COLLEGE OF DENTISTRY

DAR AL ULOOM UNIVERSITY

EMERGENCY MANUAL

Table of Contents

TERMINOLOGIES

USC	University Staff Clinics in College.
Patient	Any individual who presents with a medical emergency both inside and outside the dental clinical premises.
Faculty	Teachers with different ranks in the Dar Al Uloom involved in clinical teaching and/ or patient treatment.
Clinician	Dentist/Clinician Student, postgraduate, residents, clinicians and faculty member who provide dental treatment to patients in the college.
Staff	All the auxiliary workers in the clinic who are involved in providing the dental services in the college.

SCOPE

Dar Al Uloom University, College of Dentistry is a newly developed institution, equipped with the state of the art technologies to treat patients with dental issues. The college is run in conjunction with a university hospital. The purpose of this document is to provide guidance to all dentists, staff members, students and faculty members on how to deal with the most commonly encountered medical emergencies.

Medical emergencies can be encountered both inside and outside dental clinics. Emergency Room (ER) protocols are specific orders directing the actions pertaining to techniques and / or medications used by personnel who are required to take rapid life saving measures, which will serve to initially stabilize the patient vitally. ER protocols should be followed without any prior communication with an Emergency Medical Team/Paramedics. The protocols should be followed as soon as possible when a patient's condition is found to be life threatening and rapidly deteriorating. As soon as the situation permits, direct contact should be established with a tertiary care hospital, equipped to manage patients with all types of medical emergencies.

MEDICAL CONTROL PROTOCOLS AND PROCEDURES GUIDELINES

1. The patient history should not be obtained at the expense of the patient. Life-threatening problems detected during the primary assessment ***must*** be treated first.

2. Cardiac arrest due to trauma is not treated by medical cardiac arrest protocols. Trauma patients should be transported promptly with CPR, control of hemorrhage, cervical spine immobilization, and other indicated procedures attempted en route.

3. In patients with non-life-threatening emergencies who require IV's, only two attempts at IV insertion should be attempted in the field, additional attempts must be made enroute.

4. In patients requiring IV's, attempts should be made to obtain a full set of bloods.

5. Patient transport, or other needed treatments, must not be delayed for multiple attempts at endotracheal intubation.

6. Verbally repeat all orders received before their initiation.

7. Any patient with a cardiac history, irregular pulse, unstable blood pressure, dyspnea, or chest pain ***must*** be placed on a cardiac monitor and a copy of the EKG ***must*** be attached to the EMS Run Sheet.

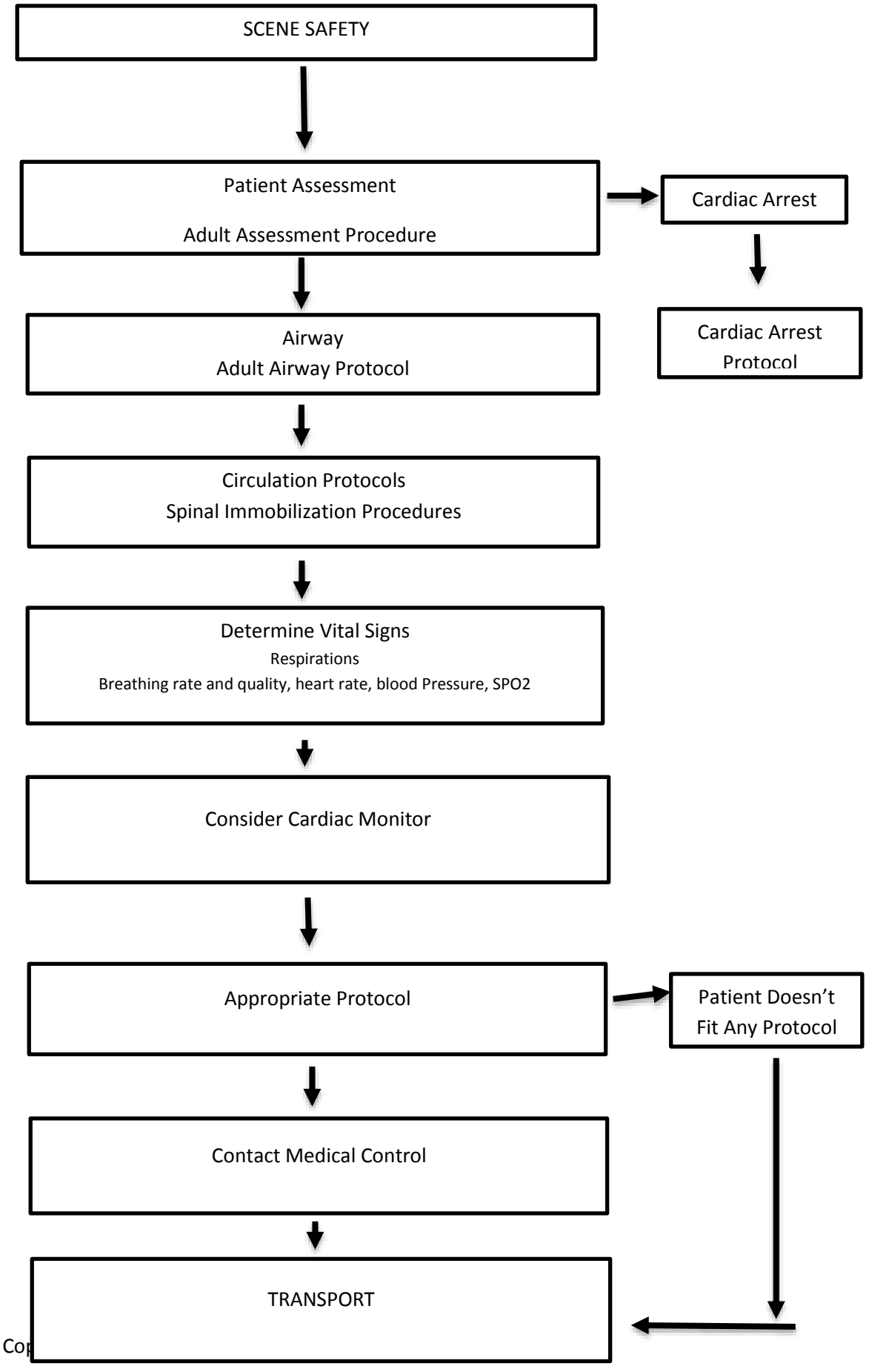
8. When transferring lower level prehospital care to a higher level of prehospital care, a thorough consult should be performed between caregivers describing initial patient presentation and care rendered to the point of transfer.

9. If the patient's condition does not seem to fit a protocol or protocols, contact Medical Control for guidance.

10. All trauma patients with mechanisms or history for multiple system trauma will be transported as soon as possible. The scene time should be 10 minutes or less.

