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Managing the Pediatric Dental Patient

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Educational Objectives

At the conclusion of this course the participant should be able to:

1. Describe the behavior management goals for pediatric dental patients and other patient groups whose behavior requires management to permit the delivery of quality dental care
2. Describe and perform techniques of Basic Behavior Guidance
3. Describe techniques of Advanced Behavior Management

About the author



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Dr Dodds graduated from the University of Edinburgh Dental School and following two years in a community dental practice moved to San Antonio Texas in 1987. She obtained an MPH at the UTHSC- Houston and secured a teaching appointment at the UTHSC-San Antonio in the Dept of Community Dentistry. She obtained a Certificate of Pediatric Dentistry from San Antonio in 2000 and PhD in Cellular and Structural Biology in 2001. Since 2000 she has been a

faculty member at the University of North Carolina, Dept of Pediatric Dentistry where she has carried out research in early dental development and treated patients in Dental Faculty Practice and UNC Hospital. She has been involved in AHEC and has written dental continuing education classes for more than 10 years.

Introduction

The goals of behavior management in dentistry are to establish effective communication, to alleviate patient fear and anxiety and build a trusting relationship with the patient that will ultimately allow the dentist to deliver quality dental care and promote in the patient a positive attitude towards dental care and oral health.

Behavioral management of this diverse group (including children and adolescents under age 21 years, patients who present behavioral challenges due to mental, physical or medical disabilities) has been traditionally considered to fall into two areas, Basic Behavior Guidance Techniques and Advanced Behavior Guidance. This course examines each of these areas in detail and offers advice in the use of basic management techniques (Tell-show-do (TSD), modeling and distraction) that can be applied in the dental office. Also includes update in 2015 for Ask-Tell-Ask technique,

meant to empower child more as a proactive participant. Advanced management modalities (physical management, aversive management and pharmacologic management) are discussed but their use will require further training to satisfy professional board requirements.

It has been said that the major difference between adult and pediatric dental patients is that the latter did not request the treatment and frequently they do not even understand why they are at the dentist's office! Essentially, from many children's perspective, a dentist has little to offer to them except short-term pain and long-term gain, the latter being a difficult concept for many a young mind to grasp. Consequently children frequently display behaviors that make traditional dental care delivery a challenge. It becomes the job of the dental practitioner, therefore, to understand the unique issues at stake and to make these patients, and often their parents too, feel at ease.

The goals of behavior management in dentistry are to establish effective communication, to alleviate patient fear and anxiety and build a trusting relationship with the child that will ultimately allow the dentist to deliver quality dental care and promote in the child a positive attitude towards dental care and oral health.

For us to fully understand the problem it is necessary to clearly define the nature of this diverse patient group. It has traditionally been considered to consist of infants, children and adolescents under age 21 years. For the purposes of specialized behavioral/dental needs this group should be extended to include those patients who present behavioral challenges due to mental, physical or medical disabilities and patients with prior negative dental or medical experiences resulting in poor behavior.

Management of these patients has been traditionally considered to comprise three elements; medical management, managing their behavior and meeting their dental needs.

The first element can be best addressed by taking a thorough medical history in consultation with the specialists providing care for the patient. Following a careful dental examination a comprehensive dental treatment plan can be developed. A behavior assessment is made which should include a history of previous dental and medical experiences, and an assessment of general behavior and communication skills. All patient responses should be evaluated in relation to those that would be considered age appropriate.

There is no question that parenting styles have evolved tremendously in the United States in the last decade. Unfortunately, these have not always been for the better, resulting in many young children arriving at the dental office with poorly developed coping skills and little or no sense of self-restraint. In addition, many parents have unrealistic expectations for the course of the dental visit, and may be unwilling to permit

the dentist to practice effective traditional behavior management techniques.

Often the first potential source of conflict to be encountered is whether to allow the parents to accompany a child into the dental operator. There is currently no real consensus regarding parental presence in the operator, however it is agreed that it may sometimes be effective in gaining cooperation for treatment. There is little disagreement however that effective communication between the dentist and the child requiring close attention from both parties is of prime importance. The presence of a parent must not circumvent this communication. Well-meaning parents in the operator can be a major source of distraction even if they are echoing the instructions from the dentist. Children vary in their response to their parents' presence or absence ranging from very positive to highly detrimental. It is the responsibility of the practitioner to determine the communication and support methods that will optimize the child's response in the dental operator and without compromising the desired outcome, to meet the requests of the parents involved. The role of the parent must be clearly defined as supportive if the parent is to be permitted in the operator during the visit, and parental questions regarding treatment should not be directed at the dentist or assistant during the delivery of dental care. Clearly some patients will benefit more than others, particularly those for whom there are language problems, very young patients, or those with a developmental disability.

In a 2019 revise of an online publication on the *Guideline on Behavior Guidance for the Pediatric Dental Patient* they explain how children can form a preconceived notion about going to the dental office based on how a parent themselves feel, as well as, how a parent's finances and/or expectations can affect care for a child:

"Parents influence their child's behavior at the dental office in several ways. Positive attitudes toward oral health care may lead to the early establishment of a dental home. Early preventive care leads to less dental disease, decreased treatment needs, and fewer opportunities for negative experiences. Parents who have had negative dental experiences as a patient may transmit their own dental anxiety or fear to the child thereby adversely affecting her attitude and response to care. Long term economic hardship and inequality can lead to parental adjustment problems such as depression, anxiety, irritability, substance abuse, and violence. Parental depression may result in decreased protection, caregiving, and discipline for the child, thereby placing the child at risk for a wide variety of emotional and behavior problems. In America, evolving parenting styles and parental behaviors influenced by economic hardship have left practitioners challenged by an increasing number of children ill-equipped with the coping skills and self-discipline necessary to contend with new experiences. Frequently, parental expectations for the child's response to care (eg, no tears) are unrealistic, while expectations for the dentist who guides their behavior are

great.” (Clinical Affairs Committee – Behavior Management Subcommittee & Council on Clinical Affairs, 2019)

Commonly stated fears reported by children regarding the dental experience can be either real - such as those based on a previous negative experience; acquired fears such as needle (pain); potential fear responses include those that may be induced by the emotional state of dentist or assistant, or protective fears – such as fear of the unknown, fear of bodily harm, of a stranger or of separation from the parent. Any child displaying these types of responses should be evaluated in the context of the patient’s cognitive age. As although they may indeed indicate a potential for a management problem, conversely they may be entirely appropriate responses for a child of that age (e.g. fear of separation is a normal developmental stage in very young children but associated with behavior management problems if displayed in a school-age child).

