APPENDIX III

Acute Pain Management

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EPIDEMIOLOGY

- Affects 25-30% community dwelling patients > 60 years
- Morbidity of the pain in 2 times higher in patients > 60 years

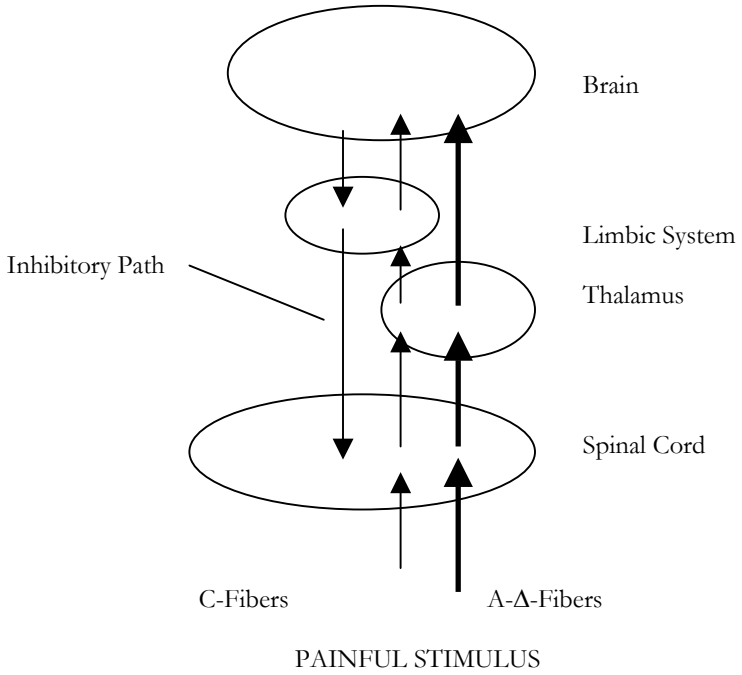
NEUROANATOMY

A-Δ fibers—large, myelinated, fast conducting—give location and intensity information
C fibers—non-myelinated, slow conducting—give dull, aching, burning sensations
Sensory neurons are generally bipolar with body in the dorsal root ganglion

- enter spinal column through dorsal roots
- synapse with interneurons in ascending internal and posterior spinothalamic tracts
- relay information to brain stem and thalamus with projections to the cortex
- also receive inhibitory stimulus via pathways from cortex, limbic system, thalamus, and midbrain

Neurotransmitters and receptors

- multiple opioid receptors—at least 5
- Serotenergic anti-depressants may stimulate the descending pathways that inhibit pain at the spinal cord level



TYPES OF PAIN

Nociceptive - results from stimulation of common pain receptors in most tissues. Most other receptors (e.g. pressure, stretch, thermal) can produce pain if stimulated appropriately. Nociceptive pain usually responds to traditional analgesic medications

- Somatic - related to skin, muscle, and tissues of somatic tissue origin
- Visceral—related to internal organs and viscera

Neuropathic - related to peripheral nerve or central nervous system injury or disfunction. Has been noted to respond to non traditional approaches such as antidepressants, anti convulsants, and sodium chanel blockers (lidocaine).

AGE RELATED CHANGES

- Clinical examples: painless myocardial infarctions and abdominal catastrophes
- Mechanoreceptor changes
    - 50% reduction in Pacinian Corpuscles
    - 10-30% reduction in Meissner's and Merkels Disks
- no change in number of free nerve endings
- Myelinated nerves—reduction in density of fibers, decreased action potential, slower conduction velocity, and increase in abnormal and degenerating fibers
- Unmyelinated nerves—some reduction of number, decreased substance P
- Loss of dorsal horn spinal neurons—altered endogenous inhibition, hyperalgesia
- Loss of neurons in cortex, midbrain, brainstem—reduced catecholamines, acetylcholine, GABA, 5HT
- Bottom line: both afferent and efferent pathways may be affected resulting in decreased excitatory and inhibitory response to pain stimulus. These changes may cancel each other out resulting in little net change in pain perception, although the system may be more sensitive to specific injury or disease.

CLINICAL ASSESSMENT

**Believe Patient—There are no biological markers for pain. The most valid and reliable indicator of pain and its intensity is the patient's own description

- History and Physical including neurological exam, musculo-skeletal, functional and psychosocial assessment
- Search for symptoms and signs of neuropathy (including autonomic neuropathy)
- Treat pain to facilitate diagnosis
- Consider alternative methods of pain control
- Reassess the patient's pain periodically

PAIN SCALES

- Scales are more reliable when asking about current pain
- Diary or bedside chart are helpful
- 0-10 (no pain-worst possible pain) verbal scale is most universal

CLINICAL PHARMACOLOGIC CONSIDERATIONS

- absorption—may be affected by decreased gastric acidity, decreased intestinal blood flow, decreased mucosal cell mass, decreased GI motility
- distribution—altered by less total body water, decreased lean body mass, decreased serum protein, and increased body fat
    - degree of protein binding and lipid solubility of a given agent will determine the effect of these changes
- metabolism—changes in hepatic blood flow and hepatic mass with decreased enzymatic acitivity
    - decreased creatinine clearance
- pharmacodynamic changes—altered receptor sensitivity may increase opioid and non-opioid effect

ANALGESIC LADDER

- World Health Organization
  - Step 1—mild pain: non-opioid analgesics; with or without adjuncts and non-drug strategies
  - Step 2—moderate pain: Step 1 plus weak opioids
  - Step 3—severe pain: Step 1 plus potent opioids

