

# Medical emergencies response plan: Is your dental clinic ready?

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## Abstract

Dentists should provide a safe environment for all patients and this also includes preparing for the occurrence of medical emergencies in dental setting. Managing medical emergencies must be considered in the initial set up of a dental clinic. Some emergencies are indeed unavoidable hence all dental clinic members must be prepared and well trained to manage medical emergencies. Among the steps that should be taken in preparing dental clinic for medical emergencies are development of emergency plan, evaluation of patients' risk, monitoring of vital signs, training of staff and availability of emergency drugs and equipment.

**Keywords:** dental care, emergency treatment, resuscitation

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## Introduction

An emergency is often regarded as a serious, unexpected, and occasionally dangerous situation requiring immediate action. Medical emergencies can occur to patients in dental setting with or without any relation to the dental procedure. The silent epidemic of aging that is taking over our population has increased the likelihood of senior citizens with complex medical histories being treated in dental clinics (Ngeow *et al.*, 2015). With the advancement in medical fields, it is anticipated that there will be more complex medical conditions which later will result in new challenges to dental practitioners.

The frequency of medical emergency in dental setting varies between countries, but it would be enough to say that it is not uncommon (Alhamad *et al.*, 2015). Recent studies on prevalence of emergencies events in dental clinic showed that many dentists will at least experience one medical emergency event annually (Obata *et al.*, 2021). Therefore, dentists should be prepared to equip themselves with proficient knowledge and training on the management of medical emergencies which includes the administration of common drugs used in such situation.

Most of the medical emergencies that occur in dental settings are not preventable and can be managed accordingly such as vasovagal syncope, hypoglycaemia, angina, choking, allergic reaction, asthmatic attack and myocardial infarction (Vaughan *et al.*, 2018; Mohamed Ramli *et al.*, 2019). Dental practitioner's ability to cope with medical emergencies during dental visit is imperative as the first responder that will ensure the adverse events do not lead to tragic consequences and occasionally any legal action. An ill-prepared team may result in delay in response time which may increase the likelihood of serious morbidity or mortality of the affected patient (Lawson, 2015). However, during a high-pressure scenario, sometimes it is hard to navigate the flow on how to respond through the crisis especially when one is unable to identify the exact diagnosis of the patient's condition. Previous studies have proven that there were significant gaps in proficiency of handling medical emergency among dental practitioners and dental students which later reflects as lack of confidence (Vaughn *et al.*, 2018).

Initiating the immediate management with ABC (airway, breathing and circulation) approach of basic cardiopulmonary resuscitation should always be considered during emergency events as it is consistent with the key principle in managing most medical emergencies especially in the situation when the diagnosis is vague (Uyamadu & Odai, 2012). Providing a effective basic pulmonary resuscitation as the cornerstone management of medical emergency is the prime contribution of dental practitioner towards sustaining the chain of survival of their patients and failure to comply may lead to the loss of life (Elacheziyan *et al.*, 2012).

## Objectives

1. To introduce comprehensive steps in preparing dental clinic in dealing with unexpected medical emergencies.

## Steps for Preparing Dental Care Managing Medical Emergency

### 1) Development of Medical Emergency Response Plan.

Appropriate preparation of the dental office is important for the rapid identification, and successful management of medical emergencies in dental setting. During the incident of medical emergency in dental setting, one can easily experience panic and may be in a confused state as how to respond to the condition. Being ill-prepared will only lead to more negative outcome. Patients' safety includes avoidance of preventable adverse events (accidents, errors, and complications) associated with health care and to limit the impact of inevitable adverse events. Medical emergencies account for 5% of patients' safety incidents recorded (Thusu *et al.*, 2012). Assessment of the current available safety management in the dental clinic is the first step that should be taken by the dental practitioner. Any data or previous experience in handling medical emergency in dental practice should not be hidden and must be acknowledged to plan for improvement (Yamalik, & Pérez, 2012).

Subsequently, a dental clinic must establish a comprehensive and easy to follow written manual on how to handle medical emergency situation. The response plan will be different from one dental clinic to another, depending on the types of treatment offered (inhalation or intravenous sedation), trained staff available, accessibility to the nearest hospital, equipment and drugs available.

Studies have shown that prevalence of medical emergency in a hospital setting and general dental clinic differs as there are more medically compromised and elderly patients being referred to dental clinic in hospital setting for treatment (Anders *et al.*, 2010). Clinic that offers dental treatment under sedation must be able to handle medical emergencies such as central nervous system depression and medical emergency related to respiratory complications (Becker *et al.*, 2014). Thus,

specific medical emergency plan must be laid out based on the type of treatment provided and the capability of dental auxiliaries in handling medical emergency.

