LESSON PLAN

Course: Pharmacology

Topic: Local and General Anesthetics

Audience: Adult learners (First-Year Dental Hygiene Students)(16 students in-person)(16 students virtually connected from distance site)

Time: 1 hour 30 minutes

Materials: Computer, Projector, PowerPoint (reverted from Keynote format), Presenter Evaluation Forms, Quiz Sheets

Instructional Objectives:

Upon completion of this lesson, the student should be able to:

1. Explain the mechanism of action, pharmacokinetics, pharmacologic effects, and adverse reactions of local anesthetics.
2. Discuss the use of nitrous oxide in dentistry, including how it works, the pharmacologic effects, adverse reactions, and contraindications.
3. Compare and contrast the routes of administration and the means of absorption and elimination of dental anesthetics.
4. Create a treatment plan for pain control based on patient needs and medical history.
5. Indicate a commitment to providing safe and effective pain control for dental hygiene patients.

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TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
3 minutes	**I. ANTICIPATORY SET** A. <u>Introduction</u> Hello everyone. Thank you for this opportunity to be with you today. My name is Jessica Gutierrez-Arnold. I am a dental hygienist practicing in hospital dentistry here in Roanoke. I am working currently on my Master of Science through ODU, with a focus on public health. I am currently a fill-in clinical instructor at Virginia Western and have previously taught the Head and Neck Anatomy course and helped with the Pain Management Lab. I also hold a certificate in Oral Systemic Education. I am here to go through your lesson this week on local and general anesthetics with you. In this lesson, we will be discussing local and general anesthetics, how they work, when to use them and when not to use them, and potential side effects of their use. We will be preparing for future provision of these agents to patients in clinic! B. <u>Gain Attention/Motivate</u> I have been blessed with many opportunities to serve patients of varied circumstances. One opportunity in particular brought me face-to-face with patients who did not know they had the choice of reducing pain during dental hygiene services. They had not received this offer in the past and we worked toward getting them comfortable. This led to them returning for future services and completing their treatment plans, ultimately leading to an improvement in their overall health and confidence! They were no longer afraid to take care of their teeth! This all occurred because I had been taught that dental anesthesia is our friend, and I want to share this sentiment and knowledge with you all! C. <u>Activate Prior Knowledge</u> Last week in class, you all discussed non-opioids, opioid analgesics, and antagonists. You discussed patients in pain and medications to control that pain. This week, we take that and go into depth of pain control in the dentist office including anesthetic agents within the direct realm of the practice of the dental hygienist. Has anyone here been on “laughing gas" before? Would you care to share about how it made you feel? Did it make your experience at the dentist office better? D. <u>Establish Rationale</u> In practice, you will have patients that require local anesthesia, as well as nitrous oxide/oxygen analgesia.	Slide #1: Local and General Anesthetics Note: These are 1st year, 2nd semester DH students Q: Have any of you worked as a dental assistant before? If so, what was used for pain pain control? A: Answers may vary, but should include local anesthetics and maybe general anesthetics Q: What hygiene services are likely to require anesthesia for patient comfort control? A: Scaling and probing Slide #2: Connecting the Dots Slide #3: The RDH and Anesthetics

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
2 minutes	Depending on where you work, you might even work with patients undergoing general anesthesia in the operating room or IV sedation, oral sedation, etc. Either way, you will want to be able to confidently provide pain relief to your patients. That confidence comes with knowing how to provide it safely and effectively, minimizing risks of side effects and reactions. This summer, you will be taking the Pain Management course and will be physically performing local injections and nitrous oxide use. E. <u>Present Instructional Objectives</u> Upon completion of this lesson, the student should be able to: 1. Explain the mechanism of action, pharmacokinetics, pharmacologic effects, and adverse reactions of local anesthetics. 2. Discuss the use of nitrous oxide in dentistry, including how it works, the pharmacologic effects, adverse reactions, and contraindications. 3. Compare and contrast the routes of administration and the means of absorption and elimination of dental anesthetics. 4. Create a treatment plan for pain control based on patient needs and medical history. 5. Indicate a commitment to providing safe and effective pain control for dental hygiene patients.	Q: What is the difference between local and general anesthesia? A: Local effects by injection versus generalized CNS effects. Slide #4: Lesson Objectives Note: Don't forget to create a sense of excitement!

