
MEDICAL EMERGENCIES IN PEDODONTIC PRACTICE

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ABSTRACT:

Medical emergencies occur on pedodontic practice. The dentist should familiar with this emergencies. A proper training is necessary for the Dentist as well as staff to deal with this emergencies. This article reviews some of the common medical emergencies and conditions that may pose threat to the patient during dental treatment. This review also provides some guidelines to their management if they were to happen in practice

Key words: medical emergencies ,, pedodontic patient

INTRODUCTION

Medical emergencies do occur in the pedodontic practice¹⁻⁴ and one should be prepared, should an event occur in order to rapidly diagnose and manage the situation. Dental practitioners and their staff need to have appropriate skills, training and equipment available to deal with potentially life threatening conditions. Preparatory steps should include the following:^{5,6}

- Telephone numbers of local hospital, ambulance and medical practitioner at hand
- Updated medical history of patient
- Emergency drug kit containing Drugs and equipment to administer typed list of drugs and dosages
- Emergency equipment readily available
- Be alert to recognise emergencies early

PREPARATION FOR EMERGENCIES^{6,7}

a. Prevention^{6,7}

The most important factor in the successful treatment of medical emergencies is to prevent them from happening. It is recommended that dentists and their staff seek training and regularly update their skills in first aid and the treatment of emergencies. A comprehensive medical history is an indispensable part of any patient's record. This medical history form must be updated regularly. An assessment should be undertaken for child patients

with unstable or severe medical conditions as to their suitability for management in pedodontic practice. Child Patients with severe or unstable medical conditions should be referred for treatment in hospital dental clinics.

b. Training^{5,6,7}.

Each member of the staff should be trained in Basic Life Support (CPR, Mouth to Mouth Resuscitation, and Heimlich Maneuver). Design an office meeting specifically for establishing and reviewing emergency protocol. A team approach to management of medical emergencies should be developed⁵.

c. Equipment and Drugs.^{8,9}

The Equipment and Drugs stored and setup for pediatric practice depends upon the expertise and training undergone by the clinician. Drugs must be readily available and up-to-date. Assemble all emergency medications and supplies in one container. They should be stored to facilitate easy identification that can be transported to any area of the office within a moment's notice. In most emergency situations, it is better to use basic life support rather than administer drugs, especially if the dentist is unsure of either dosage, indications of use, or method of administration. The doctor should be familiar with all the medications and their use well before they are needed.. They should be in

each operatory within arm's reach of the dental professional (Table I)

Table I- Emergency kit with Drugs and Equipment.

Drug Kit	
Critical and essential	<ul style="list-style-type: none"> • Injectable epinephrine(1:1000, 1:10000)-- I.M./S.C for allergic and severe asthamic attacks • injectable antihistamine- Chlorpheniramine maleate 10mg/ml-- I.V. • Vasodilator -- Glyceryl trinitrate tablets (0.3/0.5mg)or spray (0.4mg/dose) • Oxygen • ammonia vaporole—central respiratory stimulant
Semi critical	<ul style="list-style-type: none"> • Anticonvulsant-- Diazepam emulsion 10mg/2ml Slow I.V • Analgesic --- Aspirin 300mg --Oral • Corticosteroid-- Hydrocortisone sodium succinate 100mg/ml --I.M./I.V – to treat adrenal insufficiency. • Antihypoglycemic-- Glucose or dextrose drink, tabs or gel Oral/ Glucose injection 50m1 of 50% I.V./Glucagon 1 mg I.M./S.C. • Bronchodilator –Salbutamol inhaler/ nebuliserwith nebules 0.1mg/dose 2.5mg • Saline 0.9% (for flushes and eye wash) <p>Other drugs include vasopressor, antihypertensive, anticholinergic, respiratory stimulant such as ammonia vaporole etc.,</p>
EQUIPMENT	
<ol style="list-style-type: none"> 1. A Dental chair which can be easily changed to a Trendelberg position. 2. A high volume suction to clear the oral secretions 3. Equipment for recording blood pressure 4. Oxygen cylinder and regulator suitable for delivering high flow oxygen -5L/min for one hour atleast 5. Syringes and needles for drawing up and administering drugs Bag mask device with oxygen reservoir 6. Basic airway adjuncts (oro-pharyngeal and naso-pharyngeal airways) 7. Nebulisor to deliver Salbutamol or adrenaline 8. Advanced airway adjuncts (LMA + endotracheal tubes) 9. Automatic external defibrillator (presently recommended not mandatory) 	

Unconsciousness can be caused by deterioration of medical conditions, drug administration or trauma.