In the development of medical emergency plan, each dental staff should be able to respond and act according to the role assigned (Table 1). During emergency situation, it is easy to get panic and thus, unable to react appropriately. An assertive leader must be able to give instructions and

keep the team calm and take command of the situation. This role must clearly be assigned in the medical emergency plan and each dental staff should be trained to perform specific task as outlined in the response plan. Ultimately, the goal of all team members must be focused on adequate oxygenation of the brain and heart of the patient. Roles can be interchangeable according to the situation and availability.

Table 1. Example of roles during medical emergency in dental clinic.

Team Members	Role
<b>Team member 1 (T1)</b>	<ul style="list-style-type: none"> <li>• In charge and lead the management of the crisis.</li> <li>• Assign team member to call for outside assistance.</li> <li>• Assess ABCs and initiate cardiopulmonary resuscitation (CPR) if indicated until assistance arrives.</li> <li>• Give direct and clear instructions.</li> <li>• Remain with the patient throughout the emergency.</li> </ul>
<b>Team member 2 (T2)</b>	<ul style="list-style-type: none"> <li>• Preparation of emergency drugs and help with documentation (findings of the event which includes vital signs, random blood glucose, SPO2, timing, type and amount of drugs administered).</li> <li>• Assists with ABCs, CPR and vital signs monitoring.</li> </ul>
<b>Team member 3 (T3)</b>	<ul style="list-style-type: none"> <li>• Contact ambulance, wait for paramedics and lead them to the patient.</li> <li>• Locate and bring the emergency kit, portable oxygen and automated external defibrillator (AED).</li> <li>• Help in the further management of patient.</li> </ul>

Effective communication during an emergency is pivotal in making sure the management goes smoothly. “Close-loop” approach is advocated to use during such situation (Haas *et al.*, 2010). This means when the leader sends a message, the team member acknowledges receiving the instruction, thereby confirming that he or she heard and understood the message. This technique will ensure that the instructions given are not being missed by team members assuming that someone else is performing the task when in fact no one is acting on the command (Table 2).

In the manual, outline the flow of management for specific expected medical emergency. This can be simply taken from various established manual and guideline. Other factor should also be taken into consideration such as:

1. Location of the clinic
2. Usage of lift elevator (whether the size can fit a stretcher)
3. Nearest hospital direct number (prior arrangement and agreement must be made between the dental clinic and nearest hospital to refer any medical emergencies)
4. Maximum weight for dental chair (whether CPR can be performed on the

dental chair or need to transfer patient down on the floor)

## 2) Medical history and at-risk patients

Prevention is the main strategy in dealing with any diseases including in the case of emergency. Screening of at-risk patients can be done by a comprehensive medical, allergies and drug history. Advances in medicine have greatly increased the survival of patients with severe health problems and have significantly prolonged life in elderly individuals with systemic disorders. The

updated past medical history is an essential component of risk assessment for the likelihood of a patient to experience a medical emergency.

Obtaining the medical history will prompt the dental practitioner to modify the treatment plan or make any necessary specialist referral. Knowledge of the dental practitioner on medical diseases such as cardiovascular, endocrine and respiratory systems must be sound in order to identify at risk patient

Table 2. Examples of close loop communication.

Team member 1	: <i>Ali, call for ambulance.</i>	Team member 1:	: <i>Ali, bring the AED.</i>
Team member 2	: <i>I am going to call ambulance.</i>	Team member 2	: <i>I am going to get the AED.</i>
Team member 1	: <i>Yes, hurry up.</i>	<b>When Ali returns</b>	
<b>When Ali returns</b>		Team member 2	: <i>AED is here.</i>
Team member 2	: <i>I have called the ambulance and they are on the way.</i>	Team member 1	: <i>Thank you, help me assemble it.</i>

If there are any enquiries regarding a patient’s medical condition, it is best to actually consult patient’s own medical practitioner.

The ability to conduct an accurate patient risk evaluation becomes the foundation for informed practice, patient selection and risk assessment. Other than updated medical condition, risk assessment of dental patient prior to treatment can be done using American Society of Anaesthesiologists Physical Status (ASA PS) classification. This system may be useful, particularly when communicating with other teams involved in patient care. (Clough *et al.*, 2016) The ASA status of patient should be recorded in patients notes as stated in Table 4. For patients in ASA PS 1, all dental treatment can be allowed. While for ASA PS II and III, dental treatment can be done with minimal risk and

treatment modification. Extreme caution must be taken for ASA PS III. As for PS IV and V the risk for elective dental treatment is too high, and for emergency treatment, it is advisable to be done under hospital setting (Malamed, 2010).

