Dental Pain Management

Pain Management Modalities in Ambulatory Dental Care Settings

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Presented by Dr. Wil Darwin, PharmD, CDE
ABQ Area IHS Pharmacy Consultant
ABQ Area IHS RPMS-EHR Clinical Application Informaticist
Objectives

- Pain Management Standards
- The Pathophysiology of Pain
- Examples of Dental Procedures, Drugs and Disease States that can cause Pain
- Treatment Used for Pain in the Dental Field
- Antibiotic Prophylaxis Management Standards
Roadmap

- Pain Management Standards
- Pain Assessment
- Pain Diagnosis
- Pain Pathophysiology
  - Nociceptive
  - Neuropathic
  - Acute verse Chronic Pain
- Pain in Dentistry
- Pharmacotherapies
  - Pain Management
    - Non-Opioid and Opioid Analgesics
  - Antibiotic Prophylaxis
Pain Management Standards

- Every patient’s right to receive adequate assessment and treatment for pain. The self-report of pain by a patient should be considered and assessed. All members of the Dental health care team should participate in the assessment and evaluation of each patient’s need for pain intervention measures.

- To assure that pain is properly assessed and managed for all patients by providing the most possible minimal comfort measures or pain free services.

- The 3-Ds Principle should be used to manage pain in dental practice: Diagnosis, Dental Treatment, & Drugs
Pain Assessment

Here are three helpful steps to assist with the assessment of pain:

- **Step 1: Take Extra Time**
  Finding the sources of their pain (W-I-L-D-A Guide)

- **Step 2: Focus on the Patient, Not the Pain**
  In addition to investigating the sources of pain, clinicians need to find out how pain affects their patients' lives

- **Step 3: Try Reflective Listening**
  Reflective listening is a widely recommended patient assessment technique
Pain Assessment

- Pain Assessment in the conscious Adolescent, Adult and the elderly patient population

0  2  4  6  8  10  
No Pain  Some  Mild  Moderate  Severe  Worst

Smiley face  Smiley face  Neutral face  Sad face  Sad face  Crying face
Pain Assessment

Pain Assessment in unconscious/conscious Infant/Young Children/Adult and/or Elderly

The FLACC is a behavioral scale that has been validated for assessment of pain in children between the ages of two months and seven years. The behavioral scale can also be used in the unconscious infant, young child or elderly.

The acronym “FLACC” represents five categories: Face, Legs, Activity, Cry, and Consolability. Response in each category are scored between 0 and 2, for a maximal total score of 10.
Pain Diagnosis

- Diagnose the disease or condition causing pain
- Identify what has caused that disease or condition
- Most important step for managing pain
- Information gathering process
  - Obtain thorough medical and dental history
  - Discuss presenting problem in detail with patient
  - Carry out very thorough clinical examination
  - Conduct appropriate tests
- Collate information gathered and decide on definitive diagnosis
What is Pain?

- An uncomfortable or unpleasant feeling
- Can be due to potential damage or actual damage to the body
- Is **nociceptive** or **neuropathic**

Nociceptive Pain
Nociceptive Pain

- Occurs when noxious stimuli in the form of chemical, mechanical or thermal are exposed to the body’s nerves.
- The nociceptors at the nerve endings are stimulated.
- The body responds both peripherally and centrally.

Nociceptive Pain - Peripheral Response

Peripheral Response away from the spinal cord causes inflammation and tenderness due to neurotransmitter release

- Potassium Ions
- Histamine
- Prostaglandins
- Glutamate
- Serotonin
- Leukotrienes
- Substance P
- Bradykinin

Slavkin HC. What we know about pain. *JADA*. 1996;127:1536-1541
Nociceptive Pain - Central Response

- Afferent Process
- Consists of
  - Transduction
  - Transmission
  - Perception
  - Modulation

Nociceptive Pain
Transduction and Transmission

Transduction
- Sodium ions come into the cell and depolarize it
- An electrical signal is now formed from the noxious stimulus

Transmission
- Electrical signal grows and becomes an action potential
- The action potential moves its way up to the brain to be processed

Fibers That Carry the Action Potential to it’s First Destination

The action potential travels up two different types of fibers that have their cell bodies in the spinal cord’s dorsal root ganglia and their end area in the dorsal horn.