Emergency equipment must be readily available in dental practices. The equipment must be checked frequently to make sure it is operational. Check the oxygen delivery system regularly to make sure the cylinder is charged and the mechanism is working.

MEDICAL EMERGENCIES – INFORMATION ^{9-13.}

1. GENERIC RESPONSE TO THE UNCONSCIOUS PATIENT

Initial assessment and management of an unconscious/collapsed patient follows a similar pattern despite the diversity of possible causes.

Many conditions present an immediate threat to life. Almost all of these conditions do so by preventing circulation and/or oxygenation. The practice of resuscitation is focused on the restoration and maintenance of circulation and oxygenation. The Emergency algorithm , Principles of ' A B C' , ie. **A**-restoration of air way, **B**- restoration of normal breathing **C**; Control of bleeding control and restoration of circulation should be put into force. Verbal Responsiveness is the most important assessment that decides plan of action. A patient

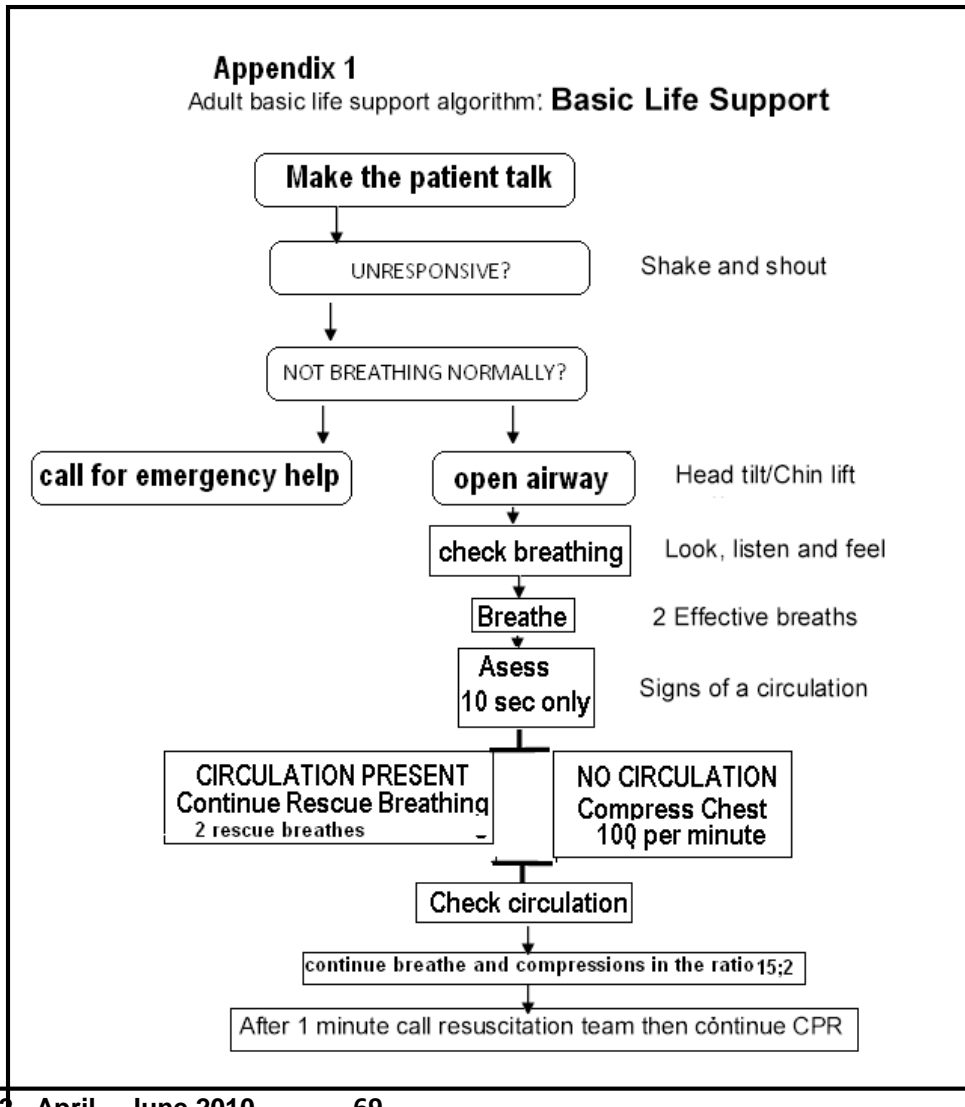
who can respond with a few words has a patent airway, can breath and has normal circulation. A person who is unresponsive may have none and is at risk of aspiration and airway obstruction. Send an assistant for help. Ask them to then return and confirm the ambulance is on its way.(**Appendix I and Appendix II**)

