Cultural, Nutritional, and Pharmacological Considerations in Home Health

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Cultural Nutritional and Pharmacological Considerations of PT Intervention in the Aging in the Home Health Environment

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COURSE OBJECTIVES

Upon completion of this course, the participant will be able to:

1. Discuss the importance of nutrition to promote health and wellness in the home health population.
2. Review nutritive and supplement interactions that can occur with certain medications.
3. Identify cultural, traditional or religious factors that may influence the patients’ compliance.
4. Explore strategies to increase communication and compliance of the patient with diverse cultural, traditional or religious background.
5. Describe the primary pharmacokinetic factors involved in drug therapy (drug administration, absorption, distribution, interaction, and elimination).
6. Explain how altered pharmacokinetics may lead to a decrease or an increase in drug effects, and how these effects may be recognized in the home health patients/clients receiving therapy.
7. Identify the general categories, mechanisms of action, risk-benefit ratio, and implications on rehabilitative interventions for the pharmacological agents routinely prescribed for conditions involving the cardiovascular, neuromuscular, endocrine, pulmonary, and central nervous systems in the home health population.
8. Identify the possible effects of polypharmacy and various drug-drug interactions on the effectiveness of rehabilitative interventions and functional outcomes in the home health patient/client.
Overview of Cultural Influences

- What is Culture?
  - Learned values, beliefs, behaviors that are shared within groups (Betancourt JR 2004)
  - Dynamic process through which ordinary activities and conditions take emotional or moral tone and meaning to participants (Kleinman A & Benson P 2006)
Overview of Cultural Influences

- Is culture the same as ethnicity or race?
  - Assumptions
  - Stereotyping

- What is the impact on communication?
  - Examples:

Overview of Cultural Influences in the Home Health Environment

- Characteristics of culturally competent Physical Therapist
  - Has developed skills in intercultural communication
  - Has knowledge in the impact of sociocultural factors on health care
  - Demonstrates an attitude of humility and willingness to learn from other cultures

(Paasche-Orlow M. 2004)
Overview of Cultural Influences in the Home Health Environment & Communication

- Language
- Verbal communication & meaning
- Body language and non-verbal communication
- History & asking questions
  - Explain purpose
- Understanding of instructions
- Name, addressing patient and family

Overview of Cultural Influences in the Home Health Environment

- Cultural perspectives influence
  - Understanding of Disease
  - Experience of health, wellness, illness and disability
  - Expectations of Health Care
  - Examples:
Cultural Influences in the Home Health Environment

- Cultural perspectives are important in determining and striving for meaningful goals
- Perspectives of the patient versus the Clinician
  - Expectations
  - Standards
  - Language
  - Belief system
- Successful communication
  - Mutual understanding
  - Positive attitude
  - Respect & Humility

Cultural & Traditional Influences in the Home Health Environment

- Concept of Functional Independence
  - Cultural influences dictate expectations of patient and family
    - Expression of respect
- Solution
  - Strive for patient centered culturally sensitive care
  - Identify relevant and realistic goals
  - Communication
  - Patient / family education
Cultural & Traditional Influences in the Home Health Environment

- Age & Aging
- Family Roles
  - Support
  - Decision making
  - Language and use of Interpreters
  - Family Dynamics
- Examples

Cultural & Traditional Issues in the PT Home Health Environment

- Compliance Issues
- Time concept and scheduling
- Extended Family and Friends
Religious / Spiritual & Traditional Influences in the PT Home Health Environment

- Religious & Spiritual Factors
  - Male / Female Roles
  - Use right vs left hand
  - Cloths and draping
  - Scheduling
  - Goals & Intervention
  - Compliance

Strategies for PT in the Home Health Environment

- Dress Code

- Universal Precautions/ Hygiene

- Time and Scheduling

- Gifts
Introduction

• Nutrition important determinant of health in elderly patients.

• Over past decade, importance of nutritional status has been increasingly recognized in a variety of morbid conditions including CA, heart disease, and dementia in persons over age of 65.

Introduction

• No uniformly accepted definition of malnutrition in elderly, some common indicators include involuntary weight loss, abnormal BMI, specific vitamin deficiencies, and decreased dietary intake.

• Malnutrition in older patients is regularly underdiagnosed and many physicians have expressed need for more education regarding nutritional status in older patients.
Introduction

• Increased risk for malnutrition compared with other adult populations.
  – Between 2%–16% of community-dwelling elderly are nutritionally deficient in protein and calories.

• Mineral and vitamin deficiencies may be as high as 35%

• Studies of hospitalized older patients suggest that between 20%–65% of these patients suffer from nutritional deficiencies
  – long-term care facilities is estimated to be between 30%–60%.

Metabolic rate and energy requirements

• Basal metabolism or energy requirements for elderly diminish by 100 kcal/day per decade.

• Difficult to meet daily micronutrient requirements with this reduced caloric intake.