11. Medical patients will be transported in the most efficient manner possible considering the medical condition. Advanced life support therapy should be provided at the scene if it would positively impact patient care. Justification for scene times greater than 20 minutes should be documented.

UNIVERSAL MEDICAL CARE PROTOCOL



Medical Emergencies

Medical Emergency is an injury or illness that is acute and poses an immediate risk to a person's life or long term health**.**

All dental practitioners and dental care professionals may have to deal with medical emergencies. Although these are rare and in spite of the fact that such events happen infrequently, yet the dental team needs to keep in mind that

- Medical emergencies can occur at any time.
- All members of staff need to know their role in the event of a medical emergency.
- Members of staff need to be trained in dealing with such an emergency.
- Dental teams should practice together regularly in simulated emergency situations.

The management of such a condition, if and when such condition does come across and a prompt action taken, can be lifesaving to the patient.

Various types of emergencies can arise in both dental and non-dental setup. These can be grouped into

Respiratory issues

- Foreign Body airway obstruction
- Respiratory distress
- Congestive heart failure and Pulmonary Edema
- Traumatic Breathing

Shock

- Anaphylactic Shock / Reaction
- Cardiogenic Shock
- Hypovolemic Shock

- Neurogenic Shock
- Septic Shock

Drug Reactions

- Allergy
- Anaphylaxis

Cardiac Emergencies

- Acute Coronary Syndrome
- Bradycardia
- Narrow - Complex Tachycardia
- Wide - Complex Tachycardia
- Cardiac Arrest
- Asystole / Pulseless Electrical Activity (PEA)
- Ventricular Fibrillation (V-FIB) / Pulseless Ventricular Tachycardia

Fits

- Epileptic Seizures

Diabetic Emergencies

- Hypoglycemia
- Hyperglycemia

Vascular Events

- Hypotension
- Hypertensive Crisis

Risk Assessment of Medical Emergencies

Prevention is the most vital phase in the management if medical emergencies. It must be remembered however, that despite all efforts at prevention EMERGENCIES will happen. The following should be considered for most of the patients:

- Any patient can have a medical emergency during dental treatment.

- A comprehensive medical and drug history will enable the Dental Practitioner to identify patients at particular risk and take measures to reduce the chance of a problem arising.

- History taking should not be delegated to another member of the dental team and patient completed health questionnaires are only acceptable if augmented by a verbal history taken by the dental practitioner.

- Modifying the planned treatment or referral to a hospital may be appropriate for some dental procedures in selected patients.

- Dental practitioners should routinely assess patients using a risk stratification scoring system, e.g., the American Society of Anaesthesiologists (ASA) classification. This may help identify patients with a higher risk of medical emergencies occurring during treatment. Such systems can be incorporated into a specifically designed medical history questionnaire so that the risk scoring becomes part of the routine medical history.

- As patients' medical problems and medication can change frequently, dental practitioners must demonstrate that medical and drug histories are formally updated at least annually and interim changes noted at treatment visits. Liaison with the patient's general practitioner may be necessary.

Drugs required for managing medical emergencies

In order to manage medical emergencies in both the clinics and outside the clinics the following drug are mandatory and should be present at all times in a crash cart

Adult Medications

- Adenocard 6mg vial (3)
- Amiodorone (with excel bag or glass bottle) (3)
- Atropine 1mg / 10mL PFS (2)
- Calcium Chloride 10% 1gm / 10mL PFS (2)
- Dextrose 50% / 50mL PFS (2)
- Dobutamine Drip 500mg / 250mL (1)
- Dopamine Drip 400mg / 250mL (1)
- Ephedrine 50mg / 1mL vial (2)
- Epinephrine 1:1,000 AMP (2)
- Epinephrine 1:10,000 / 10mL PFS (6)
- Furosemide (Lasix) 40mg vial (2)
- Isuprel 0.2mg / mL AMP (1)
- Lidocaine Drip 1g / 250mL (2)
- Lidocaine 2% 100mg / 5mL PFS (2)
- Magnesium Sulfate 50% 10mL PFS (2)
- Neo-Synephrine HCl (Phenylephrine) 10mg / mL AMP (1)
- Nitroglycerine (Sublingual Spray) (1)
- Naloxone (Narcan) 0.4mg / mL AMP (2)
- Procainamide 100mg / mL (2)
- Romazicon 0.1mg /mL vial (1)
- Sodium Bicarbonate 8.4% (2)
- Vasopressin 20 units/mL (2)

- Lasix 40mg (4 vials)
- Oral Glucose solution/tablet/ Gel/ Powder (Hypostop)

Pediatric Medications

- Adenocard 6mg/2mL
- Atropine 1mg/10mL in syringe
- Calcium chloride 10% 1gm/10mL in syringe
- Dextrose 25% 2.5gm/10mL in syringe
- Dextrose 50% in syringe
- Dobutamine 250mg/20mL
- Dopamine 200mg/5mL
- Epinephrine 1:10,000 1mg/mL syringe
- Epinephrine 1:10,000 1mg/mL 1mL
- Lidocaine (Xylocaine) 2% 100mg/5ml syringe
- Naloxone (Narcan) 0.4mg/ml 1mL
- Racepinephrine Inhalation Solution 2.25%
- Romazicon 0.5 mg/mL
- Sodium Bicarbonate 50meq/50mL syringe
- Sodium Chloride 0.9% 10mL preservative free
- Sterile Water for injection 10mL
- Midazolam (buccal or intranasal)
- Lasix 40mg
- Oral Glucose solution/tablet/ Gel/ Poweder (Hypstop)

Equipment required for management of different medical emergencies

The following equipment should be used for managing medical emergencies. It should be noted that all medical equipment should be in working condition, and if any equipment is found to be not performing properly, then it should be promptly replaced.

- Defibrillator / Adult / Pediatric Paddles (2)
- Suction Machine with Yankauer attached (1)
- package of defibrillator pads (2)
- Automated blood glucose measurement device (2)
- Pulse Oximeter (2)
- Lead wires, Electrodes
- Stethoscope (1), BP cuff Adult (1), Pediatric (1)
- Ambu Bag (1) / Mask / Face Shield / Goggles / NC (1), Non- Rebreather (1) / Adult O2 Mask (1) / Peds O2 Mask (1)
- Adult Pacer Pads (1)
- Abg kits (2)
- Oxygen Tank (D size) with pressure reduction valve and flowmeter
- Oropharyngeal and Nasopharyngeal airways
- Suction Catheters
- 'Spacer' device for inhaled bronchodilators

❖ It is essential to mention over here that adequate infection control measures for all usable and non-usable equipments must be taken at all times and most of the equipments should only be used "once".

