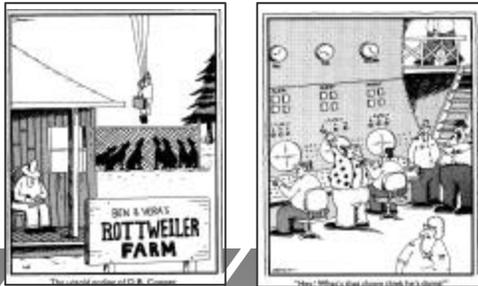


Pharmacology and the Role of the Military Physical Therapist



Pharmacology and the Role of the Military Physical Therapist



Terminal Objectives

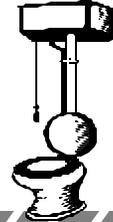
- ◆ Describe the current prescription patterns of military physical therapist
- ◆ Describe the considerations for medications commonly prescribed by military physical therapists

Perspective: in scope of practice?

- ◆ PTs prescribing meds is controversial
- ◆ PTs greatest strengths are in non-pharmacologic treatment approaches
- ◆ Primary care necessitates prescription-writing privilege
- ◆ Army PTs write fewer prescriptions as they gain experience
- ◆ PTs must know about meds whether they prescribe them or not.

First Rule

- ◆ Never under any circumstances take a sleeping pill and a laxative on the same night.



APTA's House of Delegates

- ◆ Position on use of medications in physical therapy (HOD 06-89-43-89 Program 32)
- ◆ "The scope of practice of physical therapy often requires the use of medications in the course of patient treatment, such as in the administration of phonophoresis, iontophoresis, nebulized bronchodilators, and wound management. The application and storage of medications used in physical therapy is within the scope of physical therapy practice."

History

- ◆ Shortage of Army Orthopedists in early 70s
- ◆ Army PTs began physician extender role
- ◆ Favorable report 1975 on LBP & PT NMSEs
- ◆ Limited PT drug prescription in mid-70s
 - Analgesics, M. Relaxants, NSAIDs
 - 1984: 50-75% of Army PTs prescribing meds
 - 1987: PTs prescribed meds in 23/35 (66%) clinics
 - 1994: PTs prescribed meds in 25/34 (74%) clinics
 - 2000: PTs prescribed meds in 16/17 (94%) clinics
- ◆ No record of lawsuits

Physician Support

- ◆ Only data from Franklin (1984) study
 - 68/382 (18%) surveyed physicians supported PTs prescribing medications
 - Medium to high support from orthopods, internists, GPs, neurologists, pediatricians
 - Low support from physiatrists and neurosurgeons

Service-specific Privileges: Army

- ◆ AR 40-48 (1 August 1995)–
“Prescription writing. Privileged PTs/OTs may write prescriptions for selected medications. These medications must have been-- (1) Recommended by the P&T committee. (2) Reviewed by the credentials committee. (3) Approved by the MTF commander.”

Service-specific Privileges: Navy

- ◆ BUMEDINST 630.66B (3 Nov 97) -
“Prescribe aspirin, tylenol, parafon forte, robaxin, and designated nonsteroidal anti-inflammatory drugs (to be filled only at the facility’s pharmacy).”

Service-specific Privileges:

- ◆ Air Force: Local privileges awarded
 - WHMC at the BMT clinic
 - Credentials list currently in revision
- ◆ USPHS: no current prescribing privileges

Specific Medications Prescribed by Physical Therapists

- ◆ NSAIDs
- ◆ Muscle Relaxants
- ◆ Tylenol (analgesic)
- ◆ Miscellaneous items

Survey of Army Physical Therapy Clinics April 2000

17 Clinics Responded

1. What drugs can your therapists prescribe from the formulary?
2. What drugs do you use with phonophoresis? iontophoresis?
3. Are there any dosing restrictions on the drugs approved for prescription by PTs ?
4. When prescribing, do your PTs use paper prescription pads, a computer-based system, or both?
5. Do you have any specific criteria for approving prescribing privileges for your PTs (determination of competence)?
6. What’s the ratio of (# PTs with prescribing privileges)/(Total # PTs in your clinic)?
7. After looking at the syllabus, is there anything else related to pharmacology you wish we would teach our entrylevel PTs?