Avoiding the use of evocative language and "threatening" words, such as “pain, hurt, drill, or extract” is second nature to most dental professionals. However, with a young patient, it is particularly important to use non-threatening terms such as “whistle” (not drill), “make your tooth sleepy” (not give a needle, shot, or injection) or “clean the soft part of the tooth away” (not "drill the tooth"). The use of such words and phrases, coupled with a positive environment, can result in a decrease in the negative associations and experiences, which will benefit the patient during future dental visits.

Effective communication with children poses challenges for the dentist and the dental team. A child's cognitive development will dictate how much information can be absorbed and processed. In addition, children have no appreciation of concepts and situations that they themselves have never experienced. It is important for the dentist to understand cognitive development of children so that they can communicate ideas using appropriate vocabulary, consistent with the child’s intellectual development. In the dental office, communication is accomplished primarily through speech, tone of voice, facial expression, and body language. Body language is particularly important in the close communication that takes place during dental treatment even with very young children. A dentist whose body language displays disinterest or distraction will not be effective in communicating clinical confidence. Common examples of distractions to effective communication include hearing another child cry, or parent interruption during dental treatment.

Communication based techniques are most effective in managing the cooperative preschool child. In such a situation, the two-way interchange that marks the start of a dental appointment is replaced with one-way manipulation of behavior by way of a promise “contract,” with the activity to follow request. In other words, the aim is for the dentist to frame an effective request and reframe if the desired patient response does not follow. Reframing a previously given request in an assertive voice with

appropriate facial expression and body language is the basis for the technique of voice control. Simple instructions are given to the child such as “open your mouth”, “quit wiggling” or “bite on this”.

Effective communication should follow an assessment of the cognitive ability of the patient and of parental expectations and will comprises a host of different techniques that, when integrated, enhance the evolution of a cooperative patient. Finally, the most effective communication always reflects the personality of the dental professionals themselves.

Basic Behavior Guidance Techniques

Behavior shaping means providing the child with cues and reinforcements that direct them toward more desirable behaviors. Traditional behavior shaping strategies effective in the dental office include Tell-show-do (TSD), modeling and distraction.

Tell-Show-Do (TSD)

Tell-show-do is the first technique learned by many dental professionals in dental school. An advantage of this method is that, with appropriate use of language and technical terminology, it can be used with children of all ages and comprehension abilities. Simply put, before any new procedure is used a careful explanation of the procedure is offered in phrases appropriate to the developmental level of the patient. It may include demonstrations for the patient utilizing the visual, auditory, olfactory, and tactile aspects of the procedure and then, without deviating from the explanation and demonstration, completion of the clinical procedure. This technique aims to familiarize the child with the important aspects of the dental visit, especially aspects of the procedure that are new experiences for the patient, and to encourage the development of appropriate positive patient responses to dental procedures. For example, at the first visit where the child is to encounter the use of a slow speed hand-piece it may be introduced as a “polishing brush” which feels “buzzy” on the teeth. To introduce the vibration that the patient will experience during the use of the instrument, a large round bur may be gently run at slow speed on the patient’s finger nail and the patient asked whether they can feel the brush “buzzing.” Such simple procedures can be extremely effective in reducing the anxiety in young patients and often are all that is required to allow them to happily permit the use of a slow-speed hand-piece in future caries removal and tooth preparation.

Modeling

Children are great copycats. An extension of Tell-show-do is behavior modeling, using the ability of the child to imitate others modeling the desired behaviors. This can be done in a live setting but, since even the best behavior in children cannot always be

taken for granted, may be more predictable in a video setting. The model undergoes a restorative procedure with a friendly dentist, who responds to his coping behavior with praise, and by giving a reward at the end of the session. This technique is particularly effective with a model who is personally familiar to the patient but this is not essential. It is important however that the patient identifies with the model and so the same setting should be used with models of varying age groups. There are many reports in the literature confirming significantly less negative behavior in children exposed to either desensitization or model learning therapy before undergoing restorative dental treatment than in children given more customary initial dental experiences.

Ask-Tell-Ask

Continuing in the 2019 revise of an online publication on the *Guideline on Behavior Guidance for the Pediatric Dental Patient*, it adds:

“When clinicians share information, they predominantly TELL information, often in too much detail, and in terms that sometimes alarm patients. Information sharing is most effective when it is sensitive to the emotional impact of the words used. By using a technique of ask-tell-ask, it is possible to improve the patients’ understanding and promote adherence. According to the adult learning theory, it is important to stay in dialogue (not monologue), begin with an assessment of the patient’s or parents’ needs, tell small chunks of information tailored to those needs, and check on the patient’s understanding, emotional reactions, and concerns. This is summarized by the three-step format Ask-Tell-Ask. ASK to assess patient’s emotional state and their desire for information. TELL small amounts of information in simple language, and ASK about the patient’s understanding, emotional reactions, and concerns. Many conversations between clinicians and parents sound like Tell-Tell-Tell, a process known as doctor babble, because clinicians seem to talk to themselves, rather than have a conversation with parents or patients. The Ask-Tell-Ask format maintains dialogue with patients and their parents. The important areas for sharing include: ASK to assess patient needs: 1. Make sure the setting is conducive. 2. Assess the patient’s physical and emotional state. If patients are upset or anxious, address their emotions and concerns before trying to share information. Sharing information when the patient is sleepy, sedated, in pain, or emotionally distraught is not respectful and the information won’t be remembered. 3. Assess the patient’s informational needs. Find out what information the patient wants, and in what format. Some patients want detailed information about their conditions, tests, and proposed treatments; recommendations for reading; websites; self-help groups and/or referrals to other consultants. Others want an overview and general understanding. Patients may want other family members to be present

for support or to help them remember key points. Reaching agreement with the patient about what information to review may require negotiation if the clinician understands the issues, priorities, or goals differently than the patient. Also, some patients may need more time, and so it might be wise to discuss the key points, and plan to address others later, or refer them to other staff or health educators. Instead of asking, 'Do you have any questions?' to which patients often reply, 'No,' instead ask, 'What questions or concerns do you have?' Be sure to ask, 'Anything else?' 4. Assess the patient's knowledge and understanding. Find out what previous knowledge or relevant experience patients have about a symptom or about a test or treatment. 5. Assess the patient's attitudes and motivation. Patients will not be interested in hearing your health information if they are not motivated, or if they have negative attitudes about the outcomes of their efforts, so ask about this directly. Start by asking general questions about attitudes and motivation: 'So-tell me how you feel about all of this?' If patients are not motivated, ask why, and help the patient work through the issues." (Clinical Affairs Committee – Behavior Management Subcommittee & Council on Clinical Affairs, 2015)

Distraction

Distraction involves diverting the patient's attention from what would be perceived as an unpleasant dental procedure in order to avert or delay negative or avoidance behavior. In one of the simplest forms the dentist may be talking to the patient about his pets, and massaging the cheek while delivering local anesthesia. More sophisticated diversion techniques include the use of video, music, or video games and might include allowing the patient to take a short break during a stressful procedure. The latter should be used with extreme caution however in particularly anxious patients who quickly learn that it is a way of taking control of the appointment and delaying the undesired procedure.