• Multivitamin supplement recommended
  – caloric intake is less than 1500 kcal/day
Age-related changes to the GI tract

- Alterations in taste and smell associated with aging.

- Greater satiation after meal - gastric emptying has been shown in older people.

- Oral and dental issues, esophageal motility, and atrophic gastritis may also affect nutritional status.
  - impaired vitamin B12 and iron adsorption.


Weight loss

- Loss of more than 4% per year - independent predictor of mortality.

- Rapid weight loss of 5% or more in one month is considered significant and needs to be immediately evaluated by a physician.

- Moderate declines of 5% or more over 3 years is predictive of mortality in older adults.

Malnutrition

• Symptoms
  – Weight loss
  – Disorientation
  – Lightheadedness
  – Lethargy
  – Loss of appetite

  – can easily be mistaken for illness or disease.

Malnutrition

• Medication SE:
  – reduce appetite, cause nausea, or make food taste differently.

• Decrease in gustatory/olfactory

• Poor dentition

• Financial burden- limited income—buy cheaper non nutritious foods

• Depression—forgetfulness—pain—arthritis—limited mob
General Recommendations

- 5–12 servings of grains
- 5–10 servings of fruits and vegetables
- 2–4 servings of milk products
- 2–3 servings of meat or meat alternatives

Foods high in fiber and complex carbohydrates such as whole grains, vegetables, and fruits preferred.

Fat intake should be less than 30% of total caloric intake
- nutritionally compromised patients should be encouraged to consume nutrient-dense foods.

For malnourished elderly patients, counseling is effective in improving dietary habits.

General Recommendations

• In lieu of consensus from specialized nutrition studies in the elderly, preventive dietary strategies may be inferred.

• Increasing dietary fiber useful treatment of constipation, GI, lipid disorders, and obesity.

• Reduction in sodium has been shown to reduce BP and also reduce the risk of developing HTN.


General Recommendations

• Adult calcium intake:
  – 1200 mg/day for those over 50 years of age

• 400IU of vitamin D is recommended for ages 50–70
  – 600 IU for those over 70 years of age.

• Seasonal vitamin D deficiency highly prevalent
  – 35%–90% of the institutionalized elderly

Food – Drug Interactions

- Defined as:
  - alterations of pharmacokinetics or pharmacodynamics of a drug
  - compromise in nutritional status as a result of the addition of a drug

- Elderly particularly at risk– over 30% of all the prescription drugs are taken by this population.


Food – Drug Interactions

Two main clinical effects:

- decreased bioavailability of a drug → predisposes to treatment failure

- increased bioavailability → increases risk of adverse events --may precipitate toxicities
Pharmacokinetic changes

- Water-soluble drugs become more concentrated - dehydration
- Fat-soluble drugs may have longer half lives due to slower release of drug from fatty tissues.


Recommendations

Grapefruit Juice

Overall exposure of some drugs can be increased 5X

Onset of interaction is immediate and magnitude increases with repeated consumption.

Effect continues for several days after the discontinuation of grapefruit juice consumption.
Grapefruit juice

- The benzodiazepines:  
  - Halcion, Valium, Xanax
- Antidepressant: Zoloft
- Statins
- Antihistamines
- Antiobiotics
- Oxycodone/hydrocodone
- Anti-arrythmic drugs

Anticoagulant Recommendations

- **Warfarin** - at particular risk of interactions with dietary supplements, yet approximately 30% use herbal supplements on a regular basis.

  - Possible interaction between *warfarin* and *high-protein diet*.
    - Raised serum albumin levels has been postulated as mechanisms for the resulting *decrease in international normalized ratio (INRs)*.

Cultural Nutritional and Pharmacological Considerations of PT Intervention in the Aging in the Home Health Environment

Anticoagulant Recommendations

• Some vegetables (broccoli, Brussels sprouts, kale, parsley, spinach, and others) are high in vitamin K.

• Eating large quantities or making sudden changes in the amounts eaten of these vegetables, decreases effectiveness and safety of warfarin therapy.

• Cranberry juice – elevated INR

Cardiac Meds Recommendations

• Licorice extract, causes sodium retention/potassium depletion.
  – may interfere with various medicines including antihypertensive and anti-arrhythmic agents.

• Daily consumption may also cause an increase in blood pressure.
  – No more than 10-30g liquorice and no more than half a cup of liquorice tea a day

Cardiac Meds Recommendations

• Anti-hypertensives - benefit from concomitant moderate sodium restricted diets.

• **Propranolol** serum levels - may be increased if taken with rich protein food.
  – A change in diet from high carbohydrates/low protein → low carbohydrate/high protein may result in increased oral clearance.


Psychotropic Recommendations

• Tyramine-containing food capable of producing hypertensive crisis in patients taking **MAOIs** (Moclobemide, Rolipram)
  – matured cheese, red wine, ripe bananas, yogurt, shrimp paste and salami

  -- transdermal formulations may provide a valuable therapeutic option and eliminate the drug-food interaction

Psychotropic Recommendations

Some atypical antipsychotics (Clozapine, Olanzapine, Risperidone) associated with glucose intolerance.