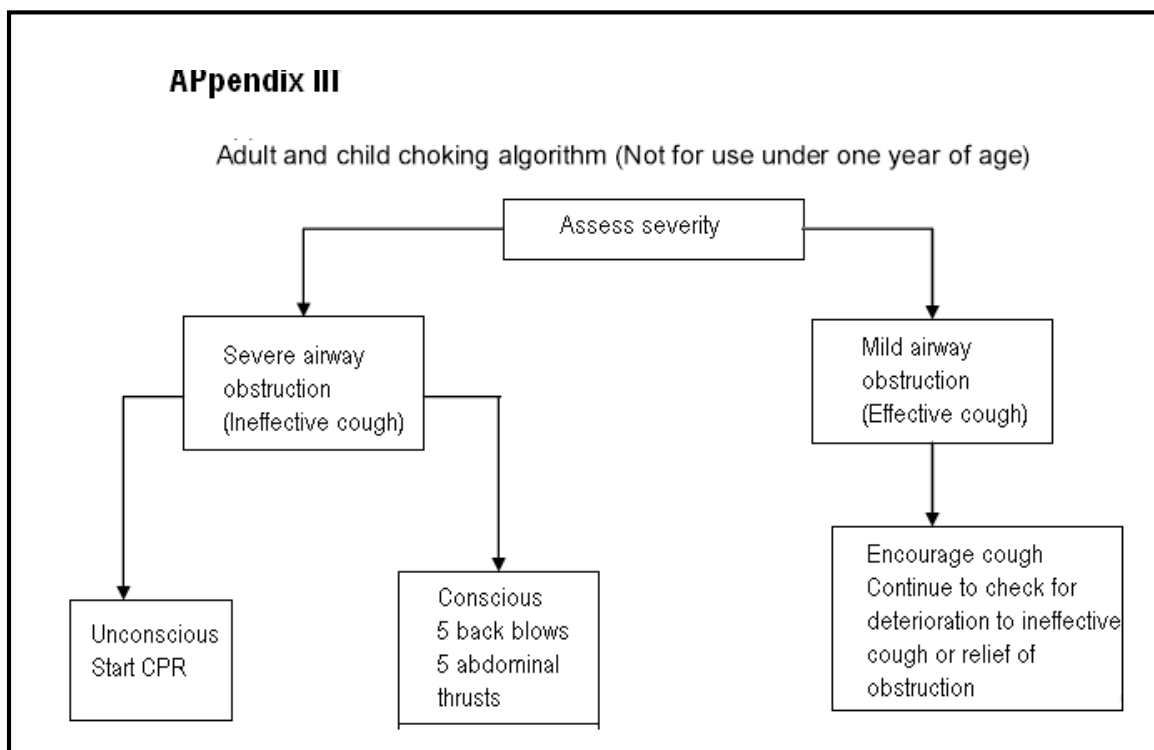
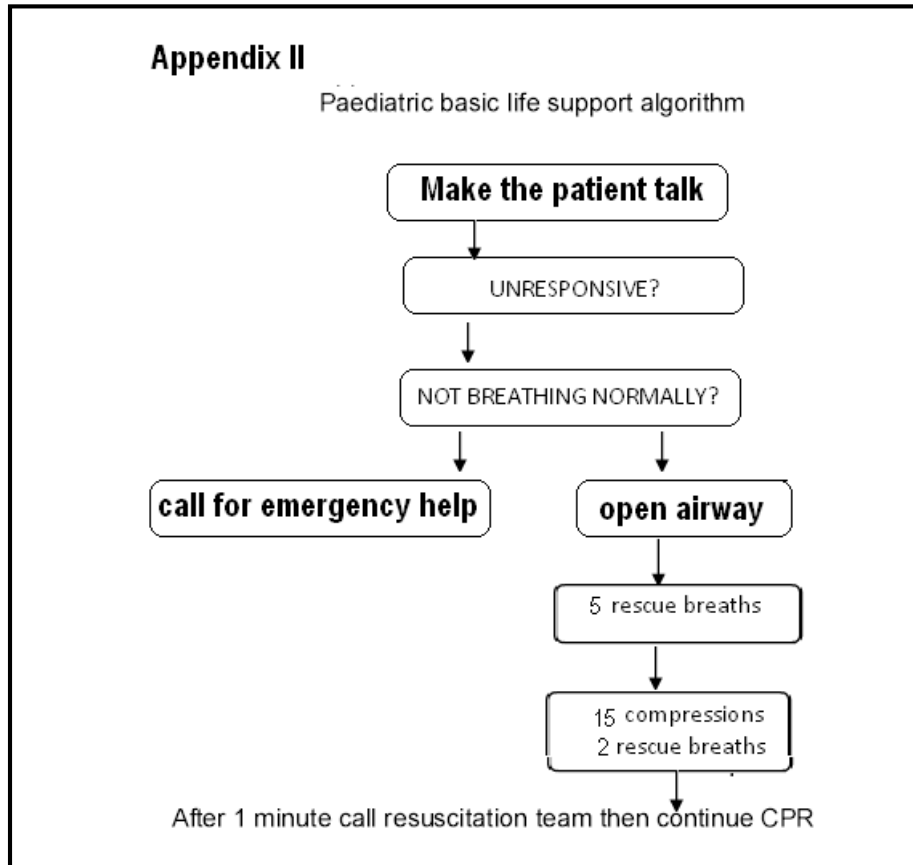
Airway – Open the airway by head tilt and chin lift. If the casualty is a victim of trauma, then the cervical spine may be damaged, use jaw thrust to open the airway and hold the head to keep the head and neck still and in alignment with the rest of the body. Open the airway with chin lift, head tilt or jaw thrust. Remove obvious causes of airway obstruction

