
Perea-Pérez et al. [13] (2011)	Spain	Transpose evidence	Development of management tool/ intervention proposal	Presents a risk management plan for dental care
Perea-Pérez et al. [82] (2011)	Denmark	Identify solutions	Cross-cultural adaptation of instrument	Provides a checklist for dental surgery
Yamalik & Perea-Pérez [9] (2012)	England	Other	Reflexive-conceptual study	Describes the foundations for patient safety and dentistry's role in the area
Thusu et al. [12] (2012)	England	Measure the harm; understand the causes	Descriptive study/ quantitative analysis of the database from the national incident reporting system	Describes safety incidents: soft tissue injuries; medical emergencies; inhalation/ingestion; adverse drug reactions; switched tooth extractions
Guzmán-Álvarez et al. [98] (2012)	New Zealand	Understand the causes	Quantitative cross-sectional study	Identifies knowledge gaps in Pharmacology that can affect patient safety in universities
Kalenderian et al. [23] (2013)	United States	Measure the harm	Descriptive, observational, retrospective patient chart review	Proposes and tests trackers of dental AE to review patient charts
Yamalik & Van Dijk [67] (2013)	England	Understand the causes	Quantitative, observational, cross-sectional study	Enforces national patient safety regulations as essential
Knepil et al. [78] (2013)	Scotland	Identify solutions; assess the impact	Qualitative-quantitative design with application of interview	Identifies surgical marking that most pleased patients and professionals. Suggests adaptation of the WHO checklist for tooth extractions

(continues)

Box 3 (continued)

Study (Year)	Country of publication	Objectives categorized according to the WHO proposed research cycle	Method	Principal results/ recommendations
Mettes et al. [24] (2013)	England	Measure the harm; understand the causes	Descriptive; observational, retrospective patient chart review	Highlights avoidable incidents related to treatment, diagnosis, and communication
Hiivala et al. [103] (2013)	England	Identify solutions	Quantitative, observational, cross-sectional review	Emphasizes the importance of management's involvement in implementing available guidelines and reporting incidents
Hiivala et al. [25] (2013)	England	Measure the harm; understand the causes	Quantitative, observational, cross-sectional review	Reports that the main AE were in prostheses, endodontic treatment, and surgery. Lists contributing factors
Perea-Pérez et al. [57] (2013)	Spain	Identify solutions	Document review with intervention proposal	Proposes evaluation of risks in dental care for persons with disability
Lee et al. [26] (2013)	United States	Measure the harm	Descriptive observational study. Retrospective database analysis	Identifies association between mortality and pediatric dental procedures under sedation
Donaldson & Touger-Decker [53] (2013)	United States	Understand the causes	Literature review	Points to the risks of interaction between dietary supplements and drugs prescribed in Dentistry
Perea-Pérez et al. [27] (2014)	Spain	Measure the harm; understand the causes	Descriptive observational study. Retrospective reviews of legal cases	Identifies tooth loss as the most common harm. The predominant specialties were: implantology, endodontology, and surgery
Raja et al. [59] (2014)	United States	Understand the causes	Quantitative cross-sectional study with pre and post-test	Highlights need to include preparation for communicating AE in undergraduate training
Ashley et al. [100] (2014)	England	Identify solutions	Reflexive article. Contextual thematic analysis	Presents various modalities of clinical audit as a strategy for quality of care and patient safety
Pemberton et al. [64] (2014)	England	Identify solutions; assess the impact	Contextual thematic analysis, document review with intervention proposal	Describes the development of a patient safety panel as a factor for encouraging safety culture and focus on key patient safety issues
Ramoni et al. [68] (2014)	United States	Understand the causes; Identify solutions	Quantitative, descriptive cross-sectional study	Measures culture as a way to add a virtuous cycle of improvement and highlights different perceptions between manager and professionals
Speers & McCulloch [17] (2014)	Canada	Identify solutions	Contextual thematic analysis	Recommends the implementation of training based on *Crew Resource Management* in dental practice
Bailey et al. [10] (2014)	England	Other	Literature review and contextual analysis	Explains and reinforces the relevance of patient safety for primary Dentistry and suggests future research areas
Beedis et al. [87] (2014)	England	Identify solutions; assess the impact	Cases series study with intervention proposal	Prepares a checklist to evaluate patients referred with trismus
Díaz-Flores-García et al. [89] (2014)	Spain	Identify solutions	Study on adaptation of instrument	Presents a checklist for endodontic treatment

(continues)

Box 3 (continued)

Study (Year)	Country of publication	Objectives categorized according to the WHO proposed research cycle	Method	Principal results/ recommendations
Donaldson & Touger-Decker [54] (2014)	United States	Understand the causes	Literature review	Identifies risks in the interaction between vitamin and mineral supplements and drugs prescribed in Dentistry
Donaldson et al. [52] (2014)	United States	Understand the causes	Literature review	Identifies the risks of interaction between drugs prescribed in Dentistry and weight loss drugs
Jonsson & Gabre [28] (2014)	Sweden	Measure the harm	Quantitative, descriptive, cross-sectional study	Acknowledges the difficulty in reporting safety incidents, but emphasizes the need for reporting by all those involved, including patients
Piccinni et al. [21] (2015)	Denmark	Measure the harm	Quantitative, analytical, case-control study	Suggests that prilocaine and/or articaíne may be associated with increased risk of paresthesia
Akifuddin & Khatoon [29] (2015)	India	Measure the harm; understand the causes	Quantitative, descriptive study with application of the Six Sigma method	Describes the most frequent complications in local anesthesia. Six Sigma methodology helps improve care
O'Brien [18] (2015)	England	Other	Thematic, contextual, reflexive analysis	Describes patient safety parameters and concepts used in Medicine that are applicable to Dentistry
Christiani et al. [30] (2015)	Colombia	Measure the harm; understand the causes	Observational, descriptive, prospective, analysis of voluntary reports	Shows that most errors are recurrent. Recommends strengthening patient safety culture to reduce AE
Christiani & Rocha [47] (2015)	Argentina	Understand the causes	Quantitative, descriptive, cross-sectional study	Points to the need to strengthen safety culture and states that dentists lack information on the topic
Perea-Pérez et al. [96] (2015)	United States	Understand the causes; Identify solutions	Retrospective review of legal cases	Concludes that most AE result from a small number of causes and that implementation of basic procedures can reduce them significantly
Bailey [48] (2015)	England	Understand the causes; Identify solutions	Qualitative; focus group	Suggestions for patient safety improvement based on dentists' expertise
Obadan et al. [31] (2015)	United States	Measure the harm	Literature review	Reports that 270 AE were found in 182 publications.
Nelson & Xu [65] (2015)	New Zealand	Understand the causes; Identify solutions	Thematic, contextual, reflexive analysis	Highlights the need for careful selection of procedures and strengthening safety culture to reduce risks involved in pediatric sedation
Bailey et al. [83] (2015)	England	Identify solutions	Literature review	Presents the adoption of surgical checklists as the only interventions in Dentistry with proven reduction of AE

(continues)

Box 3 (continued)

