Risk Factors for Dental Outpatient Sedation Procedures Derived from Deaths Reported in the Public Domain

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Abstract

The incidence of serious morbidity and mortality associated with administration of sedative drugs, deep sedation and general anesthesia are not known due to lack of prospective data collection and the failure of state boards and liability insurance companies to make closed claims data available in redacted form. Information in the public domain of deaths in dental offices, however, provides evidence of the incidence of cases and the characteristics of factors associated with serious adverse outcomes. A search of the internet using the term 'deaths in dental offices' yielded 40 cases of serious morbidity or deaths that were associated with anesthetic and sedative procedures. The majority of deaths were associated with general anesthesia and parenteral sedation; only 4 deaths were associated with oral/enteral sedation (N=2 chloral hydrate alone and in combination with other drugs, N = 2 triazolam). These data do not support attempts to further regulate the use of benzodiazepines for oral/enteral sedation but do suggest the need to re-evaluate the risks of deep sedation/general anesthesia provided to dental outpatients. The drug classes most frequently reported in cases of serious morbidity and mortality include opioids, propofol and combinations of 2 or more drugs with a benzodiazepine.

Recurring concerns over the safety of anesthesia and sedation performed in outpatient settings have often been coupled with recommendations for research needed to document the safety of drugs, combinations, monitoring methods and personnel for non-anesthesiologists to administer and monitor sedative modalities.[1-4] Despite recognition of the need for evidence upon which to base clinical practices, guidelines for outpatient dental sedation are usually based on expert opinion or extrapolated from medical applications. The weak evidentiary basis for the dental use of anesthetic and sedative drugs, and growing public concern over the number of deaths in dental offices,[5,6] may jeopardize patients as well as the continued use of outpatient anesthesia and sedation by dentists. While expert opinion that is not supported by peer-reviewed publications represents the lowest form of evidence to support clinical practice, case reports and case series are recognized as a higher tier of evidence. Deaths provide an unequivocal endpoint; other characteristics associated with case reports provide insight into factors that contributed to the adverse events. For example, the association between the increased likelihood of motor vehicle accidents while driving under the influence of alcohol or other drugs has not been validated by prospective randomized clinical trials. But it is generally recognized to be a significant risk factor for increased morbidity and mortality based on the strong association between fatalities and driving under the influence. We report here the results of a review of case reports of serious morbidity and mortality associated with dental outpatient sedation available in the public domain to identify characteristics associated with clinical practices resulting in significant adverse events.

Methods

The cases were identified by an Internet search using the term 'deaths in the dental office' that yielded greater than 603,000 reports (last accessed October 19, 2016). Unique reports were identified by inspection of newspaper reports, summaries of television broadcasts and, when available, reports of dental boards, medicolegal actions and criminal charges. Variables identified included the state in which the events occurred, the date of the death, the age and name of the patient if provided in the published reports, the identity of the dental practitioner, the reported cause of death and the drugs and doses administered. Numerous multiple reports of the same event were reviewed to assure that the information in the original report were confirmed or expanded as additional information became available. This resulted in 40 unique cases associated with general anesthesia, parenteral sedation or oral/enteral sedation in the public domain ranging from January 2005 thru September 2016. The composite information for each case is summarized in Table 1. Examples of the sources for each case are provided in Table 2. The data are summarized by the anesthesia/sedation modality reported, the specialty status of

the dentists identified in each case (if reported), and the drugs and doses used if identified. Characteristics of the events that could not be identified in the primary reports are left blank in Table 1.

Results

The most prevalent causes of death were respiratory depression or cardiac arrest secondary to anoxia (Table 1). Oral surgeons and pediatric dentists were the most frequently identified practitioners, with general dentists and endodontists also identified as the dentists performing the procedure. Drugs most frequently associated with the adverse outcomes were opioids, general anesthetics, chloral hydrate and benzodiazepines. General anesthesia was the method most often associated with mortality, with parenteral sedation, oral/enteral sedation and nitrous oxide identified in decreasing frequency. Many of the cases in which the drugs were identified reported administration of two or more drugs in combination, or in high doses. Very little information could be identified on the method of monitoring or the individual responsible for monitoring the patient while the procedure was being performed.

Discussion

The reports of serious morbidity and mortality reported in the public domain associated with the use of anesthesia or sedation modalities in dental outpatients provides imprecise but compelling evidence of the serious adverse outcomes that is associated with their use. The ages reported for these cases ranges from very young patients (14 months) to elderly patients (89 years of age), across a broad range of dental procedures and encompass nearly all types of dental practitioners. Oral surgeons and pediatric dentists are most often identified in the reported cases, likely reflecting the high use of sedation and anesthesia by these specialties. General anesthesia and IV (parenteral) sedation are the methods most commonly reported, with only five deaths attributed to oral (enteral) sedation with chloral hydrate (N=2), or triazolam (N=2). Among the cases in which the drugs were identified, 10 of the cases involved administration of 2 or 3 drugs in combination.

Despite the limitations of cases publicly reported in non-scientific publications, the unequivocal nature of the death provides some insights into the clinical practices associated with these outcomes: General anesthesia and parenteral sedation are the therapeutic modalities most frequently associated with deaths in dental offices; respiratory depression is the most prevalent etiology of these deaths and oral surgeons and pediatric dentists are the practitioners most frequently identified. It also appears that general anesthetics, opioids and chloral hydrate are drugs most frequently related to the deaths. Benzodiazepines are usually reported in

combination with other drugs, with only two cases of triazolam alone reported as the cause of death (doses of 0.75 mg and 2.0 mg). Many of these reports also indicate that the dentist performing the procedure was also administering the drugs. As discussed elsewhere in greater detail,[7] these data provide evidence that the drugs and doses administered for sedation influence the incidence of serious morbidity and mortality, and that oral/enteral sedation is the route of administration least likely to result in significant adverse events. The relationship between level of training and the incidence of adverse outcomes is not clear as oral surgeons and pediatric dentists receive extensive training and clinical experiences as part of their respective residency programs. The need to increase the amount of training for oral/enteral sedation and limit the dose of benzodiazepines as proposed in ADA resolution 37 is not supported by the data from this case series.

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