Guideline on the elective use of conscious sedation, minimal, moderate, and deep sedation and general anesthesia for pediatric dental patients

Originating Group
American Academy of Pediatric Dentistry

Review Council
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Revised

Purpose
The American Academy of Pediatric Dentistry (AAPD) intends this guideline to assist the practitioner who will use sedation or general anesthesia for managing pediatric dental patients in an outpatient or private practice site. These modalities are part of the continuum of both nonpharmacological and pharmacological behavior management techniques which are described in other guidelines of the AAPD. The guideline must be tailored to the individual patient and practitioner, and safety and quality of care must be of the utmost importance. The recommendations in this document may be exceeded at any time if the outcome of the change involves improved safety and is supported by currently accepted practice (evidence-based dentistry and medicine) and peer reviewed research. This guideline is not intended to include the use of nitrous oxide/oxygen inhalation sedation delivered through nasal mask when used alone or in conjunction with local anesthesia. In addition, it is beyond the scope of this document to dictate the use of any specific agent or agents and doses for the purpose of sedation. Monitoring and equipment appropriate for medications and doses must be provided consistent with the level of sedation achieved rather than that intended by the practitioner. The practitioner must be prepared for inadvertent changes in the depth and length of the sedation and be able to provide a safe environment for the successful outcome of the procedure.

Methods
This guideline on the Elective Use of Minimal, Moderate, and Deep Sedation and General Anesthesia for Pediatric Dental Patients replaces the document entitled Guideline on the Elective Use of Conscious Sedation, Deep Sedation, and General Anesthesia in the Pediatric Dental Patients. This new document reflects the many changes in delivery and definitions that have occurred in these modalities since the original document was proposed and accepted. Advances in pain and anxiety control, pharmacology and pharmacokinetics, monitoring, and patient safety are represented. Specific monitoring equipment and recommendations are listed in the template of these guidelines (Appendix I). Research will continue to improve the many aspects of care given to the pediatric patient and will be represented in future revisions.

Background/Literature Review
The number of sedation and general anesthesia procedures performed on dental patients in non-traditional settings (i.e. office or outpatient facilities) has risen over the last few
years as needs have increased, reimbursement levels for in-hospital procedures have
decreased, and safety and effectiveness of drugs and monitors have improved
significantly. There has also been recognition by the profession and state boards for
increased training in sedation when provided in outpatient facilities including the
private dental office.
Studies have demonstrated the safety and effectiveness of sedation when and if the
practitioner follows sedation guidelines and uses drugs in recognized therapeutic levels
It is understood that there is extreme variability in the physiology of children even of
the same age; their response to all medications, including sedative and anesthetic agents,
is only generally predictable for the average child. These guidelines cannot and do not
predict nor guarantee a specific patient outcome. Unintended loss of protective reflexes
as well as recognition of other sedation-related untoward episodes will lead the trained
practitioner to provide the currently recognized concept of rescue from deeper levels of
sedation or other emergencies. Advanced training in recognition and management of
pediatric emergencies is crucial to providing safe sedation and anesthetic care.
The American Academy of Pediatric Dentistry (AAPD)'s Guidelines for the Elective Use
of Pharmacological Conscious Sedation and Deep Sedation in Pediatric Dental Patients
were revised and published in 1996. At that time, no attempt was made to address the
issue of general anesthesia for pediatric dental patients. However, some children and
developmentally disabled patients require general anesthesia services to receive
comprehensive dental care in a humane fashion. Access to hospital-based general
anesthesia may be limited for a variety of reasons including restriction of coverage by
certain insurance companies. Many pediatric dentists (and others who treat children)
have sought to provide general anesthesia in their office or other
facilities (eg, outpatient care clinics). Therefore, we have included general anesthesia in
the
Guidelines to help facilitate safe anesthesia services for pediatric dental patients.
In 1985, the AAPD established the Guidelines for the Elective Use of Conscious
Sedation, Deep Sedation, and General Anesthesia in Pediatric Patients. To be consistent
with all aspects of delivery of care using pharmacologic interventions, it is appropriate
and timely to expand and
institute guidelines that address general anesthesia as well as sedation for those
practitioners who provide care to pediatric dental patients. General anesthesia may be
used when indicated for the delivery of oral health care to pediatric patients. It must be
provided only by qualified and appropriately trained individuals and in accordance
with state regulation. Such providers may include pediatric dentists who have
completed advanced education in anesthesiology, dental or medical anesthesiologists,
oral surgeons or certified registered nurse anesthetists.
The 1998 AAPD guidelines revision reflects the current understanding of appropriate
monitoring needs and provides further definitions and characteristics of 5 functional
levels of sedation and general anesthesia involving pediatric patients in the context of
recognized sedation terminology (ie, “conscious” and “deep”). Appendix I provides a
descriptive template for recognizing that sedation is a continuum; however, the
practitioner’s expected clinical outcomes in sedating the “average” patient can be targeted with the targeting being dependent on his/her training and experience in the use of sedative agents. The template shows 5 levels of sedation, each with its own goals, characteristics and requirements.

The pediatric dentist must be responsible for evaluating the qualifications of the general anesthesia provider and establishing a safe environment which complies with state rules and regulations as well as these guidelines for the protection of the patient. Educational qualifications for general anesthesia providers are outlined in these guidelines.