Study (Year)	Country of publication	Objectives categorized according to the WHO proposed research cycle	Method	Principal results/ recommendations
Bennett et al. [80] (2015)	United States	Understand the causes; Identify solutions	Thematic, contextual, reflexive analysis.	Proposes that care should comply with preestablished guidelines for selection of the anesthetic and patient monitoring.
Martín-Cameán et al. [56] (2015)	New Zealand	Understand the causes	Literature review	Orthodontic appliances may release metal ions that compromise patient safety
Bagg & Welbury [19] (2015)	England	Understand the causes	Thematic, contextual, reflexive analysis	Quality of care and patient safety should take priority over all other objectives. Emphasizes the importance of patient-centered care
Hiivala et al. [101] (2015)	England	Understand the causes	Quantitative study with retrospective review of legal cases	More than half of the records of complaints by patients/families involve physical harms or potential patient safety risks
Donaldson & Goodchild [51] (2015)	United States	Understand the causes	Literature review	High concentrations of sugar in medicines can increase the risk of dental caries
Hebballi et al. [32] (2015)	United States	Measure the harm	Quantitative study with retrospective analysis of AE reporting database	Presents the poor use or misfunctioning of dental devices as a contributing factor to AE. AE reports play an essential role in improving dentists' access to information on safety of dental devices
Hiivala et al. [33] (2016)	England	Measure the harm; understand the causes	Quantitative study with retrospective analysis of AE reporting database	Classified most AE as avoidable, with high severity, with permanent or lasting harms, and related to the procedure and/or clinical diagnoses
Nenad et al. [88] (2016)	United States	Identify solutions; assess the impact	Evaluation of intervention/ mixed method/ intervention group and non-randomized control group	Did not find a positive association between use of the checklist and the error rate and repetition of the X-ray
Maramaldi et al. [34] (2016)	United States	Measure the harm; understand the causes	Qualitative study/focus group/in-depth interviews	Presents a list of AE in Dentistry and their possible causes
Renton & Sabbah [44] (2016)	England	Measure the harm; understand the causes	Retrospective analysis of national AE reporting database	Describes and assesses never events in Dentistry
Castillo [20] (2016)	Mexico	Identify solutions	Thematic, contextual, reflexive analysis	Describes measures that can benefit dental care according to WHO guidelines and targets
Donaldson & Goodchild [93] (2016)	United States	Identify solutions	Thematic contextual analysis	Reviews the pharmacokinetic and pharmacodynamic principles of drug antagonists to help mitigate medical emergencies induced by drugs prescribed in Dentistry

(continues)

Box 3 (continued)

Study (Year)	Country of publication	Objectives categorized according to the WHO proposed research cycle	Method	Principal results/ recommendations
Renton & Master [75] (2016)	England	Understand the causes	Thematic contextual analysis	Reviews the complexities of patient safety systems and procedures in Dentistry
Ensaldo-Carrasco et al. [35] (2016)	United States	Measure the harm	Literature review	Presents the main types of AE, but does not reach reliable estimates of their frequency
Tokede et al. [36] (2017)	United States	Measure the harm	Quantitative, descriptive study, with retrospective patient chart review	Estimates an incidence of 3 AE per 100 patients/year. Emphasizes the need to understand the basic epidemiology of AE in terms of frequency and diversity of populations affected
Ali et al. [69] (2017)	India	Understand the causes	Quantitative, cross-sectional study	Assesses various aspects of organizational culture among dentists and highlights communication and stress reduction as contributing factors for improving quality and safety
Black & Bowie [45] (2017)	England	Measure the harm; understand the causes	Qualitative and quantitative study, including literature review, descriptive and qualitative analysis, expert panel	Presents a list of 9 never events covering a series of potentially severe situations in Dentistry
Corrêa & Mendes [37] (2017)	Brazil	Measure the harm	Qualitative study, literature review, expert panel	Proposes a set of 14 trackers for detecting AE in Dentistry
Cullingham et al. [79] (2017)	England	Understand the causes; Identify solutions	Thematic, contextual, reflexive analysis	Highlights the importance of reporting incidents and root-causes analyses to assist understating of factors contributing to switched tooth extraction
Hussein et al. [95] (2017)	Netherlands	Identify solutions	Qualitative study with document analysis and expert panel	Proposes quality indicators for prescribing antibiotics in Dentistry
Ibrahim et al. [102] (2017)	England	Understand the causes	Quantitative cross-sectional study	Patients showed adequate attitudes towards infection control but require greater knowledge of the issue and the practices to be adopted
Skaar & O'Connor [92] (2017)	United States	Understand the causes	Quantitative cross-sectional study	Points to the need to increase dentists' knowledge on drug-related AE in the elderly
Osegueda-Espinosa et al. [38] (2017)	United States	Measure the harm; understand the causes	Quantitative cross-sectional study	Points to the need for strategies to reduce risks and promote safety culture in Dentistry schools

(continues)

Box 3 (continued)

Study (Year)	Country of publication	Objectives categorized according to the WHO proposed research cycle	Method	Principal results/ recommendations
Huertas et al. [39] (2017)	Colombia	Measure the harm; understand the causes	Observational, descriptive study with analysis of AE reports and retrospective patient chart review	Identifies 43 AE, of which 42 were classified as avoidable. Shows a weak safety culture and highlights the need for training for adherence to safe practices, acquisition of communications skills, and patient-centered care
Vila-Sierra et al. [77] (2017)	Colombia	Understand the causes; assess the impact	Descriptive cross-sectional study	Identifies progress in adherence to the patient safety program in Dentistry. Suggests periodic audits to identify adherence to guidelines and protocols
Rivera-Mendoza et al. [97] (2017)	Chile	Understand the causes	Case study with root-cause analysis	Step-by-step for root-cause analysis and recommendations for its improvement
Renouard et. [76] (2017)	United States	Understand the causes	Thematic, contextual, reflexive analysis	Points to the need to introduce the concept of "human factors" in undergraduate training and professional experience; recommends reporting and analysis of errors to improve safety for professionals and patients
Pesántez Alvarado et al. [40] (2017)	Colombia	Measure the harm	Observational, descriptive study with retrospective patient chart review	Identifies 74 surgical complications, of which 66 were related to tooth extraction; classified 11 AE (9 avoidable and 2 non-avoidable)
Pérez Gómez et al. [41] (2017)	Colombia	Measure the harm; understand the causes	Observational descriptive study with retrospective patient chart review	Estimates 6.1% incidence of AE in patient sample. Of these, 58% were classified as avoidable. Emphasizes the importance of reporting
Madarati et al. [90] (2018)	Switzerland	Identify solutions	Quantitative, descriptive, cross-sectional study	Reports absolute isolation in endodontic treatment as well-accepted by patients, with its safety as the most commonly reported advantage
Robinson et al. [104] (2018)	United States	Identify solutions; assess the impact; transpose evidence	Qualitative study/ expert panel	Develops, presents, and implements a standardized procedure for collecting informed consent
Schmitt et al. [84] (2018)	United States	Identify solutions; assess the impact	Randomized clinical trial	Elaborates and validates checklists for outpatient dental surgeries
Robert & Patel [81] (2018)	United States	Identify solutions	Thematic contextual analysis	Describes the essential aspects of management plans for medical emergencies in dental offices

