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Abstract

The American Dental Association and the American Academy of Pediatric Dentistry recommend establishment of a dental home by a child's first birthday. However, many children's first encounter with a dentist is when they are 3–4 years and older at a general practitioner's office, where their parents visit. During the child's first visit, it is important for the general dentist to build a positive first impression of the dental profession. In this chapter, we will discuss tooth development and eruption, behavioral guidance techniques including pharmacological consideration in pediatric patients, preventive and restorative, common pediatric dental emergencies, orthodontic considerations, clinical pearls, and when to refer to a pediatric specialist.

16.1 Tooth Development and Eruption

A very important task a general dentist faces when meeting a pediatric patient for the first time and during subsequent periodic visits is to evaluate the child's eruption pattern as well as identify any delayed, ectopic eruption or disrupted eruption sequence. The eruption charts are provided by American Dental Association to use as a general guideline. However, individual variances exist, and it is important for a general dentist to look for symmetry (Tables 16.1 and 16.2).

Table 16.1 Primary teeth eruption table

	Enamel completion	Eruption	Root completion	Exfoliation
Mandibular centrals	2.5 months	6 months	1.5 years	6–7 years
Mandibular laterals	3 months	7 months	1.5 years	7–8 years
Maxillary centrals	1.5 months	7.5 months	1.5 years	6–7 years
Maxillary laterals	2.5 months	9 months	2 years	7–8 years
Mandibular 1st molars	5.5 months	12 months	2.5 years	9–11 years
Maxillary 1st molars	6 months	14 months	2.5 years	9–11 years
Mandibular canines	9 months	16 months	3 ¼ years	9–12 years
Maxillary canines	9 months	18 months	3 ¼ years	10–12 years
Mandibular 2nd molars	10 months	20 months	3 years	10–12 years
Maxillary 2nd molars	11 months	24 months	3 years	10–12 years

Table 16.2 Permanent teeth eruption table (AAPD 2014a, b, c, d, e, f)

	Enamel completion	Eruption	Root completion
Mandibular 1st molars	2.5–3 years	6–7 years	9–10 years
Maxillary 1st molars	2.5–3 years	6–7 years	9–10 years
Mandibular centrals	4–5 years	6–7 years	9 years
Maxillary centrals	4–5 years	7–8 years	10 years
Mandibular laterals	4–5 years	7–8 years	10 years
Maxillary laterals	4–5 years	8–9 years	11 years
Mandibular canines	6–7 years	9–10 years	12–14 years
Maxillary 1st premolars	5–6 years	10–11 years	12–13 years
Mandibular 1st premolar	5–6 years	10–12 years	12–13 years
Maxillary 2nd premolars	6–7 years	10–12 years	12–14 years
Mandibular 2nd premolars	6–7 years	11–12 years	13–14 years
Maxillary canines	6–7 years	11–12 years	13–14 years
Mandibular 2nd premolars	7–8 years	11–13 years	14–15 years
Maxillary 2nd premolars	7–8 years	12–13 years	14–16 years
Mandibular 3d molars	–	17–21 years	–
Maxillary 3rd molars	–	17–21 years	–

Some general trends of eruption include: (AAPD 2014a)

- “Rule of 4’s” for primary teeth eruption: four teeth erupt every 4 months beginning with four teeth at age 7 months.
- The eruption of teeth usually occurs symmetrically in each arch.
- There may be ethnic and gender variations with respect to eruption times, e.g., African American children and girls may generally experience earlier eruption times.
- Variation of 6 months of either side of the usual eruption age may be considered normal for a given child.
- Mandibular teeth occur before the maxilla, except permanent premolars.

- Formation of all permanent teeth begins between birth and 2.5 years.
- Look for missing teeth, supernumerary teeth, submerged teeth (ankyloses), and malformed teeth. Inform parents and treatment plan for the future.
- Be aware that children with certain medical conditions such as Down's syndrome or cleft lip and palate may experience generalized delayed eruption of teeth.

16.2 Behavioral Management Consideration

16.2.1 First Meeting with the Dentist

For most general dentists, especially the recent graduate, the idea of treating children can create a certain level of stress and anxiety. Although most practitioners may have received some didactic training during their dental school experience with regards to principles of tooth eruption, space maintenance, and management of children, their clinical experience is limited. This often creates a feeling of intimidation when asked to provide dental care to the pediatric population. The best way for young practitioners to gain experience in working with children is to be open minded and being familiar with AAPD policies and guidelines. In addition, reaching out to local pediatric dental faculty could be an additional resource when faced with particularly challenging cases.

A general dentist has one chance to create a good first impression of dentistry to a child (Fig. 16.1). The success of this interaction usually determines the outcomes of subsequent dental visits. For example, children can sense if their dentist is uncomfortable and this may inadvertently create mistrust between the child and the dentist. Depending on the age and cognitive development of the child, this distrust can manifest in the form of a refusal to cooperate, crying, and an adverse behavioral pattern, even with the simplest procedures. The authors recommend that the new practitioner review the AAPD policy guidelines on behavioral modification techniques. This can be accessed on ISSN: http://www.aapd.org/media/policies_guidelines/g_behavguide.pdf (Accessed on March 30, 2016).

Be confident when you speak to kids and remember that you are the adult and authority figure at that appointment. It is important to understand that not all children are the same nor will they behave the same. Greet them in a friendly manner and assess what type of child is sitting in your dental chair. Also try to engage the parents early to enquire about their child's past dental experience. Some practitioners categorize children by the level of fear and their response to fear.

16.2.2 Types of Children (Casamassimo et al. 2013)

1. *The fearless child.* This is a happy and confident child. They are open to strangers and are willing to try anything once. These children typically have some dental exposure or good coaching/examples from parental figures. These children usually trust the dentist, and it is important to recognize and respect this trust so as not to break it.



Fig. 16.1 For younger children, the use of puppets is a helpful tool for many reasons (Photo courtesy of Dr. Khiem Truong)

2. *The cautious child.* This child may or may not have had any dental exposure. They are not quick to warm up to strangers. The cautious child will participate in treatment but may need some coaching from the parent. Tell-show-do works extremely well with these children. These children can be reasoned with and can easily be behaviorally managed.
3. *The fearful child.* These children may not seem afraid at first when talking to them and even act “macho” but may scream in terror at the sight of an exam mirror. They may have had a bad past dental experience or fearful parents who have reinforced bad behaviors in the chair. It is very important to educate the parent that their dental experience is not indicative of their child’s experience. When performing treatments, several behavioral techniques may need to be adopted. Chemical anxiolytics such as nitrous oxide gas or benzodiazepines may also need to be considered.
4. *The scared-out-of-their-mind child.* A completely terrified child. These children are very difficult or impossible to be reasoned with. They do not want to try anything new and do not trust anyone. These children may have had one or a few bad encounters with the dentist. Their parental figures may be also terrified of the dentist and impose this fear on the child. It is recommended to refer these children to pediatric dentist for sedation or more advanced behavioral modification modalities.