– Risk factors such as underlying diabetic condition or an increase in weight are present.

Other antipsychotics with no association with glucose intolerance has been demonstrated (haloperidol, chlorpromazine) should be preferred when possible.


Antibiotic Recommendations

- **Ciprofloxacin** - Ingestion of the juice should be discouraged.

- **Azithromycin** - absorption decreased when taken with food, up to 43% reduction in bioavailability.

- **Tetracycline** - should be taken 1 hour before/2 hours after meals--not taken with milk because it binds calcium and iron, influencing its bioavailability.

Analgesic Recommendations

• Acetaminophen should be taken on empty stomach because food may slow absorption.

• NSAIDs like ibuprofen, naproxen, can cause stomach irritation and thus they should be taken with food or milk.


Analgesic Recommendations

• Avoid/limit use of alcohol because chronic alcohol use can increase the risk of liver damage or stomach bleeding.

• Daily dosage and frequency of ibuprofen must be reduced when administered with Coca-Cola.

Antidiabetic Recommendations

- **Glimepiride** - administered with breakfast or the first main meal of the day.
  - Absence of food interaction guarantee highly reproducible pharmacokinetics.
  - *Immediate release* -- should be taken 30 minutes before meals.
  - *Extended release tablets* -- should be taken with breakfast.


Summary

- More than other adults, patients over the age of 65 are at nutritional risk
  - greater burden of comorbid illnesses coupled with common physiological changes due to aging.

- Physicians need to maintain strong suspicions of malnutrition in senior population
  - aggressive in instituting preventive measures and treatment strategies for those at risk.

- Because of the impact of coexisting disease on overall nutritive status, a comprehensive, multidisciplinary approach is often helpful.
Take Home

- Multivitamin supplements are highly recommended for older patients, especially in seniors whose daily caloric intake is less than 1500 kcal/day.

- Advise patients about nutrient-dense food choices when appropriate.

- Investigate body weight losses of 4% or more.

Take Home

- Calcium and vitamin D supplementation have been shown to reduce hip fracture rates and are recommended for patients over 65 years of age.

- Advise patients on the merits of whole grains, fruits, and vegetables.
Purpose

• Describe most common drug classes taken by patients receiving therapy.
• Summarize adverse effects of these drug classes
• Provide specific examples of drug-drug interactions of importance to PTs, OTs, PTAs and COTAs.

General Description of Drug Problems

• Drug (kinetics, dynamics, & toxicity)
• Drug-Drug Interactions
• The Patient
Clinical Application

• How does all this information affect us as clinicians when treating patients?

• What should we know?

• Why is this important to us?

Why?

• Response

• Optimal time for therapy

• Side effects / adverse drug reactions
Basic Concepts of Pharmacology

**Pharmacotherapeutics** – the study of the use of drugs to prevent, treat, or diagnose disease.

**Pharmacodynamics** – the analysis of what the drug does to the body, including the mechanism by which the drug exerts its effect.

**Pharmacokinetics** – the study of how the body deals with the drug in terms of the way the drug is absorbed, distributed and eliminated.

Three types of SE/ADR
  - **Mechanism based**
    - Usually dose related
    - Same receptor or receptor types in the given tissue or in different tissues
  - **Off-target based**
    - Not a consequence of the drug’s primary mechanism of action but a consequence of the particular drug molecule.
  - **Idiosyncratic in nature**
    - Interaction of the drug with unique host factors
      - Mechanism based
      - Off-target based
• **Three types of SE/ADR**
  - **Mechanism based**
    • Bronchoconstriction with a non-selective β-blocker
    • Sedation with an anti-histamine
  - **Off-target based**
    • Hepatotoxicity of acetaminophen
  - **Idiosyncratic in nature**
    • **Mechanism based**
      – Angioedema seen with ACE inhibitors
    • **Off-target based**
      – Anaphylaxis to penicillin

**Reasons are many:**

**Age**

**Inadequate history**

**Drug selectivity**
Definitions

- **Pharmacotherapeutics** – the study of the use of drugs to prevent, treat, or diagnose disease.
  - **Pharmacodynamics** – the analysis of what the drug does to the body, including the mechanism by which the drug exerts its effect. Drug indications.
  - **Pharmacokinetics** – the study of how the body deals with the drug in terms of the way the drug is administered, absorbed, distributed and eliminated.

- **Pharmacokinetics**
  - **Administration**
  - **Absorption**
  - **Distribution**
  - **Elimination**
    - **Metabolism**
      - Biotransformation
    - **Excretion**
      - Kidney, lungs
Administration

**Enteral – administration by the GI tract**
- Oral
- Sublingual
- Rectal

**Parenteral – any route that does not require the GI tract**
- Inhalation
- Injection
- Topical
- Transdermal

• Absorption
  – This refers to the entrance of a drug into the blood stream.