(continues)

Box 3 (continued)

Study (Year)	Country of publication	Objectives categorized according to the WHO proposed research cycle	Method	Principal results/ recommendations
Al Sweleh et al. [70] (2018)	United States	Understand the causes	Quantitative, descriptive, cross-sectional study	Assesses safety culture among Dentistry professors; recommends emphasis on improvement of communications, strengthening teamwork, and non-punitive responses to error
Parker et al. [22] (2018)	United States	Assess the impact	Literature review/meta-analysis	Assesses benefits and harms associated with capnography in monitoring moderate sedation. Reports that its adoption reduces the risk of hypoxemia, indicating its routine use
Al Blaihed et al. [62] (2018)	England	Understand the causes	Quantitative, descriptive cross-sectional study	Describes the perception of clinical supervisors concerning reporting of incidents committed by students. The most commonly identified barrier was a possible negative relationship between supervisor and student
Mahmood et al. [99] (2018)	Pakistan	Understand the causes	Quantitative, descriptive cross-sectional study	Identifies gaps in knowledge on pharmacology as contributing factors to prescription errors
Nainar [74] (2018)	United States	Understand the causes	Thematic, contextual, reflexive analysis	Describes the physical and emotional compromise to professionals directly involved in AE and emphasizes the need to support them
Wright et al. [85] (2018)	England	Identify solutions; assess the impact	Adaptation of instrument with qualitative approach, expert panel	Presents a surgical checklist and recommends training for its use, aimed at patient-centered care to mitigate potential consequences of human errors
Chew et al. [71] (2018)	United States	Understand the causes	Qualitative study with interview	Recommends the promotion of safety culture in undergraduate schools, in addition to promoting adherence to clinical regulations and guidelines
Al-Surimi et al. [61] (2018)	England	Understand the causes	Quantitative descriptive cross-sectional study	Points to greater concern for patient safety among female Dentistry students. Suggests incentives for teamwork and leadership. Infers that students' perception of safety culture improves over the course of their clinical experience

(continues)

Box 3 (continued)

Study (Year)	Country of publication	Objectives categorized according to the WHO proposed research cycle	Method	Principal results/ recommendations
Ensaldo-Carrasco et al. [46] (2018)	United States	Measure the harm;understand the causes	Qualitative study with expert panel	Presents a list of never events for dental treatment in primary care
Kalenderian et al. [42] (2018)	United States	Measure the harm	Review and consensus study with expert panel	Develops electronic trackers to detect dental AE and measures their performance. Pilot study identifies the main AE: pain, infection, and soft tissue injuries
Cheng et al. [72] (2019)	China	Understand the causes	Quantitative descriptive cross-sectional study	Concludes that the results of safety culture can orient interventions to improve patient safety
Christiani & Rocha [86] (2019)	Argentina	Identify solutions	Cross-cultural adaptation of instrument	Proposes a checklist to improve patient safety during surgical interventions
Asmarz et al. [91] (2019)	England	Understand the causes; Identify solutions	Case study	Emphasizes the need to comply with the use of rubber sheet to prevent foreign body aspiration
Stahl et al. [43] (2019)	England	Measure the harm; understand the causes	Analysis of AE reports	Identifies anesthesia in the wrong site and treatment of the wrong tooth as the most common AE. Failure in communication and in adherence to protocol were the main contributing factors
Choi et al. [73] (2019)	England	Understand the causes	Quantitative descriptive cross-sectional study	Demonstrates the influence of organizational environment on patient safety
Palmer et al. [60] (2019)	England	Understand the causes	Qualitative study with focus group	Recommends the introduction of teaching patient safety in the initial undergraduate years in Dentistry

AE: adverse events; WHO: World Health Organization.
Source: prepared by the authors.

ing and infections, constant exposure to ionizing radiation, and the need to be alert to the patient's health history [10].

We observed a similar trend in studies in patient safety in Dentistry to those of patient safety in general [14,15] in relation to the sources and techniques adopted. The initial studies, which were exploratory, sought to draw a parallel between dentistry and patient safety [9,10,16,17,18,19,20]. These then gave way to more specific approaches [21,22], suggesting greater participation by Dentistry in the multidisciplinary approach that the patient safety theme requires.

The problem's size and understanding its causes

While the first studies in patient safety aimed to measure the incidence or prevalence of AE to know the problem's magnitude [6], the initial studies in Dentistry, besides measuring their frequency, aimed to understand their causes, sparking reflection on the inherent challenges in the specificities of dental practice.

From the perspective of measuring the incidence/prevalence of harms, the studies [12,21,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43] produced findings that ranges from the complications of local anesthesia/sedation; lesions to the tongue and lips; and loss of teeth from switched tooth extractions, ocular lesions and even death. Incidents involved allergies, infections, diagnostic delay or failure, and failure in the procedure, among others. However, as addressed appropriately by Ensaldo-Carrasco et al. [35], the evidence is still considered insufficient to provide reliable estimates on the incidence and frequency of these events.

In the effort to characterize "never events" in dentistry, defined as incidents that resulted in death or significant disability for the patient and that should never occur [44], three studies used a qualitative methodology and produced distinct classifications [44,45,46]. Renton & Sabbah [44] used a list of never events from the English National Health Service (NHS) updated in 2015/2016. Black & Bowie [45] refined 507 suggestions from 250 dentists using the modified Delphi method. Ensaldo-Carrasco et al. [46] also used the modified Delphi method, but drew on the literature to create an initial list of never events that was then refined by 41 specialists from various countries.

To study the avoidability of AE, Pérez Gómez et al. [41] analyzed 595 patient charts and found 36 AE. Of these, 21 (58%) were considered avoidable. Mettes et al. [24] identified a total of 46 dental AE, 39% of which were considered avoidable. The authors inferred that although the relatively low percentage of avoidable AE suggested safety in dental practice, the records' low quality plus the subjectivity of the avoidability concept may imply the measure's underestimation. The situation calls for a critical analysis, especially when comparing the above-mentioned studies with two others: Huertas et al. [39] in which 43 of the 227 complaints analyzed were classified as AE, 42 (98%) avoidable, and Pesántez Alvarado et al. [40], analyzing 1,062 clinical histories of patients that underwent surgical procedures and identifying 11 AE, 9 of which (82%) were classified as avoidable.

The contributing factors to unsafe care featured diagnostic and/or planning errors, ineffective communication, failure in the performance of procedures, low adherence to protocol, and insufficient history-taking [25,33,39,43,47,48]. These factors were described in turn as either latent or active. Obadan et al. [31] analyzed hypothetically the accidental ingestion of foreign bodies and pointed to low clinical capacity, inadequate training, and deficient equipment maintenance as possible latent failures and inadequate protection of the patient's airways as an active failure.

AE resulting from medication include prescription, dispensing, and administration and are widely described in the scientific literature. In the context of PHC, drug prescription was reported as one of the principal causes of AE [49], corroborating the object of one of the first studies included: drug prescription in Dentistry [50].

