



Medical Emergencies in the Dental Office

Matthew E. Dudziak, DDS MD
 Christopher C. Choi, DDS MD

Frequency of Emergencies

- Annually
 - Every 1.2 minutes someone dies of a sudden cardiac arrest
 - Every 20 seconds someone has a heart attack
 - Every 45 seconds someone has a stroke
 - Every 3.3 minutes someone dies from a stroke
 - Every 3 minutes someone has a seizure for the first time
 - Every 6.6 minutes someone has an anaphylactic reaction

Dental Economics July 2007 Roberson DMD and Rothman DDS

Emergencies in Dental Office

Type of Emergency	Total Number	Percentage
Syncope	15,407	51.6%
Mild Allergic Reaction	2,583	8.7%
Angina Pectoris	2,552	8.6%
Postural Hypotension	2,475	8.3%
Seizures	1,595	5.3%

JADA 112:499-501, 1986
 JADA 124:40-53, 1993

Emergencies in Dental Office

Type of Emergency	Total Number	Percentage
Asthmatic Attack	1,392	4.7%
Hyperventilation	1,326	4.4%
Epinephrine Reaction	913	3.1%
Insulin Shock (Hypoglycemia)	890	3.0%
Cardiac Arrest	331	1.1%

JADA 112:499-501, 1986
 JADA 124:40-53, 1993

Emergencies in Dental Office

Type of Emergency	Total Number	Percentage
Anaphylactic Reaction	304	1.0%
Myocardial Infraction	289	1.0%
Local Anesthesia Overdose	204	0.7%
Acute Pulmonary Edema	141	0.5%
Diabetic Coma	109	0.4%

JADA 112:499-501, 1986
 JADA 124:40-53, 1993

Emergencies in Dental Office

Type of Emergency	Total Number	Percentage
Cerebrovascular Accident	68	0.2%
Adrenal Insufficiency	25	0.1%
Thyroid Storm	4	0.0%
	30,608	

JADA 112:499-501, 1986
 JADA 124:40-53, 1993

The Five Deadly Misconceptions

1. A medical emergency will not happen to me.
2. A medical emergency will not happen in the office.
3. Calling 911/EMS is the answer.
4. My staff and I won't panic during a medical emergency.
5. CPR is all we need to know.

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Prevention

- "Complete system of physical evaluation for all prospective dental patients would be capable of **preventing approximately 90%** of all life-threatening emergencies."
- "When you prepare for an emergency, the emergency ceases to exist."

5-Point Plan to Prevent Emergencies

- Use careful, routine patient assessment procedures.
- Document and update accurate, comprehensive patient records.
- Implement stress reduction protocols.
- Recognize early signs of emergency distress.
- Organize team management plan for emergency preparedness.



Information Gathering

- Ask open ended questions
- Medical History
- Medications including herbal medications
- Surgical History
- Social History
- Allergies
- Review organ systems (General, Neurological, Cardiovascular, Respiratory, Gastrointestinal, Renal, Musculoskeletal...)



Vital Signs

- Temperature
- Pulse
- Blood Pressure
- Respiratory Rate



Temperature

- Oral - 97.3 and 99.1 °F
- Fever – 98.9 °F in a.m. and 99.9 °F in p.m.
- Hyperthermia - > 104 °F



Pulse

- Normal – 60 to 100 bpm
- Tachycardia - > 100 bpm
- Bradycardia - < 60 bpm



Blood Pressure

Blood Pressure Category	Systolic mm Hg (upper #)	and	Diastolic mm Hg (lower #)
Normal	less than 120	and	less than 80
Prehypertension	120 – 139	or	80 – 89
High Blood Pressure (Hypertension) Stage 1	140 – 159	or	90 – 99
High Blood Pressure (Hypertension) Stage 2	160 or higher	or	100 or higher
Hypertensive Crisis (Emergency care needed)	Higher than 180	or	Higher than 110

Respiratory Rate

- birth to 6 weeks: 30–60 breaths per minute
- 6 months: 25–40 breaths per minute
- 3 years: 20–30 breaths per minute
- 6 years: 18–25 breaths per minute
- 10 years: 15–20 breaths per minute
- **adults: 12–24 breaths per minute**

Team

- Know your team
- Know your roles
- Practice, Practice, Practice



Emergency Duties Four-Member Dental Team

TEAM MEMBER 1: LEADER

- Directs team members
- Positions the patient and stays with him or her
- Performs “ABCs”† of cardiopulmonary resuscitation (CPR)
- Takes command and appears calm
- States instructions directly and clearly
- Requests acknowledgment from team members that instructions are understood
- Fosters open exchange among team members
- Concentrates on what is right for the patient, not who is right

Emergency Duties Four-Member Dental Team

TEAM MEMBER 2

- Brings emergency kit
- Brings oxygen tank and attaches appropriate delivery system
- Brings automated external defibrillator
- Assists with ABCs of CPR, including monitoring vital signs
- Checks oxygen tank regularly
- Checks emergency kit regularly
- Prepares drugs for administration

Emergency Duties Four-Member Dental Team

TEAM MEMBER 3

- Telephones emergency medical services (9-1-1)
- Meets paramedics at building entrance
- Keeps chronological log of events
- Assists with ABCs of CPR

Emergency Duties Four-Member Dental Team

TEAM MEMBER 4

- Assists with ABCs of CPR
- Assists with other duties as needed

JADA 2010;141(suppl 1):8S-13S

Basic Dental Office Emergencies

- **Neurologic**
 - Syncope
 - Postural Hypotension
 - Cerebrovascular Accident
 - Seizure Disorder
- **Respiratory Distress**
 - Dyspnea
 - Hyperventilation Syndrome
 - Asthmatic Attack / Bronchospasm
 - Airway Obstruction
- **Cardiovascular**
 - Angina Pectoris
 - Acute Myocardial Infarction

Basic Dental Office Emergencies

- **Blood pressure abnormalities**
 - Hypertension
 - Hypotension
- **Diabetes**
 - Hyperglycemia
 - Hypoglycemia
- **Allergic Reactions**
 - Urticaria / Pruritus
 - Anaphylactic shock
 - Epinephrine reaction
- **Drug Overdose**
 - Local Anesthetics
 - Sedatives/Hypnotics
 - Narcotics

Neurologic Emergencies

- Syncope
- Cerebrovascular Accident
- Seizure Disorder



Syncope

What is syncope?