Educational preparation, while necessary, is only 1 aspect of safe general anesthesia care. As outlined in the guideline, the following are all essential to minimize the risk for the patient who will receive sedation or general anesthesia:

1. facilities and equipment;
2. selection of pharmacologic agents and dosages;
3. monitoring and documentation;
4. patient selection utilizing physical status and indication for anesthetic management;
5. preoperative evaluation;
6. appropriately trained support personnel;
7. emergency medications, equipment, and protocols.

Appropriate levels of training required for the administration of sedation and general anesthesia are found in other guidelines and policy statements\(^{13,14}\) and the appropriate sections of the American Dental Association Guidelines for Teaching the Comprehensive Control of Anxiety and Pain in Dentistry\(^{12}\).

The use of conscious sedation, deep sedation and general anesthesia will be affected by advances in pain and anxiety control, pharmacologic development and monitoring and patient safety techniques. As research defines safer and more effective techniques, the guidelines will be revised accordingly.

**Definition of terms**

For the purpose of this document, the following definitions shall apply:

**Guidelines:** Guidelines are systematically developed recommendations to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances. These recommendations may be adopted, modified, or rejected according to clinical needs and constraints. Guidelines are not intended as standards or absolute requirements and their use cannot guarantee any specific outcome. Like a recommendation, it originates in an organization with acknowledged professional stature. Although it may be unsolicited, it usually is developed following a stated request or perceived need for such advice or instruction.

**Pediatric dental patients:** Includes all patients who are infants, children and adolescents less than the age of majority.
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**Must or shall:** Indicates an imperative need and/or duty; as essential or indispensable; mandatory.

**Should:** Indicates the recommended need and/or duty; highly desirable.

**May or could:** Indicates freedom or liberty to follow a suggested or reasonable alternative.

**Continual:** repeated regularly and frequently in a steady succession.

**Continuous:** prolonged without any interruption at any time.

**Time-oriented record:** documentation of physiologic data obtained at appropriate intervals during patient monitoring and of other related material (eg, drugs, doses, and route of administration)

**Immediately available:** on site in the facility and available for immediate use.

**Sedation:** Pharmacological sedation is mediated by the administration of an agent or combination of agents causing alterations in the level of consciousness, cognition, motor coordination, degree of anxiety, and physiological parameters. These changes are dependent on the drug, dose, route of administration and individual sensitivity to the agent(s). Because of differences among individuals, the process of clinical sedation requires the practitioner to have special knowledge, training, consistent application of sedation principles, and management of the patient in a setting optimal for safety and positive outcomes. Sedation is not defined by specific medications or their doses but instead by the response of the patient therefore the practitioner must be able to respond appropriately to unintended levels or changes in levels of sedation in order to provide a safe outcome for the patient.

**Conscious sedation:** Conscious sedation (Appendix I, levels 1, 2 and 3) is a controlled, pharmacologically induced, minimally depressed level of consciousness that retains the patient’s ability to maintain a patent airway independently and continuously and respond appropriately to physical stimulation and/or verbal command. The drugs, dosages and techniques used should carry a margin of safety which is unlikely to render the child noninteractive and nonarousable (Appendix I, levels 4 and 5).

**Deep sedation:** Deep sedation (Appendix I, level 4) is a controlled, pharmacologically induced state of depressed consciousness from which the patient is not easily aroused and which may be accompanied by a partial loss of protective reflexes, including the ability to maintain a patent airway independently and/or respond purposefully to physical stimulation or verbal command.

**General anesthesia:** General anesthesia (Appendix I, level 5) is an induced state of unconsciousness accompanied by partial or complete loss of protective reflexes, including the ability to independently maintain an airway and respond purposefully to physical stimulation or verbal command.
Minimal Sedation: (AAPD 1998 Level 1) is a drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may somewhat be impaired, ventilatory and cardiovascular functions are unaffected.

Moderate Sedation: (AAPD 1998 Level 2,3) is a drug-induced depression of consciousness during which patients respond purposefully to verbal commands (eg, "open your eyes"), either alone or accompanied by light tactile stimulation. For older patients, this level of sedation implies an interactive state if prompted by the provider; for younger patients, age-appropriate behaviors occur and are expected (eg, crying). Reflex withdrawal, although a normal response to a painful stimulus, is not considered acceptable as the only purposeful response for this level of sedation. No interventions are required to maintain a patent airway and spontaneous ventilation is adequate unless maneuvers mediated by the procedure and practitioner potentially affect the airway. Such maneuvers should be corrected immediately as a part of facilitating the patient’s ability to maintain airway patency. Cardiovascular function usually is unaffected.

Deep Sedation (AAPD 1998 Level 3,4) is a drug-induced depression of consciousness during which patients cannot be easily aroused, but may respond purposefully following repeated verbal or painful stimulation. The ability to maintain ventilatory function independently may be impaired. Patients may require assistance in maintaining a patent airway, regardless of the procedure and practitioner manipulations, and spontaneous ventilation may be inadequate. Cardiovascular function usually is unaffected. Reflex withdrawal from a painful stimulus may occur, but is not considered as a higher functioning and purposeful response. It may be accompanied by a partial or complete loss of protective airway reflexes. The state and risks of deep sedation may be indistinguishable from those of general anesthesia.

