OMSA Weekend Handout
Table of Contents

Autonomic Nervous System
Cardiovascular System
Conduction System
Conduction System (ACLS)
Respiratory System
Endocrine System
Immune & Other Systems
Intravenous Therapy
Pharmacology
Outpatient Anesthesia
Office Anesthetic Emergencies
Important Disclaimer

Any lecture material covering the topics of I.V. placement, I.V. removal, I.V. drug draw and administration, is meant only as general information.

Attending the OMSA course and learning this material does not allow you to place I.V.’s, remove I.V.’s, or draw and administer I.V. drugs.

Only trained and licensed medical professionals may place an I.V.
The nervous system that controls the voluntary movements of the human body such as lifting a weight.

The nervous system that controls all the "Automatic" functions of the human body such as the beating of your heart.

The autonomic nervous system exerts its action on many organs and systems.

- Heart
- Lungs
- Stomach, intestines
- Liver
- Kidneys
- Blood vessels
- Pupils
- Salivary glands

The autonomic nervous system controls all the regulatory systems of the body:

- Blood pressure
- Heart rate
- Respiratory rate
- Temperature
- Digestion
- Metabolism
- Water/electrolyte balance
- Production of body fluids
- Urination
- Defecation

The sympathetic and parasympathetic nervous system exert opposite functions on many of our organs. As one goes up the other goes down.
**Parasympathetic**
- Constrict
- Produce Saliva
- Slower heart
- Stimulates digestion
- Decrease Glucose
- Constricts Bladder

**Sympathetic**
- Dilate
- Dry Mouth
- Faster Heart
- Facilitates Breathing
- Inhibits digestion
- Releases Glucose
- Releases Bladder

**Neurotransmitters**
- These are chemical “messengers” that communicate within the autonomic nervous system
- Main chemicals:
  - Acetylcholine
  - Norepinephrine

**Chemical Transmitters**
- Generally, the Parasympathetic Nervous System uses Acetylcholine and therefore sometimes it is called the Cholinergic System
- Generally, the Sympathetic Nervous System uses Norepinephrine. Sometimes it is called the Adrenergic System
  - [think Adrenaline...or “adrenergic”]

**Receptors of the Sympathetic Nervous System**
- There are types of sympathetic receptors: alpha, beta 1 and beta 2
- Alpha receptors are on BLOOD VESSELS
- Beta 1 receptors are in the HEART
- Beta 2 receptors are in the bronchioles of the LUNGS

**Tricks to remember**
- Alpha (α) = Arteries
- Beta 1 (β1) = 1 Heart
- Beta 2 (β2) = 2 lungs
Alpha receptors on blood vessels
- When stimulated: (agonist)
  - Blood vessels CONstrict
- When blocked: (antagonist)
  - Blood vessels DILATE

Beta 1 Receptors in Heart
- When stimulated:
  - Heart rate and contractility are increased
- When blocked, heart rate and contractility are decreased
  - “Beta blockers”

Beta 2 Receptors in Lungs
- When stimulated, bronchioles dilate (get bigger)
- Therefore asthma medications are “beta agonists”
- When blocked bronchioles would constrict

One more thing: the Vagus Nerve
- The Vagus Nerve is the 10th Cranial nerve. It supplies parasympathetic innervation to the heart.
- Stimulation of the Vagus nerve slows down the heart rate
- So, vasovagal syncope (fainting) is due to excessive parasympathetic stimulation of the vagus nerve, slowing down the heart rate (bradycardia) which causes the blood pressure to drop and the patient to faint.
- Atropine is a drug used to treat bradycardia and speed up the heart rate. It is a parasympatholytic, meaning it is “anti-parasympathetic” which means “anti-slowing down the heart” which actually speeds up the heart. It is like “taking the foot off the brake.”

This Concludes
Autonomic Nervous System (ANS) Review
California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course
Cardiovascular System Review
California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course

Cardiovascular
Anatomy of the Heart
Function of the heart
Cardiac Disorders:
- Heart Valve Conditions
- Coronary Artery Disease (CAD)
- Hypotension / Hypertension (HTN)
- Cerebral Vascular Accident (CVA)
- Congestive Heart Failure (CHF)

Heart Anatomy: 4 chambers
- 2 Upper chambers are the Atria / Atrium
- 2 Lower chambers are the ventricles

Heart Anatomy: 4 Valves
There are 2 valves between the Atria (top) & 2 between the Ventrices (bottom)

Tricuspid & Mitral Valves
- Tricuspid Valve = between right atrium and right ventricle.
- Mitral Valve = between left atrium and left ventricle

Think of valves as “saloon doors”
The Pulmonic Valve lies in the Pulmonary Artery

The Aortic Valve lies in the Aorta

### Pulmonic & Aortic Valves

### Cardiovascular

Anatomy of the Heart

**Function of the heart**

Cardiac Disorders:
- Heart Valve Conditions
- Coronary Artery Disease (CAD)
- Hypotension / Hypertension (HTN)
- Cerebral Vascular Accident (CVA)
- Congestive Heart Failure (CHF)

### Function of the heart

**What does the heart do?**

The heart is a muscle which pumps blood through blood vessels to provide the body with oxygen.

### How does the heart pump?

#### Atrial Contraction

- The Atria squeeze the blood into the ventricles
- Tricuspid & mitral valves open
- Aortic & pulmonic valves close

#### Ventricular Contraction

- Both ventricles are filled with blood
- Ventricles squeeze blood into the pulmonary artery and the aorta
- Pulmonic & Aortic valves open
- Tricuspid & Mitral Valves close
Superior and inferior vena cava

Right atrium
Tricuspid valve
Right ventricle
Pulmonic valve
Pulmonary artery
To the LUNGS where blood becomes oxygenated

Pulmonary Vein
Left atrium
Mitral Valve
Left ventricle
Aortic Valve
Aorta to the rest of the body

Superior & Inferior Vena Cava bring deoxygenated blood from body to right atrium
Pulmonary artery takes deoxygenated blood from right ventricle to lungs

The Pulmonary Vein takes newly oxygenated blood from the lungs to the left atrium
The Aorta takes oxygenated blood from left ventricle to the rest of the body

Let's do that blood flow again...
The _____ and the _____ bring deoxygenated blood to the _____ atrium
It goes through the _____ valve
Into the _____ ventricle
Then it passes through the _____ valve
Into the _____ artery
Which leads it to the where it picks up oxygen

Keep Going...
The blood, newly oxygenated, comes back from the lungs through the _____ vein
Into the _____ atrium
Through the _____ valve
Into the _____ ventricle
Through the _____ valve
Into the _____ (hint: BIG artery)
Which pumps the oxygenated blood to the rest of the body
As the blood moves through a capillary, oxygen (O2) & nutrients are dropped off and carbon dioxide (CO2) is picked up.

In the LUNGS the blood moves thru Capillaries, pick up oxygen (O2) & drops off carbon dioxide (CO2).
Cardiovascular
Anatomy of the Heart
Function of the heart
Cardiac Disorders:
- **Heart Valve Conditions**
- Coronary Artery Disease (CAD)
- Hypotension / Hypertension (HTN)
- Cerebral Vascular Accident (CVA)
- Congestive Heart Failure (CHF)

Heart Valve Conditions
Aortic Stenosis = Aortic Valve is “stiff”

The valve is stiff - blood has to force its way through.

Heart Valve Conditions
Mitral Valve Prolapse = “Bulge”

This is characterized by the displacement of an abnormally thickened mitral valve during systole.

Heart Valve Conditions
Mitral Valve Regurgitation = “Insufficiency”

Mitral valve does not close properly so when the heart pumps out blood, blood flows back into the chamber.

Heart Valve Conditions
Heart Valves can be
- “Stiff” – Stenotic
- “Bulge” – Prolapse
- “Insufficient” – Regurgitate

Consequences of Heart Valve Conditions
Heart Valve Problems are risk for infections of the heart

What is that called?
**Bacterial Endocarditis**

**Infection of the heart valves**

Why do we care about Bacterial Endocarditis?

**What causes it?**

- History of endocarditis
- Prosthetic heart valve
- Heart transplant
- Cyanotic congenital heart disease (birth defects)
- Repaired congenital heart disease with residual defect

Who needs to be pre-medicated with antibiotics prior to dental procedures?

- History of endocarditis
- Prosthetic heart valve
- Heart transplant
- Cyanotic congenital heart disease (birth defects)
- Repaired congenital heart disease with residual defect

**Prevention of bacterial endocarditis**

Premedication of Antibiotics Prior to Dental Procedures

- Amoxicillin 2 grams - 1 hour prior
- Penicillin Allergy
  - Clindamycin 600 mg
  - Azithromycin 500 mg
  - 1 hour prior
- The most common bacteria = Streptococcus

**Cardiovascular**

- Anatomy of the Heart
- Function of the heart
- Cardiac Disorders:
  - Heart Valve Conditions
  - Coronary Artery Disease (CAD)
  - Hypotension / Hypertension (HTN)
  - Cerebral Vascular Accident (CVA)
  - Congestive Heart Failure (CHF)
Cardiac Disorders

What is the heart made of ....?

A. Muscle  
B. Bone  
C. Cartilage  
D. Enamel

Cardiac Disorders

What do the coronary arteries do?

Coronary Arteries deliver blood to the heart muscle

Cardiac Disorders

Coronary Arteries are the first branches from the aorta and give the blood supply to the heart itself.

What is Atherosclerosis?
Pathophysiology of Atherosclerosis
A disease of the arteries where fat accumulates inside the artery

Atherosclerosis of the Coronary Arteries is called?
Coronary Artery Disease

Why does chest pain occur?
Chest pain - lack of blood flow through the coronary arteries to the heart (muscle)

Where does chest pain usually radiate to?
Pressure to chest
Left arm
Left jaw
Back
a condition marked by severe pain in the chest caused by an inadequate blood supply to the heart.

What is this called? (chest pain)

Angina

Why did this happen?
What causes the lack of blood supply? In the coronary artery, plaque builds up and plugs the coronary artery. Stopping blood flow past that blockage.

How do you treat chest pain? (Angina)

M = ?
O =
N =
A =

M = Morphine – Why?
O = ?
N =
A =
How do you treat chest pain? (Angina)

M = Morphine – Why?
O = Oxygen – Why?
N = ?
A = ?

How do you treat chest pain? (Angina)

M = Morphine – Why?
O = Oxygen – Why?
N = Nitroglycerin – Why?
A = ?

How do you treat chest pain? (Angina)

M = Morphine – Why?
O = Oxygen – Why?
N = Nitroglycerin – Why?
A = Aspirin – Why?

How do you treat chest pain? (Angina)

M = Morphine – Dosage?
O = Oxygen –
N = Nitroglycerin –
A = Aspirin –

How do you treat chest pain? (Angina)

M = Morphine – 2-4 mg IV
O = Oxygen – how much?
N = Nitroglycerin –
A = Aspirin –

How do you treat chest pain? (Angina)

M = Morphine – 2-4 mg IV
O = Oxygen – 94% SaO2
N = Nitroglycerin – Dose?
A = Aspirin –
**How do you treat chest pain? (Angina)**

M = Morphine – 2-4 mg IV
O = Oxygen – 94 % SaO2
N = Nitroglycerin – 0.4 mg
A = Aspirin – Dose?

**More nitroglycerin (Sublingual)**

OR

**Chest pain continues after one dose of nitroglycerin**

What do we do now?

**After 3 doses**

& continued Chest Pain
You must assume it’s a...

**Myocardial Infarction**

What is the difference between Angina vs Myocardial Infarction (MI)?
Angina vs Myocardial Infarction (MI)

**Angina** - ischemia of heart muscle tissue due to lack of oxygen

MI - death of heart muscle tissue due to lack of oxygen

Signs & Symptoms of MI

What are the signs and symptoms of a Myocardial Infarction (MI)?

Chest pain
Left arm pain
Left jaw pain
Back pain
Nausea
Vomiting
Sweating

Coronary Artery Disease (CAD)

**RISK FACTORS**

- Modifiable
  - High Blood Pressure
  - Smoking
  - High Cholesterol
  - Diabetes
  - Obesity
- Non Modifiable
  - Age
  - Race
  - Gender
  - Family History
  - (MI, CHF, Valve, Rhythms)

How do you treat CAD?

- Cardiac Catheterization (Stent)
- Coronary Artery Bypass Graft (CABG)
How do you treat CAD?
Cardiac Catheterization: A catheter is introduced and a dye is injected into the coronary arteries. This is called an angiogram.

Catheterization with stent placement
Balloon angioplasty and placement of a stent:
Inflate the balloon to flatten the plaque against the arterial wall.
Leave the stent in place after the balloon is deflated.

Coronary Artery Bypass Graft (CABG)
Take a graft (vessel) and attach one end to the aorta and the other end to a point in the artery beyond the blockage. They “bypass” the blockage.

Case 1
55 year old male referred by his general dentist for extraction of decayed 2nd molar.
PMH - NIDDM, CHF
MEDS - Lasix, Enalapril, Metformin
PSH - Denies
NKDA

Vital Signs:
BP 165 / 95
Pulse 103
Temp 100.4
Blood Sugar (BS) 120
BMI 30.4

Case 1
He has mild left facial swelling.
The mandibular left third molar tooth is partially erupted.
You have lightly sedated the patient. Just after you give your local anesthesia he starts c/o chest pain. You take the vital signs:
BP - 185/102
HR - 118
RR - 12
Blood Sugar (BS) - 90
EKG - Sinus tachycardia with occasional PVC’s

What is the diagnosis of this patient’s condition?
- Hypoglycemia - Blood Sugar 90
- Hyperventilation Sx - RR 12
- Hyperglycemia - Blood Sugar 90
- Angina - Sounds good
- Pre-syncope - Could be

What would be the most beneficial first intervention?
A. 6 units of Humalog sq.
B. Have patient breath into a paper bag
C. Trendelenburg positioning
D. Oxygen vis nasal cannula
E. Sublingual sugar

What would be the most beneficial next intervention?
A. Ibuprofen
B. Sublingual nitroglycerin
C. Retake Blood Sugar (BS)
D. Start an IV and give 2 mg of Versed
E. None of the above
After five minutes the patients condition is unchanged. What would be the most beneficial next intervention?

A. 2 mg Morphine sq. if SBP>90
B. Repeat sublingual nitroglycerin if SBP>90
C. Retake BS and give 2 more units of insulin if FSBG>120
D. Repeat 2 mg of Versed IVP
E. B and D

After an additional five minutes the patients condition remains unchanged. What is the next intervention?

A. Repeat sublingual nitroglycerin if SBP>90
B. Retake BS and consider 2 more units of insulin if BS >120
C. Call 911
D. A and C
E. B and C

Cardiovascular

Anatomy of the Heart
Function of the heart
Cardiac Disorders:
- Heart Valve Conditions
- Coronary Artery Disease (CAD)
- Hypotension / Hypertension (HTN)
- Cerebral Vascular Accident (CVA)
- Congestive Heart Failure (CHF)

Hypotension

What does hypotension mean?
What does hypotension mean?

Low Blood Pressure

How low is too low?

90 / 60

How low is too low?

What are the symptoms of low blood pressure?

Signs & Symptoms:
- Dizziness
- Cold, clammy
- Fatigue
- Blurry vision

Excessive anesthesia
Allergic reactions
Myocardial Infarction
Cardiac dysrhythmias
Sepsis
**Hypotension**

How do you treat low blood pressure?

When do you treat it?

**Hypotension Treatment**

Place patient in supine

Fluid challenge

Drugs - Which ones?

**Hypotension Treatment**

Place patient in supine

Fluid challenge

Drugs - Ephedrine or Phenylephrine

**Hypertension**

What pressure are we measuring?

Blood Pressure that is too high
**Hypertension**

What pressure are we measuring?

Blood pressure measures the force of the blood inside an artery.

**Blood Pressure**

Systolic = 120

Diastolic = 80

**Diastole** = Measures the pressure that blood exerts on the arteries while the heart is at rest.

**Systole** = Measures the pressure that blood exerts on the arteries while the heart is beating.

How do you take a blood pressure reading?

1. Inflate the cuff to 180 or until you hear no sounds.
2. Deflate the cuff and listen.
3. The first sound you hear is the ______ S ______.
4. When sounds stop this is your ______D______.

How do you know that your BP is correct?

Oral & Maxillofacial Surgery Assistant (OMSA) Course Weekend Seminar

California Association of Oral & Maxillofacial Surgeons ©2019
**Hypertension**

How do you know that your BP is correct?

What happens if the wrong cuff is put on?

If it’s too small then………?
BP is too ________, and
If it’s too large then………?
BP is too ________.

**Hypertension**

How do you know that your BP is correct?

What is the appropriate cuff size?

Cuff width = 40% of mid-arm circumference

Cuff length = bladder should be 80% of arm circumference.

**Hypertension**

How do you treat Hypertension?

**Blood Pressure**

DANGER

GET HELP

ELEVATED

NORMAL

**Hypertension**

Stages of Hypertension

<table>
<thead>
<tr>
<th>Blood Pressure Category</th>
<th>Systolic mm Hg (upper limit)</th>
<th>Diastolic mm Hg (lower limit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>less than 120</td>
<td>less than 80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120 – 139</td>
<td>or 80 – 89</td>
</tr>
<tr>
<td>High Blood Pressure (hypertension) Stage 1</td>
<td>140 – 159</td>
<td>or 90 – 99</td>
</tr>
<tr>
<td>High Blood Pressure (hypertension) Stage 2</td>
<td>160 or higher</td>
<td>or 100 or higher</td>
</tr>
<tr>
<td>Emergency room</td>
<td>Systolic mm Hg (hospital)</td>
<td>or Diastolic mm Hg (hospital)</td>
</tr>
<tr>
<td></td>
<td>160 or higher</td>
<td>or 110 or higher</td>
</tr>
</tbody>
</table>

**Hypertension**

How high is too HIGH?

148 94 174
98 104 118 86
Pulse/min

Oral & Maxillofacial Surgery Assistant (OMSA) Course Weekend Seminar

California Association of Oral & Maxillofacial Surgeons ©2019
**Hypertension**

**How do you treat it?**

1. **Diuretics** - “Water pill” - Lasix
2. **Beta Blockers** - Slows heart - Atenolol
3. **Calcium Channel Blockers** - Dilates - Norvasc
4. **Ace Inhibitors** - Inhibits Angiotensin - Lisinopril

**Hypertensive Crisis**

**Blood Pressure > 240 / 140**

**Signs & Symptoms:**

- Headache
- Dizziness
- Chest pain, Shortness of breath
- Nausea / Vomiting
- Numbness/weakness
- Nosebleeds
- Loss of Vision

**Hypertensive Crisis - Pathophysiology**

Precipitating factors: pain, anxiety, O₂, CO₂, or cardiopulmonary compromise (usually excessive adrenergic stimulation)

**Hypertensive Crisis - Diagnosis**

- The anesthesia team should be vigilant in monitoring blood pressure throughout the surgical procedure.
- A trend of increasing blood pressure should be noted on the monitor long before a crisis level is reached.

**Hypertensive Crisis - Treatment**

- Try to determine cause and treat if possible e.g. pain
- Avoid O₂ unless there is arterial hypoxia
- Use of calcium channel blockers
- Vasodilation
- Avoidance of minute volume

**Diuretics**

Lasix

**Beta Blockers**

Atenolol

**Calcium Channel Blockers**

Norvasc

**Ace Inhibitors**

Lisinopril

What do you think about a patient that is taking 1 medicine vs 3 medicines?
What are we concerned about Hypertension?

Patients are at increased risk of:
- Stroke (CVA)
- Heart Attack (MI)
- Congestive Heart Failure (CHF)

Patients are at increased risk of:
- Stroke (CVA)
- Heart Attack (MI)
- Congestive Heart Failure (CHF)

Anatomy of the Heart
Function of the heart
Cardiac Disorders:
- Heart Valve Conditions
- Coronary Artery Disease (CAD)
- Hypotension / Hypertension (HTN)
- Cerebral Vascular Accident (CVA)
- Congestive Heart Failure (CHF)

What do you look for?

Stroke - FAST
- F = Face
- A = Arm
- S = Speech
- T = Time

Cerebral Vascular Accident (CVA)

“Brain Attack”
What do you look for?
Cerebral Vascular Accident (CVA)

**Stroke**

A = Arm

Weakness of one arm

S = Speech

Trouble Speaking

Incomprehensible Speech

“You can’t teach an old dog new tricks”

**Stroke - FAST**

F = Face

A = Arm

S = Speech

T = Time

**Case 2**

50 year old is undergoing placement of a dental implant for tooth number 14 under IV sedation.

Past Medical History (PMH):

- Hypertension
- Hypothyroidism

Medications:

- Atenolol
- Hydrochlorothiazide
- Prozac
- Synthroid
### Case 2

**Vital Signs at consultation:**
- BP: 155/95
- HR: 87
- T: 98.1
- Weight: 275 lbs.
- Height: 6 ft.
- BMI: 37.5

**BMI Calculation:**

\[
\text{BMI} = \frac{\text{Weight}}{(\text{Height}^2)}
\]

- Normal: 18.5 - 25
- Overweight: 25 - 30
- Moderately obese: 30 - 35
- Severely obese: 35 - 40

So our patient is ________ Obese

**Her physician has cleared her for surgery.**
The patient was anxious about her missing tooth but was also concerned about finances.

**Anesthesia concerns for this patient include?**

- A. Airway obstruction
- B. Emesis and Aspiration
- C. Intra-operative hypertension
- D. All of the above

**What do you tell your patients about their routine medicines when they are going to have IV anesthesia?**

NPO...
Case 2
The patient comes in NPO and did not take her BP medicines.

What is your concern?

- Blockers (Atenolol) & Alpha Agonists (Clonidine)

Case 2
Rebound hypertension - your blood pressure rises after you stop taking your BP medicine.

You start the procedure & her blood pressure goes to 199/118. Possible reasons for this are?

- Failure to take antihypertensive medications
- Pain
- Urinary retention
- None of the above
- All of the above

Case 2
Repeat blood pressures confirm the previous BP = 199/118. What would be the most beneficial next intervention?

- Terminate procedure & awaken the patient
- Ephedrine IVP
- Fluid challenge
- B and C
- A and B

Case 2
Repeat blood pressures confirm the previous BP = 199/118. What would be the most beneficial next intervention?

- Terminate procedure & awaken the patient
- Ephedrine IVP
- Fluid challenge
- B and C
- A and B
Cardiovascular

Anatomy of the Heart
Function of the heart
Cardiac Disorders:
Heart Valve Conditions
Coronary Artery Disease (CAD)
Hypotension / Hypertension (HTN)
Cerebral Vascular Accident (CVA)
Congestive Heart Failure (CHF)

Congestive Heart Failure (CHF)

What is Congestive Heart Failure? (CHF)

Definition = The Heart is unable to Pump sufficiently to Meet the body’s needs.