Studies have demonstrated the need to focus attention on the use of medicines and other substances. The sugar in many pharmaceuticals can act as a cofactor for caries, particularly in patients with difficulty swallowing [51]. Weight-loss drugs [52], dietary supplements [53], and vitamin supplements [54] were also emphasized, suggesting that dentists should take these conditions into account in order to elaborate a safe, patient-centered treatment proposal.

Another concern is the association between AE and the technologies employed in dental care [55,56]. Along this line, Hebballi et al. [32] analyzed the reports of incidents with health devices notified to the U.S. Food and Drug Administration (FDA) in 2011. The results showed that out of a total of 1,978,056 reports, 28,046 (1.4%) were associated with dental devices. Some of the reports (2,942) were excluded because they did not furnish adequate information. Of the reports analyzed, 17,261 were related to injuries, 7,777 to poor functioning of the device, and 66 to deaths. Of these, 52 were clearly associated with the dental device.

Importantly, contributing factors are not associated only with the patient, but also with the healthcare providers and the work environment. Factors associated with patient characteristics include motor and/or intellectual disabilities and characteristics of children and the elderly. Factors associated with work conditions and the healthcare professional include agitated settings that favor distractions, high patient turnover, lack of skills from training, and deficient visibility and communication [57].

Training is essential for dealing with the problems that professionals may face during their careers [58,59,60], and it is important to incorporate the theme of patient safety starting in the early years of undergraduate school [61]. One study [39] of Dentistry students identified predisposing human factors related to AE such as operator fatigue, unawareness of risks, and failures of referrals. Corroborating

these findings, Osegueda-Espinosa et al. [38] called attention to the need for more active supervision in academic settings.

The studies confirm the importance of dentists' training to prepare them to identify urgencies and situations that escape their control in order to proceed to adequate referrals, as emphasized by Al Blaihed et al. [62], who described difficulties by professors in reporting incidents committed by students. They found that although there were verbal reports, the incidents were not recorded in writing, suggesting a weak local safety culture.

Patient safety culture means the beliefs, values, and standards shared by professionals and that also influence their behaviors and actions [63]. In the course of this review, studies alluded to the theme [13,64,65] or used it as their central focus [47,61,66,67,68,69,70,71,72,73]. Positive points were found, such has a high overall perception of patient safety; patient-centered care; the pursuit of effective and equitable care; and the value assigned to teamwork. The weaknesses described were low reporting of incidents and shortage of training, insufficient patient follow-up, and lack of the leadership's support for patient safety.

It is essential to also focus on organizational factors such as failures in the physical environment, scheduling and managing patients, lines of responsibility, and influence of policies [35]. A study of dental hygiene technicians showed that their perception of patient safety is inversely proportional to the number of hours worked and the number of patients treated [73].

Evidence shows that professionals involved in AE can suffer emotions that affect their performance and their health, potentially leading to substance use and depression [74]. Support by the organization for the professional involved in AE, also called the "second victim", is one of the key issues for safety of care. Non-punitive support in cases of safety incidents and AE, as well as simplification of reporting systems can help enhance this approach [70,75]. To allow an in-depth understanding of the AE problem requires combining the professionals' technical knowledge with their cognitive and behavior aspects [76].

Finally, the implementation of policies and periodic monitoring of compliance with clinical practice guidelines and patient safety [77] are necessary. The unavailability of national laws and/or regulations on patient safety in dentistry suggests low social awareness of the problem [67].

The solutions identified and their contribution to improvement in clinical safety

Studies on safety in surgical procedures were highlighted, possibly due to their more invasive nature. One study [78] discussed the process of marking the surgical site as an opportunity for communication between patients and professionals, allowing to reduce the odds of errors such as switched tooth extractions, which is a major concern [44,79].

Improvement in communication led to the development of a chart for display in the hospital setting, in which healthcare professionals recorded the unsafe events that occurred during routine dental care, and which contributed to periodic discussions of quality improvement by the team [64].

In order to improve safety in anesthesia, adequate monitoring and a highly trained team were identified as key factors [80,81]. In addition, a systematic review suggested the routine addition of capnography to standard monitoring of adults during moderate sedation [22].

Checklists were considered effective in the improvement of work processes, optimization of communication, and the reduction of stress levels in surgeries [78,81,82,83,84,85,86]. They also proved useful in the support of cancer diagnosis [87] and strengthening the safety culture [88].

For endodontic treatment, in addition to a checklist [89], a protocol was proposed to decrease the occurrence of incidents with ultrasound energy [55] and the use of rubber dams [90,91]. The latter is a device that isolates the dental element for the endodontic procedure and avoids incidents such as aspiration and/or swallowing of artifacts.

As solutions to prevent drug-related AE, Skaar & O'Connor [92] emphasized the need to increase dentists' knowledge of the prescribed drugs and their interactions. Donaldson & Goodchild [93] emphasized the importance of orientation for these professionals on the use of pharmacological antagonists to help mitigate drug-induced medical emergencies.

Meanwhile, Noguerado et al. [94] proposed a guide for drug prescription for pregnant and breastfeeding women, and Hussein et al. [95] suggested a set of indicators to improve prescription quality.

Importantly, many medication errors occur due to failures that could easily be avoided, including low adherence to protocols and filling out illegible prescriptions [96]. Clinical activities in a university should represent the gold standard for professional performance [97], and the implementation of educational programs could benefit the necessary development of dentists' prescribing skills [98,99].

Quality improvement methodologies tend to favor patient safety [29,97]. For example, the clinical audit is a useful tool, especially if: (i) it is structured formally and continuously with a regular schedule of meetings and events with permission for direct vertical and horizontal communication; (ii) training includes a significant number of staffers; (iii) it is aligned with local priorities; (iv) there is follow-up of all its phases (recording, data collection, data analysis, and report); and (v) there is timely monitoring of each recommendation in the action plan and its conclusion is reached before the next audit cycle is executed [100].

Another available tool is risk analysis. For patients with motor and/or cognitive needs that require specific care, Perea-Pérez et al. [57] proposed a specific risk analysis, which considers the risks related to patients and those associated with the professionals and the healthcare setting.

Reports of incidents constitute an excellent source of organizational learning and serve as substrate for the elaboration of strategies and interventions to improve patient safety [28]. Authors that used mixed databases, that is, that involved reports on health areas in general suggested that a specific reporting system for dental patients could facilitate both reporting and subsequent analysis of these events [12].

However, it is necessary to develop institutional policies to reduce barriers that hinder reporting by professionals [12,66,75] and to involve patients and their families, encouraging them to report harms [101]. Population awareness-raising of the problem is also important in the policies' wider sphere [102].

Many AE could be avoided by maintaining precise patient records [103]. Informed consent attached to the patient file has proven valuable by placing the patient at the center of the treatment decisions [104]. Adding photos and X-rays to the patient chart, recording situations pertaining to the incidents, as well as lab test results, can by highly useful in the analysis and assessment of AE [41].

Still, patient safety in Dentistry is multifactorial and complex [9]. The proposed solutions assume strong organizational action and teamwork. Such structural conditions are not always favorable, due to the inherent characteristics of dental care provision itself or other organizational factors.

Research efforts are thus explicitly needed in patient safety in Dentistry, aimed at assisting the systematization and organization of the provision of care and helping reduce AE in the field.

