

## REVIEW ARTICLE

# Pediatric Basic Resuscitation in Dental Office

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## ABSTRACT

Medical emergencies are little understood by most of the dentists. Thus, there is a significant need for increased awareness by dental professionals in the area of emergency medicine. Medical emergencies can and do occur in pediatric patients. Therefore, pediatric dentists should develop skills to handle various pediatric emergencies that have the potential to develop life-threatening conditions. We must be aware of the various protocols for initial stabilization of pediatric victims at risk in dental setup. Every patient expects his/her dentist to be familiar with emergency interventions that include at least basic life support requirements and, if necessary, advanced methods including administration of specific medication. This review article will brief us with basic protocols required to manage pediatric emergencies in case of life-threatening conditions.

**Keywords:** Pediatric, Emergency, Dental professionals, Basic life support (BLS).

## INTRODUCTION

Life-threatening pediatric emergencies may happen anytime to a patient in dental office. All possible drug intervention procedures (e.g. local anesthetics, etc.) in dentistry have the potential to develop allergic reactions, which may lead to life-threatening conditions.<sup>1</sup> In pediatric patients, the most common emergency situations seen in dentistry are associated with drug administration, most often local anesthetics and/or central nervous system depressants used for sedation. The most likely scenario for a serious drug-related emergency developing in dentistry is a younger, lighter weighted child receiving multiple quadrants of dental treatment in the office of younger, less experienced general dentist.<sup>2</sup> Aspiration and swallowing incidents in a dental environment with a young child and the medically, physically and mentally handicapped patient has been reported by many dentists leading to acutely life-threatening conditions.<sup>3</sup> Pediatric emergencies can also elicit due to pain (local anesthesia), anxiety (behavioral management, conscious sedation) and the effective management of the same will minimize the development of life-threatening conditions.<sup>4</sup> Fortunately, the incidence of pediatric cardiopulmonary arrest is extremely low in the outpatient dental office setting. Because most cardiopulmonary arrests in children result from a progressive deterioration in respiratory function, outcome critically depends on rapid diagnosis and evaluation of the adequacy of ventilation and pediatric airway.<sup>5</sup>

A comprehensive medical history must be recorded for all patients. Any acute illness or exacerbation of a chronic disease

should be cleared by the primary care physician before commencing dental treatment. This may prove to be a preventive effort taken by pediatric dentist to prevent pediatric emergencies.

Around 70.2 percent of general medical practitioners in UK have responded to medical emergencies in a dental setup.<sup>6</sup> Every patient expects his/her dentist to be familiar with emergency interventions that include at least basic life support requirements and, if necessary, advanced methods, including administration of specific medication, use of automated external defibrillator/manual defibrillator, use of advanced airway devices, etc and specially in case of pediatric victims, it becomes obligatory. It is mandatory for all health care professionals, including dentist/pediatric dentist to be aware of various protocols to handle medical emergencies. At least, every pediatric dentist must be aware of various protocols for initial stabilization of pediatric victims at risk in dental setup, which implies that pediatric dentist must have a minimum know-how of basic life support or pediatric victims. Providing basic life support for victims in medical emergency situations is the pediatric dentist's most important contribution until definitive medical care is provided or until the victim is stabilized. Our goal must be instituting simple resuscitative measures before full cardiopulmonary arrest develops.

Since office emergencies happen so infrequently, dentists need to find a way to be sure and knowledgeable in resuscitation skills. Routine reviews and updates on life-saving interventions

and resuscitations are good assets to keep one's knowledge up to date. PEARS (Pediatric emergency assessment recognition stabilization), PALS (Pediatric advanced life support), APLS (Advanced pediatric life support), MEDO (Medical emergencies in dental office) and PEDO (Pediatric emergencies in dental office) courses provide an excellent opportunity to renew knowledge and skills. The mainstay of safe practice requires the dentist to maintain a basic level of understanding of what constitutes an emergency and that office staff receives basic training and is adequately supplied with emergency equipment.

Medical emergency management training is not provided to most of the dentists at undergraduate or even at the postgraduate platform in dental schools.<sup>7</sup> Thus, it seems to be difficult for a dentist/pediatric dentist to know about various protocols with this respect. Hence, it should be mandatory for all dental schools to provide training in emergency medical services at baseline to eliminate the difficulty of undergoing advanced training in the latter field.

There are very few papers available which describe the management of pediatric emergencies in dental office. Bearing this in mind, this review article will describe the recent available protocols of basic life support for pediatric victims at the dental office to make one aware of protocols for initial stabilization of victims until definitive care is provided.