General Anesthesia: (AAPD 1998 Level 5) is a drug-induced loss of consciousness during which the patient is not arousable, even by painful stimulation. The ability to maintain ventilatory function independently often is impaired. Patients often require assistance in maintaining a patent airway, and positive pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function may be impaired.

Rescue: It is not always possible to achieve the intended level of sedation for any given patient and some patients may progress to a deeper level of sedation or general anesthesia than expected by the practitioner. The patient may demonstrate an inability to maintain his/her airway independently and hypoventilation, obstruction and/or cardiovascular compromise may occur. The practitioner must have the training, skills, and equipment to identify and manage such an occurrence until either assistance arrives (emergency medical services) or the patient returns to the intended level of sedation without airway or cardiovascular complications.

General considerations

Goals of sedation and general anesthesia

The sedation of children for the delivery of oral health care is recognized as and represents a unique clinical challenge. Consideration must be given to such factors as patient’s age and corresponding levels of cognitive and coping skills. Because of patient
extremes in responsiveness and acceptability of treatment modalities, the intended goals and outcome of sedations will vary depending on a host of factors. These guidelines should aid clinicians in achieving the benefits of sedation while minimizing associated risks and adverse outcomes for the patient. The goals of sedation in the pediatric dental patient are to:

1. facilitate and augment the provision of quality care;
2. minimize the extremes of disruptive behavior;
3. promote a positive psychological response to treatment;
4. promote patient welfare and safety;
5. return the patient to a physiological state in which safe discharge, as determined by recognized criteria, is possible (Appendix II).

The goals of general anesthesia in the pediatric dental patient are to eliminate cognitive, sensory, and skeletal motor activity in order to facilitate the delivery of quality comprehensive diagnostic, and restorative, and/or other dental services.

Indications for sedation and general anesthesia

The indications for conscious minimal or moderate sedation include:

1. preschool children requiring dental treatment who cannot understand or cooperate for definitive treatment;
2. patients requiring dental care who cannot cooperate due to lack of psychological or emotional maturity;
3. patients requiring dental treatment who cannot cooperate due to a cognitive, physical, or medical disability;
4. patients who require dental care but are fearful and anxious; and cannot cooperate for treatment;
5. patients who require extensive dental care and would require or benefit from prolonged visits.

The indications for deep sedation and general anesthesia in pediatric dental patients include:

1. patients with certain physical, mental, or medically compromising conditions;
2. patients with dental restorative or surgical needs for whom local anesthesia is ineffective;
3. the extremely uncooperative, fearful, anxious, or physically resistant child or adolescent with substantial dental needs and no expectation that the behavior will improve soon;
4. patients who have sustained extensive orofacial or dental trauma;
5. patients with dental needs who otherwise would not receive comprehensive dental care.
1. patients who are unable to cooperate due to a lack of psychological or emotional maturity and/or mental, physical or medical disability;

2. patients for whom local anesthesia is ineffective because of acute infection, anatomic variations, or allergy;

3. the extremely uncooperative, fearful, anxious, or uncommunicative child or adolescent

4. patients requiring significant surgical procedures;

5. patients for whom the use of deep sedation or general anesthesia may protect the developing psyche and/or reduce medical risks;

6. patients requiring immediate, comprehensive oral/dental care.

Local anesthesia considerations during sedation

All local anesthetic agents can become cardiac and central nervous system (CNS) depressants when administered in excessive doses. There is a potential interaction between local anesthetic and sedatives used in pediatric dentistry which can result in enhanced sedative effects and/or untoward events. Therefore, particular attention should be paid to doses used in children. To avoid excessive doses for the patient who is going to be sedated, a maximum recommended dose in based upon mg/kg or mg/lb should be calculated and t. The dose of all sedatives and local anesthetics administered should must be recorded on the time-based record for each patient prior to administration for all sedatives and local anesthetics. It is beyond the scope of this document to recommend specific dosages of local anesthetic agents.

Candidates

Patients who are ASA (American Society of Anesthesiologists) Class I or II (Appendix III) may be considered candidates for conscious sedation (Appendix I, levels 1, 2 or 3) minimal, moderate, or deep sedation (Appendix I, level 4) or general anesthesia (Appendix I, level 5). Patients in ASA Class III or IV present special problems and treatment in a hospital setting should be considered.

Responsible adult

The pediatric patient shall be accompanied to and from the treatment facility by a parent, legal guardian or other responsible adult who shall be required to remain at the facility for the entire treatment period. A second responsible person is encouraged to accompany the patient to assist the parent, legal guardian, or other responsible adult in observing the patient while being transported in a motor vehicle.

Facilities and equipment

Facilities

The practitioner who utilizes any type of sedative or local anesthetic in a pediatric dental patient shall possess appropriate training and skills and have available the proper facilities, personnel, and equipment to manage any reasonably foreseeable emergency situation that might be experienced. All newly installed systems or remodeled facilities
for delivering nitrous oxide and oxygen must be checked for proper gas delivery and
fail-safe function prior to initial use. Where equipment and facilities are mandated
regulated by state law, such statutes shall supersede these guidelines.