Table 16.3 Substituting dental terms for “kids’ language”

Dental terms	Kid’s terms	Dental terms	Kid’s terms	Dental terms	Kid’s terms
Cotton roll	Tooth pillow	Handpiece	Water whistle	Rubber dam	Tooth raincoat
Rubber dam clamp	Tooth ring	Saliva ejector	Mr. Thirsty	Local anesthetic	Sleepy juice
Explorer	Tooth counter	Etch	Blue shampoo	Sealant	Tooth face painting
Caries	Sugar bugs	X-rays	Tooth picture	Cleaning/prophy	Tickling teeth
Fluoride	Tooth vitamins	Fillings	White play-doh	Silver crowns	Tooth jewelry
Extraction	Wiggle a tooth	Extraction forceps	Mr. Wiggle	Nitrous oxide	Ice cream air
Bite blocks	Tooth chair	Dentist’s loupes	Binoculars	Impression	Tooth print with play-doh

16.2.3 Kids’ Language

When speaking with children about impending dental treatment, a general dentist should be careful to use language that creates a positive mind-set. The dentist must gauge the child’s cognition and use “kids-friendly” words to convey their “dental” message in order to build and maintain trust. Depending on the age of the child, using words like needle, shot, drill, pull, or yank teeth or any other word that suggest unpleasantness and invoke fear must be avoided. Here are some suggestions (Table 16.3).

16.2.4 Tell-Show-Do

This behavior-shaping tool is well accepted and very popular with children and adult patients (Fig. 16.2).

Tell – The dentist informs the child in age-appropriate terms what is going to happen.

Show – This is then followed by demonstrating to the child, in a nonthreatening way either on themselves, the parent, or the child.

Do – Then without deviating from the demonstration, continue with the procedure that is to be performed.

16.2.5 Desensitization

This is considered an expansion of the Tell-Show-Do technique. Here stimuli with the least anxiety are presented first. Higher anxiety evokers are presented as the

Fig. 16.2 The dentist demonstrating the prophylaxis cup on the child's finger before using it to clean his teeth

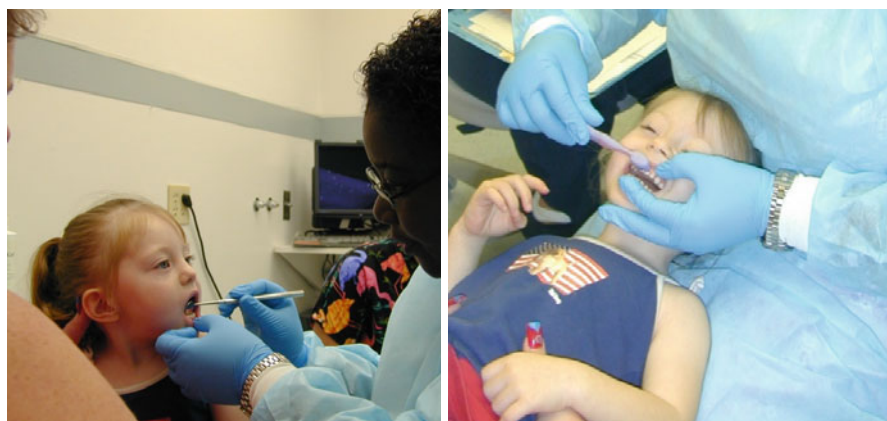


Fig. 16.3 The dentist begins by using the mirror while the young child sits on her mother's lap before proceeding to do a toothbrush cleaning using a lap exam

child is able to tolerate them, e.g., using a prophylaxis cup before using a high speed handpiece (Fig. 16.3).

16.2.6 Positive Reinforcement

This is a technique used to reward desirable positive behavior by praising the child or providing a reward and this further strengthens the recurrence of such behavior in future. Many dental offices have small prizes to give to pediatric patients at the end of the visit such as stickers and simple toys. Other social reinforcers include positive voice modulation, e.g., being “goofy,” facial expression, verbal praise, and appropriate physical demonstrations of affection by all members of the dental team.

16.2.7 Distraction

This is a technique of diverting the patient's attention from what may be perceived as an unpleasant procedure or sensation by focusing their thoughts on something other than what is being done. Examples include asking patient to wiggle his or her toes during impression taking; giggle the cheeks during local anesthetic injection; and giving patient storytelling, animated voices, or even a short break during a stressful procedure.

16.2.8 Modeling

This technique is very effective in families that have two or more children. A younger, inexperienced, or apprehensive child learns to stay calm and how to act properly by watching an older sibling or someone they look up to (Fig. 16.4),

16.2.9 Voice Control

Here, the dentist uses a controlled alteration of voice volume, tone, or pace to influence and direct the child's behavior. It may be uncomfortable for new dentists since it is not learned in dental school. It takes time and experience to develop; the facial



Fig. 16.4 While the older sibling receives treatment, her younger brother holds her hand and watches on. This process usually reassures the younger sibling that there is nothing to fear

expression is as important as voice, and it is important to explain this technique to parents beforehand to prevent misunderstanding the dentist or assistants for being “mean” to their child.

16.2.10 Parental Presence or Absence

There must be a discussion and agreement between the dentist and parent before the child sits in the chair. Parents of children >3 years that come into the operatory must be prepared to leave if/when child shows undesirable behavior. Generally children under 36–40 months do better with parents present. The behavior and attitude of a parent can be directly related to a good or a bad dental visit for their child. Children can sense their parents’ fear and parents can unintentionally transfer fear to their child by their body language or nonverbal cues. It cannot be perceived by either the parent or child as punitive. Sometimes, a dentist can use parents as leverage to obtain appropriate behavior response. First, explain the procedure to the parents separately. During the procedure, if the child shows negative or undesirable behavior, the parents are asked to leave the operatory immediately. Once the child’s behavior improves, the parents can return to the room.

