Adverse Events in Dental Care: A Review Towards Notification

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ABSTRACT

We aimed to carry out a literature review to investigate the adverse events (AEs) resulting from dental care to guide future studies, particularly those concerning the notification of AEs, to promote patient safety. Searches were performed in PubMed and SciELO databases with the keywords "patient safety", "adverse events", "dental care", "dental services", and "dentistry". We considered the observational studies carried out in adults over the last 10 years. Review studies, case reports, and clinical trials were excluded. 56 articles were identified but only 12 of these were included in this study. The AEs found were: *infections, diagnostic delay or failure, allergies, diagnostic and examination errors, treatment planning errors, procedural errors, accidental ingestion or inhalation of foreign objects, jaw fatigue due to lengthy procedures, adverse events from sedation, neural injury, post-treatment infection, prolonged pain, and temporomandibular complications.* In conclusion, the identification and recognition of the AEs specific to the dental field is only the first step towards improving patient safety in dental care; it can be done through the development of specific reporting systems. We emphasize the importance of developing and validating an AEs notification system specifically for the dental field.

Keywords: Adverse event, Dentistry, Patient safety, Trigger tool

INTRODUCTION

Patient Safety is a health discipline that aims to prevent and reduce risks, errors, and damages that occur to patients during the provision of health care. The basis of the discipline is the continuous improvement of care to prevent unintentional or unexpected harm to people during the provision of health care, based on learning about errors and adverse events (AEs) (WHO, 2019). Patient safety is a crucial feature of high-quality healthcare, as AEs cause suffering and increase healthcare costs (Jonsson and Gabre, 2014).

A Safety Incident is an event or circumstance that could result, or has resulted, in unnecessary harm to the patient. An AEs is an incident that results in harm to the patient, that is, an incident with harm (DGS, 2011).

In other words, in dental care an AEs is any unfavorable, unwanted, and generally unforeseen incident caused by an error or omission during dental

treatment, which may have negative consequences for the patient's health, including physical or mental harm and/or prolonged treatment time (Melissa David-Rhoney, 2018). It is known that the occurrence of AEs due to unsafe care is probably one of the 10 leading causes of death and disability in the world (Jonsson and Gabre, 2014; Jha, 2018; Melissa David-Rhoney, 2018; WHO, 2019). Damage can be caused by several events, around 50% of which are preventable (de Vries et al., 2008; WHO, 2019). The burden is even more important in low- and middle-income countries, where an estimated 134 million AEs occur due to unsafe care, resulting in 2.6 million deaths (National Academies of Sciences Engineering and Medicine, 2018).

In dentistry, patient safety and protection are of paramount importance (Hughes et al., 2012). Although dental professionals strive to provide safe and effective oral health care, given the nature of dental care, adverse incidents can occur, and patients are at risk (Hughes et al., 2012; Maramaldi et al., 2016). Although some patients experience AEs due to harm from dental treatments, few published reviews describe these events (Ensaldo-Carrasco et al., 2016; Corrêa, Sousa and Reis, 2020). Understanding the occurrence of AEs is essential for building a safer environment in dental practice.

Study Objectives

Conduct a literature review to investigate the AEs unique to dental care, associated with the types of procedures that dentists perform and the tools they use, to guide future studies, particularly those concerning the reporting of AEs, as a means of promoting patient safety.

METHOD AND MATERIAL

This literature review study was conducted by searching for references in PubMed and SciELO databases. The following keyword combinations with the Boolean operators AND and OR were used:

1. "patient safety" AND "adverse events"
2. "dental care" OR "dental services" OR "dentistry"
3. NOT systematic review, NOT case report

Filters applied: in the last 10 years, Humans, Adult: 18+ years.

Inclusion criteria: (1) studies performed in humans; (2) dental professionals (dentists and professors of dentistry); (3) over 18 years of age; (4) observational studies that reported any type of adverse event associated with the types of procedures and tools that could result in unnecessary harm to patients due to dental care; (5) articles published in English, Portuguese, and Spanish; (7) articles published in the last 10 years. Expert opinions, reviews, case reports, and unpublished data were excluded. In addition, studies for which harm or potential harm was not the main outcome, such as those that addressed the effectiveness of dental treatments, were excluded.

The analysis of titles and abstracts and full reading of the articles was performed by a researcher. After reading the articles in full, the information collected included: author, year of publication and place, study design, patient safety incidents, and adverse events.

RESULTS

The electronic search identified 665 references in PubMed and 14 in SciELO. The evaluation of titles and abstracts, when available, resulted in 56 references of potential relevance. Of these, 12 were selected for the present review using the best description of the AEs as a choice criterion (Sambrook et al., 2011; Jonsson and Gabre, 2014; Perea-Pérez et al., 2014; Ensaldo-Carrasco et al., 2016; Maramaldi et al., 2016; Huertas et al., 2017; Swanljung and Vehkalahti, 2018; Walji et al., 2020; Matveev et al., 2020; Corte-Real et al., 2021; Kalenderian et al., 2021; Nassar et al., 2021).