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	I. Local Anesthesia	Slide #5: Local Anesthesia “Local pain relief without CNS depression"
2 minutes	A. History: 1. Cocaine a. Incas 1532 b. Niemann isolates 1860 (see pic) c. In eye anesthesia 1884 d. Dental nerve block 1885 2. Procaine a. 1905 b. Local anesthetic prototype 3. Lidocaine a. U.S. 1948 b. Gold standard for safe effects when compared to others 4. Mepivacaine a. 1960 5. Epinephrine a. 1901 in cocaine, decreased absorption and prolonged effects, lowered dosage	Slide #6: A History Note: The issue with cocaine was that it was both addictive and toxic. Note: We are still searching for the ideal anesthetic, as all have potential effects.
3 minutes	B. Chemistry: 1. Weak bases a. Free Base b. Salt c. Intermediate linkage d. Acidic i. Hydrochloric acid ii. Preservatives iii. Vasoconstrictors	Slide #7: Chemistry Note: Refer to image Q: Why don’t local anesthetics work well in the presence of infection? A: They work at pH 7.4. Infection makes the area too acidic.

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
2 minutes	C. Mechanism of Action: 1. Sodium channel blocking 2. Permeability and binding 3. Decreased rate of depolarization	Slide #8: Mechanism of Action Note: Remember, Delivered near nerve=interface with conduction of sensory and motor signals to CNS. Slide #9 Youtube Video: Local Anesthesia Animation
3 minutes	D. Pharmacokinetics 1. Absorption 2. Distribution 3. Metabolism a. Amides by liver mostly b. Esters hydrolyzed by plasma pseudocholinesterase and liver esterase c. Kidneys excrete metabolites and drug remnants of esters and amides	Slide #10: Pharmacokinetics Note: Explain absorption, distribution and metabolism graphic Slide #11: Pharmacokinetics Slide #12: Pharmacokinetics
4 minutes	E. Pharmacological Effects 1. Toxicity 2. Peripheral Nerve Conduction 3. Antiarrythmic and hypotension	Slide #13: Pharmacological Effects Note: Avoid overdose/rapid absorption (hence vasoconstrictors), intravascular injection. Q: You will be able to scale up to 1/2 mouth using local. Why? A: Limits on dosing and risk of patient self-injury

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	F. Medical Considerations 1. Hepatic 2. Cardiovascular a. HTN b. Cardiac dysrythmias c. History of MI or CVA 3. Renal 4. Pregnancy 5. Hyperthyroidism 6. History of Reaction a. Esters b. Sulfites c. Methemoglobinemia i. Prilocaine 7. Overdosing signs and symptoms a. Talkative b. Sweaty c. Seizures/convulsions d. Respiratory Depression e. Coma f. Unconsciousness g. Irritability h. Muscle twitch i. Death	Slide #14: Medical Considerations Note: Esters are much more likely to cause reaction. Note: In U.S., no board cases for RDH reported. Q: Thinking about the physician's clearance: Why does it include a place for yes epi./no epi.? Yes local/no local? A: Certain medical conditions render local anesthesia or certain types contraindicated, due to risk of adverse reaction.
2 minutes	G. Drug Interactions 1. Tricyclic Antidepressants a. Epi. Exaggerated pressor response 2. Monoamine Oxidase Inhibitors 3. Non-Selective Beta Blockers a. Epi. HTN and reflex bradycardia 4. Alpha Adrenergic Blockers 5. Calcium Channel Blockers 6. Cocaine	Slide #15: Drug Interactions Note: Make Medscape Online recommendation for student reference Q: Should you have a drug card in clinic for anesthetics? A: Yes, due to risk of adverse reactions and contraindications.
4 minutes	H. Adverse Reactions 1. Paresthesia 2. Hematoma	Slide #16: Adverse Reactions

