Respiratory Emergencies

Hyperventilation
Hyperventilation

Respiratory Alkalosis

Cerebral Vasoconstriction

Serum Ca^{2+}

Cerebral Circulation

Lightheadedness

Tetany

Paresthesias

Sympathetic Tone

CNS & Cardiac Symptoms

Hyperventilation - Pathophysiology
Hyperventilation
Clinical Manifestations

- Anxious patient
- Shortness of breath
- Palpitations
- Tachycardia
- Lightheadedness
- Circumoral paresthesia
- Carpopedal tetany

Position patient comfortably (upright)
C – A – B – BLS as needed
Remove dental materials from patient’s mouth
Calm patient
Correct respiratory alkalosis
Drug management if needed – Versed, Valium
Complete treatment, discharge
Respiratory Emergencies

Asthma

Asthma

CDC – National Center for Health Statistics

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Gum Gardners Study Club   September 2014
Asthma - Pathophysiology

- Hyperactivity of tracheobronchial tree
- Bronchial smooth muscle contraction
- Bronchial wall edema
- Mucus hypersecretion
- Narrowed airways
- Wheezing
- Shortness of breath
- Coughing

Asthma

Asthma Inhalers

Inhaled Bronchodilators

Inhaled Anti-Inflammatories

Combination Medications
Medical Emergencies Update 2014 – Part II

Asthma - Pathophysiology

- Hyperactivity of tracheobronchial tree
- Bronchial smooth muscle contraction
- Bronchial wall edema
- Mucus hypersecretion
- Narrowed airways
- Wheezing
- Shortness of breath
- Coughing

Asthma - Signs & Symptoms

- Chest congestion/tightness
- Cough, wheezing, SOB
- Anxiety or agitation
- Increased respiratory rate
- Increased heart rate
- Pt wants to sit or stand up
- Use of accessory muscles
Asthma

Indicators of a Severe Attack

- $\text{SaO}_2$ (pulse oximeter) is below 91%
- Bronchodilator doesn’t improve Sx after two treatments
- Patient has difficulty speaking
  - Sentences < phrases < words < mute
- Patient is struggling for air

Asthma Management

Position patient comfortably (upright)

C - A – B – BLS as needed

Administer bronchodilator via inhalation
  (Albuterol inhaler)

(Episode continues)

- Administer oxygen, call EMS
- Epinephrine 0.3mg SQ or IM
- Discharge or hospital

(Episode terminates)

- Complete dental treatment
- Discharge patient
- Discharge patient
Altered Consciousness

Diabetic Emergencies (Insulin Shock)
Source: Centers for Disease Control and Prevention (CDC), National Center for Health Statistics, Feb 2009

**Type 1**
- Absolute insulin deficiency, usually autoimmune process – 8%

**Type 2**
- Insulin resistant with relative deficiency – 90%

**Gestational Diabetes Mellitus**
- Abnormal glucose tolerance during pregnancy

**DM associated with other conditions**
- Pancreatic disease, drug-induced, etc.
Hyperglycemia Hypoglycemia

Normal Range

Hypoglycemia

Hyperglycemia

Insulin

Glucose

Diabetic Emergencies

Altered Consciousness
Diabetic Emergencies

Differential Diagnosis in Diabetic with aLOC

**Hypoglycemia**
- Cool, wet, pale
- Confusion
- Lethargy
- Hunger

**Hyperglycemia**
- Hot, flushed, dry
- Acetone breath
- Dry mouth
- Irritable

---

Diabetic Emergencies

Diabetic Ketoacidosis

Lack of Insulin → Hyperglycemia

↓ Glycogenolysis

↓ Gluconeogenesis

↓ Ketogenesis

↓ Ketoacidosis

↓ Coma
Diabetic Emergencies

Diabetic patients who behave in a bizarre manner or exhibit altered level of consciousness should be managed as if they are HYPOGLYCEMIC until proven otherwise.