Summary

A key component of all of these behavior guidance techniques is immediate positive reinforcement, both verbal (praise - e. g. "You're doing great", "That's good") and non-verbal (smiles, nods, appropriate physical demonstrations of affection) where the child is given positive feedback when they are exhibiting appropriate behaviors. It is very important that even with the extremely anxious, disruptive and uncooperative child, that any positive behavior is immediately rewarded. If a child is combative and crying and stops vocalizing for a moment it is important that the dentist encourages and reinforces this desired behavior by such statements as "Thank you Tommy for being so quiet – that shows you are being a good helper." Learning theory states that behavior that is rewarded increases in frequency, while behavior that is punished or goes unrewarded

decreases in frequency. Thus behavior shaping is new behaviors that develop by reinforcing successive approximations to a desired goal. Non-social reinforcers such as toys and stickers can also be used but they should always be given to the child by the dentist at the end of the appointment. The power of verbal praise should not be understated, especially for pre-school children.

The subtly different Reward-oriented Management also uses positive reinforcement to achieve the desired behavior, however here the first component involves the establishment of rules, with conditional rewards given on completion of the activity. An example might be “Keep your hands on your lap” or “Hold still” with conditional rewards such as a gift or treat at the end of the dental visit.

Two factors are very important to consider in the use of this technique:

1. The reward is most effective if it comes directly from dental professional and
2. Use of a reward may provoke additional anxiety in some patients (i.e. patient concludes the reward must follow an unpleasant activity!). This technique tends to be more effective with school-age children.

Advanced Behavior Management

Not all undesirable behaviors in children can be so easily modified however. For these more extreme patients, advanced behavior management techniques may be required to bring about compliant behaviors. Children respond to attempts at behavioral modification in different ways, so varying types of management, and techniques originating in several areas may be required to be successful in reducing anxiety and improving behavior.

These advanced methodologies can be divided into the following areas:

1. Physical Management
2. Aversive Management
3. Pharmacological Management

Techniques that fall within the first two areas require training and practice to be used safely and to maximum effect while most that fall under “Pharmacological management” should only be practiced after appropriate advanced instruction and in accordance with relevant state licensure practices.

Physical Management

Although traditional methods of pediatric behavior management in dentistry have heavily relied on techniques falling in this management domain, many of these are becoming less commonly used since parents now see them as cruel or punishing.

The use of any type of physical restraint in managing behavior to permit the delivery of dental care is a subject that concerns healthcare providers and the public alike because of the potential for abuse or unsafe use. All restraint systems aim to restrict patient movement in order to protect the patient himself, staff, dentist, or indeed the parent from injury and to facilitate delivery of quality dental treatment. The types of patients who may benefit from restraint include those who cannot cooperate due to lack of maturity or a mental or physical disability, especially if the dental procedures to be undertaken are of short duration. In addition, restraint may be required to help reduce untoward movement in sedated patients.

The physical restraining force may be of human origin (so-called “active” restraint where the hands of a parent or dental assistant are used to restrain the child) or provided by mechanical adjuncts (“passive” restraint such as the use of a Papoose board (Olympic Medical, Seattle WA), Pedi-Wrap or Rainbow Wrap), or a combination thereof. In Scandinavia the use of passive restraints is now forbidden to use by law.

Regardless of which form of restraint is used, it should be evaluated thoroughly prior to its use and any alternatives thoroughly explored. The restraint selected, should be of the least invasive type that is effective and the tightness (particularly around the chest and extremities) must be carefully monitored and reassessed at regular intervals so as not to restrict respiration and circulation. The active involvement of the parents should be encouraged when any type of restraint is considered necessary for dental treatment.

Before any use of active or passive restraint, it is vital to obtain and document in the patient's record the informed consent of a parent. Informed consent requires a detailed explanation from the dentist regarding the need for patient restraint and the potential benefits to both patient and staff in terms of injury prevention. If there is a possibility that the use of restraint may be required then informed consent should be obtained at the outset of the appointment, not in the middle of the dental treatment with a crying child in the background. Although active restraint performed by a parent may not strictly speaking require informed consent, it is recommended that such be obtained and documented in any case.

Restraint is not an appropriate form of behavior management in non-sedated patients who require long appointments, nor is it suitable for patients who have previously experienced physical or psychological trauma from protective stabilization unless no other alternatives are available. Restraint should be terminated as soon as possible in a patient who is experiencing severe stress or hysterics to prevent possible physical or psychological trauma. In such a patient, dental treatment under general anesthesia may be desirable.

Although strictly speaking the use of a mouth prop falls into the physical management

domain, it is usually considered to be covered in the general dental consent signed at treatment planning.

Aversive Techniques in Behavior Management

This area includes the use of both voice control and time-out, but it is probably most clearly represented by the “Hand-over-mouth” (HOM) technique. This method is now only really of historical significance since parents and dental professionals alike agree that its use is inappropriate in the modern dental operator. It used to be recommended to gain the attention of a screaming, combative child, and as the name suggests involved the placement of the dentist’s hand over the patient’s mouth in some cases occluding the airway and halting the unwanted behavior. Although long –term negative effects are unproven, the distressing nature and opportunities for misuse or abuse have resulted in both HOM and the similar HOMAR (HOM - airway restricted) being unacceptable.

Voice control involves a controlled alteration in the volume, tone, or pace of voice aimed at influencing and directing the patient's behavior. This method is particularly useful for limit setting, for stopping dangerous behavior and to direct the patient’s attention and compliance with instructions. It can be used with children of any age, but is not appropriate if the patient has an impediment to normal hearing. Since voice control may be considered aversive in nature by some parents it is important that a thorough explanation is given to parents before its use in the dental setting.

Although considered by many to be the management method of choice in the home setting, time-out does not really have a useful role in behavior management in the dental office.

Pharmacological Management

Although eighty percent of children can be managed with routine behavioral techniques the remaining twenty percent require aggressive (restraint) or pharmacological support. This may include the use of anxiolytic medications, conscious or deep sedation or general anesthesia. Any sedation procedure however, should only be undertaken following identification of a clinical need and should not be used even in very uncooperative children for examination only.

The regulations governing the practice of sedation demonstrate wide variability between regulatory boards. It is therefore incumbent upon an individual who wishes to practice these techniques to ensure that they do so in compliance with their State or Regional Dental Board requirements. The author wishes to emphasize that they do not represent the following descriptions of sedation procedures to be an adequate educational foundation for the practice of sedation, but rather to provide additional basic

information that may increase the course participant's knowledge allowing them to explain some basic components of the procedure to parents that may be considering referral to a appropriately qualified specialist.