- C fibers and A-Delta fibers

<table>
<thead>
<tr>
<th></th>
<th>C Fibers</th>
<th>A-Delta Fibers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>Slower</td>
<td>Faster</td>
</tr>
<tr>
<td>Mylenation</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Noxious Stimuli</td>
<td>Thermal, mechanical and chemical</td>
<td>Thermal and mechanical</td>
</tr>
<tr>
<td>Pain Feeling</td>
<td>Dull or Achy</td>
<td>Sharp</td>
</tr>
</tbody>
</table>

Transmission Continued

- When the action potential reaches the cell bodies, more neurotransmitters are released so that the signal can be communicated.
  - Neurotransmitters include
    - Glutamate
    - Calcitonin Gene Related Peptide
    - Substance P
- This causes secondary neurons to become excited, and the signal continues its way up to the thalamus.
- At the thalamus, third order neurons become excited and continue the signal to its final destination – the cortex.

http://thalamus.wustl.edu/course/body4.gif


Perception

- At the cortex the action potential is processed and pain is felt!
  - Upon feeling pain, the brain may send a message back to the spinal cord to tell the muscles to contract and pull back from the noxious stimuli.

Modulation – The Last Step in the Nociceptive Pain Process

- Modulation is the body’s ability to modify the pain signals it feels.
  - The body will send messages to the spinal cord to discharge the body’s natural pain relievers.
    - Endogenous opioids, norepinephrine, GABA and serotonin
  - The pain signals get blocked.
    - The calcium channels get obstructed and potassium channels open.
      - The cell becomes hyperpolarized and cannot continue the pain messages.
  - Further modulation takes place throughout the whole CNS system via the endogenous opiate pathways.

Hyperalgesia

- is an increased sensitivity to pain, which may be caused by damage to nociceptors or peripheral nerves.

- Continued exposure to the same amount of noxious stimulus causes the perception of pain to increase.
  - The nociceptors are now sensitized to the original stimulus.
  - Sensitization can also happen at the second order neuron level.
    - When that occurs it is called central sensitization.

Nociceptor Pain can be Described Two Ways

<table>
<thead>
<tr>
<th></th>
<th>Somatic</th>
<th>Visceral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Muscle, Bone, Skin, Joints</td>
<td>Internal Organs</td>
</tr>
<tr>
<td>Pain Description</td>
<td>Throbbing</td>
<td>Dull</td>
</tr>
<tr>
<td>Origin</td>
<td>In a specific area</td>
<td>Can be confined, or difficult to locate origin</td>
</tr>
</tbody>
</table>

Neuropathic Pain
Neuropathic Pain

- Caused by the CNS or periphery’s atypical processing of information
- There may be a direct cause or it may be unclear.
- Usually the neurons are damaged due to injury or disease states.
  - The body’s nerves may become stimulated without prompting or there may be an enhanced number of neurons being sent from the spinal cord to the brain.

Neuropathic Pain

- Neuropathic pain feels different than pain due to nociception.
  - Burning, tingling
- The patient may experience hyperalgesia.
- The patient may experience allodynia.
  - Normally, non painful stimuli (Temperature or Physical) cause pain to occur.

Acute and Chronic Pain
Acute Pain

Acute Pain

Usually Caused by Nociceptor Pain

Does Not Last Long

The Cause is Usually Apparent

Problem Fixed Should Go Away

Antibiotics and or Analgesics Used

Slavkin HC. What we know about pain. *JADA*. 1996;127:1536-1541
Chronic Pain

Patients May Experience Mental Anguish

There May Be Central Sensitization

Patient May Have Hyperalgesia or Alloodynia

Can be From Acute Pain Not Going Away

May or May Not Have a Cause

Unknown How Long It Will Last

Can be Neuropathic or Nociceptor Driven

Examples

- Back Pain
- Arthritis
- Pain Secondary to Cancer

Pain in Dentistry

- Can be caused by
  - Disease
  - Procedures
  - Medications
Disease Induced Dental Pain

- Bulimia
  - Wearing away of the tooth enamel due to vomiting

- Diabetes
  - Can lead to pain in the mouth area even though no apparent damage
  - Can lead to periodontal disease
    - “6th complication of diabetes mellitus”
    - Increase in risk for periodontitis and gingivitis
      - Decrease in neutrophils and increase in monocytes and macrophages
    - Increased risk of bone loss
      - Changes in connective tissue and lack of new bone
    - Increased risk of dry mouth and less saliva production
      - Risk of getting cavities