ROUTE OF ADMINISTRATION

- in general, use the least invasive route
- PO, SL, PR, transcutaneous
- both IM and SQ will have fluctuations in rate of absorption
- IV

TIMING

- Use short acting medications during titration or for breakthrough pain
  Breakthrough pain:
  1. End of dose, or inadequate sustained blood level during use of sustained release preparations,
     or continuous infusions
  2. Incident pain: incident to activity or proceedure
  3. Spontaneous, random pain (e.g. muscle spasm)
- Use sustained release or long acting medications for continuous pain
- PRN dosing only for episodic pain or breakthrough pain
- PRN dosing, remember that some patients may be unable or less able to verbalize pain
- Pre-emptive dosing for procedures, activities and exercise
- PCA (Patient Controlled Anesthesia)—method of choice for post-op and end of life pain. Can be provided by a variety of techniques including subcutaneous pump, IV, epidural and intrathecal external or implanted pumps

ANALGESICS FOR MILD TO MODERATE PAIN

- Acetaminophen, NSAIDs and aspirin
- analgesic ceiling effect
- NSAID's
  - mechanism: Inhibit cyclo-oxygenase (COX) which normally converts arachidonic acid to prostaglandins
  - COX-1—involved in prostaglandin mediated blood flow and organ function
  - COX-2—inducible enzyme involved in inflammatory response
  - inhibitors associated with less GI toxicity but no difference renal toxicity
  - fewer in vitro platelet effects
- CNS side effects: dizziness, anxiety, drowsiness, confusion, aseptic meningitis
- Specific Agents:

NSAID	Toxicity or Note
Trilisate (Choline magnesium trisalicylate) Disalcid (Salsalate)	Does not cause platelet dysfunction
Nabumatone (Relafen)	Less GI irritation (partial COX-2 specific)
Meclofenamate (Meclomen)	Higher incidence of diarrhea
Ketorolac (Toradol) and Piroxicam (Feldane)	Ketorlac available IM; Higher incidence of GI bleed

Indomethacin (Indocin)	High toxicity in frail elderly
Celecoxib (Celebrex) Rocoxib (Vioxx)	COX-2 Specific inhibitors; least GI toxicity

OPIOIDS

- No ceiling for analgesic effect
- elderly may be more sensitive to analgesic effect
    - Tolerance to some side effects (sedation, cognitive impairment) develops rapidly—within days
- No tolerance to constipation
- Do not confuse tolerance, dependency, and addiction!
    - Tolerance—pharmacologic property—less drug effect over time with constant exposure
    - Dependency—pharmacologic property—experience of side effect with withdrawal of drug following constant exposure
    - Addiction—behavioral problem—compulsive use despite destructive consequences

Drug	**Notes**
Codeine	Particularly constipating; taken as a pro-drug—requires hepatic enzymes for activation. These enzymes may be inhibited by Cimetidine, Fluoxetine, and Quinidine among others
Propoxyphene (best choice may be Darvocet-N 100)	Equianalgesic to ASA; dependency potential; active metabolite renally excreted
Meperidine (Demerol)	Normeperidine (active metabolite) predisposes to seizures and delirium; erratic IM absorption
Pentazocine (Talwin)	**AVOID** Opioid agonist and antagonist; high rate of delirium in elderly—May be removed from the market
Butorphanol (Stadol)	**AVOID** Also mixed ag/antagonist; can displace other opioids at receptors—may precipitate withdrawal and autonomic crisis
Methadone	Prolonged half life; analgesic effect short relative to other effects
Fentanyl Patch	Very Potent (50x MS); for patch, reservoir is skin, so removing patch alone **will not help** in OD situation; **wide** variability of dose equivalent; 72h half life; must titrate very slowly and provide ample breakthrough meds
Levorphanol (Levo-Dromoran)	Long half life (12-16h), titrate slowly

EQUIANALGESIC DOSES OF OPIOIDS

Be sure to look up dose equivalents each time!!

Opioid	Potency relative To Morphine	Ratio of PO to IV	Half Life (h)
Morphine	1.0	3:1	2-4
Methadone	1.0	N/A	12-24 (analgesia is shorter: 4-6)
Hydromorphone	7.0	5:1	2-4
Oxycodone	.8	N/A	3-4
Fentanyl	100	N/A	.5 (IV only)
Levorphanol	7.5	2:1	

Adapted from Forman WB, 1996, page 493.

Note: One should think of dosing analgesics in the same way one doses coumadin. One size does not fit all—patients require close follow-up and dose titration. Most patients will require 2-3 dose adjustments before their pain is adequately controlled.

REFERENCES

AGS Panel on Chronic Pain in Older Persons: Management of Chronic Pain in Older Persons. Journal of the American Geriatrics Society 46:635-651, 1998

Abrahm JL. Advances in pain management for older adult patients. Clinics in Geriatric Medicine 2000; 16:269-289.

Ferrell B. Lecture on Pain Management in the Elderly. Given at the 16th Intensive Course in Geriatric Medicine and Board Review, September 1999.

Forman WB. Opioid analgesic drugs in the elderly. Clinics in Geriatric Medicine 1996; 12:489-99.

Hewitt DJ, Foley KM. Pain and Pain Management. In: Cassel CK, Cohen HJ, Larson EB, et al. Editors. Geriatric Medicine, third edition. New York: Springer, 1996:865-82.

Lipman AG. Analgesic drugs for neuropathic and sympathetically maintained pain. Clinics in Geriatric Medicine 1996; 12:501-515