The American Academy of Pediatric Dentistry in 2004 described the possible sedation end-points as *Minimal*, *Moderate* or *Deep* Sedation (see Table 1). These definitions refer to the deepest sedation level reached by the patient at any point during the sedation process. Some patients may remain at one level of sedation or hover between two levels depending upon the level of stimulation, drug metabolism and additional drugs administered.

Table 1. Definitions and Characteristics of Sedation and General Anesthesia American Academy of Pediatric Dentistry (1998 and 2004—remains as of 2020)					
AAPD 2004	Minimal Sedation	Moderate Sedation Æ		Deep Sedation	General Anesthesia
AAPD 1998	Level 1	Level 2	Level 3	Level 4	Level 5
Functional level of sedation	Mild sedation	Interactive	Non-Interactive Arousable with mild/mod stimulus	Non-Interactive Arousable with intense stimulus	Eliminate sensory and skeletal motor activity
Goal	Anxiolysis	Decrease or eliminate anxiety	Decrease or eliminate anxiety	Eliminate anxiety	Unconscious and unresponsive to stimuli

Patient selection and screening are important prior to treatment under drug- induced sedation. Patients should be ASA I or ASA II (Table 2), have a patent airway and have failed with traditional techniques. The patients who are most likely to benefit from sedation are pre-cooperative, needle-phobic, older children with poor prior experiences, or are developmentally delayed, have a handicapping condition/ medical problem and have significant dental treatment needs. In office sedation is not recommended for children with enlarged tonsils or medical contraindications (some ASA 2, all ASA 3). Sedation of children below the age of 1 year is contraindicated.

Table 2 American Society of Anesthesiologists' (ASA) physical status classification	
Class 1	Healthy patient, no medical problems
Class 2	Mild systemic disease
Class 3	Severe systemic disease, but not incapacitating
Class 4	Severe systemic disease that is a constant threat to life
Class 5	Moribund, not expected to live 24 hours irrespective of operation
An e is added to the status number to designate an emergency operation. An organ donor is usually designate as Class 6.	

The objectives of mild and moderate sedation are to reduce or eliminate anxiety allowing safe, comfortable, quality dental treatment to be rendered by reducing untoward movement and reaction to dental treatment, enhancing patient cooperation, increasing tolerance for longer appointments and aiding in the treatment of mentally, physically or medically compromised patients.

The American Academy of Pediatric Dentistry (AAPD) in 2019 defined a *Minimally Sedated* patient as “one who will respond normally to verbal commands, however their cognitive functions and coordination may be impaired while respiration and cardiovascular function remain unaffected. All vital signs are stable, there is no significant risk of losing protective reflexes, and the patient is able to return to pre-procedure mobility”. (Table 1)

As of March 2019, as seen in the Journal of the American Dental Association, authors Jason H Goodchild, DMD and Mark Donaldson BSP, ACPR, PharmD, FACHE explain updates:

“For minimal sedation via the enteral route, the dosing of medication is now limited to a single dose or multiple doses in which the cumulative amount does not exceed the US Food and Drug Administration’s (FDA) maximum recommended dose (MRD) for unmonitored home use. Supplemental dosing, as described in 2012 in which the total aggregate dose must not exceed 1.5 times the MRD on the day of treatment, is now prohibited and replaced by statements indicating that if cumulative doses exceed the MRD, or if multiple enteral medications are used, that guidelines for moderate sedation must apply. The revisions, including the use of the MRD as a limit, are meant to ‘guide dosing for minimal sedation’ and are ‘intended to create [a] margin of safety.’ Also, for minimal sedation, the use of nitrous oxide and oxygen analgesia, specifically permitted by the 2012 guidelines when used in combination with a single enteral drug, has changed. Although still allowed, the original language is replaced by a statement advising that nitrous oxide and oxygen analgesia when used in combination with a sedative agent may produce minimal, moderate, deep

sedation, or general anesthesia.” (Goodchild, Jason H. et al., 2019)

The most commonly used *anxiolytic* agent in pediatric dentistry is nitrous oxide (NO). The properties of nitrous oxide that make its use in pediatric dentistry particularly attractive include a rapid onset of action and recovery (5/10mins), easy titration and patient acceptability (more than enteral/parenteral forms of conscious sedation), however it displays only minimal analgesia (so patients will require local anesthesia for painful dental procedures). Nitrous oxide is administered in a mixture with oxygen (30% or more) to safeguard the patient’s oxygen supply. Nitrous oxide is a central nervous system depressant (with minimal cardiovascular and respiratory effects); it causes a decreased ventilation response to hypoxia leading to diffusion hypoxia if discontinued without supplemental O₂. Additionally, nitrous oxide has been associated with negative health effects in dental professionals from chronic exposure or if it is abused.

The pediatric patients who may benefit most from nitrous oxide use are potentially cooperative children (> 3years) who exhibit mild to moderate apprehension, children with limited attention spans, those with cerebral palsy, those with an accentuated gag reflex and those who require technique sensitive procedures. Some children may experience sweating or gastrointestinal discomfort such as nausea or vomiting predisposing the patient to aspiration of vomitus and associated health complications. Since the occurrence of complications increases with exposure it is recommended that nitrous oxide be titrated to the lowest possible effective levels. Usually highest levels (up to 50%) are required during local anesthetic administration and tooth preparation, while

30% N₂O may be effective during the remainder of the appointment. Its use is contraindicated in recalcitrant or hysterical patients (remember force = failure!), in children who are pre-cooperative and in children with a nasopharyngeal obstruction. It also should not be used in patients with tuberculosis, severe asthma, otitis media (where the increased pressure increases the potential for rupture of tympanic membrane) or cystic fibrosis (high O₂ removes respiratory stimulus). Nitrous oxide use has been linked to acute pulmonary edema in children undergoing Bleomycin therapy for oncology.

In *Moderate Sedation*, patients are also responsive to verbal commands (eg, “open your mouth” or “squeeze my hand”) although to evoke the response additional light tactile stimulation may be necessary. If a response can only be elicited as a result of a painful stimulus, this suggests that the patient is deeply sedated. The moderately sedated patient maintains a patent airway and adequate spontaneous ventilation unless manipulated and obstructed by the dentist. If this occurs, repositioning of the

patient head to a position where the airway is unobstructed will usually be sufficient to correct it. As with mild sedation, cardiovascular function is usually unaffected.