❖ All the staff members should update their skills atleast every 12 months

❖ All new staff hired in either the faculty or the clinics should get certified in basic life support, as a part of their induction training

- ❖ The staff members can go under training at a dental practice institute for CPR (Cardiopulmonary Resuscitation) training, or at a regional training center

Managing Medical Emergencies

Whenever there any person is suspected to have a medical emergency, the following protocols should be followed:

- ❖ There should be methods for timely identification of a sick patients
- ❖ Pre-empting any medical emergency by recognising an abnormal breathing pattern, an abnormal patient colour or abnormal pulse rate, allows appropriate help to be summoned, e.g., medical assistance, prior to any patient collapsing.
- ❖ A systematic approach to recognising the acutely ill patient based on the 'ABCDE' principles is recommended

The '**ABCDE**' approach or principle involves systematic evaluation of

Airway - Airway obstruction should be assessed and eliminated first.

Breathing - Immediate life threatening breathing should be assessed and treated.

Circulation - Circulation should be effective, this might include change in posture.

Disability - Includes assessment of any external injury or cerebral hypoxia.

Exposure - Includes loosening of patient's clothes, useful for assessment of rashes in an allergic condition

The ABCDE approach

Underlying principles

The approach to all deteriorating or critically ill patients is the same. The underlying principles are:

1. Use the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach to assess and treat the patient.
2. Do a complete initial assessment and re-assess regularly.
3. Treat life-threatening problems before moving to the next part of assessment.
4. Assess the effects of treatment.
5. Recognise when you will need extra help. Call for appropriate help early.
6. Use all members of the team. This enables interventions (e.g. assessment, attaching monitors, intravenous access), to be undertaken simultaneously.
7. Communicate effectively - use the Situation, Background, Assessment, Recommendation (SBAR) or Reason, Story, Vital signs, Plan (RSVP) approach.
8. The aim of the initial treatment is to keep the patient alive, and achieve some clinical improvement. This will buy time for further treatment and making a diagnosis.
9. Remember – it can take a few minutes for treatments to work, so wait a short while before reassessing the patient after an intervention.

First steps

1. Ensure personal safety. Wear apron and gloves as appropriate.
2. First look at the patient in general to see if the patient appears unwell.
3. If the patient is awake, ask “How are you?”. If the patient appears unconscious or has collapsed, shake him and ask “Are you alright?” If he responds normally he has a patent airway, is breathing and has brain perfusion. If he speaks only in short sentences, he may have breathing problems. Failure of the patient to respond is a clear marker of critical illness.
4. This first rapid ‘Look, Listen and Feel” of the patient should take about 30 s and will often indicate a patient is critically ill and there is a need for urgent help. Ask a colleague to ensure appropriate help is coming.
5. If the patient is unconscious, unresponsive, and is not breathing normally (occasional gasps are not normal) start CPR according to the resuscitation guidelines. If you are confident and trained to do so, feel for a pulse to determine if the patient has a respiratory arrest. If there are any doubts about the presence of a pulse start CPR.
6. Monitor the vital signs early. Attach a pulse oximeter, ECG monitor and a non-invasive blood pressure monitor to all critically ill patients, as soon as possible.
7. Insert an intravenous cannula as soon as possible. Take bloods for investigation when inserting the intravenous cannula.

Airway (A)

Airway obstruction is an emergency. Get expert help immediately. Untreated, airway obstruction causes hypoxia and risks damage to the brain, kidneys and heart, cardiac arrest, and death.

1. Look for the signs of airway obstruction:
    - Airway obstruction causes paradoxical chest and abdominal movements ('see-saw' respirations) and the use of the accessory muscles of respiration. Central cyanosis is a late sign of airway obstruction. In complete airway obstruction, there are no breath sounds at the mouth or nose. In partial obstruction, air entry is diminished and often noisy.
    - In the critically ill patient, depressed consciousness often leads to airway obstruction.
2. Treat airway obstruction as a medical emergency:
    - Obtain expert help immediately. Untreated, airway obstruction causes hypoxaemia (low PaO_2) with the risk of hypoxic injury to the brain, kidneys and heart, cardiac arrest, and even death.
    - In most cases, only simple methods of airway clearance are required (e.g. airway opening manoeuvres, airways suction, insertion of an oropharyngeal or nasopharyngeal airway). Tracheal intubation may be required when these fail.
3. Give oxygen at high concentration:
    - Provide high-concentration oxygen using a mask with oxygen reservoir. Ensure that the oxygen flow is sufficient (usually 15 L min^{-1}) to prevent collapse of the reservoir during inspiration. If the patient's trachea is intubated, give high concentration oxygen with a self-inflating bag.
    - In acute respiratory failure, aim to maintain an oxygen saturation of 94–98%. In patients at risk of hypercapnic respiratory failure (see below) aim for an oxygen saturation of 88–92%.

Breathing (B)

During the immediate assessment of breathing, it is vital to diagnose and treat immediately life-threatening conditions (e.g. acute severe asthma, pulmonary oedema, tension pneumo thorax, and massive haemothorax).

1. Look, listen and feel for the general signs of respiratory distress: sweating, central cyanosis, use of the accessory muscles of respiration, and abdominal breathing.
2. Count the respiratory rate. The normal rate is 12–20 breaths min^{-1}. A high (> 25 min^{-1}) or increasing respiratory rate is a marker of illness and a warning that the patient may deteriorate suddenly.
3. Assess the depth of each breath, the pattern (rhythm) of respiration and whether chest

expansion is equal on both sides.

4. Note any chest deformity (this may increase the risk of deterioration in the ability to breathe normally); look for a raised jugular venous pulse (JVP) (e.g. in acute severe asthma or a tension pneumothorax); note the presence and patency of any chest drains; remember that abdominal distension may limit diaphragmatic movement, thereby worsening respiratory distress.
5. Record the inspired oxygen concentration (%) and the SpO_2 reading of the pulse oximeter. The pulse oximeter does not detect hypercapnia. If the patient is receiving supplemental oxygen, the SpO_2 may be normal in the presence of a very high $PaCO_2$.
6. Listen to the patient's breath sounds a short distance from his face: rattling airway noises indicate the presence of airway secretions, usually caused by the inability of the patient to cough sufficiently or to take a deep breath. Stridor or wheeze suggests partial, but significant, airway obstruction.
7. Percuss the chest: hyper-resonance may suggest a pneumothorax; dullness usually indicates consolidation or pleural fluid.
8. Auscultate the chest: bronchial breathing indicates lung consolidation with patent airways; absent or reduced sounds suggest a pneumothorax or pleural fluid or lung consolidation caused by complete obstruction.
9. Check the position of the trachea in the suprasternal notch: deviation to one side indicates mediastinal shift (e.g. pneumothorax, lung fibrosis or pleural fluid).
10. Feel the chest wall to detect surgical emphysema or crepitus (suggesting a pneumothorax until proven otherwise).
11. The specific treatment of respiratory disorders depends upon the cause. Nevertheless, all critically ill patients should be given oxygen. In a subgroup of patients with COPD, high concentrations of oxygen may depress breathing (i.e. they are at risk of hypercapnic respiratory failure - often referred to as type 2 respiratory failure). Nevertheless, these patients will also sustain end-organ damage or cardiac arrest if their blood oxygen tensions are allowed to decrease. In this group, aim for a lower than normal PaO_2 and oxygen saturation. Give oxygen via a Venturi 28% mask (4 L min^{-1}) or a 24% Venturi mask (4 L min^{-1}) initially and reassess. Aim for target SpO_2 range of 88–92% in most COPD patients, but evaluate the target for each patient based on the patient's arterial blood gas measurements during previous exacerbations (if available). Some patients with chronic lung disease carry an oxygen alert card (that documents their target saturation) and their own appropriate Venturi mask.
12. If the patient's depth or rate of breathing is judged to be inadequate, or absent, use bag-mask or pocket mask ventilation to improve oxygenation and ventilation, whilst calling immediately for expert help. In cooperative patients who do not have airway