**Equipment**

A positive-pressure oxygen delivery system that is capable of administering greater than
90% oxygen at a 10 L/min flow for at least 60 minutes (650 liter, “E” cylinder) must be
available. When a self-inflating bag valve mask device is used for delivering positive
pressure oxygen, a 15 L/min flow is recommended. All equipment must be able to
accommodate children of all ages and sizes.

A functional suction apparatus with appropriate suction catheters (eg, tonsillar and
flexible) must be immediately available. A sphygmomanometer with cuffs of
appropriate size for pediatric patients shall be immediately available and utilized during
the procedure and the recovery phase of the procedure as recommended. Monitoring
devices such as pulse oximeters, end tidal carbon dioxide monitors, and automated
blood pressure cuffs must be maintained and safety tested regularly according to
manufacturer’s guidelines or regulations to guarantee their correct function.

Inhalation sedation equipment must have the capacity for delivering 100%, and never
less than 25%, oxygen concentration at a flow rate appropriate to the child’s size, and
must have a fail-safe system that is checked and calibrated annually. If nitrous oxide and
oxygen delivery equipment capable of delivering more than 75% nitrous oxide and less than 25% oxygen is used, an
in-line oxygen analyzer must be used. The equipment must have an appropriate
scavenging system.

Equipment that is appropriate for the technique used and capable of monitoring the
physiologic state of the patient before, during and after the procedure must be present.
Specific monitoring equipment monitoring and recommendations are listed in the
sections on conscious sedation, minimal, moderate, and deep sedation and general
anesthesia and in the template of these guidelines (Appendix I).

An emergency cart or kit (Appendix IV) must be readily accessible and should include
the necessary drugs and age- and size-appropriate equipment to resuscitate and rescue a
nonbreathing and unconscious pediatric dental patient and provide continuous support
while the patient is being transported to a medical facility. There should be

Documentation that all emergency equipment and drugs are checked and maintained on
a regularly scheduled basis (eg, monthly; see Appendix IV for suggested drugs) must be
kept.

**Backup emergency services**

Backup emergency services should be identified. A protocol outlining necessary
procedures for their immediate employment should be developed and operational for
each facility. For nonhospital facilities, an emergency assist system should be established
with the nearest hospital

emergency facility and ready access to ambulance service must be assured.

Additionally, office protocols for staff assistance during emergencies or untoward
events should be developed and emergency scenarios practiced on a regular basis.
The practitioner must document each sedation or general anesthesia procedure in the patient’s record. Documentation shall include the following:

**Informed consent**
Each patient, parent, or other responsible individual is entitled to be informed regarding benefits, risks, and alternatives to sedation or general anesthesia and to give consent. The patient record shall document that appropriate informed consent was obtained according to the procedures outlined by individual state laws and/or institutional requirements.

**Instructions to parents or responsible individual**
The practitioner shall provide verbal and written instructions to the parent(s) or responsible individual. Instructions should be explicit and include an explanation of presedation and postsedation dietary precautions, potential or anticipated postoperative behavior, and limitation of activities. A 24-hour contact number for the practitioner should be provided to all patients.

**Dietary precautions**
The administration of sedative drugs or general anesthetic agents shall be preceded by an evaluation of the patient’s food and liquid intake. Intake of food and liquids should be limited prior to treatment as follows:

1. no milk, breastmilk, formula, or solids for 6 hours for children 6 to 36 months and 8 hours for children 36 months and older
2. clear liquids up to 3 hours before procedure for children ages 6 months and older

The dental procedure must be postponed if the recommendations are not followed because of increased risk of aspiration should there be unintended loss of protective reflexes during sedation. Patients requiring general anesthesia for emergency procedures may proceed if appropriate pharmacologic and physical means are used to protect the airway before and after the procedure. Patients with a known history of gastroesophageal reflux or with a high potential for aspiration would benefit from appropriate pharmacologic treatment or an appropriate increase in N.P.O. interval to reduce gastric volume and increase gastric pH.

**Preoperative health evaluation**
The patient shall be under the routine care of a physician or appropriate medically trained and licensed personnel.

Prior to the administration of sedatives, the practitioner shall obtain and document information about the patient’s current health status. The focused health status evaluation should include:

1. allergies and previous allergic or adverse drug reactions;
2. current medications (prescription, over the counter, and herbal) including dose, time, route, and site of administration;

3. diseases, disorders or physical abnormalities and pregnancy status;

4. previous hospitalization to include the date, purpose, and hospital course;

5. history of general anesthesia or sedation and any associated complications;

6. family history of diseases or disorders especially those which might impact sedation and general anesthesia;

7. review of systems;

8. age in years and months and weight in kilograms or pounds.

9. Name, address, and telephone number of the child’s pediatrician or family physician.

It should be determined that the patient has been evaluated recently by the physician or his/her licensed designee.

Physical evaluation including:

1. weight in kilograms or pounds.

2. vital signs, including heart and respiratory rates and blood pressure;

3. evaluation of airway patency and tonsil size;

4. risk assessment (eg, ASA classification; Appendix III).

Hospitalized patients

The current hospital record may suffice for adequate documentation of presedation health. A brief note shall be written documenting that the record was reviewed, positive findings were noted, and there were no contraindications to the planned procedure(s).