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	3. Trismus 4. Syncope 5. Facial Nerve Paralysis 6. Edema 7. Pain 8. Toxicity	Q: Why might a patient receiving an injection be at risk of syncope? A: Anxiety/fear of needles Note: This does not include reactions due to the injection itself.
5 minutes	I. Composition 1. Vasoconstrictor 2. Antioxidant 3. Sodium hydroxide 4. Sodium chloride	Slide #17: Composition
	J. Agents	Slide #18: Agents Note: Provide study hint: If the generic name has 2 “I” letters, it’s an amide. If it only has 1 “I” in the name, it’s an ester.
	1. Amides (most dental anesthetics) a. More stable in solution b. Less chance of allergic reaction	Slide #19 Note: Discuss image of anesthetic color bands Slide #20: Amides Q: Prilocaine is contraindicated for patient with a history of methemoglobinemia or with reduced oxygen-carrying capacity. Why does this matter to you prior to graduation? A: Oraqix contains Prilocaine. It is also contraindicated for minors, due to higher risk.
	2. Esters (topical)	

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	3. Others	Slide #22: Others
7 minutes	K. Vasoconstrictors 1. Adrenergic Agonists/Sympathomimetics 2. Increased duration 3. Hemostasis 4. Reduced toxicity 5. Epi.	Q: Why does the duration increase? A: The blood vessels constrict, allowing less blood flow to pull the anesthetic out of the area and into the other organs. Q: Why is reduced bleeding a good thing? A: Reduced risk of excessive bleeding, improved visualization, less anesthetic reaching other parts of the body. Slide#24: Choices, choices… Slide #25 Note: Discuss safety considerations chart Slide #26 Note: Discuss duration and onset chart
	L. Topical 1. 20% Benzocaine 2. 5% Lidocaine 3. Oraqix 4. Dyclopro 5. Cetacaine 6. Gingicaine	Slide #27: Topical
	M. Injections 1. Nerve Blocks 2. Local Infiltration	Slide #28: Injections Q: Why do we aspirate? A: Avoid injecting into the blood vessels to reduce risk of toxic effects to organs

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
2 minutes	N. Dosage 1. Maximum recommended dose 2. Cardiac dose O. Contraindications 1. Allergic reaction a. LA allergy b. Bisulfite allergy 2. Atypical plasma cholinesterase 3. Methemoglobinemia 4. Liver dysfunction 5. Renal dysfunction 6. CVD 7. Hyperthyroidism	Slide #29: Dosage Note: Refer students to Table 10.3 Slide#30: Contraindications Note: Refer students to Table 10.8 Q: Who can explain why liver dysfunction creates a contraindication? A: Inability for liver to allow proper metabolism of the anesthetic agent.
6 minutes	**II. General Anesthetics** A. History 1. Pre-medicinal 2. Opium, belladonna, hemp 3. N2O/O2 a. Discovered 1776 b. Surgical use 1796 4. Ether 1846 (general) B. Mechanism of Action 1. CNS Depressants a. Increased threshold for firing 2. GABA, nicotinic receptor-activated cation channels a. Facilitate inhibitory gamma-aminobutyric acid b. Decreased duration of opening of nicotinic receptor activated cation channels 3. Stages a. 1: Analgesia i. Conscious ii. Responsive iii. Reduced pain iv. Regular breathing v. Some amnesia vi. Ends with loss of consciousness b. Delirium/Excitement i. Involuntary movement ii. Irregular breathing iii. Increased muscle tone iv. Sympathetic stimulation produces tachycardia v. Mydriasis	Slide #31: General Anesthetics Slide #32: A History Slide #33: Mechanism of Action

