

Preparing for Medical Emergencies in the Dental Office

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An emergency is a medical condition demanding immediate treatment. Emergencies do occur in dental offices: a survey of 4,000 dentists conducted by Fast and others¹ revealed an incidence of 7.5 emergencies per dentist over a 10-year period. Every dentist should have the basic knowledge to recognize, assess and manage a potentially life-threatening situation until the patient can be transported to a medical facility. Successful patient management relies on understanding the pathophysiologic processes and how to correct them.

Dealing with medical emergencies is not as difficult as most dentists expect. There is far less to know, for example, than what we have already learned and use every day in our practice. Keep in mind that some emergencies end in disaster even in hospitals where there is optimal management. People have heart attacks every day — they may just happen to be in your office at the time. Usually these tragic events happen through no fault of one's own; you just need to be prepared and know what to do to give the patient the best chance of recovery.

We are dealing here with the very basics of what keeps us alive — the ABCs, i.e., airway, breathing and circulation. Vital signs are key to assessing a patient in trouble. Respiratory rate, pulse and blood pressure are what need to be measured, nothing more sophisticated than that. If all these vital signs are normal, chances are the patient will be fine. If they are not, your goal is to normalize them until the patient can receive appropriate medical attention.

When assessing the respiratory system, look at the patient's chest and abdomen for excursive movements. In a patient where it is difficult to see movement, it may be easier to feel movement with your hand on the chest or abdomen. Pulse can be palpated for rate, rhythm and contour at any of the readily available arteries such as the radial in the wrist or the carotid in the neck. Remember that **blood pressure (BP) = cardiac output (CO) x peripheral resistance (PR)**. ($CO = \text{stroke volume [SV]} \times \text{heart rate [HR]}$). Stroke volume refers to the volume of blood returned to the heart for pumping and the force of contraction by the heart as it pumps the blood out.) Most emergencies result in an alteration of this formula and your treatment objective is to correct the deviation. Blood pressure is usually checked in the upper arm using the brachial artery. All office personnel should know

how to take vital signs. If a patient has no arms, a large blood pressure cuff can be placed around the thigh using the popliteal artery at the back of the knee to auscultate for blood flow.

Education and Preparation

All members of the dental team, including the dentists, hygienists, assistants, receptionists or other office personnel, should have current CPR certification. Yearly refresher courses are recommended. The next level in training that dentists can receive is advanced cardiac life support (ACLS), which deals with advanced life-saving techniques such as intubation, defibrillation, IV access, emergency drug administration and recognition of cardiac dysrhythmias. Emergency room physicians, nurses and medical technicians use these techniques on a daily basis. Advanced trauma life support (ATLS) is a more intense course designed for individuals dealing with traumatized victims. While most oral and maxillofacial surgeons require this training, there is little need for other dentists to become ATLS-certified other than for general interest.

Reference material such as *Medical emergencies in the dental office*² should be kept handy.

As always, prevention is the best medicine. The Fast survey found that 28% of emergencies occurred during root canal therapy and 37% during extraction procedures.¹ These statistics suggest that fear, anxiety, pain or discomfort may predispose some patients to an emergency situation. If the dentist is able to alleviate the patient's concerns and use adequate pain-control techniques, then a major step has been taken in preventing an emergency.

Preparation for emergencies includes:

- training all members of the office staff in recognizing and managing life-threatening situations;
- developing a team approach with individual responsibilities;
- conducting simulated emergency events.

Your dental office staff should also be aware of the resources available (Table I).

Prevention of a medical emergency begins as soon as the patient enters your office and fills out the medical questionnaire. An accurate medical history is extremely important for

Table I Dental Office Emergency Resources

1. Emergency telephone numbers			
911			
ambulance			
physician			
oral and maxillofacial surgeon			
2. Emergency drugs			
a) injectable:		b) non-injectable:	
sympathomimetic	epinephrine (1 mg/ml)	oxygen	
antihistamine	Benadryl (50 mg/ml)	vasodilator	nitroglycerin (sublingual tablets or spray)
anticonvulsant	Versed (5 mg/ml)	bronchodilator	Ventolin
corticosteroid	dexamethasone (5 mg/ml)	aromatic ammonia	
antihypoglycemic	glucagon (1 mg/ml) dextrose in water	source of sugar	glucose gel, table sugar
analgesic	morphine (10 mg/ml)	antiplatelet	ASA (325 mg tablets)
3. Emergency equipment			
oxygen delivery system (Ambu bag, nasal prongs)			
large bore suction tips			
needles and syringes			
oropharyngeal airway			
Chemstrips			

the dentist to identify any predisposing factors that could give rise to an unforeseen event. Remember — forewarned is forearmed. Although every dental office has its own medical questionnaire, there are six basic questions that should be asked to detect potential problems:

1. Do you have any allergies?
2. Is there a history of bleeding?
3. Do you have shortness of breath?
4. Do you have or have you had chest pains?
5. Are you taking any medication?
6. Have you previously been admitted to hospital?

A positive answer to any of these questions should be investigated to determine if treatment needs to be modified.

The next step in prevention occurs when you first see your patient. A visual inspection will allow you to detect any abnormal coloration of the skin or lips or shortness of breath, and will give you an overall impression of the patient's general health status. Talking to the patient will also give you an idea of his or her anxiety level and state of mind.

