Program Learning Objectives

Upon successful completion of this program, participants should be able to:

– Describe the pharmacology and mechanism of action of opioid and non-opioid analgesics, as well as their potential for abuse.

– Explain the intended role of opioid and non-opioid analgesics in the treatment of acute dental pain, as well as situations which may preclude their use.

Program Learning Objectives

– Describe strategies useful in developing a pain management plan that is individualized for a patient’s needs and underlying medical conditions.

– Discuss appropriate prescribing practices for opioid and non-opioid analgesics to utilize in everyday clinical situations.

The Concept of Pain

Pain is an unpleasant sensory and emotional experience in which the body is made urgently aware of actual or potential tissue damage.

• Proper management of pain requires an understanding of its complexity and an appreciation for the factors that determine its expression

The Concept of Pain

Nociception is the sensory detection, transduction, and neural transmission of noxious events.

• Pain Threshold
  – The lowest intensity of painful stimulation at which the patient becomes aware of the pain.

• Two components of pain
  – Perception
    • The physical component of pain
      – Uniform from patient to patient
  – Reaction
    • The psychological component of pain
      – Varies from patient to patient
The Concept of Pain

- Factors that “lower” pain threshold
  - Contribute to a greater reaction to pain
    - Fear
    - Depression
    - Anxiety
    - Fatigue

- Factors that “raise” pain threshold
  - Contribute to a lesser reaction to pain
    - Sleep
    - Empathy
    - Placebo effect

The Dental Pain Paradox

Pain is a powerful motivator AND de-motivator for patients to seek help from their dental professional.

- Pain keeps some patients from seeking help
  - Fear of painful procedure
  - Memory of significant/lengthy post-operative pain

- Negative feedback reinforcement
  - Treatment on inflamed, hypersensitive tissues
  - Patient mentally fatigued after endurance of pain

The Anatomy of Pain

Chemical agents that occur naturally in the environment of pain receptors after acute tissue damage are algogenic substances.

- These include adenosine, adenosine triphosphate, serotonin, histamine, bradykinin, cytokines, and prostaglandins.

- The release of these substances leads to nociceptor activation, producing the pain impulse.

The Anatomy of Pain

Inflammation promotes the formation of prostaglandins which enhance the effects of the other algogenic substances on nociceptors.

- Traumatic injury may also provoke an initial efferent sympathetic reflex, producing vasoconstriction.

- Decreased microcirculation in the injured tissue, produces ischemia, further amplifying nociceptor stimulation.

The Anatomy of Pain

For a person to feel pain, the pain impulse must be transmitted to the spinal cord and then to the cerebral cortex.

- The pain impulse is transmitted to the spinal cord by peripheral nerve fibers.

- At the dorsal horn of the spinal cord, peripheral nerve fibers interface with CNS neurons to transmit the pain signal.

Non-Narcotic Analgesics

(COX Inhibitors)
### NSAIA’s

**Types**
- ibuprofen (Motrin, Advil)
- naproxen sodium (Anaprox, Aleve)
- naproxen (Naprosyn)
- indomethacin (Indocin)
- etodolac (Lodine)
- nabumetone (Relafen)
- meloxicam (Mobic)

**Mechanism of action**
- Inhibit the enzymes COX-1 and COX-2
  - Decrease pain, fever, and inflammation
  - Decrease uterine contraction and inflammation
  - Decrease clotting inducers
  - More effective if given before painful stimuli is experienced

**Pharmacologic effects**
- Antipyretic
  - Lower body temp if above normal
- Analgesic
  - Treatment of mild to moderate pain
  - Very effective in the treatment of dental pain
- Antiinflammatory
  - Treatment of inflammatory joint disease
  - Treatment of dysmenorrhea
  - Treatment of acute attacks of gout

**Patient care considerations**
- Hypersensitivity reactions
  - Cross-sensitivity with ASA and other NSAIA’s
- Anaphylactoid reactions
- Dermatological reactions
  - Stevens Johnson Syndrome (SJS)
  - Toxic epidermal necrolysis (TEN)

**Patient care considerations (continued)**
- Teratogenic effects
  - Decrease uterine prostaglandins
    - Premature closures in fetal circulation
    - Prolonged gestation
- Iatrogenic disease
  - Available OTC
  - Not listed as medications on medical history
  - Maximum daily dose of ibuprofen: 3200mg
  - Maximum daily dose of naproxen: 1500mg
NSAIA’s

- Adverse reactions
  - Gastrointestinal ulceration
    - Decrease production of protective prostaglandins
      - Decrease protective mucous
      - Increase gastric acid secretion
    - Nausea and vomiting
    - GI bleeding

- Adverse reactions (continued)
  - Altered bleeding time
    - Reversibly reduce platelet aggregation
      - Platelet adhesiveness reduced only until drug is excreted
      - No replacement of platelets needed for normal clotting
    - May result in excessive or prolonged bleeding after procedures
      - Lesser effect than aspirin