Congestive Heart Failure (CHF)

What causes CHF?

Previous heart attack
High Blood pressure
Valve Problems
Dysrhythmias

Congestive Heart Failure (CHF)

Two type of CHF
Right sided
Left sided
**Congestive Heart Failure (CHF)**

Right sided Heart failure - Blood starts to back up...
Where does it come from?

---

**Right Sided Failure**

When the Right side of the heart fails.....

What are the signs of Right sided CHF?

---

**What happens when the Right side of the heart fails?**

Distended Neck Veins Jugular Venous Distention (JVD)
Pitting Edema to the Ankles (Ankle Edema)

---

**Ascites = Fluid accumulation in the abdominal cavity**

---

**So when the Right side of the heart fails you will see.....**
What happens when the Left side of the heart fails?

Left sided Heart failure - Blood backs up...so
Where does it back up to?

When the LEFT side of the heart fails.....
What are the signs of Left sided heart failure?

Pulmonary edema = ?

Pulmonary edema = Fluid in the Lungs
Patients feel like they can not ....?
Orthopnea
Orthopnea = can't breathe lying down

Paroxysmal Nocturnal Dyspnea
Paroxysmal Nocturnal Dyspnea = waking up at night short of breath

When the LEFT Side of the Heart Fails...
What are the signs of left sided heart failure?

How do we treat CHF?
**Congestive Heart Failure - Treatment**

How do you fix the fluid problem?
- Too much fluid

How do you get rid of that fluid?

---

**Diuretics**

**Congestive Heart Failure - Treatment**

How do you fix the fluid problem?
- Too much fluid

How do you get rid of that fluid?

---

**Diuretics**

**Congestive Heart Failure - Treatment**

Digoxin – Increases contractility of the Heart without making the Heart work any harder

---

**Lisinopril** – Vasodilator make it easier for the heart to pump.

---

**Quiz**

The heart is divided into ___ chambers. The upper chambers are called ______ while the lower chambers are called ________.

A. 4 atria ventricles  
B. 3 atria ventricles  
C. 5 ventricles atria  
D. 4 ventricles atria
Quiz
Beta one controls the:
A. Lungs
B. Salivary gland
C. Blood pressure
D. Heart

Quiz
Stimulation of the Vagus nerve will ___ the heart rate.
A. Increase
B. Decrease

Quiz
The ___ valve lies in between the right atrium and the right ventricle, while the ___ valve lies in between the left atrium and left ventricle.
A. Pulmonic, Aortic
B. Mitral, Pulmonic
C. Tricuspid, Aortic
D. Tricuspid, Mitral
Another name for the Sympathetic Nervous System is the Cholinergic System. True or False?

A. True  
B. False

Insufficient blood flow through the coronary arteries can result in:

A. Angina  
B. Diabetes  
C. Pulmonary Embolism  
D. Stroke

Name the two systems that comprise the autonomic nervous system:

A. Alpha and beta  
B. Beta one and Beta two  
C. Parasympathetic and sympathetic  
D. Adrenergic and Beta
Quiz
Trace the pathway of the conduction system through the heart:
___ node to the ___ node, to the Bundle of His in the ___ and finally to the ___.
A. AV, SA, Purkinje fibers, Bundle branches
B. SA, AV, Purkinje fibers, Bundle branches
C. SA, AV, Bundle branches, Purkinje fibers

Quiz
Follow the pathway of the blood flow through the heart:
Superior and inferior vena cava to the ___ atrium,
past the ___ valve and into the ___ ventricle,
past the ___ valve to the ___ artery
to the lungs where it picks up oxygen.
A. left, mitral, left, aortic, pulmonary
B. right, mitral, left, aortic, pulmonary
C. right, mitral, right, pulmonic, aorta
D. right, tricuspid, right, pulmonic, pulmonary

Quiz
Continue the pathway of the blood flow:
From the lungs where it picked up oxygen, blood travels
through the ___ vein to the ___ atrium, past the ___ valve
to the ___ ventricle, then through the ___ valve
and into the ___ where it is pumped to the rest of the body.
A. pulmonic, right, mitral, left, aortic, aorta
B. pulmonic, left, tricuspid, left, aortic, aorta
C. pulmonic, left, mitral, left, aortic, aorta
D. aortic, left, tricuspid, left, pulmonary, pulmonary artery

Quiz
Trace the pathway of the conduction system through the heart:
___ node to the ___ node, to the Bundle of His in the ___ and finally to the ___.
A. AV, SA, Purkinje fibers, Bundle branches
B. SA, AV, Purkinje fibers, Bundle branches
C. SA, AV, Bundle branches, Purkinje fibers

Quiz
Follow the pathway of the blood flow through the heart:
Superior and inferior vena cava to the ___ atrium,
past the ___ valve and into the ___ ventricle,
past the ___ valve to the ___ artery
to the lungs where it picks up oxygen.
A. left, mitral, left, aortic, pulmonary
B. right, mitral, left, aortic, pulmonary
C. right, mitral, right, pulmonic, aorta
D. right, tricuspid, right, pulmonic, pulmonary

Quiz
Continue the pathway of the blood flow:
From the lungs where it picked up oxygen, blood travels
through the ___ vein to the ___ atrium, past the ___ valve
to the ___ ventricle, then through the ___ valve
and into the ___ where it is pumped to the rest of the body.
A. pulmonic, right, mitral, left, aortic, aorta
B. pulmonic, left, tricuspid, left, aortic, aorta
C. pulmonic, left, mitral, left, aortic, aorta
D. aortic, left, tricuspid, left, pulmonary, pulmonary artery
Quiz
What does NECROSIS mean?
A. Abdominal swelling from fluid accumulation
B. Fluid in the lungs
C. Inadequate blood supply
D. Death of tissue

Quiz
What does NECROSIS mean?
A. Abdominal swelling from fluid accumulation
B. Fluid in the lungs
C. Inadequate blood supply
D. Death of tissue

Quiz
Symptoms of right sided heart failure include:
A. Ascites and pitting edema
B. Shortness of breath and pulmonary edema
C. Green productive sputum
D. Chest pain on exertion

Quiz
Symptoms of right sided heart failure include:
A. Ascites and pitting edema
B. Shortness of breath and pulmonary edema
C. Green productive sputum
D. Chest pain on exertion

Quiz
Which patient needs antibiotic premedication?
A. A 70 year old with a prosthetic valve
B. A 20 year old who reports a childhood heart murmur
C. A 67 year old with a previous history of a myocardial infarction
D. A 28 year old with a repaired atrial septal defect which was repaired at birth

Quiz
Which patient needs antibiotic premedication?
A. A 70 year old with a prosthetic valve
B. A 20 year old who reports a childhood heart murmur
C. A 67 year old with a previous history of a myocardial infarction
D. A 28 year old with a repaired atrial septal defect which was repaired at birth
**Quiz**

What medication is used in the treatment of angina?

A. Nitroglycerin  
B. diuretic  
C. glucose  
D. Beta blockers

---

**Quiz**

Left sided heart failure often leads to:

A. Mitral valve prolapse  
B. Right sided heart failure  
C. A MI  
D. Aortic stenosis

---

**Quiz**

What causes a heart murmur?

A. A myocardial infarction  
B. Irregularity in the electrical circuit of the heart  
C. The heart valves opening and closing  
D. Turbulence in the blood flow across the heart valves
The first heart sound is caused by:
A. The aortic and pulmonic valves closing
B. The aortic and tricuspid valves closing
C. The mitral and tricuspid valves closing
D. The mitral and pulmonic valves closing

What is the difference between angina and a myocardial infarction?
A. A patient having a myocardial infarction will appear pale and sweaty while the patient having angina will not.
B. Nothing. They are both the same.
C. Angina is chest pain due to inadequate oxygenation while a myocardial infarction means death of the actual heart muscle.
D. A myocardial infarction is reversible while angina is not.

What are two kinds of heart failure?
A. Anterior and Posterior
B. Up and Down
C. Superior and Inferior
D. Right and Left
Quiz
What is the mnemonic for a patient having a myocardial infarction?
A. ANNA
B. MONA
C. SOAP
D. LISA

Quiz
Symptoms of left sided heart failure include:
A. Ascites and pitting edema
B. Chest pain on exertion
C. Green productive sputum
D. Shortness of breath, pulmonary edema

Quiz
What does ISCHEMIA mean?
A. Infection of the lining of the heart
B. Inadequate blood supply
C. Bacteria in the blood
D. Death of the heart muscle
**Quiz**

What do Beta Blockers do?
A. Prevent platelets from clumping
B. Reduce the contractility of the heart
C. Reduce the heart rate and blood pressure
D. Dilate the coronary arteries

**Quiz**

The pneumonic for diagnosing a stroke is:
A. FAST: Fatigue, Achy, Swelling and Tremors
B. FAST: Femoral, Arterial, Systolic and Temporal
C. FAST: Face, Arm, Speech, Time

**Quiz**

Your patient wonders if he should skip his blood pressure medication the morning of surgery since he can't have anything to eat or drink. What do you tell him?
A. Go ahead and skip the morning dose
B. Take your medications with a small sip of water
C. Take double the dose the night before
Quiz
High blood pressure may increase the patient’s risk for heart attack and
A. Stroke
B. Bleeding
C. Seizures
D. GI bleeding

Quiz
Causes of hypotension include all of the following EXCEPT:
A. Excessive medication
B. Seizures
C. Cardiac dysrhythmias
D. Allergic Reaction

Quiz
Symptoms of severe hypotension include all of the following EXCEPT:
A. Chest pain
B. Dizziness
C. Orthostatic hypotension
D. Fainting
The blood pressure limit which is generally considered the upper limit of normal is?

A. 140/90  
B. 135/95  
C. 200/100  
D. 160/100

Patients in hypertensive crisis may complain of:

A. Nausea  
B. Sore throat  
C. Headache  
D. Coughing

Treatment for a patient having a hypertensive crisis includes:

A. Maalox and Tums  
B. Defibrillation and synchronized cardioversion  
C. A Beta Blocker and a vasodilator  
D. Aspirin and Tylenol
True or False: A patient that has a history of a CABG (coronary artery bypass grafting) needs to be premedicated with antibiotics.

A. True
B. False

2 kinds of stroke include:
A. Primary and secondary
B. Ischemic and hemorrhagic
C. Acquired and Congenital
D. Essential and Secondary

This concludes

Cardiovascular System Review
California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course
Conduction System Review
California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course

Cardiac Conduction System Definition
The cardiac conduction system is a group of specialized cardiac muscle cells in the walls of the heart that send signals to the heart muscle causing it to contract.

How do these cells work?
- The cell membrane at rest is polarized
- Positively charged outside
- Negative charged inside
- There are gates at the cell membrane which are normally closed

Initiation of Impulse
- The gates open, allowing the positive charges to go into the cell
- These positive charges “neutralize” the negative charges
- Therefore this is called “depolarization”
After depolarization… Repolarization

Conduction Pathway

Once the cell is depolarized, the positive ions are “pushed” outside, thus repolarizing the membrane.

This depolarization happens along a pathway of special cells, much like a wave in a football stadium, or like a bunch of dominos.

So here is the pathway in the heart

Cardiac Conduction Pathway continued

The impulse originates in the Sino-Atrial Node in the right atrium, also called the SA Node.

It travels through the right atrium to another node near the junction of the atria and ventricles called Atrio-Ventricular Node or AV Node.

The impulse then travels to the Bundle of His (pronounced HISS).

It then travels down the interventricular septum (the septum in between the ventricles) as right and left bundles.

Until it reaches the bottom of the ventricles where it divides into the Purkinje Fibers.

Did you get that?

Node to the Node to the of to the right and left fibers.

Impulse to Muscle Contraction

How does this impulse lead to the heart contracting?

It was discovered that when an electrical current was applied across a muscle, the muscle contracted.

So, as this conduction pathway progresses through the heart, the heart muscle contracts right after.
Heart Muscle Contraction

- Remember in our discussion about the cardiac cycle, we said that the atria contract followed by the ventricles.
- Additionally, the ventricles contract from the bottom up, just like you would squeeze a toothpaste tube.
- So you can see that the heart muscle contracts following the pathway of the electrical impulse.

Electrocardiogram

- The EKG machine places two electrodes on either side of the heart.
- As the cells depolarize, this produces tiny rises and falls in the voltage between the two electrodes.
- This is displayed as a wave on the screen or paper.

EKG Lead Placement

- Usually 3 leads
  - White lead designated as RA (right arm)
  - Black lead designated as LA (left arm)
  - Red lead designated as LL (left leg)
- Salt and Pepper over Ketchup
- Smoke over Fire (black over red); white on the right arm

Normal EKG Wave

- P wave = atrial depolarization
- QRS complex = ventricular depolarization
- T wave = ventricular repolarization

Wait? What about the atrial repolarization? It happens, but the wave gets lost in the QRS complex.

Other pacemakers

Cardiac rhythms can have a number of other pacemakers besides the SA node...

Determining Rate

- The graph paper is standardized to time.
- For machines that have paper coming out, they all come out at the same speed.
- 1 big square = .2 sec
- 1 little square = .04 sec
- 5 large squares = 1 second
Determining the rate

- First: find an R wave that falls on a heavy black line in the graph
- Second: Now, IGNORE the EKG tracing. Just concentrate on the graph paper
- Third: Count off and label each heavy dark line as follows: 300-150-100-75-60-50
- Fourth: Now look at the EKG tracing. Where does the next R wave fall? That’s your rate. On the example above, the rate is about 100 bpm.

Okay. Now you try it:

Terms

- Tachycardia = rate over 100 bpm
- Bradycardia = rate under 60 bpm
- Fibrillation = heart quivering
- Asystole = heart stops

Sinus Rhythms

- “Sinus” means the impulse originates in the SA node and travels in the normal route: SA node to AV node to Bundle of His to Bundle branches to Purkinje fibers.
- Sinus tachycardia: the impulse travels the usual route, just fast
- Sinus bradycardia: the impulse travels the usual route, just slower
- Normal sinus rhythms: rate is between 60-100 bpm

Premature beats

- Caused by ectopic foci.
- Ectopic = “not in the right place”
- Can occur in atria or ventricles
- Extra impulse that’s not supposed to be there
Premature beats

* Premature Atrial Contraction (PAC) occurs when an ectopic focus in the atria fires. This impulse gets conducted to the AV node which then fires. You see an abnormal P wave sooner than you expect with a normal QRS.

Premature Ventricular Contractions

* Unifocal: only 1 ectopic focus. All the PVC's look the same.
* Multifocal: more than 1 ectopic focus. PVC's look different.

Multifocal PVC’s

* Multifocal PVC's can be caused by cardiac hypoxia (lack of oxygen). Therefore they are very dangerous and require immediate attention. The multifocal PVC’s mean that there are a number of extremely irritable foci discharging and trouble is imminent. The chance of developing ventricular fibrillation is HIGH.

Runs of PVC’s ------ Ventricular Tachycardia

* Looks like PVC’s all run together. This is a dangerous, potentially fatal rhythm. The heart is not pumping in a coordinated fashion, therefore the cardiac output will decrease.

Supraventricular Tachycardia (SVT)

This is caused by a re-entry loop above the ventricles going around and around the AV node. You see very narrow complex going very rapidly (150–300 bpm).
Atrial Fibrillation
Multiple ectopic foci in atria fire, causing the atria to fibrillate, or “quiver”. Intermittent ventricular response: the AV node fires normally when it receives a signal, but this is random.

Ventricular fibrillation
- This is the most common rhythm in a patient in cardiac arrest.
- There is random, chaotic firing of multiple ectopic foci. There is no coordinated contraction and therefore no pulse.
- The heart is just quivering.
- The EKG is just a wavy line. No discernable P’s or QRS or T waves.

Ventricular fibrillation
- No discernible electrical activity in the heart
- “flatline”
- No pulse
- Confirm

Patient
The patient is a 61 year old stock broker who has “decided to fix his teeth” before his daughters wedding. His dentist has recommended initially numerous extractions followed by the placement of a treatment partial denture.

Health history
He weighs 205 lbs. and is 5’11” tall. His medical history is unremarkable. He works 60 hours per week and does not have time to exercise. There is no history of chest pain.
Health history

He does not take any medications routinely and he says he is allergic to penicillin. The patient has smoked 1 pack of cigarettes per day for the last 30 years. He drinks a martini when he gets home and has red wine with dinner.

Vital Signs at consultation:
• BP-139/89
• HR-85
• T-98.3
• BMI-28.6

Patient on day of surgery

The mandibular extractions are to be performed first. The doctor administers two carpules of 0.5% Marcaine with 1:200,000 epinephrine and two carpules of 2% lidocaine with 1:100,000 epinephrine for bilateral inferior alveolar nerve blocks. The doctor tells the patient that he will wait for the local anesthetic to take affect and return in about ten minutes.

Patient care

The first intervention is:
A. Precordial thump
B. Get ready to start an IV
C. Start CPR and call for help
D. Apply vital signs monitors
E. Place patient in reverse Trendelenburg position

Shake and shout does not arouse patient, he has no palpable pulses and there are agonal respirations.

Patient on day of surgery

You leave to retrieve some instruments from the sterilization area. When you return, you see that the patient has lost consciousness and has an ashen color to his skin.

Shake and shout does not arouse patient, he has no palpable pulses and there are agonal respirations.
Patient care
Other staff members come to help. The next intervention would be:
A. Apply and analyze EKG rhythm
B. Get ready to start an IV
C. Apply and activate AED
D. Get ready to intubate patient
E. Synchronized cardioversion

The following rhythm is seen on the EKG monitor.
This rhythm is:
A. Ventricular fibrillation
B. Atrial fibrillation
C. Asystole
D. Atrial flutter
E. Third degree heart block

Immediately defibrillate!!
- BLS: start compressions
- Call 911
- Defibrillate as soon as AED is available
- Establish IV
- ACLS
- Advanced airway

Let’s talk about Pacemakers & Defibrillators
- Cardiac Pacemaker: battery operated implanted device which regulates heart rhythm. It takes the place of the normal impulse from the sinus node.
- Implantable Defibrillators: battery operated implantable device which can provide defibrillation in patients who are prone to develop ventricular fibrillation

What about CPR & using an external defibrillator???
Q: Can CPR chest compressions be performed on patients implanted with pacemakers and/or defibrillators?
A: Yes, CPR compressions may be performed as usual.

Q&A
Q: What if the implanted defibrillator delivers a shock while the responder is administering CPR?
A: If the implanted device delivers a shock during CPR, the responder may feel a tingling sensation on the patient’s body surface. However, the shocks delivered by the implanted defibrillator will not pose a danger to the person administering CPR.
Q&A

Q: What if the implanted defibrillator delivers a shock while the responder is in the process of operating a manual external defibrillator or an AED?
A: If the implanted device delivers a shock to the patient, the AHA recommends that the responder allow 30-60 seconds for the implanted device to complete the therapy cycle before administering external defibrillation.

Q&A

Q: Can the energy associated with external defibrillation damage the implanted device?
A: Yes. Although implantable pacemakers and defibrillators are designed to withstand external defibrillation, the implanted device can sustain damage if the external defibrillation electrode pads are placed too close to or directly over the device. Use the lowest energy output of external defibrillation equipment that is clinically acceptable.

Quiz

The best treatment for ventricular fibrillation is:
A. CPR
B. Defibrillation
C. Intubation
D. Chest tube

Anterior-Posterior AED pad placement

The best treatment for ventricular fibrillation is:
A. CPR
B. Defibrillation
C. Intubation
D. Chest tube
Quiz

____ is more dangerous than
A. Supraventricular tachycardia, ventricular tachycardia
B. Atrial fibrillation, atrial flutter
C. Unifocal PVC’s, multifocal PVC’s
D. Multifocal PVC’s, unifocal PVC’s

Quiz

The T wave is caused by:
A. Repolarization of the atria
B. Depolarization of the atria
C. Repolarization of the ventricles
D. Depolarization of the ventricles

Quiz

What is the intrinsic rate of the SA node?
A. 80-100 beats per minute
B. 40-60 beats per minute
C. 20-40 beats per minute
D. 60-100 beats per minute
Quiz

True or False: Sinus arrhythmia is the same as asystole.
A. True
B. False

Quiz

The QRS complex is caused by:
A. Repolarization of the ventricles
B. Depolarization of the atria
C. Depolarization of the ventricles
D. Repolarization of the atria

Quiz

What is the correct sequence of impulses through the heart?
A. SA node—AV node—Bundle of His—Purkinje Fibers
B. AV node—SA node—Bundle of His—Purkinje Fibers
C. SA node—AV node—Purkinje Bundle—Bundle of His
D. SA node—Purkinje Fibers—Bundle of His—AV node
**Quiz**

Your patient has an irregularly irregular pulse. She most likely has:

A. Supraventricular tachycardia
B. Atrial fibrillation
C. Ventricular fibrillation
D. Atrial flutter

**Quiz**

The most common rhythm of cardiac arrest is:

A. Supraventricular tachycardia
B. Ventricular tachycardia
C. Ventricular fibrillation
D. Atrial fibrillation

**Quiz**

The P wave is caused by:

A. Depolarization of the atria
B. Repolarization of the ventricles
C. Depolarization of the ventricles
D. Repolarization of the atria

**Quiz**

Your patient has an irregularly irregular pulse. She most likely has:

A. Supraventricular tachycardia
B. Atrial fibrillation
C. Ventricular fibrillation
D. Atrial flutter
This Concludes

Conduction System
Review

California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course
Conduction System (ACLS) Review

Basic Life Support

- Review:
  - "Are you okay?", check for breathing/pulse, activate 911, go get AED
  - Start chest compressions
    - 30:2
  - Push hard, push fast ("Stayin' Alive")

Automated External Defibrillator (AED)

- Turn on AED
- Attach pads to bare chest
- Plug in connector if necessary
- Stop CPR, push Analyze button
- If shock indicated, make sure everyone is clear.