- Sudden, **brief** loss of consciousness
- Decreased blood flow to the brain
- Pre-syncope a person may feel lightheaded

What to do if someone is fainting

- Trendelenburg
- Establish airway
- 100% Oxygen
- Apply cold compress to pts forehead
- Assess consciousness
- Monitor vital signs



Causes of syncope

- Vasovagal reaction
- Panic or anxiety attacks
- Hyperventilation
- Low blood sugar
- Irregular heart beat
- Seizures

Vasovagal reaction

- A reflex of the involuntary nervous system that causes
 - Decreased heart rate (bradycardia)
 - Vasodilation (hypotension)
 - Decreased cardiac output
 - Less blood flow to head

Common Triggers

- Sight of blood
- Having blood drawn
- Straining (bowel movement)
- Standing for extended periods
- Heat exposure

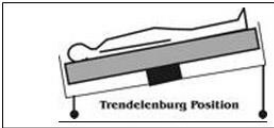
Signs/symptoms/manifestations

- Pallor - loss of color
- Sensation of warmth
- Lightheadedness
- Diaphoresis (excessive sweating – cold and clammy)
- Loss of consciousness
- Dilation of pupils



Basic Treatment

- Place patient in trendelenburg (head down, feet up)
- Assess consciousness
- Assess Airway, Breathing, Circulation (abc's)



Treatment

- 100% oxygen
- Monitor vitals
- Crushed ammonia under nose
- Cold compresses to forehead or neck
- Reassure and relax pt
- Full recovery 20 minutes



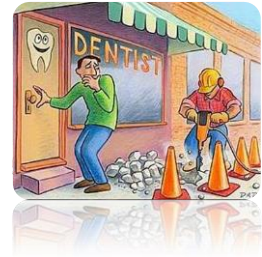
Advanced Syncope

Loss of consciousness more than 5 minutes

- Vital signs unstable
- Re-consider diagnosis
 - Seizure
 - Heart Attack
 - Stroke
 - Hypoglycemia
- Activate EMS
- Start ACLS

Prevention

- Thorough history
- Stress reduction
- Pre op sedation
- Patient monitoring
- 100% oxygen
- Early recognition



Postural (Orthostatic) Hypotension

Definition

- Rapid fall in blood pressure when moving from supine to upright position



- 20 mm Hg systolic BP
- 10 mm Hg diastolic BP



Causes

- Blood pools in lower extremity when standing causing decreased cardiac output and subsequent hypotension, decreased blood flow to brain
- Hypovolemia
 - Dehydration
 - Blood loss
 - Anemia

Risk Factors

- Prolonged periods of reclining, positioning
- Late stage pregnancy
- Advanced age
- Venous defects in legs-Varicose veins
- Exhaustion
- Starvation
- Nitrous oxide

Symptoms/signs/manifestations

- Dizziness
- Blurred or dimmed vision
- Lightheadedness
- Fainting (extreme cases)

Treatment

- Return patient to supine or trendelenburg
- Maintain airway
- Administer oxygen may assist recover
- Monitor pulse
- Ammonia capsules
- Cold compresses
- Reposition patient slowly after become stable

Treatment

- Activate EMS if condition worsens
 - Complete loss of consciousness
 - Unstable vital signs
- Re-evaluate diagnosis
 - Hypoglycemia
 - Seizure
 - CVA
 - Cardiac Arrest



Cerebrovascular Accident
(Stroke)

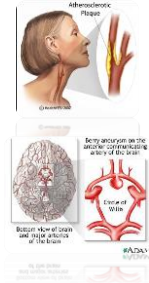
Definition

- Onset of a focal neurologic deficit or abnormality
- Decrease in blood flow to a specific area of the brain
- Lasts from a few minutes to hours



Types

- Cerebral thrombosis
 - Blockage in arteries
- Cerebral hemorrhage
 - Aneurysm or other weakened area of an artery that burst



Causes/Risk factors

- Thrombosis
 - High cholesterol
 - DM
 - CAD, PAD
- Hemorrhagic
 - Hypertension
 - Aneurysm
 - Illegal drug use
 - Trauma

Knowing Signs of Stroke

- Will help you act faster in response
- Minimize damage to the brain, improve chances of recovery- and even save your patient's life

Cincinnati Stroke Scale

Cincinnati Pre-hospital Stroke Scale

1. FACIAL DROOP: Have patient show teeth or smile.



Normal: both sides of the face move equally



Abnormal: one side of face does not move as well as the other side



Normal: both arms move the same or both arms do not move at all



Abnormal: one arm does not move or drifts down compared to the other

3. ABNORMAL SPEECH: Have the patient say "you can't teach an old dog new tricks."

Normal: patient uses correct words with no slurring. **Abnormal:** patient slurs words, uses the wrong words, or is unable to speak.

INTERPRETATION: If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%.