While performing your exam, record baseline vitals. This information is important in assessing the patient's overall

health and comparing the vital signs that are recorded during an emergency situation.

A constant review of physiology will be beneficial in helping you correctly interpret a patient's medical history and vital signs, and in relating the signs and symptoms to the patient's potential response to treatment. In the management of medical emergencies, it is important to remember the role of oxygen in maintaining the cell, the basic living unit of the body. In any emergency situation, your major concern should be how this event will affect the supply and/or demand for oxygen to each organ.

The entire body contains about 75 trillion cells. Although they perform different functions, they all have one thing in common: the need for oxygen as a substrate from which energy is derived. We need oxygen to produce energy units of ATP, which can then be used to both maintain cell membrane integrity and fuel cellular processes. If the cell doesn't have oxygen, it doesn't survive. For each specific emergency, the clinician must consider how treatment will favourably alter and improve the supply-demand equation for oxygen.

The body uses three systems that are integral to ensuring the oxygenation of all cells: the hematopoietic, the cardiovascular and the respiratory systems.

Blood consists of 40% cells; the remaining 60% is plasma. Ninety-nine per cent of the cells are red blood cells and one per cent are white blood cells. Hemoglobin in the red blood cells allows 30 to 100 times more oxygen to be transported as compared to simple dissolved oxygen in plasma. It is the loose, reversible combination of oxygen with hemoglobin that produces a bright red colour. Deoxygenated hemoglobin is bluish purple. When you examine a patient, note perfused areas such as the lips and nail beds for clues of how well the patient is being oxygenated.

To get oxygen to every cell, the body needs a pump and a circuit. The heart is the pump and the arterial and venous system is the circuit that carries blood away from and back to the heart, respectively.

When you record a patient's pulse and blood pressure, you gather a considerable amount of information about this system. A recorded blood pressure of 120/80 means the patient has a reading of 120 mm of mercury during systole, which is the period of contraction by the left ventricle. The reading of 80 mm of mercury occurs during diastole, the interval during which the left ventricle is relaxed and refilling with oxygenated blood. Remember that $BP = CO (SV \times HR) \times PR$; a change in any part of this equation will have a direct effect on increasing or decreasing the recorded value of the blood pressure. You can use patient management and positioning as well as pharmaceutical means to favourably alter the blood pressure. To quickly assess the cardiovascular system, feel the radial or carotid pulse to determine heart rate and stroke volume. There is a significant difference in managing a patient whose pulse is strong and regular, as opposed to a patient whose pulse is weak and irregular.

To get oxygen into the blood, the patient needs both ventilation and perfusion. Ventilation is the inflow and outflow of air between the atmosphere and lung alveoli, while perfusion is the flow of blood to the lung alveoli. If the flow of blood in the lungs is interrupted — as a result of a large blood clot or embolus, for example — then there may be insufficient oxygen getting into the blood even with adequate ventilation. Conversely, if the flow of air into the lungs is obstructed by a tooth, a rubber dam clamp or an acute asthmatic attack, then there may be insufficient oxygen getting into the blood even with adequate blood flow. It is important to remember the act of breathing is driven by the level of carbon dioxide in the blood. As this level increases secondary to cellular metabolism, our stimulus to breathe increases. Conditions affecting this stimulus can be the basis of management or, indeed, the cause of a medical emergency.

Emergency Team Structure

The dental office should have a working emergency plan in place and rehearse it at least once a year. Because of the variation in practices, every office needs to design its own emergency team structure. All emergency situations require a team leader — this structure is no different from the one adopted in emergency rooms where one person is designated to oversee the entire process of caring for the patient, giving all the orders

and directing people to do various tasks. In the dental office the team leader will probably have a more active role in assessing and treating the patient. The team leader is usually the dentist, but any number of more qualified individuals can assume the role, such as a cardiologist or a physician whose office is nearby. Make sure the individual whose help you solicit is current and knowledgeable about medical emergencies. Keep a contact number for this individual at the receptionist's desk along with other emergency numbers such as ambulance, emergency room or local hospital.

The team leader is person 1 (P1). The next most available person (P2), perhaps the assistant who is already in the room, will assist P1 directly, and can be responsible for vital signs, the application of oxygen, getting the emergency cart or whatever common sense dictates according to your team structure. The next available person (P3) will have the task of going down the hall for an emergency cart, preparing emergency drugs or whatever else P1 decides. The office receptionist plays a vital role and is given organizational tasks, including making all necessary phone calls, soliciting help and recording events. As in a hospital emergency department, this person is responsible for advising the team leader as to the time elapsed since any particular drug was given, for recording all vitals with corresponding time, and for charting all events and interventions. This information may seem of secondary importance during a life-threatening emergency, but it is very valuable in reviewing a patient's progress, especially once he or she gets to a hospital where emergency room physicians will need to know what was done and when so they can further manage the problem at hand.

Summary

If you discover an unconscious patient in your office, attend to the ABCs while you evaluate the patient's medical history and piece together the events leading up to the emergency. These actions will help you arrive at a diagnosis. Then as the emergency cart and team arrive, you will be able to provide good, safe care to stabilize the patient and get him or her to a medical facility. ♦

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