obstruction consider the use of non-invasive ventilation (NIV). In patients with an acute exacerbation of COPD, the use of NIV is often helpful and prevents the need for tracheal intubation and invasive ventilation.

Circulation (C)

In almost all medical and surgical emergencies, consider hypovolaemia to be the primary cause of shock, until proven otherwise. Unless there are obvious signs of a cardiac cause, give intravenous fluid to any patient with cool peripheries and a fast heart rate. In surgical patients, rapidly exclude haemorrhage (overt or hidden). Remember that breathing problems, such as a tension pneumothorax, can also compromise a patient's circulatory state. This should have been treated earlier on in the assessment.

1. Look at the colour of the hands and digits: are they blue, pink, pale or mottled?
2. Assess the limb temperature by feeling the patient's hands: are they cool or warm?
3. Measure the capillary refill time (CRT). Apply cutaneous pressure for 5 s on a fingertip held at heart level (or just above) with enough pressure to cause blanching. Time how long it takes for the skin to return to the colour of the surrounding skin after releasing the pressure. The normal value for CRT is usually < 2 s. A prolonged CRT suggests poor peripheral perfusion. Other factors (e.g. cold surroundings, poor lighting, old age) can prolong CRT.
4. Assess the state of the veins: they may be underfilled or collapsed when hypovolaemia is present.
5. Count the patient's pulse rate (or preferably heart rate by listening to the heart with a stethoscope).
6. Palpate peripheral and central pulses, assessing for presence, rate, quality, regularity and equality. Barely palpable central pulses suggest a poor cardiac output, whilst a bounding pulse may indicate sepsis.
7. Measure the patient's blood pressure. Even in shock, the blood pressure may be normal, because compensatory mechanisms increase peripheral resistance in response to reduced cardiac output. A low diastolic blood pressure suggests arterial vasodilation (as in anaphylaxis or sepsis). A narrowed pulse pressure (difference between systolic and diastolic pressures; normally 35–45 mmHg) suggests arterial vasoconstriction (cardiogenic shock or hypovolaemia) and may occur with rapid tachyarrhythmia.
8. Auscultate the heart. Is there a murmur or pericardial rub? Are the heart sounds difficult to hear? Does the audible heart rate correspond to the pulse rate?
9. Look for other signs of a poor cardiac output, such as reduced conscious level and, if the patient has a urinary catheter, oliguria (urine volume < 0.5 mL kg^{-1} h^{-1}).
10. Look thoroughly for external haemorrhage from wounds or drains or evidence of concealed haemorrhage (e.g. thoracic, intra-peritoneal, retroperitoneal or into gut).

Intra-thoracic, intra-abdominal or pelvic blood loss may be significant, even if drains are empty.

11. The specific treatment of cardiovascular collapse depends on the cause, but should be directed at fluid replacement, haemorrhage control and restoration of tissue perfusion. Seek the signs of conditions that are immediately life threatening (e.g. cardiac tamponade, massive or continuing haemorrhage, septicaemic shock), and treat them urgently.
12. Insert one or more large (14 or 16 G) intravenous cannulae. Use short, wide-bore cannulae, because they enable the highest flow.
13. Take blood from the cannula for routine haematological, biochemical, coagulation and microbiological investigations, and cross-matching, before infusing intravenous fluid.
14. Give a bolus of 500 mL of warmed crystalloid solution (e.g. Hartmann's solution or 0.9% sodium chloride) over less than 15 min if the patient is hypotensive. Use smaller volumes (e.g. 250 mL) for patients with known cardiac failure or trauma and use closer monitoring (listen to the chest for crackles after each bolus).
15. Reassess the heart rate and BP regularly (every 5 min), aiming for the patient's normal BP or, if this is unknown, a target > 100 mmHg systolic.
16. If the patient does not improve, repeat the fluid challenge. Seek expert help if there is a lack of response to repeated fluid boluses.
17. If symptoms and signs of cardiac failure (dyspnoea, increased heart rate, raised JVP, a third heart sound and pulmonary crackles on auscultation) occur, decrease the fluid infusion rate or stop the fluids altogether. Seek alternative means of improving tissue perfusion (e.g. inotropes or vasopressors).
18. If the patient has primary chest pain and a suspected ACS, record a 12-lead ECG early.
19. Immediate general treatment for ACS includes:
    - Aspirin 300 mg, orally, crushed or chewed, as soon as possible.
    - Nitroglycerine, as sublingual glyceryl trinitrate (tablet or spray).
    - Oxygen: only give oxygen if the patient's SpO_2 is less than 94% breathing air alone.
    - Morphine (or diamorphine) titrated intravenously to avoid sedation and respiratory depression.

Disability (D)

Common causes of unconsciousness include profound hypoxia, hypercapnia, cerebral hypoperfusion, or the recent administration of sedatives or analgesic drugs.

1. Review and treat the ABCs: exclude or treat hypoxia and hypotension.
2. Check the patient's drug chart for reversible drug-induced causes of depressed consciousness. Give an antagonist where appropriate (e.g. naloxone for opioid

toxicity).

3. Examine the pupils (size, equality and reaction to light).
4. Make a rapid initial assessment of the patient's conscious level using the AVPU method: Alert, responds to Vocal stimuli, responds to Painful stimuli or Unresponsive to all stimuli. Alternatively, use the Glasgow Coma Scale score. A painful stimuli can be given by applying supra-orbital pressure (at the supraorbital notch).
5. Measure the blood glucose to exclude hypoglycaemia using a rapid finger-prick bedside testing method. In a peri-arrest patient use a venous or arterial blood sample for glucose measurement as finger prick sample glucose measurements can be unreliable in sick patients. Follow local protocols for management of hypoglycaemia. For example, if the blood sugar is less than 4.0 mmol L^{-1} in an unconscious patient, give an initial dose of 50 mL of 10% glucose solution intravenously. If necessary, give further doses of intravenous 10% glucose every minute until the patient has fully regained consciousness, or a total of 250 mL of 10% glucose has been given. Repeat blood glucose measurements to monitor the effects of treatment. If there is no improvement consider further doses of 10% glucose. Specific national guidance exists for the management of hypoglycaemia in adults with diabetes mellitus.
6. Nurse unconscious patients in the lateral position if their airway is not protected.