Management

- Terminate procedure
- Oxygen by mask or nasal cannula
- Keep patient's head slightly elevated
- Place patient on cardiac monitor
- Check vital signs frequently
- Activate EMS

Management - Advanced

- 250 ml bolus of normal saline (NS) or lactated Ringer's (LR) if the patient's blood pressure is low
- **Do not treat blood pressure** unless it is 220/120 if so aim is to bring it down slightly and slowly
- ACLS as appropriate
- Transport to hospital capable of fibrinolytic therapy
 - Ischemic CVA

Prevention

- Review patients history
- Take blood pressure before treatment



Seizure Disorder

Management

- Terminate procedure
- Supine position
- Ensure patient safety
- Establish airway
- Monitor vital signs
- 100% oxygen

Definition

- Abnormal electrical activity in the brain
- Change or loss of consciousness and involuntary muscle spasms called convulsions.
- Sudden onset with variation in duration and severity.



Causes

- Syncope
- Brain Tumor
- Head injuries
- Stroke
- Electrolyte imbalance
- Elevated body temperatures
- Brain infections (e.g., meningitis)
- Hypoglycemia (very low blood sugar)
- Medication or alcohol withdrawal
- Administration of local or general anesthesia
- Cocaine and heroin abuse
- Antipsychotics and some asthma drugs

Types

Generalized Seizures (Produced by the entire brain)	Symptoms
1. "Grand Mal" or Generalized tonic-clonic	Unconsciousness, convulsions, muscle rigidity
2. Absence	Brief loss of consciousness
3. Myoclonic	Sporadic (isolated), jerking movements
4. Clonic	Repetitive, jerking movements
5. Tonic	Muscle stiffness, rigidity
6. Atonic	Loss of muscle tone

Types

Partial Seizures (Produced by a small area of the brain)	Symptoms
1. Simple (awareness is retained) a. Simple Motor b. Simple Sensory c. Simple Psychological	a. Jerking, muscle rigidity, spasms, head-turning b. Unusual sensations affecting either the vision, hearing, smell taste, or touch c. Memory or emotional disturbances
2. Complex (Impairment of awareness)	Automatisms such as lip smacking, chewing, fidgeting, walking and other repetitive, involuntary but coordinated movements
3. Partial seizure with secondary generalization	Symptoms that are initially associated with a preservation of consciousness that then evolves into a loss of consciousness and convulsions.

Management – Early

- Terminate procedure
- Protect patient
- Place patient in the supine position
- Loosen clothing
- Relocate instruments/supplies
- Establish airway
- Position head on side
- Suction mouth



Management – Early

- Apnea >30 seconds-establish basic life support
- Monitor vital signs
- Monitor vital signs and record in writing
- 100% oxygen by mask
- Observe in office for minimum of 1 hour after seizure
- Consult with physician

Management - Advanced

- With continued seizures, consider IM benzodiazepine (**Ativan**)
- Establish IV if possible
 - Diazepam(**Valium**)- 5mg/minute I.V up to 10 mg
 - Midazolam(**Versed**) - 3mg/minute I.V. or I.M. up to 6mg

Management - Advanced

- Activate EMS
- Observe patient following a grand mal seizure for depressed respirations
- Support respiration during the recovery period (postictal state- period of time immediately following a seizure during which the patient will be confused and lethargic)

Prevention

- For known epileptics, check medication compliance
- Limit the amounts of precipitating drugs to the lowest effective dose to allow adequate results
- Avoid rapid injection of local anesthetic
- Calculate the maximum dose prior to initiating the procedure
- Aspirate prior to injection to avoid intravascular injection
- Consider diazepam instead of midazolam in I.V. sedation cases

Local Anesthetic Maximum Doses

Anesthetic	Maximum Dosage		Maximum total dosage	Cartridges	mg/cartridge
	mg/kg	mg/lb			
2% Lidocaine 1:000,000 epi (Xylocaine)	7	3.2	500 mg	8	34 - 36mg
3% Mepivacaine plain (Carbocaine)	4.4	2.0	300 mg	5	51 - 54mg
4% Articaine 1:100,000 epi (Septocaine)	7.0	3.2	500 mg	6	68 - 72mg
4% Prilocaine plain (Citanest)	6.0	2.7	400 mg	5	68 - 72mg
0.5% Bupivacaine 1:200,000 epi (Marcaine)	1.3	0.6	90 mg	10	8.5 - 9mg

Adapted from Stanley Malamed, Handbook of Local Anesthesia, Fifth Edition

Respiratory Emergencies

- Dyspnea
- Airway Obstruction
- Hyperventilation Syndrome
- Asthmatic Attack / Bronchospasm



Dyspnea

Dyspnea

- Establish airway
- 100% oxygen
- Monitor Vitals
- Treat underlying cause



Definition

- Sensation of labored, difficult, and uncomfortable breathing.
- Due to inadequate control of respiration, oxygenation, and ventilation

Causes

- Heart disease
- Chronic obstructive pulmonary disease (asthma, COPD, emphysema, chronic bronchitis)
- Anxiety/hyperventilation
- Aspiration
- Lung infection
- Pulmonary embolism



Signs and Symptoms

- Sensation of not getting enough air
- Breathing is shallow and slightly labored
- Difficulty breathing at rest or after mild exertion
- Unable to speak in complete sentences
- Chest tightness
- Severe wheezing
- Anxiety, fear, agitation, restlessness
- Extreme drowsiness

Treatment

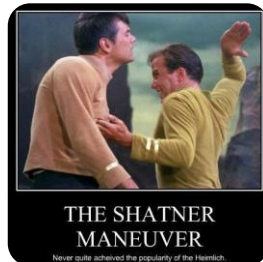
- Establish and maintain airway
- Assist ventilation as necessary
- 100% oxygen
- Monitor
 - ✓ Pulse oximeter
 - ✓ Blood pressure
 - ✓ Cardiac status
- Identify underlying cause and treat accordingly
- Transport unstable pt. to Emergency Room



Airway obstruction

Airway Obstruction

- Upright position
- Pack off surgical site
- Suction oropharynx
- Determine if airway obstructed
- Heimlich maneuver, if indicated.