16.3 Pharmacologic Considerations

Please always refer to a dental drug reference guide for the proper dosage to give your pediatric patients. There are numerous sources online that offer up-to-date dosages and precautions. One example is <http://www.epocrates.com/marketing/products/rx/index.html>.

16.3.1 Fluoride

Using fluoride for the prevention and control of dental caries is proven to be both safe and effective when dosed appropriately (AAPD 2014b). The frequency of fluoride exposure from various sources should be identified when formulating a dental plan for the patient. Fluoride sources could include water, dietary supplements, mouth rinses, and toothpaste. Prior to prescribing supplemental fluoride to any child, initial testing of the drinking water should be performed. A caries risk assessment is also essential in order for proper parental counseling to reduce the child’s caries risk (See Chap. 3 Caries Prevention) (Table 16.4, Fig. 16.5).

16.3.1.1 Topical Fluoride

Topical fluoride application is available via professionally applied topical fluoride treatment, over-the-counter rinses for home use, prescription rinses and gels for home use, and fluoride-containing toothpastes. Over-the-counter fluoride mouth rinses are not recommended for preschool-aged children. Toothpaste

Table 16.4 Dietary fluoride supplementation schedule (AAPD 2014a, b, c, d, e, f)

Age	Concentration of fluoride		
	<0.3 ppm F	0.3–0.6 ppm F	>0.6 ppm F
Birth–6 months	0	0	0
6 months–3 year	0.25 mg	0	0
3–6 year	0.50 mg	0.25 mg	0
6–16 year	1.00 mg	0.50 mg	0

**Fig. 16.5** Commercially available fluoride comes in various “child-friendly” packages

usage should be always supervised by parents in young children. American Academy of Pediatric Dentistry recommends for children under 3 years old a smear or rice-size amount of fluoridated toothpaste twice a day. A small amount of toothpaste equal to the size of a pea should be wiped onto the toothbrush by the caretaker for children between ages 3–6 years old twice a day. Caution should be taken by the parents and prescribing dentists to not create fluoride overdose during critical periods of enamel formation and fluorosis (AAPD 2014a, b, c, d, e, f).

16.3.2 Local Analgesics

Dosage of local anesthetic in pediatric patients should be measure by the child's body weight. Children do not have fully developed livers which slow down

Table 16.5 Local anesthetic efficacious dosage for pediatrics (AAPD 2015b)

Anesthetic	Maximum dosage		Maximum total dosage (mg)	Mg/ cartridge (mg)	Duration of action in minutes	
	Mg/kg	Mg/lb			Pulp	Soft tissue
Lidocaine 2% 1:100,000 epi	4.4	2.0	300	36	60	180–240
Mepivacaine 3% plain	4.4	2.0	300	54	5–10	90–120
Articaine 4% 1:100,000 epi	7.0	3.2	500	68	60–75	180–300
Prilocaine 4% plain	8.0	3.6	600	72	10–15 (infiltration) 60–120 (block)	40–60 (infiltration) 120–240 (block)

Bupivacaine is not recommended in pediatric patients due prolonged numbness and postoperative Trauma (AAPD 2015a, b)

metabolism of certain anesthetics. Use caution in the amount of anesthetic you give and never exceed the maximum total dosage based on the child's weight (Table 16.5).

To calculate the maximum amount of lidocaine 2% with 1:100,000 epinephrine and the number of cartridges that can be safely administered to a 30-lb patient, perform the calculations below (AAPD 2015a, b):

$$\text{Maximum dosage (mg/lbs)} \times \text{patients weight (lbs)} = \text{Maximum total dosage (mg)}$$

$$2.0 \times 30 = 60 \text{ mgs}$$

$$\text{Maximum total dosage (mg)} \div \text{mg/cartridge} = \text{Maximum \# cartridges}$$

$$60 \div 36 = 1.67 \text{ cartridges}$$

Clinical tips in administering local anesthesia (LA):

- Consider having an assistant place his/hers arms lightly across the child's chest or hold their hands during the injection to protect the child from reaching up and grabbing the syringe.
- Use a bite block or a mouth prop during LA administration to prevent the child from suddenly closing their mouth; this is sometimes a reflex reaction to the LA "stab."
- Use distraction techniques, like wiggling the cheek or lip when giving local anesthesia.
- For upper infiltration, insert a 30-gauge needle 1 mm or less into the tissue and very slowly infiltrate a quarter of a carpule. Wait a couple seconds and then proceed with normal injection protocol to give the rest of the carpule.
- After buccal anesthesia is achieved, you may give buccal intrapapillary injection numbing the palatal through the buccal. This is due to the porous nature of the maxilla. Then give normal palatal injection. This procedure may take longer but is a good way to reduce discomfort and introduce kids to dental procedures.

Fig. 16.6 Local anesthesia should not be a problem in older well-behaved children



- Remember that pain is how you feel and a child in pain is an uncooperative child so it is important to try and achieve profound anesthesia as much as possible. Always test your LA *subjectively* by asking child if the area feels “heavy, weird, different, or swollen” compared to the contralateral side. Remember most children may not know what numb means especially if this is their first LA experience. You can also test LA *objectively* by using an explorer to gently touch the mucosa around the tooth and watch for signs of pain such as “wincing, raised, or hunched shoulders, withdrawal from injection site”. You can also ask the child to raise their hand, as a stop sign if they feel a sharp pain (Fig. 16.6).

16.3.3 Postoperative Pain Control in Pediatric Patients

Pain management in children requires careful consideration. Anxiety also reduces the pain threshold so the dentist must take care to perform a behavioral evaluation ahead of time so as to plan for pain as well as anxiety management. If at all possible, it should be done by planning preoperative strategies to control and minimize physical and mental trauma to the child. A careful review of a patient’s medical history is necessary to identify allergies and contraindications to prescribed analgesics (Table 16.6).

16.3.4 Common Antibiotics for Odontogenic Infection in Children

Following careful examination of the patient and determination that the infection is bacterial in nature, consideration of antibiotic prescription can be considered. A careful review of the medical history is also necessary to avoid contraindications.