Categories of Cardiac Dysrhythmias

- Too Slow
  - Bradycardias
  - Heart blocks
- Too Fast
  - Supraventricular tachycardia
  - Ventricular tachycardia
- Too Dead
  - Ventricular fibrillation
  - Pulseless Electrical Activity
  - Asystole

Bradycardias & Heart Blocks

- Is patient symptomatic? Are the symptoms due to the bradycardia?
- Symptoms:
  - Hypotension
  - Dizziness
  - Shock
  - Chest pain
  - Shortness of breath
  - Altered mental status?
- Treatment:
  - Atropine .5 mg IV

Tachycardias

- Could be
  - Sinus tachycardia
  - Supraventricular tachycardia
  - Ventricular tachycardia
Tachycardias

- Does the patient have a pulse? If no, treat as ventricular fibrillation & defibrillate, start CPR.
- Is the patient stable? Look for altered mental status, chest pain, hypotension.
- If unstable, will need to do synchronized cardioversion (applying a shock on the R wave of the EKG). The AED cannot do this.
- If stable, look at the QRS complex. Is it wide or narrow?
  - Narrow? Possibly SVT. Try vagal maneuvers
    - Adenosine 6 mg IV push. If no response, give 12 mg IV push
  - Wide complex? Possibly Ventricular tachycardia. Consider Amiodarone 150 mg over 10 minutes.

Ventricular Fibrillation/Pulseless Ventricular Tachycardia

- Confirm EKG is connected. Does patient have a pulse? No? Then probably v. fib is real
- Start CPR, call 911
- Get defibrillator
- Shock once with AED
- Oxygen + CPR [5 cycles] + Start IV + check rhythm
- Shock
- Epinephrine 1 mg IVP
- CPR [5 cycles] + check rhythm
- Shock
- Amiodarone 300 mg IVP
- CPR [5 cycles] + check rhythm
- Shock
- Continue shock - medication - CPR until transported

Asystole (Flatline)

- CPR
- O2
- Epinephrine 1 mg IV
- Cannot defibrillate this rhythm!

Quiz

The second medication used in the treatment of ventricular fibrillation is:

A. Atropine
B. Adenosine
C. Amiodarone
D. Epinephrine

Quiz

The second medication used in the treatment of ventricular fibrillation is:

A. Atropine
B. Adenosine
C. Amiodarone
D. Epinephrine
Quiz

A patient who is in a narrow complex tachycardia is complaining of chest pain. You notice that the blood pressure is falling and the patient has an altered level of consciousness. Your next move is to:
A. Administer Adenosine 6 mg
B. Perform a defibrillation
C. Sedate the patient, then perform a synchronized cardioversion
D. Start CPR and administer 1 mg Epinephrine

Quiz

True or False: Patients in ventricular fibrillation (v fib) have a pulse.
A. True
B. False

Quiz

True or False: All bradycardias with rate < 50 should be given Atropine .5 mg.
A. True
B. False
When performing CPR, the rate of compression is how many per minute?
A. 60
B. 100
C. 120
D. 75

The first MEDICATION for a patient in ventricular fibrillation is:
A. Amiodarone 300 mg IV
B. Epinephrine 1 mg IV
C. Atropine .5 mg IV
D. Epinephrine .1 mg IV

You come upon a patient who you have determined is not breathing and has no pulse. Your next move is to:
A. Open the airway
B. Defibrillate the patient
C. Try to find help
D. Start chest compressions
True or False: You can defibrillate asystole.
A. True
B. False

Vagal maneuvers can be used in diagnosis and treatment of patients with which rhythm?
A. Ventricular fibrillation
B. Ventricular tachycardia
C. Supraventricular tachycardia
D. Heart block

The most effective treatment for a patient in ventricular fibrillation is:
A. CPR
B. Defibrillation
C. Epinephrine 1 mg IV
D. Synchronized cardioversion
This Concludes
Conduction System (ACLS)
Review
California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course
Respiratory System Review
California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course

Respiratory System: Anatomy

Anatomy: Upper airway
- Nostrils = nares
- Turbinates: increase surface area to warm & humidify air
- Back of nose = nasopharynx
- Back of mouth = oropharynx

Anatomy: Upper airway

Anatomy: Lower airway

Right vs. Left Mainstem Bronchi
The left mainstem bronchus arises from the trachea at a more acute angle than the right mainstem bronchus. What’s on the left?
Alveoli
- The bronchi divide again and again into smaller bronchioles until they terminate in tiny thin-walled air sacs called **alveoli**.
- The alveoli are surrounded by a mesh of capillaries...the walls are thin, so O₂ and CO₂ just diffuse out.

Did you get that?
Let's try that one more time:

N______, N______, O______, L______
T_______, right and left B_______ B______
A_______

Gas Exchange
- When the pt. inhales, the alveoli have a higher concentration of O₂ than the capillary blood from the right ventricle. So O₂ will just diffuse out of the alveoli into the capillaries.

Oxygen & Hemoglobin
- Oxygen binds to the hemoglobin part of the red blood cell.
- Each molecule of hemoglobin can carry 4 molecules of oxygen.
Oxyhemoglobin Dissociation curve
- Scary looking curve!
- The point of this curve is that at 95-96% O₂ saturation (on the pulse oximeter), the oxygen is already falling off the hemoglobin at an alarming rate.
- PO₂ at this point is only 60 mm Hg. That’s low.
- That’s why our alarms are set at 90%.

Breathing
- When you inhale, the thoracic cavity gets bigger: ribs expand, diaphragm moves downward. This causes negative inspiratory pressure and air flows in. Active.
- When you exhale, the ribs contract, the diaphragm moves upward and the thoracic cavity gets smaller. Air then flows out. Passive.

Control of Breathing: Autonomic
- You don’t have to think to breathe!
  - medulla & pons
  - measure blood pH
  - coordinate breathing, heart rate & body's need for energy
  - Medulla oblongata will stimulate diaphragm to contract.

Control of Breathing: Chemical
- Chemical Control of Ventilation
  - Effect of carbon dioxide: small change in carbon dioxide in blood triggers a large increase in rate and depth of respiration
  - Hyperventilation: greater than normal amount of carbon dioxide
  - Hypoventilation: lower than normal amount of carbon dioxide
  - Chemosensitive area in medulla oblongata is more important for regulation of PO₂ and pH than the central & aortic bodies (insignificant for 1% to 2% change in pH).
  - During intense exercise, central & aortic bodies respond more rapidly to changes in blood pH than does the chemosensitive area of medulla.
until you can no longer...you **have** to take a breath.

- What **made** you breathe? Is it controlled by:
  A. Lack of O2
  B. Accumulation of CO2?
- That’s right! It is the **accumulation of CO2** that produces the respiratory drive.

**Respiratory Depression**

- Abnormally slow breathing, results in accumulation of CO2.
- Many of the drugs we use for sedation cause respiratory depression, normal sensitivity to CO2 and regular control of respiration is impaired.
  - Narcotics
  - Benzodiazepines
  - Sedative hypnotics
  - Barbiturates

**Terminology**

- Apnea = No breathing
- Dyspnea = Difficulty breathing
- Tachypnea (hyperpnea) = Fast breathing

**How do we monitor respiration?**

1. **Visual**: chest rise
2. **Listen**: Precordial stethoscope
3. **Monitors**: Capnography: measures CO2 production (ventilation = are they breathing?)
4. **Pulse oximeter**: measures oxygenation (oxygenation = is oxygen getting to the blood?)

**Pulse Oximetry**

- How does it work?
- What are limitations of it?
- At which number is your lower limit set? Why?

Pulse Oximetry

The finger sensor has **red** and **infrared** lights which get transmitted through the nail bed. On the opposite end are diodes.
**Pulse Oximetry**

Property No. 3

Oxyhemoglobin absorbs more infrared light than red light. Deoxyhemoglobin absorbs more red light than infrared light.

- Oxyhemoglobin = Infrared
- Deoxyhemoglobin = Red

The difference in absorption spectrums of infrared & red produces a percentage number that is displayed on the screen.

**Limitations of Pulse Oximetry**

- Fingernail polish
- Cold fingers or venous congestion
- Movement
- Lag time
- Abnormal hemoglobin's (e.g. carboxyhemoglobin as seen in smokers)

**Capnography**

- Measures how much Carbon dioxide (CO₂) is present in the patient's breath.
- REQUIRED by AAOMS as “standard of care”

Consequently, the use of capnography for patients under moderate sedation, deep sedation, and general anesthesia should be instituted in OMS practice and used on these patients - effective January 2014 unless precluded or invalidated by the nature of the patient, procedure, or equipment.

- How does it work?
  - Infrared light (not visible to the human eye) is absorbed by gases that have two or more different atoms.
    - For instance, O₂ has 2 of the same type of atoms (oxygen), so it does NOT absorb infrared light.
    - CO₂ has two different kinds of atoms, so it will absorb infrared light.
  - The more CO₂, the more infrared light is absorbed.
  - The capnography machine takes a sample of the patient’s exhaled breath and measures the amount of infrared light absorbed.
  - The amount of exhaled CO₂ is then transmitted to a graph.
Normal Capnography Graph

Sample Capnography Graphs
- Capnograph sensor not connected
- Complete obstruction of lungs
- Complete obstruction of the airway
- Respiratory arrest - apnea (secondary to opioids)
- Cardiac arrest

Sample Capnography Graphs
- Partial obstruction: (bronchospasm, COPD)
- Partial obstruction of airway (tracheal tube secretions, kinking)

Sample Capnography Graphs
- Hyperventilation

Sample Capnography Graphs
- Hypoventilation: Inadequate ventilation - the lung has to pack more CO₂ in each breath
- Increased CO₂ production (for example, malignant hyperthermia)

Sample Capnography Graphs
- Intubated patient
- IV sedation patient

How is CO₂ monitored in Oral Surgery?

Sample Capnography Graphs
- Inspiration
- Expiration
How do we provide oxygenation?

- Supplemental Oxygen via:
  - Nasal cannula
  - Nasal hood

How do we control the airway and oxygenation?

- Oral airways: opens a path for oxygen and keeps the tongue away from the posterior pharyngeal wall

How do we control the airway and oxygenation?

- Nasal airways: opens a path for oxygen and keeps the tongue away from the posterior pharyngeal wall

How do we control the airway and oxygenation?

- Laryngeal Mask Airway (LMA)

How do we control the airway and oxygenation?

- Endotracheal tube: considered the optimum method of airway maintenance. Allows administration of oxygen and prevents any possibility of aspiration.

Respiratory Disorders

- Upper respiratory infection
- Laryngospasm
- Respiratory depression/apnea
- Asthma/bronchospasm
- Aspiration (foreign body or from regurgitation)
- Anaphylaxis
- Bronchitis/COPD/emphysema
- Airway obstruction
Upper Respiratory Infection (URI)

Scenario:
A 12-year-old male who needs primary teeth and bicuspids extracted. His mother calls the morning of his surgery and states he just came down with a cold.
What do you tell her?
Do you proceed with the surgery?
What are the risks?

Upper Respiratory Infection

- URI’s increase the secretions in the airway.
- Increase the risk of anesthesia.
- If the surgery is elective, it is best to defer it if possible.

Laryngospasm

- Defined as an occlusion of the glottis secondary to contraction of laryngeal constrictors.
- Defense mechanism of the upper airway and lungs
- Mediated by the vagus nerve.

Laryngospasm

- Protective reflex closure of the vocal cords that attempts to prevent passage of foreign matter such as blood or saliva into the larynx, trachea and lungs.

Treatment of Laryngospasm
Laryngospasm

- Signs and Symptoms
  - Crowing = stridor
  - Suprasternal retraction
  - Increased respiratory effort and decreased exchange
  - \( O_2 \) saturation drops

Laryngospasm Treatment

- Initial: Stop procedure, pack off site
- Suction oral cavity
- Tongue forward, suction oropharynx
- Reposition head, possible push on chest, listen for “huff”
- Attempt to ventilate

If still present, administer succinylcholine
- Remember, succinylcholine is a paralyzing agent (muscle relaxant). It will also paralyze muscles of respiration. Therefore, you may have to ventilate the patient!

Pathophysiology of Asthma

- Initiating factors including allergic irritants
- Allergic-IgE (mast cells), Histamines, SRS-A, prostaglandins
- Constriction of bronchial smooth muscle
- Mucus plugging of the bronchi and smaller airways

Physiology of Asthma

Asthma Symptoms

- Wheezing - during expiration
- Shortness of breath
- Coughing
- Fatigue
Treatment of Asthma

- **Emergency**: Epinephrine - Beta agonist properties to dilate bronchioles (Short-acting)
- Bronchodilator therapy: inhalers, usually Beta agonists (Short-acting)
- Steroids: reduce inflammation in airways (Long-acting)
- Non-invasive ventilation / mechanical ventilation in severe cases

Vomiting/Emesis & Aspiration

- **Emesis** (vomiting) is regurgitation of acidic content of the stomach into the esophagus.
- If the patient is under anesthesia, their protective reflexes (coughing) are depressed.
- This allows entry of stomach contents (liquid or solid) into the lungs (aspiration).

Signs and Symptoms of Vomiting

- Retching
- Large amounts of fluid in throat
- Gurgling
- Wheezing
- Signs of airway obstruction

Vomiting/Emesis & Aspiration

Why do we roll the patient on the right side?

- "cause the doctor stands on the right side & I don’t want vomit on my shoes" ???!
- NOOO!
- Idea is to save the left lung. Vomit will travel down right mainstem bronches anyway.
- Because of acute angle of left mainstem bronchus, vomit will not go there.
**Bronchitis**

- Definition: Daily cough and sputum production
- Excess secretions
- Patients are prone to laryngospasm and bronchospasm

**Chronic Obstructive Pulmonary Disease (COPD)**

- COPD is an umbrella term that encompasses three different disease processes:
  - Chronic bronchitis
  - Emphysema
  - Asthma
- Characterized by progressive accumulation of inflammatory mucous exudates in the airways with thickening of their walls
- Defining feature: irreversible limitation of airflow during forced expiration

**Emphysema**

- Gradual destruction of alveolar septae (the walls in between the individual alveoli) and the capillary bed that surrounds them, leading to a decreased ability to oxygenate blood.

**Foreign body aspiration**

- Symptoms of foreign body aspiration into the tracheobronchial tree:
  - (40% no symptoms!!!!!)
  - 40% with classic triad:
    - Wheezing
    - Coughing
    - Dyspnea
  - Respiratory arrest
  - Stridor
- Patient should be sent or transported to ER for evaluation

**Case #1**

HPI: 29-year-old male currently experiencing extreme pain on the lower right side with difficulty opening mouth. Patient has stated that he has had on and off pain on the lower right side for the last 6 to 8 weeks. Now pain and swelling has gotten severe within the last two days. Patient also states that he has had some moderate difficulty eating and swallowing.
**Case #1**

- **Medications:**
  - Flonase and Seravent inhalers
  - Albuterol inhaler as needed, omeprazole

- **Allergies:**
  - Latex (anaphylaxis)

- **Habits:**
  - Smoking: 1 pack per day

- **Family History:**
  - Non-contributory

**Case #1: Clinical Exam**

- **Extraoral**
  - Tenderness to palpation of right mandibular angle of mandible and masseter muscle region
  - Erythema approximately 4 to 5 cm extending from the angle of the mandible to the submandibular region
  - Maximal mouth opening = 15 to 20 mm
  - Minimal tenderness to palpation of submental region

- **Intraoral**
  - Full complement of dentition noted.
  - Multiple large amalgam restorations and onlays.
  - Obliteration of buccal vestibule on lower right side.
  - Pericoronitis noted around erupted tooth #32.
  - No sublingual or pharyngeal swelling noted.

**Diagnosis & Treatment:**

- 29-year-old male with infected tooth number 32 with concomitant buccal space infection progressing to submandibular infection.

Determination was made to sedate the patient in the office and extract tooth #32 in order to drain the buccal space infection.

**Clinical Summary**

Patient was placed in a supine position. EKG leads were placed appropriately along with a pulse oximeter, blood pressure cuff, nasal hood with 100% O₂, and CO₂/ capnography.

A precordial stethoscope was also placed to monitor breathing during the procedure.

A 20G IV was placed in the right ACF without difficulty and general IV anesthesia was undertaken with versed, fentanyl and propofol.
Back to our patient: Clinical summary

On induction, it was noted that the patient saturation dropped to 89%. The patient was coughing profusely and having difficulty controlling secretions.

What would you do at this point??

- A - Adjust pulse oximeter
- B - Protract mandible and suction out oropharynx
- C - Give 1mg/kg Succinylcholine
- D - Give epinephrine 0.5cc 1:1000 epi IM

Clinical summary

The patients' oropharynx was suctioned out and the anesthesia was deepened using Propofol. The patients' saturation returned to 96%. The surgical portion of the case was then continued.

Clinical summary

2% lidocaine with epinephrine was administered with a mandibular block and buccal infiltration.
- The mouth was opened to 35mm using a ratchet prop.
- A 4x4 gauze was placed as a throat screen along with a tongue retractor.
- Elevators and forceps were used to remove the tooth without difficulty.
- A 15 blade was used along with a mosquito to drain right buccal space infection (approx. 8-10cc pus drained from buccal space) a ¼ inch Penrose drain was sutured in place with 3-0 silk. Gauze was placed at #32 extraction site for direct pressure.

Clinical summary

At the end of the procedure as the patient is becoming more arousable you notice that the patient suddenly becomes unresponsive and the oxygen saturation abruptly drops to 72%.
- Initial efforts to protract tongue and support airway do not work. In supporting airway, you note there is copious amounts of bleeding and a restoration on #31 that is missing.

What would you do at this point??

- A – place an AED and shock and call 911
- B – give epiinephrine IM for Bronchospasm
- C – give 1mg/kg Succinylcholine and attempt to intubate
- D – use a Macintosh intubation blade and a Magill forceps to retrieve a foreign body
Clinical summary

The patient is placed in lateral position, the gauze is removed and the oropharynx is suctioned out thoroughly. An intubation blade and a Magill are used to remove a suspected foreign body.

What would you do at this point??

A – check for bilateral breath sounds using stethoscope
B – stimulate patient with ammonium salts
C – get new pulse ox from another room to check O2 sat
D – call ride and have patient get ready to go home

Final summary

Patient is transported to ER after persistent low saturations (despite being alert).
A chest x-ray was taken showing what appears to be a dental onlay in the middle lobe of the right lung.
A bronchoscopy is attempted but the foreign body is not retrievable.
The decision is made to perform a thoracotomy with partial lobectomy of the right lung to retrieve foreign body.

Clinical summary

• When the tongue is retracted you see open cords but no foreign body.
• The patient saturation subsequently comes back up to 91% and the patient becomes slightly arousable.
• Despite adjusting the pulse oximeter you still only get a saturation of 91%.

Clinical summary

• You note decreased breath sounds in right middle and lower lobes of lung.
• Patient is now awake and complaining only of pain in his jaw and nausea.

What would you do at this point??

• A – check for bilateral breath sounds using stethoscope again to verify pneumonia
• B – call ride to go home and have patient follow up with PMD
• C – call 911 and transport patient to ER
• D – prescribe patient bronchodilator and steroids to treat bronchospasm/asthma related problem
Case #2

- 17 year old male high school athlete wrestler presents for removal of bony impacted third molars.
- PMH: non-contributory, Meds: None, Allergies: None
- Exam: No visible maxillary or mandibular third molars. Mild pericoronitis noted associated with teeth #17 and 32. No purulent drainage noted.
- Remaining oral tissues, tongue and neck exam were unremarkable.

Case #2...continued

- TMJ: with no pain or clicking
- Airway: Mallampati Class I
- Cardiovascular exam: Coronary: RRR, Lungs clear bilaterally
- Weight: 90 kgs, height 5'8" BMI 29

Panoramic Image

Diagnosis & Treatment

- Diagnosis
  - 18 year old male athlete, ASA I patient with asymptomatic complete bony impacted third molars #1,16, and symptomatic complete bony impacted third molars #17, 32 due to pericoronitis.
- Proposed Treatment
  - Removal of four bony impacted third molars under deep sedation/non-intubated GA with open airway technique in an ambulatory surgery center.

Treatment (cont.)

- Patient was NPO and consent was signed
- Patient was placed in a semi-supine position
- Supplemental O2 at 2L/min was provided by nasal cannula
- Monitors including EKG, NIBP, and pulse oximetry were placed on the patient
- A 20 gauge angiocatheter was started in a left hand vein
- Baseline VS were recorded

Treatment (cont’d)

- The EKG revealed a normal sinus rhythm
- The patient’s VS were stable: P - 84, BP – 124/78, O2 sat – 99%
- Fentanyl 75 mcg and midazolam 4 mg were administered to the patient over 8 minutes
- Dexamethasone 10 mg was administered
Treatment (cont’d)
- Prior to local anesthesia administration a Propofol bolus of 40 mg was given
- Local anesthesia of 9 ml of 2% lidocaine with epi 1:100,000 was administered to the patient
- Following the administration of the local anesthesia the patient VS revealed P: 98, BP 100/58, O2 sat 97%

Maxillary third molars #1 and 16 were removed and gauze packs were placed
Mandibular third molars #17 and 32 were surgically removed
During suturing of the third molar sites some blood entered the hypopharynx
The VS revealed P 88, BP 108/82, SpO2 88%, EKG: sinus rhythm
A slight “crowing” like noise was noted during inspiration

Treatment (cont.)

Diagnosis?
- A. Bronchospasm
- B. Upper airway obstruction
- C. Partial laryngospasm
- D. Allergic reaction

Answer
C. Partial laryngospasm produces a “crowing” noise with inspiration with some passage of air through the partially adducted vocal cords.

Treatment (cont’d)
- The patient’s O2 saturation continued to fall and the patient was noted to have paradoxical chest movements upon attempted inspiration.
- VS revealed: P-90, BP-110/80, SpO2-76%, EKG – NSR
- Attempted upper airway repositioning and suctioning was unsuccessful in alleviating the paradoxical chest movements and airway obstruction.
- No breath sounds or air movement was noted upon auscultation of the lungs.

Diagnosis
- A. Foreign body airway obstruction
- B. Complete laryngospasm
- C. Bronchospasm
- D. Pneumothorax
Answer

B. Complete laryngospasm with no air movement due to complete adduction of the vocal cords. A foreign body airway obstruction is unlikely with the use of a throat barrier and no visible foreign body dislodgement. Bronchospasm would produce expiratory wheezing on lung auscultation.

A spontaneous pneumothorax is possible although very unlikely.

Laryngospasm Treatment

- Initial treatment of laryngospasm includes thorough suctioning of the oropharynx and hypopharynx, positive pressure ventilation with 100% O₂ through a bag valve mask.
- If the laryngospasm and continued desaturation persist, the use of muscle relaxants with 10-20 mg of succinylcholine should be used.
- The succinylcholine will relax the vocal cord’s musculature to permit ventilation and oxygenation.

Recommended Treatment?

- A. Continued ventilation with BVM
- B. Administration of additional succinylcholine
- C. Administration of albuterol
- D. Endotracheal intubation and ventilation

Answer

D. Endotracheal intubation to secure the airway and permit more effective ventilation and oxygenation via ambu-bag versus a bag valve mask alone.