Definition

- Bronchoconstriction, secretions, or solid material causing decreased or absence of ventilatory movement.



Causes

- Posterior displacement of the tongue due to loss of tone of pharyngeal muscle secondary to deep anesthesia and / or sedation.
- Foreign body on larynx and pharynx – secretions or solid material.

Signs / Symptoms

- Choking
- Gagging
- Violent expiratory effort
- Substernal notch retraction
- Cyanosis
- Rapid pulse initially then decreased pulse, respiratory arrest, cardiac arrest
- Airway obstruction causes HYPOXIA (deficiency of oxygen in body tissue) which leads to cardiovascular complications
- Respiratory arrest
- Cardiac arrest

Treatment - Early

- Position patient upright or comfortable position
- Pack off surgical site
- Suction oropharynx
- Digital traction of tongue with:
 - Gauze
 - Tongue Forceps
 - Hemostat
 - Suture

Treatment - Advanced

IF NO SUCCESS AT CLEARING AIRWAY, AND IF PATIENT LOSES CONSCIOUSNESS:

- Place patient supine
- Chin lift- jaw thrust
- Tilt head backwards and continue to attempt to open airway
- Check for respiratory sounds; ventilate if possible
- Perform abdominal thrust if no airflow with ventilations

Heimlich Maneuver

- Stand behind patient
- Place fist of one hand slightly above patient's navel
- Grasp fist with other hand
- Give quick upward thrusts into abdomen (chest thrust over sternum if pregnant or obese)
- Continue until object is expelled or patient becomes unconscious



If patient is unconscious

- Activate 911
- Positive pressure ventilation
- Endotracheal intubation
- Cricothyroidotomy



Prevention

- Proper placement of throat pack
- Preoperative removal of potential foreign bodies (dentures, partials, tongue piercings, secretions)
- Adequate suctioning
- Adequate visualization of operative field

Follow Up

- If the foreign body is not recovered or does not pass, refer patient as soon as possible for radiographic localization
 - PA / Lateral neck x-ray
 - Chest x-ray
 - Abdominal x-ray



Hyperventilation

Basic Treatment

- Upright / semi-reclined position
- Verbally calm / reassure patient
- Rebreathing bag to reduce carbon dioxide elimination
- Hold breath

Definition

- Patient breathes faster and deeper
- Patient exhales too much carbon dioxide, causing hypocapnea
- Respiratory alkalosis → cerebral vasoconstriction
 - Dizziness
 - Tingling of lips/extremities
 - Headache
 - Weakness
 - Fainting

Causes

- Stress
- Anxiety



Causes

- Ingestion or overdose of medications
 - Amphetamine
 - Aspirin
 - Beta-2 Agonist
 - Cocaine
 - Iron
 - LSD
 - Methamphetamine
 - Methanol

SIGN/SYMPTOMS/MANIFESTATIONS

- Feeling of anxiety, nervousness, or tenseness
- Light headedness, vertigo
- Muscle twitching and spasm
- Numbness / tingling of hands, feet or around mouth
- Sweating
- Pounding and racing heartbeat
- Chest tightness, fullness, pressure, tenderness or pain

TREATMENT

- Breathe deliberately and slowly
- “7-11” breathing
 - Inhale 7 seconds
 - Exhale 11 seconds
- Breathing in bag no longer advised
 - Restricts inspired oxygen, worsening hypoxia

Causes

- Increased metabolism from
 - Exercise
 - Fever
 - Graves’ disease, hyperthyroidism, thyroid storm
 - Infection

TREATMENT

- Terminate treatment and remove foreign bodies from the mouth
- Position patient in an upright/semireclining
- Maintain patent airway
- Calm patient

TREATMENT - ADVANCED

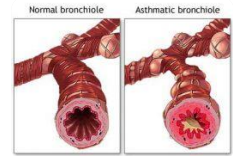
- If nonsedated patient fails to respond consider
 - Midazolam (Versed) 1-22mg slow IV
 - Diazepam (Valium) 5-10 mg slow IV
 - Methohexital (Brevital) 10 mg slow
 - Propofol (Diprivan) 10-20 mg slow IV
- Continue to monitor vital signs
- Discontinue rebreathing bag as patient’s breathing returns to normal
- Activate EMS call for assistance if patient’s condition deteriorates (patient loses consciousness, vital signs unstable)



Asthma Attack

Definition

- Generalized smooth muscle contraction of the bronchi and bronchioles
- Restriction of inhalation and exhalation air flow
- Bronchospasm – more difficult with exhalation

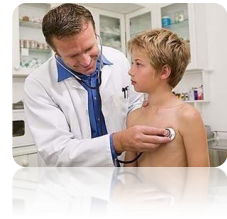


Causes

- Genetic
- Environmental
- Immune system
 - Allergens
 - Triggers
- Sinusitis
- GERD
- Medication reactions (Aspirin and NSAIDS)
 - Samter's triad: asthma, nasal polyposis, ASA sensitivity

Signs / Symptoms / Manifestations

- Labored breathing
- Expiration difficulty
- Diminishing respiratory status
- Cyanosis
- Decreased oxygen saturation
- Decreased ventilations
- Wheezing
- Chest tightness
- Shortness of breath
- Tiring quickly during exercise
- Anxiety
- Spastic cough



Treatment - Early

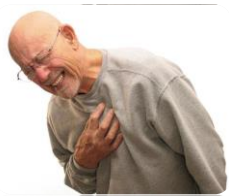
- Patient in upright position
- Monitor vital signs
- Administer 100% oxygen

Treatment - Advanced

- Activate EMS
- Bronchodilating medications
 - Albuterol (Ventolin)
 - 4-8 puffs every 20 minutes for up to 4 hours than q1-4 hours
 - Ipratropium bromide (Atrovent)
 - 2 puffs stat than every 4 hours
 - 0.5mL of 0.02% nebulized solution every 4 hours
 - Epinephrine 0.3-0.5mg 1:1000 subcutaneous every 20 minutes to max of 1gm
- Prednisone 40-60mg orally

Prevention

- Thorough medical history
 - Assess severity of asthma
 - Last attack?
 - How often do you use inhaler?
 - Prior hospitalizations? Intubation required?
 - Other medications?