Slavkin HC. What we know about pain. *JADA*. 1996;127:1536-1541
Vernillo AT. Dental considerations for the treatment of patients with diabetes mellitus.*JADA*. 2003;134:24S-33S.
Disease Induced Dental Pain

- **Sinus Infections**
  - May appear as pain in the teeth
  - This may be because the maxillary sinus and the maxillary teeth are near each other.
    - Nerves located in the teeth come into contact with inflamed tissues in the sinuses.
    - It appears to be dental pain but it is really sinus pain

- **Tetanus Infection**
  - Rare outside of undeveloped countries
  - A symptom of infection is trouble opening the mouth
  - From the bacteria *clostridium tetani*
    - Vaccination


Disease Induced Dental Pain

- TMJ (Temporomandibular Joint Disorder)
  - Made up of at least one of three things
    - Muscle disorders
    - Derangement disorders
    - Degenerative disorders
  - Causes behind TMJ include
    - Getting older
    - Person’s activities
    - Damage to the jaw area
  - Symptoms include
    - Locked up jaw
    - Face pain
    - Noises made by the jaw
    - Changes in how the jaw and the teeth align
Disease Induced Dental Pain

- Sensitive Teeth
  - The dentin portion of the tooth contains empty tubes.
  - When the dentin layer is no longer surrounded by such things as enamel or cementum, the tubes can then interact with their surroundings.
    - If a person eats something cold, hot or acidic, this can get into the tube and touch the nerve.
      - Upon nerve stimulation and the pain process, pain gets perceived.

- Treatments
  - Special toothpaste that desensitizes the teeth
  - Fluoride gel
  - Fillings, bondings or crowns
  - Gum surgery

For the dental patient...Sensitive teeth causes and treatment. *JADA*. 2003;134:1691.
Medication Induced Dental Pain

- Calcium Channel Blockers
  - Examples include: Nifedipine, Diltiazem, Verapamil, Amlodipine
    - Used for varying forms of cardiovascular problems such as hypertension, atrial fibrillation, angina and coronary artery disease
    - May cause Gingival Hyperplasia.
      - Recommended dental exam and cleaning at each 6 month interval.

- Bisphosphonates
  - Examples include Fosomax, Actonel, Boniva, Zometa, Aredia
    - Used to treat or prevent osteoporosis
    - May cause a rare condition called Osteonecrosis of the Bone.
      - Can happen randomly or after a dental procedure.
      - More common in patients on IV form of drug.
Procedures Causing Dental Pain

- Extractions
- Fillings or root canals
- Dental Surgery
- Cleaning and probing of tissues surrounding the teeth in patients with periodontal disease

Treating Dental Pain

- Focus mainly on medication given after the procedure to reduce dental pain.
- Usually, a medication’s pain treating ability in dentistry is based on 3rd molar extraction.

Drugs Used to Treat Dental Pain

- Paracetamol (aka – Acetaminophen)
  - Short acting pain reliever that can treat moderate pain at most
  - Has anti pain and anti fever properties
  - May be useful for severe pain when given with opioids
- Theory of mechanism
  - May block nitric oxide pathway
  - May reverse NMDA or substance P stimulated hyperalgesia
- Ceiling effect at 1000 mg

Moore PA. Tramadol vs. codeine combinations. *JADA.* 1999;130:1075-1079
Http://tylenol.com
Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)
Normophysiologic Processes

- **COX-1 Pathway**
  - Makes prostaglandins that safeguard the GI lining
  - Helps to keep blood flowing to the kidneys
  - Helps to make thromboxanes that cause platelets to stick together

- **COX-2 Pathway**
  - Gets made in response to an injury or damage
  - Is involved in the pain process
    - Causes inflammation and sensitization

COX = Cyclo-Oxygenase

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Non Steroidal Anti Inflammatory Drugs

- Is useful in cases of mild to severe pain
- Can offer both pain relief and anti-inflammation relief
- Blocks the COX-1 and COX-2 pathways
- Ibuprofen works better by itself than Acetaminophen by itself when used to treat dental pain.