Table 16.6 Dosage for pediatric pain management (Mosby 2014)

Medication	Recommended dosage (oral)	Benefits	Disadvantage/ contraindication	Dispensed
Acetaminophen	Under 44 kg: 10–15 mg/kg every 4–6 h max = 2.6 g/day Over 44 kg: 325 mg–650 mg/ dose every 4–6 h max = 4 g/day	Antipyretic agent Safe record of use	No anti- inflammatory action Mild pain relief Caution on patient with liver disorders	Drops: 80 mg/0.8 ml Suspension: 160 mg/5 ml Chewable tabs: 80 mg/tabs Tablets: 325 mg, 500 mg
Ibuprofen	4–10 mg/kg every 6–8 h 40 mg/kg/day	Antipyretic anti- inflammatory properties relieves moderate to severe pain	Gastric irritant Impair clotting May be contraindicated in some asthmatic children	Suspension: 40 mg/1 ml (oral drops) 100 mg/5 ml (oral) Chewable: 50 mg and 100 mg tabs Tablets: 200 mg, 400 mg, 600 mg, 800 mg
Aspirin	Oral, rectal: 10–15 mg/kg/ dose every 4–6 h up to a total of 80–100 mg/kg/ day	Antipyretic anti- inflammatory properties	Gastric irritant Impair clotting Reye's syndrome – especially in children who take aspirin when experiencing fever or other symptoms of viral illness Allergies in children (last choice for children)	Chewable tabs: 81 mg Caplets, tablets: 325 mg, 500 mg Suppository, rectal: 300 mg, 600 mg
Acetaminophen w/codeine	Under 44 kg: Codeine: 0.5–1 mg/kg every 4–6 h Over 44 kg: Codeine: 30–60 mg/dose every 4–6 h. See acetaminophen table for consideration	Codeine acts at central site of pain Acetaminophen at peripheral site for enhanced analgesia	Acute dosing (3 days or less). Codeine can cause nausea, sedation, constipation, and dependency. Use acetaminophen with caution in patients with liver disorders	Suspension: acetaminophen 120 mg and codeine phosphate 12 mg per 5 ml Tablets: #3: Acetaminophen 300 mg and codeine phosphate 30 mg #4: Acetaminophen 300 mg and codeine phosphate 60 mg

Table 16.7 Antibiotic dosage (AAPD 2014a, b, c, d, e, f; Wynn et al. 2015)

Antibiotics	Dosage		Contraindication	Warnings/ precautions
	Children	Adults		
Penicillin VK	≤12 years: 25–50 mg/kg q6–8h for at least 7 days; max dose 3 g/day	>12 years: 500 mg q6h for at least 7 days	0.7–10% allergy rate Around 85% of allergic reaction is delayed and take greater than 2 days to develop	Severe renal impairment (modify dosage), history of seizure, hypersensitivity to cephalosporins
Clindamycin	<12 years: 10–25 mg/kg/ day for 10 days >12 years: 600–1800 mg/ day for 10 days; Max dose 2–3 g/day	150–450 mg q6h for at least 7 days; max dose 1.8 g/day	Hypersensitivity to clindamycin; previous pseudomembranous colitis, regional enteritis, ulcerative colitis	Liver dysfunction (modify dosage); discontinue drug if significant diarrhea, cramps, or blood and mucus passage occurs
Cephalexin (Keflex)	25–50 mg/kg/ day q6h; Severe infection: 50–100 mg/kg/ day q6h; max dose 3 g/ day	250–1000 mg q6h; max dose 4 g/day	Allergy to the cephalosporin group of antibiotics	Inflammation of the large intestine, kidney disease, colitis
Amoxicillin	<40 kg: 20–40 mg/kg/ day q8h; >40 kg: 250–500 mg q8h or 875 mg q12h for at least 7 days; max dose 2 g/day	>40 kg: 250–500 mg q8h or 875 mg q12h for at least 7 days; max dose 2 g/day	Hypersensitivity to amoxicillin, penicillin	Severe renal impairment (modify dosage); low incidence of cross-allergy with other beta-lactams and cephalosporins exists

The most common side effects of antibiotics include mild diarrhea, abdominal pain, nausea, and vomiting. In teenage patients, precautions should be given to patients that antibiotics can affect effectiveness of oral contraceptives (Table 16.7).

16.3.5 Nitrous Oxide (Laughing Gas)

A general dentist needs to be certified by an institution after receiving proper education and clinical training hours prior to administering nitrous oxide in his or her own practice (Fig. 16.7).

Characteristics of nitrous oxide:

1. Reduces or eliminates anxiety, promotes analgesia, and potentiates the effects of sedatives
2. Reduces the gag reflex but not the cough reflex
3. Minimal or nonexistent toxicity when used on healthy patients properly

Fig. 16.7 Nitrous oxide patients should be attended to by the provider and an assistant to monitor the patient through the whole procedure



4. Highly insoluble in blood and water; therefore quick absorption and elimination
5. Mostly (99%) eliminated from the body through the lungs without significant biotransformation, which makes it have minimal effect on other organ systems
6. Not metabolized through the liver
7. Reduces untoward movement and reaction to dental treatment
8. Enhances communication and patient cooperation. More effective when used in conjunction with hypnotic suggestions and other simple behavioral modification techniques
9. Raises the patient's pain reaction threshold
10. Increases tolerance for longer appointments

Nitrous oxide is not indicated for every pediatric patient. The key to a successful dental appointment with the help of nitrous oxide lies in dentist's patient selection. Here are the types of patients who could benefit from nitrous oxide:

1. The fearful and anxious, yet cooperative patients
2. Patients with a strong gag reflex
3. Patient who is fearful of specific procedures, such as the "shot" or the drill
4. A cooperative child undergoing a lengthy dental procedure

Nitrous oxide will not help in treatment with these types of children by a general dentist without other sedative measures:

1. Chronologically immature child
2. The cognitively impaired child

The success and effectiveness of nitrous oxide is largely dependent on psychological reassurance. This can only be accomplished if the patient has the ability to understand verbal communication.

3. Defiant child

This is the child that behaves poorly for dental treatment, not because of excessive fear or anxiety or a physical or mental disability, but because he or she just doesn't want to. A general dentist should attempt behavior modification techniques or refer the child to a pediatric specialist.

16.3.5.1 Contraindications

- *Absolute*: Pregnancy (may cause spontaneous abortion in chronic exposure especially in the first trimester of pregnancy), otitis media, congenital pulmonary blebs, sinus blockage, bowel obstruction, nasal obstruction, cystic fibrosis, and COPD.
- *Relative*: URI, extreme phobias, hysterical behavior to dentistry, and patients with a previous bad experience with nitrous oxide and children who have no respect for authority, do not follow instructions, or are naturally defiant must be assessed with caution.
- *Note*: Nitrous oxide is not contraindicated in patients with asthma. It is nonirritating to the mucous membranes, and since anxiety can trigger an asthmatic episode, nitrous oxide usage can reduce the possibility of an attack in the dental chair.