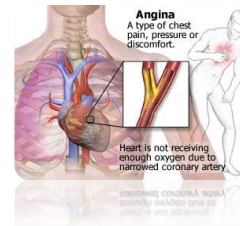
Angina Pectoris

Cardiovascular Emergencies

- Angina Pectoris
- Myocardial Infarction

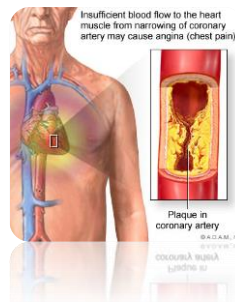
Definition

- Chest pain or discomfort due to insufficient oxygen to the heart



Causes

- Narrowing or constriction or coronary arteries
- Decreased blood supply/oxygen
- Increased cardiac demand for oxygen (caused by cold, stress, increased heart rate)



Signs / Symptoms

- Early symptoms mistaken for indigestion
- Pain in chest
- Wide differential diagnosis
- Heaviness or squeezing sensation
- Exhibits a crescendo-decrescendo pattern
- Key to differentiate from MI
 - Duration of symptom
 - History of similar symptoms
 - Relieved by rest, nitroglycerin, or reduction of stress
 - Angina pain usually relieved within 5-15 minutes

Management - Early

- Terminate surgery
- Activate EMS if new onset or signs of hemodynamic instability
- Monitor vital signs
- Immediate administration of oxygen
- Nitroglycerine sublingually (.2-.6mg) every 5 minutes to max 3 doses over 15 minutes if BP>90
 - Vasodilatation to improve cardiac flow
- Place patient in comfortable position
- Loosen all clothing



Management - Early

- Continuous EKG and pulse oximeter monitoring
- Set up and activate automatic external defibrillator
- Continue dialogue with patient to reassure
- Quickly review medical history
- Second /third nitroglycerine at 5 minute intervals over 15minutes with max of 3 doses
- After 3rd dose, if no relief, assume MI
- Activate EMS with signs of hemodynamic instability
 - Unrelieved chest pain
 - New onset of chest pain
 - Pain does not subside with nitro
 - Pain not typical of angina pain

Management - Advanced

- Aspirin, nonenteric coated-325mg orally (chewable)
- MONA (Morphine, Oxygen, Nitroglycerin and Aspirin)
- Transport patient to medical facility

Prevention

- Consult with patient's physician prior to tx
- Use premedication for stress reduction
- Consider preoperative medications – discuss with physician
- Administer supplemental oxygen
- Monitor vital signs
- Limit amount of epinephrine used
- Discuss with pt how they are feeling



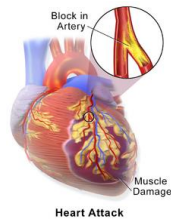
MYOCARDIAL INFARCTION

Definition

- Inadequate blood flow and oxygen (ischemia) to the heart muscle (myocardium) resulting in irreversible injury to the myocardium

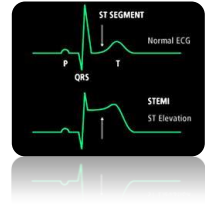
Causes

- Decreased oxygen flow to the heart muscle
- Complete or partial blockage of the coronary arteries



Signs/Symptoms/Manifestations

- New onset of chest pain
- Chest pain which lasts for at least 20 minutes
- Evidence of ischemia on EKG
- Increased levels of cardiac enzymes
- Chest pain-crushing / squeezing
- Pain continues at rest



Signs/Symptoms/Manifestations

- Elevated or reduced blood pressure
- Pain not immediately relieved by nitroglycerin
- Pain may originate under sternum-may radiate to arm, neck, and mandible
- Nausea / vomiting
- Diaphoresis
- Anxiety
- Sense of impending doom
- Dyspnea

Management - Early

- Place patient in upright/ semi-reclined position
- Activate EMS
- Establish and maintain airway
- Administer 100% oxygen

Management - Advanced

- Set up automated external defibrillation
- Administer non-enteric coated aspirin 325mg (chewable)
- Establish I.V. access
- Nitroglycerin –0.2-0.6 mg sublingually
 - repeat every 5 minutes up to 3 doses over 15 minutes

Management - Advanced

- Monitor vital signs / EKG
- Reassure patient
- Start ACLS if patient loses consciousness
- Transport patient to hospital

Prevention

- Identify patient at risk for myocardial infarction
 - Thorough medical history
 - Family history
 - Exercise tolerance
- Physician consult
- Consider anxiolytic night before and morning of surgery
 - 5-10 mg diazepam (Valium) POHS
 - Continue anti-hypertensive
- Consider preoperative nitroglycerin if blood pressure allows or is desirable
- Avoid low PaCo₂

Blood Pressure Abnormalities

- Hypertension
- Hypotension



Hypertension

- An elevation in blood pressure that increases the risk for end-target organ damage.
 - Systolic blood pressure >140 mm Hg
 - And/or a diastolic pressure >90 mm Hg

Causes

- Anxiety
- Inadequate anesthesia or light anesthesia
- Hypoxia
- Excessive or intravascular injection of vasoconstrictor
- Anesthetic overdose
- Exacerbation of essential hypertension
- Noncompliance with medications