There were eight cross-sectional studies (Perea-Pérez et al., 2014; Ensaldo-Carrasco et al., 2016; Maramaldi et al., 2016; Huertas et al., 2017; Swanljung and Vehkalahti, 2018; Matveev et al., 2020; Walji et al., 2020; Corte-Real et al., 2021) and four cohort studies (Jonsson and Gabre, 2014; Swanljung and Vehkalahti, 2018; Kalenderian et al., 2021; Nassar et al., 2021), as well as a total sample of 10958 reports of AEs reporting in dentistry in different countries, as described in Table 1.

Adverse Events

The AEs resulting from patient safety incidents in dental care are reported in Table 1. The most common AEs in dental care settings were infections, delayed or failed diagnosis, allergies, diagnostic and examination errors, errors in planning treatment, procedural errors (such as incorrect tooth extractions), accidental ingestion or inhalation of foreign objects, jaw fatigue from lengthy procedures, AEs from sedation, neural injury, post-treatment infection, prolonged pain, and temporomandibular complications that can take weeks or months to detect after treatment.

Tools

The tools used for tracking AEs included the "trigger tool", generally inspired by the Institute for Healthcare Improvement's global and outpatient trigger tools. They are retrospective medical record search tools used to identify AEs in electronic dental health records (Kalenderian et al., 2013; Walji et al., 2020). No tools were identified for reporting AEs in dentistry through physical and/or electronic forms.

DISCUSSION

This study aimed to investigate the AEs unique to dental care and the tools particularly related to their reporting. The results were based on 12 references involving approximately 10958 participants, with reports of adverse event reporting in dentistry. Different AEs were identified, and they included: infections, allergies, AEs of sedation, failure or errors in diagnosis, examination and procedural errors, treatment planning errors, accidental ingestion or inhalation of foreign objects, jaw fatigue from lengthy procedures, nerve damage, post-treatment infection, prolonged pain, and temporomandibular complications that can take weeks or months to detect after treatment.

Table 1. The main characteristics of the articles included. (*cont.*)

Autor, year, country	Study design	Sample size	Patient safety incident	Adverse events (AEs)
Corte-real et al. (2021) Portugal	Cross-sectional study	107	Bodily damage related to iatrogenic sequelae during dental practice.	Iatrogenic sequelae in 73.8% (n = 79) cases, of which ≈76% were categorized as risk and ≈24% as malpractice. Those categorized as risk were mainly associated with mandibular dysfunction and orthodontic treatment (62.2%), and those categorized as malpractice were associated with neurological deficits and implant rehabilitation (47.4%).
Ensaldo-Carrasco et al. (2016) United Kingdom	Cross-sectional study	1456	AEs during the preoperative (40.3%, n = 587), intraoperative (56.1%, n = 817), and postoperative (3.6%, n = 52) phases	Treatment delays in 23.6% (n= 344), procedural errors in 15.6% (n= 227), medication-related adverse incidents in 11.6% (n = 161), equipment failure in 6.2% (n = 90), and x-ray related errors in ≈6% (87) cases. Procedural errors in 15.6% (n = 227) cases, of which ≈34% (n =77) were related to incorrect tooth extraction, and of these, 48.1% (n = 37) were mainly due to distraction of the dentist and 91.9% (n = 34) required additional unnecessary procedures.
Huertas et al. (2017) Colombia	Cross-sectional study	227	Adverse event during the clinical management of treatments in different specialties (76.18%, n = 32). 9.5% (n = 4). AEs of dental treatment.	Soft tissue injury, misdiagnosis, and swallowing of foreign objects.
Jonsson e Gabre (2014) Sweden	Cohort study	273	AEs of dental treatment.	Late diagnosis and inadequate treatments, mainly endodontic
Kalenderian et al. (2021) USA	Cohort study	958	AEs of dental treatment.	Pain and infection in 73% of the cases reviewed (n = 699) (56% and 17%, respectively). Moderate to severe temporary harm to the patient in 88% (n = 843) cases.
Maramaldi et al. (2016) USA	Cross-sectional study	76	Dental treatment damage	Aspiration/ingestion of foreign objects in 14% (n = 76) cases. Wrong site, wrong procedure, wrong patient errors in 13% (n = 10) cases, hard tissue damage in 13% (n = 10), and soft tissue damage in 12% (n = 9). Death due to cardiac arrest and jaw fatigue from lengthy procedures.

Continued.

Table 1. Continued.