As of March 2019, updates discussed in the Journal of the American Dental Association, authors Jason H Goodchild, DMD and Mark Donaldson continue:

“In addition, for moderate sedation, deep sedation, and general anesthesia, the monitoring of ventilation must now be assisted by capnography and monitoring of end-tidal carbon dioxide (CO₂). In the previous document, end-tidal CO₂ monitoring was only required for intubated patients and was only suggested for nonintubated patients. Finally, patient evaluation for these 3 deepest levels of sedation and anesthesia should include body mass index and the consideration of patients with obstructive sleep apnea as part of the preoperative risk assessment.” (Goodchild, Jason H. et al., 2019)

Sedation agents may be administered orally, nasally, rectally or intramuscularly with oral administration being the most common route used in dentistry. It can be unreliable in determining the actual dose ingested due to vomiting, gastric stasis, incomplete absorption or the patient spitting up. Orally administered drugs cannot be titrated so dosing is somewhat empirical and is not very predictable in its effect. Since the patient may be reluctant to swallow medications, it often cannot be determined accurately how much of the medication was ingested. Double dosing of sedation medications is a practice that should never be undertaken under any circumstances. It is better that the sedation visit be aborted due to poor cooperation if the dose ingested was insufficient than the child be overdosed. Always assume the dose ingested to be the total you administered, even if you can see that much of the drug ended up on the operatory floor.

Nasal administration has been effective with specific agents in very young children (under age 3); it has a quick onset and a short-acting duration thereby reducing total office time. However, since the sedation medications are highly irritating to the nasal mucosa it is not well tolerated and can only be delivered when the patient is lying flat as in a knee-to-knee examination position. Fortunately nasal administration is a fairly brief procedure, as only 2-3ml of the drug needs to be given.

Rectal administration is popular in Europe and results in a highly predictable absorption, but is rarely used in the US. It is particularly useful in children unable or unwilling to take medication orally or for very uncooperative patients. It has the added advantage of avoidance of the “first-pass effect” via the large intestine.

Intramuscular administration of sedation drugs results in a short onset of action (15 min), reliable absorption (avoids variable GI absorption) and a short maximal clinical action (30 min). The most common sites for IM administration are the gluteal area, ventrogluteal area (hip), vastus lateralis (thigh) or mid mid-deltoid. Disadvantages of this route include the possibility of injury to tissue at the site of injection, nerve injury, and formation of emboli or periostitis. Additionally, drug action cannot be titrated or reversed if administered IM.

The risks associated with sedation depend upon the specific drugs used. However, almost all will depress the central nervous system if the dose is high enough.

The commonly used drugs fall into the following groups: narcotics (Mepiridene (Demerol) that are strongly associated with respiratory depression and nausea/vomiting, benzodiazepines (Midazolam, Diazepam - most commonly used drugs due to their wide dosage range of therapeutic activity), sedative- hypnotic non-barbiturates (chloral hydrate) that are highly irritant to the gastric mucosa and associated with nausea and vomiting, antihistamines (Hydroxyzine) or H1 receptor antagonists (the phenothiazine derived Phenergan) that are sedative and antiemetic.

Sedation success is dependent upon choosing the correct drug and dosage for the patient taking into account their age, cooperation and cognitive ability, and the treatment proposed. In the US, since these medications are normally administered orally, this means that the duration of action is extended necessitating careful post-operative monitoring.

When calculating maximum safe dosages, it is vital that the local anesthetic dose is considered.

(The maximum recommended dose of Lidocaine hydrochloride (2% with 1:100,000 epinephrine) is 4.4 mg/kg=>15kg child)

Most sedation related mortalities result in part from polypharmaceutical sedation regimens, which in total exceed maximum safe dosages for the drugs involved.

The use of local anesthesia is extremely important in reducing poor behavior in children. Most children can tolerate the temporary discomfort of local anesthetic administration if it guarantees they are pain-free during the remainder of the dental visit. Never dismiss a child's cry in pain. If your patient tells you that a procedure is painful, it is your responsibility as a caring practitioner to do everything you can to eliminate or minimize the cause of discomfort. Profound anesthesia and the use of a rubber dam are the two most important clinical procedures in obtaining good cooperation in children during an operative dental appointment.

Safe Sedation requires meticulous planning. Procedures that seek to reduce later problems must be strictly adhered to for all patients. Prior to the *sedation appointment*, a specific informed consent must be obtained in writing following a thorough discussion of risks and benefits, the use of restraints and the probability of success. The parents must also be given the option for “no treatment” and what is likely to result if this course of action is selected. The patient’s fitness for the procedure should be documented in the form of a history and physical report from their pediatrician. The parent must be informed in writing of the dietary restrictions for the sedation appointment and why they are necessary.

It is currently recommended that patients undergoing sedation have no milk/solids after midnight the previous night, and clear liquid consumption is restricted according to the patient’s age as follows:

- < 3 years – 4 hr prior to appointment
- 3-7 years – 6 hr prior to appointment
- > 7 years – 8 hr prior to appointment

The parent should be given additional written pre- and post sedation instructions and it is highly recommended that the patient be accompanied by two responsible adults - one to monitor the patient during travel from the dental office to home when they may still be in danger of airway obstruction if the patient falls asleep in an unfavorable position. Before discharge, children should be alert and oriented (or have returned to an age-appropriate base line).

Monitoring requirements during the procedure depend upon the deepest level of consciousness that may be attained (Table 3) and may include any or all of the following: head position, patient color, breath and heart sounds (precordial stethoscope), blood pressure, O₂ saturation (pulse oximeter) and end-tidal CO₂ (capnograph). Although not the focus of this module, for monitoring general anesthesia an ECG, defibrillator and thermometer must also be available.

Table 3. Minimum Monitoring by level of Sedation					
AAPD 2004	Mild Sedation	Moderate Sedation	Moderate Sedation	Deep Sedation	General Anesthesia
Number personnel	2	2	2	3	3
Minimal monitoring standards	Clinical observation	PO, precordial recommended	PO, precordial	PO and capnograph, ECG, precordial, BP, defibrillator desirable	PO and capnograph, ECG, temperature, precordial, BP, defibrillator

The dentist and staff should all be trained in basic life support and emergency management. They should be familiar with the use of basic airway management equipment - nasal/oral airways and know how to alert emergency medical back up (an estimated arrival time for EMS should be posted by the telephone). In addition, the dentist may be required to be certified in advanced life support (e.g. PALS). The practice should hold regular emergency drills, and individual staff members should be trained to carry out specific tasks.

In terms of emergency kits, the selection currently available commercially makes choosing the correct kit a bewildering task. It is easy to think that bigger is better, however most experts advise that you only carry drugs you know how and when to correctly use. Many emergency kits are available that contain color-coded drugs in pre-filled syringes. Ensure your kit is checked regularly as the shelf life for different drugs may vary within the same kit, and replace individual drugs as needed. Many manufacturers offer emergency drug kits with automatic drug refill services available, however these can be expensive. In addition to the emergency kit a positive-pressure oxygen delivery system capable of delivering >90% O₂ at 10L/min for at least 60 mins (equivalent to 2 or 3 “E” cylinders) must be available.