Ibuprofen Molecule

Chemical Formula: $C_{13}H_{18}O_2$
Non Steroidal Anti Inflammatory Drugs

http://www.uninet.edu/cin2001/html/conf/bala/fig2.jpg
Non Steroidal Anti Inflammatory Drugs

- COX-1 and COX-2 Blockers
  - Ibuprofen
  - Naproxen
  - Indomethacin
  - Aspirin
  - Piroxicam
  - Nabumetone

- Selective COX-2 Blockers
  - Celecoxib
  - Rofecoxib (Vioxx) & Valdecoxib (Bextra)
    - pulled from the market
Non Steroidal Anti Inflammatory Drugs

- Side Effects
  - GI mucosa is no longer protected
    - Stomach discomfort and bleeding in GI tract
      - Should be avoided in people who have current GI bleeds or ulcers.

- Dosages
  - May be better if given before prostaglandins are formed
    - May want to start the patient on a loading dose twice the dosage of maintenance therapy
    - May want to give every 4 hours for up to 2 days, and then as needed
  - Has ceiling effect
    - Need higher daily dosing to achieve anti inflammatory properties
      - 2400-3200 mg a day


Non Steroidal Anti Inflammatory Drugs

- Numerous double-blind placebo-controlled clinical trials have demonstrated NSAIDs are effective for reducing pain due to surgical, periodontal, or endodontic procedures.
- Superior to opioids for managing musculoskeletal pain with lower incidence of side effects and potential for abuse.
- Systematic reviews of studies support the clinical recommendation that NSAIDs should be the Analgesic of First Choice in patients who can tolerate
## Non-Opioid Analgesic Side Effects

<table>
<thead>
<tr>
<th>Agent</th>
<th>GI Irritation</th>
<th>CNS Effects</th>
<th>Hepatic Toxicity</th>
<th>Renal Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Aspirin</td>
<td>++++++++++</td>
<td>+</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Diflunisal</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Etodolac</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Ketoprofen</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Naproxen</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
</tbody>
</table>
Non-Opioid Analgesic Onset / Duration

<table>
<thead>
<tr>
<th>Agent</th>
<th>Analgesic Onset</th>
<th>Analgesic Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen</td>
<td>30-60 min</td>
<td>3-6 hours</td>
</tr>
<tr>
<td>Aspirin</td>
<td>30 min</td>
<td>3-6 hours</td>
</tr>
<tr>
<td>Ibuprofen (Motrin)</td>
<td>30 min</td>
<td>4-6 hours</td>
</tr>
<tr>
<td>Etodolac (Lodine)</td>
<td>30-60 min</td>
<td>6-8 hours</td>
</tr>
<tr>
<td>Ketoprofen (Orudis)</td>
<td>60 min</td>
<td>4-8 hours</td>
</tr>
<tr>
<td>Diflunisal (Dolobid)</td>
<td>60 min</td>
<td>8-12 hours</td>
</tr>
<tr>
<td>Naproxen (Naprosyn)</td>
<td>60 min</td>
<td>Up to 12 hours</td>
</tr>
</tbody>
</table>
Opioid Analgesics
Tramadol

- Not often used in dental pain management
- Mechanism of action
  - Prevents reuptake of norepinephrine and serotonin
  - Works on opiate receptors as well
- Less opiate related side effects because it works multiple ways
- Better than Codeine alone, but not as good as codeine + APAP
- May work for up to 6 hours
- Side effects include
  - Dizziness, nausea and constipation
- Useful in people who can’t take NSAIDS or who don't tolerate Codeine or other opiates

Moore PA. Tramadol vs. codeine combinations. *JADA*. 1999;130:1075-1079
Opiates

Mechanism of Action

- Works on the body’s central nervous system
  - Binds to opiate receptors to block pain signals to the brain
  - Triggers pain blocking pathways to the spinal cord
- **Codeine, Oxycodone, Propoxyphene and Hydrocodone** are not as good as other pain relievers when given by themselves to treat dental pain.
  - Work better in combination form

Side effects

- Respiratory depression, constipation, dependence, sedation, nausea

Diversion Risk

## Action of Opioid Analgesic

<table>
<thead>
<tr>
<th>Receptors</th>
<th>mu</th>
<th>kappa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects in common</td>
<td>Analgesia</td>
<td>Analgesia</td>
</tr>
<tr>
<td></td>
<td>Respiratory Depression</td>
<td>Respiratory Depression</td>
</tr>
<tr>
<td></td>
<td>Sedation</td>
<td>Sedation</td>
</tr>
<tr>
<td>Other Effects</td>
<td>Euphoria</td>
<td>Dysphoria</td>
</tr>
<tr>
<td></td>
<td>Dependence</td>
<td>Psychomimetic</td>
</tr>
<tr>
<td></td>
<td>Constipation</td>
<td></td>
</tr>
</tbody>
</table>
Combination Medications

- Combination products with Acetaminophen and codeine can provide greater analgesia effects.
- Use less of both drugs, get better pain relief and fewer side effects.
- Block multiple pathways at the same time.
  - Provide pain relief using short and long acting drugs.
- Usually in the form of an opiate + either Acetaminophen or Ibuprofen.