16.3.5.2 Nitrous Oxide Dosage (AAPD 2013)

- Low = 33 % N₂O (children) – 2 L/min N₂O to 4 L/min O₂.
- Medium = 50 % N₂O (most adults, max children) – 3 L/min N₂O to 3 L/min O₂.
- High = 62.5 % N₂O (some adults) – 5 L/min N₂O to 3 L/min O₂.
- Maximum = 70 % – 7 L/min N₂O to 3 L/min O₂.
- Oxygen must always keep flowing at the rate of at least 3 L/min.

16.3.5.3 Delivery Protocol (AAPD 2013)

1. Give verbal instruction to the patient. Describe to child floating sensation (will be flying like Superman or Batman) and they may feel warm and tingly (ants are climbing on them).
2. Place monitors: pulse oximeter and BP cuff if available.
3. Turn on 5 L/min oxygen (100 %) before placing the mask on the patient.
4. Place mask on patient – ensure snug fit (no breeze in eyes).
5. Adjust scavenging system valve to green zone.
6. Two delivery methods:
 - (a) The standard titration process begins by decreasing the oxygen flow and increasing the nitrous oxide flow to obtain a concentration of 20 % nitrous oxide and 80 % oxygen. Then slowly increasing N₂O and decreasing O₂ until desired level is reached.
 - (b) Rapid titration (useful for nervous patients) administration is initiated with a 50 % oxygen/50 % nitrous oxide concentration prior to seating of the nasal hood.

7. When finishing procedure, turn off the nitrous and leave the patient on 100 % oxygen for 5 min.
8. The dentist must remember to document the amount and rate of nitrous oxide administered during the procedure along with the 100 % at the end of treatment.

16.3.5.4 Clinical Tips (Rappaport et al. 2011)

1. Nitrous too low: no effect.
2. Nitrous too high: oppression, unpleasant, nausea, sleepiness, sweating.
3. Quick onset in 2–3 min.
4. Total flow = 5–6 L/min = respiratory minute ventilation = tidal volume x respiratory rate = 500 mL x 12.
5. Fluctuating amounts during treatment may result in nausea and vomiting.

16.4 Treatment Considerations

16.4.1 Medical History: The Exam and Caries Risk Assessment

Before performing a clinical exam, a dentist should discuss past and present medical history with the parents and the children. Review any medical conditions and medications the child may be taking. If the medical history is too complicated for your practice, consult with the patient's pediatrician or refer to a pediatric dentist. The general must know their limitations with respect to treating or managing medically compromised children in their office.

The actual exam is a great way for the dentist to access a child's behavior and level of anxiety as well as gauge whether a child can be treated successfully with simple behavioral management techniques or requires sedation. A child's caries risk assessment should be completed in order to determine the customized plan for the patient's needs. There are many forms online that can be utilized such as those on the American Dental Association site: http://www.ada.org/~media/ADA/Member%20Center/Files/topics_caries_under6.ashx.

16.4.2 Sealants

Sealants play a very important role in preventive dentistry and have proven to reduce the occurrence of pit and fissure caries. Prior to treatment planning for sealants, a general dentist needs to perform a thorough caries risk assessment. Sealants should be placed based upon the patient's caries risk, and not the age or time elapsed since tooth eruption (AAPD 2014a, b, c, d, e, f).

Once treatment is planned, the key to clinical success is isolation. Rubber dam placement is highly recommended. The current sealant material of choice is resin based. Sealant placement method should include cleaning of the pits and fissures with pumice and without removal of any appreciable enamel. In some circumstances, preventive resin restoration (PRR) is indicated, where the dentist

cleans out the pits and grooves with a small bur. The dentist needs to monitor existing sealants for incipient lesion progression and sealant retention.

Important Tip When sealing mandibular permanent molar, it is important to seal the occlusal as well as buccal surfaces, whereas for the maxillary molars, the lingual surface must be sealed in addition to the occlusal surface.

16.4.3 Restorations Consideration in Primary Teeth (Casamassimo et al. 2013)

In primary teeth, considerations of the anatomical characteristics should be taken to ensure the success of restorations.

1. Mesiodistal dimension of a primary molar crown is greater than the cervico-occlusal dimension.
2. Buccal and lingual surfaces converge toward the occlusal.
3. Enamel and dentin are thinner.
4. The pulp chambers of primary teeth are proportionally larger and closer to the surface.
5. Primary teeth contacts are broader and flatter.
6. Shorter clinical crown height.

16.4.3.1 Composite Restorations

Composite is recommended for primary teeth in pit-and-fissure caries, class II lesions that the preparations do not extend beyond the proximal line angles, and class III, IV, and V lesions. Avoid using composite as the material of choice when:

1. Isolation is a problem.
2. Carious lesions involve multiple surfaces.
3. High-risk patients present with extensive rampant decay or with poor oral hygiene.

16.4.3.2 Amalgam Restorations

Amalgam is recommended for primary teeth in class I lesions, class II lesions where the preparation does not extend beyond the proximal line angles, and class V lesions.

In primary molars, 3-surfaced amalgam restorations can be placed, although full coverage with a stainless steel crown may be a better treatment option.

16.4.4 Pulp Therapies (Table 16.8)

Generally, stainless steel crowns (SSCs) are recommended for primary teeth having received pulp therapy. However, in a tooth with conservative pulpal access, intact walls, and less than 2 years to exfoliation, amalgam or resin restorations can also be considered.