Study limitations

The study presents some limitations. The integrative review is an important tool that allows analyzing the literature widely and systematically. However, the search terms in the databases only included English, Portuguese, and Spanish, which may have limited the number of articles retrieved. Another limitation related to the search terms is the fact that they did not include the MeSH term adverse events, widely used to index publications on patient safety. To mitigate this issue, the authors expanded the search beyond the MeSH terms used, including the term patient safety in titles and abstracts, which allowed retrieving studies published since 2005. The use of only three reference databases may also have introduced a bias, although the authors felt that the three databases cover the major research output in the health field. In the literature search, 13 articles were excluded. Seven of these did not present an available abstract and 6 were inaccessible. Thus, the review did not include potential findings from the 13 studies. In the attempt to minimize these biases, 9 more articles were included, based on analysis of the references from the retrieved articles.

Conclusion

The publications showed that Dentistry is evolving towards better knowledge of patient safety issues, especially in developed countries. The possibility of collecting studies with diverse methodologies and objectives contributed to describing their actual role in the theme and allowed identifying a range of proposals for improving patient care safety.

Healthcare's complexity includes factors inherent to the setting and to human action, which in Dentistry amplifies the odds of AE through single and fragmented work. Shaping a favorable environment for patient safety in dentistry requires involvement by universities, industry, and the services' administration, together with the healthcare professionals directly providing the care, the patients, and their families. In this sense, qualitative studies proved quite useful, although few in number in this review.

As in other professions that produce the direct fruits of human labor, the results of the care depend largely on the attending professional. Thus, training, ergonomics, sufficient time to conduct the care, and appropriate operational inputs were identified as crucial for the real work to approach the ideal and reduce the risk of harms to dental patients.

The trend in research according to the components of the cycle proposed by the WHO showed that studies dedicated to the first phase, namely measuring the harm, were not the majority. The main AE in Dentistry were: hard and soft tissue lesions to the oral cavity, with special attention to switched tooth extractions; allergies, anesthetic complications, and infections, circumstances which if aggravated can even lead to death. Many studies addressed the importance of understanding the causes of AE and identifying solutions to avoid them, in an effort to mitigate the problem.

Contributing factors included failures in planning and management of care, ineffective communication, inadequate use of technologies, deficiencies in training, and a weak safety culture. The study instruments' proposals and the methods presented to decrease the problem's impact require further assessment studies.

Finally, only two studies classified in the last phase of the cycle transpose to practice the measures assessed as having a positive impact and improving patient safety. These findings confirm Dentistry's participation in this area, but point to a long road ahead, suggesting fertile ground for research to help improve quality and safety in dental care.

Contributors

C. D. T. S. O. Corrêa and C. T. Reis contributed to the elaboration and implementation of the methodology and the article's drafting and revision. P. Sousa contributed to the data analysis and the article's final revision.

Additional informations

ORCID: Claudia Dolores Trierweiler Sampaio de Oliveira Corrêa (0000-0001-9323-9720); Paulo Sousa (0000-0001-9502-6075); Claudia Tartaglia Reis (0000-0002-5392-9281).

References

1. Organização Mundial da Saúde. Estrutura conceitual da Classificação Internacional sobre Segurança do Doente. Relatório técnico final. Lisboa: Organização Mundial da Saúde; 2011.
2. Trindade L, Lage MJW. A perspectiva histórica e principais desenvolvimentos da segurança do paciente. In: Sousa P, Mendes W, organizadores. Segurança do paciente: conhecendo os riscos nas organizações de saúde. 2ª Ed. Rio de Janeiro: Coordenação de Desenvolvimento EducacionaI e EAD, Escola Nacional de Saúde Pública Sergio Arouca, Fundação Oswaldo Cruz; 2019. p. 41-58.
3. Institute of Medicine Committee on Quality of Health Care in America; Kohn LT, Corrigan JM, Donaldson MS, editors. To err is human: building a safer health system. Washington DC: National Academies Press; 2000.

4. Institute of Medicine Committee on Quality of Health Care in America. Crossing the quality chasm: a new health system for the 21st century. Washington DC: National Academies Press; 2001.
5. World Health Organization. Assessing and tackling patient harm: a methodological guide for data-poor hospitals. Geneva: World Health Organization; 2010.
6. Caldas BN, Sousa P, Mendes W. Investigação/pesquisa em segurança do paciente. In: Sousa P, Mendes W, organizadores. Segurança do paciente: criando organizações de saúde seguras. 2ª Ed. Rio de Janeiro: Coordenação de Desenvolvimento EducacionaI e EAD, Escola Nacional de Saúde Pública Sergio Arouca, Fundação Oswaldo Cruz; 2019. p. 201-23.
7. Mendes W, Martins M, Rozenfeld S, Travassos C. The assessment of adverse events in hospitals in Brazil. Int J Qual Health Care 2009; 21:279-84.
8. Hughes A, Davies L, Hale R, Gallagher JE. Adverse incidents resulting in exposure to body fluids at a UK dental teaching hospital over a 6-year period. Infect Drug Resist 2012; 5: 155-61.
9. Yamalik N, Perea-Pérez B. Patient safety and dentistry: what do we need to know? Fundamentals of patient safety, the safety culture and implementation of patient safety measures in dental practice. Int Dent J 2012; 62:189-96.
10. Bailey E, Tickle M, Campbell S. Patient safety in primary care dentistry: where are we now? Br Dent J 2014; 217:339-44.
11. Viola NV, Oliveira ACM, Dota EAV. Ferramentas automatizadas: o reflexo da evolução tecnológica na Odontologia. Rev Bras Odontol 2011; 68:76-80.
12. Thusu S, Panesar S, Bedi R. Patient safety in dentistry – state of play as revealed by a national database of errors. Br Dent J 2012; 213:E3.
13. Perea-Pérez B, Santiago-Sáez A, García-Marín F, Labajo-González E, Villa-Vigil A. Patient safety in dentistry: dental care risk management plan. Med Oral Patol Oral Cir Bucal 2011; 16:e805-9.
14. Thomas EJ, Petersen LA. Measuring errors and adverse events in health care. J Gen Intern Med 2003; 18:61-7.
15. Murff HJ, Patel VL, Hripcsak G, Bates DW. Detecting adverse events for patient safety research: a review of current methodologies. J Biomed Inform 2003; 36:131-43.
16. Perea-Pérez B. Seguridad del paciente y odontología. Cient Dent 2010; 8:9-15.
17. Speers RD, McCulloch CA. Optimizing patient safety: can we learn from the airline industry? J Can Dent Assoc 2014; 80:e37.
18. O'Brien T. Reducing harm in healthcare systems. Prim Dent J 2015; 4:34-7.
19. Bagg J, Welbury R. The Francis Report: why it matters to the dental team. Dent Update 2015; 42:206-9.
20. Castillo HPC. Seguridad del paciente en los servicios de estomatología. Rev ADM 2016; 73:155-62.
21. Piccinni C, Gissi DB, Gabusi A, Montebugnoli L, Poluzzi E. Paraesthesia after local anaesthetics: an analysis of reports to the FDA Adverse Event Reporting System. Basic Clin Pharmacol Toxicol 2015; 117:52-6.
22. Parker W, Estrich CG, Abt E, Carrasco-Labra A, Waugh JB, Conway A, et al. Benefits and harms of capnography during procedures involving moderate sedation: a rapid review and meta-analysis. J Am Dent Assoc 2018; 149: 38-50.e2.
23. Kalenderian E, Walji MF, Tavares A, Ramoni RB. An adverse event trigger tool in dentistry: a new methodology for measuring harm in the dental office. J Am Dent Assoc 2013; 144: 808-14.
24. Mettes T, Bruers J, van der Sanden W, Wensing M. Patient safety in dental care: a challenging quality issue? An exploratory cohort study. Acta Odontol Scand 2013; 71:1588-93.
25. Hiivala N, Mussalo-Rauhamaa H, Murtomaa H. Patient safety incidents reported by Finnish dentists: results from an internet-based survey. Acta Odontol Scand 2013; 71:1370-7.
26. Lee HH, Milgrom P, Starks H, Burke W. Trends in death associated with pediatric dental sedation and general anesthesia. Paediatr Anaesth 2013; 23:741-6.
27. Perea-Pérez B, Labajo-González E, Santiago-Sáez A, Albarrán-Juan E, Villa-Vigil A. Analysis of 415 adverse events in dental practice in Spain from 2000 to 2010. Med Oral Patol Oral Cir Bucal 2014; 19:500-5.
28. Jonsson L, Gabre P. Adverse events in public dental service in a Swedish county: a survey of reported cases over two years. Swed Dent J 2014; 38:151-60.
29. Akifuddin S, Khatoon F. Reduction of complications of local anaesthesia in dental healthcare setups by application of the sixsigma methodology: a statistical quality improvement technique. J Clin Diagn Res 2015; 9:ZC34-8.
30. Christiani JJ, Rocha MT, Valsecia M. Seguridad del paciente en la práctica odontológica. Acta Odontol Colomb 2015; 5:21-32.
31. Obadan EM, Ramoni RB, Kalenderian E. Lessons learned from dental patient safety case reposts. J Am Dent Assoc 2015; 146:318-26.
32. Hebballi NB, Ramoni R, Kalenderian E, Delattre VF, Stewart DC, Kent K, et al. The dangers of dental devices as reported in the Food and Drug Administration Manufacturer and User Facility Device Experience Database. J Am Dent Assoc 2015; 146:102-10.
33. Hiivala N, Mussalo-Rauhamaa H, Tefke HL, Murtomaa H. An analysis of dental patient safety incidents in a patient complaint and healthcare supervisory database in Finland. Acta Odontol Scand 2016; 74:81-9.