Endotracheal intubation also prevents air from entering the esophagus resulting in possible emesis and aspiration.

Endotracheal intubation also facilitates alveolar recruitment to improve oxygenation and also facilitates possible pulmonary suctioning.

PA view CXR was obtained
The CXR reveals?

- A. Foreign body airway obstruction
- B. Pneumothorax
- C. Aspiration pneumonitis
- D. Bilateral diffuse interstitial and alveolar infiltrates

Answer

D. Bilateral diffuse alveolar and interstitial infiltrates appearing as soft fluffy white areas and surrounding dark butterfly pattern of the peripheral lung fields.

No evidence of any foreign body airway obstruction is present. There is no evidence of pneumothorax with loss of lung markings. Aspiration pneumonitis would result in an inferior lung lobe consolidation.

Treatment (cont’d)

- The patient was intubated and endotracheal suctioning was performed
- Upon endotracheal suctioning copious pink frothy sputum was suctioned from the endotracheal tube
- Auscultation of the lungs revealed bilateral rales
- VS P=116 BP 104/84 SpO2 80% EKG: sinus tachycardia

Diagnosis?

- A. Acute narcotic overdose
- B. Negative pressure pulmonary edema
- C. Mucous plugging of the trachea
- D. Acute heart failure

Answer

B. Negative pressure pulmonary edema may be encountered upon breaking a laryngospasm, especially in young or muscular athletic patients.

Ventilation with an ambu-bag should be possible in a patient with a narcotic overdose or mucous within the trachea.

Acute heart failure is unlikely in a healthy young patient with no prior cardiac history.

Quiz

The order of airflow in the lower respiratory system is:

A. Alveoli, trachea, bronchioles, bronchus
B. Trachea, right and left mainstem bronchi, bronchioles, alveoli
C. Trachea, bronchioles, alveoli, right and left mainstem bronchi
D. Right and left mainstem bronchus, trachea, alveoli, bronchioles
Quiz
The order of airflow in the lower respiratory system is:
A. Alveoli, trachea, bronchioles, bronchus
B. Trachea, right and left mainstem bronchi, bronchioles, alveoli
C. Trachea, bronchioles, alveoli, right and left mainstem bronchi
D. Right and left mainstem bronchus, trachea, alveoli, bronchioles

Quiz
Oxygen is carried by the:
A. Red blood cell
B. White blood cell
C. Platelet

Quiz
Oxygen is carried by the:
A. Red blood cell
B. White blood cell
C. Platelet

Quiz
The order of airflow inside the upper respiratory system is:
A. oropharynx, trachea, nasopharynx, laryngopharynx (larynx)
B. Laryngopharynx (larynx), nasopharynx, oropharynx, trachea
C. Nasopharynx, oropharynx, laryngopharynx (larynx), trachea

Quiz
Control of respiration is dependent on:
A. The level of oxygen in the blood
B. The level of carbon dioxide in the blood
C. The level of bicarbonate ions in the blood
Quiz
Control of respiration is dependent on:
A. The level of oxygen in the blood
B. The level of carbon dioxide in the blood
C. The level of bicarbonate ions in the blood

Quiz
The anatomic structure where a cricothyrotomy is performed is:
A. Through the thyroid cartilage
B. Through the cricoid cartilage
C. Through the lower tracheal cartilages
D. Through the cricothyroid membrane

Quiz
The anatomic structure where a cricothyrotomy is performed is:
A. Through the thyroid cartilage
B. Through the cricoid cartilage
C. Through the lower tracheal cartilages
D. Through the cricothyroid membrane

Quiz
Inspiration is more of a(n) _____ process whereas expiration is more of a(n) _____ process.
A. Active; passive
B. Passive; active

Quiz
Inspiration is more of a(n) _____ process whereas expiration is more of a(n) _____ process.
A. Active; passive
B. Passive; active

Quiz
The ____ bronchus is straighter and wider while the ____ bronchus is narrow and angles more acutely.
A. Right, Left
B. Right, Mainstem
C. Left, Tracheal
D. Left, Right
Quiz

The ___ bronchus is straighter and wider while the ___ bronchus is narrow and angles more acutely.
A. Right, Left
B. Right, Mainstem
C. Left, Tracheal
D. Left, Right

Quiz

Gas exchange (where oxygen goes from the air to the blood & CO2 goes from blood to the air) takes place in the:
A. Trachea
B. Bronchi
C. Bronchioles
D. Alveoli

Quiz

Gas exchange (where oxygen goes from the air to the blood & CO2 goes from blood to the air) takes place in the:
A. Trachea
B. Bronchi
C. Bronchioles
D. Alveoli

Quiz

The hair like projections on the cells within the trachea are called:
A. Alveoli
B. Cilia
C. Buffy coat
D. Dead space

Quiz

The hair like projections on the cells within the trachea are called:
A. Alveoli
B. Cilia
C. Buffy coat
D. Dead space

Quiz

Foreign bodies that are aspirated usually go down the ____ mainstem bronchus.
A. Right
B. Left
C. Esophageal
D. Tracheal
Quiz
Foreign bodies that are aspirated usually go down the ____ mainstem bronchus.
A. Right  
B. Left  
C. Esophageal  
D. Tracheal

Quiz
Asthma medications include all of the below EXCEPT:
A. Corticosteroids  
B. B2 agonists (bronchodilators)  
C. Antihistamines  
D. A (Alpha) agonists

Quiz
Asthma medications include all of the below EXCEPT:
A. Corticosteroids  
B. B2 agonists (bronchodilators)  
C. Antihistamines  
D. A (Alpha) agonists

Quiz
Asthma medications include all of the below EXCEPT:
A. Corticosteroids  
B. B2 agonists (bronchodilators)  
C. Antihistamines  
D. A (Alpha) agonists

Quiz
Normal adults show a pulse oximeter reading of at least ____% on room air.
A. 55%  
B. 75%  
C. 84%  
D. 96%
Quiz
Asthma is a disease of:
A. Bronchoconstriction
B. Bronchodilation

Quiz
True or False: An LMA is the most ideal, preferred method of airway maintenance.
A. True
B. False

Quiz
True or False: An LMA is the most ideal, preferred method of airway maintenance.
A. True
B. False

Quiz
Oxygen tanks are uniformly ____ in color, while nitrous oxide tanks are uniformly ___ in color
A. Green; Blue
B. Blue; Green

Quiz
Oxygen tanks are uniformly ____ in color, while nitrous oxide tanks are uniformly ___ in color
A. Green; Blue
B. Blue; Green

Quiz
With nitrous oxide delivery systems, at the maximum nitrous oxide delivery rate, at least how much oxygen should be concurrently delivered?
A. 5%
B. 95%
C. 77%
D. 22%
Quiz
With nitrous oxide delivery systems, at the maximum nitrous oxide delivery rate, at least how much oxygen should be concurrently delivered?
A. 5%
B. 95%
C. 77%
D. 22%

Quiz
Pulse oximeter readings can be affected by all of the following EXCEPT:
A. Patient movement
B. Fingernail polish
C. Chronic exposure to nicotine
D. Asthma medications

Quiz
Pulse oximeter readings can be affected by all of the following EXCEPT:
A. Patient movement
B. Fingernail polish
C. Chronic exposure to nicotine
D. Asthma medications

Quiz
True or False: You can insert an LMA (laryngeal mask airway) in a conscious patient with an intact gag reflex.
A. True
B. False

Quiz
True or False: You can insert an LMA (laryngeal mask airway) in a conscious patient with an intact gag reflex.
A. True
B. False

Quiz
Ideally, patients should stop smoking how long before an elective surgical procedure?
A. 1 week
B. 2 weeks
C. 4 weeks
D. 8 weeks
Quiz

Ideally, patients should stop smoking how long before an elective surgical procedure?
A. 1 week
B. 2 weeks
C. 4 weeks
D. 8 weeks

Quiz

Rescue inhalers are usually:
A. Bronchodilators
B. Steroids

Quiz

Rescue inhalers are usually:
A. Bronchodilators
B. Steroids

Quiz

Medications to treat Bronchospasm are usually:
A. Beta agonists
B. Beta antagonists
C. Alpha agonists
D. Alpha antagonists

Quiz

Medications to treat Bronchospasm are usually:
A. Beta agonists
B. Beta antagonists
C. Alpha agonists
D. Alpha antagonists

Quiz

Protective reflex closure of the vocal cords is a:
A. Laryngospasm
B. Bronchospasm
C. Emesis
D. Aspiration
Quiz

Protective reflex closure of the vocal cords is a:
A. Laryngospasm
B. Bronchospasm
C. Emesis
D. Aspiration

Quiz

True or False: If a patient had asthma years ago, you don’t have to have them puff their inhaler preoperatively.
A. True
B. False

Quiz

True or False: If a patient had asthma years ago, you don’t have to have them puff their inhaler preoperatively.
A. True
B. False

Quiz

The crowing sound indicating a laryngospasm is called:
A. Apnea
B. Dyspnea
C. Xiphoid
D. Stridor

Quiz

The symptoms of hyperventilation are caused by:
A. The decrease in blood CO2
B. The decrease in blood O2
C. The increase in blood CO2
D. The decrease in blood O2
Quiz

The symptoms of hyperventilation are caused by:
A. The decrease in blood CO₂
B. The decrease in blood O₂
C. The increase in blood CO₂
D. The decrease in blood O₂

Quiz

Medication used to treat persistent laryngospasm is:
A. Succinylcholine
B. Atropine
C. Albuterol
D. Epinephrine

Quiz

Medication used to treat persistent laryngospasm is:
A. Succinylcholine
B. Atropine
C. Albuterol
D. Epinephrine

Quiz

Treatment of emesis is to turn the patient to the:
A. Right
B. Left

Quiz

Treatment of emesis is to turn the patient to the:
A. Right
B. Left

Quiz

The most common cause of airway obstruction is:
A. Foreign body
B. Tongue
C. Solid food/vomiting
D. Asthma attack
**Quiz**
The most common cause of airway obstruction is:
A. Foreign body
B. Tongue
C. Solid food/vomiting
D. Asthma attack

**Quiz**
Initial treatment for laryngospasm is to:
A. Administer 100% Oxygen
B. Administer Succinylcholine
C. Positive pressure O2
D. Suction the oropharynx

**Quiz**
Initial treatment for laryngospasm is to:
A. Administer 100% Oxygen
B. Administer Succinylcholine
C. Positive pressure O2
D. Suction the oropharynx

**Quiz**
Treatment of respiratory depression from an overdose of narcotics and benzodiazepines are _____ and _____ respectively.
A. Naloxone and Flumazenil
B. Albuterol and Epinephrine
C. Succinylcholine and oxygen

**Quiz**
Treatment of respiratory depression from an overdose of narcotics and benzodiazepines are _____ and _____ respectively.
A. Naloxone and Flumazenil
B. Albuterol and Epinephrine
C. Succinylcholine and oxygen

**This Concludes**
Respiratory System Review
California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course
Endocrine System Definition

Collection of glands that secrete hormones directly into the circulation to be carried towards distant target organs.

Glands

- Pituitary
- Pancreas
- Ovaries
- Testes
- Thyroid
- Parathyroid
- Adrenal

Control of the Glands

A lot of these glands are controlled by a feedback mechanism similar to the way the heater works in your house.
Hypothalamus

- Almond shaped part of the brain that sits above the brainstem
- It secretes *releasing hormones*
- These releasing hormones travel to the pituitary and cause the pituitary to release *stimulating hormones*

Pituitary

- About the size of a pea
- Sits under the hypothalamus
- Receives hormone signals from the hypothalamus that trigger the pituitary to release *stimulating hormones* that travel to distant glands

Example: Thyroid

- The thyroid gland is in the neck
- It secretes thyroid hormone which regulates metabolism

TRH --- TSH feedback loop

- "Thyroid releasing hormone"
- "Thyroid stimulating hormone"
- "too much thyroid hormone? Shut off production!!"

TRH (Thyroid Releasing Hormone) stimulates the pituitary gland to release TSH (Thyroid Stimulating Hormone), which in turn stimulates the thyroid gland to produce thyroid hormones. These hormones regulate metabolism, and if there are "too much thyroid hormone," the negative feedback loop is activated to reduce hormone production.
Insulin and glucagon are hormones produced in the pancreas, along with digestive enzymes.

Insulin pushes glucose into its storage form: glycogen.

Insulin & Glucagon

When energy is needed, glucagon will convert the glycogen into its active form, glucose.

Diabetes

Type 1
- Insulin dependent diabetes mellitus (IDDM)
- Pancreas do not produce enough insulin
- Possibly autoimmune
- Must take insulin
- Usually starts at young age

Type 2
- Non-insulin dependent diabetes mellitus (NIDDM)
- Insulin resistance-cells do not respond to insulin
- Usually adult onset

Diabetes symptoms

- The 3 P’s:
  - Polyuria: frequent urination
  - Polyphagia: always hungry
  - Polydipsia: always thirsty
Diabetes Symptoms

Identification of Diabetes

- Blood glucose level
  - Normal = 80-130

- Hemoglobin A1C = glycated hemoglobin
  - Glucose in your blood will attach to the hemoglobin which can be measured
  - The average lifespan of a red blood cell = 3 months
  - Therefore the hemoglobin A1C test will show the level of glucose in your blood for the past 3 months
  - Normal HbA1c should be less than 6%

Complications of Chronic Diabetes

- Diabetic Nephropathy (chronic renal failure)
- Diabetic Retinopathy (blindness)
- Diabetic Neuropathy (numbness in extremities)
- Increased risk for coronary artery disease, cerebrovascular disease and peripheral vascular disease

Treatment Considerations of Diabetic Patients

- How well is their diabetes controlled?
- Do they monitor their blood sugar?
- What medications are they on?
- Do they have any secondary diseases as a result of the diabetes?
- History of infections?
Intraoperatively

Hyperglycemia
- Stress causes increase in blood sugar
- If we totally discontinue all diabetic medications:
  - Increase risk of infections
  - Impaired wound healing

Hypoglycemia
- Weakness
- Fatigue
- Confusion
- Behavioral changes
- Seizures
- Brain damage
- Death
- Difficult to diagnose when patient is under anesthesia

Preoperative Instructions

- Insulin pump: maintain basal rate
- Intermediate-acting (NPH): hold morning dose until after case or give percentage of dose
- Fixed combination long & short acting: Hold morning dose or give percentage

Preoperative Instructions

- Do finger stick blood test preoperatively and postoperatively
- Schedule early morning surgery time
- If hypoglycemic, can consider dextrose containing IV fluids

Thyroid Disease

- Produces hormones which control metabolism and growth
- **Hypothyroidism**: not enough thyroid hormone produced
- **Hyperthyroidism**: too much thyroid hormone

Hypothyroidism
- Dry Skin
- Lethargic
- Weight gain
- Cold intolerance
- Depression
- Hair thinning
- “Myxedema madness”

Hyperthyroidism
- Exophthalmos (bulging eyes)
- Facial flushing
- Tachycardia
- Hypertension
- Intolerance to heat
- Insomnia
- Tremors
Anesthetic Considerations

- Don’t want patient to be hyperthyroid or hypothyroid
- Patients should be clinically **euthyroid** prior to surgery (normal functioning gland)

Anesthetic Considerations

Hypothyroid:
- Sensitivity to narcotics & barbiturates
- Hashimoto’s thyroiditis: most common cause of hypothyroidism: autoimmune disorder, creating antibodies against the thyroid
- Patients cannot handle stress, may lapse into coma

Anesthetic Considerations

Hyperthyroid:
- Susceptible to **thyroid storm**: anesthetic risk
- **Graves’ Disease**: also autoimmune: thyroid stimulating proteins bind to and activate TSH receptors, increasing hormone synthesis
- Treatment is radioactive iodine, destroy thyroid gland and then supplement with thyroid hormone

Thyroid Storm

A severe, life threatening condition, caused by excess thyroid hormone.

-Thyroid Storm

- Tachycardia
- CHF
- Fever
- Altered mental state
- Nausea
- Vomiting

Adrenal Gland Diseases

Where are your adrenal glands?

They are small pyramid shaped glands that sit on top of each kidney
Adrenal Gland Hormones

- **Cortex (outside)**
  - Secretes **corticosteroids**
- **Medulla (inside)**
  - Secretes **epinephrine and norepinephrine**
  - Stimulated by sympathetic stimulation: fight or flight

Cortisol

- What does cortisol do?
  - Mobilizes amino acids, glucose and fat to keep blood sugar from going too low
  - Has anti-inflammatory and anti-allergic effects

Cushing’s Disease

- Adrenal gland hyperplasia
- Caused by a tumor of the pituitary gland
- Results in **too much** hormone production by the adrenal glands

Addison’s Disease

- Adrenal Insufficiency due to an autoimmune disease
- Symptoms include: dehydration, hypoglycemia, disorientation, nausea, vomiting, muscle aches, low blood pressure, cardiovascular collapse

Corticosteroids

- Cortisone
- Prednisone
- Methylprednisolone
- Dexamethasone

Indications:
- Allergy
- Asthma
- Autoimmune diseases
- Rheumatology
- Organ transplant
Long Term Effects on Patients

With chronic corticosteroid usage, the adrenal glands atrophy (shrink) and will not be able to produce adrenal hormones (adrenal suppression) when needed in times of stress.

Rule of 2’s

- 20 mg or more of cortisone or its equivalent daily
- 2 weeks or long of therapy
- 2 years or less prior to dental therapy

*no longer used as a rigid guideline
**consultation with patient’s MD is appropriate

Case Study

- This patient is an 18 year old male with a history of Type I diabetes mellitus who presents to the oral and maxillofacial surgeon with the complaint “my wisdom teeth hurt”
- The patient reports moderate pain (5/10) for the past week, centered over the posterior mandibular areas bilaterally

Case Study: Medical History

- Diagnosed with Type I diabetes mellitus at age 10, and has been taking insulin for the pat 8 years
- Followed by his family physician
- Medications include:
  1. Lantus: Long acting synthetic insulin that provides a steady concentration of insulin once daily
  2. Humalog: (short acting insulin) three times daily

Case Study: Medical History

- No prior surgeries
- Hospitalized twice during the previous years for hypoglycemia:
  (previous episodes of hypoglycemia are a risk factor for future episodes: social, physiology, compliance reasons)
- Reports blood glucose between 80-160 mg/DL over the past week (normal or ideal blood glucose 80-120 mg/DL)
- No family history of diabetes mellitus (positive family history is often seen with Type 2 diabetes mellitus)
Case Study: Examination

- Thin, calm, cooperative
- **Type I:** thin and/or cachectic
- **Type II:** rotund/overweight
- Vital signs stable
- Maxillofacial: No edema, erythema or induration MIO > 40 mm
- Intraoral: bilateral pericoronitis retromolar areas

Case Study: Imaging & Labs

- Panorex: Partial bony impaction #17 and 32, Supraerupted #1 and 16 with impingement on mandibular retromolar areas
- Labs: Blood glucose 125 mg/DL, HBA1C three months earlier = 6.5%

Case Study: Preparation

- Operation scheduled early in the morning
- Oral hypoglycemics are stopped the day before the surgery
- Short acting insulin medications should be avoided on the morning of the surgery to prevent dangerous hypoglycemia
- For short ambulatory procedures, long acting insulin preparations may be continued
- For major procedures in the hospital, stop long acting insulin 1-2 days before & start short acting insulin

Case Study: Patient Instructions

- NPO after midnight
- Continue Lantus (Long Acting)
- Withhold Humalog in the morning

Case Study: Treatment

- Patient was jittery and nervous
- Skin clammy, palms sweaty (sympathetic response to hypoglycemia)
- Tachycardia: HR 120 bpm
- BP 120/80
- Checking pre-operative blood glucose: finger stick taken: patient becomes unresponsive [Syncope vs. hypoglycemia]

Case Study: Treatment

- Finger stick was immediately processed
- Blood glucose 55 mg/DL [confirms hypoglycemia]
- Treatment: 1 ampule of 50% dextrose given IV/IM
- HR 80 bpm
- Patient regains consciousness and is now responsive
- Non-agitated
Case Study: Assessment

- It was determined that the patient misunderstood the pre-operative instructions - refrained from breakfast, but had taken his routine insulin injections before arriving at the office.
- IMPERATIVE to confirm that patient has followed all the pre-operative instruction accurately BEFORE STARTING SURGERY!!

Quiz

What is the normal blood glucose level?
A. 1-10
B. 80-130
C. 350-400
D. 50-75

Quiz

What is the function of insulin?
A. To drive glucose into the cells
B. To release glucose from the cells into the bloodstream
C. To aid in healing
D. To vasoconstrict blood vessels

Quiz

What is the normal blood glucose level?
A. 1-10
B. 80-130
C. 350-400
D. 50-75

Quiz

What is Endocrinology?
A. It is the study of glands that secrete hormones that regulate the body
B. It is the study of root canals
C. It is the study of the digestive system
D. It is the study of the immune system
Quiz

What is Endocrinology?
A. It is the study of glands that secrete hormones that regulate the body
B. It is the study of root canals
C. It is the study of the digestive system
D. It is the study of the immune system

Quiz

What is the function of glucagon?
A. To drive glucose into the cells
B. To release glucose from the cells into the bloodstream
C. To aid in healing
D. To vasoconstrict blood vessels

Quiz

What is the function of glucagon?
A. To drive glucose into the cells
B. To release glucose from the cells into the bloodstream
C. To aid in healing
D. To vasoconstrict blood vessels

Quiz

What are symptoms of diabetes?
A. Polyphagia (always hungry), polydipsia (always thirsty), polyuria (frequent urination)
B. Sweating, nervousness and tremor
C. High blood pressure, chest pains & shortness of breath
D. Dizziness, ringing in ears, deafness

Quiz

What are symptoms of diabetes?
A. Polyphagia (always hungry), polydipsia (always thirsty), polyuria (frequent urination)
B. Sweating, nervousness and tremor
C. High blood pressure, chest pains & shortness of breath
D. Dizziness, ringing in ears, deafness

Quiz

Where is Insulin produced?
A. Liver
B. Pancreas
C. Bone marrow
D. Stomach
Quiz
Where is Insulin produced?
A. Liver
B. Pancreas
C. Bone marrow
D. Stomach

Quiz
What is the problem with performing surgery on a patient whose blood sugar is too high?
A. They will have fruity breath
B. They will have difficulty with normal wound healing
C. They won't be able to feel their wounds
D. They will experience circulatory collapse

Quiz
What is the problem with performing surgery on a patient whose blood sugar is too high?
A. They will have fruity breath
B. They will have difficulty with normal wound healing
C. They won't be able to feel their wounds
D. They will experience circulatory collapse

Quiz
What are the two types of Diabetes?
A. Type I: Beta cells don't produce Insulin at all, Type II: Insulin binds to cells, but the glucose gates don't open
B. Type I: Insulin binds to the cells, but the glucose gates don't open, Type II: Beta cells don't produce Insulin at all
C. Type I: Patient doesn't have a pancreas, Type II: Patient's pancreas doesn't have any Beta cells
D. Type I: Adult onset, Type II: Juvenile diabetes

Quiz
What are the two types of Diabetes?
A. Type I: Beta cells don't produce Insulin at all, Type II: Insulin binds to cells, but the glucose gates don't open
B. Type I: Insulin binds to the cells, but the glucose gates don't open, Type II: Beta cells don't produce Insulin at all
C. Type I: Patient doesn't have a pancreas, Type II: Patient's pancreas doesn't have any Beta cells
D. Type I: Adult onset, Type II: Juvenile diabetes

Quiz
What does the Thyroid do?
A. Produces hormones that control metabolism and growth
B. Produces glands that control the reproductive systems
C. Produces nerve cells
D. Produces red blood cells
Quiz
What does the Thyroid do?
A. Produces hormones that control metabolism and growth
B. Produces glands that control the reproductive systems
C. Produces nerve cells
D. Produces red blood cells

Quiz
What is the danger of doing surgery on a patient who is adrenally suppressed?
A. They will have difficulty with wound healing
B. They may experience a drop in blood pressure and shock
C. They may suffer from seizures
D. They will be dizzy after surgery

This Concludes
Endocrine System Review
California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course
Overview of the Immune System

- The immune system defends the body against foreign invaders such as:
  - Microorganisms (bacteria, virus, fungi)
  - Parasites (such as worms)
  - Cancer cells
  - Even transplanted tissues

Overview of Immune System

- In order to defend itself the immune system must be able to distinguish between:
  - What belongs in the body (self)
  - What does not (non-self or foreign)
  - Non-self substances are called antigens

Overview of the Immune System

- To get rid of the antigens (bad guys), this means WAR!
  - Just like a country needs an army, navy and air force, your body needs an array of cells to fight the antigen. (soldiers!)