Table 16.8 A summary of pulp therapy in primary teeth (AAPD 2014a, b, c, d, e, f)

Pulp therapy	Indication	Pulpal diagnosis	Radiographic diagnosis	Technique	Prognosis
Indirect pulp cap	When the deepest carious dentin is not removed to avoid a pulp exposure	Normal pulp or reversible pulpitis	No radiographic evidence of external or internal root resorption	A liner such as a resin-modified glass ionomer, calcium hydroxide, zinc oxide/eugenol, or glass ionomer cement is placed over the remaining carious dentin to stimulate healing and repair	As long as the tooth remains sealed from bacterial contamination, the prognosis is good for caries to arrest and reparative dentin to form. Normal exfoliation time of the primary tooth
Direct pulp cap	Pinpoint mechanical (noncarious) exposure of the pulp during cavity preparation or traumatic injury	Normal pulp	No radiographic evidence of external or internal root resorption	A biocompatible base such as TMA or calcium hydroxide may be placed in contact with the exposed pulp tissue	No posttreatment signs or symptoms such as sensitivity, pain, or swelling should be evident. Pulp healing and reparative dentin formation should result. No harm to the succedaneous tooth
Pulpotomy	Pulp exposure in primary tooth during caries removal	Normal pulp or reversible pulpitis	No evidence of radicular pathology. No radiographic evidence of external or internal root resorption	Coronal pulpal tissue is amputated, and the remaining radicular tissue is judged to be vital without suppuration, purulence, necrosis, or excessive hemorrhage that cannot be controlled by a damp cotton pellet after several minutes	Radicular pulp remains asymptomatic without clinical signs and symptoms such as sensitivity, pain, or swelling. No external root resorption. Internal root resorption may be self-limiting and stable
Pulpectomy	Primary tooth exhibits clinical signs of irreversible pulpitis or necrosis	Irreversible pulpitis or necrotic pulp	May or may not have radicular pathology	Root canals are debrided and shaped with files. Irrigate with 1% NaOCl and/or chlorhexidine. After the canals are dried, a resorbable materials such as zinc oxide eugenol, and iodoform-based paste are used to fill the canals	Clinical signs and symptoms should resolve within a few weeks. Radiographic evidence should resolve in 6 months. Normal resorption of the primary tooth root and filling material. Normal eruption of the succedaneous tooth
Root canal treatment	Permanent teeth	Irreversible pulpitis or necrotic pulp	May or may not have radicular pathology	Follow the normal RCT protocol. Note that in young permanent teeth when apex is fully formed and apexification needs to be initiated prior to root canal filling	

16.4.5 Stainless Steel Crowns (SSCs)

Most of the general dentists' offices do not routinely use stainless steel crowns. If your office is located in a relatively remote or rural area, or the nearest pediatric dentist is far away, you should consider stocking up stainless steel crowns in the office. It is the standard of care with many indications for use in pediatric patients. If a general dentist cannot provide stainless steel crowns, the patient should be referred to a pediatric specialist.

16.4.5.1 Indications for SSC (Casamassimo et al. 2013):

1. Following a pulpotomy or pulpectomy
2. Teeth with developmental defects such as molar incisor hypomineralization (MIH), dentinogenesis, or amelogenesis imperfecta
3. Extensive carious lesions, with multiple surfaces where an amalgam restoration is likely to fail.
4. Fractured teeth
5. Extensive tooth surface loss due to attrition, abrasion, or erosion
6. Children with high caries risk and rampant decay
7. Primary molars in children under 4 years old

16.5 Pediatric Emergencies

The most common pediatric dental emergencies involve:

- Odontogenic infections (OIs)
- Facial cellulitis from odontogenic infections
- Dental and facial trauma to the primary or permanent teeth
- Loose teeth
- Bleeding or pain following extractions

A general dentist should strive to provide emergency treatment as needed, stabilize the condition, and refer to related specialists as soon as possible.

16.5.1 Assess the Emergency

For emergency patients, a quick yet thorough soft and hard tissue exam followed by an extraoral and intraoral exam. Take periapical radiographs to evaluate dental damage, such as fracture of the crown or root. Take a panoramic radiograph to rule out possible alveolar, condylar, and jaw fractures. Look for subjects that may be dislodged inside the soft tissue of the lip or cheeks, such as pieces of a tooth, orthodontic brackets and wire, and foreign objects (Tables 16.9 and 16.10).

Table 16.9 Types of injuries to teeth (Diangelis et al 2012)

Type of injury	Signs and symptoms	Treatment	Prognosis/ follow-up
<i>Concussion</i> – injury to tooth supporting structures with no mobility or displacement but tender to palpation/percussion no gingival bleeding	No mobility or displacement but tender to palpation/percussion	None. Observe and follow-up	1-year follow-up on pulpal condition
<i>Subluxation</i> – an injury to the tooth supporting structures without displacement of the tooth	Gingival bleeding Tender to percussion Increased mobility (±) Pulp sensitivity	No treatment is often needed The child may want to eat soft food for 2 weeks Flexible splint may be used if child has discomfort	Long-term prognosis is generally good Monitor 2 weeks, 4 weeks, 6–8 weeks, and 1 year Use clinical and radiographic control
<i>Lateral luxation</i> – a displacement injury to the tooth in any direction other than axially. Fracture of the buccal and palatal alveolar plate may be present	Tooth is often displaced palatally or buccally Rigid nonmobile Metallic sound upon percussion Radiographs show a widened PDL	(Primary teeth) No occlusal interference: observe allowing for spontaneous repositioning If occlusal interference: use local anesthesia and reposition with combined labial/palatal pressure Severe displacement: extract (permanent teeth) Give anesthesia Clean exposed root with saline Reposition tooth with digitation Stabilize tooth with flexible splint for 4 weeks	(Primary teeth) monitor (Permanent teeth) Tooth may revascularize or go through pulpal necrosis Monitor 2 weeks, 4 weeks, 6–8 weeks, and 1 year If necrosis then RCT
<i>Intrusion</i> – a displacement injury of the tooth into the alveolar bone. There can be a comminution or fracture of the alveolar socket	Tooth is often intruded in the alveolar socket Tooth is immobile PDL may be absent from radiograph The CEJ of intruded tooth is more apical than adjacent teeth	Spontaneous eruption (primary teeth) apex displaced toward or through labial bone plate: observe for spontaneous repositioning (2–4 months) If apex displaced into developing tooth germ, extract (permanent teeth) Orthodontic repositioning Surgical repositioning RCT 3–4 weeks posttrauma permanent teeth	High incidence for (primary teeth) Monitor 2 weeks, 4 weeks, 6–8 weeks, and 1 year (Permanent teeth) ankylosis and pulpal necrosis in permanent teeth Monitor 2 weeks, 4 weeks, 6–8 weeks, and 1 year

(continued)

Table 16.9 (continued)

Type of injury	Signs and symptoms	Treatment	Prognosis/ follow-up
<i>Avulsion (primary teeth)</i> – tooth is completely displaced out of socket	Tooth is missing from the socket X-ray to confirm tooth was not intruded	(Primary teeth) During examination make sure that all avulsed teeth are accounted for. For unaccounted teeth take X-rays of site in order to ensure no primary teeth were intruded or root fracture with loss of the coronal fragment. If the avulsed tooth has not been found, refer the child to the pediatrician to exclude aspiration	(Primary teeth) It is not recommended to reimplant primary teeth. (Permanent teeth) See avulsion chart below for permanent teeth

16.6 Pediatric Pearls

- *Do not plan for more procedures in one visit than you or the child can handle.* With deep sedation, a pediatric dentist may be able to do eight stainless steel crowns and pulpotomies in one visit. With only behavioral management or nitrous sedation, a general dentist may be able to do only one or two fillings in one setting. Keep in mind of children’s low pain tolerance and short attention span.
- Always warn children not to bite the “numb” cheek or lips post anesthetics.
- Teach parents to start flossing their children’s teeth around age 3–4, when contacts start to develop between the primary teeth.
- Bruxing is common and perfectly normal in the primary dentition.