Prescriptions

Home administration of sedative medications poses an unacceptable risk for infants, toddlers, and young children traveling in car seats. Their breathing is not easily observed and the risk of medication administration error by untrained personnel is a possibility. Administration of anxiolytic medications may be beneficial in older patients but such medications when used in therapeutic doses must not possess significant sedative effects capable of rendering loss of consciousness or protective reflexes. If a prescription is written or medication is given for home use, the amount must be for a single administration to avoid medication administration errors. Specific instructions for the anxiolytic or minimal sedation medication including adverse and untoward reactions must be discussed with the parent(s) or responsible adult. Administration of repeated oral doses of sedative medications is not an acceptable therapeutic modality in children.

Child’s physician

Name, address and telephone number of the child’s physician or family physician should be recorded in the patient’s record.
Rationale for sedation or general anesthesia

The practitioner shall briefly document the reason for the need for sedation or general anesthesia.

Baseline vital signs

Before administration of sedatives or general anesthesia, a baseline determination of vital signs (heart and respiratory rates and blood pressure) should be documented in the patient’s record. If determination of baseline vital signs is prevented by the patient’s physical resistance or emotional condition, the reason(s) should be documented.

Preprocedural prescriptions

The only classification of drugs for sedation to be administered enterally by a responsible adult preprocedureally outside the treatment facility is minor tranquilizers. Minor tranquilizers (i.e., hydroxyzine or diazepam) do not include chloral hydrate or narcotics. A copy or a note describing the content of the prescription should be documented in the patient’s record, along with a description of the instructions given to the responsible individual.

Vital signs

The patient’s record shall contain documentation of intermittent quantitative monitoring, and recording of oxygen saturation (pulse oximetry), heart and respiratory rates, and blood pressure, as recommended for specific sedation techniques. It should be documented that the patient’s responsiveness of the patient was monitored and documented at specific intervals before and during the procedure and until the patient was discharged. Inability to accurately monitor and record vital signs at appropriate intervals because of adverse or uncontrollable patient behavior should be documented but clinical observation must continue.

Drugs

The patient’s record shall document the name, dose and route, site, and time of administration of all drugs, including local anesthetics, administered. The maximum recommended dose per kilogram or pound should be calculated and the actual dose given shall be documented in milligrams. The practitioner should calculate or have readily available the dosages of emergency drugs and if appropriate, reversal agents. The concentrations, flow rate, and duration of administration of oxygen and anesthetic gases including nitrous oxide shall be documented.

Recovery

The condition of the child and the time of discharge from the treatment facility should be documented in the record. Documentation shall include that appropriate discharge criteria have been met (Appendix II). The record also should identify the responsible adult to whose care the patient was discharged.

Continuous Quality Improvement

In order to reduce medical errors including those related to sedation and general anesthesia, a careful examination of index events with a complete and thorough analysis
of cause and effect should be undertaken. The practitioner should maintain records that track events such as non-behavioral mediated desaturations, prolonged sedation, apnea events, unexpected airway interventions including jaw thrust and/or positive pressure ventilation prior to, during, or after procedures, and unintended hospital admission. Such events then can be examined and assessed for future risk reduction and patient safety.

**Conscious-Minimal and moderate sedation (levels 1, 2, 3)**

**Personnel**

The practitioner responsible for the treatment of the patient and/or the administration of drugs for conscious minimal and moderate sedation (levels 1, 2 and 3) shall be appropriately trained in the use of such drugs and techniques, shall provide appropriate monitoring, and shall be capable of managing and rescuing the patient from any reasonable foreseeable complications including loss of airway, hypoxia, apnea, or unintended progression to a deeper level of sedation. Training and certification in basic life support (BLS or equivalent) is required; training and certification in advanced pediatric airway management and advanced life support, such as Pediatric Advanced Life Support (PALS) or Advanced Cardiac Life Support (ACLS) or equivalent, is recommended.

Drugs, other than minor tranquilizers, used for the purpose of minimal or moderate conscious sedation (levels 1, 2 and 3) shall be administered in the treatment facility and shall be prescribed, dispensed, or administered only by appropriately licensed individuals, or under the direct supervision thereof, according to state law. In addition to the operating practitioner, an individual trained to monitor appropriate physiologic parameters and to assist in any supportive or resuscitative measures required shall be present. Both individuals must have training and certification in basic life support, shall have specific assignments, and shall have familiarity with the emergency cart (kit) inventory. The practitioner and all treatment facility personnel should participate in periodic reviews of the office’s emergency protocol, the emergency drug kit and simulated exercises to assure proper emergency management response.