Types of Immune Cells

- B cell (B lymphocyte): a white blood cell that produces specific antibodies to specific antigens
- T cells: white blood cell that identifies antigens (surveillance system). Three types: helper, killer or regulatory
- Neutrophil, eosinophil, basophil: types of white blood cells that kill foreign cells (like bacteria), ingests them, attracts other white blood cells to the area, releases histamine

Where are these cells produced?

- Bone marrow: produces all the different kinds of white blood cells
- Thymus gland: T cells multiply, trained to recognize foreign antigens and ignore the body’s own antigens
Lymph and Lymph Glands

- Lymph is a fluid that contains oxygen, proteins and other nutrients that nourish the tissues.
- Lymph also transports foreign substances, like bacteria to lymph nodes.
- A lymph node is where white blood cells can collect, interact with each other and with antigens to produce an immune response.

Patient #1

- 28 y/o male
- Multiple carious teeth
- Hx drug abuse (meth), NKDA
- HIV positive
- Frequent dental abscesses

HIV: Human Immunodeficiency Virus

- The HIV virus attacks the T-helper cells (called CD-4 cells). These are the cells that help the B cells produce antigens against specific antigens, helps killer T cells to become active and stimulates macrophages (cells that digest foreign cells).
- With the T helper cells crippled, the body cannot fight infections.

HIV

Concerns:
- Decreased patient resistance
- Opportunistic infections
- Doctor and Staff exposure

Treatment Considerations:
- Optimal patient health
- Antibiotic coverage
- Universal precautions
Patient #2
- 21 y/o female
- Removal of 3rds
- Allergy to codeine and ‘I think Demerol or morphine’
- Wants sedation
- Hospitalized in past for ‘lung issues’, OK now
- VS P-77, BP 125/68

Patient #2
- Start the IV
- Titrate the benzodiazepine
- Add the narcotic
- Monitor starts ringing in<5 minutes
- Complains of
  - Difficulty breathing
  - Pale
  - BP drops to 75
  - ????

Patient #2
- Vital signs deteriorating
- Peripheral color also pale
- Lungs wheezing
- Voice restricted

Allergic Reaction vs. Adverse Reaction
- Allergic Reaction:
  - True initiation of immune response
  - Urticaria/rash
  - Hives
  - Angioedema
  - Difficulty breathing: laryngeal edema
  - Hypotension (shock)
  - Repeated exposure could result in anaphylactic shock
- Adverse Reaction
  - An untoward reaction (bad) that is not directly related to triggering the immune system
  - Nausea/vomiting
  - Headache
  - Repeated exposure does not increase the immune response

Rapid Allergy
- Within 5-10 minutes of time of exposure...
- Life-threatening components of anaphylaxis are bronchoconstriction, laryngeal edema and cardiovascular collapse

Severe Allergic Reactions
- α - Vasoconstriction
- β Effects
  - β1 ↑’s HR, ↑’d BP
  - β2 Bronchodilation
- β1 ↑’s HR, ↑’d BP
- Bronchoconstriction
- β2 Bronchodilation
- Vasoconstriction of edematous (swollen) membranes of throat - α
Treatment Of Allergic Reactions – Additional Medications

**Dexamethasone (Decadron):**
- To stabilize membranes, which will reduce swelling
- To combat the other symptoms of inflammation

**Benadryl (diphenhydramine):**
- Stop or decrease release of histamine
- Reduce allergic reaction

---

**Patient #2**

- Management?
  - O₂
  - Epinephrine
  - Benadryl
  - Dexamethasone
  - Open IV
  - Intubate early!!
  - Note vital signs

---

**Patient #3**

- 56 y/o male referred for rem of posterior teeth
- Undergoing chemotherapy
- About to start radiotherapy
- Lymphoma
- Has frequent oral infections: URI, bronchitis, gastric distress
- Labs: WBC 1,200, neutrophils <40%

---

**Patient #3**

- Problem list:
  - Chemotherapy patients can be immunosuppressed. The drugs wipe out good cells AND bad cells.
  - Susceptible to infections (low WBC)
  - Anemic (low RBC)
  - Tendency to bleed (low platelets)
- Solution(s):
  - Be as non invasive as possible
  - Consider pre op CBC
  - Use antibiotics
  - Close wounds as well as possible

---

**Patient #3**

- Problem list:
  - Immunosuppressed
  - Multiple surgical sites (molars)
  - Low WBCs
  - Susceptible to infection(s)
  - Must proceed before radiation
  - Wants sedation
- Management:
  - Medical consult to clarify condition
  - Atraumatic surgery
  - Antibiotic coverage
  - ‘Light’ sedation
  - Minimal flap reflection
  - Remove questionable bony prominences

---

**Patient #4a, 4b**

- 35 y/o female referred for placement of two implants in maxillary left region.
- Type I diabetic
- Takes insulin
- Wants to go to sleep
- 23 y/o female referred for ext x 3
  - Healthy
  - Allergy to latex
  - Precautions:
    - Non-latex gloves
    - Tape
    - Tubing
Latex Allergy

Patient #5

- 22 y/o male s/p removal of 3rd molars 12 hrs previously
- Sedation / codeine meds
- Calls with complaints of
  - Swelling of face, lips, eyes
  - Pain moderate

Patient #5

- Probably diagnosis: angioedema
- Management:
  - Stop meds
  - Antihistamine
  - Review medical history
  - Follow up patient
    - Symptoms slow to resolve
    - Review history for other possible sources
- Allergy prone patient:
  - History
    - Rash, hives
  - Watery eyes
  - Rhinitis
  - Spring is allergy season

Monitoring – Observe for...

Rash
Watery eyes
Lip swelling
Hives
Swollen eyes
Itching

Also: Listen for wheezing and watch monitors.

Allergy To Drugs - Diagnosis

Watery Eyes
Sneezing
Labial swelling
Coughing
Skin: Rash, “Flushing” Hives, itching
Shortness of breath, wheezing
Hypotension
Nausea

Patient #6

- 44 y/o male
- Presents for ext abscessed #12, 13
- Swollen, painful
- Couldn’t eat
- Medical history
  - HBP
  - Diabetes
- Vital signs
  - 99.2, 102/75, HR 85

Treatment:
- Local given
- Patient
  - Pale, diaphoretic
  - Disoriented
  - BP 95/65, HR 200
Patient #6

- **Evaluation:**
  - Patient reacting to what?
  - Did the patient take his medications and when?
  - Glucometer: 325
- **Problems list:**
  - Infection
  - Diabetes, management
  - High blood pressure

- **Management:**
  - Continue with extractions?
  - Correct probable imbalance
  - Treat when vital signs and metabolism controlled
  - Glucometer
  - Give glucose
  - Monitor vital signs

Other Body Systems

Liver Disease

What does your liver do?

1. Filters blood (removes ammonia, bilirubin, which is a breakdown of hemoglobin and other toxins)
2. Produces clotting factors
3. Metabolizes and breaks down drugs

Liver Disease

Symptoms of Liver Disease:
- Fatigue
- Weight loss
- Abdominal pain
- Yellowing of skin or eyes due to elevation of bilirubin
- Swelling of legs

Types of Liver Diseases:
- Hepatitis A, B, C
- Cirrhosis
- Non alcoholic fatty liver disease
- Alcoholic hepatitis

Considerations in Patients with Liver Disease

- Alter drug therapy
- Prolonged mental depression after anesthesia due to decreased metabolism of anesthetics and analgesics
- Post operative healing
- Universal precautions
- Assess ability to clot

Indications for Anticoagulant Therapy

- History of thrombophlebitis/pulmonary embolus
- Stroke patients
- Atrial fibrillation
- Prosthetic cardiac valves
- Cardiac stents (but usually not on Coumadin)

Kidney Disease

- Functions of kidney
- Filters blood
- Eliminates Waste
- Fluid & electrolyte balance
Considerations in Patients with Kidney Disease

- Drug doses may need to be reduced because they are not being eliminated as efficiently
- Hypertension
- Dialysis: blood is usually anticoagulated during dialysis. Therefore usually perform procedure on an OFF-dialysis day.
- Risk of infection

Quiz

True or False: Patients with liver disease should be given higher doses of anesthetic agents?
A. True
B. False

Quiz

The optimal time for elective procedures to be performed on a pregnant patient is the:
A. First trimester
B. Second trimester
C. Third trimester

Quiz

Your patient is in kidney failure and requires dialysis. He is on a Monday, Wednesday, Friday dialysis schedule. Which day do you want to do the surgery?
A. Tuesday or Thursday
B. Monday, Wednesday or Friday
Quiz

Your patient is in kidney failure and requires dialysis. He is on a Monday, Wednesday, Friday dialysis schedule. Which day do you want to do the surgery?

- A. Tuesday or Thursday
- B. Monday, Wednesday or Friday

Quiz

Indications for patients to be on Coumadin include:
- A. Heart murmurs
- B. Previous heart attack
- C. History of pneumonia
- D. Stroke or cerebral vascular accident

Quiz

Indications for patients to be on Coumadin include:
- A. Heart murmurs
- B. Previous heart attack
- C. History of pneumonia
- D. Stroke or cerebral vascular accident

Quiz

Which of the following are signs of a true allergic reaction?
- A. Itchy rash
- B. Vomiting
- C. Diarrhea
- D. Flatulence

Quiz

Which of the following are signs of a true allergic reaction?
- A. Itchy rash
- B. Vomiting
- C. Diarrhea
- D. Flatulence

Quiz

Medications for treatment of allergic reactions include Benadryl and:
- A. Succinylcholine
- B. Penicillin
- C. Decadron
- D. Vicodin
Quiz

Medications for treatment of allergic reactions include Benadryl and:
A. Succinylcholine
B. Penicillin
C. Decadron
D. Vicodin

Quiz

An important blood level to inquire about in an HIV positive patient is:
A. T helper cell count
B. T killer cell count
C. B cell count
D. WBC count

Quiz

An important blood level to inquire about in an HIV positive patient is:
A. T helper cell count
B. T killer cell count
C. B cell count
D. WBC count

Quiz

An extreme allergic reaction is called:
A. Circulatory shock
B. Neurogenic shock
C. Anaphylactic shock
D. Hypovolemic shock

Quiz

An extreme allergic reaction is called:
A. Circulatory shock
B. Neurogenic shock
C. Anaphylactic shock
D. Hypovolemic shock

Johnny’s mother states he is allergic to Penicillin because he got sick to his stomach the last time he took it. You calmly tell mom:
A. Mom’s right: Johnny is allergic to Penicillin.
B. No, Mom, Johnny had an ADVERSE reaction to Penicillin, not a true allergy.
C. Let’s prescribe Keflex for Johnny.
D. It’s okay to give Johnny Penicillin as long as we give Benadryl with it.
Quiz

Johnny’s mother states he is allergic to Penicillin because he got sick to his stomach the last time he took it. You calmly tell mom:

A. Mom's right: Johnny is allergic to Penicillin.
B. No, Mom. Johnny had an ADVERSE reaction to Penicillin, not a true allergy.
C. Let’s prescribe Keflex for Johnny.
D. It’s okay to give Johnny Penicillin as long as we give Benadryl with it.

Quiz

In a patient in anaphylactic shock, the two most important considerations are: 1. the drop in blood pressure and 2:

A. Entire body rash
B. Nausea and vomiting
C. Fever
D. Laryngeal edema

This Concludes

Immune System Review

California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course
**Important Disclaimer**

Any lecture material covering the topics of I.V. placement, I.V. removal, I.V. drug draw and administration, is meant only as general information.

Attending the OMSA course and learning this material does not allow you to place I.V.’s, remove I.V.’s, or draw and administer I.V. drugs.

Only trained and licensed medical professionals may place an I.V.

**IV sites**

- Antecubital fossa: most common
- Radial branch of cephalic vein: “intern’s vein”
- Dorsal venous plexus of the hand
- Greater saphenous vein (foot): anterior to medial malleolus
- Dorsal venous arch
- External jugular (neck)

**Antecubital Fossa Anatomy**

**What to avoid? Brachial Artery!!**

Arterial Supply to the Arm and Hand

**Yikes! It’s right there!!**

*Arteries cont.*

Brachial Artery continues down from the axillary artery, ends approximately 1 cm distal to the elbow joint. It then divides into the radial and ulnar arteries.

The brachial artery is superficial, covered only by skin and fascia of the Bicipital Aponeurosis. The median nerve runs along side it.

*California Association of Oral & Maxillofacial Surgeons ©2019*
At or near the Hand

IV Fluids
- Categorized by their “tonicity”.
- What’s that?

What’s the difference?
- Gatorade contains electrolytes, while water does not.
- What are electrolytes?
- Sodium, potassium, chloride, calcium
- These are also found in the body, and specifically in the body plasma (fluid surrounding the cells)

Electrolytes

Tonicity
- When the solution containing the electrolytes are at the same concentration as that found in plasma = isotonic
- When the solution containing the electrolytes have more electrolytes than the plasma = hypertonic
- When the solution containing the electrolytes have less electrolytes than plasma = hypotonic

Why is it important?
- In the body, water is divided into
  - Intracellular (in the cells)
  - Extracellular (outside the cells)
    - Intravascular (in the blood vessels)
    - Interstitial (between the cells, but outside the blood vessels)
- Water can move freely between compartments
Why is it important (part 2)?

- Movement of the water depends on the concentration of electrolytes.
- Water will naturally move toward an area that has more electrolytes to try to dilute them.
- In general, we want the solution to stay intravascularly.

Effect of IV Fluids of Different Tonicity

Different IV Fluids

- D5W: 5% dextrose in water
- LR: Lactated Ringers: isotonic solution containing sodium chloride, potassium chloride, calcium chloride and sodium lactate in sterile water
- NS: (or NSS) Normal Saline: isotonic solution containing .9% sodium chloride
- D5NS: 5% dextrose in normal saline
- D51/2NS: 5% dextrose in a half normal saline
- D51/4 NS: 5% dextrose in a quarter normal saline

Most ideal fluids

It is now recommended that maintenance fluids in outpatient surgery consist of a solution such as normal saline (NS) or Lactated Ringer’s solution (LR)

Setting up an IV

Chose IV type (NS, LR) and size (1 liter, 500 cc, 250 cc)

IV Administration Set

Remove this cover
4. Remove IV solution from outer packaging and gently squeeze.

5. Remove primary IV tubing from outer packaging.

6. Move the roller clamp about 3 cm below the drip chamber and close the clamp.

7. Remove the protective cover on the IV solution port and keep sterile. Remove the protective cover on the IV tubing spike.

8. Without contaminating the solution port, carefully insert the IV tubing spike into the port, gently pushing and twisting.

9. Hang bag on IV pole. The IV bag should be approximately one meter above the IV insertion site.

10. Fill the drip chamber one-third to one-half full by gently squeezing the chamber. Remove protective cover on the end of the tubing and keep sterile.

11. With distal end of tubing over a basin or sink slowly open roller clamp to prime the IV tubing. Invert backcheck valve and ports as the fluid passes through the tubing. Tap gently to remove air and to fill with fluid.

12. Once IV tubing is primed, check the entire length of tubing to ensure no air bubbles are present.

13. Close roller clamp. Cover end with sterile dead-ender or sterile protective cover. Hang tubing on IV pole to prevent from touching the ground.

Why is it important to prime the line (flush with IV fluid)?

- Prevents air from entering the IV fluid and ultimately, into the vasculature.
- What if that were to happen?
- Then it is called an Air Embolus.
What happens to an Air Embolus?
- It will travel through the vasculature to the heart
- Where it may obstruct blood flow

Types of Catheters
- Butterfly catheters. Don’t use these!!
- Angiocatheters: use these!

Inserting the IV Catheter
- Place tourniquet above IV site
- Disinfect skin surface with alcohol wipe or betadine wipe
- Stabilize the overlying skin with the non‐dominant hand
- Gently pierce the skin and then advance to the vein
- When flashback appears, advance the entire needle/catheter another 1/16 – 1/8” to insure the catheter is in the vein

Removing the IV Catheter
- Stop the IV fluid infusion by rolling the rollerball down
- Remove the tape and adhesive dressing around the IV site
- Have a gauze (usually a 2x2) ready
- Slowly withdraw the cannula (compare length to original catheter length to be sure entire catheter was removed)
- Then press the gauze over the site for 1-3 minutes until no further bleeding is seen
Understanding Concentrations of Medications

Medication strengths are usually expressed in milligrams.

Grams vs. Liter

A gram is a unit of dry weight. A liter is a unit of liquid volume.

Now mix grams into a liter

If I mix the 1 gram of powder into 1 liter of liquid, I get a concentration ratio of:

\[
\frac{1 \text{ gram}}{1 \text{ liter}}
\]

Remember the Metric System?

- 1 liter = 1000 milliliters
- And did you know?
- 1 ml = 1 cc
- So when you see “cc”, you can replace it with “ml”

Concentration of Drugs

- 1% solution means 1 gram in 100 cc (or ml)

\[
\frac{1 \text{ gram}}{100 \text{ cc}}
\]

- Which is the same as

\[
\frac{1000 \text{ mg}}{100 \text{ cc}}
\]
Higher Math

- Now cross out all the zeros from the numerator and denominator and you get: \[
\frac{10 \text{ mg}}{1 \text{ cc}}
\]
- 1% solution = 10 mg/cc
- 2% solution = 20 mg/cc

Let’s look at Vasoconstrictors

- 1:100,000 means 1 gram in 100,000 cc
- 1:200,000 means 1 gram in 200,000 cc
- Which one is more dilute?
- The 1:200,000 concentration!

Withdrawing Medication from a Vial

- Choose the smallest gauge needle appropriate for the task and avoid coring the rubber top of the vial and introducing particulate into the liquid inside
- Attach needle onto the syringe
- Wipe rubber top of vial with alcohol wipe to disinfect it

Withdrawing Medication from a Vial

- Draw into the syringe an amount of air equal to the amount of medication you wish to withdraw from the vial
- Puncture the rubber stopper with the syringe, bring both the syringe and bottle to a vertical position with the bottle on top
- Now inject the air into the vial and withdraw the plunger and double check to make sure the correct volume of medication has been withdrawn
- Remove the syringe from the bottle
- Confirm with the doctor, the medication and dose before injecting
- Show the doctor the vial
Complications of IV Therapy

When things go wrong...

Infiltration

Inadvertent administration of IV fluid into surrounding tissues

Thrombophlebitis

- Inflammation (phlebitis) and thrombus (clot) formation in the vein itself
- Pain, tenderness
- Redness of the vein
- Ropey, hard feeling to the vein

Thrombophlebitis

Caused by direct injury to the vein, causing platelets to aggregate, forming the clot

Treatment:
- Warm moist heat
- Elevate the arm
- NSAIDS or aspirin
- Severe cases may need steroid or antibiotic

Intra-arterial injection

We thought the catheter was in the vein, but it was accidentally in the artery instead.

Intra-arterial Injection

- Mechanism of injury:
  - Arterial spasm caused by drug
  - Direct tissue destruction
  - Subsequent chemical arteritis, destroying the endothelium and muscular layer of the vessel
Intra-arterial Injection

- The result? The blood supply to the tissues distal to the injection site is compromised.
- Vascular emergency!!
- Can lead to necrosis of the limb

Vascular surgery consult

Compartment Syndrome

- Muscles of the forearm (and legs also) are divided, along with blood vessels and nerves into different compartments
- Thick fascia surrounds (wraps around) these compartments

An increase in pressure within the compartment (interstitial tissues) that is greater than the ability of the blood to perfuse the area will lead to a dangerous compartment syndrome

Causes:
- Trauma (multiple IV attempts)
- Infiltration of hypertonic fluids
- Extensive soft tissue injury
- Bone fractures

Quiz

When inserting the catheter, which artery is at risk?

