



# The use of anaesthetic agents to provide anxiolysis and sedation in dentistry and oral surgery

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## REVIEW

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## Abstract

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Throughout the world there is considerable variation in the techniques used to manage anxious dental patients requiring treatment. Traditionally anxious or phobic dental patients may have been sent for general anaesthesia to allow dental treatment be undertaken. While this is still the case for the more invasive oral surgical procedures, such as wisdom teeth extraction, sedation in general dentistry is becoming more popular.

Various sedation techniques using many different anaesthetic agents have gained considerable popularity over the past 30 years. While the practice of sedating patients for dental procedures is invaluable in the management of suitably assessed patients, patient safety must always be the primary concern. Medical, dental and psychosocial considerations must be taken into account when evaluating the patient need and the patient suitability for sedation or general anaesthesia.

The regulations that govern the practice of dental sedation vary throughout the world, in particular regarding the techniques used and the training necessary for dental practitioners to sedate patients. It is necessary for medical and dental practitioners to be up to date on current practice

to ensure standards of practice, competence and safety throughout our profession.

This article, the first in a two-part series, will provide information to practitioners on the practice of sedation in dentistry, the circumstances where it may be appropriate instead of general anaesthesia and the risks involved with sedation. It will also discuss the specific training and qualifications required for dental practitioners to provide sedation. The second article in this series will outline the different techniques used to administer inhalation, oral and intravenous sedation in dentistry and will focus on specific methods that are practiced.

### Key Words

Conscious sedation, sedation, dentistry, anaesthetic agents, fear, dental phobia, anxiolysis, access to treatment

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## What this study adds:

- 1. What is known about this subject?** There have been no previous reviews outlining the guidelines for doctors and general dentists in Australia in regard to sedation for dental patients.
  - 2. What new information is offered in this study?** Information on the potential options for dental phobic patients, as well as information on the regulations governing the practice of sedation in dentistry.
  - 3. What are the implications for research, policy or practice?** Practitioners may become aware about safe and more efficient options for dental phobic patients.
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## Background

The routine use of general anaesthesia (GA) in the general dental practice setting has been phased out in the United Kingdom (UK) since the Poswillo Report<sup>1</sup> was published in 1990. This report made recommendations regarding GA, sedation and resuscitation in dentistry in order to improve safety standards because dental practitioners used to provide GA for patients in the dental chair. Modern standards of training and facilities were not required for this practice. Properly administered sedation is seen as an effective and safe alternative in appropriate circumstances



and this may be partly due to increasing difficulties in accessing GA services for dentistry.<sup>2-5</sup>

A similar trend has been seen in many other countries over the past 30 years, including Australia, with the near abandonment of GA for routine dentistry.<sup>6-10</sup> However what constitutes sedation varies from country to country and techniques differ.<sup>11,12</sup> Some governing bodies strictly allow for only single-drug conscious sedation, as opposed to more profound sedation that may require multiple anaesthetic agents. It should be pointed out that sedation and anaesthesia are a continuum where GA is defined as a medically induced coma with the loss of protective reflexes resulting from the administration of one or more GA agents. This is distinct from the definition for conscious sedation that specifies that verbal communication must be maintained with a conscious patient and that the protective pharyngeal and laryngeal reflexes must remain intact at all times. Furthermore the conscious sedation techniques must “carry a margin of safety wide enough to render unintended loss of consciousness unlikely”.<sup>3</sup> This review, part one of a two-part series, outlines the current approaches to treating anxious patients for the purposes of providing dental treatment. The concluding article in this series will focus on the specific methods practiced in providing dental sedation and discuss the pharmacology of the drugs used, and will highlight the limitations of these techniques where GA remains best practice.

### **The practice of conscious sedation**

Using sedation for dental treatment is not without significant risks for both the patient and the practitioner.<sup>13</sup>

Adequate assessment should lead to the selection of patients that are psychologically and medically suitable for sedation. While sedative techniques do offer a useful alternative for patients, including for those with challenging behavioural issues, there are still situations where the use of GA is advisable or unavoidable.<sup>4</sup> In certain circumstances treatment under sedation is not reasonable, or is frankly contra-indicated. This can be because of the complexity of the dental treatment required, such as invasive oral surgical procedures, or the medical status of the patient.<sup>7,11</sup>