**Operating facility and equipment**

The operating facility used for the administration of minimal and moderate conscious sedation (levels 1, 2 or 3), shall have available all facilities and equipment previously recommended and outlined in Appendix 1. With the possible exception of During minimal conscious sedation (level 1), the patient remains fully awake and communicative but may exhibit unexpected changes in level of consciousness and depth of sedation. The practitioner must maintain the equipment necessary and the ability to monitor the patient at the level to which this change may occur until such time as the patient returns to the original level of cognitive and physiological function mediated by minor tranquilizers administered enterally and/or nitrous oxide and oxygen inhalation sedation at 50% nitrous oxide concentration or less. Minimum monitoring equipment for conscious moderate sedation (levels 2 or 3) shall be a pulse oximeter, precordial stethoscope and sphygmomanometer. Capnography is desirable and may be substituted for the precordial stethoscope, for level 3. A sphygmomanometer shall be immediately available. A precordial/pretracheal stethoscope is required for level 3.
Monitoring procedures before and during treatment

Whenever drugs for conscious minimal or moderate sedation (levels 1, 2 or 3) are administered, the patient should be monitored continuously for patient responsiveness and airway patency. With the possible exception of conscious sedation (level 1), mediated by minor tranquillizers administered enterally and/or nitrous oxide and oxygen inhalation sedation at 50% nitrous oxide concentration or less, there shall be continual monitoring of oxygen saturation and heart and respiratory rates. For the patient whose anticipated sedation level is moderate, oxygen saturation and heart and respiratory rates shall be recorded at specific intervals throughout the procedure until the child has met documented discharge criteria. A precordial/pretracheal stethoscope, sphygmomanometer and/or end tidal carbon dioxide monitor shall be used for obtaining additional information on heart and respiratory rates and for monitoring airway patency during level 3 moderate sedations. Clinical observation should accompany all levels of sedation.

Treatment immobilization Protective stabilization devices should be checked periodically to prevent airway obstruction or chest restriction and ensure limb perfusion. The child’s head position shall be checked frequently to ensure airway patency. A patient who has received sedation medication must be observed continuously by a trained individual.

Recovery

After completion of the treatment procedures, vital signs should be recorded at specific intervals. The patient who has received moderate sedation must be observed in a suitably equipped recovery facility in which there is the availability of high volume suction, oxygen with bag/mask/valve supplementation, and access to emergency equipment. The practitioner or his/her designee shall assess the patient’s responsiveness and discharge the patient only when the appropriate discharge criteria have been met (Appendix II).

Deep sedation (level 4)

Personnel

The techniques of deep sedation (level 4) require the following 3 individuals:

1. the treating practitioner, who may direct the sedation;
2. a qualified individual to assist with observation and monitoring of the patient and who may administer drugs if appropriately licensed;
3. other personnel to assist the operator as necessary.

Of the 3 individuals, one shall have training and certification in advanced pediatric airway management and advanced life support, such as Pediatric Advanced Life Support (PALS) or Advanced Cardiac Life Support (ACLS) or equivalent, trained in advanced cardiac life support or pediatric advanced life support (PALS, ACLS) and the other 2 shall be currently trained and certified in basic life support (BLS or equivalent).
If a certified registered nurse anesthetist is permitted to function under the supervision of a dentist, the dentist is required to have completed training in deep sedation and be licensed or permitted, as appropriate, as specified above.

Operating facility and equipment

In addition to the facilities and equipment previously recommended for conscious minimal and moderate sedation (levels 1, 2 and 3), deep sedation requires an electrocardiograph (ECG) and a capnograph in conjunction with pulse oximetry. The availability of a defibrillator appropriate for pediatric patients is desirable required.

Intravenous access

Patients receiving deep sedation (level 4) should have an intravenous line in place or have immediately available an individual skilled in establishing vascular access in pediatric patients. In special circumstances, induction of deep sedation may begin prior to vascular access because of patient uncooperativeness or may occur without for a very short procedure.

Monitoring procedures before and during treatment

The sedated patient shall be continuously monitored continuously by an appropriately trained individual. There shall be continual monitoring of oxygen saturation by oximetry and expired carbon dioxide concentration via capnography, heart and respiratory rates and blood pressure, all of which shall be recorded minimally every 5 minutes. A pulse oximeter and capnograph, precordial/pretracheal stethoscope, ECG, and blood pressure cuff are required. Temperature monitoring is desirable. The child’s head position must be checked frequently to ensure airway patency. The operator should be observing the patient as well as the monitors and observing trends in the data obtained from the monitors. At no time shall a sedated patient be left unobserved by an appropriately trained individual must continuously observe the patient until discharge.

Recovery

After treatment has been completed, the patient must be observed in a suitably equipped recovery facility. This facility must have a functioning suction apparatus and suction catheters of appropriate size as well as the capacity to deliver greater than 90% oxygen and provide positive pressure ventilation for pediatric patients. An individual experienced in recovery care must be in attendance at all times to assess and record vital signs, observe the patient, and ensure airway patency until the patient is stable. The patient must remain in the recovery facility until cardiovascular and respiratory stability are ensured and appropriate discharge criteria have been met (Appendix II).

General anesthesia (level 5)

Personnel

The provision of general anesthesia requires the following 3 individuals:
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1. a physician or dentist who has completed an advanced training program in anesthesia or oral and maxillofacial surgery and related subjects beyond the undergraduate medical or dental curriculum, who is responsible for anesthesia and monitoring of the patient 8,10;

2. a treating dentist, responsible for the provision of dental services 8,10;

3. other personnel to assist the operator as necessary.

Of these individuals, the anesthetist shall be currently certified, have training and certification in advanced pediatric airway management and/or advanced life support, such as Pediatric Advanced Life Support (PALS), Advanced Cardiac Life Support (ACLS) or equivalent, trained in advanced cardiac life support or pediatric advanced life support (PALS, ACLS) and The others shall be trained and currently certified in basic life support (BLS or equivalent).