Acetaminophen + Opiate

- Combination is more effective in treating dental pain than either medication by itself.

- Examples
  - 325mg APAP+5mg Oxycodone (Percocet)
  - 300mg APAP+30mg Codeine (Tylenol 3)
  - 500mg APAP+5mg Hydrocodone (Vicodin)

Ibuprofen + Opiate

Opiates with Ibuprofen resulted in better pain relief for dental pain than Ibuprofen alone.

Examples

- 400mg Ibuprofen + 30 mg Codeine
- 400mg Ibuprofen + 5 mg Oxycodone
- 400mg Ibuprofen + 15 mg Hydrocodone (2 tabs of Vicoprofen)

# Opioid Analgesics Onset/Duration

<table>
<thead>
<tr>
<th>Agent</th>
<th>Analgesic Onset</th>
<th>Analgesic Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codeine/APAP (Tylenol #3)</td>
<td>10-20 min</td>
<td>4-6 hours</td>
</tr>
<tr>
<td>Hydrocodone/APAP (Vicodin/Lortab/Lorcet)</td>
<td>30-60 min</td>
<td>4-6 hours</td>
</tr>
<tr>
<td>Oxycodone/APAP (Percocet)</td>
<td>30-60 min</td>
<td>4-6 hours</td>
</tr>
<tr>
<td>Tramadol (Ultram)</td>
<td>&lt; 60 min</td>
<td>4-6 hours</td>
</tr>
<tr>
<td>Tramadol/APAP (Ultracet)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Opioid Analgesics Side Effects

<table>
<thead>
<tr>
<th>Effects</th>
<th>Manifestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood Changes</td>
<td>Dysphoria, euphoria</td>
</tr>
<tr>
<td>Somnolence</td>
<td>Lethargy, drowsiness, apathy, inability to concentrate</td>
</tr>
<tr>
<td>Stimulation of chemoreceptor trigger zone</td>
<td>Nausea, vomiting</td>
</tr>
<tr>
<td>Respiratory depression</td>
<td>Decreased respiratory rate</td>
</tr>
<tr>
<td>Decreased gastrointestinal motility</td>
<td>Constipation</td>
</tr>
<tr>
<td>Increase in sphincter tone</td>
<td>Biliary spasm, urinary retention</td>
</tr>
<tr>
<td>Histamine release</td>
<td>Urticaria, pruritis, rarely exacerbation of asthma (varies among agents)</td>
</tr>
<tr>
<td>Tolerance</td>
<td>Larger doses for same effect</td>
</tr>
<tr>
<td>Dependence</td>
<td>Withdrawal symptoms upon abrupt discontinuation</td>
</tr>
</tbody>
</table>
Step 1

- Ibuprofen 400-800mg po TID/QID or equivalent NSAID

and/or

- Acetaminophen 500-1000mg po QID
Stepped Approach for Managing Postoperative Pain

- Step 2
  - Add any of the following to Step 1 Regimen:
    - Oxycodone 5-10mg po every 4 hours PRN
    - or
  - Use combinations, when no APAP included in Step 1
    - Hydrocodone/APAP 5-10mg/500mg po 1 tablet every 4-6 hours PRN
      - or
    - Oxycodone/APAP 5-10mg/500mg po 1 tablet every 4-6 hours PRN
      - or
    - Tramadol/APAP 37.5mg/325mg po 1-2 tablets every 4-6 hours PRN
Corticosteroids

- Rarely indicated in dentistry, but can be useful for inflammation management at times

- Reserved for specific situations:
  - Correct diagnosis has been made
  - Dental treatment has been provided adequately
  - No other anti-inflammatory medication has helped
  - Medical history does not reveal any contraindication
  - No signs of infection
  - No possibility of infection developing
Corticosteroids