Insulin Shock

Hypoglycemia

( < 40mg/dl )

Altered Cerebral Function

Epinephrine Release

Signs & Symptoms Of Hypoglycemia
Insulin Shock

Hypoglycemia – Early manifestations

- Diminished cerebral function
- Alteration of mood
- Lack of spontaneity
- Weakness, dizziness
- Pale, moist skin
- Headache

Insulin Shock

Hypoglycemia – Late manifestations

- Sweating
- Tachycardia
- Hypotension
- Anxiety
- Seizure activity
- Unconsciousness
**Insulin Shock - Management**

**Conscious Patient**

Position patient comfortably

C - A - B - BLS as needed

Administer oral carbohydrate (InstaGlucose)

(Episode continues)

Observe one hour

Discharge patient, escort?

(Episode terminates)

Activate EMS

Glucagon 1mg IM or IV

Dextrose 50% 50ml IV

Discharge or hospital?

---

**Unconscious Patient**

Position patient supine, legs elevated

C - A - B - BLS as needed

Activate EMS - ASAP

**Parenteral Carbohydrates**

Dextrose 50% 50ml IV

Glucagon 1mg IM or IV

(Epinephrine 0.5mg SQ or IM)

Oral carbohydrates after recovers

Discharge or transport to hospital
Altered Consciousness
Cerebrovascular Accident
(Acute Stroke)

Cerebrovascular Accident
CVA Classification

Hemorrhagic Stroke
Hemorrhage/blood leaks into brain tissue

Ischemic Stroke
Clot stops blood supply to an area of the brain
**Cerebrovascular Accident**

**CVA Classification**

Transient Ischemic Attack (TIA)

- Focal ischemic neurologic deficits that last < 24 hrs, usually resolve in 2 - 10 minutes
- Indicates cerebrovascular disease

“Angina of the Brain”

---

**Cerebrovascular Accident**

**Associated Risk Factors**

- Hypertension
- Atrial Fibrillation
- Abnormal heart valve
- Smoking
- Elevated lipids
- Prior TIAs
Cerebrovascular Accident

CVA or TIA Diagnostic Clues

ASSESSING THE PATIENT WITH SUSPECTED STROKE

1. **Frontal lobe**
   - Executive functions: thinking, planning, organizing, and problem solving
   - Emotions and behavioral control, personality

2. **Motor cortex**
   - Movement

3. **Sensory cortex**
   - Sensations

4. **Parietal lobe**
   - Perception, making sense of the world: arithmetic, spelling

5. **Occipital lobe**
   - Vision

6. **Temporal lobe**
   - Memory, understanding, language

---

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Cerebrovascular Accident

CVA or TIA Diagnostic Clues

- Hypertension, BP > 140/90
- Altered consciousness
- Hemiparesis, hemiparalysis
- Headache, blurred vision
- Asymmetry of face or pupils
- Incontinence
- Aphasia, slurring words

Cerebrovascular Accident

CVA or TIA Diagnostic Clues

FAST

**Face**
Smile - is one side drooping?

**Arms**
Raise both arms - is one side weak?

**Speech**
Speak - unable to? Words jumbled, slurred?

**Time**
Act fast and call 911. Time lost may mean brain lost.
CVA or TIA Management

- Position patient comfortably
- C – A – B – BLS as needed
- Monitor vital signs
- Activate EMS
- Administer oxygen
- Elevate head if BP elevated
- ASA Stroke Protocols
CVA or TIA Management

TIME IS BRAIN

Altered Consciousness
Seizures
Seizures
Classifying Epilepsy and Seizures

Seizure types:

<table>
<thead>
<tr>
<th>Partial</th>
<th>Generalized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>Absence</td>
</tr>
<tr>
<td>Complex</td>
<td>Convulsive</td>
</tr>
</tbody>
</table>

Consciousness is maintained
Consciousness is lost or impaired
Altered awareness
Characterized by muscle contractions with or without loss of consciousness

What do you do when you have your seizure?
Seizures

Questions to ask patient

- How frequent are seizures? Last?
- What precipitates seizures?
- What type of seizure activity?
- How long do seizures last?
- How are you after seizure?
- What medications do you take?