If a certified registered nurse anesthetist is permitted to function under the supervision of a dentist, the dentist is required to have completed training in general anesthesia and be trained and certified in advanced cardiac life support or advanced pediatric airway management, as specified above.

Operating facility and equipment

In addition to the facilities and equipment previously recommended for conscious sedation deep sedation (level 4; ie: pulse oximeter, capnograph, precordial stethoscope, blood pressure monitor, and ECG), a temperature monitor and pediatric defibrillator also are also required.

Intravenous Access

 Patients receiving general anesthesia should have an intravenous line in place or have immediately available a individual skilled in establishing vascular access in children. In special circumstances, induction of general anesthesia may begin prior to vascular access because of patient uncooperativeness or for a very short procedure.

Monitoring procedures

The anesthetized patient shall be continuously monitored continuously by the anesthesia provider. There shall be continual monitoring of oxygen saturation by pulse oximetry, and expired carbon dioxide concentration via capnography, heart and respiratory rates, and blood pressure, all of which shall be recorded minimally every 5 minutes. The anesthesia provider should be visualizing the patient as well as the monitors and observing trends in the data obtained from the monitors. At no time should the patient be unobserved by trained personnel until discharge criteria have been met. An appropriately trained individual must continuously observe the patient until discharge.

Recovery

After treatment has been completed, the patient must be observed continuously and monitored appropriately in a suitably equipped recovery facility until the patient becomes stable exhibits respiratory and cardiovascular stability through continual monitoring. This facility must have a functioning suction apparatus and suction catheters of appropriate size as well as the capacity to deliver greater than 90% oxygen
and provide positive pressure ventilation for pediatric patients. An individual experienced in recovery care must be in attendance at all times to assess and record vital signs, observe the patient, and ensure airway patency. The patient must remain in the recovery facility until cardiovascular and respiratory parameters and function are stable and appropriate discharge criteria have been met (Appendix II).

Appendix I

Template of definitions and characteristics for levels of sedation and general anesthesia

Conscious Deep General

sedation-sedation anesthesia

Functional level of sedation MILD-sedation Interactive Noninteractive/ Noninteractive/ General (Anxiolysis) arousable nonarousable anesthesia with mild/ except with moderate stimulus intense stimulus (Level 1) (Level 2) (Level 3) (Level 4) (Level 5)

Goal Decrease anxiety; Decrease or eliminate Decrease or eliminate Eliminate anxiety; Eliminate cognitive,

facilitate coping skills anxiety; facilitate anxiety; facilitate coping skills sensory and coping skills coping skills; over-ridden skeletal motor promote non-activity; some interaction sleep autonomic activity depressed

Responsiveness Uninterrupted Minimally depressed Moderately depressed Deeply depressed level Unconscious and interactive ability; level of consciousness; level of consciousness; of consciousness; sleep- unresponsive to surgical

totally awake eyes open or mimics physiologic sleep like state, but vitals stimuli; partial or temporarily closed; (vitals not different from may be slightly depressed complete loss of responds appropriately that of sleep); eyes closed compared to physiologic protective reflexes to verbal commands most of time; may or sleep; eyes closed; does not including the airway; may not respond to verbal respond to verbal prompts does not respond prompts alone; responds alone; reflex withdrawal purposefully to physical to mild /moderate stimuli with no verbalization when and verbal command (eg. repeated trapezius intense stimuli occurs pinching or needle (eg. repeated, prolonged insertion in oral tissues and intense pinching elicits reflex withdrawal of the trapezius); and

appropriate verbalization airway expected to [complaint, moan, crying]); require constant monitoring airway only occasionally and frequent management may require readjustment

via chin thrust Personnel 2 2 2 3 3

Monitoring Clinical PO; precordial PO, precordial, BP; PO, Capno, ECG; PO, Capno, defibrillator desirable* capno desirable* precordial, BP, precordial, BP, defibrillator required* ECG, temperature and
defibrillator required
Guideline on the elective use of sedation and general anesthesia

Monitoring information

None HR, RR, O2 pre; HR, RR, O2, BP; HR, RR, O2 and HR, RR, O2, during (every 15 min); CO2 if available CO2, BP, ECG CO2, BP, ECG, post, as needed pre; during pre; during temperature pre; (every 10 min); post (every 5 min); post during (every 5 min till stable/discharge till stable/discharge minimum); post criteria criteria till stable/discharge criteria

Monitors: PO (pulse oximetry); Capno (capnography); BP (blood pressure cuff); ECG (electrocardiogram). It should be noted that clinical observation should accompany any level of sedation and general anesthesia.