  – All drugs, except those given IV or intra-arterial, must pass through the membrane of the GI lining &/or the blood vessel before they gain access to the blood.
Fick’s Law of Diffusion
Passive movement across a plasma membrane

\[ \text{ROM} = \frac{([C_o-C_i] \times A \times P)}{D} \]

\( C_o-C_i \) = concentration difference  
\( A \) = surface area available  
\( P \) = permeability coefficient  
\( D \) = distance across the membrane

Table 3-1: Routes of administration, general characteristics, and bioavailability

<table>
<thead>
<tr>
<th>Route</th>
<th>Characteristics</th>
<th>Bioavailability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enteral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PO</td>
<td>Most convenient; first-pass effect may be significant</td>
<td>5 to &lt;100</td>
</tr>
<tr>
<td>Sublingual/buccal</td>
<td>Avoids first-pass effect</td>
<td>75 to &lt;100</td>
</tr>
<tr>
<td>PR</td>
<td>Less first-pass effect than oral</td>
<td>30 to &lt;100</td>
</tr>
<tr>
<td>Parenteral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Most rapid onset</td>
<td>100 (by definition)</td>
</tr>
<tr>
<td>IM</td>
<td>Large volumes often feasible; may be painful</td>
<td>75 to ≤100</td>
</tr>
<tr>
<td>SC</td>
<td>Smaller volumes than IM; may be painful</td>
<td>75 to ≤100</td>
</tr>
<tr>
<td>Inhalation</td>
<td>Often very rapid onset</td>
<td>5 to &lt;100</td>
</tr>
<tr>
<td>Transdermal</td>
<td>Usually very slow absorption; used for lack of first-pass effect; prolonged duration of action</td>
<td>80 to ≤100</td>
</tr>
</tbody>
</table>

PO = oral; PR = rectal; IV = intravenous; IM = intramuscular; SC = subcutaneous.
• Absorption
  – Bioavailability
  – Lipid solubility
  – Drug Ionization
  – Transportation
  – First-pass effect

• Absorption
  – Ph = weak acids do not ionize so ↑ absorption
  – Lipid Soluble - ↑ cell uptake / absorption
  – Water Soluble - ↓ cell uptake / absorption
  – Coatings – enteric coatings slow stomach acid effect so the drug may be absorbed in the small bowel.
• **Distribution**
  - The process of drug molecules moving into and out of the various tissues of the body generally being carried by the bloodstream.
  - Plasma Protein Binding
  - Tissue permeability – solubility of a drug in tissue
    - Brain – high lipid content. Drugs with high lipid solubility will diffuse more rapidly and to a greater extent than drugs with a low lipid solubility.
  - Blood Flow
    - Well perfused tissues will achieve high tissue concentrations sooner than poorly perfused tissues
      - Brain, heart, kidney > fat, cartilage, bone
Distribution – Where does it go?

Benadryl and morphine both cause nausea and sedation. Both pass BBB and enter brain stem: Vomit reflex and RAS both in medulla

Claritin and other newer antihistamines are less lipid soluble so they do not cross BBB & do not cause sedation

Fat soluble (non-polarized) drugs are absorbed in adipose…..and released later!

• Volume of Distribution – $V_d$

  – Relates the amount of drug in the body to the plasma concentration

  – $V_d = \text{Amount in Body}/\text{Plasma Concentration}$
Elimination (may occur by several mechanisms)

Irreversible removal of the drug from the body

Half-life (T1/2)

Biotransformation

Excretion

Elimination

Half-life

The time required for the blood or plasma concentration of the drug to fall to half of its original level.

It is determined by biotransformation /metabolism and excretion.

4-5 half-lives for >90% of the drug to be eliminated from the body.
Elimination

Biotransformation – Drug Metabolism

The chemical changes that take place in the drug following administration.

The primary location for drug metabolism is the liver.

DMMS enzymes are abundant on hepatic smooth endoplasmic reticulum.

Other organs include the lungs, kidneys, GI epithelium & skin.
Elimination
The liver manages bioconversion of most drugs.
Lipid soluble A → B → C → water soluble D → excreted

Altered liver function will change drug concentrations and duration of action.

Multiple drugs suing the same liver enzyme systems may increase toxicity or effect.
Check cytochrome P450 isoenzymes

Elimination
Excretion
Renal Excretion
Drugs made water soluble by the liver are easily eliminated by the kidney
Renal function declines with age so most drug durations and effects increase in the elderly

Respiratory Excretion
GI Excretion
Pharmacokinetics

- How do we take it
  - Absorption
- Where does it go
  - Volume of Distribution (Vd)
- How long does it stay
  - Biotransformation/Clearance (CL)
- $t_{1/2} \approx \frac{Vd}{CL}$
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Definitions

• **Pharmacotherapeutics** – the study of the use of drugs to prevent, treat, or diagnose disease.