Exposure (E)

To examine the patient properly full exposure of the body may be necessary. Respect the patient's dignity and minimise heat loss.

Additional information

1. Take a full clinical history from the patient, any relatives or friends, and other staff.
2. Review the patient's notes and charts:
    - Study both absolute and trended values of vital signs.
    - Check that important routine medications are prescribed and being given.
3. Review the results of laboratory or radiological investigations.
4. Consider which level of care is required by the patient (e.g. ward, HDU, ICU).
5. Make complete entries in the patient's notes of your findings, assessment and treatment. Where necessary, hand over the patient to your colleagues.
6. Record the patient's response to therapy.
7. Consider definitive treatment of the patient's underlying condition.

AIRWAY OBSTRUCTION

Choking and Aspiration

Dental patients are susceptible to choking with the potential risk of aspiration. They may have blood and secretions in their mouths for prolonged periods. Local anaesthesia may diminish the normal protective pharyngeal reflexes and 'impression material' or dental equipment is often within their oral cavity and poses additional risks.

Causes of Airway Obstruction

- Hypo-pharyngeal obstruction (Foreign body)
- Blood, vomitus, water, or saliva in mouth
- Bronchoconstriction
- Laryngospasm
- Tongue (This is the most common)

Partial Obstruction	Total Obstruction
Snoring	No noise
Gurgling	
Wheezing	
Crowing	

General Signs and Symptoms

- Gasping for breath
- Patient grabs at throat
- Panic
- Suprasternal or supraclavicular retraction

A. Conscious Patient

- The patient may cough and splutter.
- They may complain of difficulty breathing.
- Breathing may become noisy with wheeze (usually aspiration) or stridor (usually upper airway obstruction).
- They may develop 'paradoxical' chest or abdominal movements.
- They may become cyanosed and lose consciousness.

✓ In cases of aspiration, allow the patient to cough vigorously.

✓ Symptomatic treatment of wheeze with a salbutamol inhaler may help (as for asthma).

✓ If any large pieces of foreign material have been aspirated, e.g., teeth or dental amalgam, the patient should be referred to hospital as an emergency for a chest x-ray and possible removal.

✓ The treatment of the choking patient involves removing any visible foreign bodies from the mouth and pharynx. High volume suction or a haemostat is preferred over using fingers.

✓ Encourage the patient to cough if conscious. If they are unable to cough but remain conscious then sharp back blows should be delivered. These can be followed by abdominal thrusts if the foreign body has not been dislodged.

B. Unconscious Patient

- ✓ Place patient supine on the floor or 15-30 degrees back in the dental chair
- ✓ Head tilt/chin lift
- ✓ Check airway and breathing, assess cause of obstruction
- ✓ If obstruction caused by fluids use suction (Yankhauer suction)
- ✓ Consider Jaw Thrust
- ✓ Open mouth with thumbs
- ✓ Reassess airway and breathing
- ✓ If not breathing attempt artificial ventilation and CPR This will not only provide circulatory support but the pressure generated within the chest by performing chest compressions may help to dislodge the foreign body

BREATHING PROBLEMS

A. Asthma

Patients with asthma (both adults and children) may have an attack while at the dental surgery.

Signs and Symptoms

Acute Severe Asthma	Life Threatening Asthma
• Inability to complete sentences in one breath	• Cyanosis or respiratory rate < 8 per minute
• Respiratory rate > 25 per minute	• Bradycardia (heart rate < 50 per minute)
• Tachycardia (heart rate > 110 per minute)	• Exhaustion, confusion, decreased conscious level

Treatment

- ✓ Most attacks will respond to a few 'activations' of the patient's own short-acting beta2-adrenoceptor stimulant inhaler such as salbutamol (100 micrograms/actuation). Repeat doses may be necessary.

- ✓ If the patient does not respond rapidly, or any features of severe asthma are present, a medical assistance should be summoned. Patients requiring additional doses of bronchodilator should be referred for medical assessment after emergency treatment. If the patient is unable to use the inhaler effectively, additional doses should be given through a large-volume spacer device.

- ✓ If the response remains unsatisfactory or if the patient develops tachycardia, becomes distressed or cyanosed (blueness around the lips or extremities), arrangements must be made to transfer the patient urgently to hospital.

- ✓ Whilst awaiting medical assistance transfer, oxygen (10-15 litres per minute) should be given. 4–6 activations from the salbutamol inhaler should be given using a large-volume spacer device and repeated every 10 minutes if necessary until a medical assistance arrives.

- ✓ If asthma is part of a more generalised anaphylactic reaction or if signs of life threatening asthma are present, an intramuscular injection of adrenaline 1:1000 can be used as 0.5 ml.

B. Hyperventilation

Hyperventilation (Over-breathing) is the state of breathing faster and/or deeper than normal. It can result from a psychological state such as a panic attack, from a physiological condition such as metabolic acidosis or self induced.

Signs and Symptoms

- Dizziness
- Hard to breathe
- Shaking and trembling
- Cold clammy hands (Diaphoresis)
- Tight feeling in chest, chest pain, and palpitations
- Lightheaded, giddy, impaired consciousness
- Uncontrolled over-breathing. Respiration rate increases to 25-30/minute
- Globus hystericus: feeling of lump in throat and suffocating
- Tingling in hands, feet, and peri-oral areas
- Increase in blood pressure and increase heart rate

Management

- ✓ Discontinue treatment and remove any foreign objects from the patient's mouth.
- ✓ Position patient upright.
- ✓ Assess airway.
- ✓ Reassure patient and try to calm them.
- ✓ Have patient breath slowly and shallowly into a paper bag or mask 6-10 time/minute.
- ✓ Patient can be asked to breathe his own exhaled air by asking to close his/her hands in front of his/her mouth and breathe slowly.
- ✓ Monitor vital signs.
- ✓ Determine what precipitated attack.
- ✓ Dismiss patient only after vital signs return to a normal range.

CARDIAC EMERGENCIES

The signs and symptoms of cardiac emergencies include chest pain, shortness of breath, fast and slow heart rates, increased respiratory rate, low blood pressure, poor peripheral perfusion (indicated by prolonged capillary refill time) and altered mental state. Providing oxygen during treatment or treatment under Nitrous oxide may be helpful for such patients.

A. Angina Pectoris

Signs and Symptoms

- Angina pain manifests typically as a central crushing pain in the chest which may radiate to the left arm or even sometimes to the jaw.
- Patient can have stable angina which is brought about exertion or stress and is relieved by the Glyceryl Trinitrate (GTN) spray.
- Some patients have unstable angina which can manifest in the absence of exertion or stress. Such patients are more vulnerable and a medical consultation should be sought before any proposed dental treatment.