Despite careful precautions, even the most careful practitioner may be involved in an emergency procedure. The negative sequellae will be greatly mitigated if they and their staff are appropriately trained and equipped. The basic tenet of emergency management is to monitor TRENDS in patient vital signs and respond quickly and effectively. In most cases, problems with ventilation are the first to occur in sedated children. They can usually be reversed simply and quickly by careful head positioning - re-establishing the airway and supporting ventilation temporarily with an “ambo” bag or positive pressure O₂. If ventilation problems are not addressed and the cardiovascular system fails the outcome for the patient is poor.

Deep sedation may be useful in more uncooperative patients, especially those with poor cognitive abilities, and is often offered as an alternative office-based alternative to hospital general anesthesia. Parenteral deep sedation is considered by most operators to be more predictable, however it requires that vascular access be established and this may be problematic in very anxious young patients. The monitoring requirements are similar to general anesthesia. Deep sedation should never be undertaken by a practitioner without extensive further training and certification in its use and the management of related emergencies. In many dental offices it is often performed by a visiting anesthesiologist freeing the dentist to concentrate on the dentistry.

General Anesthesia is the ultimate mechanism of behavioral control in dentistry. It is also the procedure associated with the highest mortality and morbidity (1:670,000-1:1,000,000 – dental office US, 1: 30,000 – hospital (anesthetic care team)). Most deaths are attributed to respiratory difficulties or sudden cardiovascular collapse. These occur because general anesthesia causes a loss of protective reflexes and the patient cannot maintain an independent airway.

The indications for general anesthesia in dentistry include the medically compromised patient, patients with dental needs for whom LA is ineffective because of acute infections, anatomic variations or allergy, extremely uncooperative patients where treatment cannot be deferred, and patients with dental needs who otherwise would not obtain dental care and in the treatment of orofacial/dental trauma.

In summary, pediatric patients did not request the treatment and frequently they do not understand why they are there. It is the responsibility of the dental practitioner to make these patients feel at ease and to help prepare them for a dental future in which they can participate without undue anxiety or fear.

Rules of behavior management:

1. Never deny a child's fear
2. Use age appropriate behavior modification techniques
3. Ensure profound anesthesia

And perhaps most importantly,

4. Remember that all children can be treated using the appropriate modality

Pediatric Anesthesia Updates as of 2019

According to the website <http://www.calebslaw.org/caleb-s-story-and-law/>, AB224 is a legislative bill immediately created and established to better protect children being put under general anesthesia, including in dentistry.

The website says, “Caleb Sears was a healthy six-year-old living in the Bay Area. He was in his first year of elementary school and just starting to read and write. He loved playing with his little sister, climbing trees, singing Les Miserables, and making up funny stories about llamas and time machines. In March 2015, Caleb went with his parents to a reputable oral surgeon’s office to have a mesiodens extraction, a necessary but elective dental procedure. Caleb stopped breathing after general anesthesia, (including the drugs Propofol, Fentanyl, Ketamine, and Versed,) was administered. The oral surgeon was performing the procedure alone in his office with his dental assistant and a sedation assistant. Moments passed before anyone noticed that Caleb had stopped breathing. He suffered irreversible massive injuries and died because there were no adequately trained support personnel available or sufficient monitoring equipment.

Caleb’s death was preventable, as were those of numerous other children. Help us prevent this from happening ever again.

Caleb's Law was signed into law in California by Governor Brown on September 23, 2016 and it went into effect on January 1, 2017.*

- It requires that the Dental Board of California establish a committee to study the safety of pediatric anesthesia in dental offices and whether additional safety measures would reduce the potential for injury or death in minors. These findings will be reported to the Board and be made publicly available.
- It requires that people licensed by the Dental Board to administer general anesthesia inform a child’s parent or guardian of the differing practice models and safety precautions currently in place.
- It facilitates the epidemiological study of pediatric anesthesia and sedation by requiring the Dental Board to collect more information regarding adverse events.

*A follow up bill to change the way anesthesia is administered in dental offices and make it safer for children undergoing sedation and anesthesia met with strong opposition from the dental lobby, who do not support banning the operator-anesthetist model of care for children aged 6 and under during general anesthesia.” (Caleb’s Law Website, 2017)

In a subsequent clinical report by authors Charles J. Coté, Stephen Wilson called Guidelines for Monitoring and Management of Pediatric Patients Before, During, and

After Sedation for Diagnostic and Therapeutic Procedures: Update 2019, they explain:

“The number of diagnostic and minor surgical procedures performed on pediatric patients outside of the traditional operating room setting has increased in the past several decades. As a consequence of this change and the increased awareness of the importance of providing analgesia and anxiolysis, the need for sedation for procedures in physicians’ offices, dental offices, subspecialty procedure suites, imaging facilities, emergency departments, other inpatient hospital settings, and ambulatory surgery centers also has increased markedly. In recognition of this need for both elective and emergency use of sedation in nontraditional settings, the American Academy of Pediatrics (AAP) and the American Academy of Pediatric Dentistry (AAPD) have published a series of guidelines for the monitoring and management of pediatric patients during and after sedation for a procedure. The purpose of this updated report is to unify the guidelines for sedation used by medical and dental practitioners; to add clarifications regarding monitoring modalities, particularly regarding continuous expired carbon dioxide measurement; to provide updated information from the medical and dental literature; and to suggest methods for further improvement in safety and outcomes. This document uses the same language to define sedation categories and expected physiologic responses as The Joint Commission, the American Society of Anesthesiologists (ASA), and the AAPD.

This revised statement reflects the current understanding of appropriate monitoring needs of pediatric patients both during and after sedation for a procedure. The monitoring and care outlined may be exceeded at any time on the basis of the judgment of the responsible practitioner. Although intended to encourage high-quality patient care, adherence to the recommendations in this document cannot guarantee a specific patient outcome. However, structured sedation protocols designed to incorporate these safety principles have been widely implemented and shown to reduce morbidity. These practice recommendations are proffered with the awareness that, regardless of the intended level of sedation or route of drug administration, the sedation of a pediatric patient represents a continuum and may result in respiratory depression, laryngospasm, impaired airway patency, apnea, loss of the patient’s protective airway reflexes, and cardiovascular instability.