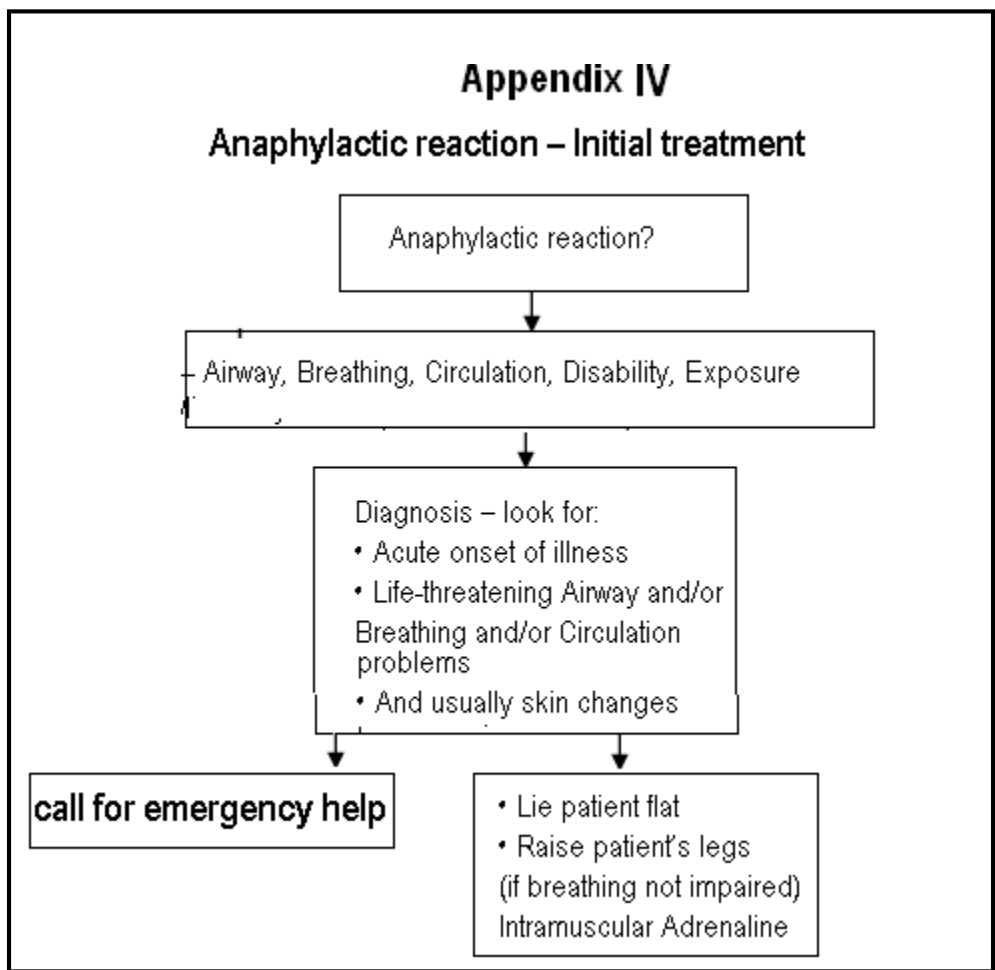
Breathing - The breathing must be assessed quickly. If there is no breathing, start rescue breathing. Consider intubation to protect the airway. If the breathing is inadequate, the rescuer may need

to give assisted rescue breathing. The breathing check will also indicate any difficulty with breathing from asthma, heart disease, anaphylaxis. Within 20 seconds check for breathing and assess for signs of circulation. Feel the carotid pulse while looking for other signs of life, movement or breathing.