16.7 Miscellaneous Pediatric/Orthodontic Considerations

The American Association of Orthodontists recommends that every child should first visit an orthodontist no later than age 7. Although comprehensive orthodontic treatment does not start at age 7, interceptive treatment may be appropriate in children with specific problems, such as anterior crossbite, posterior crossbite, open bite, ectopic eruption, complete skeletal Class III, and oral habits.

A general dentist is often the first dental professional to see a patient and first to recognize that the patient may have an orthodontic problem. It is important to refer to the orthodontist in a timely manner, so the most appropriate treatment can be produced at the most appropriate time. From age 6 and older, there are a few different types of treatment approaches an orthodontist can provide: space maintainers, orthodontic appliances, guiding general dentists for serial extractions, and phase I or full orthodontic treatment.

Table 16.10 Management of avulsed permanent teeth (Andreasen et al. 2012; Lambert 2015)

Avulsed permanent teeth	Condition	Treatment recommendation
Closed apex	Extra oral dry Time <60 mins	<ol style="list-style-type: none"> 1. Clean the area with saline or chlorhexidine. Make sure no alveolar wall fracture 2. Verify normal position of avulsed tooth both clinically and radiographically 3. Replant and place a flexible splint for up to 2 weeks. Use systemic antibiotics doxycycline, penVk, or amoxicillin. RCT 2 weeks after
	Extraoral dry Time >60 mins	<ol style="list-style-type: none"> 1. Clean the area with saline, or chlorhexidine. Make sure no alveolar wall fracture 2. Clean necrotic PDL off with gauze. Soak tooth in 2% sodium fluoride 3. Verify normal position of avulsed tooth both clinically and radiographically 4. Replant and place a flexible splint for up to 4 weeks. Use systemic antibiotics doxycycline, penVk, or amoxicillin. RCT 7–10 days after or RCT in hand before reimplantation. Expect ankylosis
Open Apex	Extra oral dry Time <60 mins	<ol style="list-style-type: none"> 1. Make sure no alveolar wall fracture exists. Soak tooth in doxycycline for 5 min. Rinse debris with saline 2. Verify normal position of avulsed tooth both clinically and radiographically 3. Replant and place a flexible splint for up to 2 weeks. Use systemic antibiotics doxycycline, penVk, or amoxicillin. RCT need only if no signs of revascularization
	Extra oral dry Time >60 mins	<ol style="list-style-type: none"> 1. Make sure no alveolar wall fracture. Irrigate tooth with saline. Clean necrotic tissue off with gauze 2. Verify normal position of avulsed tooth both clinically and radiographically 3. Replant and place a flexible splint for up to 2 weeks. Use systemic antibiotics doxycycline, penVk, or amoxicillin. RCT 1 week later consider no reimplantation due to poor prognosis of revascularization. Expect ankylosis

16.7.1 Common Space Maintainers

Space maintainers are known by many parents as “spacers.” They are generally indicated in early loss of primary teeth, prior to $\frac{1}{2}$ – $\frac{2}{3}$ of root formation of the succedaneous teeth. In some children, space maintainers need to stay for 2 years or more. Therefore, it is important for the general dentist to perform periodic checkups on the health of the banded teeth and oral hygiene (Tables 16.11 and 16.12).

16.7.2 Common Orthodontic Appliances

Many orthodontic appliances can be used with or without braces to facilitate habit cessation, correct functional shift, and deliver minor orthodontic correction.

Table 16.11 Space maintainers and their indications

Types	Indication
Lingual holding arch	Early loss of primary mandibular molars bilaterally
Nance	Early loss of primary maxillary molars bilaterally
Band-and-loop	Early loss of a single tooth such as 2nd primary molar, after eruption of the 1st permanent molar
Distal shoe	Early loss of the most distal primary molar, such as 2nd primary molar, prior to eruption of the 1st permanent molar

Table 16.12 Correctional orthodontic appliances (Proffit et al. 2012; AAPD 2014a, b, c, d, e, f)

Types	Indication	Duration	Follow-up observation
Thumb crib	Thumb or finger sucking habit	6 months	Anterior open bite closes slightly without any fixed orthodontic treatment. Depends on the malocclusion, the orthodontist will decide the following treatment
Tongue crib	Tongue thrusting habit	6 months	Anterior open bite closes slightly without any fixed orthodontic treatment. Depends on the malocclusion, the orthodontist will decide the following treatment
Bluegrass tongue trainer	Tongue thrusting habit	6 months	Anterior open bite closes slightly without any fixed orthodontic treatment. Depends on the malocclusion, the orthodontist will decide the following treatment
Palatal expander	Unilateral or bilateral posterior functional or skeletal crossbite	Leave in the mouth for 4–6 months post expansion at orthodontist's discretion	Multiple types of expander can be used by an orthodontist such as Quad-helix and Hyrax. Expander can be used with or without fixed appliances (braces)
Spring aligners	Singer tooth anterior crossbite	Patient needs to be seen by orthodontist monthly for adjustment on the aligner	Spring aligners are very effective in tipping a maxillary anterior tooth out of crossbite, when space is available. It is often recommended in young children who are not ready for phase I orthodontic treatment. Patient compliance is required

16.7.3 Extraction Under Orthodontic Guidance

After a child has seen an orthodontist for a consultation, sometimes the orthodontist will refer the patient back to the general dentist for extraction of primary or permanent teeth. Early extraction of primary teeth can lead to arch length deficiency, mid-line shifting, and impaction of permanent teeth. Extraction of carious permanent

teeth can lead to shifting of the rest of the permanent teeth and not enough space available for future tooth replacement.