Hypertensive Crises

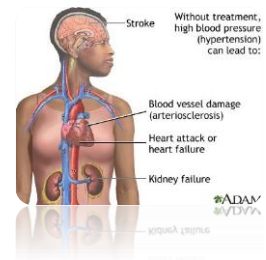
Hypertensive Urgency

- SBP > 180 or DBP > 110
- No end organ damage
- Possible Symptoms
 - severe headache
 - shortness of breath
 - nosebleed
 - severe anxiety

Hypertensive Crises

Hypertensive Emergency

- SBP > 180 or DBP > 110
- With symptoms of end organ damage
 - Stroke
 - Loss of consciousness
 - Memory loss
 - Heart attack
 - Damage to eyes
 - Loss of kidney function
 - Pulmonary Edema



Treatment - Early

- Cessation of TX
- Confirm patient airway, adequacy of ventilation and give 100% O₂
- Benzodiazepines for hypertension secondary to anxiety or emergence delirium
- Review medications and dose given
- Reassess patient
- Record vital signs every 5 minutes
- Check for monitor malfunctions
- If using electronic monitors confirm with manual determination

Treatment - Advanced

- Consider activating EMS
- Oral therapy

Table 1. Agents for the Management of Hypertensive Urgency

Agent	Class	Onset of Action	Duration of Action	Dosing	Adverse Effects
Captopril	ACE-I	5-15 min	2-6 h	Recommended: 25 mg po or SL. Dosing range: 6.25-50 mg po Max dose: 50 mg po	Hyperkalemia, angioedema, rash, decreased renal function in renal artery stenosis
Clonidine	Centrally-acting, α_2 -agonist	15-30 min	2-8 h	Recommended: 0.1-0.2 mg po, followed by 0.05-0.1 mg every hour until desired effect Max dose: 0.8 mg	Dry mouth, sedation, orthostatic hypotension, rebound hypertension
Labetalol	α_1 -selective, β -nonselective antagonist	2 h	4 h	Recommended: 200 mg po, followed by 200 mg every hour until desired effect Max dose: 1,200 mg	Hypotension, dizziness, headache, nausea, vomiting

ACE-I: Angiotensin-converting enzyme inhibitor; max: maximum; min: minute; po: by mouth; SL: sublingual.

Source: *Pharmacology*, 10-11, 14-16.

Prevention

- Continue anti-hypertensive drug therapy
- Check compliance to medications
- Consider oral antianxiety night before surgery and day of surgery
- Adequate local anesthesia and pain control

Hypotension

Definition

- Systolic BP < 90 mm Hg
- Diastolic BP < 60 mm Hg
- Good cardiovascular health
- Pathologic - inadequate blood flow to the heart, brain and other vital organs.

Causes

Preoperative:

- Dehydration
- Poor diet
- Heart problems
- Blood loss
- Excessive premedication or drug allergies
- Orthostatic: rapid fall in blood pressure when moving from supine to upright position)

Causes

Intraoperative:

- Hypoxia
- Anesthetic overdose (especially narcotics and barbiturates)
- Drug allergies

Signs/symptoms/manifestations

- Weakness
- Nausea
- Impending loss of consciousness
- Dizziness
- Thirst
- Cold, clammy, pale skin
- Fatigue

Early Treatment

- Terminate surgery
- Support airway, give 100% oxygen
- Monitor vital signs
- Stimulate the patient
- Trendelenburg position or raise legs above head
- Activate EMS if condition deteriorates
- Ammonia inhalant

Advanced Treatment

- Initial fluid bolus of normal saline solution
- **Ephedrine-2.5-5 mg I.V** then titrate until blood pressure is stabilized
 - increases heart rate
 - causes vasoconstriction
- **Phenylephrine**
- Hypotension from narcotics
 - Naloxone(Narcan) 0.4 - 2 mg I.V. every 2-3 hours as needed start with lower dosage for narcotic dependent patients.

Diabetic issues

- Hypoglycemia
- Hyperglycemia

Diabetes

- **Type I** – body cannot produce insulin
 - Formerly known as insulin dependent DM or juvenile onset
 - Requires insulin replacement
 - Causes: genetic, autoimmune
 - Diabetic ketoacidosis (emergency, LOC)
- **Type II** – body cannot use insulin properly (insulin resistance)
 - Formerly known as non-insulin dependent DM or adult onset
 - Can be combined with reduced insulin secretion
 - Treated with oral hypoglycemics and/or insulin
 - Causes: lifestyle, genetics
 - Hyperosmolar hyperglycemic state

Symptoms

- Polyuria, polydipsia, polyphagia, weight loss, loss of strength
- Bed wetting, skin infections, irritability, headache drowsiness, malaise, xerostomia

Diagnosis

- Fasting Blood Sugar (FBS) < 125 mg/dl
 - Current more stringent guidelines <100 mg/dl
- Post Prandial (PP) < 140 mg/dl
- HbA1C (4-6%) > 8% uncontrolled in the past 2-3 months



Managing the Diabetic Patient

- Maximum of 2 carpules in poorly controlled patient
 - Epi causes glycogen breakdown which increases hyperglycemia
- Use full dose of antibiotics after major procedure For management of infections.
- Treat only acute dental issues and delay treatment for routine procedures for poorly controlled diabetic
- Control blood glucose first
- A normal type 2 diabetic can undergo all dental procedures unless diabetic complication exists
- Avoid chronic use of NSAIDS and Steroids

Hypoglycemia

Definition

- Reduction in blood glucose level
- Blood levels of glucose drop too low to properly fuel the body



Causes

- Excessive insulin therapy/oral hypoglycemics
- Missed/delayed meals
- Illness/infection
- Excessive exercise
- Alcohol ingestion