Army PTs Prescribe in 16/17 Clinics (94%)

Total Percent

Army PTs Prescribe in 16/17 Clinics (94%)

Army PTs Prescribe in 16/17 Clinics (94%)

Prodoxine (36) 1 6%

Dosing Restrictions? 7 (41%) replied "none"

◆ Other responses:

- Yes, cannot renew Indocin
- 1 month supply, no refills
- Acetaminophen – 1 gram qid x 10 days with 2 refills;
- Ibuprofen – 800 mg po tid x 10 days with 2 refills;
- Naproxen – 500 mg po bid x 10 days with 2 refills
- <31 day supply for NSAIDS (except BCT 5 day supply, AIT 10 day supply), <6 day supply for M. relaxants
- 800mg Motrin
- only restrictions are the four day refills as per "1".
- we can only prescribe to AD, 1 thirty day dosage w/o refills
- No refills on Rx's
- 15 or 30 day supply: see list
- NSAIDs (60 day supply only). There is no specific dosing restriction. We are allowed to maintain a two week supply of dexamethasone for clinic use.

Prescription pads, computer, or both?

◆ All respondents use CHCS.

◆ Other interesting responses:

- Both computer and prescription pads (since our computers are down more than up).
- At the TMCs, the PTs give the Motrin directly to the PNT. At the hospital we use the computer.

Specific criteria for approving prescribing privileges (determination of competence)?

- ◆ Only one clinic had formal criteria:
1) PT Licensure, 2) Inservice by Pharmacist
- ◆ For several clinics, pharmacy inservice was optional (available).
- ◆ Remainder of respondents indicated that prescribing privileges are part of the credentials process (tied to NMSE credentials), relying on the judgment of the clinic chief.
- ◆ One respondent commented that physicians do not have special competence criteria for prescribing privileges.

Ratio of (# PTs with prescribing privileges)/(Total #PTs in your clinic)?

- ◆ 100%
- ◆ All therapists in all of the clinics responding to the survey had prescribing privileges, except for the one responding clinic where none of the PTs prescribe drugs.

Requests from Clinic Chiefs for Pharmacology Instruction of Entry -level PTs

- ◆ Emphasize importance of understanding drug interactions.
- ◆ Help students understand that prescribing medications is only a minor adjunct for PTs: our focus is primarily non-pharmacologic intervention.



NSAIDs, Analgesics, & Muscle Relaxants

Treatment of Pain and Inflammation

- ◆ analgesics
 - nonopioids
 - ◆ NSAIDs
 - ◆ acetaminophen
 - opioids
- ◆ anti-inflammatory agents
 - glucocorticoids
 - NSAIDs

Non-narcotic Analgesics: NSAIDs & acetaminophen

- ◆ for mild to moderate pain
- ◆ therapeutic effects

- | | |
|---------------------|------------------|
| ◆ NSAIDs | ◆ Tylenol |
| – analgesic | – analgesic |
| – antipyretic | – antipyretic |
| – anticoagulant | |
| – anti-inflammatory | |

Specific NSAIDs (see Tables 2-4)

- ◆ Over-the-counter (OTC):
aspirin (many trade names)*
- ◆ ibuprofen (Advil, Motrin, others)*
- ◆ naproxen (Aleve, Naprosyn)*
- ◆ ketoprofen (Orudis)

*Approved for Army PT prescription, 2009 survey

Prescription NSAIDs:

- | | |
|-----------------------------|---------------------------------|
| ◆ salsylate (Disalcid)* | ◆ diclofenac (Voltaren) |
| ◆ indomethacin (Indocin)* | ◆ diflusal (Dolobid) |
| ◆ meclofenamate (Meclomen)* | ◆ etodolac (Lodine) |
| ◆ piroxicam (Feldene)* | ◆ fenoprofen (Nalfon) |
| ◆ sulindac (Clinoril)* | ◆ flurbiprofen (Ansaid) |
| ◆ tolmetin (Tolectin)* | ◆ ketorolac (Toradol) |
| | ◆ mefenamic acid (Ponstel) |
| | ◆ nabumetone (Relafen) |
| | ◆ oxaprozin (Daypro) |
| | ◆ phenylbutazone (Cotybutazone) |