Common triggering factors

- Flashing lights
- Fatigue, missed meal
- Emotional stress
- Alcohol ingestion
- Physical stress
- Hypoglycemia
Seizures
Possible causes in dental office
- Epilepsy
- Local anes overdose
- Hyperventilation
- CVA (stroke)
- Hypoglycemia
- Syncope (hypoxia)

Grand Mal Seizures
- Prodromol Phase
  - Change in mood
  - Aura – related to senses
- Preictal Phase
  - Falls to floor
  - Epileptic cry
Grand Mal Seizures

- **Ictal Phase**
  - Tonic – sustained contractions
  - Clonic – alternate flexor / extensor

- **Postictal Phase**
  - Muscle flaccidity
  - Incontinence
  - Slowly regains consciousness

---

Grand Mal Management

**Ictal Phase**
Position supine, legs slightly elevated

<p>| | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activate EMS if new onset</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C - A – B – BLS as needed</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Protect from injury *</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administer oxygen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor vital signs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Grand Mal Management

Postictal Phase

- Keep supine, legs slightly elevated
- C - A – B – BLS as needed
- Monitor vital signs
- Reassure patient, permit recovery
- Discharge patient

To hospital  To home  To physician

True Seizure vs Syncope

Seizure associated with syncope:
- Movement mainly in extremities
- Generally lasts only 5 – 10 seconds
- No confusion afterwards
- No urinary incontinence
- No injury to tongue/cheek
Seizure Don’ts

Potentially Dangerous Responses to Seizure

- Don’t restrain person
- Don’t put anything in the person’s mouth
- Don’t try to hold down or restrain the person
- Don’t attempt to give oral antiseizure medication
- Don’t keep the person on their back face up
U.S. Causes of Death 2006

Twenty Leading Causes of Death Among Persons Ages 10 Years and Older, United States, 2006

Ischemic Heart Disease

Oxygen supply

Oxygen demand

Steven W. Beadnell, DMD
Gum Gardners Study Club     September 2014
Ischemic Heart Disease

Angina
a type of temporary chest pain, pressure or discomfort.

Narrowed artery
Ischemia
Heart muscle is not receiving enough oxygen due to a narrowed coronary artery.

Chest Pain
Acute Coronary Syndrome

Unstable Angina
Myocardial Infarction
Angina Pectoris

Clinical manifestations

- Substernal, squeezing / burning pain
  - “Heavy weight”, “Indigestion”
- Sudden onset with exertion or emotion
- Radiates to shoulder, face, left arm
- Subsides with rest or nitroglycerin
Angina Pectoris

Precipitating Factors

- Physical activity
- Caffeine ingestion
- Hot, humid room
- Fever, anemia
- Cold weather
- Cigarette smoking
- Large meals
- Smog
- Emotional stress
- High altitudes

Angina Pectoris

Anxiety, fear, pain

Release of catecholamines (EPI)

Increases BP, heart rate, contraction

Increases myocardial oxygen demand

Myocardial ischemia

Chest Pain
Angina Pectoris Management

Is this your typical angina?

- Location
- Radiation
- Severity of pain
- Other symptoms
- Response to NTG

Position patient comfortably (upright)
BLS as needed, monitor vital signs
History of angina pectoris? Typical Symptoms?

YES ➔ Nitroglycerin 0.4mg SL
Administer oxygen, monitor VS
Repeat NTG q3-5', Total 3 doses
Discharge Pain Resolves ➔ Hospital

NO ➔ Activate EMS

If no response in 3 doses, Tx as MI
Preventing Angina

Give 3-5’ before local anesthetic injections

Nitroglycerin Contraindication
Cardiac Emergencies

Myocardial Infarction

Etiology of Myocardial Infarction

Coronary artery
(supplies blood and oxygen to heart muscle)

Coronary artery

Heart muscle

Dead heart muscle

Blocked blood flow

Plaque buildup in artery

Blood clot blocks artery

Healthy heart muscle
Myocardial Infarction

Clinical manifestations

- Retrosternal severe pain
  - “Crushing”, “choking”
- Usually > 30 minutes
- Radiates as angina
- N/V, palpitations, SOB
- “Impending doom”

From: Symptom Presentation of Women With Acute Coronary Syndromes: Myth vs Reality

Acute Coronary Syndrome Presentation Without Chest Pain or Discomfort According to Sex—Summary of Studies From Large Cohorts