Clinical Dental Indications:

- Emergencies (adrenal crisis, anaphylaxis, allergic rxns)
- Severe post-operative swelling
- Following severe trauma
- Periapical nerve sprouting and acute apical periodontitis following removal of acutely inflamed pulp
- Severe muscle inflammation associated with tempromandibular dysfunction
- Some oral ulcerations and mucosal lesions that cannot be managed with topical medications
- Periapical inflammatory response following endodontic treatment
Corticosteroids

- Should only be used as adjunct to dental treatment and not as sole means of managing pain
- Adult Dosage = Dexamethasone 8mg loading dose, then 4mg every 8 hours for 2-3 days (Max 5 days)
- Renal/Hepatic Impairment – No dosage adjustment
- Pregnancy/Lactation
  - Avoid in pregnancy
  - Lactation – Enters breast milk, use caution
Medication Used Prior to Procedure

- **Topical anesthetics (Benzocaine)**
  - Numbs the gum’s outer layer
  - Usually used before a shot of local anesthetic is given

- **Injections (Lidocaine, Prilocaine, Bupivacaine, Mepivacaine)**
  - An injection of local anesthetic may also have epinephrine, sodium chloride, and sodium hydroxide in it.
  - **Nerve Blocking**
    - Local anesthetic is used to obstruct the trigeminal nerves.
    - This prevents pain signals from the procedure traveling to the brain.
    - Used in or around the area of the procedure
    - A section of the jaw gets numb.
    - Used at the same time as the dental procedure rather than after it is over
  - **Infiltration**
    - A smaller section of the mouth becomes numb

- **Nitrous Oxide**
  - Mechanism is unclear
  - Creates a state where the patient is awake, but tired and less anxious

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Slavkin HC. What we know about pain. *JADA*. 1996;127:1536-1541
American Dental Association. Available at.
Adjunctive Agents
Benzodiazepines

- Useful in people who get anxiety thinking about dental visits or procedures
- Examples
  - Alprazolam
  - Midazolam
  - Diazepam

Potential Drug Interactions

- NSAIDS

  - ACEI, Beta Blockers and Diuretics
    - May interact because these drugs have some reliance on the prostaglandin system that affects blood flow to the kidneys.
    - These drugs increase prostaglandins which the NSAIDs then block.
  
  - Blocking COX-1 by an NSAID results in constricted blood vessels, less water and salt secretion and less filtration.
  
  - Thought to increase blood pressure by 5mmHg
  
  - May not pose a large risk in dental use as long as use is short term
    - No more than 4 days

Special Populations

- Alcoholics
  - APAP can cause liver damage in people who drink alcohol.
    - Maximum is 2 grams in a 24 hour period
  - NSAIDS may increase their risk of GI bleeding as well as sedation when given with alcohol.
  - Concurrent opiate use may increase sedation
  - May lower the effects of erythromycin and tetracyclines when combined with alcohol
  - May cause flushing, nausea and rapid heart beat when metronidazole or cephlasporins are taken with alcohol


Special Populations

- Patients with active GI bleeds
  - Should not take NSAIDS due to increased risk of bleeding

- Asthmatics
  - Should take NSAIDS cautiously as blockage of COX-1 and COX-2 pathways lead to further synthesis of leukotrienes
    - May cause inflammation and bronchospasms of the airways

Special Populations

- Diabetics
  - May want to avoid Tramadol use if taking antidepressants or anticonvulsants to treat diabetic neuropathy
    - Increase seizure risk
  - May want to avoid NSAIDS or long periods of NSAID use in patients taking ACEI for renal protection
    - NSAIDS decrease the blood flow to the kidney

Special Populations

■ Hypertensive Patients
  ■ NSAID use for 4 days or less should not affect blood pressure medications.
    ■ NSAIDS do decrease renal blood flow.
    ■ NSAIDS can interact with blood pressure medication in the long run, making the blood pressure medication less effective.
  ■ NSAIDS should not be used in patients with heart failure.

■ Warfarin users
  ■ NSAID use increases a patient’s risk of bleeding.
    ■ Risk is increased if more than 3 grams of aspirin is given.

Common Dental Dosages

- **Acetaminophen**
  - Tablet size varies. 500-1000 mg by mouth every four to six hours. No more than 4 grams in a 24 hour period.