- Drug interactions
  - Increased effectiveness of other drugs
    - Mechanism
      - Displacement of plasma-protein bound drugs
    - Common drugs affected
      - Coumadin (warfarin)
    - Result
      - Increased risk of hemorrhage

- Drug interactions (continued)
  - Decreased effectiveness of other drugs
    - Mechanism
      - Decrease renal prostaglandins
      - Increase sodium/fluid retention
    - Common Drugs Affected
      - Antihypertensives
    - Result
      - Exacerbated cardiovascular disease
NSAIA's

- Contraindications
  - Asthma
  - Cardiovascular disease with fluid retention
  - Peptic ulcer/ulcerative colitis

- Renal function impairment
- Pregnancy
- History of hypersensitivity
  - Cross-sensitivity with aspirin

Acetaminophen (APAP)

- Types
  - Tylenol, Panadol

- Mechanism of action
  - Unknown (hypothesized)
  - Decreases PG synthesis in CNS
    - Elevates overall pain threshold
  - Decreases PG synthesis in hypothalamus
    - Reduces fever

Acetaminophen (APAP)

- Pharmacologic effects
  - Antipyretic
    - Lowers body temp if above normal
  - Analgesic
    - Used to treat mild to moderate pain
    - Very effective in the treatment of dental pain
    - Considered the most "safe" analgesic

Acetaminophen (APAP)

- Adverse reactions
  - Hepatotoxicity
    - Converted to a liver-toxic metabolite
      - Inactivated by glutathione in liver
    - Possible liver failure
      - Maximum daily dose of APAP: 4000mg
    - Possible with acute ingestion of supratherapeutic doses OR chronic ingestion of high therapeutic doses
  - Exacerbated by liver-enzyme inducing drugs
    - Alcohol, cigarette smoking, anticonvulsants
  - Delayed reaction
    - Peak hepatotoxicity occurs 3 to 4 days after acute intoxication
    - IF patient survives, recovery may take up to three months
Acetaminophen (APAP)

- Contraindications
  - Hepatitis or other known decreased liver function
  - Chronic alcohol ingestion
  - Other liver microsomal enzyme inducing drugs
  - Impaired renal function

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Opioid Analgesics

- Opioid Analgesics used in Dentistry
  - Codeine
    - Combination with APAP (Tylenol w/codeine)
  - Hydrocodone
    - Combination with APAP (Vicodin, Lortab)
    - Combination with ibuprofen (Vicoprofen)
  - Oxycodone
    - Combination with APAP (Percocet, Endocet)

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Why Opioids???

- Pharmacologic effects
  - Analgesia
    - Treatment of moderate to severe pain
  - Cough suppression
    - Treatment of severe non-productive coughs
  - GI hypo-motility
    - Treatment of diarrhea and traveler’s sickness

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Opioid Analgesics

- Substance P facilitates the transfer of pain impulse from peripheral neurons to CNS signaling neurons.
  - In the dorsal horn of the spinal cord, peripheral pain neurons meet CNS signaling neurons.
  - At the synapse, the peripheral pain neurons release substance P, a pain neurotransmitter.
  - The CNS signaling neurons carry the pain impulse to the brain.

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Opioid Analgesics

- Patient care considerations
  - Addiction and dependence
    - Tolerance develops to most effects
    - Withdrawal symptoms upon abrupt cessation
  - Respiratory effects
    - Respiratory depression leads to death from overdose
Opioid Analgesics

- Adverse reactions
  - GI effects
    - Constipation (OIC)
      - Reduced GI motility
  - Nausea and emesis
    - Direct stimulation of the chemoreceptor trigger zone
  - Hypersensitivity reactions
    - Dermatological reactions (pruritis, flushing)

- Contraindications
  - Chronic respiratory disease (COPD)
  - Head injuries
  - Hepatic, renal function impairment
  - Prostatic hypertrophy, constipation

Vivitrol (naltrexone)
- Administered by once-monthly IM injection
- Assists in maintaining opioid-free state
- Blocks effects if opioids are taken

Sublocade (buprenorphine)
- Administered by once-monthly SC injection
- Assists in maintaining opioid-free state
- Blocks effects if opioids are taken

Suboxone (buprenorphine plus naloxone)
- Licit Use
  - Part of treatment plan for opioid addiction
  - Blocks effects of opioid
- Illicit Use
  - Hoarded by recipients and taken in high doses
  - Naloxone blocks effects if recipient attempts to illicitly liquify and inject this drug

Preventing Opioid Analgesic Diversion

Since dental offices are potential sources of opioid analgesics, the dental team must take precautions to prevent diversion.

- Preventing opioid analgesic diversion in the dental office requires that the dental team
  - Recognize drug-seeking behavior
  - Prescribe opioid analgesics appropriately
  - Utilize strategies to prevent order alteration

Questions?

Knowledge of pharmacology has never been more essential to patient care.
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