Sedation should not be used habitually when there is no specific indication. The over-use of sedation in anxious patients is recognised and this can lead to patients becoming accustomed and reliant on sedation.<sup>13,14</sup> It is viewed as bad practice to not allow patients every opportunity to acclimatise to treatment without the need for sedation,<sup>15</sup> therefore practitioners should be aware of alternative methods available to treat dental fear and

anxiety that are based on psychological techniques. These include systematic desensitisation, conditioning, hypnosis, relaxation and distraction techniques, imaginable exposure and cognitive restructuring. There is evidence that behavioural interventions, such as cognitive behavioural therapy, can considerably help adults with dental anxiety or phobia.<sup>16-20</sup>

The different sedation techniques are associated with different qualifying criteria. The importance of thorough history taking as well as clinical examination cannot be overemphasised.<sup>21-23</sup> Authors differ on their approach to the pre-operative assessment of patients for sedation.<sup>22,24,25</sup> However, each aims to determine both the physical and psychosocial status of the patient, establish and categorise risk factors, and implement a suitable treatment plan.<sup>5,26-29</sup>

The risks to the practitioner may relate to potential accusations arising from vivid hallucinations that patients often experience.<sup>30,31</sup> This phenomenon is a side effect of the benzodiazepines, propofol and also nitrous oxide, which may be used to provide “relative analgesia” (RA). Patients should be advised of this side effect as part of the pre-operative informed consent process. Frighteningly real vivid sexual fantasies may occur and must be safeguarded against for both the patient and the practitioner,<sup>4,15</sup> therefore a member of the dental team should act as a chaperone and must be present in the surgery at all times during the dental sedation.<sup>6,16</sup> This ensures that potential false accusations against dental staff can be accurately rebutted. Fortunately these accusations are rare.<sup>14</sup>

Chronic occupational exposure to nitrous oxide poses a potential risk to staff, especially female staff.<sup>6,32</sup> The vast majority of non-anaesthetic adverse effects of nitrous oxide are due to its reaction with the reduced form of vitamin B12 (cobalamin). This inhibits the action of methionine synthase, a co-enzyme of vitamin B12, which converts homocysteine to methionine that indirectly supports methylation reactions and nucleic acid synthesis.<sup>32</sup> Haematological, immunological and in particular female reproductive problems have been associated with nitrous oxide when used as a sedative and anaesthetic agent.<sup>33-36</sup> Although these adverse effects are less likely than originally reported, nitrous oxide has been shown to interrupt normal biological processes and it is imperative to practice meticulously to minimise these risks.<sup>37,38</sup> Nitrous oxide is used as the carrier for the volatile anaesthetic gas sevoflurane, which is being increasingly used at low concentrations to provide dental sedation in children in the outpatient setting. This is in an attempt to compensate for GA where these services are not available. Regulations generally put the onus on the



practitioner providing the sedation to have adequate scavenging equipment to reduce the nitrous oxide contamination of the surgery environment.<sup>39-42</sup>

While conscious sedation helps reduce anxiety in patients it may also mask the signs of an impending medical emergency, therefore the provision of conscious sedation in the outpatient practice setting must not be taken lightly. Fortunately high standards of preparedness and equipment are already mandatory for general dental practices.<sup>5,6,12</sup> Antagonist drugs are available to treat overdose, such as the benzodiazepine antagonist flumazenil. It is expected that those providing sedation should be proficiently trained to deal with the emergencies that may occur when the central nervous system and respiratory function are depressed, such as the potential airway management issues that may arise. Without exception every member of the dental team should be trained in resuscitation. Training should be a team activity and should be regularly practiced in surgery under simulated conditions with refresher training courses at appropriate intervals.<sup>4,6,12,15</sup>

#### **Pre-assessment for conscious sedation**

There should be a specific requirement and justification for each patient to be offered sedation for dental treatment. As discussed above, alternatives such as behavioural interventions do play a definite role and should be explored in each case.<sup>17-19</sup> Furthermore, treatment under sedation is not an alternative for GA when providing treatment under GA is definitely warranted.

Following the systems review, medical history and physical examination, including the body mass index (BMI), the practitioner should be able to determine the patient's medical risk for sedation.<sup>22,23</sup> The patient is then graded using the American Society of Anesthesiologists (ASA) Physical Status Classification System.<sup>26</sup> This is a general consensus in many different regulations that patients who fit into ASA 1 (a normal healthy patient) or ASA 2 (a patient with mild systemic disease) may be safely treated in general dental practice.<sup>5,27-29</sup>