Circulation – Assess quickly and if there is no circulation chest compressions must be started immediately. If there is bleeding use direct compression to stop further blood loss. If circulation is absent, the onset of arrest occurred within two minutes, a defibrillator is not immediately available and chest compressions have not already been started, give a single precordial thump. Once ABC have been assessed and secured, give consideration to other aspects of emergency care and positioning of the patient/victim. Some patients may deteriorate after the initial assessment. It is therefore best to consider **ABC** as a cycle, performed regularly while awaiting the ambulance or medical attention is achieved.







EMERGENCY SITUATIONS : SPECIFIC RESPONSES

Some of the emergency situations and the Dentists response to this situations are discussed here.

Vasovagal Syncope ^{5,6,7,15,16}

Emergencies such as syncope that arise out of psycho-physiologic responses are rarely life threatening and can be managed readily by the alert dental office team. Syncope is usually defined as a transient loss of consciousness and posture due to cerebral ischaemia caused by a reduction in blood supply to the brain. Vasodilatation causes pooling of blood in the peripheries and vagal stimulation causes slowing of the heart. This combination causes a dramatic fall in blood pressure. The dental surgeon is expected to be familiar with the various etiologies of syncope and should be able to differentiate between them. The dental surgeon should be able to differentiate the causes of syncope that occurs frequently in a child and that of the adult. In the presyncope stage patient feels light

headed or dizzy, possibly nauseous, uncomfortable or agitated. They will appear pale and sweaty with a thready slow pulse and hypotension with increased heart rate. In the syncope stage patient loses consciousness, generalised muscle relaxation followed by seizures. Management depends upon the medical condition of the patient. An other wise healthy pedodontic patient does not require medical intervention: Stop all dental treatment. Remove all objects from the patient's mouth. Place patient in supine position with legs and arms elevated and head at level of heart. Raise patient's legs. Follow the basic vital life support algorithm and ensure that ABC's are under control. Oxygen can be delivered at 3-5L/min by nasal canula or 10L/ min by mask. When consciousness is regained, patient should be kept flat and reassured. Once pulse and blood pressure recover, slowly raise patient to seated position. Start I.V. fluids, if available. Augment ventilation if respiratory effort is poor. Reassess airway every 30 seconds. Patients with significant medical problems, or when syncope is prolonged or

complicated by seizure activity, should be transferred to a hospital environment for further assessment as indicated.

<ul style="list-style-type: none"> • Cardiac arrhythmia 	Sick sinus syndrome, complete heart block Supraventricular and ventricular
<ul style="list-style-type: none"> • Neurocardiogenic syncope 	Vasovagal syncope, Situational syncope, Micturition syncope, Tussive syncope
<ul style="list-style-type: none"> • Syncope associated with low cardiac output 	Myocardial infarction, Pulmonary embolism and Severe aortic or mitral stenosis, Hypertrophic cardiomyopathy
<ul style="list-style-type: none"> • Orthostatic hypotension • Carotid sinus syndrome • Drug-induced syncope • Postprandial syncope 	

Hyperventilation ^{5,6,7,16.}

Hyperventilation is a fairly common emergency in the dental office. A patient may hyperventilate due to extreme anxiety, pain, metabolic acidosis, drug use, hypercapnia, cirrhosis, and some central nervous system disorders. The best prevention for hyperventilation is to address any anxieties about dentistry before starting treatment. During hyperventilation the patient's breathing accelerates and he or she feels as though not enough air is getting into his or her lungs. Prolonged rapid deep breathing often in very anxious patients can lead to profound metabolic changes that may result in loss of consciousness. Symptoms include: lightheadedness, numbness or tingling in the extremities and around the mouth and lips, muscle twitches, and difficulty in catching a deep breath. The patient usually does not lose consciousness immediately, but prolonged hyperventilation may lead to convulsions. These symptoms tend to increase an anxiety and respiratory rate and depth. Eventually the patient will become unconscious due to a relative cerebral hypoxia. In such cases, immediately stop all the dental procedures being rendered at the time, and remove all instruments, rubber dam, etc. from the patient's mouth. The patient usually exhibits differing levels of inability to breathe. Reassure the patient and allow the patient to sit partially or fully upright. Speak calmly to the patient. Try to have the patient regulate his or her breathing in a slower, more even rate. This may help balance the respiratory alkalosis and the episode may be self-limiting. If the episode

continues, have the patient breathe into a small paper bag at a rate of 6 to 10 breaths per minute.

Do not administer oxygen. Once the episode has ended, the Dentist and parents should discuss the root of the attack and address the fears of the parents

After being reassured, the patient can be discharged with no medical consultation. If respiration does not return to normal, transport the patient to their physician or an emergency room.