### **BASIC LIFE SUPPORT...A STEP WISE APPROACH**

The golden rule of basic life support is to perform Effective Cardiopulmonary Resuscitation (CPR) with main emphasis on **Airway, Breathing and Circulation** which in common is termed as **ABC's**. These ABC's can be further explained as:

**Airway:** Patency of airway and its maintenance

**Breathing:** Effective Breathing in order to prevent respiratory arrest

**Circulation:** Adequate supply of blood to vital organs

Basic life support also takes into account the use of an AED (Automated external defibrillator) along with CPR.

Thus, for the ease of understanding, basic life support for pediatric victims can be described as:

1. Cardiopulmonary resuscitation (CPR)
2. Automated external defibrillator (AED)

### **Cardiopulmonary Resuscitation (CPR)**

External cardiac massage, today known as chest compression, was introduced to patient care in 1958 by William Kouwenhoven.<sup>8</sup> Between 1958 and 1961, artificial respiration was combined with artificial circulation to create CPR. The period began with demonstrations that mouth-to-mouth ventilation was effective for artificial respiration and chest compression was effective for artificial circulation. Now all that needed was the formal connection of two techniques to create CPR as it is practised today.

Pediatric dentists must use child CPR guidelines for children from 1 year of age to puberty. Once a child reaches puberty,

adult CPR guidelines for resuscitation must be followed. Although the steps for giving CPR to an adult and child are almost similar, there are few differences with respect to amount of air, depth of compressions, 1 handed chest compressions, etc.

Steps for giving CPR to a child can be described as follows:

1. **Positioning of victim and dentist:** Position the victim on a safe firm flat surface in order to provide effective care. The BLS provider is to be positioned at victim's side. There should be enough space around the victim in order to provide prompt care.
2. **Assess/check for response:** Check for response of victims is the first step in BLS. You need to make sure that the scene is safe for you and the victim. Tap the victim's shoulder and shout 'Are you all right?'. If the victim does not respond that means the victim is unresponsive.  
In case of pediatric victims even if the pulse is present and is less than 60 with signs of poor perfusion, viz. cold and clammy skin, poor color, low temperature, etc. follow the same sequence as given below.
3. **Activate emergency response system (ERS) and get an AED:** If the victim is found to be unresponsive, the BLS provider must shout for help. Dental office well equipped with various advanced equipment for emergency procedure intervention may be of advantage in handling emergency situations else would require the activation of emergency response system and if available to get an AED.
4. **Open airway and assess breathing:** Tongue is the most common structure causing airway obstruction in an unresponsive infant or child. To open up airway head-tilt chin-lift maneuver must be performed, which prevents the tongue to fall back on the posterior pharyngeal wall.<sup>9,10</sup>

Following which breathing assessment is done by LLF.

**Look:** Look for chest rise

**Listen:** Listen for breath sounds

**Feel:** Feel for the flow of air against your cheek

This assessment procedure should take atleast 5 seconds but not more than 10 seconds to determine whether the patient is breathing or not.

5. **Give 2 rescue breaths:** If the victim is not breathing adequately, use a barrier device (pocket mask, bag valve mask, etc.) to give 2 rescue breaths over a period of 1 second each, while watching for the victims chest to rise.

While giving breaths to children, make sure you give only enough air to make the victims chest rise. For very small children, you may use less air than for larger children or adults. BLS providers may need to try a couple of times to give total of 2 rescue breaths that make the victim's chest rise. If either breath does not make the chest rise, the rescuer should try again to open the child's airway and give a breath that makes the chest rise. Generally, infants and children, who develop sudden cardiac arrest often do not have enough oxygen delivery to the brain and heart and other vital organs

even before the heart stops pumping blood. It is very important to give effective breaths for infants and children during CPR that provides a visible chest rise.

6. *Check for pulse:* After effective 2 rescue breaths BLS providers should take atleast 5 seconds and no more than 10 seconds to check for major pulse like carotid pulse.<sup>11</sup> In order to locate the carotid pulse, locate the trachea gently move the fingers laterally into the depression to feel the pulse.

7. *If no pulse, begin cycles of 30 chest compressions and 2 breaths:* Lone rescuer should use a compression-ventilation ratio of 30 compressions to 2 breaths when giving CPR.

Rescuers should use a 15:2 compression-ventilation ratio for 2-rescuer CPR for child victims.