- **Ibuprofen**
  - Tablet size varies. 400 mg by mouth every four to six hours. May need up to 800 mg every 6 hours (3200 mg in a 24 hour period) to get anti inflammatory properties.

- **Tramadol**
  - 50 mg tablets. 1-2 tablets by mouth every four to six hours, with a maximum amount of 400 mg in a 24 hour period.


Moore PA. Tramadol vs. codeine combinations. *JADA*. 1999;130:1075-1079

In the AI/AN Population

- 1999 survey from IHS found
  - 96% of people aged 35-44 that were looked at had gingivitis.
  - 43% of people aged 35-44 that were looked at had mouths full of untreated decay and disease of the periodontal area.
  - People aged 35-44 with diabetes were 38% more likely than their non diabetic counterparts to have advanced periodontal disease.
  - 21% of people 55 years of age or older had none of their original teeth left.

Antibiotic Prophylaxis

Antibiotic prophylactic regimens are recommended by the American Heart Association (AHA) only for patients with underlying cardiac conditions associated with the highest risk of adverse outcome from infective endocarditis.
High Risk Cardiac Conditions

- Prosthetic cardiac valve
- History of Infective Endocarditis
- Congenital Heart Disease (CHD)
  - *Antibiotic prophylaxis is no longer recommended for any other form of CHD except for the following:*
    - Unrepaired cyanotic CHD, including palliative shunts and conduits
    - Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure
    - Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibits endothelialization)
- Cardiac transplantation recipients with cardiac valvular disease
Dental Procedures

- **Antibiotic prophylaxis recommendation**
  - High cardiac risk patients – **ALL** dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa.

- The following dental procedures do **NOT** require endocarditis prophylaxis:
  - Routine anesthetic injections through noninfected tissue
  - Dental radiographs
  - Placement of removable prosthodontic or orthodontic appliances
  - Adjustment of orthodontic appliances
  - Placement of orthodontic brackets
  - Shedding of deciduous teeth
  - Bleeding from trauma to the lips or oral mucosa
Treatment Regimens

- *S. viridans* (alpha-hemolytic streptococci) is the most common cause of endocarditis for dental, oral, respiratory tract, or esophageal procedures.

- Recommended standard prophylactic regimen is a single dose of oral amoxicillin.
  - Preferred over ampicillin and penicillin due to superior GI absorption that provides higher and more sustainable serum levels.
Prophylaxis doses are administered once as a single dose 30-60 min before the procedure.

**Standard general prophylaxis**

- **Amoxicillin**
  - Adult dose: 2 g PO
  - Pediatric dose: 50 mg/kg PO; not to exceed 2 g/dose

**Unable to take oral medication**

- **Ampicillin**
  - Adult dose: 2 g IV/IM
  - Pediatric dose: 50 mg/kg IV/IM; not to exceed 2 g/dose
Treatment Regimens

- **Allergic to penicillin**
  - **Clindamycin**
    - Adult dose: 600 mg PO
    - Pediatric dose: 20 mg/kg PO; not to exceed 600 mg/dose
  - **Cephalexin or other first- or second-generation oral cephalosporin in equivalent dose**
    - Adult dose: 2 g PO
    - Pediatric dose: 50 mg/kg PO; not to exceed 2 g/dose
    - Not used in patients with h/o immediate-type hypersensitivity penicillin allergy (urticaria, angioedema, anaphylaxis)
  - **Azithromycin or clarithromycin**
    - Adult dose: 500 mg PO
    - Pediatric dose: 15 mg/kg PO; not to exceed 500 mg/dose
Treatment Regimens

- Allergic to penicillin and unable to take oral medication
  - **Clindamycin**
    - Adult dose: 600 mg IV
    - Pediatric dose: 20 mg/kg IV; not to exceed 600 mg/dose
  - **Cefazolin or ceftriaxone**
    - Adult dose: 1 g IV/IM
    - Pediatric dose: 50 mg/kg IV/IM; not to exceed 1 g/dose
Most Common Pathogens

- Streptococci viridens (alpha-hemolytic)
  - *Streptococcus mutans*
  - *Streptococcus sobrinis*
  - *Streptococcus milleri*