Signs/symptoms/manifestations

Mild (<60-65mg/dl)

- Cold, clammy wet skin
- Extreme hunger
- Nausea
- Tachycardia
- Numbness/tingling lips and fingers tips
- Trembling



Signs/symptoms/manifestations

Moderate(50mg/dl)

- Lack of energy
- Irritability
- Restlessness
- Headache
- Dizziness
- Slurred speech
- Blurred vision



Signs/symptoms/manifestations

Severe (<30mg/dl)

- Loss of consciousness
- Seizures / convulsions
- Hypothermia

Treatment - Early

- Stop dental treatment
- Placed patient in supine patient
- Monitor vital signs
- Check blood glucose <50 mg/dl, even with no symptoms

Treatment - Early

- Oral Glucose:
 - Regular soft drink, fruit juice
 - Candy, cake frosting
- Eating quick sugar foods puts glucose into the blood stream in about 5 minutes
- Any quick-sugar food on this list will raise blood sugar about 30mg/dl in about 15-20 min

Food and amount

- Fruit juice and regular soda - ½ cup
- Glucose tablets - 3 tablets
- Glucose Gel - ½ tube
- Hard Candy - 3 pieces



Treatment - Advanced

- Patient becomes unconscious: Basic life support
- Patient not responding - Activate EMS

Establish I.V access

- 1 ampule I.V glucose (50 ml or 50% glucose solution)
- Recheck blood glucose in 15 minutes
- Start I.V infusion of 5% to 20% dextrose solution

Treatment - Advanced

Without I.V access:

- 1 mg of glucagon I.M
- Recheck blood glucose in 15 min
- Repeat glucagon ,as needed, base on blood glucose



Prevention

- Thorough medical history and physical examination
- Focus on glycemic/insulin control
- Maintain normal glycemic control
- Avoid hypoglycemia
 - A little high is better than a little low
- Early identification and management

Preoperative

Insulin dependent diabetes:

- Consider half dose of long acting insulin if fasting for surgery
- Check blood glucose
- Start I.V with D5W

Noninsulin-dependent diabetes:

- Discontinue oral hypoglycemic in the morning
- Check blood glucose

Hyperglycemia

Definition

- Increase in blood sugar level
 - 100 – 126 mg/dl: hyperglycemia
 - > 126 mg/dl: diabetic

Hyperglycemic crises

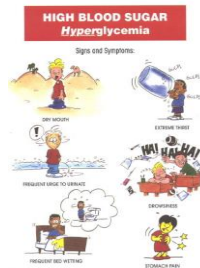
- Diabetic ketoacidosis
 - Type 1 diabetic
 - 5% mortality
- Hyperosmolar hyperglycemic state
 - Type 2 diabetic
 - 15% mortality

Hyperglycemic crises

- Causes
 - non-compliance/under-treatment of insulin (DKA)
 - Infection
 - Alcohol abuse
 - Trauma
 - PE
 - MI

Signs/symptoms/manifestations

- Dry mouth
- Increased thirst
- Frequent urination
- Drowsiness
- Stomach pain
- Bed wetting



Treatment - Early

- Fluids/hydration
- Administer insulin
- Send to ED for management

Prevention

- Check compliance with medications
- Check blood glucose
- Treat infections aggressively

Allergic Reactions

- Urticaria / Pruritus
- Anaphylactic Shock
- Epinephrine Reaction



Urticaria / Pruritus

Definition

- Inappropriate or excess immune reaction to antigen / allergen
- Slow (delayed) or fast (immediate) onset
- Intense itchy and erythematous plaque that occurs on the skin

Causes

- Allergic response to:
 - Medications
 - Latex
 - Environment
 - Food



Signs / Symptoms / Manifestations

- Urticaria (wheal / flare)
 - Face, trunk, extremities
 - Blanching
 - Hives
- Pruritus
 - Mild to severe itching



Signs / Symptoms / Manifestations

- Angioedema
 - Face, lips, perioral tissues
 - Edema
 - Lesions (painful or burning)
- Erythema
 - Generalized or localized
 - Hives
 - Redness



Treatment - Early

- Upright / semi-reclining position
- Administer oxygen
- Monitor pulse, blood pressure and PaO₂

Treatment - Advanced

- Unsure – activate EMS
- Monitor vital signs
- Withdraw drug in question
- Benadryl (diphenhydramine)
 - 25-50mg PO every 4-6 hours (max 300 mg/day)
 - 25-50mg IV/IM every 2-4 hours (max 400 mg/day)
 - More severe reactions

Treatment - Advanced

- Epinephrine
 - Severe reactions
 - See anaphylactic reactions
 - 0.3-0.5mg (1:1,000) IM
- Oral Benadryl 25-50mg PO every 6-8 hours for 3 days



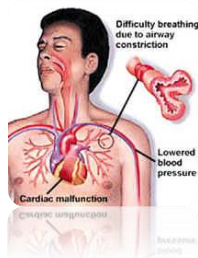
Prevention

- Thorough history
- Avoid known allergens

Anaphylactic Shock

Definition

- Immediate hypersensitivity
- Sudden and severe allergic reaction
- Characterized by
 - Cardiovascular collapse (severe hypotension)
 - Respiratory compromise (bronchospasm)



Causes

- Allergic response to:
 - Medications
 - Latex
 - Environment
 - Food

Signs / Symptoms / Manifestations

- Onset
 - Injectable drugs: 5-30 minutes
 - Oral ingestion: up to 2 hours

Signs / Symptoms / Manifestations

- Skin
 - Flushed face (early symptoms)
 - Rash
 - Urticaria (nose / hands)
 - Tingling (lips, axilla, groin, hands, feet)
 - Angioedema (tongue / oropharynx)