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	vi. Hypertension vii. Vomiting and incontinence c. Surgical anesthesia i. Planes I and II ii. Regular respiration iii. Muscle relaxation iv. Normal heart and pulse rates v. Plane III-IV vi. Intercostal muscle paralysis vii. Respiratory to medullary paralysis viii. Cessation of respiration ix. Circulatory failure x. Pupil dilation xi. BP drops rapidly xii. Reverse, or death xiii. Artificial respiration	
	C. Adverse Reactions 1. Cardiovascular collapse 2. Arrythmias 3. Hypo/Hypertension 4. Respiratory distress 5. Teratogenicity 6. Hepatogenicity 7. Headache, fatigue, irritability 8. Malignant hyperthermia	Slide #34: Adverse Reactions Note: Refer students to Table 11.2 Note: Discuss malignant hyperthermia
5 minutes	D. Agents 1. Gases a. Easily controlled b. N2O i. Weak ii. Low potency iii. Insufficient as general anesthetic iv. Colorless gas v. Pulmonary alveoli>circulatory system vi. Low solubility vii. Analgesic viii. Conscious sedation phase I ix. Quick onset x. Protective reflexes intact xi. Helps anxiety, not defiance xii. 3-5 minute onset xiii. 5 minute recovery with O2 xiv. Contraindications xv. Respiratory obstruction/COPD xvi. Emotional instability	Slide #35: Agents Note: Describe method of “laughing gas” Q: Why do we give O2 for 5 minutes? A: To remove nitrous oxide from the body and prevent diffusion hypoxia.

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
1 minute	xviii. Pregnancy xix. History of abuse 2. Volatile liquids a. Halogenated carbons (evaporate easily) b. Replaced ether 3. IV agents a. Conscious sedation dentistry b. Ex: Etomidate, Propofol (favorable), Valium, Versed	Note: Mention this included pregnancy of the operator, too. "Monitor the patient!" Q: Patients coming in for IV sedation are told not to pre-medicate at home (ex: Valium). Why is that? A: Risk of adverse reaction. Provider is unable to adequate measure amount of anesthesia, thus it is difficult to control.
4 minutes	E. Finding Balance 1. Tension of anesthetic in inspired gases 2. Rate and volume of delivery to lungs 3. Anesthetic solubility in body tissues a. Blood/gas partition coefficient i. Definition: Defines the solubility of a gas in blood and the rate of induction and recovery. It compares the amount of drug in 1mL of blood to the amount of drug in 1mL of alveolar gas. ii. "In the case of a poorly soluble gas, where there is a low blood/gas partition coefficient, the drug travels into the alveoli, enters the blood where it is poorly soluble, thus increasing the partial pressure of the drug (because it doesn't dissolve in the blood), and this forces it out of the blood and into the brain more easily. Poor solubility results in increased pressure, which speeds brain saturation and decreases the onset time of the gas." iii. "In the case of a highly soluble drug, where there is a high blood/gas partition coefficient, the drug passes into the alveoli, and then dissolves into the blood (high solubility), so it	Slide #36: Signs and Symptoms of the Response to Nitrous Oxide and Oxygen Conscious Sedation Slide #37: Finding Balance

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
1 minute	takes longer for the partial pressure to build, which forces the drug to move into the brain more slowly. High solubility results in decreased pressure, which slows brain saturation and delays onset time of the gas." a. Less soluble=more rapid onset and recovery b. N2O is least soluble inhalation anesthetic 4. Pain control, muscle relaxation, relaxation	Q: Is it a good thing that nitrous oxide has low solubility? A: Yes: This option allows us to get started quickly and end quickly. The agent flushes out of the patient's body, making it safe for them to leave the office after the 5 minutes of O2. Note: Ask if there are any questions

