Pharmacology for Pain

Analgesics to Anti-Inflammatories and Beyond

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Causes of Pain

1. **Nociceptive**
   Noxious mechanical, thermal or chemical stimulus
2. **Inflammatory**
   Chemicals released by injured tissue sensitize nociceptors
3. **Neuropathic**
   Injury to/abnormal activity of neurons

Medications for Pain

1. **Nociceptive**
   Block nociceptors from sending pain signal
2. **Inflammatory**
   Reduce inflammation
3. **Neuropathic**
   Alter neural signals (transmission)

Medications for Pain

1. **Nociceptive**
   Opioids
2. **Inflammatory**
   Aspirin, NSAIDs, Acetaminophen
3. **Neuropathic**
   Antidepressants, Anticonvulsants

Opioids

- Alfentanil
- Buprenorphine
- Butorphanol
- Codeine
- Fentanyl
- Hydromorphone
- Levorphanol
- Meperidine
- Methadone
- Morphine
- Nalbuphine
- Oxycodone
- Oxymorphone
- Phentanyl
- Remifentanil
- Sufentanil
- Tapentadol
- Tramadol

Opioids MOA

- Bind to endogenous opioid receptors
  - Reduced pain transmission
    - Reduce likelihood of action potential
    - Potency directly correlated to affinity
  - Not limited to locations related to pain
    - GI tract
    - Brainstem respiratory centers

Opioids
PT Considerations

INPATIENT

Joe is a 55 year old male admitted to the hospital with a TBI and fractured femur following a fall from a ladder.

Med: Fentanyl

Opioid
PT Considerations

Practice Changes

- Orthostatic Hypotension
- Sedation
- Scheduling

Screening

- Respiratory rate
- Constipation
- Withdrawal

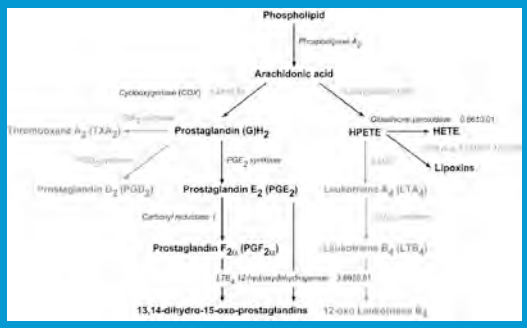
Aspirin & NSAIDS

- Aspirin
- Bromfenac
- Celecoxib
- Diclofenac
- Etodolac
- Fenoprofen
- Flurbiprofen
- Ibuprofen
- Indomethacin
- Ketoprofen
- Ketorolac
- Meloxicam
- Nabumetone
- Naproxen
- Oxaprozin
- Piroxicam
- Sulindac
- Tolmetin

Aspirin & NSAIDS MOA

- Block COX enzyme
  - Inhibits prostaglandin synthesis
    - Involved in the inflammatory response
      - Anti-inflammatory
    - Peripherally sensitizes nociceptors
      - Analgesic

Eicosanoid Pathway



Aspirin & NSAIDS PT Considerations

OUTPATIENT

April is a 28 year old woman with Rheumatoid Arthritis

Med: Meloxicam

Aspirin & NSAIDS PT Considerations

Practice Changes

- Scheduling
- Q&A for OTC and GI complaints

Screening

- GI complaints
- Bleeding
- Reye's syndrome
- Tissue Healing
  (for review see Vuolteenaho et al 2008)

Aspirin & NSAIDS PT Considerations

Patients at Higher Risk for Adverse Events

- Over the age of 65
- History of GI Ulcers
- Pre-existing heart-vascular condition including hypertension, hyperlipidemia, heart failure
- History of CVA
- History of RA
- Concurrent use of anticoagulant, corticosteroid, anti-depressants (SSRIs)
- Use of tobacco/alcohol

Acetaminophen MOA

- Block COX enzyme
  - Inhibits prostaglandin synthesis
    - Peripherally sensitizes nociceptors
      - Analgesic

Acetaminophen PT Considerations

OUTPATIENT

Charlie is a 50 year old male with hip osteoarthritis. PMHx includes ulcerative colitis.

Med: Acetaminophen

Acetaminophen PT Considerations

Practice Changes

- Scheduling
- Education

Screening

- Hepatotoxicity

Antidepressants

- Tricyclics
  - Amitriptyline
  - Clompramidine
  - Desipramine
  - Doxepin
  - Imipramine
  - Nortriptyline
  - Trimipramine
- SNRIs
  - Duloxetine
  - Milnacipran
  - Nefazodone
  - Venlafaxine

Antidepressants MOA

- Interfere with pain transmission
  - Block Na^+, Ca^{2+} channels
  - Block NMDA receptors
- Enhance pain suppression
  - Inhibit amine reuptake

Antidepressants PT Considerations

HOME HEALTH

Sadie is a 78 year old female with diabetic neuropathy (LE>UE) who is confined to home who has diabetic neuropathy

Med: Amitriptyline

Antidepressants PT Considerations

Practice Changes

- Orthostatic Hypotension
- Sedation
- Dysrhythmias
- Scheduling

Screening

- Changes in mental status/cognition
- Anticholinergic effects
  Dry as a bone, blind as a bat, red as a beet, mad as a hatter

Anticonvulsants

- Carbamazepine
- Lamotrigine
- Gabapentin
- Oxcarbazepine
- Pregabalin
- Topiramate

Anticonvulsants MOA

- Alter the activity of neurons
  - Block Na^+, Ca^{2+} channels
  - Enhance the activity of GABA

Anticonvulsants PT Considerations

OUTPATIENT

Joan is a 40 year old woman with fibromyalgia

Med: Pregabalin

Anticonvulsants PT Considerations

Practice Changes

- Orthostatic Hypotension
- Sedation
- Scheduling

Screening

- Skin rash