A. Femoral artery
B. Brachial artery
C. Carotid artery
D. Radial artery
Quiz
When inserting the catheter, which artery is at risk?
A. Femoral artery
B. Brachial artery
C. Carotid artery
D. Radial artery

Quiz
What is the preferred IV fluid?
A. D5W
B. NS
C. D5-1/2 NS
D. D50W

Quiz
What is the preferred IV fluid?
A. D5W
B. NS
C. D5-1/2 NS
D. D50W

Quiz
Which is the preferred vein for the IV site for oral surgery procedure?
A. Antecubital fossa
B. Popliteal area
C. Femoral artery
D. Jugular area

Quiz
Which is the preferred vein for the IV site for oral surgery procedure?
A. Antecubital fossa
B. Popliteal area
C. Femoral artery
D. Jugular area

Quiz
The preferred method of starting an IV is to use:
A. A catheter
B. A butterfly
Quiz
The preferred method of starting an IV is to use:
A. A catheter
B. A butterfly

Quiz
Treatment of an intra-arterial injection is:
A. 2cc 1% lidocaine
B. 10cc 1% lidocaine
C. 1cc 10% Procaine
D. 10cc 1% Procaine

Quiz
Treatment of an intra-arterial injection is:
A. 2cc 1% lidocaine
B. 10cc 1% lidocaine
C. 1cc 10% Procaine
D. 10cc 1% Procaine

Quiz
Less severe venipuncture complications include:
A. Headache & nausea
B. Laceration of the vein
C. Numbness and tingling of the arm
D. Phlebitis and extravasation

Quiz
Less severe venipuncture complications include:
A. Headache & nausea
B. Laceration of the vein
C. Numbness and tingling of the arm
D. Phlebitis and extravasation

Quiz
Why must you run the IV fluid through the line before administering to the patient?
A. To achieve the proper dilution of medication
B. To prevent air embolus
C. To prevent extravasation
D. To achieve the correct rate of infusion
Quiz
Why must you run the IV fluid through the line before administering to the patient?
A. To achieve the proper dilution of medication
B. To prevent air embolus
C. To prevent extravasation
D. To achieve the correct rate of infusion

Quiz
Inflammation of the vein is called:
A. Necrosis
B. Compartment syndrome
C. Extravasation
D. Phlebitis

Quiz
Inflammation of the vein is called:
A. Necrosis
B. Compartment syndrome
C. Extravasation
D. Phlebitis

Quiz
The danger of an intra-arterial injection is:
A. Intense chemical inflammation destroying the inner layer of the artery, preventing blood supply to the limb.
B. The medication’s won’t work.
C. The blood pressure readings will not be accurate.

Quiz
Treatment for phlebitis includes:
A. 1% lidocaine
B. 1% Procaine
C. Pressure, moist heat and elevation
D. Penicillin
Quiz

Treatment for phlebitis includes:

A. 1% lidocaine
B. 1% Procaine
C. Pressure, moist heat and elevation
D. Penicillin
Pharmacology Review

Methods of administration
- Topical: skin
- Subcutaneous: just under the skin
- Intramuscular: injected into the muscle

Methods of administration (cont.)
- Intravenous: directly into a vein and the bloodstream.
- IV is the most rapid onset of action, preferred route, greater bioavailability of drugs and ability to titrate.
- ** Most oral surgery offices use total intravenous anesthesia

Fate of drugs in the body: (what happens to these drugs?)
- Drugs are distributed to the brain, muscle mass & fat stores
- ***They are metabolized in the liver
- Excreted by the kidneys

Question:
- How do you adjust the dosage of anesthetic agents for a patient who has renal or liver disease?
How do anesthetics work?

- Remember conduction of the impulse in those specialized cells in the heart? Nerve cells work the same way.
- The cell is polarized: positive ions on the outside, negative ions on the inside, with “gates” in the cell wall.
- Usually, the gates open up and allow the positive ions to flow in, thus depolarizing the membrane.

Local anesthetic

- Local anesthetics BLOCK THE GATES and do not allow the positive ions to flow into the cell, thus preventing conduction of the impulse.

General anesthetics

- General anesthetics work a little bit differently. They prevent synaptic transmission of impulses between neurons.

General Anesthetics

We’ll explain:
- Neurons (nerve cells) are separated by a tiny space called a synapse.
- One end of the neuron has chemicals in it.
- When the impulse comes along, chemicals are released from the end of one neuron and travels across the synapse to the end of the other neuron.
Local vs. General

Local: “locked out”  General: “botched relay”

What parts of the brain are affected?

- Center for Emotion
- The Wakefulness System
- The Central Relay Center

Inhalational Anesthetics

- Oxygen
  - Green tanks (universal)
  - Use with every sedation and general anesthetic in the office!
  - 21% O₂ in room air
  - Use 30% or greater when using other agents
  - Caution in patients with COPD

- Nitrous Oxide
  - Blue tanks
  - Non flammable
  - Gives a sense of euphoria and relaxation
  - Analgesic properties
  - Diffusion hypoxia
Diffusion Hypoxia
- If, at the end of a procedure, a patient who was on N₂O + O₂ is allowed to breathe only room air, the N₂O will diffuse from the blood stream to the lungs and fill up the alveoli.
- This displaces oxygen and also dilutes the CO₂, thereby decreasing respiratory drive & ventilation.
- Causes a hangover type effect
- Avoid this complication by breathing 100% O₂ for 3-5 minutes.

Intravenous Agents
- Benzodiazepines
- Opioids
- Sedative Hypnotics
- Dissociative Anesthetics
- Barbiturates

Other intravenous drugs
- Anti-emetics
- Anticholinergic
- Corticosteroids
- Reversal agents

Benzodiazepines
- Diazepam---------Valium
- Midazolam--------Versed
- Lorazepam--------Ativan
- Alprazolam--------Xanax
- Triazolam--------Halcion

Benzodiazepines: Action
- Reduces anxiety, relaxes patient
- [works on the Center of Emotion]
- Amnesia
- Reversal agent = Flumazenil (Romazicon)
Benzodiazepines: Considerations

- Anticonvulsant
- Contraindication: narrow angle glaucoma
- Minimal change in respiration, but it IS a respiratory depressant
- Mild decrease in blood pressure
- Relaxes muscles

Valium vs. Versed

- Valium can be irritating to the veins due to the carrier, propylene glycol
- Versed is stronger (greater sedation) than Valium
- Versed has more profound anterograde amnesia than Valium
- Versed is Water soluble (no propylene glycol) so doesn’t irritate veins

Narcotics

- Also known as Opioids as parent compound is Opium, derived from the poppy.
- Mainly used for Pain Control

Narcotics

- Morphine
- Demerol
- Fentanyl
- Sufentanyl
- Alfentanyl
- Codeine
- Hydrocodone
- Oxycodone

Narcotics: Action

- Used for pain relief (analgesics)
- Produces drowsiness, mental clouding, euphoria, vomiting (stimulates vomiting center)
- Can constipate
- Pinpoint pupils

Narcotics: Considerations

- Can trigger nausea and vomiting
- Respiratory depressant (patient forgets to breathe)
- Use with caution in asthmatics: (histamine release)
- Cardiovascular system remains stable, but can see bradycardia
- Reversal agent = Naloxone (Narcan)
- Fentanyl : 100X more potent than Morphine
Morphine

- Parent compound
- Derived from the poppy

Meperidine (Demerol)

- Synthetic
- 1/10 as potent as morphine
- Mild histamine release
- May produce hypotension

Fentanyl

- 100x more potent than Morphine
- (dosage is in micrograms)
- Rapid onset
- Ultra short duration (30-60 min)
- Cardiovascular system stable

Pain medications after surgery

- Hydrocodone (Vicodin, Norco)
- Oxycodone (Percocet)
- Codeine

Sedative-Hypnotic: Propofol

- Propofol (Diprivan): used to put patient to sleep
- Targets the Wakefulness Center
- Associated with emergence euphoria (patients feel good when they wake up)
- Anti-emetic effect

Propofol: Considerations

- Cardiovascular system: slight decrease in blood pressure
- Little or no change in heart rate
- Respiratory depressant
- Very rapid recovery (distribution half life = 2 – 8 min)
- Anti-emetic properties
Propofol: Considerations
- Carried in a lipid emulsion containing soybean oil, glycerin, and egg lecithin
- Contraindications to use:
  - Allergy to egg YOLK (most people allergic to egg white)
  - Allergy to soybeans
  - Can burn on injection
  - Elderly: decreased dose
  - Women & children: increased dose

Barbiturates: Brevital
- Ultra short acting barbiturate
- Used to put patients to sleep (affects wakefulness center)

Brevital: Considerations
- 1% solution (10 mg/cc)
- Drop in blood pressure: hypotension
- Increase in heart rate (reflex tachycardia)
- Respiratory depressant (see apnea after induction)
- See more laryngospasms with Brevital than Propofol

Dissociative Anesthetic: Ketamine
- Synthesized in 1962 from PCP
- Some classify it as a hallucinogen
- Known by street names as Special K, baby food, ket

Dissociative Anesthetic: Ketamine
- Action in cerebral cortex in the "relay center"
- Potent analgesic
- Produces amnesia
- Sympathetic stimulation: increase HR & BP
- Increased cerebral blood flow & intracranial pressure
- Can be associated with emergence delirium (prevent with benzodiazepines)
- Half life: 10-15 minutes

Respiratory Depression
- What is it? A decrease in respiratory RATE and/or VOLUME
- Which anesthetic agents can cause it?
  - Narcotics
  - Benzodiazepines
  - Sedative Hypnotics
  - Barbiturates
Reversal Agents

- Reversal for Narcotics
  - Naloxone = Narcan
  - Danger: short duration of action means Narcan could wear off and patient could get re-sedated if the narcotics haven’t worn off yet.

Reversal Agents

- Reversal for Benzodiazepines
  - Flumazenil = Romazicon
  - Duration = 60 – 90 min.
  - Duration of action of midazolam = 2 – 4 hours
  - Watch for re-sedation!

Corticosteroids

- Function: suppress immune system
- Use to decrease inflammation and swelling
- Will increase blood glucose
- Commonly used:
  - Decadron
  - Medrol
  - Solu-Medrol/Solu-Cortef
  - Prednisone
  - Cortisone

Antiemetics (Anti-nausea)

- What causes nausea?
  - Medications
  - Tummy bugs (gastroenteritis)
  - Migraines
  - Pregnancy
  - Anxiety
  - Ear problems
  - Motion sickness

Medications that cause nausea

- Narcotics
- Antibiotics
- Some antidepressants
- Chemotherapy drugs

Medications for Nausea

- Ondansetron (Zofran): blocks chemical called serotonin (5HT) in the gut and brain which causes nausea
- Promethazine (Phenergan): antihistamine, thought to block the histamine receptor in the brain that causes nausea. Works well for motion sickness & ear problems.
Medications for nausea (cont’d)

• **Prochlorperazine (Compazine):** blocks dopamine
• **Decadron**

Case Study

• Your patient is a 22 year old male who presents to your office for extraction of his third molars. He complains #32 is painful and the gum is swollen.

Past Medical History

• Childhood asthma: hasn’t used an inhaler or had an attack in over 7 years
• Fractured wrist, age 13
• No medications
• Allergic to soy & eggs

Clinical examination

• Patient is afebrile
• No extraoral swelling is noted
• Mild trismus: opening = 30 mm
• + edema and erythema of pericoronal tissue over #32

Anesthetic Plan

• What medications would you use?
• Versed? Valium?
• Fentanyl? Demerol? Morphine?
• Decadron? SoluMedrol?
• Ketamine?
• Propofol?
• Brevital?

Anesthetic Course

• You plan to sedate this patient using
• Versed
• Fentanyl
• Decadron
• Brevital
Anesthetic Course

- Patient is 6'1”, weighs 165 lbs.
- Treatment plan and NPO is confirmed.
- Just before starting, the patient asks you when he can smoke again after the surgery because he smokes marijuana daily.
- Monitors attached.
- O2 was administered via nasal hood at 6L/min.
- A 20 gauge angiocath was used to start an IV in the right antecubital fossa w/ NS.

Versed 5 mg, Fentanyl 50 mcg & Decadron 4 mg was administered through the IV.

Local anesthetic 2% lidocaine with 1:100,000 epi and .5 % Marcaine with 1:200,000 epi was administered as bilateral mandibular blocks and infiltrations around the teeth.

6 cc’s of 1% solution of Brevital (10mg/cc) was administered.

What is your diagnosis?

- #17 was extracted uneventfully.
- An additional 3 cc’s of Brevital was “bumped” or administered and #16 was then extracted.
- Before #32 could be extracted, “crowing” or stridor was heard.
- O2 saturation dropped to 92%.

What would your next course of action be?

- The surgery was terminated temporarily, and the sites were packed off.
- The airway was repositioned by using a head-tilt maneuver.
- The throat pack was removed and the oropharynx was suctioned.
- Within a few minutes, the saturation returned to 99% and patient’s ventilations returned to normal.

Anesthetic Course

- However, when the surgery was resumed, the patient became very agitated and combative.
- An additional 25 mcg of Fentanyl was administered as well as a bolus of 50 mg (5cc’s) of Brevital.
- Additional local anesthetic .5% Marcaine with 1:200,000 was administered as a mandibular block.
Anesthetic Course

• However, the patient continues to be very combative.
• He repeatedly removes the pulse oximeter from his finger, so a reading is difficult to obtain.
• Additional Versed 4 mg, Fentanyl 25 mcg and a bolus of Brevital 40 mg was given.

Anesthetic Course

• The decision was made to administer 30 mg Ketamine to the patient.
• Finally, the patient calmed down and #32 and #1 were finally extracted.

Post operative Course

• Post operatively, the patient remains drowsy and non-responsive to verbal stimuli.
• You notice that you repeatedly have to remind him to breathe, occasionally even doing a head-tilt procedure to get him to breathe.
• Finally, after 30 minutes, you decide to tell the doctor.

Post operative course

• Flumazenil and Narcan were administered.
• The patient finally was arousable.
• Following another 25 minutes, the patient was finally able to be discharged.
• Right before putting him in the wheelchair, the patient complained he was nauseated.

What is your diagnosis?

• What are the next steps in your treatment?

What medication would you give for his nausea?

What dose would you use?

What prescriptions would you send home with this patient?

Are there any specific instructions you would tell his driver?
Local Anesthetics

- Two types:
  - Esters (chemical structure: C=O)
  - Amides (chemical structure: NH2)

Local Anesthetics

- Esters
  - Not used very much today due to high incidence of allergy
  - Procaine (Novocain) is most commonly known. (remember accidental intra-arterial injection??)
  - Benzocaine, Cocaine Tetracaine

Local Anesthetics

- Lidocaine
- Mepivacaine
- Bupivacaine
- Prilocaine
- Etidocaine
- Ropivacaine

Mechanism of Local anesthetics

- Local anesthetics block the gates and do not allow the positive ions to flow into the cell, thus preventing conduction of the impulse.

Local Anesthetic Toxicity (overdose)

- Early signs – Patient may become anxious, talkative and disoriented
- At higher doses the patient may develop seizures which can require emergency treatment

Vasoconstrictors

- Epinephrine or Neo-cobefrin are commonly added to local anesthetics to
  - Increase duration of action
  - Limit absorption of local anesthetic into the system. Therefore the maximum number of carpules that can be safely delivered is increased.
  - Vasoconstriction
### Maximum Doses of Local Anesthetics

<table>
<thead>
<tr>
<th>Agent</th>
<th>Mg/mL cartidge</th>
<th>Max mg/kg</th>
<th>Max mg/lb</th>
<th>Max dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>2% lidocaine</td>
<td>96</td>
<td>4.5</td>
<td>2</td>
<td>300</td>
</tr>
<tr>
<td>2% lidoc w/ 1:100,000 epi</td>
<td>96</td>
<td>7</td>
<td>3.3</td>
<td>500</td>
</tr>
<tr>
<td>3% mepivacaine (Carbocaine)</td>
<td>54</td>
<td>5.5</td>
<td>2.6</td>
<td>400</td>
</tr>
<tr>
<td>2% mepivacaine w/ 1:20,000 levonordefrin</td>
<td>96</td>
<td>5.5</td>
<td>2.6</td>
<td>400</td>
</tr>
<tr>
<td>4% prilocaine (Citanest)</td>
<td>72</td>
<td>4</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>4% prilocaine w/ 1:200,000 epi</td>
<td>72</td>
<td>4</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>0.5% bupivacaine w/ 1:20,000 epi (Marcaine)</td>
<td>4.5</td>
<td>0.6</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>1.5% etidocaine w/ 1:200,000 epi (Duranest)</td>
<td>27</td>
<td>5.5</td>
<td>2.6</td>
<td>400</td>
</tr>
<tr>
<td>4% articaine w/ 1:200,000 epi</td>
<td>68</td>
<td>7</td>
<td>3.2</td>
<td>500</td>
</tr>
</tbody>
</table>

### Anesthesia for Pregnancy
- Ideally: defer elective procedures until after delivery
- Next best time: second trimester
- Let the OB know treatment plan
- ALL medications cross the placental barrier
- Usually treat using local anesthetic only
- Confirm pain medication with OB: Tylenol considered safe

### Quiz

Anesthetic agents act by:
A. Disrupting the membrane of the cell
B. Freezing the neuron
C. Interfering with the depolarization of the membrane
D. Increasing the number of sodium ions

### Quiz

The main organ that eliminates the drugs is the:
A. Kidney
B. Liver
Quiz

Normally a nerve cell is POLARIZED. This means:

A. There are more positive ions on the outside of the cell membrane and more negative ions on the inside of the cell
B. There are more negative ions on the outside of the cell membrane and more positive ions on the inside of the cell
C. There are an equal number of positive and negative ions on the outside of the cell
D. There are an equal number of positive and negative ions on the inside of the cell

Quiz

Nerves conduct impulses by:
A. Depolarization of the nerve membrane
B. Polarization of the nerve membrane
C. Opening of the nerve membrane
D. Closing of the nerve membrane

Quiz

The main organ that process the anesthetic drugs and changes the chemical structure of the drug is the:
A. Kidney
B. Liver

Quiz

The main organ that process the anesthetic drugs and changes the chemical structure of the drug is the:
A. Kidney
B. Liver
Quiz

Your patient is really really nervous. You probably want to give this patient an anesthetic agent targeted at:
A. The Wakefulness System
B. The Central Relay System
C. The Vital Centers
D. The Center for Emotion

Quiz

The stimulus for respiration is:
A. Decrease O₂ levels
B. Increase in body temperature
C. Increasing CO₂ levels
D. Increase in Lactic Acid

Quiz

Increase in salivation is due to stimulation of the:
A. Parasympathetic System
B. Sympathetic System

Quiz

Increase in salivation is due to stimulation of the:
A. Parasympathetic System
B. Sympathetic System
Quiz

The two components of the Autonomic Nervous System are:
A. Metabolism and Biotransformation
B. Fight or Flight
C. Parasympathetic and Sympathetic
D. Yin and Yang

Quiz

Increased heart rate and blood pressure are due to stimulation of the:
A. Sympathetic system
B. Parasympathetic system

Quiz

The most rapid and effective method of administration of drugs is:
A. Orally (PO)
B. Rectally
C. Intramuscularly (IM)
D. Intravenously (IV)
The function of narcotics is to:
A. Reduce anxiety and relax the patient
B. Minimize or eliminate pain
C. Put the patient to sleep
D. Reduce inflammation

True or False: Morphine is stronger than Fentanyl.
A. True
B. False

Steroids are used to:
A. Decrease swelling and inflammation
B. Decrease secretions
C. Put the patient to sleep
Quiz

Oxygen:
A. Is stored in green tanks
B. Should be administered to every patient undergoing sedation or general anesthesia
C. Should be administered at a concentration of 30% or higher when given with other inhaled agents
D. Should be given cautiously to patients with COPD
E. All choices are correct

Quiz

The action of benzodiazepines is to:
A. Relieve pain
B. Suppress inflammation
C. Relax and sedate the patient
D. Put the patient to sleep

Quiz

Benzodiazepines are reversed by:
A. Decadron (dexamethasone)
B. Narcan (naloxone)
C. Romazicon (Flumazenil)
D. Sublimaze (Fentanyl)
Quiz

Nitrous Oxide:
A. Is stored in blue tanks
B. Produces euphoria and promotes relaxation
C. Should always be used in combination with oxygen
D. Is a non-flammable gas
E. All choices are correct

Quiz

Simply shutting off Nitrous Oxide and allowing the patient to breathe room air can result in:
A. Diffusion Hypoxia
B. Seizures
C. Bronchospasm
D. Respiratory depression

Quiz

Atropine or glycopyrrolate are sometimes given to:
A. Enhance other anesthetic agents
B. Minimize inflammation
C. Reduce salivary secretions
D. Combat hypotension
Quiz
Brevital may predispose the patient to:
A. Asthma
B. Choking
C. Laryngospasm
D. Convulsions

Quiz
Brevital may predispose the patient to:
A. Asthma
B. Choking
C. Laryngospasm
D. Convulsions

Quiz
Brevital is classified as a:
A. Sedative hypnotic
B. Narcotic
C. Benzodiazepine
D. Barbiturate

Quiz
Brevital is classified as a:
A. Sedative hypnotic
B. Narcotic
C. Benzodiazepine
D. Barbiturate

Quiz
Ketamine is classified as a:
A. Sedative hypnotic
B. Narcotic
C. Dissociative anesthetic
D. Benzodiazepine

Quiz
Ketamine is classified as a:
A. Sedative hypnotic
B. Narcotic
C. Dissociative anesthetic
D. Benzodiazepine
Quiz
Acetaminophen toxicity affects which organ?
A. Kidney
B. Lungs
C. Liver
D. Brain

Quiz
Early signs of a local anesthetic overdose include:
A. Anxiety, talkative, disoriented
B. Seizures, facial palsy
C. Tachycardia and hypertension
D. Hypotension and shock

Quiz
Contraindications for the use of Propofol include allergy to:
A. Eggs
B. Soy
C. All choices are correct
True or False: Brevital can cause respiratory depression.
A. True
B. False

Which category of patients will usually require MORE Propofol?
A. Children and adults
B. Children and women
C. Children and elderly
D. Elderly and women

True or False: Ketamine can cause respiratory depression.
A. True
B. False
Quiz
Propofol is classified as a:
A. Narcotic
B. Barbiturate
C. Sedative Hypnotic
D. Benzodiazepine

This Concludes
Pharmacology Review
California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course
### Outpatient Anesthesia Review

California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course

### Outline
- a. Introduction: Chief complaint/history of present illness
- b. Past medical history
- c. Medications
- d. Allergies
- e. Clinical Exam
- f. Diagnosis
- g. Then, a clinical summary of what happens in the case
- h. Anesthetic emergency happens
- i. Treatment of anesthetic emergency

### CHIEF COMPLAINT
- 54 y.o. “retired” male referred from GD for extractions of all remaining teeth due to non-restorability in pain
- Has currently mild jaw pain and had several weeks of dental pain and head aches.
- GD has placed patent on Penicillin VK 500mg QID two days ago.
- Patient recently moved in with his mother
- Dentist took impression last week for Full Upper/Lower Dentures

### PAST MEDICAL HISTORY
- High Blood Pressure
- Prostate hypertrophy
- Bleeding Ulcers/Colitis
- Gout
- Sinus Problems
- Recently switched to a new doctor locally
- Appendectomy 30 year ago, T/A and 3rd molars as a teen

### Medications
- Atenelol
- Allopurinol
- Tamsulosin
- Trazadone
- Pen VK
- Tylenol ES

### ALLERGIES/Adverse reactions & Social History
- ASA – Stomach Problems
- Ativan – Gets angry violent
- SulfA-Utricaria, Pruritus
- DENTISTS – severe phobia
- TOB 1-2 PPD trying to quit last two weeks
- MJ occasional non last 48hrs
- History of polysubstance abuse >1 year ago
- ETOH quit 3 mos. ago
Additional Questions BASED on Med Hx

- MET status
- CP/SOB incidence
- Current use of medications
- Most recent Use of ETOH/Illicit "recreational" Drugs

CLINICAL Exam

- 5'9" 220 lbs.
- BMI 32.4
- NAD/B Alert/Oriented/Disheveled/Minimally Verbal
- Presents with 84 y.o. mother
- No JVD, Neck Supple, No peripheral edema
- Extremities I x 4, but palpable joint pain and slow to ambulate
- Chest CTA no wheezing, rales, rhonchi, crackles

The ASA Classification is?