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
2 minutes	**SUMMARY:**	
	III. Anesthetics: A Review A. Review 1. Local and general 2. Injection and topical 3. Medical considerations 4. No perfect agent 5. Nerve blocking action/CNS effects 6. Esters and amides 7. Vasocontrictors 8. Onset, duration, safety B. Objectives 1. Local Anesthetics a. Mechanism of action b. Pharmacokinetics c. Pharmacological effects d. Adverse reactions e. Routes of administration f. Means of absorption and elimination 2. Nitrous oxide a. How it works b. Pharmacological effects c. Adverse reactions d. Contraindications 3. Safety and efficacy a. Patient needs b. Medical history	Slide #38: Anesthetics: Review Q: Which type of anesthesia utilizes nerve blocking? A: Local anesthesia Slide #39: Objectives: In review….
5 minutes	C. Challenge 1. Happy patient 2. Safe patient 3. Happy hygienist 4. Improved calculus removal D. Questions? 1. Next week: Spring Break 2. Then, anti-infective, anti-fungal and antiviral agents 3. Then, Unit 3 exam	Slide #40: The Challenge Slide #41: Questions?
2 minutes	I hope you all feel some excitement about this lesson and that you now know more so how anesthetics work and what to expect when using them. I know students typically have a sense of fear when first using anesthetics. With this lesson, and what all you will learn in your Pain Management course this summer, I believe you will quickly feel competent and confident in giving your patients pain and anxiety relief. It really does make a big difference, and helps patients return for needed dental services!	Note: Don't forget to show excitement! Motivate them!

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	CRITICAL THINKING ACTIVITY:	Slide #42: Case Studies
8 minutes	**Case:** Sally H., a 35-year-old administrative assistant, comes into the Happy Smiles Dental Clinic with severe pain and swelling on the left side of her lower jaw. She is extremely dental phobic, and on examination and the taking of a radiograph, she apparently has an abscess on tooth #19, which is decayed to the gum line and is nonrestorable. She asks that you "just pull it and get it over with." Her health history indicates that she is in her second trimester of pregnancy, has seasonal and food allergies, and has asthma, which is controlled with albuterol. Her blood pressure is 140/96 mm Hg, her pulse rate is 110 bpm, and she seems very anxious and worried about the injection. The dentist asks the dental hygienist to perform an inferior alveolar block of the area to prepare Sally for the extraction. The dental hygienist prepares a syringe of local anesthetic with 1:100,000 epinephrine. Within seconds after starting the injection, Sally sits up in the chair exclaiming, "My heart is pounding!" Her pulse rate is now 140 bpm, and the injection is stopped, with the dental hygienist reassuring Sally that she is having a normal reaction to the local anesthetic. After a few minutes, her pulse rate drops to 100 bpm, and she says she is ready to proceed. Two cartridges of local anesthetic are administered, and Sally is asked whether her lip feels numb. She replies that it does not, and an additional cartridge is given. When the dentist starts to manipulate the tissue around the tooth, Sally jumps and says that she feels everything. In spite of the additional injection of seven more cartridges, she never becomes numb. The dental assistant staying with Sally notices that she is trembling, and before the assistant can call in the dentist, Sally starts to have seizures. The dental team keeps her from falling from the dental chair during the seizure, but as soon as the seizure is over, she slumps into unconsciousness. An ambulance is called, and Sally is transported to the hospital. 1. What questions might you have asked Sally? Answer: Are you allergic to sulfate preservatives? Have you ever had an allergic reaction to local anesthetics? Remember that local anesthetics with a vasoconstrictor such as epinephrine must use a sulfite antioxidant preservative. Sulfites trigger allergic and asthmatic reactions in many people, and a positive answer to this question would indicate use of a vasoconstrictor-free local anesthetic. 2. Which local anesthetic agents would be safest for Sally and her unborn baby? Answer: Lidocaine 2% with 1:100,000 epinephrine Lidocaine 2% with 1:100,000 epi. In the lowest effective dose is in the FDA pregnancy category B, whereas Articaine,	Slide #43: Case Study #1