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  – **Pharmacodynamics** – the analysis of what the drug does to the body, including the mechanism by which the drug exerts its effect. Drug indications.
Pharmacodynamics

• What does it do once there
  – Block function (Antagonist)
    • Antihypertensives, NSAIDs, chemotherapy
  – Augment function (Agonist)
    • Antidepressants, Dopaminergic (PK)

Basic Concepts in Pharmacodynamics

**Site of Action** – it is the location within the body where the drug exerts its therapeutic effect.

**Mechanism of Action** – this explains how a drug produces its effects.

**Receptor Site** – the specific location on cells where drugs attach.

**Agonist** – drugs that bind to specific receptors & produce a drug action.

**Antagonists** – drugs that bind to specific receptors but do not produce any drugs action.
  - Competitive
  - Non-competitive
• Pharmacodynamics
  – Drug Receptors
    • Site of action
    • Specificity
    • Mechanism of action
    • Agonist vs Antagonist

  – Dose-Response Relationships

• Drug Receptors
  – Specificity

Figure 2–1. Specificity of a drug for the receptor. The structure of drug “a” allows binding only to receptor “A.” In contrast, the structure of drug “b” allows binding to either receptor “A” or “B.” The conformation of drug “a” is such that this drug would be considered to be specific to receptor “A.”
Cultural Nutritional and Pharmacological Considerations of PT Intervention in the Aging in the Home Health Environment

- Drug Receptors
  - Mechanism of action
    - Signaling Mechanism

![Figure 2-6. Signaling mechanisms for drug effects. Five major signaling mechanisms are recognized: (a) transmembrane diffusion, (b) receptor activation, (c) intracellular signaling, (d) protein phosphorylation, and (e) nuclear translocation.](image)

- Drug Receptors
  - Agonist vs Antagonist

![Figure 4-5. Drug classification: agonist versus antagonist. The antagonist (blocker) prevents the agonist from binding to the receptor and exerting a physiologic effect.](image)
Dose – Response Relationship

- **Dose-Response-Curve** – the relationship between the dosage of a drug and a specific response to the drug.
  - Threshold dose
  - Ceiling effect or Maximal efficacy

![Dose-Response-Curve Diagram]

Basic Concepts in Pharmacology

- **Potency** – it is a measure of the strength, or concentration, of a drug required to produce a specific effect.
Basic Concepts in Pharmacology

- Patient A has hypertension averaging 150/90 – Which drug would work best for him?
- Patient B has hypertension averaging 190/100 – Which drug would work best for him?

Graded dose-response curves for 3 drugs differing in maximal efficacy and potency. (Emax = maximum effect)
Basic Concepts in Pharmacology

**Median effective dose (ED50)** – the dose at which 50% of the population respond.

**Median effective concentration (EC50)** – the dose at which 50% of the maximum effect is achieved.

**Median toxic dose (TD50)** – the dose at which 50% of the population demonstrate an ASE.

**Median lethal dose (LD50)** – the dose at which 50% of the population die.

**Therapeutic Index** - the ratio of the TD50 to the ED50. It gives an estimate of the relative safety of the drug.

The greater the value of the TI, the safer the drug is considered to be.
Quantal dose-response curve for the therapeutic and toxic effects of a drug. TI = 1600/200 = 8

**Therapeutic Index**

- Assessment of clinical efficacy compared to toxicity
- TI = (TD\(_{50}\))/(ED\(_{50}\))
  - Closer to 1 more toxic the drug
- Medications
  - Warfarin, theophylline, digitalis, cyclosporine, cyclophosphamide, others
• **Clinical Relevance of These Basic Principles**
  – Individual Variation
    • Age
    • Genetic make-up
    • Body weight & composition
    • Physiological variables
      – Drug interactions
    • Pathological factors
      – Disease

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**General Principles of Pharmacotherapeutics**

The Elderly
• The physiologic contexts in which these pharmacological principles operate are different in the elderly.
  – Pharmacokinetics
  – Pharmacodynamics

Drug Therapy in the Elderly

• General changes in the lives of older people have significant effects on the way drugs are used:
  – Multiple diseases
  – Nutritional problems
  – Reduced financial resources
  – Decreased dosing compliance
  – Physiological effects of aging
• Pharmacokinetic changes in the elderly
  – Absorption
    • Altered nutritional habits
    • Greater consumption of OTC drugs or multiple drug therapies
    • Changes in gastric emptying
  – Distribution
    • Reduced lean body mass with increased % body fat.
  – Metabolism
    • Alter metabolism rates due to changes in enzyme production and decreased liver blood flow.
  – Elimination
    • Decline in renal functional capacity is very critical.
Effects of age on hepatic clearance of some drugs

- Age-related decrease in hepatic clearance found:
  - Alprazolam
  - Barbiturates
  - Diazepam
  - Imipramine
  - Propranolol
  - Quinidine
  - theophylline