- ASA I
- ASA II
- ASA III
- ASA IV

ASA Classification I

Class I: Few patients will truly be in this category. The patient has no physiological, or psychiatric disturbances whatsoever, is less than 50 years old, a non-smoker, and takes no medication.

Exceptions: Birth Control Pills, Estrogen Replacement Therapy, Prophylactic Salicylates (aspirin), but without any cardiac history i.e. atrial fib or stent.

ASA Classification II

Class II: Most patients will be in this classification therefore, requiring lab work. The patient has mild to moderate systemic disturbances caused either by the condition to be treated surgically or by other pathophysiologic processes. These disturbances do not limit activity.

Examples:
- Current smoker
- Age over 65 years or less than 3 months old will automatically require a medical consult
- Asthma, well controlled on as needed basis for medication.
- Hypertension well controlled with medication and/or diet; HTN requires an EKG at any age

(continued on next slide...)
ASA Classification II (continued)
• History of heart dysrhythmia (heart rhythm issue) controlled on medication
• Obstructive Sleep Apnea (OSA)
• Stable Angina, well controlled, not limiting activity
• Mild Diabetes, well controlled on medication
• Mild to moderate obesity
• History of seizure disorder, controlled with medication
• History of Congestive Heart Failure, controlled on medication
• COPD, stable
• Chronic Bronchitis
• History of Hepatitis C or Cirrhosis stable, not limiting activity
• Renal Insufficiency, stable

ASA Classification III (continued)
• “Heart attack,” a healed myocardial infarction (MI) of more than 6 months ago, or patients who have undergone coronary artery bypass surgery (CABG), valve replacement or angioplasty.
• Pacemaker, Internal Cardiac Defibrillator (ICD), sometimes CABG patients also have these.
• Diabetes with complications to vascular or other organs, i.e., retinopathy, neuropathy, etc.
• Chronic Pain Management patients taking daily pain medication must have a consultation with a pain management physician prior to the day of surgery for the purpose of pain management during the immediate post-op period while in the post anesthesia care unit.
• Pulmonary insufficiency, including asthma, requiring the use of chronic medications and which limit activity or have uncontrolled symptoms, i.e., shortness of breath, cannot lay flat.
• Any implantable electronic device (IED) i.e., for pain, insulin, deafness, etc.
• Renal failure requiring Dialysis

ASA Classification III
Class III: Many patients are actually in this classification and require a medical consult.
The patient has serious systemic disturbances or diseases, even though it may be impossible to define the degree of disability. The disease process limits activity in some way but is not incapacitating.
- Appropriate specialty consultation, where deemed necessary is also required.
- i.e., patients with issues such as: pain management, insulin pumps, or pacemakers.
Examples:
• Any combination of 3 or more of the disease processes listed for a Class II patient.
• Any single disease process listed for a Class II patient with one or more of these criteria:
  • Intense severity
  • Pseudo controlled on medication
  • Limits activity in some way

ASA Classification IV
Class IV: These patients are not candidates for surgery.
The patient has severe systemic disease that is already life threatening.
Examples:
• Organic heart disease with marked signs of cardiac insufficiency (i.e., NYHA class 4).
• Recent myocardial infarction of less than 6 months duration.
• Unstable angina.
• Patients with advanced degrees of pulmonary, renal or endocrine insufficiency.

Body Mass Index (BMI) Kg/m²

<table>
<thead>
<tr>
<th>Classification</th>
<th>BMI Caucasian</th>
<th>BMI Asian</th>
<th>Health Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>18.5 &lt;</td>
<td>18.5 &lt;</td>
<td>Low</td>
</tr>
<tr>
<td>Normal/Weight</td>
<td>18.5-24.9</td>
<td>18.5-22.9</td>
<td>Average</td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0 &lt;</td>
<td>23.0 &lt;</td>
<td>Mildly increased</td>
</tr>
<tr>
<td>Pre-Obese</td>
<td>25.0-29.9</td>
<td>23.0-24.9</td>
<td></td>
</tr>
<tr>
<td>Obese Class I</td>
<td>30.0-34.9</td>
<td>25.0</td>
<td>Moderate</td>
</tr>
<tr>
<td>Obese Class II</td>
<td>35.0-39.9</td>
<td>27.0-29.9</td>
<td>High</td>
</tr>
<tr>
<td>Obese Class III</td>
<td>40.0 &lt;</td>
<td>30.0 &lt;</td>
<td>Very High</td>
</tr>
</tbody>
</table>

Body MASS INDEX and Health Risk
• Normal weight
• Overweight
• Obese Mild
• Obese Severe (Morbid)
Clinical Oral exam
- Generalized coronal caries
- MIO 37mm TMJ Normal
- MP III Airway
- Gingival swelling and discharge on multiple site
- Macroglossia

Mallampati airway classification
![Mallampati airway classification diagram]

DIAGNOSIS
Medical
- ASA III male
- Medically controlled hypertension
- Type II Diabetes
- Benign prostatic hyperplasia
- Subacute Gout poorly controlled
- TOB Smoker
- Hx of Substance abuse/alcoholism

Dental
- Generalized caries
- Moderate to severe periodontitis with gingival abscesses
- Multisite chronic periapical inflammatory disease

Medical Clearance/Optimization?
- Patient stable as of last visit 6 months ago
- No contraindication to dental work

ASA NPO Guidelines

ASA Fasting guidelines

<table>
<thead>
<tr>
<th>Ingested material</th>
<th>Minimum fast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear liquids</td>
<td>2 h</td>
</tr>
<tr>
<td>Breast milk</td>
<td>4 h</td>
</tr>
<tr>
<td>Infant formula milk</td>
<td>4-6 h</td>
</tr>
<tr>
<td>Non human milk</td>
<td>6 h</td>
</tr>
<tr>
<td>Light meal</td>
<td>6 h</td>
</tr>
<tr>
<td>Heavy meal (contain fat &amp; meat)</td>
<td>8 h</td>
</tr>
</tbody>
</table>

Treatment Plan FOR OFFICE SURGERY
- Local Anesthesia
- Oral Conscious sedation
- IV conscious sedation
- IV Moderate Sedation GA

Questions:
1. How difficult will the surgical procedure be? How stimulating?
2. What is this patient's anesthetic risk?
**Surgery**
- Monitors NIBP, EKG, CO2, O2 Sat
- IV 22 gauge LR at 100cc/hr.
- O2 via Nasal cannula 2l/min
- IV Meds: Versed 10mg, Fentanyl 50mg, Propofol 30mg, Toradol 30mg
- Local:
  - 15.3 cc 2% Lidocaine + 1:100K Epi
  - 3.4 cc 4% Marcaine + 1:100K Epi

**Summary of Events**
- Patient still responds to surgical stimulus after 3 minutes of administration
- Local anesthesia and initial dose sedation deemed not effective
- Additional medications given
- Patient becomes hypertensive and some hypopnea ensues
- Attempt to deepen plane of anesthesia results in worsening of hypopnea, tachycardia and hypertension
- PPV improves SAT and maintains ventilation but voluntary breathing is slow and shallow
- Procedure is quickly completed with mild persistent hypoxia and moderate hypertension
- Patient does not fully return to baseline LOC within 1hr of the last sedative dose

**Summary of Events (continued)**
- Reversal agent given with minimal improvement of cognitive function
- After one additional hour patient still groggy, but ambulates with assistance to recovery area
- Initially when walking to recovery, slight left sided weakness and foot drag is present, but patient is able to stand up and walk 20 feet with slight assistance. He normally walks with slight limp due to gout.
- Patient able to nod and speak, but gauze is present in the mouth, so not very articulate. However, he appears to respond appropriately and follows commands. He is discharged on his own power, ambulating with assistance to his vehicle, 3hrs after start of the procedure.

**Reflexes Determining Depth of Anesthesia**
- Ventilation vs. oxygenation
  - Ventilation - patient is breathing
  - Chest rise & fall
  - Precordial stethoscope
  - Capnography (End tidal CO2): 5-6% or 35-45 mm Hg
  - Watch the reservoir bag
  - Oxygenation: does the blood have oxygen?
  - Pulse oximeter (> 96%)
  - Color of blood (deoxygenated blood is very dark)

**C. Reflexes and Other Indicators of Anesthetic Depth**
- Reflexes
  1. Sabre tooth...diminishing of deeper anesthesia
  2. Patient reflex -- blink
  3. Shudder reflex - no indication of spinal or cord block
  4. Suck reflex - aspiration of material in the back
  5. Ear tick reflex - base of the ear
  6. Corneal reflex - control contact with eye/eyelid
  7. Cymognathus - control response
  8. Muscular tone - severe slowing
  9. Ear pinching and painful area - 1 percent lidocaine solution
  10. Salivary and lacrimal secretions - why we need tube
  11. Nasal and retiglottic sternal - inferior disconnection pred
  12. Response to surgical stimulation - pain response

California Association of Oral & Maxillofacial Surgeons ©2019
Airway adjuncts
- Nasal airway
- Oral airway
- Endotracheal intubation

Stages of Anesthesia

Stage 3
- Plane 1: Light: still has blink and swallowing reflexes and regular respiration
- Plane 2: Surgical Anesthesia: Loss of blink reflexes, pupils become fixed and respiration is regular.
- Plane 3: starts to lose ability to use the respiratory muscles and breathing becomes shallow, may require assisted ventilation
- Plane 4: Loss of all respiratory effort, breathing may stop entirely.

Vitals

<table>
<thead>
<tr>
<th>Time</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP SYS</td>
<td>185</td>
<td>169</td>
<td>200</td>
<td>220</td>
<td>197</td>
<td>188</td>
<td>180</td>
<td>130</td>
<td>126</td>
<td>113</td>
<td>129</td>
<td>125</td>
<td>122</td>
<td>122</td>
<td>129</td>
<td></td>
</tr>
<tr>
<td>BP DIA</td>
<td>99</td>
<td>93</td>
<td>100</td>
<td>110</td>
<td>99</td>
<td>99</td>
<td>100</td>
<td>93</td>
<td>96</td>
<td>93</td>
<td>99</td>
<td>91</td>
<td>96</td>
<td>96</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>HR</td>
<td>99</td>
<td>89</td>
<td>105</td>
<td>110</td>
<td>115</td>
<td>100</td>
<td>99</td>
<td>97</td>
<td>88</td>
<td>96</td>
<td>99</td>
<td>93</td>
<td>99</td>
<td>89</td>
<td>98</td>
<td>99</td>
</tr>
<tr>
<td>SAT O2</td>
<td>97</td>
<td>92</td>
<td>88</td>
<td>83</td>
<td>88</td>
<td>93</td>
<td>89</td>
<td>92</td>
<td>91</td>
<td>92</td>
<td>93</td>
<td>93</td>
<td>94</td>
<td>92</td>
<td>97</td>
<td>93</td>
</tr>
<tr>
<td>RESP</td>
<td>18</td>
<td>15</td>
<td>8</td>
<td>53</td>
<td>53</td>
<td>87</td>
<td>35</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Local</td>
<td>Toradol</td>
<td>4</td>
<td>L</td>
<td>2M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>Versed</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>Romazicon</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>Naloxone</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fentanyl</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propofol</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Direct Delivery

Immediate Denture Delivery

EMERGENCY ISSUES
- HTN
- RESPIRATORY DEPRESSION
- HYPOXIA
- DELAYED EMERGENCE FROM IV SEDATION
Recovered for additional 25 minutes. Discharged home ambulatory with assistance to his mom with full instructions.
Post op call: Sleeping with no complaints. Next day: Call from DDS, patient is at the office but appears disoriented, potential hemi-facial weakness, balance issues, and slightly slurring his speech. Recommended to be seen by ER for STAY eval. Patient drive to local ER. Seen after hours in hospital; impression TIA vs stroke, apparently fell at home twice last night and seemed "Out of it."

Post Op

Sequelae
- Patient spent three days in hospital under observation.
- Diagnosis: Mild Cerebral infarction R side with slight left sided paralysis due to unsppecific artery occlusion.
- Patient discharged home.
- Had another mild stroke in three days.
- Readmitted for another eval.
- Seen for PT and Speech therapy for subsequent three months.
- At six months recovered almost entirely to baseline.
- Small sequestrum removed at 3 months post extractions with local.

Delayed Emergence Causes
- Pharmacological
- Metabolic
- Neurological

Pharmacologic Differential
- Residual anesthetic (volatile, Propofol, barbiturates, ketamine)
- Excess narcotics - can be reversed by naxalone (0.4 mg bolus) - remember it’s short acting CAREFULLY MONITOR FOR ADDITIONAL TIME - RESUSCITATION POSSIBLE
- Preooperative sedatives – too much midazolam? – reversed by flumazenil 0.2 mg qmin up to 3 mg CAREFULLY MONITOR FOR ADDITIONAL TIME - RESUSCITATION POSSIBLE
- Acute alcohol intoxication or other illicit drugs rendering unconsciousness may significantly extend the length of the anesthesia
- Physostigmine 0.25 mg IV can reverse cholinergic effects (ex. scopolamine) and possibly the effects of anesthetic agents (Stanford Delayed Emergence Protocol)
- Inadequate reversal or no reversal of muscle relaxation or rarely pseudo cholinesterase deficiency – edrophonium or acepromazine work faster (1-2 mins) than neostigmine/glycopyrrolate (peak effect around 30 mins) and may be indicated in this setting

Basic WORK UP FOR DE
- Vital signs (including temperature) – hypothermia, Malignant Hyperthermia
- Neurologic Exam (pupils, cranial nerves, reflexes, response to pain)
- Over sedation, Stroke, aneurism
- Finger stick- glucose level hypoglycemia
- Make arrangements for naloxone, flumazenil, physostigmine, imaging (ex. CT scan-Hospital admission)
- ABG with electrolytes (Hospital/Surgery Center) – Rule out metabolic unbalance
- Twitch monitor (Hospital/Surgery Center) – Ensure recovery from Paralytic/Inhalation agents

Metabolic Differential
- Hyponatremia – may require mechanical ventilation or supplemental oxygen
- Hypercarbia – check gas, may need to ventilate postoperatively until the patient resumes adequate spontaneous ventilation
- Acidosis – correct the underlying disorder (metabolic/respiratory)
- Hypoglycemia/Hyperglycemia – FS or check Met Panels, correct as indicated
- Hyponatremia – correct slowly such as not to create central pontine myelinolysis
- Hyperthermia/Hyperthermia – correct as indicated with warming/cooling
- Malignant Hyperthermia – Dantrone ICU care
- Underlying metabolic disorder – e.g. Liver disease
Neurologic Differential

- New ischemic event – Evaluate for reperfusion with thrombolytics STAT
- Cerebral Hemorrhage – Need Head CT STAT
- Seizures or post-ictal state – Check history and use of meds
- Increased ICP or pre-existing obtundation – Mostly Trauma cases

Focal “Brain” ATTACK

Acute ischemic stroke

- Destruction of brain due to:
  - Intra-cranial hemorrhage
  - thrombosis
  - embolism
- Risks factors:
  - HTN
  - Stress
  - Atherosclerosis
  - Age
  - arrhythmias
Reperfusion therapy with Thrombolytics

Quiz
Agents that induce respiratory depression include all EXCEPT:
A. Opioids
B. Benzodiazepines
C. Alkylphenols
D. Dissociative Anesthetics

Quiz
Agents that induce respiratory depression include all EXCEPT:
A. Opioids
B. Benzodiazepines
C. Alkylphenols
D. Dissociative Anesthetics

Quiz
Examination of a patient with a protruded tongue reveals visualization of the soft palate and base of the uvula only. This patient's Mallampati classification is:
A. Mallampati Class I
B. Mallampati Class II
C. Mallampati Class III
D. Mallampati Class IV

Quiz
Examination of a patient with a protruded tongue reveals visualization of the soft palate and base of the uvula only. This patient's Mallampati classification is:
A. Mallampati Class I
B. Mallampati Class II
C. Mallampati Class III
D. Mallampati Class IV

Quiz
A doctor requests his assistant to "take the patient's vital signs". He demands document all of the following EXCEPT:
A. Blood Pressure
B. Temperature
C. Pulse oximeter reading
D. Pulse
E. Respiration
Quiz

A doctor requests his assistant to “take the patient’s vital signs”. He demands document all of the following EXCEPT:
A. Blood Pressure
B. Temperature
C. Pulse oximeter reading
D. Pulse
E. Respiration

Quiz

Versed is classified as a:
A. Narcotic
B. Alkylphenol
C. Dissociative Anesthetic
D. Benzodiazepine

Quiz

Versed is classified as a:
A. Narcotic
B. Alkylphenol
C. Dissociative Anesthetic
D. Benzodiazepine

Quiz

The target organ for anesthetic drugs is:
A. Lungs
B. Heart
C. Liver
D. Brain

Quiz

The target organ for anesthetic drugs is:
A. Lungs
B. Heart
C. Liver
D. Brain

A 38 year old female presents for a consultation. Her past medical history includes Asthma, for which she takes a daily medication, Advair, as well as an emergency “rescue” inhaler, Albuterol. She reports she had an “attack” a few days ago in her doctor’s office. Her physician then put her on a nebulizer and steroids. She also has diabetes for which she takes Metformin and Insulin. She says her last A1C is about 9.4. Her ASA classification is:
A. ASA Class I
B. ASA Class II
C. ASA Class III
D. ASA Class IV
A 38 year old female presents for a consultation. Her past medical history includes Asthma, for which she takes a daily medication, Advair, as well as an emergency "rescue" inhaler, Albuterol. She reports she had an "attack" a few days ago in her doctor's office. Her physician then put her on a nebulizer and steroids. She also has diabetes for which she takes Metformin and Insulin. She says her last A1C is about 9.4. Her ASA classification is:

A. ASA Class I
B. ASA Class II
C. ASA Class III
D. ASA Class IV

ASA NPO guidelines recommend restriction of clear fluids ___ hours before the procedure and restriction of solid food ___ hours before the procedure.

A. 1 and 2
B. 2 and 6
C. 3 and 5

The function of narcotics is:

A. Anxiolysis or reduction in anxiety
B. Analgesia or relief of pain
C. Sleep

A 78 year old female is given 5 mg Versed and 50 micrograms of Fentanyl. She now needs her chin tilted upwards to keep her airway open and she does not respond to verbal stimuli. Her level of sedation is:

A. Minimal sedation or anxiolysis
B. Moderate Sedation
C. Deep sedation, possibly general anesthetic
Quiz

A 78 year old female is given 5 mg Versed and 50 micrograms of Fentanyl. She now needs her chin tilted upwards to keep her airway open and she does not respond to verbal stimuli. Her level of sedation is:

A. Minimal sedation or anxiolysis
B. Moderate Sedation
C. Deep sedation, possibly general anesthetic

Quiz

True or False? It is easy to prevent a patient from progressing from a moderate sedation to a general anesthetic.

A. True
B. False

Quiz

True or False? It is easy to prevent a patient from progressing from a moderate sedation to a general anesthetic.

A. True
B. False

Quiz

The stage of anesthesia where surgery can be performed is:

A. 1
B. 2
C. 3
D. 4

Quiz

The stage of anesthesia where surgery can be performed is:

A. 1
B. 2
C. 3
D. 4

Quiz

Children have ___ heart rates and ___ blood pressure when compared to adults.

A. higher, lower
B. higher, higher
C. lower, higher
D. lower, lower
Quiz

Children have ___ heart rates and ___ blood pressure when compared to adults.
A. higher, lower  
B. higher, higher  
C. lower, higher  
D. lower, lower

Quiz

Johnny is a 5 year old male who requires extraction of 4 carious baby teeth. His mom calls the day before his surgery stating he came down with a cold that day. You should tell her:
A. Come on in anyway.  
B. Let’s reschedule in 2 weeks.  
C. Wait until Johnny feels better. Then call us and we will schedule you 2 weeks from then.

Quiz

Passage of air into the lungs follows the course:
A. Nose/mouth, oropharynx, larynx, nasopharynx, trachea  
B. Nose/mouth, nasopharynx, oropharynx, larynx, trachea  
C. Nose/mouth, larynx, oropharynx, nasopharynx, trachea

Quiz

The following questions should be asked while the patient is in recovery in which order:
A. Is the patient awake? Do they still need airway assistance? What is their O2 saturation on room air?  
B. Do they still need airway assistance? Is the patient awake? What is their O2 saturation on room air?  
C. Do they still need airway assistance? What is their O2 saturation on room air? Is the patient awake?
Quiz

The following questions should be asked while the patient is in recovery in which order:
A. Is the patient awake? Do they still need airway assistance? What is their O2 saturation on room air?
B. Do they still need airway assistance? Is the patient awake? What is their O2 saturation on room air?
C. Do they still need airway assistance? What is their O2 saturation on room air? Is the patient awake?

Quiz

The eyelash reflex is a form of the ___ reflex.
A. Pupillary
B. Corneal
C. Palpebral
D. Withdrawal

Quiz

The eyelash reflex is a form of the ___ reflex.
A. Pupillary
B. Corneal
C. Palpebral
D. Withdrawal

Quiz

True or False? It is okay to use the patient’s family to watch the patient in recovery while we do the next procedure.
A. True
B. False

Quiz

Elderly patients require ___ medications than younger adults.
A. Less
B. More
Quiz

Elderly patients require ___ medications than younger adults.
A. Less
B. More

Quiz

The trachea is ___ to the esophagus. This means, when the patient is lying supine (on their back), the trachea will be ___ to the esophagus.
A. anterior, superior
B. anterior, posterior
C. posterior superior
D. posterior, posterior

Quiz

The trachea is ___ to the esophagus. This means, when the patient is lying supine (on their back), the trachea will be ___ to the esophagus.
A. anterior, superior
B. anterior, posterior
C. posterior superior
D. posterior, posterior

Quiz

The most ideal airway management is:
A. Oropharyngeal airway
B. Nasal airway
C. Bag-valve-mask
D. LMA
E. Endotracheal intubation

Outpatient Anesthesia Review

California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course
Office Anesthetic Emergencies Review

California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course

Emergency Scenarios

- Be Prepared!
- Know Signs & Symptoms
- Know what is happening: the pathophysiology of the emergency
- Know the treatment: drugs, dose, sequence of actions
- And...