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	Mepivacaine, and Bupivacaine are FDA category C drugs and present a higher risk to a developing fetus. 3. What factor could account for Sally's reaction of a racing heart and increased heart rate at the beginning of the injection? Answer: Toxic reaction. The inadvertent injection into a blood vessel with a local anesthetic containing epinephrine can cause transient sympathomimetic effects such as increased heart rate and blood pressure. She does exhibit symptoms of anxiety and fear, which could contribute to the effect 4. Why doesn't the local anesthetic produce the desired effect for Sally, despite the additional cartridges administered? Answer: Due to infection, the abscess. Infected tissue provides an acidic environment. Local anesthetic needs to be in a weak base form to block nerve conduction. Infected tissue is acidic, reducing the amount of freebase available. The freebase form allows adequate tissue penetration. 5. What is the probable cause of Sally's seizure and unconsciousness? Answer: Toxic reaction to the local anesthetic. Although toxicity to local anesthetics is rare in the doses used in general dentistry, Sally is suffering from a classic toxic reaction. Local anesthetic toxicity causes stimulation of the CNS, including restlessness, tremor, and seizures followed by CNS depression and coma. The maximum recommended dose is 8.3 cartridges, and she received 9 in total. Inflammation in the area and inadvertent injection into the blood vessel further exacerbated the situation. 6. What would have been the maximum safe dose (# of cartridges) of Lidocaine 2% with 1:100,000 epi. For this patient? Answer: 8 The maximum safe dose of Lidocaine 2% with 1:100,000 epi. Is 8.3 cartridges. Many experts believe that pregnant women should never receive more than the cardiac dose of 2.2 cartridges for absolute safety. 7. What total dosage of lidocaine and epinephrine did Sally receive in the 9 cartridges ? Answer: Lidocaine 324mg, Epinephrine 0.162mg One cartridge of Lidocaine 2% with 1:100,000 epi. Contains 36mg of Lidocaine and 0.018mg of Epinephrine. Multiply that amount times 9 to obtain the total dosage.	

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
7 minutes	**Case:** Barbara has just been hired as a dental hygienist in a busy general dentistry practice that sees many children. She is practicing in a state that allows dental hygienists to administer nitrous oxide, and she has been certified to do so. She notices that all children are routinely given nitrous oxide, and the majority of adult patients are also given nitrous oxide, even when there are no clear indications that it is needed. She also observes that many children have adverse reactions such as nausea, vomiting, or headaches after administration. The office manager tells her that everyone should be started on 50% nitrous oxide and that the office "doesn't have the time" to administer pure oxygen after the procedure. 1. Which are the most likely causes of nausea and vomiting after administration of nitrous oxide-oxygen sedation? Answer: Failure to gradually increase the level of nitrous oxide, dosage of nitrous oxide is too high, eating a large meal before appointment. Nitrous oxide-oxygen sedation should begin by gradually increasing the concentration of nitrous oxide to titrate the patient to the desired level. By starting all patients at 50% concentration, too high of a dosage is reached for many people. The percentage of nitrous oxide for patient comfort is variable and ranges from 10% to 50%, with the average being 35%. Patients should be advised to eat a light meal prior to the appointment and to avoid eating a large meal within 3 hours of the appointment. 2. How could headaches following the administration of nitrous oxide-oxygen sedation be prevented? Answer: At the termination of N2O-O2, place the patient on 100% oxygen for 5 minutes, to prevent the phenomenon known as diffusion hypoxia. The rapid outflow of nitrous oxide accompanied by oxygen and carbon dioxide can cause severe headache and other adverse effects. **Case:** You, the dental hygiene student, are bringing in a 12 year-old patient with severe cold sensitivity to all teeth. You have previously identified this patient as have class I calculus. You need to perform four quads of scaling today. You request 4 carpules of 2% Lidocaine with 1:100,000 epi. for your patient from the clinical faculty, so that you may use it on the quadrants today as you scale. You are berated and have been asked to come to the clinical faculty office after the clinic session is over to discuss this matter. In response, you request Oraqix instead, so as to complete the patient's scaling today. The clinical instructor grabs an improvement needs form and begins filling it out with your name on it. You go back to your clinical cubicle flabbergasted and frustrated.	