Procedural sedation of pediatric patients has serious associated risks. These adverse responses during and after sedation for a diagnostic or therapeutic procedure may be minimized, but not completely eliminated, by a careful preprocedure review of the patient’s underlying medical conditions and consideration of how the sedation process might affect or be affected by these conditions: for example, children with developmental disabilities have been shown to have a threefold increased incidence of desaturation compared with children without developmental disabilities. Appropriate

drug selection for the intended procedure, a clear understanding of the sedating medication's pharmacokinetics and pharmacodynamics and drug interactions, as well as the presence of an individual with the skills needed to rescue a patient from an adverse response are critical. Appropriate physiologic monitoring and continuous observation by personnel not directly involved with the procedure allow for the accurate and rapid diagnosis of complications and initiation of appropriate rescue interventions. The work of the Pediatric Sedation Research Consortium has improved the sedation knowledge base, demonstrating the marked safety of sedation by highly motivated and skilled practitioners from a variety of specialties practicing the above modalities and skills that focus on a culture of sedation safety. However, these groundbreaking studies also show a low but persistent rate of potential sedation-induced life-threatening events, such as apnea, airway obstruction, laryngospasm, pulmonary aspiration, desaturation, and others, even when the sedation is provided under the direction of a motivated team of specialists. These studies have helped define the skills needed to rescue children experiencing adverse sedation events.

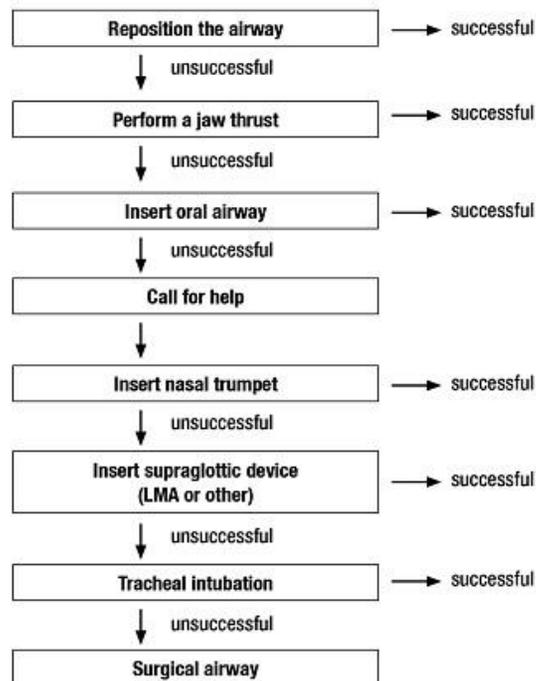
The sedation of children is different from the sedation of adults. Sedation in children is often administered to relieve pain and anxiety as well as to modify behavior (eg, immobility) so as to allow the safe completion of a procedure. A child's ability to control his or her own behavior to cooperate for a procedure depends both on his or her chronologic age and cognitive/emotional development. Many brief procedures, such as suture of a minor laceration, may be accomplished with distraction and guided imagery techniques, along with the use of topical/local anesthetics and minimal sedation, if needed. However, longer procedures that require immobility involving children younger than 6 years or those with developmental delay often require an increased depth of sedation to gain control of their behavior. Children younger than 6 years (particularly those younger than 6 months) may be at greatest risk of an adverse event. Children in this age group are particularly vulnerable to the sedating medication's effects on respiratory drive, airway patency, and protective airway reflexes. Other modalities, such as careful preparation, parental presence, hypnosis, distraction, topical local anesthetics, electronic devices with age-appropriate games or videos, guided imagery, and the techniques advised by child life specialists, may reduce the need for or the needed depth of pharmacologic sedation.

Studies have shown that it is common for children to pass from the intended level of sedation to a deeper, unintended level of sedation, making the concept of rescue essential to safe sedation. Practitioners of sedation must have the skills to rescue the patient from a deeper level than that intended for the procedure. For example, if the intended level of sedation is 'minimal,' practitioners must be able to rescue from 'moderate sedation'; if the intended level of sedation is 'moderate,' practitioners must have the skills to rescue from 'deep sedation'; if the intended level of sedation is 'deep,'

practitioners must have the skills to rescue from a state of ‘general anesthesia.’ The ability to rescue means that practitioners must be able to recognize the various levels of sedation and have the skills and age- and size-appropriate equipment necessary to provide appropriate cardiopulmonary support if needed.

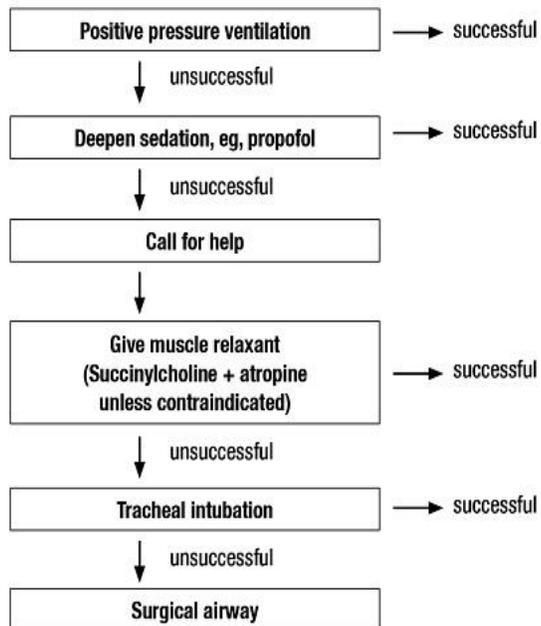
These guidelines are intended for all venues in which sedation for a procedure might be performed (hospital, surgical center, freestanding imaging facility, dental facility, or private office). Sedation and anesthesia in a nonhospital environment (eg, private physician’s or dental office, freestanding imaging facility) historically have been associated with an increased incidence of ‘failure to rescue’ from adverse events, because these settings may lack immediately available backup. Immediate activation of emergency medical services (EMS) may be required in such settings, but the practitioner is responsible for life-support measures while awaiting EMS arrival. Rescue techniques require specific training and skills. The maintenance of the skills needed to rescue a child with apnea, laryngospasm, and/or airway obstruction include the ability to open the airway, suction secretions, provide continuous positive airway pressure (CPAP), perform successful bag-valve-mask ventilation, insert an oral airway, a nasopharyngeal airway, or a laryngeal mask airway (LMA), and, rarely, perform tracheal intubation. These skills are likely best maintained with frequent simulation and team training for the management of rare events. Competency with emergency airway management procedure algorithms (below) is fundamental for safe sedation practice and successful patient rescue.” (Coté & Wilson, 2019)