- No age-related difference found:
  - Ethanol
  - lidocaine
  - Lorazepam
  - Prazosin
  - Salicylate
  - warfarin

- Pharmacodynamic changes
  - Decrease in sensitivity to the actions of a few drugs
    • Beta stimulants
  - Increase in sensitivity to the actions of many drugs
    • More sensitive to some sedative-hypnotics and analgesics
• Major drug groups showing altered effects in the elderly
  – Sedative hypnotics
    • Increase in half-life
  – Analgesics
    • More sensitive to the respiratory side effects
  – Antipsychotics & Antidepressants
    • Sedation - common desired side effect but not always ethical
  – Antihypertensive drugs
    • To avoid drug-drug interactions, diet and sodium reductin a must
  – NSAIDs
    • Irreversible renal damage
  – Steroids
    • Dose and duration-related osteoporosis
Commonly Prescribed Medications in Patients Receiving Therapy.

- Analgesics / Pain Medications
- Anticoagulants
- Cardiovascular Medications
  - Antihypertensives
  - Diuretics
- NSAIDs
- Skeletal Muscle Relaxants
- Steroids
- CNS Drugs
  - Sedative / Hypnotics
  - Tricyclic Antidepressants
  - Psychotropics
  - Antidepressants
  - Diabetic Drugs
  - Gastrointestinal Drugs
Polypharmacy Definition

- Too many medications or use of unnecessary drugs
- Use of more than one medication to treat a specific pathophysiology
- World Health Organization
  - Five or more medications used empirically
    - Polypharmacy (> 5)
  - Excessive polypharmacy (>10 medicines)

Geriatric Statistics

- Most common drug classes taken
  - Cardiovascular & CNS
- Number of medications (average)
  - Community dwelling = 7
  - Institutional care = 11
- Increase from 1998 to 2003
  - ↑ in mean number of medicines from 6 to 8
  - Prevalence of polypharmacy (> 5 drugs) from 54% to 67%
  - Prevalence of excessive polypharmacy (>10 drugs) from 19% to 28%
Adverse Effects Statistics

• Frequency of Adverse Event
  – Cardiovascular 33%
  – CNS 28%
  – Musculoskeletal 10%
  – Other 29%

• 95% were predictable AE

Causes of Adverse Effects

• Pharmacokinetic
  – ↑ total body fat ⇒ ↑ Vd & t_{1/2} lipophilic drugs
    • CNS drugs, amiodarone (Cordarone), Ca^+ channel blockers
  – ↓ total body water and lean muscle mass ⇒ ↑ blood concentration of hydrophilic drug
    • Digoxin (Lanoxin), NSAIDs, some DMARD
  – ↓ hepatic biotransformation or ↓ renal function ⇒ ↑ blood concentration or ↑ t_{1/2} of many drugs
### Causes of Adverse Effects

- **Pharmacodynamic**
  - Pt has ↓ compensatory cardiovascular responses
    - Drugs: cause orthostatic hypotension or ↓ cardiac function
  - Pt has ↓ compensatory balance responses
    - Drugs: ↑ sedation, delay psychomotor response, inhibit visual function

### Orthostatic Hypotension

- Entacapone (Comtan): Anti-Parkinson drugs
- Meperidine (Demerol): most opiates
- Olanzapine (Zyprexa): atypical neuroleptics
- Chlorpromazine (Thorazine): Phenothiazine
- Tizanidine (Zanaflex): $\alpha_2$ agonist, antispastic drug
- Alprazolam (Xanax): benzodiazepine
- Phenytoin (Dilantin): many antiseizure drugs
- All antihypertensives except
  - ACE inhibitors, ARB, Clonidine
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Cardiac Function - Arrhythmias

- Selegiline (Emsam/Eldepryl): MAO\(_{A(\text{II})B(\text{II})}\) Inhibitor
- Albuterol (Proventil): Beta\(_2\) Agonist
- Benztropine (Cogentin): Anticholinergic PK
- Carbidopa + L-Dopa (Sinemet): Anti-PK drug
- Propafenone (Rythmol): Most Class 1-4 AA
- Paroxetine (Paxil): Some SSRI
- Trospium (Sanctura): Anticholinergic
- Digoxin (Digitek): Cardiac Glycoside
- Propranolol (Inderal): Most Beta Blockers
  - Acute withdrawal

CNS Effects

- Sedation & Delayed Psychomotor Response
  - Codeine: opiate analgesics
  - Valproic Acid (Depakene): most antiseizure drugs
  - Eszopiclone (Lunesta): sedative/hypnotics
  - Nortriptyline: TCA antidepressants
  - Olanzapine (Zyprexa): many neuroleptics
  - Topiramate (Topamax): most antispastic drugs
  - Chlorzoxazone (Parafon-Forte): muscle relaxants
  - Dimenhydrinate (Dramamine): antihistamines
  - Clonidine (Catapress): alpha\(_2\) agonist
  - Apomorphine (Apokyn): some anti-PK drugs
Diplopia, Blurred Vision or Nystagmus