Airway Obstruction ^{5,6,7}

The small objects like dental burs, endodontic instrument like reamers and files during a dental procedure can be easily slipped into the esophagus. Usually, a conscious patient will swallow the object or cough it back up as a reflex action. If the object can pass through the esophagus, it will usually pass through the entire gastrointestinal tract. It may, however, lodge somewhere in the tract and cause a perforation, an abscess, or a blockage. If the object is aspirated into the lung, it may produce infection, pneumonia, or an abscess.

If an object is dropped, the assistant should immediately try to aspirate it out with the high speed suction. Magill intubation forceps are specially designed to reach into the pharynx without trauma to the surrounding tissues. Where practical, tie dental floss to items like endodontic instruments, rubber dam clamps et.,. If the item is dropped, pulling on the floss can retrieve it. Use of a rubber

dam is effective in blocking the throat, with a piece of floss attached to the clamp.

Patients will instinctively want to sit up but gravity will work against the object being retrieved and it is more likely to be swallowed. Reposition the dental chair so the patient's head is down below the chest, and have him or her turn on their side to try to expel the item. If the entire object is retrieved, the patient may be dismissed without radiographs. The patient should be referred to their physician for a follow up examination. If the object is not retrieved, the patient should be accompanied (by the doctor if possible) to an emergency room or radiology laboratory and further referred to a specialist for consultation.

Severe or complete upper airway obstruction due to a foreign body rapidly progresses to unconsciousness and cardiac arrest within minutes. The patient is distressed. There is choking reflex coughing. Patient stops breathing and cyanotic. This is followed by loss of consciousness. If there is partial obstruction, encourage the patient to cough up or spit out. Initially do nothing else. If the entry of air is poor due to complete obstruction there is increasing high pitched stridor, increased respiratory distress. In complete airway obstruction victim cannot speak, breathe or cough. If patient is in the dental chair sit them up, turn patient side on in chair. Support chest with one hand and deliver five sharp back blows between the shoulder blades with the heel of the other hand. If back blows fail, apply the Heimlich Maneuver (five abdominal thrusts). If the patient loses consciousness, emergency help should be summoned. commence CPR with finger sweep between each cycle. If emergency help is delayed, doctors trained in invasive surgical procedures may opt to perform an emergency cricothyrotomy(appendix III)

Anaphylaxis^{5,6,7,17}

Anaphylaxis is potentially life threatening immune reaction to foreign material. It may present in the form of Urticaria, angioedema, hypotension, tachycardia, bronchospasm. In the dental office, drugs (especially antibiotics) latex gloves ,preservatives in parenterals are usually the offending agents. An anaphylactic reaction begins when the allergen enters the blood stream and reacts with an IgE type antibody. This reaction

causes cells to release histamine and often inflammatory substances thus precipitating immune inflammatory response. Typically, in 1 to 15 minutes, the patient feels uneasy, becomes agitated and flushed may present with the following: Palpitations, Paresthesia (sensation of pins and needles), Pruritus (itching) and hives, Throbbing in the ears, Coughing, wheezing and difficulty in breathing, difficulty in swallowing because of swelling of the tongue and throat. Histamine release during immune mechanisms cause bronchial smooth muscle constriction, resulting in wheezing; difficulty in breathing. Gastrointestinal symptoms such as abdominal pain, cramps, vomiting, and diarrhea are also common.. Histamine causes the blood vessels to dilate (which lowers blood pressure) and fluid to leak from the bloodstream into the tissues (which lowers the blood volume) resulting in edema and shock. Fluid can leak into the alveoli (air sacs) of the lungs causing pulmonary edema. Angioedema may be severe enough to cause obstruction of the airway. Prolonged anaphylaxis can cause cardiac arrhythmias. Management depends on the severity of presentation.

Assess the degree of cardiovascular collapse (pulse and blood pressure). Assess the degree of airway obstruction (upper - angioedema, lower – bronchospasm). Stop the administration of the suspected drug. Immediately call for emergency help. Make the patient lie in supine position. Ensure airway is clear. Assess breathing difficulty (stridor, wheeze, can't speak). Ventilate with oxygen supply 5-7 litres per minute. Monitor consciousness, airway, breathing, circulation, pulse, blood pressure. Prepare for CPR. If the patient is shocked or having signs of bronchospasm, raise the legs to elevate the Blood Pressure. Administer salbutamol two puffs repeatedly. Adrenaline 0.5 ml, IM, 1:1000 = 0.5 mg should be given immediately into ventral musculature of tongue or floor of mouth. Repeat IM adrenaline every five minutes while waiting for ambulance and arrange transfer to hospital. (Appendix IV)

Obtaining a thorough history to identify drug allergy (e.g., H/o allergy to sulpha group of drugs) can to a large extent prevent anaphylactic attack. Avoid drugs that have immunologic in nature. Administer drugs orally rather than parenterally when possible.