“Recommended” and “desirable” should be interpreted as not a necessity, but as an adjunct in assessing patient status

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<table>
<thead>
<tr>
<th>Level</th>
<th>Minimal sedation</th>
<th>Moderate sedation</th>
<th>Deep sedation</th>
<th>General anesthesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>Decrease or eliminate anxiety; facilitate coping skills</td>
<td>Decrease or eliminate anxiety; facilitate coping skills. Younger patients show age-appropriate behaviors including crying; older patients demonstrate interactive state.</td>
<td>Eliminate anxiety; coping skills unaffected and overridden. Patient uneasily aroused but may respond to purposeful stimulation</td>
<td>Eliminate sensory and skeletal motor activity, autonomic activity depressed</td>
</tr>
<tr>
<td>Patient Responsiveness</td>
<td>Subjectively, the patient may sense and/or express less anxiety about the clinical procedure compared to pre-sedation periods. Objectively, the patient may appear more calm and less overtly responsive to clinical stimuli, and purposefully interactive with the clinician compared to pre-sedation periods.</td>
<td>Subjectively, the patient may sense and/or express less anxiety about the clinical procedure compared to pre-sedation periods. Objectively, the patient may appear less tense, cognizant of, but less overtly responsive to, clinical stimuli, and purposefully interactive with the clinician compared to pre-sedation periods. The patient, if</td>
<td>Subjectively, the patient may sense and/or express limited or no feelings of anxiety associated with the clinical procedure. Objectively, the patient may appear very relaxed, not cognizant of and minimally or non-responsive to clinical stimuli, and non-interactive with the clinician at any time. The patient would not be able independently to move his/her head</td>
<td>Unconscious and unresponsive to surgical stimuli.</td>
</tr>
</tbody>
</table>
Guideline on the elective use of sedation and general anesthesia

| Physiologic changes | Patient remains stable and within age-appropriate and health status norms for parameters involving hemodynamic, ventilation, and oxygenation functions. No loss of protective reflexes | Patient remains stable and within age-appropriate and health status norms for parameters involving hemodynamic, ventilation, and oxygenation functions. No loss of protective reflexes | Patient remains stable and either minimally or moderately below the patient’s age and health status norms for hemodynamic, ventilation, and oxygenation functions. Accompanied by partial or complete loss of protective reflexes | Partial or complete loss of protective reflexes including the airway; does not respond purposefully to verbal command or physical stimulus |
| Personnel needed | 2 | 2 | 3 | 3 |
| Monitoring equipment | Clinical observation unless patient becomes moderately sedated then appropriate monitoring needed | BPC, PO, PC or Capno | BPC, PO, PC/Capno, ECG | BPC, PO, PC/Capno, ECG, Temp |
| Monitoring Info and frequency | Skin color, respiratory effort. (Continual) | HR, RR, BP, SaO₂ (q15m)) | HR, RR, BP, SaO₂, ETCO₂, EC (q5m) | HR, RR, BP, SaO₂, ETCO₂, Temp, EC (q5m) |

Key to abbreviations:

BP: blood pressure

BPC: blood pressure cuff/sphygmomanometer

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Appendix II

Recommended discharge criteria

1. cardiovascular function satisfactory and stable;
2. airway patency uncompromised and satisfactory;
3. patient easily arousable and protective reflexes intact;
4. state of hydration adequate;
5. patient can talk, if applicable;
6. patient can sit unaided, if applicable;
7. patient can ambulate, if applicable, with minimal assistance;
8. for the child who is very young or disabled and incapable of the usually expected responses, the presedation level of responsiveness or the level as close as possible for that child should be achieved;
9. responsible individual is available.

Appendix III

American Society of Anesthesiologists Classification (modified)

Class I: A normally healthy patient with no organic, physiologic, biochemical or psychiatric disturbance or disease.
Class II: A patient with mild-to-moderate systemic disturbance or disease.
Class III: A patient with severe systemic disturbance or disease.
Class IV: A patient with severe and life-threatening systemic disease or disorder.
Class V: A moribund patient who is unlikely to survive without the planned procedure.
Class VI: A declared brain dead patient whose organs are being removed for donor purposes.

E: Emergency operation of any variety; used as a modifier.

Appendix IV

Appropriate emergency equipment should be available whenever sedative drugs, capable of causing cardiorespiratory and central nervous system depression, are administered. The items below should be used as a guide, which should be modified depending on the individual practice circumstances.

Emergency medications
1. oxygen;
2. ammonia spirits;
3. glucose (50%);
4. atropine;
5. diazepam;
6. epinephrine;
7. lidocaine (cardiac);
8. diphenhydramine hydrochloride;
9. hydrocortisone;
10. pharmacologic antagonists (as appropriate);
   11. naloxone hydrochloride;
   12. flumazenil.

Basic Airway management equipment
1. nasal and oral airways of different assorted pediatric and adult sizes;
2. portable oxygen delivery system capable of delivering bag and mask ventilation greater than 90% at 10 L/min flow for at least 60 minutes (eg, “E” cylinder);
3. self-inflating resuscitation breathing bag and reservoir with masks that will accommodate children and adults of all sizes.
4. Deep sedation and general anesthesia:
   assorted pediatric endotrachial tubes;
   laryngoscopes with straight and curved blades;
   Magill forceps.

Intravenous equipment (level 4 sedations) (deep sedation and general anesthesia)
1. gloves,
2. alcohol wipes,
3. tourniquets,
4. sterile gauze pads,
5. tape;
6. intravenous solutions and equipment for administration appropriate to the patient population being treated:
   a. intravenous catheters (22, 24 gauge)
   b. intravenous administration set (tubing) (microdrip 60 drops/ml)
   c. intravenous fluids
   d. assorted needles for drug aspiration and administration
   e. appropriately-sized syringes

References

13. AAPD, Clinical guideline on the use of anesthesia-trained personnel in the provision of general anesthesia/deep sedation to the pediatric dental patient, Pediatr Dent. 25(7):82-83.