- Alprazolam (Xanax): benzodiazepines
- Most antispastic & antiseizure medications
  - Tizanidine (Zanaflex), Topiramate (Topomax)
- Methocarbamol (Robaxin): many muscle relaxants
- Ropinirole (Requip): few dopamine agonists (PK)
- Benztropine (Cogentin): anticholinergic PK drugs
- Solifenacin (Vesicare): anticholinergic (bladder)
- Aripiprazole (Abilify): most neuroleptics
- Bupropion (Wellbutrin): most antidepressants

Decreased Muscle Function/Force

- Hypokalemia: cramps, weakness, fatigue
  - Furosemide (Lasix): loop diuretics
  - Chlorothiazide (Diuril): thiazide diuretics
- Hyperkalemia: cramps, weakness, fatigue
  - Amiloride (Midamor): K sparing diuretics
- Chronic Use results in ↓ mass
  - Prednisolone: glucocorticoid
- Many antispasm, antispastic & antiseizure
  - Cyclobenzaprine (Flexeril), Gabapentin (Neurontin), Carbamazepine (Tegretol)
Pulmonary Function

- Depress CNS respiratory drive
  - Oxycodone (Oxycontin): opiate analgesics
  - Sedatives/hypnotics/anxiolytics/antiseizure
    - Lorazepam (Ativan), Phenobarbital, Zolpidem (Ambien, rare), overdose most antiseizure med
  - Antispastic/Antispasmodic drugs
    - Baclofen, Carisoprodol (Soma)
    - Ethanol
- Bronchoconstriction
  - Bisoprolol (Zebeta): Most Beta blockers
  - Nicotine: smoking

Chronic Adverse Effects

- Hypoglycemia: (Beta blockers ↓ recognition)
  - Insulin, most oral hypoglycemics

- Decreased wound healing:
  - Dexamethasone (Decadron), Methotrexate (Rheumatrex), Phenytoin (Dilantin)

- Osteoporosis
  - Methylprednisolone (Solu-Medrol), Thyroxine (Synthroid), Phenytoin (Dilantin), Ethanol
### Drug-Drug Interactions

- **Augment each other**
  - Cardiac dysfunction
    - Digitalis & furosemide
    - (Telmisartan or Enalapril) & Propafenone
    - (Telmisartan or Enalapril) & Spironolactone
  - Orthostatic hypotension
    - Diltiazem & Amitryptiline
    - Methyclothiazide & Oxycodone
  - Severe hypotension
    - Sildenafil & nitroglycerin

- **Antagonize each other**
  - Bronchoconstriction vs arrhythmia
    - Esmolol vs Albuterol
  - Pseudoparkinsonism vs Psychosis
    - Haloperidol vs L-DOPA
  - Hypo- vs Hyper-Glycemia
    - Metformin vs Albuterol
    - Pioglitazone vs Prednisolone
  - Hypo- vs Hyper-lipidemia
    - Rosuvastatin vs Methylprednisolone
Cultural Nutritional and Pharmacological Considerations of PT Intervention in the Aging in the Home Health Environment
Case Study 1- Ankle Fracture

- **Brief History:** Mrs B is an 82-year-old female lives with her daughter, and requires moderate assistance in her activities of daily living. She is fluent in Spanish can understand some English if spoken slowly.

- **PMHX:** non-insulin-dependent DM-requiring meds PO, osteoarthritis, HTN, ischemic heart disease, CHF, chronic pain and constipation, moderate dementia.

- Mrs B recently suffered a bimalleolar fracture following a fall for which she was casted requiring no surgery.
Case Study 1- Ankle Fracture

- Complications post fall include cellulitis in right LE due to heel decubiti, and Stage 3 decubiti in buttocks area. She also had hypotension and increased confusion.

- Meds: Rythmol, Lyrica, Bumex, Potassium, Norvasc, Plavix, Metropolol, Celebrex, Trazadone, Cymbalta, Namenda

Case 1: Ankle Fracture

- The patient had pain in bilateral extremities as well as buttocks area after sitting for a few minutes. Trunk extension was limited due to pain.

- At the activity level, patient had limited function with sit-to-stand, bed mobility, and transfers and required max assistance with all.

- At the participation level, patient stated she was unable to assist with any mobility or things like cooking or cleaning and felt very useless as he had to rely on others to take care of these issues. The patient had limited mobility and pain resulting in limited function secondary to a fracture and decubiti.
Case 2 – PVD, Diabetes, HTN, s/p Angioplasty

• Brief History: FN is 64 y/o female, 158 lbs, 5’2” tall with diagnosis of PVD, Diabetes, HTN, and s/p angioplasty.