Autor, year, country	Study design	Sample size	Patient safety incident	Adverse events (AEs)
Matveev et al. (2020) Russian	Cross-sectional study	122	AEs due to drugs used in dentistry.	Hospitalization or prolongation of hospitalization in 5.7% of cases (n = 7) and temporary disability in 4.1% of cases (n = 5). 2 cases (1.6%) developed fatal outcomes as a result of suspected anaphylactic shock (n = 1) and central nervous system disorders (convulsions, respiratory failure) (n = 1).
Nassar et al. (2021) Israel	Cohort study	508	Worsening of periodontal disease during prosthetic or implant therapy and when incorrect or non-existent diagnosis and preoperative planning are suspected.	Pain and anguish in 84.8% (n = 431) cases, worsening of existing periodontal disease in 83.3% (n = 423), tooth loss in 78.1% (n = 397), and violation of autonomy in 47% (n = 239).
Perea-Pérez et al. (2014) Spain	Cross-sectional study	4.149	AEs resulting from dental care.	Tooth loss in 2.94% (n = 122) Permanent damage to the inferior dental nerve in 1.35% (n = 56); Significant bone loss in 1.04% (n = 43); Chronic damage to the sinuses in 0.92% (n = 38); Permanent damage to the lingual nerve in 0.46% (n = 19); Chronic Temporomandibular joint damage in 0.31% (n = 13); Death in 0.27% (n = 11); Chronic eye damage in 0.12% (n = 5); Chronic liver damage in 0.05% (n= 2); Permanent facial nerve damage in 0.02% (n = 1)
Sambrook et al. (2011) Australian	Cross-sectional study	227	Systemic adverse effects of injections of local anesthetic solutions.	Allergic reactions.Syncope, cardiovascular, and central nervous system reactions. Facial nerve palsy.
Swanljung & Vehkalahti, (2018) Finland	Cohort study	970	Application of root canal irrigants and medications (sodium hypochlorite and calcium hydroxide in root canals).	Endodontic lesions in 65% of cases (n = 635).
Walji et al. (2020) USA	Cross-sectional study	1885	AEs resulting from dental care.	Pain 27.5% (n = 518), hard tissue 14.8% (n = 279), soft tissue injury 14.8% (n = 278) and nerve injuries 13.3% (n = 251). Most AEs were classified as temporary damage 89.2% (n = 1681). Permanent damage was present in 9.6% (n = 181) of the AEs and 1.2% (n = 23) required transfer to the emergency room.

These results were similar to those obtained in other reviews (Ensaldo-Carrasco et al., 2016; Corrêa, Sousa and Reis, 2020). Of these reviews, one considered the articles published between 1994 and 2015 (Ensaldo-Carrasco et al., 2016), where the authors identified that patient safety incidents were errors in diagnosis and examination, treatment planning, communication, procedural errors, and accidental ingestion or inhalation of foreign objects. (Ensaldo-Carrasco et al., 2016). The other review included the studies published up to 2019 and identified as adverse events: allergies, infections, delayed or failed diagnosis, and technical error (Corrêa, Sousa and Reis, 2020).

The present review identified that the tools used to track AEs were the "trigger tools," used in a retrospective search of medical records. However, it was possible to verify, in the literature reviewed, that there is a gap regarding the existence of AEs notification tools in dentistry. Compared to medicine, less research has focused on contributing to the adoption of electronic AE records in dentistry (Chauhan et al., 2018).

The identification of the threats to patient safety is a key element of improving dental safety (Maramaldi et al., 2016). However, although dentistry has advanced in patient safety, there is still need to translate research into practice, where efforts are essential to prevent AEs (Corrêa, Sousa and Reis, 2020). It is observed in the literature that the AEs notification forms of dental clinics are not standardized in structure, organization, or content, thus the need for standardization and organization (Maramaldi et al., 2016; Rooney et al., 2020). In addition, it is important to improve communication, encourage notification, and seek tools to help manage care, with the development of patient safety strategies. Clear policymaking and data to drive safety improvements, skilled healthcare professionals, and effective patient involvement in care are all necessary (WHO, 2019; Corrêa, Sousa and Reis, 2020).

This review presents as strengths the description of the latest evidence involving AEs during dental care and the identification of the tools related to its notification, citing the latest published reviews on the subject. Efforts to track, prevent, and mitigate AEs through the creation of forms, with a standardized method of collecting and evaluating AEs, will allow for quality improvement and greater patient safety (Maramaldi et al., 2016; Rooney et al., 2020). Therefore, there is a need to conduct new prospective studies to identify the potential risks associated with dental treatment, work organization, devices, or materials. Additionally, the field of dentistry will benefit from the creation of adverse event reporting forms.

CONCLUSION

As in other healthcare environments, dentistry brings with it inherent risks to patient safety due to the possibility of the occurrence of AEs. Identifying threats to patient safety is a key element in improving dental safety. It is considered that the identification and recognition of AEs specific to the dental field is only the first step to improve patient safety in dental care, through the development of specific reporting systems. In future works, we intend to develop and validate an AE notification system specifically for the dental

field using the clinic of the school of Dentistry at the University of Rio Verde as the study site.

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