Practice, rehearse, drill!!!

The Emergency Cart:

- Organize by condition with written treatment, not A to Z

An Ounce of Prevention is Worth a Pound of Cure
- Benjamin Franklin -
Never Treat a Stranger!

- Always take and record a thorough medical history
- Fax the patient's primary physician for concerns, using form
- "Time Out"

Emergencies to know:

- Laryngospasm
- Bronchospasm
- Airway obstruction
- Emesis/aspiration
- Respiratory Depression/Arrest
- Angina Pectoris
- Myocardial Infarction

(continued on next slide -->)

Emergencies to know: (continued)

- Hypertension
- Hypotension
- Cardiac Dysrhythmias: non arrest & arrest
- Syncope
- Seizures
- Hypoglycemia
- Mild allergic reactions
- Severe allergic reactions: anaphylaxis

Symptoms:

- Little or no air movement
- Decreased O₂ Saturation
- "Crowing" or stridor
- Labored Respiratory effort
- Suprasternal notch retraction

What is the diagnosis?

Laryngospasm

- Pathophysiology
- Protective reflex closure of vocal cords that attempts to prevent passage of foreign matter, such as blood or saliva, into the larynx, trachea & lungs

Laryngospasm

- Treatment
  - 100% oxygen
  - Pack off surgical site
  - Suction oropharynx
  - Positive pressure O₂
  - Succinylcholine (10-20 mg) IV
  - Support respiration
- Prevention
- Throat packs
- Effective suctioning
- Head position
- Careful titration
Symptoms:
- Labored breathing, difficulty with expiration
- Decreased O₂, increased CO₂
- Wheezing
- Increasing resistance to ventilation
- Cyanosis of skin & mucous membranes

What is the diagnosis?

Bronchospasm
- Pathophysiology
  - Generalized contraction of smooth muscles of the bronchioles due to asthma, an allergic reaction or chemical irritation (emesis with aspiration)

Bronchospasm
- Treatment
  - Beta 2 agonist drugs: Albuterol (inhaler)
  - Epinephrine 1:1000 (little ampule) .3mg SQ or IM
  - Consider steroid
- Prevention
  - Keep a dry field
  - Pre-operative inhaler puffs
  - Avoid histamine releasing drugs (Demerol)
  - Careful with Brevital

Albuterol Nebulizer:

Airway Obstruction
- Signs & Symptoms
  - Stridor, wheezing
  - Use of accessory breathing muscles
  - Decreased O₂ saturation
  - Cyanosis
- Pathophysiology
  - Complete or partial blockage of the airway resulting in insufficient gas exchange

Airway Obstruction
- Treatment
  - Conventional methods first
  - Intubation
  - Cricothyrotomy
  - Tracheostomy
- Prevention
  - Appropriate head position
  - Count-throat packs
  - Adequate suction
  - Good visualization
**Did he swallow it?**

**ALLWAYS GET A CHEST X-RAY!**

**Symptoms:**
- Retching
- Large amounts of fluid in throat
- Gurgling sounds
- Signs of airway obstruction
- Wheezing

**What is the diagnosis?**

**Emesis/Aspiration**
- Pathophysiology
- Vomiting when the patient has depressed or absent laryngeal reflexes which may allow stomach contents to enter the lungs
- Acidic stomach contents digest and irritate the walls of the alveoli resulting in bronchospasm

**Emesis/Aspiration**
- Treatment
  - Tonsil suction (rubber tip)
  - Trendelenburg position on the right side
  - 100% O₂
  - Visualize with laryngoscope and remove large particles with Magill forceps
  - If wheezing, treat as bronchospasm
  - Possible intubation

**Respiratory Depression**
- Pathophysiology
- Decreased normal breathing rate and/or volume
- In anesthesia, secondary to narcotics (Fentanyl) and/or benzodiazepines (Versed, Valium)

**Symptoms:**
- Decreased respiration: rate and depth (dyspnea) or absence of breathing (apnea)
- Mental clouding, drowsiness
- Low O₂ saturation
- Skin: pallor and ultimately cyanosis
- Loss of consciousness

**What is the diagnosis?**
Respiratory Depression
- Treatment
  - Supine position
  - Airway and Oxygen
  - Reposition head: head tilt/chin-lift
  - Naso/oropharyngeal airway
  - Narcan (naloxone 0.4-2 mg IV, repeat 2-3 min)
  - Flumazenil (Romazicon) 0.2 mg IV over 15 sec. initially, then .1 mg/min up to 1 mg.
- Prevention
  - Titrate sedative and narcotic medications
  - If respiratory depression occurs after a seizure or local anesthetic overdose, support airway and provide positive pressure O₂ prn

Symptoms:  
- Pressure-like chest pain
- Pain radiates to arm, shoulder, neck, mandible or teeth
- Relieved by nitroglycerin

What is the diagnosis?

Angina Pectoris
- Pathophysiology
  - Narrowing of coronary artery from plaques, depriving cardiac musculature of oxygen
  - Commonly occurs in times when heart needs more oxygen as with emotional distress or exercise

Angina Pectoris
- Treatment
  - Terminate surgery
  - Suction, pack surgical site
  - 100% O₂ by mask
  - Semi-sitting position: Loosen clothing
  - Nitroglycerin sublingually (tablet or spray) – may repeat every 5 minutes X 3, if no improvement; assume MI
  - Monitors
  - Call 911
  - MONA

Prevention
- Patient’s History
- Oral premedication or sedation
- 100% O₂ during surgery
- Profound local anesthesia
- Pre-operative nitroglycerin

Myocardial Infarction
- Signs & Symptoms
  - Chest pain not relieved by nitroglycerin
  - Sweating, pallor
  - Nausea
  - Arm, shoulder or jaw pain
  - Hypotension
  - Cardiac dysrhythmias
- Pathophysiology
  - Necrosis or death of heart muscle precipitated by decreased oxygenation from partial or complete blockage of blood flow in the coronary arteries

Myocardial Infarction
- Treatment
  - Terminate surgery
  - 100% Oxygen
  - Place patient in comfortable position, loosen clothing
  - Call 911
  - Monitor vital signs
  - Establish IV
  - MONA
- Prevention
  - Thorough medical history
  - 100% O₂ throughout procedure
  - Oral premedication or sedation
  - Profound local anesthesia

What is the diagnosis?
Hypertension
- Treatment
- Terminate procedure
- Place patient in comfortable position and loosen tight clothing
- Pain control-reinject if under anesthesia
- Beta-blocker (Labetalol) or vasodilator (Hydralazine)

Prevention
- Thorough medical history
- MD consultation and medication adjustment when necessary
- Maintain antihypertensive medications
- Profound local anesthesia
- Consider sedation

Hypotension
- Signs & Symptoms
- Pallor
- Dizziness
- Weakness
- Nausea
- Tachycardia
- BP drop > 20%

Pathophysiology
- Abnormally low arterial blood pressure (<90/60)
- Pooling of blood in extremities and abdomen

Prevention
- Titrate doses of anesthetic and sedative medications and avoid excessive doses, especially in the elderly
- Avoid stress
- Avoid rapid positional changes
- Recognize dehydration

Bradycardia
- Treatment
- Terminate procedure
- 100% O₂
- Monitor vital signs
- Atropine 0.5 mg every 3-5 minutes

Prevention
- Consider medical history
- Appropriate consultation
- Appropriate anesthetic

Pathophysiology
- Abnormally fast heart rate with EKG showing regular narrow complex tachycardia (150-250 bpm) which decreases ventricular filling time. Ultimately, cardiac output falls.

Signs & Symptoms
- Palpitations (racing feeling in heart)
- Chest pain
- Dizziness or lightheadedness
- Sweating
- Founding pulse

What is the diagnosis?
**Supraventricular Tachycardia**
- Treatment
  - Terminate procedure
  - 100% O₂
  - Monitor Vital Signs
  - Try Vagal Maneuvers
  - Adenosine 6 mg IV
- Prevention
  - Consider medical history
  - Appropriate consultation
  - Appropriate anesthetic

**Ventricular Tachycardia**
- Treatment
  - Terminate procedure
  - 100% O₂
  - Monitor Vital Signs
  - Call 911
  - If stable: consider medications: Procainamide, Amiodarone or Sotalol
  - If unstable, treat as ventricular fibrillation: defibrillate
- Prevention
  - Consider medical history
  - Appropriate consultation
  - Appropriate anesthetic

**Ventricular Fibrillation**
- Treatment
  - Call 911
  - Start chest compressions while obtaining AED (CPR)
  - Apply shock from AED to defibrillate
  - Epinephrine 1 mg
  - Continue CPR
  - ACLS
- Prevention
  - Consider medical history
  - Appropriate consultation
  - Appropriate anesthetic

**Pathophysiology**
- Results from a single ectopic focus in the ventricles; sometimes creates a re-entry circuit in the ventricles. May also be caused by problems with ventricular repolarization (possibly from scar tissue from previous MI)
- Wide complex tachycardia

**Signs & Symptoms**
- Dizziness
- Fatigue
- Chest pain
- Shortness of breath
- Pallor
- Hypotension
- Tachypnea

**Pathophysiology**
- Chaotic electrical signals/multiple ectopic foci arising from heart
- The heart is no longer beating. It is only quivering.
- No cardiac output

**Signs & Symptoms**
- Loss of consciousness
- No pulse
- Possibly earlier symptoms of chest pain, dizziness, nausea

**Pathophysiology**
- No electrical activity in the heart
- Cannot be treated with defibrillation

**Signs & Symptoms**
- Loss of consciousness
- No pulse
- Possibly earlier symptoms of chest pain, dizziness, nausea

**Pathophysiology**
- No electrical activity in the heart
- Cannot be treated with defibrillation

**What is the diagnosis?**
- Oral & Maxillofacial Surgery Assistant (OMSA) Course Weekend Seminar
- California Association of Oral & Maxillofacial Surgeons ©2019
Asystole
- Treatment
  - CPR
  - Call 911
  - Place monitors
  - ACLS
  - Establish IV
  - Epinephrine 1 mg
  - Intubate
- Prevention
  - Consider medical history
  - Appropriate consultation
  - Appropriate anesthetic

Syncope
- Signs & Symptoms
  - Disorientation, Dizziness
  - Pallor
  - Nausea
  - Sweating
  - Very slow pulse
  - Low BP
- Pathophysiology
  - Slow heart rate results in low cardiac output, causing these symptoms
  - Vasovagal
- Prevention
  - Terminate Procedure
  - Pack off surgical site
  - Trendelenburg
  - Monitor BP and pulse
  - 100% Oxygen
  - Cool cloth on head
  - Possible ammonia inhalant
  - Consider Atropine .4 mg IV

Seizures
- Signs & Symptoms
  - Change in sense of smell, sight, sound ("aura")
  - Loss of consciousness
  - Muscle spasm and flailing
  - Tonic/clonic jerking
- Pathophysiology
  - Aberrant electrical discharge in the brain which stimulates various motor nerves
- Prevention
  - Check drug levels (Dilantin)
  - Valium premedication
  - Avoid hypoxia
  - Monitor dose of local anesthetic
This diabetic patient is NPO and took his dose of insulin.

If not treated, symptoms of tachycardia, loss of consciousness & seizures.

What is the diagnosis?

Hypoglycemia

- Pathophysiology
- Possible etiology: patient takes a normal insulin dose but has no oral intake, such as fasting prior to surgery
- When glucose drops below the critical level for brain function, the patient loses consciousness

What is the diagnosis?

Hypoglycemia

- Treatment
  - Conscious patient
    - High sugar beverages/food
  - Unconscious patient
    - 50% dextrose solution IV
    - Glucagon IM
- Prevention
  - Careful patient history
  - Watch time of day for surgery
  - Check patient’s blood sugar
  - Intravenous dextrose infusion

This patient was administered penicillin 1 hour ago.

What is the diagnosis?

Anaphylaxis (severe allergic reaction)

- Signs & Symptoms
  - Skin rash, flushing, hives, itching
  - Shortness of breath, wheezing
  - Hypotension
  - Nausea
  - Coughing
  - Labial swelling
- Pathophysiology
  - Systemic release of chemical mediators of allergic response: particularly histamine

Anaphylaxis (severe allergic reaction)

- Treatment
  - Stop administration of all drugs
  - Epinephrine
    - 1:1000 dilution .3-5 cc SQ or IM
  - Benadryl: 25-50 mg IV or IM
  - Corticosteroids
  - Early intubation
  - 911
- Prevention
  - Thorough medical history with details of previous reaction
Mild Allergic Reaction

- Signs and Symptoms
  - Rash, itching
  - Mild swelling of eyes or mouth

- Pathophysiology
  - Systemic release of chemical mediators of allergic response: particularly histamine

Treatment

- Benadryl 25-50 mg. P.O or I.M
- Corticosteroids

Prevention

- Accurate history
- Careful administration of medications

Quiz

Treatment for respiratory depression is:
A. Romazicon .2 mg IV
B. Narcan .4 mg IV
C. Zofran 4 mg IV
D. Epinephrine .3 cc of 1:1000 SQ

Quiz

The most common cause of airway obstruction is:
A. Throat pack going too far back in throat
B. Displaced tooth down in the trachea
C. Base of tongue falling back and occluding the airway
D. Implant screwdriver in the back of the throat
Quiz

Laryngospasm is:
A. Spasm of the bronchiolar walls
B. Foreign body obstruction of the airway
C. Another name for an asthma attack
D. Protective reflex closure of the vocal cords to prevent foreign material from entering into lungs

Quiz

Treatment of bronchospasm is:
A. Suction airway, positive pressure ventilation
B. Succinylcholine 10 mg IV
C. Laryngoscopy and removal of the foreign body with Magill forceps
D. Beta 2 agonists such as Albuterol and Epinephrine

Quiz

Bronchospasm can be diagnosed by:
A. Auscultation of rales in lungs
B. Stridor
C. Expiratory wheeze and difficulty in positive pressure ventilation
D. Arterial blood gas testing
Quiz

The danger of administering Narcan for treatment of respiratory depression is:
A. Possible seizures
B. Increased blood pressure and heart rate
C. Increased risk of laryngospasm
D. The Narcan may wear off before the respiratory depressive effect of the narcotics wear off

Quiz

Bronchospasm occurs when:
A. Constriction of smooth muscle walls of the bronchioles
B. Destruction of the alveoli
C. Plugging of small airways by mucous

Quiz

The side effect of succinylcholine to be careful of is:
A. Increased blood pressure and heart rate
B. Causes bronchospasm
C. Wears off too soon
D. Is a muscle relaxant and can cause patient to stop breathing
Quiz

Your sedated patient vomits mid-procedure. What do you do?
A. Stop the procedure, pack off the site, positive pressure ventilation
B. Intubate the patient
C. Roll the patient to the right side and suction airway
D. Roll the patient to the left side and suction airway

Quiz

ASA Guidelines for NPO prior to surgery are:
A. No solids for 8 hours prior to procedure and no clear liquids 2 hrs before surgery
B. No solids for 6 hours prior to procedure and clear liquids up to 2 hours before procedure
C. No solids for 12 hours prior to procedure, clear liquids up until procedure
D. No solids for 6 hours prior to procedure and liquids up to 2 hours prior to procedure

Quiz

Preliminary treatment of a patient with hypotension under anesthesia includes:
A. Fluid challenge
B. Vasodilator
C. Aspirin
D. Narcan
Quiz

The medication used to treat overdose of benzodiazepines is:
A. Epinephrine  
B. Ephedrine  
C. Narcan  
D. Romazicon

Quiz

Treatment for angina is:
A. Aspirin  
B. A Beta blocker  
C. Ephedrine  
D. Nitroglycerin

Quiz

The difference between angina and a myocardial infarction is:
A. Angina is worse  
B. Angina is caused by lack of oxygen in the coronary arteries while an MI implies necrosis or death of the heart muscle  
C. The MI can result in radiation of pain to the jaw while angina will not  
D. You have to administer aspirin to an MI patient, but you don't have to give a patient with angina an aspirin
Quiz

If a patient doesn’t take his antihypertensive medication prior to surgery, it can result in:
A. Angina
B. Heart attack
C. Stroke
D. Rebound hypertension

Quiz

If a patient doesn’t take his antihypertensive medication prior to surgery, it can result in:
A. Angina
B. Heart attack
C. Stroke
D. Rebound hypertension

Quiz

If your patient is determined to be in respiratory depression with a respiratory rate of 7, you would:
A. Put a nasal hood with O2 on her and call 911
B. Head tilt to open the airway and put a nasal hood on her
C. Head tilt to open the airway and apply a full face mask with positive pressure O2

Quiz

If your patient is determined to be in respiratory depression with a respiratory rate of 7, you would:
A. Put a nasal hood with O2 on her and call 911
B. Head tilt to open the airway and put a nasal hood on her
C. Head tilt to open the airway and apply a full face mask with positive pressure O2

Quiz

The drug for treatment of an overdose of narcotic medications is called:
A. Epinephrine
B. Ephedrine
C. Narcan
D. Romazicon

Quiz

The drug for treatment of an overdose of narcotic medications is called:
A. Epinephrine
B. Ephedrine
C. Narcan
D. Romazicon
Quiz
Treatment for hypertensive crisis includes:
A. Fluid challenge
B. Aspirin
C. Beta blocker
D. Narcan

Quiz
MONA stands for:
A. Morphine, oxygen, nitroglycerin, aspirin
B. Morphine, oxygen, nitroglycerin, antacid
C. Magnesium, oxygen, Narcan, aspirin

Quiz
Symptoms of angina include:
A. Crushing, squeezing chest pain
B. Diarrhea
C. Cough
D. Expiratory wheezing
**Quiz**

A patient is in asystole (flatline). Your next move is to:

A. Defibrillate  
B. Intubate  
C. Synchronized cardioversion  
D. Start CPR and give Epinephrine 1 mg

**Quiz**

Your patient is extremely nervous and apprehensive. The EKG shows sinus tachycardia at 135 bpm (beats per minute). Your next step is to:

A. Start CPR and give 1 mg Epinephrine  
B. Perform a vagal maneuver  
C. Go ahead and sedate the patient because sinus tachycardia is normally seen in an anxious patient  
D. Defibrillate

**Quiz**

True or False: It is possible to see a normal sinus rhythm on an EKG but the patient does not have a pulse.  
A. False  
B. True

**Quiz**

True or False: It is possible to see a normal sinus rhythm on an EKG but the patient does not have a pulse.  
A. False  
B. True
Quiz

The drug of choice for treatment of a supraventricular tachycardia is:

A. Adenosine
B. Epinephrine
C. Atropine
D. Succinylcholine

Quiz

The most effective treatment for a patient in ventricular fibrillation is:

A. Synchronized cardioversion
B. Defibrillation
C. Glucose
D. CPR and oxygen

Quiz

Example of a vagal maneuver is:

A. Have the patient stick out his tongue
B. Have the patient bear down as if having a bowel movement
C. Have the patient press his foot as if he is stepping on a gas pedal
D. Have the patient turn his head to the right and then the left
The drug of choice to speed up the heart in a symptomatic bradycardia is:
A. Aminophylline  
B. Adenosine  
C. Atropine  
D. Amiodarone

The cardiac rhythms in which the patient does not have a pulse include asystole, pulseless ventricular tachycardia, pulseless electrical activity and:
A. Supraventricular tachycardia  
B. Third degree heart block  
C. Sinus bradycardia  
D. Ventricular fibrillation

Which one is more ominous (dangerous):
A. Unifocal PVC's (premature ventricular contractions)  
B. Multifocal PVC's
Patients with a dysrhythmia who are symptomatic will complain of chest pain, shortness of breath and:

A. Fever and sweating  
B. Dizziness and ringing in ears  
C. Dizziness and hypotension  
D. Stomach pain and diarrhea

For moderate allergic reactions, in addition to Benadryl, this drug is often added:

A. Decadron  
B. Tylenol  
C. Calamine lotion  
D. Epinephrine

The most common presentation of an allergic reaction is:

A. Wheezing  
B. Itchy red rash  
C. Swollen lips
Quiz

If a diabetic patient takes their medications as usual the morning of surgery (planned sedation, patient is NPO), we would worry about:

A. Hypoglycemia
B. Hyperglycemia

Quiz

A patient’s mother states the patient is allergic to Vicodin. She says he becomes nauseated to it. Is this a true allergy?

A. Yes
B. No

Quiz

The first medication to consider in a life-threatening anaphylaxis condition is:

A. Defibrillation
B. Epinephrine
C. Antihistamines
D. Cortisone
Quiz
Treatment for syncope is:
A. Defibrillation
B. 50% Dextrose IV
C. Epinephrine 1 mg IV
D. O₂, Trendelenburg position

Quiz
Treatment for syncope is:
A. Defibrillation
B. 50% Dextrose IV
C. Epinephrine 1 mg IV
D. O₂, Trendelenburg position

Quiz
True or False: If a patient with a known seizure disorder (epilepsy) is non-compliant (doesn't take) his medications, it can precipitate a seizure.
A. True
B. False

Quiz
True or False: If a patient with a known seizure disorder (epilepsy) is non-compliant (doesn't take) his medications, it can precipitate a seizure.
A. True
B. False

Quiz
The cause of syncope is:
A. Low blood sugar
B. Slowed heart rate and blood pressure
C. Cardiac arrhythmia
D. High blood pressure

Quiz
The cause of syncope is:
A. Low blood sugar
B. Slowed heart rate and blood pressure
C. Cardiac arrhythmia
D. High blood pressure
Quiz

A severe allergic reaction is called:

A. Insulin shock
B. Cardiac arrest
C. Diabetic ketoacidosis
D. Anaphylaxis

Quiz

A severe allergic reaction is called:

A. Insulin shock
B. Cardiac arrest
C. Diabetic ketoacidosis
D. Anaphylaxis

Quiz

Treatment of a mild allergic reaction usually is prescribing:

A. Cortisone
B. Epinephrine
C. Benadryl
D. Aspirin

Quiz

Treatment of a mild allergic reaction usually is prescribing:

A. Cortisone
B. Epinephrine
C. Benadryl
D. Aspirin

This Concludes
Office Anesthetic Emergencies Review
California Association of Oral & Maxillofacial Surgeons
Oral & Maxillofacial Surgery Assistant’s Course