Signs / Symptoms / Manifestations

- Respiratory
 - Apnea (without breathing)
 - Dyspnea (shortness of breath)
 - Dysphagia (difficulty swallowing)
 - Labored breathing
 - Coughing
 - Dysphonia (change in voice)
 - Inspiratory stridor
 - Wheezing

Signs / Symptoms / Manifestations

- CNS
 - Diaphoresis
 - Impending doom
 - Altered level of consciousness
 - Seizure – unconsciousness
 - Incontinence

Signs / Symptoms / Manifestations

- CVS
 - Cyanosis / pallor
 - Dizziness
 - Hypotension
 - Tachycardia to bradycardia
 - Vascular collapse
 - Cardiac arrest

Treatment - Early

- If suspect, ACTIVATE EMS IMMEDIATELY
- Supine – BLS
- Administer oxygen and/or ventilate
- Monitor pulse, blood pressure, PaO₂, patient color, and verbal response
 - Document and record
- Check patient's history and medication record

Treatment - Advanced

- Administer epinephrine
 - 0.3-0.5mg (1:1,000) IM
 - 0.2-0.5mg (1:10,000) IV
 - Repeat every 10-20 minutes
- Bronchospasm / laryngospasm
 - Albuterol (Ventolin)
 - 4-8 puffs every 20 minutes for up to 4 hours than q1-4 hours



Treatment - Advanced

- Moderate to severe anaphylaxis
 - Prevent late-phase recurrence symptoms
 - Dexamethasone (Decadron): 4mg IV
 - Hydrocortisone: 100mg IV
- Pruritus / Urticaria
 - Benadryl (diphenhydramine hydrochloride)
 - 25-50mg IV/IM every 2-4 hours (max 400 mg/day)

Treatment - Advanced

- IV fluids: 500 – 1000 mL normal saline or Ringer's lactate
- Intubate or cricothyrotomy
- Transfer to hospital STAT

Epinephrine Reaction

Symptoms

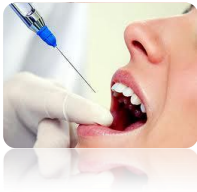
- Rapid elevation in blood pressure
- Increased pulse rate
- Anxiety
- Tremor
- Treatment
- Position patient comfortably
- Administer Oxygen
- Reassure patient
- Monitor vitals (could be 20 minutes for return to normal bp)
- Activate EMS if further symptoms develop or if elevated BP remains

Treatment

- Position patient comfortably
- Administer Oxygen
- Reassure patient
- Monitor vitals (could be 20 minutes for return to normal bp)
- Activate EMS if further symptoms develop or if elevated BP remains

Epinephrine Interactions

- Hypertensive episodes associated with:
 - Tricyclic antidepressants (-ptyline)
 - Non-selective beta blockers



Local Anesthetics

Drug Overdose

- Local anesthetics
- Sedatives/hypnotics
- Narcotics

Local Anesthetic Maximum Doses

Anesthetic	Maximum Dosage		Maximum total dosage	Carpules	mg/carpule
	mg/kg	mg/lb			
2% Lidocaine 1:000,000 epi (Xylocaine)	7	3.2	500 mg	8	34 - 36mg
3% Mepivacaine plain (Carbocaine)	4.4	2.0	300 mg	5	51 - 54mg
4% Articaine 1:100,000 epi (Septocaine)	7.0	3.2	500 mg	6	68 - 72mg
4% Prilocaine plain (Citanest)	6.0	2.7	400 mg	5	68 - 72mg
0.5% Bupivacaine 1:200,000 epi (Marcaine)	1.3	0.6	90 mg	10	8.5 - 9mg

Adapted from Stanley Malamed, Handbook of Local Anesthesia, Fifth Edition

Signs / Symptoms / Manifestations

Low to Moderate Overdose Levels

- Confusion
- Talkativeness
- Apprehension
- Excitement
- Slurred speech

Signs / Symptoms / Manifestations

Low to Moderate Overdose Levels

- Elevated BP
- Elevated HR
- Elevated RR
- Generalized stutter
- Twitching

Signs / Symptoms / Manifestations

Low to Moderate Overdose Levels

- Restless
- Visual disturbances
- Auditory disturbances
- Numbness
- Metallic taste

Signs / Symptoms / Manifestations

Low to Moderate Overdose Levels

- Light-headed and dizzy
- Drowsy and disoriented
- Losing consciousness
- Sensation of twitching (before actual twitching is observed)

Signs / Symptoms / Manifestations

Moderate to High Overdose Levels

- Generalized tonic-clonic seizure activity
 - followed by**
 - Generalized CNS depression
 - Depressed BP, heart rate
 - Depressed respiratory rate

Treatment - Early

- Administer oxygen
- Monitor vitals

Treatment - Advanced

- Activate EMS
- Place patient in supine position
- Maintain airway
- Manage seizures
 - Diazepam (Valium) 5-10mg IV
- Manage postictal state
- Transfer

Sedatives / Hypnotics

Signs / Symptoms / Manifestations

- Decreased respiratory rate
- Cyanosis
- Unresponsiveness

Treatment

- Place patient in supine position
- Maintain open airway
- Administer oxygen and ventilation assistance if needed
- Monitor vital signs
- Activate EMS
- Flumazenil (Romazicon)
 - 0.2mg IV than 0.1mg/minute up to 1 mg

Narcotic Overdose

Signs / Symptoms / Manifestations

- Decreased respiratory rate
- Cyanosis
- Unresponsiveness

Treatment

- Place patient in supine position
- Maintain open airway
- Administer oxygen and ventilation assistance if needed
- Monitor vital signs
- Activate EMS
- Naloxone (Narcan)
 - 0.4-2mg mg IV every 2-3 minutes

References

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