*Approved for prescription by Army PTs (April 2009 Survey)

Comparison of OTC to Prescription NSAIDs

- ◆ OTC NSAIDs sold in smaller doses
- ◆ for patient safety
- ◆ OTC ibuprofen: 200mg tablets
- ◆ prescription Motrin: 800mg tablets
- ◆ Take 4 200mg ibuprofen tablets for same effect

Acetaminophen (Tylenol etc.): relationship to NSAIDs

- ◆ **Analgesic properties equal to NSAID's**
- ◆ Less gastric irritation with Tylenol
- ◆ Tylenol has no anti-inflammatory effect or anticoagulant effect
- ◆ Tylenol drug of choice for pregnant women and children with fever

This stuff CAN Kill you!

Toxic dose: varies, depends on many factors, including hydration level (hydrated cells more robust)

NSAIDs Therapeutic Effects (memorize this)

- ◆ analgesic
- ◆ antipyretic
- ◆ anticoagulant
- ◆ anti-inflammatory

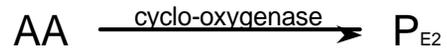
NSAIDs Mechanism of Action: the prostaglandin story

- ◆ Prostaglandins: lipid-like compounds
- ◆ Every cell (except RBCs) can produce
- ◆ Wide range of effects
 - pain
 - fever
 - coagulation
 - inflammation
 - uterine contractions
 - protection for stomach
 - protection for kidney

Prostaglandins don't cause pain; they sensitize cells to bradykinins

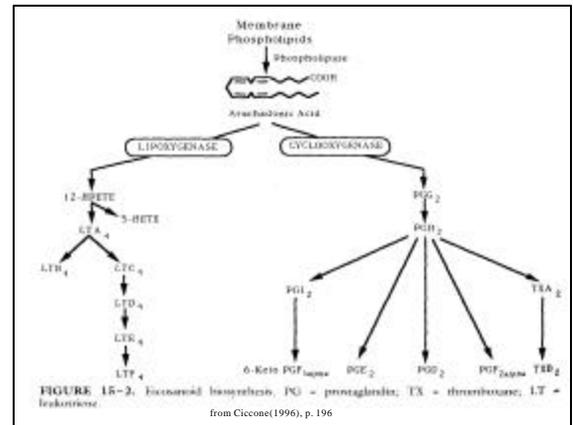
NSAIDs: Prostaglandin Inhibition

- ◆ prostaglandin E2 synthesized from arachidonic acid only if cyclo-oxygenase available



NSAIDs: Prostaglandin Inhibition

- ◆ prostaglandin E2 synthesized from arachidonic acid only if cyclo-oxygenase available
- ◆ ASA inhibits cyclo-oxygenase



NSAIDs: Prostaglandin Inhibition

- ◆ ALL NSAIDs work by prostaglandin inhibition
 - aspirin
 - Feldene
 - Indocin
 - Motrin
 - etc.
 - etc.
 - etc.

Primary Problem with NSAID's?

They cause GI Irritation and Damage
(direct & indirect)

Cyclooxygenase Subtypes: COX-1 and COX-2

- ◆ Two isoforms (isoenzymes) of cyclooxygenase
- ◆ COX-1: normally present, protects cells (particularly in stomach & kidneys)
- ◆ COX-2: produced when cells injured

COX-1 helps protect stomach mucosa against HCL, helps glomerular filtration in kidney; helps platelets become "sticky"

COX-2 selective drugs

- ◆ Celecoxib (Celebrex)
- ◆ Rofecoxib (Vioxx)
- ◆ These drugs don't inhibit the "good" PGs that protect the stomach & kidneys
- ◆ May ↓ pain & inflammation with less gastric irritation, less renal toxicity

side effects are lower GI tract cramping, diarrhea
more expensive (new)

Clinical Considerations (patient education)