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	1. How can you control cold sensitivity in a patient? Answer: Local anesthesia, and potentially general anesthesia. Topical anesthesia does not anesthetize hard tissues (in this case, the teeth). 2. How many quadrants of scaling can be done using local anesthetics? Answer: Up to 2 (same side of mouth). Anesthetizing the patient bilaterally increases the risk of patient self-mutilization, as they lose feeling to the lips, tongue, cheeks, etc. Can also affect gag and swallowing reflex. 3. Why did the faculty member not give the 4 carpules to the student? Answer: You must have permission by the program dentist to have a patient anesthetized. The dentist must be present to monitor the injections. You should not be performing 4 quads of anesthesia at a single given appointment. 4. How does Oraqix differ from local injectable anesthetics? Answer: Oraqix is a topical anesthetic that is placed sub-gingivally. It will provide soft tissue anesthesia, but not anesthesia to the hard tissues (ex: teeth). 5. Why did the faculty member not provide the Oraqix? Answer: The patient is a minor. Oraqix is contraindicated in minors, due to the heightened risk of methemoglobinemia. Oraqix use in clinic requires a written prescription from the program dentist, which must be shown to faculty prior to obtaining Oraqix. 6. How could this interaction have gone better? Answer: The student should have prepared ahead of time for pain control, or reappointed the patient to be able to more adequately provide pain control. Anxiety control methods for the patient might also be utilized to help them through the appointment. The student needs to study local anesthetics more, to be able to better decide what is best for the patient. Yes, faculty should be better in this case about leading the student to discover what went wrong and give him/her a chance to fix the problem.	
7 minutes	**Case:** Maria is a 150-lb., 57y.o. female with a BP of 118/80mm Hg. You plan to perform SRP on the mandibular right quad, but need to provide local anesthesia. Maria is difficult to anesthetize and states that she usually requires “a lot of Novocaine.” Maria has Type II DM and has not responded well to vigorous therapy. Her blood sugar was 135mg/dl before her appointment. She is medicated with a nonselective beta-blocker for hypertension, which is working well for her. 1. What type of anesthetic agent should not be used on Maria?	

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	Answer: Epi. Epinephrine is contraindicated for Maria, due to her uncontrolled blood sugar and her nonselective beta-blocker medication. Epi can raise blood sugar and BP and cause reflexive bradycardia. You should chose a plain solution anesthetic. 2. Are there other treatment factors you should consider before beginning any treatment on this patient? Answer: Physicians clearance, A1C, food intake today. Patient education (oral systemic link). Discuss case with program dentist to choose best anesthetic and treatment concerns.	
3 minutes	**Case:** Jacob is a 45y.o. construction worker with a family hx of HTN and cancer. He has had arthroscopic knee surgery after a sports-related injury. Although he has no medication allergies, he is allergic to dust and has seasonal allergies to pollen. He takes prescription antihistamines and decongestants as needed. He carries an inhaler with a bronchodilating drug during “peak season” because he occasionally wheezes with exertion. He has had inconsistent dental care as an adult. He recalls childhood dental visits resulting in at least one restoration per visit. He doesn’t like coming to the dentist and wishes to avoid x-ray procedures because of his intense gag reflex. Jacob has agreed to try intro oxide/oxygen sedation today. The RDH has titrated the N2O to an appropriate level, and Jacob is relaxed and comfortable. 1. Is Jacob an ideal N2O candidate? Answer: Yes, it can help him with his gag reflex and anxiety about the dentist. The N2O will not react with his medications, doesn’t cause allergy symptoms. 2. What questions should the RDH ask Jacob? Answer: Does he have asthma? Does he have his inhaler with him today? What is the expiration date? When was his last wheezing “attack?” What is his diet like? Is he willing to try radiographs if the nitrous helps with his gag reflex? Has he ever had a reaction to anesthesia? Has he undergone nitrous oxide/oxygen analgesia before?	