<table>
<thead>
<tr>
<th>Source</th>
<th>Study Description</th>
<th>Population</th>
<th>Study Years</th>
<th>Sample Size</th>
<th>Mean Age</th>
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<th>Rate Adjusted</th>
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<td>69.3</td>
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<td>Canto et al., 2003</td>
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<td>Cui et al., 2001</td>
<td>CCU's Creati</td>
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<td>Dwork et al., 2000</td>
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<td>1995</td>
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<td>Goldberg et al., 1999</td>
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<td>1996-1998</td>
<td>1360</td>
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<td>Miner et al., 2004</td>
<td>Worcester MI Study</td>
<td>MI</td>
<td>1997-1999</td>
<td>2173</td>
<td>70.1</td>
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<td>No</td>
<td>30.9 (45.8), 37.3</td>
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<td>Roger et al., 2000</td>
<td>Olmsted County</td>
<td>MI</td>
<td>1990-1999</td>
<td>2271</td>
<td>63.6</td>
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<td>Stern et al., 2004</td>
<td>26 Hospitals, CCU,</td>
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</tr>
</tbody>
</table>

Abbreviations: ACS, acute coronary syndrome; CCU, coronary care unit; MI, myocardial infarction; UA, unstable angina.
Myocardial Infarction

Assume MI, not angina, if:

- New onset chest pain
- Change in previous angina pain
  - More severe, different location
- Pain unrelieved by rest or NTG
Myocardial Infarction Management

Position comfortably
- BLS, oxygen, NTG X 3 doses as in angina

** If no response or if pain resolves, but returns **

- Activate EMS
- Administer fibrinolytics (ASA)
- Monitor vital signs
- Manage pain - narcotics
  Morphine 2-15mg IV q15 minutes
  Nitrous oxide is option
- Transport to hospital - - ACLS

23% mortality reduction
ISIS-2 study

Time is Muscle
Cardiac Emergencies

Cardiac Arrest

Possible causes

- Myocardial infarction
- Sudden cardiac death
- Airway obstruction
- Drug overdose reaction
- Anaphylaxis
- Seizure disorder
- Acute adrenal insufficiency
Cardiac Arrest

Ventricular Fibrillation

About 90% of cardiac arrests

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Gum Gardners Study Club  September 2014
Cardiac Arrest

Conversion of Ventricular Fibrillation to normal rhythm

<table>
<thead>
<tr>
<th>Time in Ventricular Fibrillation</th>
<th>Success of Defibrillation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than one minute</td>
<td>90%</td>
</tr>
<tr>
<td>One to two minutes</td>
<td>80%</td>
</tr>
<tr>
<td>Each add’l minute</td>
<td>Decreases 10%</td>
</tr>
</tbody>
</table>

Efficacy of Defibrillation

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Automated External Defibrillator

AED Instructions

Instructions for operation – two steps

Step one
✓ Patient is unconscious
✓ Patient is not breathing
✓ Patient is pulseless

Step two
✓ Apply defibrillator pads
✓ Follow verbal instructions
BLS – The Primary Survey

First C – A – B - D

- Circulation
  - Give chest compressions
- Airway
  - Open the airway
- Breathing
  - Provide positive-pressure ventilation
- Defibrillation
  - Shock ventricular fibrillation

Drug-Related Emergencies

Allergic Reactions
**Allergic Reactions**

**Common Dental Allergens**

- Antibiotics
  - Penicillin
  - Cephalosporins
  - Tetracyclines

- Analgesics
  - Aspirin-compounds
  - Nonsteroidal

- Opioids
  - Meperdine
  - Codeine

- Antianxiety agents
  - Barbiturates

- Local anesthetics
  - Esters: Benzocaine
  - Sodium bisulfite
  - Methylparaben

- Others
  - Acrylic monomer
  - Latex

---

**Schematic representation of the main mechanisms of allergies and their diseases**

- Histamine
- Leukotrienes
- Cytokines and Chemokines

- Immediate release of antihistamines
- Prolonged symptoms: Airway narrowing and swelling

- Anaphylaxis: Seasonal allergic rhinitis, Oral allergy syndrome, Atopic dermatitis
- Acute urticaria

- Immediate allergic response
- Prolonged allergic response

- Allergic asthma
- Contact dermatitis
- Asthma attacks

**Steven W. Beadnell, DMD**

_Gum Gardners Study Club_  _September 2014_
Allergic Reactions

Allergen

Mast cells & Basophils

- Histamine
- Leukotrienes
- ECF – Anaphylaxis
- Kallikreins
- Prostaglandins

Allergic phenomenon

Allergic Reactions - Cutaneous

Clinical manifestations

Increased vascular permeability

- Vasodilation

- Urticaria / Hives
- Rash
- Pruritis (itching)
- Tingling and warmth
- Flushing
Allergic Skin Reactions