- ◆ The analgesic doses for NSAIDs are less than the anti-inflammatory doses
- ◆ **Anti-inflammatory effects are realized later (10-21 days) than analgesic effects (20-30 min)**
- ◆ Typical analgesic dose for aspirin is 3 tablets (325 mg) qid

Adult anti-inflammatory dose for ASA is 3600 mg (~12 tabs @325mg/tab) to 5400 mg

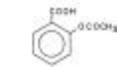
Clinical Considerations (patient education)

- ◆ NSAIDs should not be taken on an empty stomach
- ◆ Most patients will have to be convinced to comply with anti-inflammatory regimen
- ◆ Inform patients: Tylenol ≠ NSAID

Food in the stomach will neutralize, absorb some. HCl in the stomach at the time

Aspirin: The Prototype for NSAIDs

- ◆ Aspirin = acetylsalicylic acid = ASA
- ◆ Used clinically for a century
- ◆ Some patients disrespect ASA
 - "old" drug
 - inexpensive
 - readily available without prescription
- ◆ Truth: ASA is very powerful, very effective drug; probably drug of choice



Aspirin
(acetylsalicylic acid)
from Cicconati 1996, p. 195

ASA vs. other NSAIDs

- ◆ Summary: other NSAIDs are attempts by drug companies to make a better aspirin; goals:
 - More Efficacious
 - Fewer side-effects
- ◆ Result: most are really no better, but are far more expensive
 - May provide better effects in some patients

Adverse Effects

- ◆ Gastric irritation, ulcers
 - most NSAIDs give some GI irritation to most people
- ◆ hepatic and renal toxicity, particularly in patients with previous damage
- ◆ overdose: ASA intoxication
 - hearing loss
 - tinnitus
 - confusion
 - headache

As little as 10g ASA can be fatal (~31 tabs @ 325mg/tab : only do uble the max daily antiinflammatory dose)

Prevention of GI Irritation

- ◆ Misoprostol (Cytotec)
 - Prostaglandin E1
 - ✦ Inhibits gastric acid secretion & prevents gastric damage.
- ◆ Indications/Contraindications
 - Individuals with known/developed or at risk for GI irritation
 - ????
- ◆ Side-effects
 - Diarrhea
- ◆ Others

Smalley et al. (1995) Article

- ◆ ~104,000 elderly patients' records reviewed
- ◆ ~1,400 hospitalized for ulcers or UGI bleeds
- ◆ NSAID users 4x as likely to be hospitalized
- ◆ New NSAID users 5x - 6x as likely to be hospitalized
- ◆ Higher doses = higher hospitalization rates

75 million NSAID scripts/year (~5% of all) at a cost of \$2.5 billion.
OA primary reason for NSAID use in elderly.

Tamblyn et al. (1997) Article

- ◆ NSAID prescriptions → 7,600 deaths/yr
- ◆ 76,000 hospitalizations per year
- ◆ Elderly women 2x as likely to have GI problems from NSAIDs as men
- ◆ Unnecessary NSAID prescriptions written in 42% of 139 blinded visits by standardized patients
- ◆ Risk for inappropriate prescriptions greater if risks not assessed in history

Sobering Treatment Facts

What determines the clinical decision to treat some, but not other, individuals with hypertension?

- ◆ Level of blood pressure
- ◆ Patient's age
- ◆ Physician's year of graduation from medical school
- ◆ The amount of target organ damage

Relative Contraindications for NSAIDs

(memorize this)

- ◆ History of peptic ulcer disease
- ◆ History of renal disease
- ◆ History of liver disease
- ◆ History of CHF
- ◆ Hypertension
- ◆ Asthma/reactive airway disease
- ◆ Pregnancy, nursing mothers
- ◆ Concurrent use of corticosteroids
- ◆ Concurrent use of anticoagulants

Another Relative Contraindication for NSAIDs?