• Following angioplasty of the right superficial femoral artery, she received 3 days of PT in the Acute Care Hospital. She was d/c to her home and was referred to Home Health PT for evaluation and intervention as indicated.

Case 2 – PVD, Diabetes, HTN, s/p Angioplasty

• Patient is a recent immigrant from North Africa. She lives with her son, daughter-in-law and three grandchildren in a two story home. She is Muslim and Arabic is her primary language. She non-English speaking and requires family to interpret.

• Her daily medications includes: Insulin, Pletal, Atrovastin, Carcedilol, Losartin, and Furosemide. Her family state that at times it is difficult to convince patient to take her medication. Diabetic diet was recommended by the nutritionist at the hospital, but patient states she prefers to eat what the family eat and not the recommended diet.
Case 2 – PVD, Diabetes, HTN, s/p Angioplasty

- Body function & structure level: through her interpreter, patient states she has numbness and tingling and complains of pain in both legs - left more than right leg.

- She also states “I am very weak and fall often”. PT examination indicates weakness of both lower extremities, poor balance, poor endurance; and impairment of cardiovascular, peripheral nervous systems, the integument, and mild impairment of vision.

- Activity level: through her interpreter patient states “I am not able to walk and I have to rest often. I am not able to climb stairs and unable to leave the house. Patient is severely limited in self care, walking, and stair-climbing.

Case 2 – PVD, Diabetes, HTN, s/p Angioplasty

- Participation level: patient indicates, she is unable to help with the house chores, prepare meals and help care for the children.

- She states – “I am a burden to my son and his family.” Patient is dependent in all her domestic life. Further, she states she is unable to leave the house, and misses socializing with friends. Family state that “patient is lonely c/o she feels isolated.”
Brief History: N.B. is a 72-year-old Japanese female with a primary diagnosis of chronic stroke secondary to a left cerebrovascular accident five years ago with resultant right lower extremity hemiparesis and right upper extremity (Neuromuscular Preferred Practice Pattern 5D). Patient is 5'2" and weighs 180 lbs.

The patient initially received rehabilitation immediately following the onset of stroke in an acute inpatient rehabilitation facility for approximately 8 weeks. She was discharged to home where she lives with her husband who is a retired physician.

Case Study 3 - CVA

- She notes she was able to walk initially after discharge from the inpatient rehabilitation facility for limited distances with a large base quad cane and was able to take care of personal hygiene care but did need assistance for dressing if she was required to get dressed quickly.
Case Study 3 - CVA

**Brief History (con’t):** She states she would like to participate in her social activities including weekly lunch with friends and participation in three bridge groups. She also states that she has started a diet to lose weight. She has been referred to home health physical therapy as she believes she has more potential for improving her functional abilities and overall endurance so she can get out of her home. She noted she wanted to get good enough with her walking to use a fancy cane.

Significant past medical history includes a myocardial infarction 3 years prior to the onset of stroke requiring coronary artery bypass graph x 2.

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Case Study 3 - CVA

**Brief History (con’t):** Her medications at this time include the following: propranolol hydrochloride (Inderal®) 100 mg bid, verapamil hydrochloride (Calain-SR®) 200 mg bid, chlorothiazide (Diuril®) 250 mg daily, and aspirin daily.

She states she has been well controlled on this regimen for several years with no major problems. She began a therapy intervention of activity focusing at all three levels of the ICF disablement model (i.e., body functions and structures level, activity level, and participation level) and was making improvements at all three levels.
Case Study 3 - CVA

- **Problem/Influence of Medication:** On this particular day of therapy she reported that approximately five days ago (over the weekend) she developed vertigo and, as she has had this before, it presented just like it did before.

She stated that any rapid change in position caused dizziness and the room appeared to get dark and spin. She stated she contacted her primary care physician, who has been her physician for 15 years, by phone. He prescribed for her meclizine hydrochloride (Antivert®) 25 mg daily (antihistamine), which is commonly used to treat acute vertigo.

She stated that even though she had been taking it for 5 days it had not helped and her vertigo was still a major problem and she was not sure how much she could do on this day of therapy.
Case Study 3 - CVA

- Upon physical examination, the patient was able to ambulate independently with her straight cane but walked at a much slower pace than on previous therapy sessions.

- Blood pressure taken in standing after a few minutes of walking was 110/80. Blood pressure sitting was 116/85. In supine blood pressure was 124/80. There were no major changes in her physical examination related to her physical therapy diagnosis of stroke.

Case Study 3 - CVA

Cardiovascular responsiveness was evaluated by the following: the patient was asked to lie supine and then to come to sitting for several trials where her blood pressure was monitored.

The patient complained of the dizziness with each trial however the dizziness would subside in a few minutes. Blood pressure taken immediately after obtaining a sitting posture was 100/60. This same examination was repeated with the activity of going sit to stand. Again, blood pressure taken immediately after obtaining a standing posture decreased drastically, taking a few minutes to rebound.