#### **Children and conscious sedation**

Anxiety and fear are barriers to routine dental care in both children and adults. The provision of techniques, other than GA, such as sedation in general dental services aims to allow and support the treatment of patients.<sup>7,43-45</sup> A recent Cochrane review highlighted that while behavioural techniques play an important role in managing children, many require sedation or even GA.<sup>46</sup> Providing safe and appropriate sedation services that have decreased financial and logistical limitations relative to GA, has been shown to

be effective and efficient for certain health services.<sup>28,36,43,47</sup>

This is very important because data report that in countries such as the UK and US, 40-47 per cent of children aged five and six years have evidence of dental caries. Worryingly only 27-33 per cent of these children had received any treatment.<sup>48</sup> This represents a significant problem - if dentine caries is left untreated it can result in pain and sepsis, which can often only be managed by extensive restoration or even extraction of the affected teeth. Historically this has been managed in children with the use of GA. Whilst a proportion of children will always require GA, wherever possible this should be avoided due to the associated rare risk of death.<sup>48</sup> Multi-drug paediatric sedation is also associated with this risk, especially when inappropriate techniques are used in inappropriate patients and settings.<sup>27,28,36</sup> Indeed, between the years 1980-2011, 44 children died subsequent to receiving either sedation or GA for a dental procedure in the US. Over 50 per cent of the deaths occurred in children aged two to five years and this correlates with prior findings related to the prevalence of tooth decay in this age group. While this age group may also require more pharmacological anxiolysis compared with older children, the data indicates an association between mortality and paediatric dental procedures under multi-drug sedation, particularly in office settings.<sup>49</sup> Techniques used in the US, particularly providing GA in the office setting, are not permitted in the UK or Australia. This emphasises the importance of the strict regulation and robust education of practitioners involved in providing sedation or GA to patients.

#### **Training and qualifications required to practice conscious sedation**

Training in conscious sedation for dentists throughout the world has been ongoing for decades. In Australia the regulations place emphasis on a particularly high level of training for dental practitioners to be licensed to perform conscious sedation and practitioners must hold a specific University of Sydney post-graduate diploma qualification, or equivalent, to gain their endorsement.<sup>12</sup> Currently 96 out of 19,769 registered dentists in Australia hold this endorsement. This advanced training allows qualified practitioners to use multi-drug techniques. This is in contrast to the UK where dentists can undertake less advanced training to practice sedation and this means only the simpler sedation techniques are allowed.<sup>5,11</sup> This allows for the dentist to act as both the practitioner and sedationist in many circumstances in the UK, whereas in Australia the dentist qualified to provide sedation would usually do this while a second dentist provided the required dental work.<sup>5,12</sup> In the United States (US) there are massive variations throughout the different States with regards the



governance of both the training required and the techniques that can be used in dental sedation.

The advanced sedation techniques must only be undertaken in a suitable setting and following appropriate pre-operative assessment of the patient. Many of these techniques involve the administration of multiple anaesthetic agents. Some that have gained popularity include the use of various combinations including benzodiazepines, propofol, opiates, ketamine, barbituates, nitrous oxide and sevoflurane.<sup>50</sup> Many of these drugs are anaesthetic drugs that are used in sub-anaesthetic doses.<sup>15,36,40,41,51-53</sup> They may be used in combinations to produce synergistic effects, where the clinical aim is to produce sedation rather than GA, which would require management of the patient's airway, likely endotracheal intubation, and respiratory support.<sup>27,52</sup> Many of the regimens used today are advances of techniques that were introduced many decades ago.<sup>54</sup> The "Jorgensen Technique" is one such technique was introduced in 1945 in the US, where a combination of phenobarbitone, hyoscine and pethidine was administered to provide sedation.<sup>55</sup> In Australia the current conscious sedation techniques commonly use the benzodiazepine midazolam and fentanyl. The midazolam is delivered in a titrated manner to give the desired "end-point" where the patient is suitably sedated for treatment to proceed. Combining the midazolam and fentanyl give a synergistic effect that can provide profound sedation and also allow for a smaller overall dose of each drug to be administered.<sup>6,50</sup> Some practitioners may also introduce propofol that gives enhanced and deeper sedation for a brief period when it may be required during certain procedures, such as dental extraction.

While the more advanced levels of training allow for the use of a wider variety of techniques in administering dental sedation, it must be emphasised that there is also greater emphasis on the level of training of support staff. For instance, annual training and re-certification in the management of sedation-related emergencies is mandatory in Australia.<sup>12</sup>

## Conclusion

This review presents information detailing current practice in relation to the management of anxious dental patients and those phobic of dentistry. In particular it has discussed the administration of sedation by dentists for their patients and the potential benefits that sedation may provide relative to GA, in appropriate circumstances. As with any advancement in any area of dentistry or medicine there must firm governance regulating each proposed beneficial step, making sure that patients are not harmed and that patient safety remains paramount.

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#### **CONFLICTS OF INTEREST**

The author declares that they have no competing interests.