- ◆ Acute muscle injury
- ◆ Evidence is emerging from animal studies that NSAIDs given during acute stage of muscle injury may delay muscle fiber regeneration and recovery of force generating capacity

-Almekinders LC, Gilbert JA. Healing of experimental muscle strains and the effects of nonsteroidal anti-inflammatory medication. Am J Sports Med 14:3030-3038, 1986
 -Mishra DK, Friden J, Schmitz MC et al: Anti-inflammatory medication after muscle injury. A treatment resulting in short-term improvement but subsequent loss of muscle function. J Bone Joint Surg 77:1510-1519, 1995
 -Obrensky WT, Seaber, AV Ribbeck BM, et al: Biomechanical and histological evaluation of a controlled muscle strain injury treated with piroxicam. Am J Sports Med 22:558-561, 1994

Treatment of Muscle Spasm & Spasticity

- ◆ Primary goal: selective decrease skeletal muscle excitability
- ◆ Primary use:
 - muscle spasms
 - spasticity

rick is to relax hyperexcitable muscle without relaxing all muscles

Conditions of increased skeletal muscle excitability

- | | |
|---|-----------------------------------|
| ◆ Muscle spasms: | ◆ Spasticity: |
| – injury usually to muscle, peripheral nerve | – CNS lesion (SCI, CP, CVA, etc.) |
| – tonic contraction in paraspinals, traps, etc. | – exaggerated stretch reflex |

Drugs for Muscle Spasms:

- ◆ Polysynaptic inhibitors
 - orphenadrine (**Norflex, Norgestic**)*
 - methocarbamol (**Robaxin**)*?
 - cyclobenzaprine (**Flexeril**)*
 - carisoprodol (Soma)
 - chlorzoxazone (Parafon Forte, others) ?
 - metaxalone (Skelaxin)
- ◆ Diazepam (Valium)

? Approved for Navy PT prescription
 *Approved for Army PT prescription, 2000 survey

Polysynaptic Inhibitors

- ◆ Act on polysynaptic reflex arc in spinal cord (?)
- ◆ Inhibit excitatory input onto alpha motor neuron
- ◆ Also cause sedation... primary effect?

Question mark is because there's no evidence that these drugs really work on the polysynaptic reflex pathway.

Therefore, do they really act as muscle relaxers, or is all the effect due to sedation?

AHCPR LBP Guideline

◆ Panel findings and recommendations:

- Muscle relaxants are an option in the treatment of patients with acute low back problems. While probably more effective than placebo, muscle relaxants have not been shown to be more effective than NSAIDs. (Strength of Evidence = C.)
- No additional benefit is gained by using muscle relaxants in combination with NSAIDs over using NSAIDs alone. (Strength of Evidence = C.)
- Muscle relaxants have potential side effects, including drowsiness in up to 30 percent of patients. When considering the optional use of muscle relaxants, the clinician should balance the potential for drowsiness against a patient's intolerance of other agents. (Strength of Evidence = C.)

C = "moderate" evidence

http://text.nlm.nih.gov/ftp/pub/clinical/brochure/ahcpr/ahcprbk_1998thK448.tsk_55108Et-096080061&collec=ahcpr

DOD/VA LBP Guideline

(repeats AHCPR recommendations verbatim)

- ◆ Muscle relaxants are an option in the treatment of patients with acute LBP. While probably more effective than placebo, muscle relaxants have not been shown to be more effective than NSAIDs.
- ◆ No additional benefit is gained by using muscle relaxants in combination with NSAIDs over using NSAIDs alone.

<http://www.cs.amedd.army.mil/Qmo/lbpfr.htm>

Drugs for Muscle Spasticity:

- ◆ Diazepam (Valium)
- ◆ Baclofen (Lioresal)
- ◆ Alpha-2 agonists: clonidine, tizanidine
- ◆ **Dantrolene sodium (Dantrium)**

Muscle Relaxants: Rehabilitation Concerns

- ◆ Generalized weakness
- ◆ Sedation
- ◆ Possible drastic change in muscle tone over relatively short time span

Pharmacologic References

- ◆ Physician's Desk Reference (PDR)
- ◆ Software pharmacologic references
- ◆ Web-based pharmacologic references
 - www.mdconsult.com
 - www.cvs.com/
 - www.fda.gov/cder/consumerinfo/default.htm
 - www.healthtouch.com
 - www.druginfonet.com