Management

✓ The patient will probably carry Glyceryl Trinitrate (GTN) spray or tablets (or Isosorbide dinitrate tablets) and they should be allowed to use them. If not, prophylactic GTN spray or tablets can be used from the emergency drug kit to reduce chances of angina during the treatment.

✓ Where symptoms are mild and resolve rapidly with the patient's own medication, hospital admission is not normally necessary.

✓ Dental treatment may or may not be continued at the discretion of the dental practitioner.

✓ More severe attacks of chest pain always warrant postponement of treatment and a medical assistance should be summoned.

✓ Sudden alterations in the patient's heart rate (very fast or very slow) may lead to a sudden reduction in cardiac output with loss of consciousness. Medical assistance should be summoned.

B. Myocardial Infarction

The pain of myocardial infarction is similar to that of angina but generally more severe and prolonged. There may only be a partial or no response to GTN. In a person with a recent history of myocardial infarction, it is sensible to defer elective dental treatment for six months since the attack.

Signs and Symptoms

- Skin becomes pale and clammy.
- Nausea and vomiting are common.
- Pulse may be weak and blood pressure may fall.
- Shortness of breath

Management

✓ Immediately seek for a medical assistance.

✓ Allow the patient to rest in the position that feels most comfortable. In the presence of breathlessness, this is likely to be the sitting position. Patients who faint or feel faint should be laid flat; often an intermediate position (dictated by the patient) will be most appropriate.

✓ Give high flow oxygen (10-15 litres per minute). Nitrous oxide may also be helpful to relieve anxiety.

✓ Give sublingual GTN spray if this has not already been given.

✓ Reassure the patient as far as possible to relieve further anxiety.

✓ Give aspirin in a single dose of 300 mg orally, crushed or chewed. Medical assistance staff should be made aware that aspirin has already been given as should be the hospital.

✓ Many medical assistance services will administer thrombolytic therapy before hospital admission. Any dental treatment carried out that might contraindicate this must be brought to the attention of the medical assistance crew.

✓ If the patient becomes unresponsive, always check for ‘signs of life’ (breathing and circulation) and start CPR in the absence of signs of life or normal breathing

DRUG REACTIONS

A. Allergic Drug Reaction

Usage of various applications including dental materials and drugs may predispose a vulnerable individual to an allergic reaction in a dental setting. Those individuals who have had already experienced such events are more vulnerable as compared to a person who has never experienced such an event.

Signs and Symptoms

- Cutaneous reactions are the most common occurrence and include urticarial, exanthematous, and eczemoid reactions. Itching is common and exfoliative dermatitis may be present.
- Angioedema (Swelling) varies from localized slight swelling of the lips, eyelids, and face to more uncomfortable swelling of the mouth, throat, and extremities.
- Respiratory symptoms like tightness in the chest or repeated sneezing.
- Bronchospasm is a generalized contraction of bronchial smooth muscles resulting in the restriction of airflow. This may also be accompanied by oedema of the bronchiolar mucosa. Bronchospasm is more common with pre-existing pulmonary disease such as asthma or infection but can also be caused by the inhalation of a foreign substance.
- Ocular reactions include conjunctivitis and watering of eyes.
- Hypotension can occur with any allergic reaction.

Treatment

- ✓ ABCDE approach
- ✓ Maintain airway, administer oxygen, and monitor vital signs.
- ✓ Identify and remove allergen.
- ✓ If in shock, put patient in a horizontal or slight Trendelenburg position.
- ✓ Antihistamines are usually effective for mild reactions.
- ✓ Follow up medications in 4-6 hours.

B. Anaphylaxis

Anaphylaxis is a severe, life-threatening, generalised or systemic hypersensitivity reaction. It is characterised by rapidly developing life-threatening airway and/or breathing and/or circulation problems usually associated with skin and mucosal changes.

Anaphylactic reactions in dentistry may follow the administration of a drug or contact with substances such as latex in surgical gloves. In general, the more rapid the onset of the reaction, the more serious it will be. Symptoms can develop within minutes and early, effective treatment may be life saving.

Anaphylactic reactions may also be associated with additives and excipients in medicines. It is wise therefore to check the full formulation of preparations which may contain allergenic fats or oils (including those for topical application, particularly if they are intended for use in the mouth).

Signs and Symptoms

The lack of any consistent clinical manifestation and a wide range of possible presentations can cause diagnostic difficulty. Clinical assessment helps make the diagnosis. Possible signs are:

- Urticaria, erythema, rhinitis, conjunctivitis.
- Abdominal pain, vomiting, diarrhoea and a sense of impending doom.
- Flushing is common, but pallor may also occur.
- Marked upper airway (laryngeal) oedema and bronchospasm may develop, causing stridor, wheezing and/or a hoarse voice.
- Vasodilation causes relative hypovolaemia leading to low blood pressure and collapse. This can cause cardiac arrest.
- Respiratory arrest leading to cardiac arrest.

Treatment

- ✓ Use an ABCDE approach to recognise and treat any suspected anaphylactic reaction. First-line treatment includes managing the airway, breathing, restoration of blood pressure (laying the patient flat, raising the feet) and the administration of oxygen (10-15 litres per minute).

- ✓ For severe reactions where there are life-threatening airway and/or breathing and/or circulation problems, i.e., hoarseness, stridor, severe wheeze, cyanosis, pale, clammy, drowsy, confusion or coma, immediate use of adrenaline may be life saving.

- ✓ Adrenaline should be given intramuscularly (Antero-lateral aspect of the middle third of the thigh) in a dose of 500 micrograms (0.5 ml adrenaline injection of 1:1000). An auto-injector preparation delivering a dose of 300 micrograms (0.3 ml adrenaline injection 1:1000 known as Epipen) is available for immediate self-administration by those patients known to have severe reactions. This is an acceptable alternative if immediately available.

- ✓ The dose is repeated if necessary at 5 minute intervals according to blood pressure, pulse and respiratory function.

- ✓ The paediatric dose for adrenaline is based on the child's approximate age or weight. Usually 0.3 ml for less than 12 years of age.

- ✓ In any unconscious patient always check for 'signs of life' (breathing and circulation) and start CPR in the absence of signs of life or normal breathing, ignoring occasional 'gasps'.

- ✓ In less severe cases any wheeze or difficulty in breathing can be treated with a salbutamol inhaler.

- ✓ All patients treated for an anaphylactic reaction should be sent to hospital or assessed by medical assistance for further assessment, irrespective of any initial recovery.