## 3) Vital Signs

The National Early Warning Score (NEWS) can be used as a method in avoiding medical emergencies in dental setting (Omar, 2013). In this system, it uses simple scoring system in which a score is allocated to physiological measurements undertaken when a patient becomes or complains of feeling ‘unwell’. The parameters include respiratory rate, oxygen saturation, temperature, systolic blood pressure, pulse rate and level of consciousness.

Patient with medical problems must have basic monitoring such as blood pressure and pulse rate before receiving dental treatment to ensure safety during the treatment (Table 4). Value for each sign must be recorded and make sure that vital signs are stable prior to dental treatment. The dental practitioner and staff involved in treating the patient can perform these basic monitoring without the need for costly monitoring equipment. During emergency, monitoring of these vital signs is important as it will reflect on patient's condition from time to time. From previous study, sadly it was found that majority of the dental practitioner did not take vital signs before performing dental treatment (Kumarswami S. *et al.*, 2015). Vital signs are early signs showing that patient is not in a stable condition, for example, blood pressure readings will help the dental

practitioner to identify patient with severe hypertension which carries risk of heart attack and stroke (Southerland *et al.*, 2016)

Pain and stress experienced by the patient may alter the vital signs. The stress leads to changes of physiological parameters that can in return induces medical emergencies. Dental anxiety itself is able to cause hemodynamic changes by releasing catecholamines and increases workload of the heart. Therefore, close monitoring of patients with dental anxiety during the treatment is advised (Alghareeb Z. *et al.*, 2022). This practice allows dental practitioners to treat patients in a safer environment as well as improving overall health outcomes.

Table 3. Indicator for increased risk of medical emergency.

Medical Condition	Criteria for increased risk for medical emergency
Angina	Recent chest pain. Consider risk factor in patient (stress). Raised blood pressure upon physical examination.
Asthma	The number of inhalers and the dose that patient is on. History of frequent asthma attacks (requiring nebulisation or visit to emergency department) Previously been hospitalized, previous intensive care unit (ICU) admission and those patients currently taking oral corticosteroids.
Epilepsy	Recent change of medication and poor seizure control. Information regarding trigger for previous seizures for precaution. Early recognition of aura.
Diabetes	Type 1 diabetes patients are more at risk of going into hypoglycaemic state. Patient on oral hypoglycaemic agents is at lower risk. Patient with poor control or poor awareness.
Allergies	Patient with known allergies including previous reactions to antibiotics, latex and rarely local anaesthetics. History of hospitalization due to allergic reaction.

#### 4) Training of dental practitioners and dental auxiliaries

Dental practitioners and auxiliaries being prepared in dealing with emergency in dental setting is the best way to handle the situation. Studies have shown alarming statistics where many dental practitioners were not well prepared in handling emergency situations (Kumarswami, *et al*, 2015; Smereka *et al.*,2019). The lack of training and inability to manage patients with medical emergencies can lead to

unfortunate consequences legal action. The aim of Basic Life Support (BLS) is to perform effective cardiopulmonary resuscitation (CPR) with attention towards circulation, airway, and breathing. BLS knowledge and practical competency deteriorates over time and it is necessary to update the training periodically (Kim SY *et al.*, 2020). Simulation education in medical emergencies such as team training and system testing for dental practitioners and auxiliaries have been proven to improve knowledge and skills among them (Hadfield A. *et al.*, 2018).

Table 4. American Society of Anesthesiologists (ASA) Physical status classification system.

ASA PS Classification	Description	Adult Examples and blood pressure reading	Treatment recommendation
I	A normal healthy patient	Healthy, non-smoking, no or minimal alcohol use	All dental treatment can be done without special precaution.
II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Current smoker, social alcohol drinker, pregnancy, obesity (30<BMI)  Blood Pressure (BP) reading: 140-159/90-94mmHg	Elective dental treatment can be done, maybe need treatment modifications depending on the case.
III	A patient with severe systemic disease	Substantive functional limitations; one or more moderate to severe diseases. Poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, history (>3 months) of MI, CVA, TIA, or CAD/stents.  BP reading: 160-199/ 95-114 mm Hg	Dental treatment with precautions. Will need medical consultation prior to dental treatment.
IV	A patient with severe systemic disease that	Recent (valve dysfunction, severe reduction of ejection fraction, shock, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis	Elective dental care is contraindicated. Emergency care: non-invasive or need to be done in hospital setting.

	is a constant threat to life	BP reading: > 200/> 115 mm Hg	
V	A moribund patient who is not expected to survive without the operation	Ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction	All dental care is done in hospital setting. Palliative only.