Serial extraction is a planned extraction of specific primary teeth and permanent teeth in a timely manner due to foreseen crowding. If done at the right time, serial extraction can facilitate eruption, prevent canine impaction, and reduce the complexity of future orthodontic treatment (Proffit et al. 2012).

16.7.4 Phase I Orthodontic Treatment

Phase I orthodontic treatment is also limited treatment, designed with specific goals to correct early skeletal discrepancies and functional occlusion shift and provide early esthetic corrections. Most children who received phase I orthodontic treatment eventually end up choosing to go through phase II treatment for esthetic concerns.

16.7.5 Full Orthodontic Treatment (Proffit et al. 2012)

The average time for a simple full orthodontic treatment is between 18 and 24 months. During this time, it is important for the general dentist and orthodontist to maintain frequent conversation about patient's oral hygiene and restorative needs. The general dentist should be actively involved in the orthodontic treatment planning when there is restorative needs post orthodontic treatment such as build up for peg lateral incisors, veneers/crowns for transposed teeth, flippers, or Maryland bridges for missing teeth.

16.7.6 Orthodontic Myths Among General Dentists (Proffit et al. 2012)

- *A child is too young to get braces until he or she has all permanent teeth.* Endlessly waiting for all permanent teeth to erupt prior having an orthodontic consultation can lead to missing the golden timing for interceptive or phase I treatment. Growth modification in hope to guide skeletal development sometimes needs to start at the transitional dentition age, in order to catch the peak of growth.
- *Wisdom teeth need to be extracted prior to start of braces. Teeth will shift and get crooked again when wisdom teeth come in.* Many research studies have shown that late mandibular incisor crowding is multifactorial. Relapse after orthodontic treatment happens to anyone at anytime, regardless of whether wisdom teeth were extracted. Just like the rest of human body, teeth and occlusion are constantly evolving as we mature. The key to prevent relapse is excellent retainer wear.

- *All cavities need to be filled prior to an orthodontic consultation. Orthodontic treatment should not be started without a patient first completing all restorations and has a good oral hygiene. However, a general dentist should recognize a child's orthodontic needs and refer for consultation prior to starting extensive restorations, noting that sometimes posterior permanent teeth can be extracted instead of filled.*

16.8 When to Refer to a Pediatric Dentist

Being the first professional for many children, the general dentists have an important responsibility to build the best first impression possible for the generations to come. The dentists should always keep the patients' best interests in mind. The bottom line is "Do no harm." If you cannot provide the best care or feel uncomfortable treating a child, refer. Build the best first impression of dental professionals. Here are a few examples when you should refer.

1. Unmanageable children and/or their parents, after several attempts of behavioral management.
2. The patient has extensive needs that may be better treated under sedation or general anesthetic, i.e., rampant decay.
3. The office is not equipped with the armamentarium needed for the procedures, i.e., SSCs and nitrous oxide.
4. Developmentally or physically disabled patients who the dentist cannot communicate well with.
5. The dentist and/or the staff do not have the kids' friendly personality and patience. It is ok to admit that you are not good with children. That is why we have the specialists. Instead of putting the children and yourself through the suffering, please refer them to someone who will give them a much better experience and care that they deserve.

References

- Andreasen JO, Ebeleseder KA, Kenny DJ, Trope M, Sigurdsson A, Andersson L, Bourguignon C, Flores MT, Hicks ML, Lenzi AR, Malmgren B, Moule AJ, Pohl Y, Tsukiboshi M. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations of permanent teeth. *Dent Traumatol.* 2012;28:66–71. Erratum in *Dent Traumatol.* 2012;28: 499.
- American Academy of Pediatric Dentistry (AAPD). Guideline on use of nitrous oxide for the pediatric dental patient. Chicago: American Academy of Pediatric Dentistry (AAPD); 2013. p. 5 [40 references].

- American Academy of Pediatric Dentistry (AAPD). Dental growth and development. Chicago: American Academy of Pediatric Dentistry (AAPD); 2014a. p. 1 [1 reference].
- American Academy of Pediatric Dentistry (AAPD). Guideline on fluoride therapy. Chicago: American Academy of Pediatric Dentistry (AAPD); 2014b. p. 4 [37 references].
- American Academy of Pediatric Dentistry (AAPD). Guideline on use of antibiotic therapy for pediatric patients. reference manual revised. 2014c;37(6):289–91.
- American Academy of Pediatric Dentistry (AAPD). Guideline on management of the developing dentition and occlusion in the pediatric dental patient. Chicago: American Academy of Pediatric Dentistry (AAPD); 2014d. p. 13 [138 references].
- American Academy of Pediatric Dentistry (AAPD). Guideline on pulp therapy for primary and immature permanent teeth. Chicago: American Academy of Pediatric Dentistry (AAPD); 2014e. p. 9 [109 references].
- American Academy of Pediatric Dentistry (AAPD). Guideline on restorative dentistry. Chicago: American Academy of Pediatric Dentistry (AAPD); 2014f. p. 12. [135 references].
- American Academy of Pediatric Dentistry (AAPD). Guideline on behavior guidance for the pediatric dental patient. Chicago: American Academy of Pediatric Dentistry (AAPD); 2015a. p. 14 [95 references].
- American Academy of Pediatric Dentistry (AAPD). Guideline on use of local anesthesia for pediatric dental patients. Chicago: American Academy of Pediatric Dentistry (AAPD); 2015b. p. 7 [36 references].
- Casamassimo PS, et al. Pediatric dentistry: infancy through adolescence. 5th ed. St. Louis: Elsevier/Sanders; 2013.
- DiAngelis AJ, Andreasen JO, Ebeleseder KA, Kenny DJ, Trope M. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations of permanent teeth. *Dent Traumatol.* 2012;28:2–12.
- Lambert D. Splinting rationale and contemporary treatment options for luxated and avulsed permanent teeth. *Gen Dent.* 2015;63(6):56–60.
- Proffit WR, et al. Contemporary orthodontics. 5th ed. St. Louis: Mosby; 2012.
- Rappaport B, Mellon RD, Simone A, Woodcock J. Defining safe use of anesthesia in children. *N Engl J Med.* 2011;364(15):1387–90.
- Wynn RL, Meiller TF, Crossley HL. Drug information handbook for dentistry. 21st ed. Hudson: Lexicomp; 2015.