When parenteral administration is necessary, keep patients in the office 20 to 30 min after injections

Asthma^{5,6,7,18,19.}

Bronchial Asthma is due to reversible airway obstruction characterized by hypersensitivity, bronchial inflammation, smooth muscle spasm and hypertrophy, mucosal congestion and hypersecretion, all of which compromise bronchial patency. Asthma is a common disorder of young patients and may be associated with allergies or elevated blood eosinophil counts. Allergic reactions are one source of hyper-reactivity response and are triggering source of the asthmatic attacks.

Asthmatic attack is sudden in onset with tightness in the chest and commonly with cough, Dyspnea, and wheezing sounds. There is difficulty in respiration. The termination of attack is commonly accompanied by productive cough with thick, stringy mucus. Episodes usually are self-limiting but severe episodes may require medical assistance

Most asthma-related attacks can be minimised by taking a careful medical history. Management depends on the assessment of severity. If the attack is acute and severe, patient is unable to speak in complete sentences, pulse rate will be greater than 110 per minute and respiratory rate greater than 45 per minute. In Life threatening asthma – “Silent chest”, cyanosis, sweating, hypercarbic flush, bradycardia/hypertension, confusion, agitation can be noticed. If more than one feature severe, or any life threatening, arrange hospital transfer; otherwise administer high flow oxygen. Bronchodilator such as Salbutamol administered as one puff into large volume spacer and allow six breaths, repeated for six times. Corticosteroids like Prednisone can be given 30-60 mg orally. If not improving, arrange hospital transfer. Repeat Bronchodilator therapy.

The dentist should also bear in mind that the patients on chronic asthmatic treatment will be on significant dosages of corticosteroid therapy. This should alert the dentist to the possibility that she is adrenally suppressed and requires an increased steroid dose on the day of dental procedures to prevent adrenal crisis

Diabetes^{5,6,7}

The most common diabetic emergencies are due to either extreme on both sides of normality. Low blood sugar levels – hypoglycaemia occurs in patients on anti-diabetic medications. On the other hand, high blood sugar – hyperglycaemia occurs particularly in diabetic ketoacidosis. Most of the child patients with diabetes are of Type I and generally on insulin therapy.

Hyperglycaemia is characterized by clinical symptoms include thirst, increased urine output and dehydration. A progressive reduction in conscious level and hypotension, with coma and cessation of urine output in severe cases. Management Includes the primary assessment and resuscitation (ABC) securing the airway, breathing and circulation. Transport the patient immediately to a hospital facility.

Hypoglycaemia. Clinical symptoms of hypoglycaemia include sweating, hunger, tremor, agitation with progression drowsiness, confusion and coma. Assume any diabetic with impaired consciousness has hypoglycaemia until proven otherwise. Conscious patients can usually be treated with rapid acting oral carbohydrates, e.g. fruit juice, packets of granulated sugar, glucose powder neat or dissolved in water. After ten minutes this short acting carbohydrate should be followed up with food which contains longer acting carbohydrate. It is important that the victim is not left alone until all danger of hypoglycaemia has passed. If the patient is unconscious, attend to the airway, breathing and circulation. Protect the victim from injury and call for emergency care

Epilepsy^{5,6,7, 20.}

Epileptic seizure is not a disease but rather a complex symptom characterised by chronic recurrent paroxysmal changes in neurologic function that are caused by abnormal activity in the brain. Seizures may be either convulsive or manifested by other changes in neurologic function. Proper pretreatment medical evaluation is necessary to face the emergency situations.

Table III. GUIDELINES FOR GOOD PRACTICE ON EMERGENCIES IN DENTAL PRACTICE
CONDITION CLINICAL FEATURES TREATMENT/ RESPONSE