- Anaerobic gram-positive cocci
  - *Peptostreptococcus*

- Anaerobic gram-negative rods
  - Bacteroides
  - Porphyromonas
  - Actinobacillus actinomycetemcomitans
  - Prevotella intermediud
  - Porphyromonas gingivalis
  - Fusobacterium nucleatum
  - Eikenella corrodens

- Most odontogenic infections (70%) contain mixed aerobic and anaerobic bacteria.
  - Pure aerobic infections have less than a 5% incidence
  - Pure anaerobic infections have a 25% incidence.
Antibiotic Considerations

- Stage of infection development
- Ability of the patient to take the antibiotic – medical conditions or allergy
- Antibiotic method of attack
  - Bactericidal antibiotics actually kill microorganisms
    - Penicillins
    - Cephalosporins
  - Bacteriostatic antibiotics slow bacterial growth and depend on the host immune system to eliminate the microorganism
    - Macrolides
    - Tetracyclines
    - Sulfonamides
    - Should not be used in immunocompromised patients
- Antibiotics may have mixed properties for different organisms
- Bactericidals are preferable over bacteristatics in most situations
Ideal Dental Infection Antibiotics

- Bactericidal against gram positive cocci and the major pathogens of mixed anaerobic infections.
- Cause minimal adverse effects and allergic reactions
- Relatively low cost
## Empiric Antibiotic Regimens

<table>
<thead>
<tr>
<th>Type of Infection</th>
<th>Antibiotic of Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early (first 3 days of infection)</td>
<td>Penicillin VK, amoxicillin, Clindamycin, Cephalexin (or other first generation cephalosporin)¹</td>
</tr>
<tr>
<td>No improvement in 24-36 hours</td>
<td>Beta-lactamase-stable antibiotic: Clindamycin or amoxicillin/clavulanic acid (Augmentin®)</td>
</tr>
<tr>
<td>Penicillin allergy</td>
<td>Clindamycin, Cephalexin (if penicillin allergy is not anaphylactoid type), Clarithromycin (Biaxin®)²</td>
</tr>
<tr>
<td>Late (&gt;3 days)</td>
<td>Clindamycin, Penicillin VK-metronidazole, amoxicillin-metronidazole</td>
</tr>
<tr>
<td>Penicillin allergy</td>
<td>Clindamycin</td>
</tr>
</tbody>
</table>

¹ For better patient compliance, second generation cephalosporins (cefaclor; cefuroxime) at twice daily dosing has been used.

² A macrolide useful in patients allergic to penicillin, given as twice daily dosing for better patient compliance.

Adapted from Drug Information handbook for Dentistry; Richard Wynn, Timothy Meiller, Harold Crossley, 12th Edition
# Renal Dosing Considerations

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Renal Dosing Adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin VK</td>
<td>CrCl &lt;10 ml/min – 250mg Q6H</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>No renal dosage adjustments required</td>
</tr>
<tr>
<td>Cephalexin (Keflex)</td>
<td>CrCl 10-50 ml/min – 500mg Q8-12H</td>
</tr>
<tr>
<td></td>
<td>CrCl &lt;10 ml/min – 250-500mg Q12-24H</td>
</tr>
<tr>
<td></td>
<td>Dialysis – 250mg Q12-24H</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>CrCl &lt;30 ml/min – No 875mg doses</td>
</tr>
<tr>
<td></td>
<td>CrCl 10-30 ml/min – 250-500mg Q12H</td>
</tr>
<tr>
<td></td>
<td>CrCl &lt;10 ml/min – 250-500mg Q24H</td>
</tr>
<tr>
<td></td>
<td>Dialysis – 250-500mg Q24H</td>
</tr>
<tr>
<td>Amoxicillin/Clavulanate (Augmentin)</td>
<td>CrCl &lt;30 ml/min – No 875mg or ER tabs</td>
</tr>
<tr>
<td></td>
<td>CrCl 10-30 ml/min – 250-500mg Q12H</td>
</tr>
<tr>
<td></td>
<td>CrCl &lt;10 – 250-500mg Q24H</td>
</tr>
<tr>
<td></td>
<td>Dialysis – 250-500mg Q24H</td>
</tr>
</tbody>
</table>
Final Words of Advice

- Screen for pain management
- Document pain management processes
- Try acetaminophen or NSAIDS first when managing pain that is moderate at most.
- If pain is still present after reaching the maximum ceiling dosages of acetaminophen or NSAIDS, add an opiate.
- Pre-existing Co-Morbidity

Questions