ENDOCRINE DISORDERS

A. Hypoglycaemia

Patients with diabetes should eat normally and take their usual dose of insulin or oral hypoglycaemic agent before any planned dental treatment. If food is omitted after having insulin, the blood glucose will fall to a low level (hypoglycaemia). This is usually defined as blood glucose < 3.0 mmol per litre, but some patients may show symptoms at higher blood sugar levels. Patients may recognise the symptoms themselves and will usually respond quickly to glucose. Children may not have such obvious features but may appear lethargic.

Signs and Symptoms

- Shaking and trembling
- Sweating
- Headache
- Difficulty in concentration / vagueness
- Slurring of speech
- Aggression and confusion
- Fitting or seizure
- Unconsciousness

Treatment

✓ ABCDE approach and confirm the diagnosis by measuring the blood glucose. In case of emergency and a doubt about hypoglycaemia, it might be advisable to give some form of glucose as it will not cause any short term problem even in diabetics.

✓ **Early stages** - where the patient is co-operative and conscious with an intact gag reflex, give oral glucose, milk with added sugar, glucose tablets or gel. ***Hypostop***, which is a concentrated Glucose Gel, can be used and is effective as it is absorbed through the buccal mucosa quickly. If necessary, this may be repeated in 10 –15 minutes.

- ✓ **In more severe cases** - where the patient has impaired consciousness, is uncooperative or is unable to swallow safely, buccal glucose gel (Hypostop) and / or glucagon should be given.

- ✓ Glucagon should be given via the IM route (1 mg in adults and children > 8 years old or > 25 kg, 0.5mg if < 8 years old or < 25 kg).

- ✓ It may take 5-10 minutes for glucagon to work and it requires the patient to have adequate glucose stores. Thus, it may be ineffective in anorexic patients, alcoholics or some non-diabetic patients and those who are fasting or starving.

- ✓ Re-check blood glucose after 10 minutes to ensure that it has risen to a level of 5.0 mmol per litre or more, in conjunction with an improvement in the patient's mental status.

- ✓ If any patient becomes unconscious, always check for 'signs of life' (breathing and circulation) and start CPR in the absence of signs of life or normal breathing ignoring occasional 'gasps'.

- ✓ It is important, especially in patients who have been given glucagon, that once they are alert and able to swallow, they are given a drink containing glucose and if possible some food high in carbohydrate. The patient may go home if fully recovered and if they are accompanied. They should be advised not to drive.

B. Adrenal Insufficiency

Adrenal insufficiency may follow long term administration of oral corticosteroids and can persist for years after stopping therapy. A patient with adrenal insufficiency may become hypotensive when under physiological stress. The nature of dental treatment makes this a rare possibility. However, if a patient collapses during dental treatment other causes should be considered first and managed before diagnosing adrenal insufficiency. Routine enquiry about the current or recent use of corticosteroids as part of the medical history prior to dental treatment should alert the dental practitioner to the patient at risk of this condition. Some patients carry a steroid warning card.

Acute adrenal insufficiency can often be prevented by administration of an increased dose of corticosteroid prior to treatment. Dental treatment that requires an increased steroid dose is that which may cause significant physiological stress. Usually simple dental extractions and restorative procedures, including endodontics, are not a cause for concern, but surgical extractions or implant placement should be considered as a risk. Patients who are systemically unwell from a dentally related infection are also recommended to have a prophylactic increase in steroid dose in addition to any surgical and antimicrobial treatment indicated.

Steroid therapy suppresses the function of the adrenal cortex reducing the production of natural cortisol. Because of this suppression, patients who have been on long term steroid therapy lose their ability to respond to stress. If these patients are stressed, symptoms of acute adrenal insufficiency may result.

Nicholson et al. in 2004 have recommend doubling the patient's steroid dose before significant dental treatment under local anaesthesia for patients who are taking steroids like prednisolone in the range of 10 mg to 50 mg for last six months. Lesser dose is not considered to affect the cortisol negative feedback in the body while a dose more than 50 mg is considered to have enough exogenic steroid present in the body and does not warrant supplementation during dental treatment.

Signs and Symptoms

- Mental confusion
- Muscle weakness
- Fatigue
- Nausea and vomiting
- Hypotension
- Intense pains in abdomen, lower back, and/or legs

Management

- ✓ Discontinue all treatment and remove foreign objects from the patient's mouth
- ✓ Summon medical assistance as quickly as possible
- ✓ Place patient supine
- ✓ Monitor and record vital signs
- ✓ Oxygen at 10-15 L/minute
- ✓ Hydrocortisone 100mg IV (Dexamethasone 4mg) over 30 seconds or IM if IV not available

FITS OR EPILEPTIC SEIZURES

Patients with epilepsy must continue their normal dosage of anticonvulsant drugs before attending for dental treatment. Epileptic patients may not volunteer the information that they are epileptic, but there should be little difficulty in recognizing a tonic-clonic (grand mal) seizure.

Signs and Symptoms

- There may be a brief warning or 'aura'.
- Sudden loss of consciousness, the patient becomes rigid, falls, may give a cry, and becomes cyanosed (***Tonic phase***).
- After a few seconds, there are jerking movements of the limbs; the tongue may be bitten (***Clonic phase***).
- There may be frothing from the mouth and urinary incontinence.
- The seizure typically lasts a few minutes; the patient may then become floppy but remain unconscious.
- After a variable time the patient regains consciousness but may remain confused.

Fitting may be a presenting sign of *Hypoglycaemia* and should be considered in all patients, especially known diabetics and children. An early blood glucose measurement is essential in all actively fitting patients (including known epileptics)

Check for the presence of a very slow heart rate (< 40 per minute) which may drop the blood pressure. This is usually caused by a vasovagal episode. The drop in blood pressure may cause transient cerebral hypoxia and give rise to a brief fit.

Treatment

✓ During a convulsion try to ensure that the patient is not at risk from injury but make no attempt to put anything in the mouth or between the teeth (in the mistaken belief that this will protect the tongue). Do not attempt to insert an oropharyngeal airway or other airway adjunct while the patient is actively fitting.

✓ Give high flow oxygen (10-15 litres per minute) and do not attempt to restrain convulsive movements.

- ✓ After convulsive movements have subsided, place the patient in the recovery position and reassess.

- ✓ If the patient remains unresponsive always check for 'signs of life' (breathing and circulation) and start CPR in the absence of signs of life or normal breathing.

- ✓ Check blood glucose level to exclude hypoglycaemia. If blood glucose < 3.0 mmol per litre or hypoglycaemia is clinically suspected, give oral/buccal glucose, or glucagon.

- ✓ After the convulsion, the patient may be confused ('***Post-ictal confusion***') and may need reassurance and sympathy. The patient should not be sent home until fully recovered and they should be accompanied. It may not always be necessary to seek medical attention or transfer to hospital unless the convulsion was atypical, prolonged (or repeated), or if injury occurred.