Typical Distribution Pattern

Most common
Common
Uncommon
Rare

Allergic Reactions - Cutaneous
Allergic Reactions - Cutaneous

Clinical manifestations

Increased vascular permeability & vasodilation
Increased exocrine gland secretions
Bronchiole smooth muscle contraction

Rhinitis
Nasal congestion
Nasal itching
Rhinorrhea

Laryngeal edema
Dyspnea
Hoarseness
Throat tightness
Laryngeal stridor

Bronchospasm
Cough
Wheeze
Tachypnea
Allergic Reactions - Respiratory

Bronchospasm

Cough
Wheezing
Tachypnea

Allergic Reactions - Cardiovascular

Clinical manifestations
Increased vascular permeability & vasodilation
Decreased cardiac output
Loss of vasomotor tone

Circulatory collapse
Light-headed
Weakness
Syncope
Ischemic chest pain

Dysrhythmias
Light-headedness
Weakness
Palpitations
Ischemic chest pain

Cardiac arrest
Pulselessness
EKG changes
Vent fibrillation
Asystole
Allergic Reactions

Predictors of severity of the reaction
Rapidity of onset of signs and symptoms
Rapidity of progression of signs and symptoms

Epinephrine
- Reverses the pathologic processes causing the allergic reaction

Diphenhydramine
- Antagonizes histamine, preventing progression of the allergic reaction
Delayed-Onset Allergic Skin Rxn Management

Onset skin reaction (> 1 hour) from allergen
Position patient comfortably
Assess and perform BLS as needed
Definitive care

Increasingly severe symptoms

Observe patient
Administer oral histamine blocker prn
Benadryl 50mg oral
Administer IM + oral histamine blocker q4-6h
Benadryl 50mg IV or IM
Benadryl orally X 2-3 days (25 – 50mg qid)

Rapid-Onset Allergic Skin Rxn Management

Onset skin reaction (< 1 hour) from allergen
Position patient comfortably
Assess and perform BLS as needed
Definitive care

Cardiac or respiratory involvement ?

NO
Benadryl 50mg oral / IM
Discharge

YES
Oxygen, start IV
Epinephrine 0.3mg SQ, IM, IV
Activate EMS
Benadryl 50mg IV or IM
Hospital
Medical Emergencies Update 2014 – Part II

**Tx Respiratory Allergic Rxn**

Position patient comfortably

Assess and perform BLS as needed

Calm patient

Activate EMS

Administer Epinephrine 0.3mg q 15-30 min
SC, IM, IV, inhaler

Benadryl 50mg IM

Discharge or hospitalize

**Allergic Reactions**

Angioedema
A noninflammatory, nonpruritic edema involving the skin, subcutaneous tissue, underlying muscle, and mucus membranes, especially those of the GI and upper respiratory tracts.
Angioedema

Three types of angioedema:

- Allergic angioedema
- Hereditary angioedema
- Idiopathic angioedema
Angioedema

Exposure to trigger

Faulty or deficient C1-INH

Increased Bradykinin levels

Increased vascular permeability

Mucosal edema

Deficiency or Defect in C1-INH

Inherited or acquired defect

High association with dental office triggers

Latex, other office materials

Other known triggers

ACE inhibitors

Other drugs: Abx, NSAIDs, ASA

Environmental
Allergic Angioedema

Allergic angioedema symptoms include:

- Marked skin swelling:
  - Eyes, mouth, hands, feet, throat
  - Usually does not itch, may burn or be painful
  - May be asymmetric

Abdominal pain or cramping – swollen mucosa
Hives possibly present
Laryngeal edema, hoarseness
Angloedema Management

Remove trigger
Secure Airway
Transfer to hospital
Medical ICU

Medications include:
- Antihistamines (Benadryl)
- Adrenalin (Epinephrine)
- Terbutaline (Bronchodilator)
- Cimetidine (Tagamet)
- Corticosteroids
- Sedatives
- Tranquilizers

Activate EMS

Medical Emergencies Update 2014 – Part II