	condition	Clinical features	response /treatment
1.	Vasovagal syncope [fainting] approximately 40%.	Faintness, weakness, pallor, sweaty skin, lowered pulse rate, hypotension	Lie horizontally, elevate feet, oxygen, monitor vital signs
2.	Hyperventilation approx.30% [frequently confused with syncope].	Dyspnoea, rapid breathing, faintness, paraesthesia of extremities, palpitations.	Encourage slower breathing, rebreath expired air with a paper bag.
3.	Asthma [Medical History]	Dyspnoea, cyanosis, audible wheezing, cyanosis.	Reassure, use up to 4 metered doses of aerosol bronchodilator.
4.	Epilepsy [Grand Mal] [Inquire as to control of condition, medication, last episode.]	Sudden unconsciousness, temporary aspnoea and cyanosis in tonic phase, involuntary movement of limbs in clonicphase.	Place in lateral position, protect from injury, monitor vital signs, oxygen, medical assistance.
5.	Toxic effects from LA [rare].	Adrenaline toxicity - restlessness, throbbing headache, pallor, rapid full pulse,palpitations. LA base toxicity - first CNS stimulation then depression with convulsions	Basically supportive - effects should terminate rapidly
6.	Hypoglycaemia [History of insulin dependent diabetes.]	Slurred speech, altered behaviour, sweating, rapid pulse, apprehension, then loss of consciousness.	Give orange juice, glucose drink or sugar lumps at first sign which will rapidly terminate event ie. loss of consciousness should never occur. If loss of consciousness occurs, will need parenteral therapy [glucose or glucagon.]
7.	Acute airway obstruction [choking].	Sudden aspnoea or dyspnoea cyanosis, violent coughing spasms, inability to catch breath.	Try to remove cause - 5 back blows with patient leaning forward. If unable to remove, administer oxygen, arrange transfer to hospital for bronchoscopy
8.	Severe Allergic reaction. [Anaphylaxis]. NB. History of allergies.	Asthma like symptoms. [sneezing and dyspnoea] circulatory collapse, cardiac arrest, following drug administration.	Call emergency immediately. Always check that respiratory distress not due to other causes. Adrenalin 1:1000 IM [1/2 ml] as injection or epipen. May need to repeat dose after 5 minutes. 100% oxygen. CPR if cardiac arrest occurs.

Source: AUSTRALIAN DENTAL ASSOCIATION INC

Evaluation should be directed to the type of epilepsy, Drug regimen and frequency of seizure attack. There are several types of epilepsy. In a major seizure there is a sudden spasm of muscles producing rigidity (tonic phase). Jerking movements of the head, arms and legs may occur (chronic clonic). The victim becomes unconscious and may have noisy or spasmodic breathing, salivation and urinary incontinence. Status epilepticus occurs when a convulsion lasts longer than 30 minutes or when a tonic-chronic seizure occurs repeatedly. Management includes the removal of dangerous objects from the mouth and around the patient, e.g. dental cart. Loosen the tight clothing and avoid restraining the patient. The mouth should not be forced open, nor attempts made to insert any object into the mouth. Turn the victim into a stable side position as soon as the seizure stops, open and maintain a clear airway and avoid aspiration. Check for breathing. If absent, follow the guidelines for collapse. Allow the victim to sleep under supervision at the end of the seizure. On recovery, give reassurance. Transfer to hospital if:

- (i) First fit.
- (ii) Tonic phase lasts longer than five minutes.
- (iii) Repeat seizure.
- (iv) Any post-seizure respiratory difficulty.
- (v) Patient has suffered an injury.
- (vi) Post-seizure confusion greater than five minutes.

Dental therapy contraindicated for patients with poor control (i.e., more than one seizure per month). If narcotic analgesics necessary, reduce dosage for patients concurrently receiving CNS depressant drugs. Tetracyclines relatively contraindicated for

patients on phenytoin, phenobarbital, or primidone; degradation of antibiotic accelerated. Primary goal is to prevent self inflicted injuries. Place patient in supine position. Gently, but not forcibly, restrain the patient. If possible, place part of a towel or padded tongue depressor between teeth (to prevent biting lips and tongue). Ensure airway patency by extending patient's head. Monitor vital signs. Most seizures last two to five minutes, followed by post-ictal phase. During post-ictal phase, the patient may be confused and recovers over one hour period. Discharge patient from dental office in the custody of a responsible person. Inform patient's physician. With recurrent seizures or persistent seizure activity (more than 5 minutes), obtain medical assistance. Call for immediate transportation to an emergency room. Administer 5 to 10 mg i.v. diazepam slowly over 1 to 2 minutes.

CONCLUSION

It is to conclude that the medical emergencies can happen anywhere. The stressful nature of a dental visit can trigger an emergency in sensitive child patients. Knowledge is power. Know what to do and also know your limitations, and most of all, should know when to call in experts. A quick review chart (table III) is given for guidance in emergency situations. In summary, recording a patient's medical and drug history will enable dental practitioners to identify those at particular risk of suffering an emergency episode and appropriate measures can be taken to reduce the chance of such an emergency occurring. However, emergencies will still happen and it is recommended that Dental surgeon and his staff members review their current knowledge and skills including the administration of drugs, and seek appropriate training if required.

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