- ✓ The National Institute for Clinical Excellence (NICE) UK guidelines suggest the indications for sending to hospital are:

    - Status epilepticus
    - High risk of recurrence
    - First episode
    - Difficulty monitoring the individual's condition

- ✓ Medication should only be given if seizures are prolonged (convulsive movements lasting 5 minutes or longer) or recur in quick succession. In this situation, a medical assistance should be summoned urgently.

- ✓ With prolonged or recurrent seizures, medical assistance personnel will often administer IV diazepam which is usually rapidly effective in stopping any seizure. An alternative, although less effective treatment, is midazolam given via the buccal or intranasal route in a single dose of 10 mg for adults. For children the dose can be simplified as follows: child 1-5 years 5 mg, child 5-10 years 7.5 mg, above 10 years 10 mg.

SYNCOPE

Inadequate cerebral perfusion (and oxygenation) results in loss of consciousness. This most commonly occurs with low blood pressure caused by vagal over-activity (*a vaso-vagal attack, simple faint, or syncope*). This in turn may follow emotional stress or pain. Some patients are more prone to this and have a history of repeated faints. This is by far the most common event that occurs in the dental setting as compared to other medical emergencies.

Postural hypotension can be a consequence of rising abruptly or of standing upright for too long. Several medical conditions predispose patients to hypotension with the risk of syncope. The most common culprits are drugs used in the treatment of high blood pressure, especially the ACE inhibitors and angiotensin antagonists. When rising, patients should take their time. Treatment is the same as for a vasovagal attack.

Signs and Symptoms

Syncope can be broken into three categories or phases:

Post-Syncope

- Variable period on mental confusion
- Heart rate increases (Strong rate and rhythm)
- Blood pressure back to normal levels

Syncope

- Patient loses consciousness
- Generalized muscle relaxation
- Bradycardia (Weak thready pulse)
- Seizure (Twitching of hands, legs, and face)
- Eyes open (Out and up gaze)

Pre-Syncope

- Warm feeling in face and neck
- Pale or ashen coloration
- Sweating
- Feels cold
- Abdominal discomfort
- Lightheaded or dizziness
- Mydriasis (Pupillary dilatation)
- Yawning
- Increased heart rate
- Steady or slight decrease in blood pressure

Prevention

✓ Stress is the major cause of syncope in the dental practice. Prevention is the key to management of syncope. This includes taking a complete medical history and thorough evaluation of the patient.

✓ Use stress management protocols, morning appointments, consider sedation.

✓ Ensure that patients do not miss meals prior to treatment.

✓ Under stressful circumstances, many anxious patients **hyperventilate**. This may give rise to feelings of light headedness or faintness but does not usually result in syncope. It may result in spasm of muscles around the face and of the hands. In most cases reassurance is all that is necessary.

Treatment

✓ 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 or below the level of heart, this will improve venous return.

✓ If patient is pregnant roll onto left side.

✓ ABCDE Protocol to ensure that the airway is open.

- ✓ Loosen any tight clothing, especially around the neck
- ✓ Oxygen 10-15 L/min by mask.
- ✓ Reassess airway.
- ✓ If unconscious for more than 1 minute, activate emergency service.
- ✓ Augment ventilation if respiratory effort is poor (Use bag and mask.)
- ✓ Reassess airway every 30 seconds.
- ✓ Respiratory stimulants like ammonia are not necessary if the preceeding steps are followed.
- ✓ If any patient becomes unresponsive, always check for 'signs of life' (breathing, circulation) and start CPR in the absence of signs of life or normal breathing.

After Recovery

- ✓ Determine the cause of the Syncopal episode prior to completing further treatment.
- ✓ Delay further elective dental treatment especially if the patient lost consciousness.
- ✓ If the patient lost consciousness they must not be permitted to leave unescorted or drive a motor vehicle.

VASCULAR EVENTS

A. Hypertensive Crisis Signs and Symptoms

A rise in the systolic blood pressure to 200 mm HG or greater and a corresponding rise in the diastolic pressure to 120 mm HG or greater.

Management

- ✓ Activate the EMERGENCY MEDICAL SERVICE and a prompt referral to the hospital
- ✓ In the dental office a hypertensive crisis will most likely be seen in four types of patients. Those with primary hypertension, those on MAO inhibitors or other drugs that deplete catecholamine storage in adrenergic nerve endings, those with undiagnosed pheochromocytoma and those with uncontrolled thyroid crisis.

B. Hypotension Signs and Symptoms

- Weakness
- Diaphoresis
- Decreased level of consciousness
- Possible nausea and vomiting

Management

The treatment of hypotension is based on treating the aetiology. Possible aetiologies include psychological factors (stress), overdose of medication, postural changes, coexisting disease, hypovolemia, anaesthetic overdose, reflex (pain), hypoxemia, and hypercarbia.

- ✓ Stop dental treatment and remove all foreign objects from the patient's mouth and administer oxygen.
- ✓ Place patient in semi-recumbent position with legs elevated above the level of the heart.
- ✓ Monitor and record vital signs, check pulse for rate, rhythm, and character.
- ✓ Check level of consciousness.
- ✓ If patient does not respond to the above treatment a major systemic complication should be considered. Activate EMERGENCY MEDICAL SERVICE at this point. Consider possible pulmonary embolism, cerebral vascular accident (stroke), myocardial infarction, and congestive heart failure.

REFERENCES AND RECOMMENDED READING

- Standards for clinical practice and training for dental practitioners and dental care professionals in general dental practice; a statement from the resuscitation council (UK)-2015
- National Institute of Health and Clinical Excellence (NICE) United Kingdom.
- Pocket Guide to Medical Emergencies in the Dental Office by Lapointe, DC, USN
- Faculty of General Dental Practice (FGDP) Royal College of Surgeons, England; Key Skills in General Dental Practice; Medical Emergencies in Dental Practice
- MEDICAL EMERGENCIES IN DENTAL PRACTICE Office Preparation and Managing the Unconscious Patient; Morton Rosenberg, DMD & John Yagiela, DDS, PhD
- Malamed, Stanley. Medical Emergencies in the Dental Office. Mosby-Year Books; Sixth Edition; 2007.
- Morrison, Archibald D. and Reginald H.B Goodday. (1999) Preparing for Medical Emergencies in the Dental Office. J Can Dental Association; 65: 284- 6.
- Management of Medical Emergencies in the Dental Office: Conditions in Each country, the Extent of Treatment by the Dentist; Daniel A Haas

Prepared by

Dr. Syed Bilal Tanvir
Lecturer and Course Director
Dar Al Uloom University
College of Dentistry

Dr Altaf H Shah
Associate professor and Head of Department
Preventive Dental Sciences
Dar Al Uloom University
College of Dentistry

Dr Ali Alqerban
Vice dean
Dar Al Uloom University
College of Dentistry

Prof Dr Hesham S Almoallim
Dean
Dar Al Uloom University
College of Dentistry