Test Items

Objective #1: Explain the mechanism of action, pharmacokinetics, pharmacologic effects, and adverse reactions of local anesthetics.

Test Item #1: Epinephrine is added to local anesthetic carpules to:

a. Create vasoconstriction
b. Create vasodilation
c. Preserve the anesthetic
d. Alkalize the solution

Objective #2: Discuss the use of nitrous oxide in dentistry, including how it works, the pharmacologic effects, adverse reactions, and contraindications.

Test Item #2: What is the **BEST** way to reduce the chance of diffusion hypoxia after the use of nitrous oxide?

a. Titrate the nitrous to the optimal effective level as quickly as possible.
b. Ensure that the patient is acting normal after sitting them up once the procedure is over.
c. Check the vitals for normal ranges.
d. Place the patient on pure oxygen for 5 minutes after turning off the nitrous oxide.

Objective #3: Compare and contrast the routes of administration and the means of absorption and elimination of dental anesthetics.

Test Item #3: Excretion of local anesthetics occurs through the:

a. Liver
b. Kidneys
c. Blood
d. Brain

Objective #4: Create a treatment plan for pain control based on patient needs and medical history.

Test Item #4: Your patient is a 45 year old female taking a non-selective Beta Blocker for heart disease. You need to complete 1 quadrant of SRP for this patient today during clinic. What would be the most appropriate anesthetic agent and dosage for this patient, and why? Discuss in 3-5 sentences.

Objective #5: Indicate a commitment to providing safe and effective pain control for dental hygiene patients.

Test Item #5: You have an 8 year-old patient coming to the dental practice you work at who is very anxious about having his teeth cleaned. You call the patient's parents to offer them "laughing gas" to help the patient get through the appointment. What do you discuss with the parents, as far as what to expect before, during, and after the appointment?

Correct Answer Key:

1. A
2. D
3. B
4. Possible answers: Mepivacaine 3% plain, Lidocaine 2% with 1:200,000 epi. or with 1:100,000, or Prilocaine 4%. Cardiovascular disease carries a relative contraindication for high concentrations of vasoconstrictors. This patient takes a non-selective Beta blocker medication which increases cardiac output/heart rate. Since epinephrine does the same thing, it is very important to consider the added cardiac effect if epinephrine is used. In Mepivacaine 3% plain, there is 54mg of anesthetic agent and no epinephrine in each carpule. In Lidocaine 2% with 1:200,000 epi., there are 36mg of anesthetic agent and 0.009mg of epi. per carpule. For Lidocaine with 1:100,000 epi., there is 36mg of anesthetic agent and 0.018mg of epinephrine per carpule. The maximum recommended dose of anesthetic agent for a cardiac patient is 2.2 cartridges. The maximum cardiac dose of epinephrine is 0.04mg.
5. Before the appointment, they will need to ensure that the patient arrives on an empty stomach. It is important to state no food or drink for at least 2 hours prior to the appointment. This is due to the heightened risk of nausea and vomiting, and thus aspiration for the patient. During the appointment, the parents may accompany the patient, but that person may not be pregnant. The patient will feel relaxed and will remain conscious throughout the appointment. There may be sensations of tingly fingers and toes, and there may be slight temporary amnesia. After the procedure, the patient will receive 5 minutes of pure oxygen, and upon vital signs being at normal levels, the patient can be dismissed. They will not be numb, unless local anesthetic was used, as well. Since nitrous oxide is short-acting, no lasting effects are expected.