34. Maramaldi P, Walji MF, White J, Etolue J, Kahn M, Vaderhobli R, Kwatra J, et al. How dental team members describe adverse events. J Am Dent Assoc 2016; 147:803-11.
35. Ensaldo-Carrasco E, Suarez-Ortegon MF, Carson-Stevens A, Cresswell K, Bedi R, Sheikh A. Patient safety incidents and adverse events in ambulatory dental care: a systematic scoping review. J Patient Saf 2016; (Online ahead of print).
36. Tokede O, Walji M, Ramoni R, Rindal DB, Worley D, Hebballi N, et al. Quantifying dental office-originating adverse events: the Dental Practice Study methods. J Patient Saf 2017; (Online ahead of print).
37. Corrêa CDTSO, Mendes W. Proposal of a trigger tool to assess adverse events in dental care. Cad Saúde Pública 2017; 33:e00053217.
38. Osegueda-Espinosa AA, Sánchez-Pérez L, Perea-Pérez B, Labajo-González E, Acosta-Gio AE. Dentists survey on adverse events during their clinical training. J Patient Saf 2017; (Online ahead of print).
39. Huertas MF, Gonzalez J, Camacho S, Sarralde AL, Rodríguez A. Analysis of the adverse events reported to the office of the clinical director at a dental school in Bogotá, Colombia. Acta Odontol Latinoam 2017; 30:19-25.
40. Pesántez Alvarado JM, Camacho Ladino JM, Rodríguez Ciódaro A, Camacho Peña SP, Sarralde Delgado AL, Castro Haiek DE, et al. Análisis de los eventos desfavorables como resultado de la atención en cirugía oral. Univ Odontol 2017; 36(77). https://revistas.javeriana.edu.co/index.php/revUnivOdontologica/article/view/21137.
41. Pérez Gómez W, Pita Bejarano AM, Ramos Vargas CA, González Moncada J, Güiza Cristancho EH, Rodríguez Ciódaro A. Análisis de los eventos adversos em el área de rehabilitación oral de la Facultad de Odontología de la Pontificia Universidad Javeriana Bogotá. Univ Odontol 2017; 36(77). https://revistas.javeriana.edu.co/index.php/revUnivOdontologica/article/view/20829.
42. Kalenderian E, Obadan-Udoh E, Yansane A, Kent K, Hebballi NB, Delattre V, et al. Feasibility of electronic health record-based triggers in detecting dental adverse events. Appl Clin Inform 2018; 9:646-53.
43. Stahl JM, Mack K, Cebula S, Gillingham BL. Dental patient safety in the military health system: joining medicine in the journey to high reliability. Mil Med 2019; 185:e262-8.
44. Renton T, Sabbah W. Review of never and serious events related to dentistry 2005-2014. Br Dent J 2016; 221:71-9.
45. Black I, Bowie P. Patient safety in dentistry: development of a candidate 'never event' list for primary care. Br Dent J 2017; 222:782-8.
46. Ensaldo-Carrasco E, Carson-Stevens A, Cresswell K, Bedi R, Sheikh A. Developing agreement on never events in primary care dentistry: an international eDelphi study. Br Dent J 2018; 224:733-40.
47. Christiani JJ, Rocha MT. Percepción de la seguridad del paciente en odontología. Rev Asoc Odontol Argent 2015; 103:154-9.
48. Bailey E. Contemporary views of dental practitioners' on patient safety. Br Dent J 2015; 219:535-40.
49. Marchon SG, Mendes WV. Segurança do paciente na atenção primária à saúde: revisão sistemática. Cad Saúde Pública 2014; 30: 1815-35.
50. Mendonça JMD, Lyra Jr. DP, Rabelo JS, Siqueira JS, Balisa-Rocha BJ, Gimenes FRE, et al. Analysis and detection of dental prescribing errors at primary health care units in Brazil. Pharm World Sci 2010; 32:30-5.
51. Donaldson M, Goodchild JH, Epstein JB. Sugar content, cariogenicity, and dental concerns with commonly used medications. J Am Dent Assoc 2015; 146:129-33.
52. Donaldson M, Goodchild JH, Ziegler J. Dental considerations for patients taking weight-loss medications. J Am Dent Assoc 2014; 145:70-4.
53. Donaldson M, Touger-Decker R. Dietary supplement interactions with medications used commonly in dentistry. J Am Dent Assoc 2013; 144:787-94.
54. Donaldson M, Touger-Decker R. Vitamin and mineral supplements: friend or foe when combined with medications? J Am Dent Assoc 2014; 145:1153-8.
55. Gluskin AH, Ruddle CJ, Zinman EJ. Thermal injury through intraradicular heat transfer using ultrasonic devices: precautions and practical preventive strategies. J Am Dent Assoc 2005; 136:1286-93.
56. Martín-Cameán A, Jos A, Mellado-García P, Iglesias-Linares A, Solano E, Cameán AM. In vitro and in vivo evidence of the cytotoxic and genotoxic effects of metal ions released by orthodontic appliances: a review. Environ Toxicol Pharmacol 2015; 40:86-113.
57. Perea-Pérez B, Labajo-González E, Bratos-Murillo M, Santiago-Sáez A, Albarrán-Juan E, Villa-Vigil A. The clinical safety of disabled patients: proposal for a methodology for analysis of health care risks and specific measures for improvement. Med Oral Patol Oral Cir Bucal 2013; 18:e251-6.
58. Tan GM. A medical crisis management simulation activity for pediatric dental residents and assistants. J Dent Educ 2011; 75:782-90.
59. Raja S, Rajagopalan CF, Patel J, Van Kanegan K. Teaching dental students about patient communication following an adverse event: a pilot educational module. J Dent Educ 2014; 78:757-62.
60. Palmer JC, Blanchard JR, Jones J, Bailey E. Attitudes of dental undergraduate students towards patient safety in a UK dental school. Eur J Dent Educ 2019; 23:127-34.
61. Al-Surimi K, Al Ayadi H, Salam M. Female dental students' perceptions of patient safety culture: a cross sectional study at a middle eastern setting. BMC Med Educ 2018; 18:301.