Suggested Management of Airway Obstructions



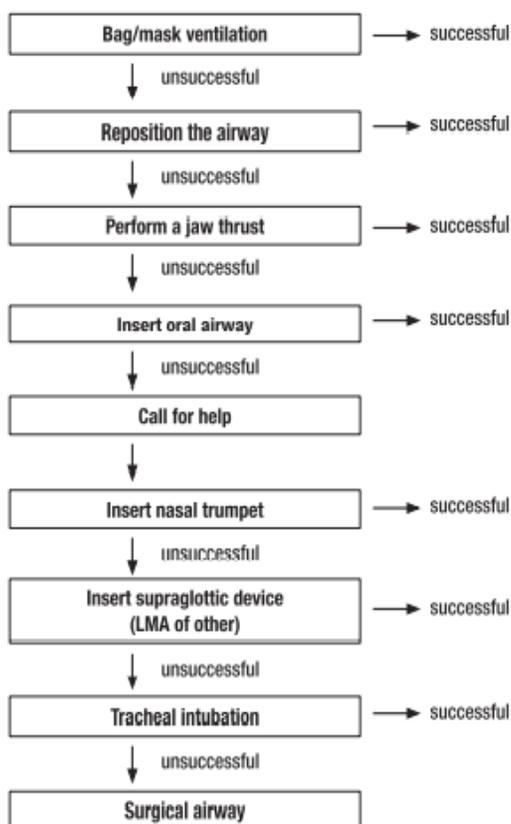
June 2016, the American Academy of Pediatrics Clinical Report found at:

Suggested Management of Laryngospasm



June 2016, the *American Academy of Pediatrics Clinical Report* found at:
<http://pediatrics.aappublications.org/content/early/2016/06/24/peds.2016-1212>

Suggested Management of Apnea



June 2016, the American Academy of Pediatrics Clinical Report found at:
<http://pediatrics.aappublications.org/content/early/2016/06/24/peds.2016-1212>

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Clinical Affairs Committee – Behavior Management Subcommittee & Council on Clinical Affairs, 2019

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Managing the Pediatric Dental Patient: Course Test

1. Drugs used in conscious sedation in dentistry are commonly:
 - A. CNS depressants.
 - B. CVS depressants.
 - C. A and B.
 - D. Neither A nor B.

2. The two most important dental procedures for reducing uncooperative behavior in children are:
 - A. Slow speed handpiece and hand instrumentation where appropriate.
 - B. Profound anesthesia coupled with the use of rubber dam.
 - C. Tell-show-do and restraint.
 - D. None of above.

3. NPO instructions prior to a sedation appointment should:
 - A. Include no milk/solids after midnight the previous night.
 - B. Include no solids after midnight the previous night and no liquids the day of the procedure.
 - C. Be dependent upon the patient's age.
 - D. A and C.

4. Double dosing of sedation medications:
 - A. Should never be undertaken under any circumstances.
 - B. Should be done if the patient vomits the medication.
 - C. Can only be done safely if medication administered nasally.
 - D. A and C.

5. The goals of behavior management are:
- A. To establish effective communication.
 - B. To alleviate patient fear and anxiety.
 - C. To build a trusting relationship with the child that will ultimately permit the dentist to deliver quality dental care.
 - D. To promote the child's positive attitude towards oral/dental health.
 - E. All of the above.
6. Which ASA classification of patient can safely be treated by in-office conscious sedation?
- A. Some ASA I.
 - B. All ASA II.
 - C. All ASA I and some ASA II.
 - D. Some ASA I and some ASA II.
7. Parents of dentally fearful children:
- A. Should always accompany the child into the dental operatory.
 - B. May accompany a fearful child at the dentist's discretion.
 - C. Always improve a fearful child's behavior.
 - D. Improve communication between dentist and patient.
8. Body language is particularly important in the close communication that takes place during dental treatment.
- A. True.
 - B. False.
9. Which of the following words/phrases commonly use in the dental setting is/are considered evocative language and should be avoided?
- A. "Whistle."
 - B. "Make your tooth sleepy."
 - C. "Clean the soft part of the tooth away."
 - D. "Drill the soft part of the tooth away."
10. What is the desired end-point for moderate sedation?
- A. Unresponsive to verbal commands.
 - B. Responsive to verbal commands.
 - C. Responsive to verbal commands with painful stimulus.
 - D. None of the above.

11. Tell-show-do is a behavioral technique that:
- A. Can only be used with young children.
 - B. May include visual demonstrations.
 - C. Involves diverting the patient's attention.
 - D. All of the above
12. Reward-oriented Management is a behavioral technique that...
- A. Uses positive reinforcement.
 - B. Involves the establishment of rules.
 - C. States that the reward is most effective if it comes directly from the dentist.
 - D. All of the above.
13. What is the most commonly used anxiolytic agent in pediatric dentistry?
- A. Demerol.
 - B. Midazolam.
 - C. Nitrous oxide.
 - D. Halothane.
14. Tell-show-do is rooted in learning theory.
- A. True.
 - B. False.
15. Most emergencies involving children undergoing dental treatment under conscious sedation are first seen as:
- A. Cardiovascular collapse.
 - B. Heart attack.
 - C. Fainting.
 - D. Problems with ventilation.
16. Which of the following means of restraint is not considered "passive?"
- A. Papoose board.
 - B. Pedi-Wrap.
 - C. Parent's hands.
 - D. None of the above.

17. Restraint is considered an appropriate form of behavior management to restrain patients:
- A. For long appointments
 - B. For short appointments.
 - C. For patients who have previously experienced physical trauma from protective stabilization.
 - D. All of the above.
18. Use of a mouthprop:
- A. Usually requires separate, specific written consent.
 - B. Is considered to be covered in general dental consent.
 - C. Is prohibited in developmentally challenged patients.
 - D. None of the above
19. Which of the following is not an absolute contraindication to the use of nitrous oxide?
- A. Tuberculosis.
 - B. Mild asthma.
 - C. Otitis media.
 - D. Cystic fibrosis
20. Voice control:
- A. Involves a controlled alteration in the volume, tone, or pace of voice.
 - B. Is aimed at influencing and directing the patient's behavior.
 - C. Is the same as shouting.
 - D. All of the above.
 - E. A and B only.
21. What is the percent of children whose behavior in the dental office can be managed with routine behavioral techniques?
- A. 20.
 - B. 40.
 - C. 60.
 - D. 80.
 - E. 90.

22. Which of the following are not considered desirable properties of nitrous oxide?
- A. Easily titratable.
 - B. Cost.
 - C. Decreased ventilation response to hypoxia.
 - D. Patient acceptability.
23. What, according to the AAPD is defined as the “diminution or elimination of anxiety in a conscious patient?”
- A. Conscious sedation.
 - B. Deep sedation.
 - C. Anxiolysis.
 - D. General anesthesia.
24. Most deaths during general anesthesia administered to permit the delivery of dental care are attributed to:
- A. Respiratory difficulties or sudden cardiovascular collapse.
 - B. Heart attack.
 - C. Laryngospasm.
 - D. Overdose of anesthetic gas.
25. Monitoring requirements during sedation procedures:
- A. Depends upon the deepest level of consciousness that may be attained.
 - B. May include patient color, breathing and heart sounds.
 - C. May include use of a pulse oximeter.
 - D. All of the above.