Children often have respiratory difficulty, which leads to cardiac arrest. Therefore, more frequent ventilations are of greater benefit to children.

If the child's heart rate is less than 60 beats per minute with signs of poor perfusion, one should start CPR.

### One Handed Compressions

For very small children, one may use either 1 or 2 hands for chest compressions. Make sure you compress the chest 1/3 to 1/2 the depth of the chest with each compressions. The advantage of giving 1 hand chest compressions is mostly seen in case of 1-rescuer CPR where the compressions can be given with one hand and the other hand is used to maintain head-tilt to prevent the tongue from falling back onto the posterior pharyngeal wall.<sup>9,10</sup>

### Good Quality CPR

Good quality CPR may act as an additive advantage for victims and providers to encounter emergency situations. For good quality CPR, following points need to be considered.

1. Push hard, push fast: compress at a rate of 100 compressions per minute.
2. Allow full chest recoil after each compression.
3. Minimize interruptions in chest compressions try to keep interruptions to less than 10 seconds.
4. Avoid hyperventilation.

### Automated External Defibrillator (AED)

Ventricular fibrillation is the rhythm generally noticed in case of sudden cardiac arrest (SCA). The treatment to correct this arrhythmia is defibrillation. The first successful human defibrillation with recovery of the patient was performed by Claude Beck in 1947.<sup>12</sup> Paul Zoll recorded the first successful closed-chest human defibrillation in 1955 on a man with recurrent syncope and ventricular fibrillation, and Bernard Lown showed that direct current was superior to alternating current defibrillation in 1962. In 1979, the first portable automatic external defibrillator was developed with a pharyngeal electrode for sensing, shocking electrodes on the abdomen and tongue,

and a simple algorithm to detect abnormal rhythms and automatically deliver rescue pacing or a defibrillation shock, as appropriate.<sup>13</sup>

Ventricular fibrillation, if not corrected at an appropriate time, may lead to asystole and can finally lead to death. Thus, early defibrillation is critical for victims of sudden cardiac arrest (SCA). The earlier defibrillation occurs, the higher the survival rate.

AEDs are sophisticated, computerized devices that are reliable and simple to operate allowing laypersons and healthcare providers to attempt defibrillation safely.<sup>14</sup> Thus, AED is an automatic type of defibrillator, which even a layman can use. Hence, this increases the use of defibrillators on a larger scale in order to save life by shortening the time between collapse and defibrillation. The earlier defibrillation occurs, the higher the survival rate.<sup>15-21</sup>

AED can only be used, if the victim is unresponsive, does not breath and has no evidence of circulation.

### Use of an AED by BLS Provider

Once the AED arrives, put it at the victim's side, next to the rescuer, who will operate it. This position provides ready access to the AED controls and easy placement of electrode pads. It also allows a second rescuer to perform CPR from the opposite side of the victim without interfering with AED operation.

AEDs are available in different models. There are small differences from model to model, but all AEDs operate in basically the same way. The following table lists the 4 universal steps for operating an AED.

1. Power on the AED
2. Attach pads
3. Clear the victim and analyze the rhythm.
4. If AED advises a shock, shock the patient and resume CPR

For unwitnessed victims, perform 5 cycles or 2 minutes of CPR before using and attaching the AED.

Some AED systems have been designed to deliver both adult and child shock doses. If you use an AED on a child and that AED can deliver a child shock dose, follow the AED instructions to select the lower shock dose. You may need to turn a child key/switch or use child size pads, or both, to reduce the shock dose. You must be careful not to deliver the child shock dose for victims over 8 years of age because the smaller dose may not be effective for the larger or older victim. You need to be familiar with your AED.

If you are using an AED for a child 1 to 8 years of age and the AED does not have child pads or a child key or switch, you may use the adult pads and deliver the adult dose.

If an AED has optional child pads or a key or a switch to enable the child dose to be delivered. It is important to select the pads and settings that are correct for victims.

Currently, there is not enough evidence to recommend for or against the use of AEDs in infants less than 1 year of age.<sup>22</sup>

## CONCLUSION

Most of the dental schools do not offer training to handle pediatric emergencies<sup>7</sup> and it is our duty as doctors to save one's life in case of emergencies. Preparedness to recognize and appropriately manage pediatric emergencies in the dental environment should include minimum certification of basic life support (BLS). This update of handling pediatric emergencies in dental office will provide most of the support but it becomes mandatory for all dentists to become basic life support health care providers with adequate hands-on training.

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