62. Al Blaihed RM, Al Saeed MI, Abuabat AA, Ahsan SH. Incident reporting in dentistry: clinical supervisor's awareness, practice and perceived barriers. Eur J Dent Educ 2018; 22:e408-18.
63. Reis CT. Cultura de segurança em organizações de saúde. In: Sousa P, Mendes W, organizadores. Segurança do paciente: criando organizações de saúde seguras. 2ª Ed. Rio de Janeiro: Coordenação de Desenvolvimento EducacionaI e EAD, Escola Nacional de Saúde Pública Sergio Arouca, Fundação Oswaldo Cruz; 2019. p. 77-109.
64. Pemberton MN, Ashley MP, Shaw A, Dickson S, Saksena A. Measuring patient safety in a UK dental hospital: development of a dental clinical effectiveness dashboard. Br Dent J 2014; 217:375-8.
65. Nelson TM, Xu Z. Pediatric dental sedation: challenges and opportunities. Clin Cosmet Investig Dent 2015; 7:97-106.
66. Leong P, Afrow J, Weber HP, Howell H. Attitudes toward patient safety standards in U.S. dental schools: a pilot study. Dent Educ 2008; 72:431-7.
67. Yamalik N, Van Dijk W. Analysis of the attitudes and needs/demands of dental practitioners in the field of patient safety and risk management. Int Dent J 2013; 63:291-7.
68. Ramoni R, Walji MF, Tavares A, White J, Tokede O, Vaderhobli R, et al. Open wide: looking into the safety culture of dental school clinics. J Dent Educ 2014; 78:745-56.
69. Ali I, Singla A, Gupta R, Patthi B, Dhama K, Niraj LK, et al. Psychometric utility in determining dental organizational attribute: a cross sectional study in Ghaziabad, India. J Clin Diagn Res 2017; 11:ZC52-5.
70. Al Sweleh FS, Al Saedan AM, Al Dayel OA. Patient safety culture perceptions in the college of dentistry. Medicine (Baltimore) 2018; 97:e9570.
71. Chew BKS, Sim DZ, Pau A. Dentists' perceptions of the meaning and promotion patient safety: a qualitative study. Oral Health Dent Manag 2018; 17:1-5.
72. Cheng H-C, Yen AM, Lee Y-H. Factors affecting patient safety culture among dental healthcare workers: a nationwide cross-sectional survey. J Dent Sci 2019; 14:263-8.
73. Choi EM, Mun SJ, Chung WG, Noh HJ. Relationships between dental hygienists' work environment and patient safety culture. BMC Health Serv Res 2019; 19:299.
74. Nainar SMH. Adverse events during dental care for children: implications for practitioner health and wellness. Pediatr Dent 2018; 40:323-6.
75. Renton T, Master S. The complexity of patient safety reporting systems in UK dentistry. Br Dent J 2016; 221:517-24.
76. Renouard F, Amalberti R, Renouard E. Are "human factors" the primary cause of complications in the field of implant dentistry? Int J Oral Maxillofac Implants 2017; 32:e55-e61.
77. Vila-Sierra LA, Salcedo-Salgado JD, Fernández-Roncallo YY, Narváez-Barandica MM. Grado de implementación del proceso de seguridad en el paciente en IPS odontológicas públicas y privadas en Santa Marta. Rev Gerenc Políticas Salud 2017; 16:116-25.
78. Knepil GJ, Harvey CT, Beech AN. Marking the skin for oral surgical procedures: improving the WHO checklist. Br J Oral Maxillofac Surg 2013; 51:413-5.
79. Cullingham P, Saksena A, Pemberton MN. Patient safety: reducing the risk of wrong tooth extraction. Br Dent J 2017; 222:759-63.
80. Bennett JD, Kramer KJ, Bosack RC. How safe is deep sedation or general anesthesia while providing dental care? J Am Dent Assoc 2015; 146:705-8.
81. Robert RC, Patel CM. Oral surgery patient safety concepts in anesthesia. Oral Maxillofac Surg Clin North Am 2018; 30:183-93.
82. Perea-Pérez B, Santiago-Sáez A, García-Marín F, Labajo González E. Proposal for a 'surgical checklist' for ambulatory oral surgery. Int J Oral Maxillofac Surg 2011; 40:949-54.
83. Bailey E, Tickle M, Campbell S, O'Malley L. Systematic review of patient safety interventions in dentistry. BMC Oral Health 2015; 15:152.
84. Schmitt CM, Buchbender M, Musazada S, Bergauer B, Neukam FW. Evaluation of staff satisfaction after implementation of a surgical safety checklist in the ambulatory of an oral and maxillofacial surgery department and its impact on patient safety. J Oral Maxillofac Surg 2018; 76:1616-39.
85. Wright S, Ucer TC, Crofts G. The adaption and implementation of the WHO surgical safety checklist for dental procedures. Br Dent J 2018; 225:727-9.
86. Christiani JJ, Rocha MT. Checklist quirúrgico en odontología: componente clave en la seguridad del paciente. Rev Asoc Odontol Argent 2019; 107:33-7.
87. Beddis HP, Davies SJ, Budenberg A, Horner K, Pemberton MN. Temporomandibular disorders, trismus and malignancy: development of a checklist to improve patient safety. Br Dent J 2014; 217:351-5.
88. Nenad MW, Halupa C, Spolarich AE, Gurenlian JR. A dental radiography checklist as a tool for quality improvement. J Dent Hyg 2016; 90:386-93.
89. Díaz-Flores-García V, Perea-Pérez B, Labajo-González E, Santiago-Sáez A, Cisneros-Cabello R. Proposal of a "checklist" for endodontic treatment. J Clin Exp Dent 2014; 6:e104-9.
90. Madarati A, Abid S, Tamimi F, Ezzi A, Sammani A, Shaar MBAA, et al. Dental-dam for infection control and patient safety during clinical endodontic treatment: preferences of dental patients. Int J Environ Res Public Health 2018; 15:E2012.