It is worthwhile to send all dental personnel to attend BLS training periodically. Routine simulated medical emergency drills is also advocated to connect between knowledge and real situation as realistic simulation training is an effective adjunct coupled with

theory session (Lawson L., 2017). Simulation training must include all the common medical emergencies that can take place in dental setting such as syncope, epileptic episode, hypoglycaemia, and asthma attack (Vaughan M. *et al.*, 2018)

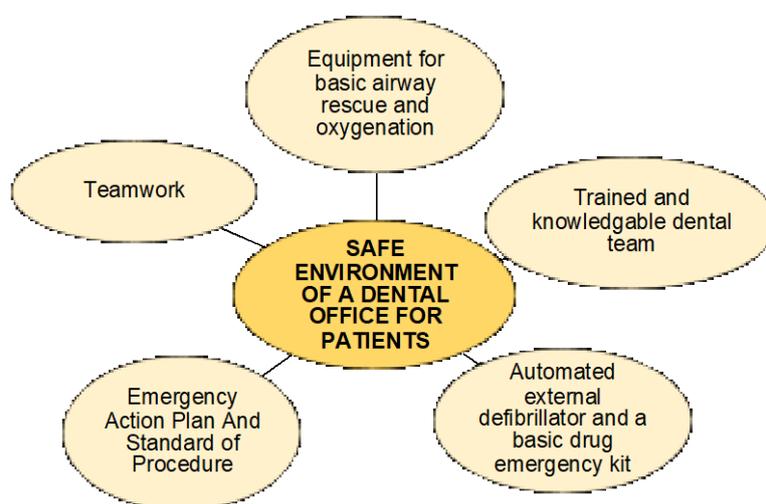


Figure 1. Factors contributing to safe environment of a dental clinic.

**5) Equipment and Drugs and its maintenance**

A dental clinic should have appropriate medical emergencies equipment and drugs available. A minimum list of equipment and drugs (Table 4) have been recommended by several authors and guideline (Jevon, 2012; Lawson, 2017; Greenwood and Meechan, 2014). The targeted list of drugs and equipment are based on the likely occurrence of medical emergency that can happen in the dental setting. Furthermore, consideration of capability of a dental practitioner administering those drugs is

also important. The use of intravenous drugs for medical emergencies in general dental practice is to be discouraged. Intramuscular, inhalational, sublingual, buccal and intranasal routes are all much quicker method to administer drugs during emergency by taking into consideration the capability of a dental practitioners to obtain intravenous line.

All drugs should be stored together in a custom-designed 'Emergency Drug' storage container. Having the necessary emergency drugs and equipment readily accessible (and portable) in the dental clinic help to minimize response time. The equipment

should be available for use within the first minutes of cardiorespiratory arrest. It is crucial to highlight that the team members should be proficient and had been fully trained to administer the drugs contained in the emergency kit. The drugs should be

properly labelled and periodically checked to ensure they have not expired. Resuscitation standards expected for clinics that offer “conscious sedation” are different from a primary dental practice setting (Resuscitation Council UK, 2013).

Table 5. List of recommended emergency drugs and equipment in primary dental care practice (Resuscitation Council UK, 2013).

Emergency Drugs	Emergency Equipment
<ul style="list-style-type: none"> <li>• Adrenaline injection (1:1,000, 1 mg/ml)</li> <li>• Aspirin dispersible 300 mg</li> <li>• Glucagon injection 1 mg</li> <li>• Glyceryl trinitrate (GTN) spray (400 µg/dose)</li> <li>• Oral glucose solution/tablets/gel/powder</li> <li>• Midazolam 10 mg (buccal)</li> <li>• Salbutamol aerosol inhaler (100 µg/actuation)</li> </ul>	<ul style="list-style-type: none"> <li>• Protective equipment - gloves, aprons, eye protection</li> <li>• Pocket mask with oxygen port</li> <li>• Portable suction <i>e.g.</i> Yankauer</li> <li>• Oropharyngeal airways sizes 0,1,2,3,4</li> <li>• Self-inflating bag with reservoir (adult and child)</li> <li>• Clear face masks for self-inflating bag (sizes 0,1,2,3,4)</li> <li>• Oxygen cylinder</li> <li>• Oxygen masks with reservoir</li> <li>• Oxygen tubing</li> <li>• Automated external defibrillator (AED)</li> <li>• Adhesive defibrillator pads</li> <li>• Razor</li> <li>• Scissors</li> </ul>

## Conclusion

Prevention of medical emergency in dental clinic must be one of the major aims in practicing safe dentistry. Even though it is not common, but all dental practitioners should be able to handle medical emergencies as they are mostly manageable and non-life threatening. Patients’ risk assessment must be made thoroughly, and their medical status should be updated at each visit. In preparing for an emergency situation, the dental clinic must have a functional medical action plan, trained staff, good teamwork, adequate medical emergency equipment and drugs.

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