91. Asmarz HY, Benfati CAM, Bolan M. Accidental ingestion of a dental irrigation needle: a case report. Eur Arch Paediatr Dent 2019; 20:123-6.
92. Skaar DD, O'Connor H. Using the Beers criteria to identify potentially inappropriate medication use byolder adult dental patients. J Am Dent Assoc 2017; 148:298-307.
93. Donaldson M, Goodchild JH. Pharmacological reversal agents in dental practice: keys to patient safety. Compend Contin Educ Dent 2016; 37:681-7.
94. Noguerado M, Perea B, Labajo E, Santiago A, García F. Seguridad del paciente: prescripción de fármacos enodontología a mujeres embarazadas y en período de lactancia. Cient Dent 2011; 8:51-60.
95. Hussein RJ, Krohn R, Kaufmann-Kolle P, Willms G. Quality indicators for the use of systemic antibiotics in dentistry. Z Evid Fortbild Qual Gesundhwes 2017; 122:1-8.
96. Perea-Pérez B, Labajo-González E, Acosta-Gío AE, Yamalik N. Eleven basic procedures/practices for dental patient safety. J Patient Saf 2015; 16:36-40.
97. Rivera-Mendoza F, Acevedo-Atala C, Perea-Pérez B, Labajo-González E, Fonseca GM. Análisis causa-raíz sobre evento adverso producido en la Clínica Odontológica Docente Asistencial, Facultad de Odontología, Universidad de La Frontera, Chile. Int J Odontostomatol 2017; 11:207-16.
98. Guzmán-Álvarez R, Medeiros M, Lagunes LR, Campos-Sepúlveda A. Knowledge of drug prescription in dentistry students. Drug Healthc Patient Saf 2012; 4:55-9.
99. Mahmood A, Tahir MW, Abid A, Ullah MS, Sajjid M. Knowledge of drug prescription in dental students of Punjab Pakistan. Pakistan Journal of Medical and Health Sciences 2018; 12:232-7.
100. Ashley MP, Pemberton MN, Saksena A, Shaw A, Dickson S. Improving patient safety in a UK dental hospital: long-term use of clinical audit. Br Dent J 2014; 217:369-73.
101. Hiivala N, Mussalo-Rauhamaa H, Murtomaa H. Can patients detect hazardous dental practice? A patient complaint study. Int J Health Care Qual Assur 2015; 28:274-87.
102. Ibrahim NK, Alwafi HA, Sangoof SO, Turkistani AK, Alattas BM. Cross-infection and infection control in dentistry: knowledge, attitude and practice of patients attended dental clinics in King Abdulaziz University Hospital, Jeddah, Saudi Arabia. J Infect Public Health 2017; 10:438-45.
103. Hiivala N, Mussalo-Rauhamaa H, Murtomaa H. Patient safety incident prevention and management among Finnish dentists. Acta Odontol Scand 2013; 71:1663-70.
104. Robinson FG, Fields HW, Ness GM, Heinlein DJ, Gellin RG, Larsen PE. Development and implementation of a uniform dental school-wide electronic treatment consenting process for patients. J Dent Educ 2018; 82:949-60.

Resumo

Eventos adversos constituem grave problema relacionado à qualidade do cuidado de saúde. A prática odontológica, por ser eminentemente invasiva e implicar contato íntimo e rotineiro com secreções, é potencialmente propícia à ocorrência desses eventos. Diversos estudos em segurança do paciente foram desenvolvidos nas duas últimas décadas, entretanto, em maior número no ambiente hospitalar, em função de sua complexidade organizacional, gravidade de casos, diversidade e especificidade de procedimentos. O objetivo foi identificar e explorar os estudos voltados à segurança do paciente odontológico. Foi realizada revisão integrativa da literatura com consulta ao MEDLINE via PubMed, Scopus via Portal Capes e ao Portal Regional da Biblioteca Virtual de Saúde, utilizando-se os termos segurança do paciente *e* odontologia *nos idiomas inglês, espanhol e português a partir de 2000. Utilizou-se o ciclo de pesquisa em segurança do paciente, proposto pela Organização Mundial da Saúde para classificar os estudos incluídos. Foram analisados 91 artigos. Os eventos adversos mais comuns foram relacionados às alergias, às infecções, ao atraso ou falha de diagnóstico e ao erro da técnica. Medidas para mitigar o problema apontaram para a necessidade de melhoria da comunicação, incentivo à notificação e procura por instrumentos para auxiliar a gestão do cuidado. Constatou-se carência de estudos de implementação e avaliação de impacto das propostas de melhoria. A Odontologia evoluiu no campo da segurança do paciente, mas ainda está aquém de transpor resultados para a prática, sendo importante envidar esforços para prevenir os eventos adversos nesta área.*

Segurança do Paciente; Odontologia; Qualidade dos Cuidados de Saúde; Eventos Adversos

Resumen

Los eventos adversos constituyen un grave problema relacionado con la calidad del cuidado en la salud. La práctica odontológica, por ser eminentemente invasiva e implicar contacto íntimo y rutinario con secreciones, es potencialmente propicia para la ocurrencia de esos eventos. Diversos estudios en seguridad del paciente se desarrollaron en las dos últimas décadas, sin embargo, en mayor número en el ambiente hospitalario, en función de su complejidad organizativa, gravedad de casos, diversidad y especificidad de procedimientos. El objetivo fue identificar e investigar los estudios dirigidos a la seguridad del paciente odontológico. Se realizó una revisión integradora de la literatura con consulta al MEDLINE vía PubMed, Scopus vía Portal Capes y al Portal Regional de la Biblioteca Virtual de Salud, utilizándose los términos seguridad del paciente *y* odontología *en los idiomas inglés, español y portugués a partir de 2000. Se utilizó el ciclo de investigación en seguridad del paciente, propuesto por la Organización Mundial de la Salud para clasificar los estudios incluidos. Se analizaron 91 artículos. Los eventos adversos más comunes estuvieron relacionados con las alergias, infecciones, retraso o fallo de diagnóstico y con el error de la técnica. Las medidas para mitigar el problema apuntaron la necesidad de una mejora de la comunicación, incentivos a la notificación y búsqueda de instrumentos para apoyar la gestión del cuidado. Se constató la carencia de estudios de implementación y evaluación de impacto de las propuestas de mejora. La Odontología evolucionó en el campo de la seguridad del paciente, pero todavía está lejos de trasladar resultados a la práctica, siendo importante aunar esfuerzos para prevenir eventos adversos en esta área.*

Seguridad del Paciente; Odontología; Calidad de la Atención de Salud; Evento Adverso

Submitted on 08/Oct/2019
Final version resubmitted on 24/Jun/2020
Approved on 29/Jun/2020